Sociocultural concepts of pandemic influenza and determinants of community vaccine acceptance in Pune, India

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Let us read, and let us dance; these two amusements will never do any harm to the world

~Voltaire

Table of Contents

List of Appendices

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Summary

The World Health Organization (WHO) estimates a worldwide burden of three to five million cases of severe illness and 250,000-500,000 deaths from influenza every year. Influenza occurs in two epidemiological forms: epidemics and pandemics. An epidemic is more localized, as observed with seasonal influenza outbreaks, as a large proportion of the population possesses cross-reacting antibodies against recent variants of the virus. Hence, severe disease and deaths occur primarily among young children, the elderly, pregnant women and persons with other underlying disease conditions. An influenza pandemic, on the other hand, is a large-scale worldwide outbreak of the disease. Pandemic influenza results from the emergence of a new subtype of influenza virus to which the population has no pre-existing immunity. The entire population, including young and healthy adults, may be affected and mortality tends to be higher during pandemics as compared to local epidemics. A pandemic in 1918, called the 'Spanish flu', is believed to be the most devastating disease outbreak in recent history and resulted in 20-50 million deaths. The first influenza pandemic of the 21st century, commonly referred to as 'swine flu', was declared in June 2009 when outbreaks caused by the novel influenza A (H1N1) virus reached pandemic proportions. Although the 2009 pandemic was less severe than expected, it still resulted in an estimated 300,000 deaths worldwide. Other estimates indicated that as many as 200 million cases occurred globally.

India was affected by the 2009 influenza pandemic. The district of Pune, which suffered a high burden, was considered a hotspot of the pandemic in India. During the pandemic, India officially reported 202,790 cases, of which 2,971 were from Pune. These figures which refer to laboratory confirmed cases are underestimated. Pune is also home to a large vaccine manufacturer that has the capacity to produce intramuscularly injected inactivated influenza vaccine and intranasally administered live attenuated influenza vaccine.

Vaccination is a cornerstone of influenza prevention and community acceptance of a vaccine is a critical determinant of its effectiveness. Limited vaccine uptake

was a problem worldwide during the 2009 pandemic. Consideration of local sociocultural concepts of illness is crucial in understanding vaccine hesitancy and is likely to influence vaccine acceptance. Studies exploring vaccine hesitancy and reasons for poor uptake that limit effectiveness of pandemic response have been largely restricted to high-income settings. Despite acknowledged cross-cultural differences in public response to pandemic influenza and need for country-specific studies, few have been conducted in lower income settings.

The overall aim of this thesis was to study sociocultural features of illness and acceptance of pandemic influenza vaccines from a community perspective in a developing country setting with influenza vaccine production capacity. Research findings are intended to contribute to state-level and national-level policy in India on improving pandemic preparedness and influenza control.

A cross-sectional, mixed-method study was conducted in urban and rural Pune in 2012-2013. Semi-structured interviews were developed based on the explanatory model interview catalogue framework for cultural epidemiology to obtain representative distributions of perceptions of pandemic influenza and the role of vaccines. Vignette-based interviews were administered to community residents (n=436) to study sociocultural features of illness, including illness-related experience, meaning and behaviour. The interview examined awareness, experience and preference amongst available vaccines for pandemic influenza. Anticipated acceptance of pandemic influenza vaccines at different price levels was also assessed and sociocultural determinants of vaccine acceptance were identified with logistic regression models. Complementary components of the data set included quantitative data for comparative analysis and narrative data for qualitative thematic analysis and elaboration. Formative focus group discussions provided insight on the setting and guided development of other instruments. Additional in-depth interviews that elaborated personal experience with pandemic influenza and vaccination, and motivations for vaccine use and potential barriers or hesitancy, complemented the survey.

Descriptive analysis of sociocultural features of pandemic influenza found that a majority considered the illness fatal if untreated, but with treatment 96% predicted a full recovery. A third of respondents identified the illness described in

the vignette as a respiratory illness and more urban respondents (36.7% vs. 16.3% rural) identified the illness as ‘swine flu’. The emotional impact of the illness was considered more troubling than physical symptoms. The most prominently identified perceived causes—‘exposure to a dirty environment’ and ‘cough or sneeze of an infected person’—were more prominently identified by urban than rural respondents. The most prominently identified home-remedy was herbal treatment; more rural respondents suggested reliance on prayer, while symptom relief was more of a priority for urban respondents. Sources of help outside home were government hospitals and private health services, and a general preference for private health facilities was noted. Among those reporting personal or family history of swine flu during the 2009 pandemic, treatment delays were noted.

Community awareness of pandemic influenza vaccines was low (25%). Some respondents did not consider vaccines relevant for adults, but nearly all (94.7%), when asked, believed that a vaccine would prevent swine flu. Reported vaccine uptake was 8.3%; but this needs to be interpreted in context given that vaccines were not available during the first wave of the pandemic in Pune, and when available subsequently, had to be privately purchased. Main themes identified as reasons for uptake of influenza vaccines during the pandemic were having heard of a death from swine flu, health care provider recommendation or affiliation with the health system, influence of peers and information from media. Reasons for non-use were low perceived personal risk, problems with access and cost, inadequate information and a perceived lack of a government mandate endorsing influenza vaccines. A majority indicated a preference for injectable over nasal vaccines, especially in remote rural areas.

Over 93% anticipated accepting a no-cost vaccine for ‘swine flu’ in the future, 91.2% at INR 75, 87.8% at INR 150, 74.1% at INR 500 and 61.7% at INR 1000. Some respondents preferred low-cost over no-cost vaccines due to a lack of trust and scepticism about quality of a vaccine provided for free by the government. Sociocultural determinants of anticipated influenza vaccine acceptance that were positively associated included illness-related concerns about social isolation, contaminants (e.g., germs or dirt) identified as a perceived cause, private-hospital or traditional-healer help seeking, and a higher

income. Humoral imbalances as perceived cause, home remedies and increasing age were negatively associated.

In conclusion, problems with access to vaccines and absence of organised mass vaccination, insufficient government priority and endorsement, and low community awareness limited vaccine coverage during the 2009 pandemic. High acceptability of pandemic influenza vaccines, however, indicates good prospects. Identified sociocultural determinants provide practical suggestions for pandemic preparedness and control using vaccines. Hesitancy arising from a lack of confidence in pandemic influenza vaccines appears to be less of an issue compared to factors including access, complacency, inadequate confidence in the health system and other sociocultural considerations.

This work is a contribution to global advances in the study of vaccine hesitancy and it underscores the value of sociocultural study and community preferences in planning effective vaccine action. Large influenza outbreaks in India in 2015 and local vaccine production capacity highlight a need for government policy to reconsider influenza vaccination priority beyond use in pandemics.

Zusammenfassung

Die Weltgesundheitsorganisation (WHO) schätzt die weltweit jedes Jahr durch Infektionen mit dem Influenzavirus verursachte Krankheitslast auf drei bis fünf Millionen schwere Erkrankungen und 250‘000-500‘000 Todesfälle. Influenza tritt als Epidemie und Pandemie auf. Eine Epidemie, wie im Falle saisonaler Influenza, tritt lokaler auf, da ein grosser Anteil der Bevölkerung kreuzreagierende Antikörper gegen neuere Varianten des Virus in sich trägt. Daher treten schwerwiegende Erkrankungen und Todesfälle primär bei jungen Kindern, älteren Personen, Schwangeren und Personen mit Grunderkrankungen auf. Eine Influenzapandemie dagegen wird durch einen grossräumigen weltweiten Krankheitsausbruch charakterisiert. Influenzapandemien treten nach dem Auftauchen eines neuen Influenzavirus-Subtyps auf, gegen den die Bevölkerung keine bereits vorhandene Immunität besitzt. Dabei kann die ganze Bevölkerung inklusive junge und gesunde Erwachsene betroffen sein, wobei die Mortalität während Pandemien tendenziell höher ist als bei lokalen Epidemien. Die Pandemie von 1918, die ‚Spanische Grippe‘, wird mit 20-50 Millionen Todesfällen als verheerendster Krankheitsausbruch in der jüngeren Geschichte angesehen. Die erste Influenzapandemie des 21. Jahrhunderts, gemeinhin als ‚Schweinegrippe‘ betitelt, wurde im Juni 2009 ausgerufen, nachdem Ausbrüche durch das neuartige Influenzavirus A H1N1 pandemische Ausmasse erreicht hatte. Obwohl die Pandemie von 2009 weniger schlimm als befürchtet ausfiel, verursachte sie doch geschätzte 300‘000 Todesfälle weltweit. Andere Schätzungen gingen von weltweit bis zu 200 Millionen Krankheitsfällen aus.

Indien war durch die Pandemie von 2009 betroffen. Der Distrikt Pune, welcher eine besonders hohe Krankheitslast zu tragen hatte, wurde als Hotspot der Pandemie in Indien angesehen. Während der Pandemie wurden von Indien offiziell 202‘790 Fälle, davon 2‘971 aus Pune, gemeldet. Diese Zahlen beziehen sich auf laborbestätigte Fälle und sind unterschätzt. In Pune befindet sich auch eine grosse Impfstoffherstellerin, welche in der Lage ist, inaktivierte Impfstoffe zur intramuskulären und attenuierte Lebendimpfstoffe zur intranasalen Verabreichung gegen Influenza herzustellen.

Impfen stellt ein wichtiger Eckpfeiler der Influenzaverhütung dar, wobei die Akzeptanz von Impfungen in der Bevölkerung entscheidend ist für deren Effektivität. Ein eingeschränkter Gebrauch von Impfungen stellte ein Problem dar während der Pandemie von 2009-2010. Die Berücksichtigung lokaler soziokultureller Krankheitserfahrungskonzepte ist entscheidend zum besseren Verständnis der Impfunschlüssigkeit und beeinflusst wahrscheinlich auch die Impfakzeptanz. Studien zur Impfunschlüssigkeit oder zum eingeschränkten Gebrauch von Impfungen, beides limitiert eine effektive Antwort auf Pandemien, waren bislang meistens auf Hochlohnländer beschränkt. Obwohl kulturell bedingte Unterschiede in der öffentlichen Antwort auf Influenzapandemien und der Bedarf an länderspezifischen Studien anerkannt sind, wurden nur wenige solche Studien in Ländern mit tieferen Einkommen durchgeführt.

Das Hauptziel dieser Arbeit bestand darin, soziokulturelle Merkmale von Influenzaerkrankungen und die Akzeptanz von Impfungen gegen pandemische Influenza aus der Perspektive der Bevölkerung eines Entwicklungslandes, das über Impfstoffherstellungskapazitäten verfügt, zu untersuchen. Die Erkenntnisse dieser Forschungsstudie sollen den Unionsstaaten und der Zentralregierung in Indien zur Verbesserung der Pandemievorbereitung und der Influenzabekämpfung dienen.

Eine auf einem Mixed-Methods-Ansatz basierende Querschnittsstudie wurde 2012-2013 in urbanen und ländlichen Gebieten in Pune durchgeführt. Es wurden halbstrukturierte Interviews mit Vignetten entwickelt, die auf dem in der Kulturellen Epidemiologie eingesetzten Explanatory Model Interview Catalogue beruhten, um die in der Bevölkerung verbreiteten Wahrnehmungen zu pandemischer Influenza und zur Rolle von Impfungen zu untersuchen. Es wurden 436 Gemeindemitglieder interviewt, um soziokulturelle Merkmale einer Erkrankung, d.h. Krankheitserfahrungen, Bedeutungen und Verhaltensweisen, zu studieren. Das Interview untersuchte Bekanntheit, Erfahrungen und Präferenzen in Bezug auf verfügbare Pandemieimpfstoffe. Die Bereitschaft zum Gebrauch von Pandemieimpfstoffen in Abhängigkeit vom Preis wurde ebenfalls untersucht und soziokulturellen Determinanten der Impfakzeptanz anhand logistischer Regressionsmodelle identifiziert. Der Datensatz beinhaltete sich ergänzende

quantitative und narrative Komponenten zur vergleichenden bzw. thematischen Analyse und Interpretation. Formative Fokusgruppendiskussionen lieferten Einblicke in das Umfeld und halfen mit, die weiteren Forschungsinstrumente zu entwickeln. Zusätzlich durchgeführte Tiefeninterviews zu persönlichen Erfahrungen von Befragten mit Bezug zu pandemischer Influenza und Impfungen sowie zu Motivationen zum Impfstoffgebrauch bzw. mögliche Hürden oder Unschlüssigkeiten vervollständigten die Umfrage.

Deskriptive Analysen der soziokulturellen Merkmale von pandemischer Influenza ergaben, dass eine Mehrheit diese Erkrankung ohne Behandlung als schwerwiegend einschätzte, wobei 96% nach Behandlung von einer vollständigen Genesung ausgingen. Ein Drittel der Befragten identifizierte die in der Vignette beschriebene Erkrankung als Atemwegserkrankung und mehr Befragte aus den urbanen Gemeinden (36.7% vs. 16.3% in ländlichen Gemeinden) identifizierten die Erkrankung als ‚Schweinegrippe'. Emotionale Auswirkungen einer solchen Erkrankung wurden als beunruhigender eingeschätzt als körperliche Symptome. Die am prominentesten wahrgenommenen Ursachen — ‚Exponiertsein gegenüber einer dreckigen Umwelt' und ‚Husten oder Niesen einer infizierten Person' — wurden mehr von urbanen statt ländlichen Befragten geäussert. Als Hauptbehandlungsoptionen zu Hause wurden pflanzliche Behandlungen identifiziert; während ländliche Befragte eher auf Gebete hinwiesen, wurde die Linderung von Symptomen unter den urbanen Befragten prioritärer angesehen. Ausserhalb des Haushalts wurde Hilfe in öffentlichen Spitälern und privaten Gesundheitseinrichtungen in Betracht gezogen, wobei letztere von den meisten bevorzugt angegeben wurden. Bei den Befragten, welche angaben, selber (oder Mitglieder aus deren Familien) während der Pandemie von 2009 an der Schweinegrippe erkrankt zu sein, wurden Verzögerungen in der Behandlung bemerkt.

Das Bewusstsein für Pandemieimpfungen in den befragten Gemeinden war niedrig (25%). Einige schätzten Impfungen für Erwachsene als nicht wichtig ein; jedoch glaubten fast alle (94.7%), nachdem sie befragt wurden, dass man die Schweinegrippe durch Impfungen verhindern kann. Gemäss eigenen Angaben hatten sich 8.3% impfen lassen; dies sollte mit Vorsicht interpretiert werden, da in Pune während der ersten Welle der Pandemie keine Impfstoffe verfügbar

waren und danach erhältliche Impfstoffe aus dem eigenen Sack bezahlt werden mussten. Hauptgründe, warum man sich während der Pandemie impfen liess, waren folgende: von einem Todesfall wegen Schweinegrippe gehört, von Gesundheitspersonal empfohlen oder im Gesundheitssystem tätig, Peerinformation und Medienberichte. Gründe, die gegen eine Impfung sprachen, bezogen sich auf ein als niedrig eingeschätztes persönliches Risiko, auf Zugangs- und finanzielle Probleme und auf ungenügende Informationen und die Annahme, dass die Regierung Influenzaimpfungen nicht unterstütze. Eine Mehrheit bevorzugte Injektionen statt nasale Impfungen, vor allem in entfernteren ländlichen Regionen.

Über 93% der Befragten gaben an, in Zukunft eine kostenlose Impfung gegen die ‚Schweinegrippe' zu akzeptieren; 91.2% würden die Impfung für INR 150, 74.1% für INR 500 und 61.7% für INR 1000 kaufen. Einige der Befragten bevorzugten Impfungen, die etwas kosteten, gegenüber kostenlosen Impfungen, da sie wenig Vertrauen hatten bzw. Skeptizismus zeigten gegenüber einer von der Regierung angebotenen Gratisimpfung. Soziokulturelle Determinanten, die positiv mit einer Impfabsicht gegen Influenza assoziiert waren, bezogen sich auf mit der Krankheit zusammenhängende Bedenken wegen sozialer Isolation, auf Kontaminanten (z. B. Keime oder Dreck) als wahrgenommene Ursachen, auf die Behandlung in Privatspitälern oder bei traditionellen Heilern sowie auf höhere Einkommen. Humorale Ungleichgewichte als mögliche Ursachen, häusliche Heilmittel zur Behandlung und zunehmendes Alter waren hingegen negativ assoziiert.

Zusammenfassend kann gesagt werden, dass Probleme mit dem Zugang zu Impfungen und das Fehlen von Massenimpfungen, ungenügende Prioritäten und zu wenig Unterstützung seitens der Regierung, sowie ein niedriges Bewusstsein in der Bevölkerung die Durchimpfungsrate während der Pandemie von 2009 eingeschränkt haben. Jedoch lässt die hohe Akzeptanz für Pandemieimpfungen auf bessere Aussichten schliessen. Die hier ermittelten soziokulturellen Determinanten liefern praktische Vorschläge zur Vorbereitung und zur Bekämpfung von Pandemien mittels Impfungen. Unschlüssigkeit gegenüber Impfungen, welche aus einem Mangel an Vertrauen in Pandemieimpfstoffe entsteht, scheint hier weniger ein Problem zu sein; folgenden Faktoren spielen

eine grössere Rolle: Zugang zu Impfungen, Selbstgefälligkeit, unzureichendes Vertrauen in das Gesundheitssystem sowie weitere soziokulturelle Erwägungen.

Diese Arbeit, die zum globalen Fortschritt im Bereich der Impfunschlüssigkeitsforschung beitragen soll, hebt den Wert soziokultureller Studien und die Relevanz der Berücksichtigung von Bevölkerungspräferenzen bei der Planung effektiver Impfaktionen hervor. Grosse Influenzaausbrüche in Indien im Jahr 2015 zusammen mit lokalen Impfstoffherstellungskapazitäten deuten darauf hin, dass die Prioritäten in den nationalen Strategien zur Influenzaimpfung ausserhalb von Pandemien neu überdacht werden sollen.

सारांश

जागतिक आरोग्य संघटनेच्या आकडेवारीनुसार जगभरातून दरवर्षी ३०-५० लाख लोकं फ्लू मुळे गंभीर आजारी पडतात, तर जवळजवळ २.५ ते ५ लाख लोकं मृत्युमुखी पडतात. फ्लू हा आजार दोन प्रकारात दिसतो, स्थानिक पातळीवरची साथ/उद्रेक आणि खंडव्यापी साथ. स्थानिक पातळीवरची साथ/उद्रेक हा एखाद्या विशिष्ठ ठिकाणापुरता सीमित असतो. दरवर्षी विशिष्ठ ऋतूमध्ये अशा प्रकारच्या साथी दिसून येतात. बहुतांशी लोकांना दरवर्षी साथ घेऊन येणाऱ्या फ्लूच्या विषाणूविरुध्द प्रतिकार शक्ती आलेली असते. परंतु प्रतिकार शक्ती कमी असलेल्या व्यक्ती, म्हणजे मुख्यत्वेकरून लहान मुलं, जेष्ठ नागरिक, गरोदर स्त्रिया आणि रक्तदाब, मधुमेह असे आजार असणाऱ्या व्यक्तीं, यांच्यामध्ये साध्या फ्लूच्या विषाणूंमुळेदेखील गंभीर आजार किवा मृत्यू होऊ शकतो. खंडव्यापी फ्लू म्हणजेच एकाच वेळी जगाच्या वेगवेगळ्या भागात एकाच प्रकारच्या फ्लू आजाराचा झालेला उद्रेक. खंडव्यापी फ्लू हा नवीन प्रजातीच्या फ्लू विषाणूमुळे होतो. ह्या नवीन विषाणूचा सामना करण्यासाठी आवश्यक अशी प्रतिकारशक्ती लोकांमध्ये नसते. त्यामुळे समाजातील सर्व व्यक्तींना, अगदी तरुण आणि सुदृढ व्यक्तींना देखील ह्या आजाराची लागण होऊ शकते. ह्या आजारामुळे होणाऱ्या मृत्यूंचे प्रमाण हे साध्या फ्लूच्या साथीने झालेल्या मृत्यूंच्या तुलनेत खूप अधिक असते. १९१८ साली आलेली खंडव्यापी फ्लूची साथ ज्याला 'स्पॅनिश फ्लू' म्हणून ओळखले जाते, ही अलीकडील काळातील सर्वात भयंकर साथ मानली जाते. ह्या साथीत जवळपास २०-५० लाख लोकं मृत्युमुखी पडले. तर जून २००९ मध्ये इन्फ़्लुएन्ज़ा A H1N1 ह्या नवीन प्रकारच्या विषाणूंमुळे झालेल्या आजाराचा उद्रेक एकाच वेळी जगातील वेगवेगळ्या खंडांमध्ये दिसून आला आणि खंडव्यापी फ्लूची साथ जाहीर करण्यात आली. २१ व्या शतकातील ह्या पहिल्या साथीला 'स्वाईन फ्लू'ची साथ म्हणून ओळखले जाते. जरी २००९ मधील खंडव्यापी फ्लूची साथ अपेक्षेएवढी गंभीर नसली तरी, साधारणपणे ३ लाख व्यक्ती ह्या साथीत मृत्युमुखी पडल्या तर जगभरातून जवळपास २० कोटी व्यक्ती या आजाराने बाधित झाल्या होत्या.

भारताला देखील या २००९ सालच्या खंडव्यापी फ्लूच्या साथीचा सामना करावा लागला. पुणे जिल्हा हा भारतातील खंडव्यापी फ्लूच्या साथीचे केंद्रस्थान म्हणून ओळखला जातो कारण या आजाराचे सर्वाधिक रुग्ण

आणि मृत्यू पुणे जिल्ह्यातून नोंदविले गेले. अधिकृत माहितीच्या आधारे २००९ सालच्या खंडव्यापी फ्लूच्या साथीत भारतातून २०२,७९० रुग्ण नोंदविले गेले त्यापैकी २,९७१ रोगी पुणे जिल्ह्यातून नोंदविले गेले. पुण्यामध्ये एक वेगवेगळ्या प्रकारच्या लसी बनवणारी एक मोठी कंपनी आहे. ह्या कंपनीत फ्लू आजारापासून बचाव करण्यासाठी दोन प्रकारच्या लसी तयार होतात, एक लस इंजेक्शनद्वारे दिली जाते तर दुसरी लस नाकाद्वारे दिली जाते.

फ्लू प्रतिबंधासाठी लसीकरण हा खूप महत्वाचा घटक आहे पण लसीकरणाची परिणामकारकता ही लसीकरणाला असलेली लोकांची अनुकुलता ह्या वरून ठरते. २००९-२०१० च्या खंडव्यापी फ्लूच्या साथीदरम्यान खूप कमी प्रमाणात झालेले लसीकरण ही जगभरात दिसून आलेली समस्या होती. लोकांचा लसीबद्दलचा संभ्रम समजून घेण्यासाठी, आजाराबद्दल असलेल्या स्थानिक सामाजिक-सांस्कृतिक संकल्पना जाणून घेणे महत्वाचे असते. ज्यामुळे कदाचित लसीकरणाचे प्रमाण वाढू शकेल. लसीबद्दल असलेला संभ्रम आणि लसीकरण कमी होण्यामागची कारणे जाणून घेणारे संशोधन अभ्यास हे जास्त करून विकसित देशांमध्येच झालेले दिसतात. खंडव्यापी फ्लूसाठी केलेली उपाययोजना समजून घेण्यासाठी विकसित देशांबरोबरच विकसनशील आणि अविकसित देशांच्या उपाययोजनांचा अभ्यास करण्याची गरज आहे, हे लक्षात येऊनही फारच कमी विकसनशील आणि अविकसित देशांमध्ये अशा प्रकारचे संशोधन अभ्यास केले गेले आहेत.

या प्रबंधाचा सर्वसाधारण उद्देश, ज्या विकसनशील देशात खंडव्यापी फ्लूची लस तयार करण्याची क्षमता आहे अशा देशातील स्थानिक लोकांच्या दृष्टीकोनातून फ्लू आजाराच्या तसेच खंडव्यापी फ्लूच्या लसीच्या स्वीकृती बाबतचे सामाजिक-सांस्कृतिक घटक जाणून घेणे हा होता. ह्या अभ्यासातून आलेले निष्कर्ष खंडव्यापी आजारांचा सामना करण्याची तयारी आणि फ्लू आजार नियंत्रणाच्या दृष्टीने केंद्रीय तसेच राज्य पातळीवरचे धोरण ठरविण्यासाठी मार्गदर्शक ठरतील.

२०१२-२०१३ मध्ये पुण्याच्या ग्रामीण आणि शहरी भागांत संख्यात्मक आणि गुणात्मक संशोधन पद्धतींचा एकत्रित वापर करून एक अभ्यास केला गेला. खंडव्यापी फ्लू नियंत्रणात लसीची भूमिका याबाबत लोकांची मते/संकल्पना जाणून घेण्यासाठी, Cultural Epidemiology या संशोधन पद्धतीत वापरल्या जाणाऱ्या Explanatory Model Interview Catalogue ह्या आराखड्यावर आधारित, मुलाखत अनुसूची तयार

केली. एक छोटी गोष्ट सांगून त्यापाठोपाठ वरील मुलाखत अनुसुचीच्या आधारे, आजाराचे सामाजिक-सांस्कृतिक घटक, आजाराबद्दलचा अनुभव, समज आणि वर्तणूक यांचा अभ्यास करण्यासाठी पुण्यातील ४३६ नागरिकांच्या मुलाखती सर्वेक्षण पद्धतीने घेतल्या गेल्या. या मुलाखतींतून खंडव्यापी फ्लूसाठी उपलब्ध असलेल्या लसींबद्दलची माहिती, जागरूकता, अनुभव आणि पसंती ह्या गोष्टी तपासल्या गेल्या. वेगवेगळ्या किमतींच्या आधारावर भविष्यातील खंडव्यापी फ्लूसाठीच्या लसीची स्वीकार्हता पडताळून पाहिली गेली. संख्याशास्त्रीय विश्लेषण पद्धतीचा (लॉजिस्टिक रिग्रेशन) वापर करून खंडव्यापी फ्लू लसीच्या स्वीकृतीवर परिणाम करणारे सामाजिक-सांस्कृतिक घटक शोधले गेले. ह्या अभ्यासाद्वारे गोळा केलेली काही माहिती ही पूरक माहिती म्हणून वापरली गेली, जसे की तुलनात्मक विश्लेषणासाठी वापरण्यात आलेली संख्यात्मक माहिती तसेच गुणात्मक विश्लेषणासाठी आणि संदर्भ स्पष्ट करण्यासाठी वापरण्यात आलेली गुणात्मक माहिती. ह्या अभ्यासात घेतलेल्या गटचर्चांमधून अभ्यास केला गेला त्या भागाची अधिक माहिती मिळाली तसेच अभ्यासासबंधित माहिती घेण्यासाठीची साधने तयार करण्यासाठी गटचर्चांमधून आलेल्या माहितीचा उपयोग झाला. त्याच बरोबर खंडव्यापी फ्लू या आजाराचे आणि लसीकरणाचे वैयक्तिक अनुभव, लस घेण्यामागची कारणे, अडचणी, संभ्रम समजून घेण्यासाठी काही सखोल मुलाखती घेण्यात आल्या.

खंडव्यापी फ्लूशी संबधित सामाजिक-सांस्कृतिक घटकांच्या विश्लेषणातून असे दिसून आले की, बहुतांशी लोकांच्या मते जर ह्या आजारावर उपचार केले नाही तर मृत्यू उद्भवू शकतो. पण ९६.०% लोकांच्या मते जर उपचार केले तर हा आजार पूर्ण बरा होऊ शकतो. एक तृतीयांश सहभागींनी हा हा श्वसनाचा आजार आहे असे सांगितले, जास्त करून शहरी सहभागींनी (३६.७% विरुद्ध १६.३% ग्रामीण) हा 'स्वाईन फ्लू' आहे असे सांगितले. ह्या आजारामुळे होणाऱ्या शारीरिक त्रासापेक्षा मानसिक त्रास हा अधिक त्रासदायक असल्याचे सांगितले गेले. जास्त ठळकपणे सांगितल्या गेलेल्या आजाराच्या कारणांमध्ये, अस्वच्छ/ घाण परिसर हे कारण प्रामुख्याने सांगितले गेले. ग्रामीण सहभागींच्या तुलनेत अधिक शहरी सहभागींनी बाधित व्यक्तीचा 'खोकला' किंवा 'शिंक' हे आजाराचे कारण सांगितले. अधिक ठळकपणे नोंदविल्या गेलेल्या घरगुती उपचारांमध्ये औषधी वनस्पती/ वनौषधींचा समावेश होता. प्रार्थना करणे हा उपाय ग्रामीण भागामधून अधिक प्रमाणात सांगितला गेला तर लक्षणांपासून आराम मिळणे हे शहरी सहभागींच्या दृष्टीने महत्वाचे होते. घराबाहेरच्या मदतीबद्दल विचारले असता, सरकारी दवाखाना किंवा खाजगी दवाखान्यात जाणार असे सांगितले गेले, पण खाजगी

दवाखान्याला अधिक प्राधान्य दिले गेले. ज्यांनी २००९ च्या खंडव्यापी साथीदरम्यान त्यांना स्वतःला किंवा त्यांच्या घरच्यांना स्वाईन फ्लू झाल्याचे सांगितले, त्यांच्या बाबतीत उपचार मिळण्यासाठी दिरंगाई झाल्याचे लक्षात आले.

खंडव्यापी फ्लूच्या लसीबाबत लोकांमध्ये जागरूकतेचे प्रमाण कमी दिसले(२५.०%). काही सहभागींच्या मते लस ही प्रौढ व्यक्तींसाठी नसते, परंतु बहुतांश सहभागींना (९४.७%) लसीबाबत विचारले असता, लस घेतल्याने स्वाईन फ्लू पासून बचाव होईल असे वाटले. ह्या अभ्यासात प्रत्यक्ष लस घेतलेल्यांचे प्रमाण हे केवळ ८.३% होते, पण खंडव्यापी फ्लूच्या साथीच्या सुरुवातीच्या काळामध्ये पुण्यात लस उपलब्ध नव्हती, ती नंतरच्या कालावधीमध्ये उपलब्ध झाली आणि त्यावेळेस ती मोफत उपलब्ध नसून खाजगी स्वरुपात विकत घ्यावी लागत होती, हा संदर्भ लक्षात घेणे गरजेचे आहे. खंडव्यापी फ्लूच्या काळात लस घेण्यामागच्या मुख्य कारणांमध्ये स्वाईन फ्लूमुळे कुणाचा तरी मृत्यू झाला हे ऐकणे, डॉक्टरांनी लस घेण्याचा सल्ला देणे, आरोग्य सेवांशी कुठल्यातरी प्रकारे संबधित असणे, आजूबाजूचे लोकं आणि प्रसारमाध्यमाचा प्रभाव ह्या कारणांचा समावेश होता. तसेच लस न घेण्यामागच्या कारणांमध्ये स्वतःला आजार होण्याची शक्यता कमी वाटणे, लसीच्या उपलब्धतेबाबत आणि किमती सबंधित अडचणी, लसीबद्दल अपुरी माहिती, शासनाकडून फ्लूच्या लसीकरणाला पुष्टी देणाऱ्या आदेशाचा/ सूचनेचा अभाव ही प्रमुख कारणे होती. बहुतांशी लोकांनी नाकाद्वारे घेतल्या जाणाऱ्या लसीपेक्षा इंजेक्शनद्वारे दिल्या जाणाऱ्या लसीला अधिक पसंती दर्शविली, ह्यात दुर्गम ग्रामीण भागातल्या सहभागींचे प्रमाण उल्लेखनीय होते.

साधारण ९३.०%पेक्षा जास्त सहभागींनी भविष्यात जर 'स्वाईन फ्लू' ची लस मोफत दिली गेली तर आम्ही घेऊ असे सांगितले. तर ९१.२% सहभागींनी रु. ७५/-, ८७.८% सहभागींनी रु१५०/-, ७४.१%सहभागींनी रु. ५००/- आणि ६१.७% सहभागींनी रु. १०००/- या किमतींना लस घेण्याची तयारी दर्शविली. काही सहभागींनी अगदी मोफत मिळणाऱ्या लसीपेक्षा कमी किमतीची लस घेण्यास प्राधान्य दिले कारण त्यांना शासनाकडून मोफत मिळणाऱ्या लसीच्या गुणवत्तेबद्दल शंका होती. एकीकडे, हा आजार झाल्यास इतर लोकांपासून वेगळे राहावे लागणे, आजार होण्याचे कारण 'जंतू किंवा घाण', ह्या आजाराच्या उपचारासाठी खाजगी डॉक्टरांकडे किंवा पारंपारिक उपचार घेणे आणि उत्पन्न, इत्यादी सामाजिक-सांस्कृतिक घटकांमध्ये आणि लस घेण्याला अनुकुलता ह्यात निश्चित

संबंध दिसून आला. तर दुसरीकडे, आजार होण्याचे कारण-प्रकृतीदोष, घरगुती उपचार आणि वय इत्यादी घटक आणि लस घेण्याला अनुकुलता ह्यात नकारात्मक संबंध दिसून आला.

थोडक्यात, लसीच्या उपलब्धीसंदर्भात असलेल्या समस्या आणि सर्वसाधारण लोकांसाठीच्या लसीकरण कार्यक्रमाचा अभाव, शासनाकडून लसीकरणासाठी प्राधान्य किंवा पुष्टी न दिली गेल्याने २००९ सालच्या खंडव्यापी फ्लूच्या साथीच्या दरम्यान लसीचा वापर हा खूप मर्यादित राहिला. या अभ्यासात बहुतांशी लोकांनी खंडव्यापी फ्लूच्या बचावासाठी लस घेण्याची गरज आहे असे सांगितले आहे, यातून भविष्यात लसीकरणाच्या प्रमाणात वाढ होण्याच्या दृष्टीने चांगला वाव असण्याची शक्यता दिसून आली. या अभ्यासातून दिसून आलेले सामाजिक-सांस्कृतिक घटक हे खंडव्यापी आजारांना तोंड देण्यासाठी तसेच या आजारांच्या प्रतिबंधासाठी लसीकरणाचा कसा उपयोग करता येईल याबाबत उपयुक्त सूचना देतात. खंडव्यापी फ्लूच्या लसीच्या उपयोगाबद्दलच्या साशंकतेतून निर्माण होणाऱ्या संभ्रमापेक्षा लसीची उपलब्धी, समाधान, आरोग्य यंत्रणेबद्दल खात्री न वाटणे तसेच इतर सामाजिक-सांस्कृतिक संदर्भ हे लसीच्या वापराच्या दृष्टीने जास्त महत्वाचे आहेत.

जगभरात 'प्रतिबंधात्मक लसी बद्दल असलेल्या दोलायमानतेचा अभ्यास' ह्या विषयासंदर्भात जी नवनवीन प्रगती होत आहे, त्यात सदर संशोधन अभ्यासाने मोलाची भर घातली आहे. या संशोधनाद्वारे परिणामकारक लसीकरण कार्यक्रमाच्या नियोजनासाठी सामाजिक-सांस्कृतिक घटकांचा अभ्यास आणि स्थानिक लोकांकडून लसीला असलेले प्राधान्य ह्यांचे महत्व अधोरेखित झाले आहे. २०१५ साली भारतात मोठ्याप्रमाणावर झालेला फ्लू रोगाचा फैलाव आणि त्याचबरोबर स्थानिक पातळीवर प्रतिबंधात्मक लस तयार करण्याची क्षमता या दोन गोष्टी लक्षात घेता शासनाने आगामी धोरण ठरवताना खंडव्यापी साथीच्या फ्लू खेरीज सध्या फ्लूच्या प्रतिबंधासाठी लसीचा वापर करण्याच्या आवश्यकतेचा पुनर्विचार करावा.

Abbreviations

AIC	Akaike Information Criterion
ARI	Acute respiratory infection
CDC	Centers for Disease Control and Prevention, United States
EMIC	Explanatory model interview catalogue
FGD	Focus group discussion
GP	General practitioner
GVAP	Global Vaccine Action Plan
HA	Hemagglutinin
HIV/AIDS	Human immunodeficiency virus infection / acquired immune deficiency syndrome
HPV	Human papillomavirus
HS	Help seeking
IAP	Indian Academy of Pediatrics
ICMR	Indian Council for Medical Research
IDI	In-depth interview
IIV	Inactivated influenza vaccine
INR	Indian Rupees
KAP	Knowledge, attitudes and practices
LAIV	Live attenuated influenza vaccine
LAIV	Live attenuated influenza vaccine
LMIC	Low-and middle-income countries
MAAS	Maharashtra Association of Anthropological Sciences
MOHFW	Ministry of Health and Family Welfare
NA	Neuraminidase
OCV	Oral cholera vaccine
PC	Perceived causes
PD	Patterns of distress
PPRP	Pandemic Preparedness and Response Plan
RNA	Ribonucleic acid
SAGE	Strategic Advisory Group of Experts
Km	Kilometre
SSI	Semi-structured interview
TB	Tuberculosis
TIV	Trivalent inactivated vaccine
UK	United Kingdom
US/USA	United States of America
USD	United States Dollar
WHO	World Health Organization

List of Figures

List of Tables

CHAPTER 1

Introduction

1.1 Global burden of influenza

Influenza, an acute viral infection, is responsible for substantial mortality and morbidity among persons of all ages, around the world[1]. The World Health Organization (WHO) estimates a worldwide burden of three to five million cases of severe illness and 250,000-500,000 deaths from seasonal influenza every year[2]. An annual attack rate of 5-10% in adults and 20-30% in children is estimated globally for influenza[3]. A recent study estimated that 28,000 adults are hospitalised due to influenza-associated critical illness every year in the United States (US)[4]. Although data on morbidity and mortality from influenza in developing countries are scare, influenza incidence is considered significantly higher in developing countries compared to developed countries. A recent systematic review and meta-analysis estimated that 99% of deaths from influenza-associated acute lower respiratory infections in children under five years of age occur in developing countries[5]. A systematic review of seasonal influenza epidemiology in Sub-Saharan Africa found that influenza accounted for 10% of outpatient and 6.3% of hospital admissions for acute respiratory infections (ARIs) in children[6]. A review from India reported that 1.5%-14.5% of all ARIs were due to influenza[7]. In general, influenza burden in the tropics and subtropics are likely to be underestimated[3,8].

Particular risk groups for influenza include healthcare workers, who have a greater risk of exposure, and those who are at increased risk of developing severe disease resulting in hospitalisation or death[3]. The latter group includes pregnant women, children under five years of age and persons with other medical conditions. Influenza also imposes a significant economic burden on society through productivity and income losses, in addition to direct medical costs[9-12].

Influenza exhibits a seasonal pattern with peak activity during the winter (December through March) in temperate climates[13]. In tropical regions, a seasonal pattern is less pronounced and influenza outbreaks may coincide with rainfall[14], relative humidity[15] and occur throughout the year[3].

1.1.1 Distinction between seasonal and pandemic influenza

Among humans, influenza occurs in two epidemiological forms: epidemics and pandemics[16]. While an epidemic is more localized, as observed with seasonal influenza outbreaks, an influenza pandemic is a large-scale worldwide outbreak of the disease. In an influenza epidemic, a large proportion of the population possesses cross-reacting antibodies against recent variants of the influenza virus. Hence, severe disease and mortality occurs primarily among young children, the elderly, pregnant women and persons with other underlying disease conditions. Pandemic influenza which results from the emergence of a new subtype of influenza A virus or a new strain of a subtype, on the other hand, escapes control by strain-specific immunity in the population[17]. Since there is little or no existing immunity in the population, the novel virus with an efficient capacity for transmission between humans may spread rapidly around the world with high attack rates[18]. The entire population, including young and healthy adults may be affected. Mortality is also typically much higher during pandemics compared to local epidemics[19]. It is currently not possible to predict when the next influenza pandemic will occur[20]. As attention was focussed on H5N1 and on other strains of influenza for causing the next pandemic[17], unexpectedly in 2009 the influenza A (H1N1) virus emerged[21].

1.1.2 The 2009 influenza A (H1N1) virus pandemic

A novel influenza A (H1N1) virus was first identified in Mexico, and the first death from 2009 H1N1 influenza was reported in Oaxaca, Mexico, in April 2009[21,22]. Cases were also identified in California and New York, US, and quickly spread worldwide through transmission between humans[23]. On 11 June 2009, the first influenza pandemic of the 21st century was announced by the director general of WHO[24]. The 2009 influenza A (H1N1) virus was antigenically distinct from other human and swine influenza A (H1N1) viruses, but was found to be derived from viruses circulating in pigs[18,21]. This novel virus was the result of triple reassortment of recent North American H3N2 and classical H1N1 swine

viruses and Eurasian avian-like swine viruses. It contained genetic material from avian, swine and human influenza strains[18]. The strain was initially referred to as 'swine-origin influenza virus' due to its likely swine origin[21]. However, there is no evidence indicating the role of pigs in the spread of the virus among humans[25]. Efficient human-to-human transmission of the virus caused the 2009 pandemic.

The official number of laboratory-confirmed deaths worldwide from 2009 H1N1 influenza reported to WHO was 18,449 for the period between April 2009 and August 2010[26] (Figure 1-1). This number is most likely an underestimate due to difficulties associated with laboratory-confirmed diagnosis, the absence of such laboratories or over-strained facilities in many countries and because most cases were clinically diagnosed rather than laboratory confirmed. A study estimated the actual worldwide burden of the 2009 influenza pandemic at 201,200 deaths from respiratory complications with an additional 83,000 deaths from cardiovascular complications[27]. Other estimates indicate that one out of six Americans had experienced 2009 H1N1 influenza as of December 2009 and that as many as 200 million cases occurred globally[21].

While the overall case fatality rate of the 2009 influenza pandemic in Mexico was estimated to be 0.4%[28], other estimates have been lower[29]. These estimates are all much lower than the 2% case fatality rates for severe pandemics[30]. On the whole, the 2009 pandemic was less severe than expected and the overall mortality was significantly lower than previous pandemics.

However, an important feature of the 2009 pandemic was that it disproportionately affected children and young adults as compared to older persons[23,31-33]. Most hospitalizations were recorded for young children and least for those aged above 65 years; although mortality was highest in the latter group[22,33]. Furthermore, a high burden on critical care services[30] and an economic burden were also imposed by the 2009 pandemic. A study from the Republic of Korea noted considerable socioeconomic burden from the 2009 influenza pandemic in 2009-2010 where total medical costs were 37 times higher than costs for seasonal influenza in 2007-2008[34].

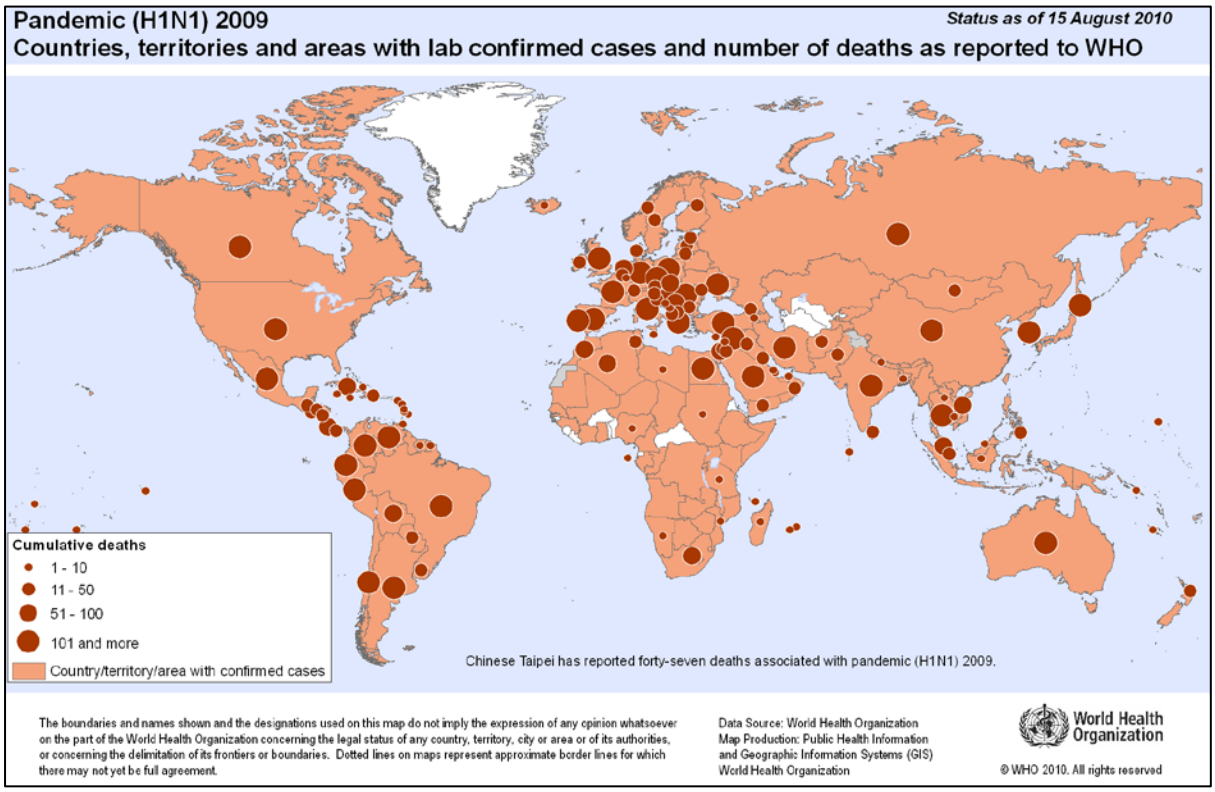

Figure 1-1: Countries reporting pandemic (H1N1) influenza as of 15 August 2010

Source: Adapted from WHO

1.2 History of influenza

Influenza is thought to derive its name from Italian for 'influence'[35]. Sudden and widespread outbreaks in Italy were attributed to cosmic forces or a destructive *influenza* (influence) of the heavens or stars. Descriptions of disease outbreaks quite similar to influenza have been noted from Hippocrates as far back as 412 B.C.E[36]. Historian August Hirsch noted an epidemic described in 1173-1174 C.E as the first clearly defined influenza epidemic, although this identification remains open to debate due to imprecision in depiction of symptoms and lack of a fixed medical identity in ancient chronicles. Medical historians have identified influenza with greater confidence in the 17th century and later from clinical accuracy of descriptions. By the end of the 18th century it was recognized as a distinct disease[35]. In the 18th and 19th centuries, twenty five influenza epidemics are believed to have occurred, and eight are thought to have been influenza pandemics[37].

Until the late 1800's, influenza was considered commonplace and not any more serious than a common cold[35]. Epidemics of influenza in the 1830s that often alternated with cholera brought attention to the disease, as did seminal work by statistician, William Farr, in the 1840s. Farr, who is considered a founding father of surveillance and epidemiology, developed a key concept of calculating excess mortality during certain seasons to demonstrate the impact of influenza[38]. Thereafter, the Russian flu of 1889-1890 which killed 110,000 people in Britain alone, causing panic and dread, transformed the perception of influenza[35].

1.2.1 Influenza pandemics of the 20th century

Three major influenza pandemics occurred in the 20th century. The pandemic of 1918-1919, also known as the 'Spanish flu' is believed to be the most devastating disease outbreak in recent history, resulting in 20-50 million deaths around the world[39]. It was caused by an influenza A (H1N1) subtype and mainly affected young adults. India was considered a focus of this pandemic in terms of mortality, as an estimated 10-20 million people died in the British-controlled provinces of India[40,41].

The next pandemic, popularly known as 'Asian flu' (H2N2 subtype), occurred in 1957-1958[42]. It caused approximately 1-4 million deaths and mainly affected children[43]. The third pandemic, 'Hong Kong flu', resulted in 1-4 million deaths between 1968 and 1969[42]. All age groups were affected by this influenza A (H3N2) virus.

1.3 Clinical and virological features of influenza infections

Influenza is caused by an infection of the respiratory tract and sometimes the gastrointestinal tract. The incubation period of influenza is typically 1-4 days, with an average of 2 days[3,44]. Infected persons can transmit the virus through viral shedding a day before onset of symptoms and up to five days after for adults[45], or right into the second week of clinical disease for infants and young children[46]. Symptoms can include fever, cough, sore throat, runny nose, headache, body ache and marked fatigue. Diarrhoea and vomiting may also be present as additional symptoms and this was seen more commonly during the 2009 influenza pandemic[47]. Secondary bacterial pneumonia is a frequent

complication of influenza, particularly among the elderly and those with certain chronic conditions[48].

1.4 Influenza viruses

Influenza viruses are single-stranded ribonucleic acid (RNA) viruses and belong to the family *Orthomyxoviridae*[49]. There are three types of influenza viruses—A, B and C—determined by their internal nucleoprotein. Influenza A and B commonly cause human disease, while influenza C rarely does[1]. Influenza A viruses tend to cause more severe disease, and are responsible for most seasonal epidemics and all recognized worldwide pandemics. They are diverse and classified into subtypes based on combinations of their surface glycoproteins, namely, hemagglutinin (HA) and neuraminidase (NA). HA allows attachment of the virus to the host cell, while NA digests sialic acid on the host cell surface enabling the virus to gain entry into the host cell[49]. So far, 17 HA and 10 NA proteins have been identified in at least one animal species, but only some subtypes have caused widespread transmission in humans[50]. These are viruses of subtypes H1, H2 or H3, and N1 or N2.

1.4.1 Mechanisms of variation: antigenic drift and shift

Influenza viruses have evolved efficient ways to promote antigenic variability[50]. A high rate of mutations from an error-prone viral RNA polymerase results in wide variability of the HA and NA antigens. Point mutations causing minor changes occur frequently, especially in the HA gene, and accumulate over time. This phenomenon known as antigenic drift, results in individuals lacking immunity to the drifted strain, despite having been previously immune to the original strain. Antigenic drift is responsible for seasonal outbreaks and limited epidemics during inter-pandemic years because a majority of the population have pre-existing antibodies that provide at least partial protection against the virus[17]. Influenza strains have usually undergone antigenic drift in a typical influenza season. A second mechanism of variation, known as antigenic shift, results from re-assortment of genetic material from different influenza A subtypes[50]. The segmented influenza genome allows for mixing of viral genes, and one influenza strain can acquire a new HA or NA gene resulting in a novel virus subtype. Antigenic shift can occur through re-assortment between two or

more different human strains or through cross-species transmission. Antigenic shift is less frequent than drift, but more sudden. It can result in larger epidemics or pandemics, particularly if people lack pre-existing immunity to the new virus and if there is sustained person-to-person transmission.

1.4.2 Influenza virus as a noneradicable zoonosis

Aquatic birds are a known large natural reservoir of influenza viruses[51,52] and they cause no apparent signs of disease in their hosts[53]. Recently, bats have also been identified as a potentially important reservoir for influenza viruses[54]. Influenza A viruses are capable of infecting a range of mammals (e.g., pigs, horses, dogs, cats and marine mammals) and birds in nature or under laboratory conditions[55]. The high rate of mutations, dynamic genetic re-assortment of the segmented genome, and existence in multiple natural reservoirs, suggests that the influenza A virus is a noneradicable zoonosis and will remain a potential threat to the human population[17]. Strategies for eradication of the virus are impractical, and pandemic influenza control through limiting intermingling of wild bird and domestic animal populations may not be feasible. Preparedness for emergence of a novel influenza virus is therefore critical.

1.5 Influenza control strategies

A three-pronged approach is useful in preventing and containing influenza: this includes non-pharmaceutical interventions, treatment with antivirals and vaccination.

1.5.1 Non-pharmaceutical interventions

Non-pharmaceutical interventions are particularly useful in limiting transmission early in a pandemic, before a vaccine has been developed[56]. Non-pharmaceutical means of controlling influenza may include isolation of patients and quarantine of contacts, social distancing through closing school or public gatherings, and hand and respiratory hygiene. Compulsory isolation and quarantine that may limit disease transmission may be impractical and ineffective[57]. School closures have had mixed success and are hence not widely recommended. They have, however, been shown to be effective when implemented early in the pandemic in Hong Kong[58]. Handwashing was very effective in reducing influenza viruses on human hands under controlled conditions[59]. However, a recent systematic review

and meta-analysis found that hand hygiene alone had a modest effect, but in combination with facemasks was efficacious in preventing laboratory-confirmed influenza[60]. Combining non-pharmaceutical measures with use of antivirals and vaccination has been found to be quite effective in influenza control[61,62].

1.5.2 Treatment of influenza

Neuraminidase-inhibiting drugs—oseltamivir, zanzamivir, and more recently peramivir and laninamivir—are recommended by WHO for those requiring antiviral treatment for influenza[3]. For uncomplicated clinical presentation of patients in high-risk groups, or severe clinical presentation in all patients, treatment with oseltamivir as soon as possible, is recommended[63]. Early and widespread treatment with antivirals has been associated with decreased risk of death during the 2009 pandemic[64,65], although recent reviews question the role of antivirals in pandemic influenza control[66,67]. Antiviral treatment may also be used prophylactically[68], however, development of antiviral resistance is a serious concern.

1.5.3 Influenza vaccines

Although non-pharmaceutical interventions and use of antivirals can be effective in slowing the spread of disease, vaccination remains the most effective means for controlling pandemic influenza[56]. Vaccines are thus the mainstay of influenza prevention and a global priority in pandemic response[21,69]. Currently available influenza vaccines include trivalent inactivated vaccines (TIVs) and live attenuated influenza vaccines (LAIVs)[3]. Both types of vaccines contain predicted antigenic variants of two influenza A strains and one influenza B strain. Antigenic characteristics of currently circulating viruses obtained from WHO global influenza surveillance and response system are used to predict the antigenic composition of the vaccines biannually[70].

1.5.3.1 Trivalent inactivated vaccines

TIVs are administered intramuscularly. Vaccine efficacy in individuals under 65 years of age is 70%-90% when the vaccine strain closely matches the circulating influenza viruses[71]. Vaccine efficacy is lower in those above 65 years. TIVs are generally considered safe[72,73]. Transient side-effects may include local reactions at the injection site, fever and malaise. TIVs have been associated with a slight

increase in the risk of Guillain-Barré syndrome (approximately 1-2 excess cases per million persons vaccinated), in certain influenza seasons and mostly among older adults[74,75]. The only influenza vaccines licensed for pregnant women, individuals over 50 years of age and children under 2 years are TIVs. No influenza vaccines are currently licensed for children under 6 months of age. However, TIVs given during pregnancy protect both expectant mothers and newborns against influenza[76], and are a highly cost-effective intervention[77].

1.5.3.2 Live attenuated influenza vaccines

LAIV is administered as an intranasal spray and its use is restricted to healthy persons between 2 to 49 years of age. Vaccine efficacy in healthy children above 2 years of age was 82% against laboratory-confirmed influenza[78]. An additional benefit of LAIVs is community-wide indirect protection when given to school children[79]. LAIVs are considered safe when administered as per indications[80]. Side-effects may include runny nose, nasal congestion or fever[3].

1.5.3.3 Influenza vaccine production

During the 2009 influenza pandemic, the number of doses of monovalent pandemic H1N1 vaccine produced by 1 December 2009 was 534 million[81]. Global influenza vaccine manufacturing capacity is currently higher than ever before[82]. A study assessing current or near-future global capacity in 2010 reported 41 influenza vaccine production facilities distributed over 25 countries[81]. Although a large number of these facilities are located in WHO geographic regions of Western Pacific and Europe, there has also been an increase in the number of production facilities in low-and middle-income countries (LMIC), partly due to a WHO technology transfer initiative launched in 2008 to improve vaccine access in these countries[83]. In 2006, the estimated global annual production capacity of seasonal TIV was 350 million doses, which increased to over 800 million doses in 2010[81]. However, this impressive increase in production capacity may be undermined by insufficient demand, as evidenced by the 1.6 fold increase in production capacity between 2009 and 2011 without a corresponding increase in actual production[84]. Demand for seasonal vaccines in turn affects potential vaccine availability for pandemic influenza vaccination.

1.6 Global perspectives on vaccine hesitancy and acceptance

Ensuring the ability to develop and rapidly produce large quantities of a well-matched and efficacious vaccine has been a focus of pandemic preparedness at the global and national levels. Notwithstanding the importance of these preparedness measures, its availability and clinical efficacy alone may not be sufficient for the vaccine to be effective at a community level.

1.6.1 From vaccine efficacy to vaccine effectiveness: the importance of community acceptance

From epidemiological theory, the basic reproductive number, R_0, is defined as the number of secondary infection cases caused by one primary case of infection introduced into a wholly susceptible population[85]. From a school outbreak in the US early in the 2009 influenza pandemic, an estimate for R_0 ranged between 1.3 to 1.7[86]. Estimates of peak R_0 from April through July 2009 in the Americas varied between countries and ranged from 1.3 to 2.1[87]. The virus from the 1918 influenza pandemic that was considered highly transmissible, had an estimated R_0 of 3-4[88]. Critical vaccination coverage, which is the proportion of susceptible individuals that need to be vaccinated in order to prevent an epidemic or to achieve eradication, p_c, is equal to $1-(1/ R_0)$[89]. Given a perfect vaccine, the critical vaccination coverage using the 1918 pandemic as an example would be 67%-75%. However, critical vaccination coverage is dependent on vaccine efficacy as well as actual coverage in the population. The importance of considering additional dimensions, including community priorities and acceptance, as determinants of community effectiveness of any intervention was proposed by Marcel Tanner in 1990[90]. Factors influencing actual coverage may be viewed through the framework for access that refer to availability, accessibility, affordability, adequacy and acceptability, and includes health system and user dimensions[91]. Effectiveness of the vaccine, which is the multiplicative effect of all these factors and vaccine efficacy, tends to be much lower than expected even when individual factors have relatively high performance[92]. This concept of how interventions lose traction is explained using an example of an intervention with 100% efficacy which finally translates to less than 20% effectiveness at the community level (Figure 1-2)[93]. Similarly, vaccine effectiveness is lower than vaccine efficacy, and in order to improve

effectiveness, user and community acceptance need to be considered, in addition to vaccine efficacy and distribution through the health system.

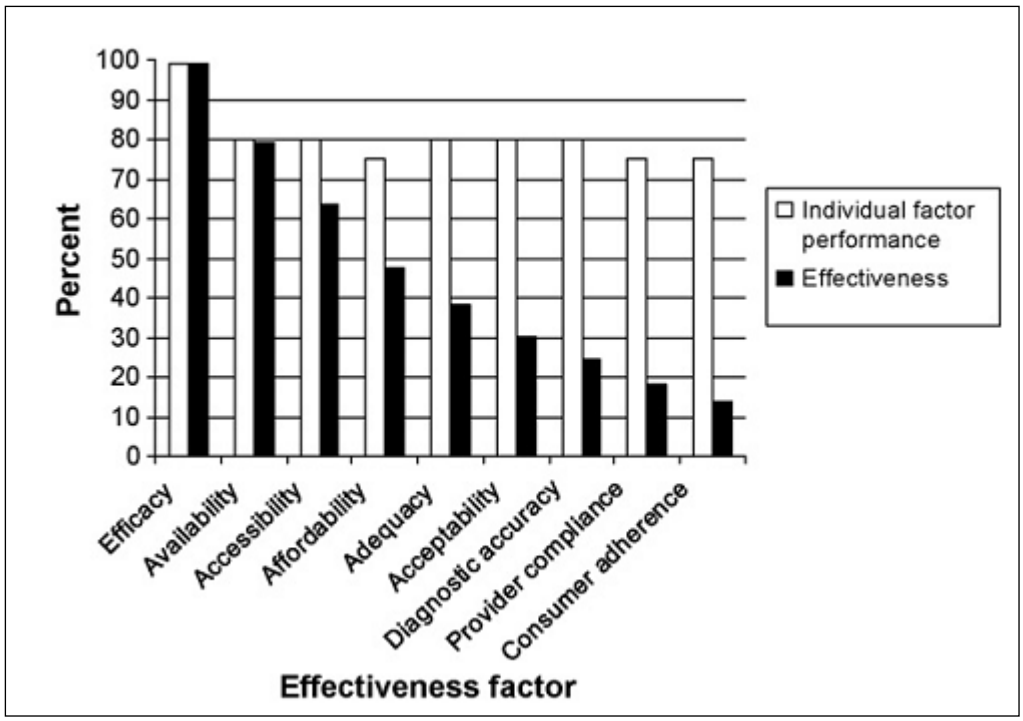

Figure 1-2: From efficacy to effectiveness or how interventions lose traction

Source: Zinsstag et al.[93]

1.6.2 Vaccine hesitancy

Vaccines are considered one of public health's greatest achievements[94]. Evidence demonstrating the benefits of immunization in eradicating diseases and in preventing significant mortality and morbidity is overwhelming[95]. Yet, public concerns and hesitancy towards acceptance of vaccines has been noted around the world for various vaccines. These problems are not new as opposition to vaccination has been noted since introduction of the first vaccine for smallpox[96]. Anti-vaccination movements are thought to have been spawned by compulsory vaccination introduced for smallpox in the mid-1800s[97]. Anti-vaccination groups of today, although considered to have similar beliefs including paranoia, concerns about unnaturalness of vaccines, lack of trust in establishment and false claims of vaccine harm among others, as in the past[97i], now have unprecedented global influence through social networking and the internet[98,99]. Beyond the dichotomous groups of 'vaccine acceptors' and 'vaccine rejecters' are

[i] In 1802, British citizens feared that the smallpox vaccine could turn people into cows.

a large group of persons who lie in the continuum between acceptors and rejecters and may delay vaccines, opt for schedules not backed by scientific evidence and accept only some vaccines but not others. To include this diverse group of individuals in the vaccine acceptance discourse, the term 'vaccine hesitancy' has been accepted in the literature[100]. A systematic review of published literature on determinants of vaccine hesitancy found that a variety of factors were associated with hesitancy and they were context-specific – varying across time, place and vaccines[101]. A definition of vaccine hesitancy put forth by the Strategic Advisory Group of Experts on Immunization (SAGE) Working Group on Vaccine Hesitancy is useful to provide context[102]:

> *"Vaccine hesitancy refers to delay in acceptance or refusal of vaccination despite availability of vaccination services. Vaccine hesitancy is complex and context specific, varying across time, place and vaccines. It is influenced by factors such as complacency, convenience and confidence."*

The near disappearance of many childhood diseases in high-income countries of Europe and North America is thought to have contributed to vaccine hesitancy. Successful implementation of vaccine programmes over the past century has reduced public memory of these diseases and the value of preventing them. Excessive and often unfounded concerns about the safety of vaccines have overshadowed concerns regarding acquiring these diseases and thus, ironically, vaccines have become victim to their own success. While calling for action, Paul Offit emphatically states: *"We've reached a tipping point. Children are suffering and dying because some parents are more frightened by vaccines than by the diseases they prevent. It's time to put an end to this"*[97]. A recent measles outbreak in Disneyland[103] in the US highlights the problem of poor measles vaccination coverage in higher income countries[104] (Figure 1-3).

Figure 1-3: "Do not give measles a chance"

Poster in Basel encouraging measles vaccination highlights the problem of suboptimal measles vaccination coverage in Switzerland. Photograph: N. Sundaram

In developing countries, although many vaccine-preventable diseases are still highly visible, vaccine hesitancy has been documented too. A classic example is the polio eradication campaign using oral polio vaccines in Northern Nigeria in 2003[105,106]. Pressure from local communities and religious and political leaders brought the program to a grinding halt due to rumours that the vaccine was mixed with drugs intended to sterilize young Muslim girls[107]. This had dire consequences globally as the disease thereafter spread to previously polio-free countries such as Sudan and Indonesia. Similarly, a rumour in Cameroon led young girls to fear the tetanus vaccine for it was believed to cause sterility[108]. Other notable examples of vaccine hesitancy are reluctance to accept oral polio vaccines in Pakistan[109] and suspension of the human papilloma virus (HPV) vaccination programme in India[110]. Political, economic, social and cultural influences play a role in influencing vaccine hesitancy. Rumours, personal or religious beliefs and other nuanced perceptions or ideas regarding vaccines highlight the complexity.

1.6.3 Vaccine acceptance

In some contexts, access to vaccines may be challenging due to a number of reasons including unavailability of vaccines, unaffordability of vaccines, lack of vaccination services or difficulties in accessing vaccination services. In such settings, problematic access to vaccination is the main reason limiting vaccine

uptake. Although vaccine hesitancy may also be present, it is not the primary driver, and the definition of vaccine hesitancy excludes these reasons that are not related to behavioural choices[102]. In many low-and-middle income settings, access to vaccination is a major problem limiting uptake. In order to capture the wide range of factors influencing vaccination uptake, including vaccine hesitancy, access and economic considerations, the term 'vaccine acceptance' has been used in this thesis.

In a recent report, Heidi Larson and colleagues characterised vaccine acceptance as the outcome of the following three determinants: convenience, complacency and confidence[111]. The '3Cs' provide a useful conceptual model. Convenience refers to ease of access, and complacency to risk perception of the disease and lack of perceived need for a vaccine. Confidence is defined as trust in the vaccine itself (safety and efficacy), trust in the system that delivers the vaccine, including reliability of health professionals, and lastly, trust in policymakers who make the vaccine recommendations. The report notes that *"understanding vaccine confidence means understanding the more difficult belief-based, emotional, ideological and contextual factors whose influences often live outside an immunisation or even health programme but affect both"*[111].

Additionally, it is widely accepted that consideration of local cultural concepts of illness, and community perceptions of vaccination in their sociocultural context, are crucial for local acceptance of immunization[112-114].

1.7 Vaccine hesitancy and acceptance for pandemic influenza

Poor uptake of vaccines against influenza A (H1N1) was noted during the 2009 pandemic. On one hand, considerable efforts went into scaling up production of vaccine against influenza A (H1N1), and rationing and prioritizing who should be given the vaccine, since supply was limited[115]. On the other hand, problems were noted among those who the vaccine was prioritized for and actively offered to, such as healthcare workers[116-119] and pregnant women[120]. Problems in pandemic influenza vaccine uptake were also noted among the general population across different countries that offered the vaccine[121-124].

A systematic literature review found that factors such as concerns regarding vaccine safety and vaccine efficacy, perceived seriousness of the disease and risk of getting the disease, social pressure, receipt of information from official sources, vaccine recommendation by a healthcare provider, uptake of seasonal influenza vaccines in the past and certain sociodemographic characteristics influenced uptake of pandemic influenza vaccines during the 2009 pandemic[125]. In some settings, the pandemic was perceived as similar to seasonal influenza and was hence not considered much of a threat[126]. A study in Switzerland found that some community members did not consider themselves at risk of pandemic influenza due to perceptions of discipline and individual responsibility of Swiss citizens and national affluence[127]. Mistrust of intentions of the pharmaceutical industry perceived to benefit from the pandemic and a general mistrust in motives of government and WHO were also reported to have negatively influenced vaccination decisions[126]. A review of risk communication during the pandemic reported many of the factors mentioned above and additionally reported factors such as comments by opinion leaders and consulting the internet as negatively influencing vaccination intentions[128].

Differences in national and cultural attitudes regarding the threat of pandemic influenza, and differences in national and public responses, including vaccination behaviour, were observed during the 2009 pandemic[129,130]. Despite cross-cultural differences and an acknowledged need for country-specific studies, relatively little research has focussed on determinants of pandemic influenza vaccine hesitancy and uptake in LMIC. A report by the SAGE working group on vaccine hesitancy further highlights a dearth of published research on vaccine hesitancy in LMIC in general[131]. A particular need for research in LMIC on individual and community determinants and contextual factors influencing vaccination hesitancy has been indicated[132].

1.8 Pandemic influenza and research on influenza and vaccine acceptance in India

1.8.1 Pandemic influenza in India and Pune

Although the exact burden is not known due to poor surveillance in many developing settings, a high burden of disease from 2009 influenza A (H1N1) was borne by LMIC[133,134]. Even within higher-income countries such as Canada, New Zealand and the US, the pandemic had a disproportional impact among minority populations [135]. Murray et al. estimate that if a pandemic of similar severity to the 1918 pandemic were to occur, 96% of deaths would be in developing countries[136]. In India, officially reported data indicated that among the 202,790 persons who were tested for influenza through laboratory confirmation, 23% were positively identified and 6% of cases ended in death[137]. The attack rate was highest among 10-39 year-olds, while the highest case fatality was observed among those between 20-39 years of age, followed by young children under 5 years of age.

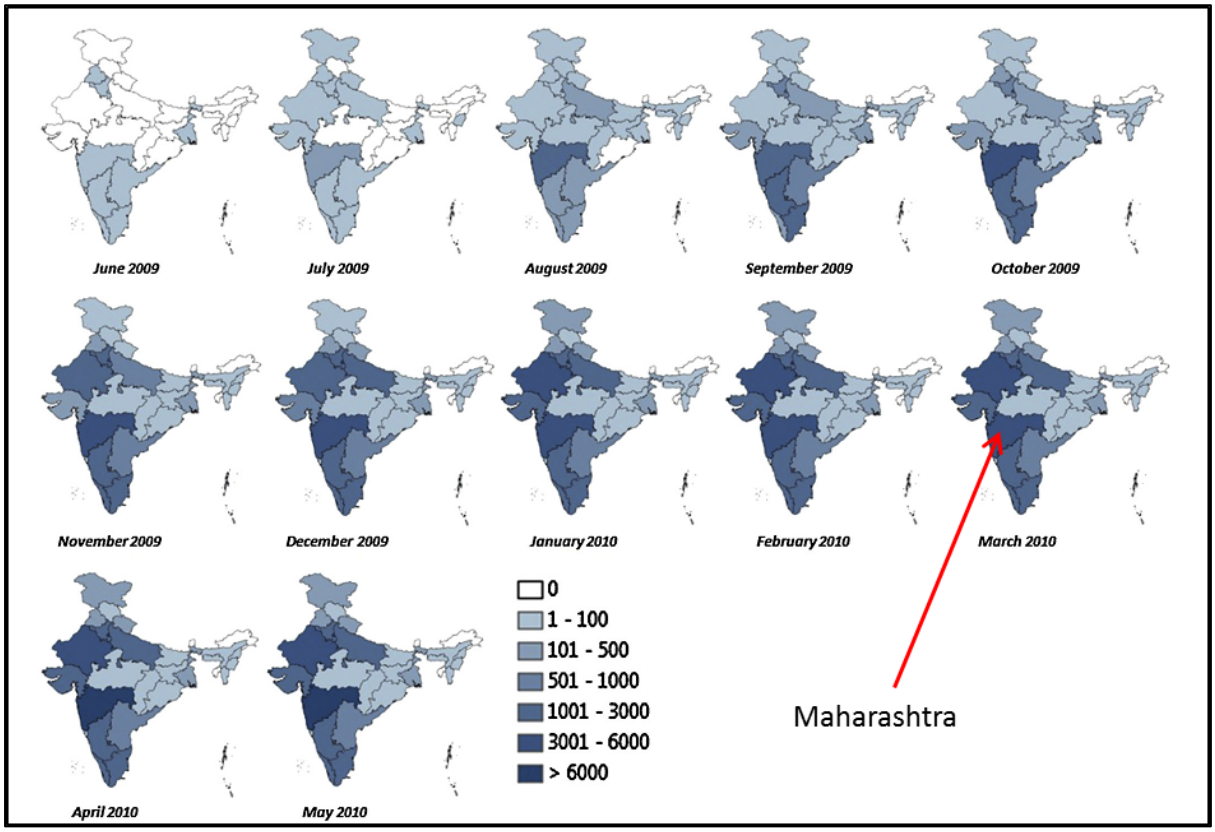

Figure 1-4: Cumulative incidence of confirmed cases of influenza A (H1N1), by month, in India

June 2009-May 2010, Source: Adapted from Ali et al. 2013[143]

Maharashtra was particularly affected (Figure 1-4) and recorded 36% of all 2009 H1N1 influenza-related deaths in the country. In a rural community in Maharashtra, 20% of all hospital admissions in the monsoon period (August 2009 and August 2010) were due to 2009 influenza A (H1N1) viruses[138]. Pune, Maharashtra's second largest city, recorded the country's first death from 2009 H1N1 influenza on 22 June 2009[139] and was considered a hotspot of the 2009 influenza pandemic in India[140,141]. Between June 2009 and August 2010, 246 deaths and 2,971 laboratory-confirmed cases of 2009 influenza A (H1N1) were recorded in Pune[142]. However, similar to other incidence estimates for India, these figures refer to laboratory-confirmed cases only and are therefore likely an underestimate.

1.8.2 Acceptance of vaccines for pandemic influenza in India

Concerns with vaccination on political, social and cultural grounds have been documented since the introduction of smallpox vaccination in India. Reluctance by Hindu groups to accept a vaccine believed to come from cows which are considered sacred, and organized opposition to vaccination by groups involved in variolation who were afraid of losing employment, have been noted[144]. Culturally founded doubts about the efficacy of smallpox vaccination which only caused a mild reaction compared to variolation, have been also been documented[112]. More recently, vaccine hesitancy has been noted for oral polio vaccines[111], HPV vaccines[110], and *Haemophilus influenzae* type b vaccines[145] in India.

Acceptance of pandemic influenza vaccines during the 2009 pandemic in India varied widely. Although vaccines were not made available to the general public by the government, many purchased vaccines privately. Initially there was a high demand for vaccines, leading to stock-outs[146,147]. However, demand waned as time went by; and problems with vaccine acceptance were noted, especially among the high-risk group of healthcare workers to whom vaccines were made freely available by government[148,149].

The Pandemic Preparedness and Response Plan for India acknowledges vaccines as the *"best preventive strategy to combat a pandemic"*[150]. For effective control through vaccine action, it is essential to understand reasons for use or non-use of influenza vaccines and sociocultural determinants of vaccine acceptance.

Willingness to accept a vaccine indicates perceived need and demand. Local ideas of illness and social, cultural and economic factors that are known to influence vaccine hesitancy and uptake require careful consideration.

1.8.3 Limitations in current research on pandemic influenza and vaccine hesitancy in India

Four publications on community concepts of pandemic influenza in India were identified from a literature review. One assessed knowledge and awareness of swine flu among school children in Bareilly, Uttar Pradesh, and found that 98% of students had heard of swine flu and 97% reported masks as useful in preventing swine flu[151]. The second reported knowledge, attitudes and practices (KAP) regarding novel H1N1 influenza and reported insufficient awareness among paediatricians in Chandigarh[152]. The third study conducted among the general population in Udaipur, Rajasthan, was also a KAP study using a self-administered questionnaire and showed that 83% were aware of influenza A (H1N1); but awareness varied on the basis of gender, age and education[153]. The fourth study assessed awareness of persons visiting swine flu screening booths in Belgaum, Karnataka, and found that approximately 50% believed that the disease was transmitted through proximity to pigs and by eating pork[154]. These studies were useful additions to the literature, but did not examine associations of perceptions with vaccination intentions.

Published literature on pandemic (H1N1) influenza vaccine hesitancy or acceptance in India is also scarce, and only four studies were identified. Two studies considered reasons for pandemic influenza vaccine uptake in Pune. The study by Hiremath et al. among healthcare workers found that all participants considered vaccines important, but only 26% took a pandemic influenza vaccine due to safety and efficacy concerns[155]. A KAP study by Pandey et al. among healthcare workers and medical students found a 83% vaccination uptake and most commonly reported reasons for uptake were protecting self, relatives and recommendation by healthcare providers[156]. Two more studies conducted in Tamil Nadu among medical students and healthcare workers examined determinants of pandemic influenza vaccine acceptance and reported a lack of risk perception, and safety and efficacy concerns as limiting uptake[157,158]. These studies were conducted using convenience samples. The instruments used in all

four studies were limited in scope and depth by categories that were used to examine self-reported reasons for vaccine acceptance or refusal and were not guided by ethnographical insight. Moreover, some questions were leading in a detrimental manner with the potential to plant ideas that may not have previously been considered and could adversely affect the vaccine program. For example, a category noted in the self-administered survey by Suresh et al. was "I do not want to be an experimental animal"[157].

Although the literature indicates the nature of interest and approach of various KAP studies in India, many were not well-conducted, and none considered social factors or cultural influences in explaining vaccine acceptance. A careful study of social and cultural determinants of vaccine hesitancy is required. Furthermore, consideration of patterns of behaviour (i.e. intention to be vaccinated) and sociocultural determinants need not be limited to self-reported respondent accounts. Just as the evidence base for risk and treatment of disease relies on study of epidemiological patterns, rather than anecdotal clinical reports, the evidence base for social and cultural determinants of behaviour may also be rooted in evidence, based on study of how illness-, treatment- and vaccine-related experience and meaning are related to behaviour, and with regard to our current interest, the acceptance of influenza vaccine. The approach and methods of cultural epidemiology have been developed to address such questions.

1.9 Overview of research approaches

1.9.1 Cultural epidemiology

Culture has a powerful influence on the understanding of sickness and illness-related behaviour[159]. The framework of cultural epidemiology used in this thesis was developed from integrating the frameworks and methods of anthropology and epidemiology to achieve an effective interdisciplinary collaboration (Figure 1-5)[160]. Classical epidemiology through application of quantitative methods to study of occurrence and determinants of disease has greatly contributed to advances in control and management of diseases for public health. Findings from classical epidemiology, however, are not primarily concerned with context, or clarifying the nature and impact of locally-valid ideas of illness and risk

perception. Such understanding is required to ensure effectiveness of policy at the local level[161]. Medical anthropology focuses on the nature of local illness experience and understanding using ethnography and other largely qualitative methods to gain insights into the influence of social, cultural, historical and political forces affecting illness-related behaviour. However, most anthropological studies do not provide a sense of the distribution of ideas or facilitate comparative interests. Notwithstanding valuable contributions made by both disciplines in furthering the agenda of public health, efforts to integrate them have been limited[160].

Cultural epidemiology was thus developed to integrate the local validity of anthropology and the explanatory power of epidemiology through a mix of qualitative and quantitative research methods. Cultural epidemiology, as defined and operationalised by Mitchell Weiss, is the study of locally valid representations of illness and their distribution—specified by variables, descriptions, and narratives, accounting for illness experience, its meaning, and associated behaviour—in order to clarify the cultural basis of outcomes of practical significance to public health[160].

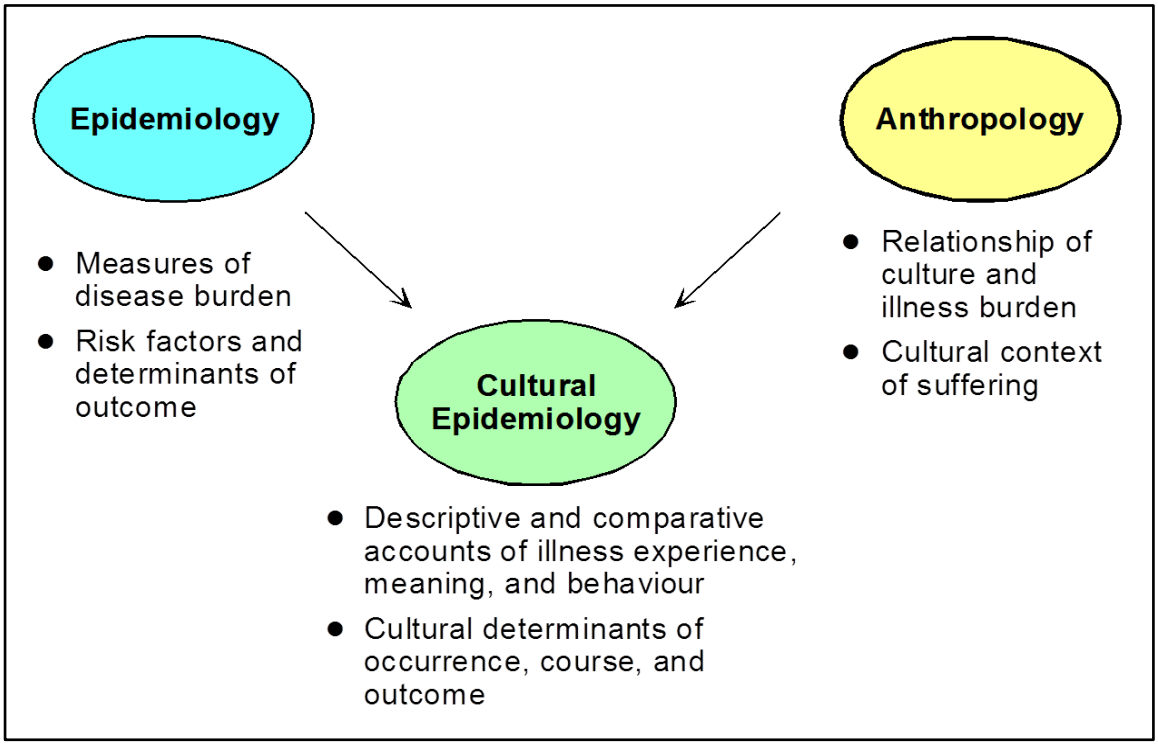

Figure 1-5: Integrative framework of cultural epidemiology

Source: From 'Cultural epidemiology: principles and practice' course by Weiss M.G.

Frameworks that were influential in the development of medical anthropology have been extended for use in cultural epidemiology and they include first and foremost, distinguishing professional orientations (*etic*) from local ideologies (*emic)*. *Emic* constructs, which are referred to as the insider's perspective or a 'bottom-up' approach, are *"accounts, descriptions, and analyses expressed in terms of the conceptual schemes and categories regarded as meaningful and appropriate by the native members of the culture whose beliefs and behaviours are being studied"*[162]. *Etic*, on the other hand, refers to the outsider's perspective or a 'top-down' approach, which are conceptual schemes and categories regarded as meaningful by the scientific observers or professionals. Kenneth Pike formulated these terms by drawing from linguistics and linguistic anthropology[162]. The second influential framework is the distinction between *disease* and *illness*. While disease refers to abnormalities in bodily functions as understood through a scientific paradigm, illness refers to experiences by the patient that are disvalued. Leon Eisenberg, who first made this semantic distinction, noted *that "patients suffer illnesses; physicians diagnose and treat disease"*[163]. Thus a person with asymptomatic hypertension, may have a disease in the absence of illness. The third influential framework was the 'explanatory model' by Arthur Kleinman that gave priority to illness experience, causal explanations, help-seeking, and approach to treatment[164]. This formulation of illness explanatory models was developed to provide cultural validity in clinical practice.

Semi-structured, explanatory model interview catalogue (EMIC) interviews, principal instruments of cultural epidemiological research, are rooted in the explanatory model framework, but allow systematic comparisons and have enhanced operational precision[165]. EMIC interviews assess locally relevant, sociocultural representations of illness—e.g. categories of somatic, emotional, and social symptoms constituting patterns of distress (PD), perceived causes (PC) and help seeking (HS)—from the perspective of affected persons. Local adaptation of interviews is required, so that they are indeed *emic*. They thus refer to a common framework of instruments known collectively as the EMIC to guide locally relevant research, rather than one definitive EMIC interview.

The design of a cultural epidemiological research study begins with careful attention to context and concepts of illness through an ethnographic study. This

is followed by a survey that collects quantitative data for comparative statistical analysis between sub-groups of the study population. The interviews also rely heavily on qualitative narrative data that are useful in clarifying categories and in explaining their role and significance. An analytic component often includes univariable or multivariable analysis to examine the influence of sociocultural features of illness on behaviour. The health-related behaviour in question for this thesis was vaccine acceptance. However, cultural epidemiological studies using EMIC interviews have been carried out in many settings and for a variety of illness conditions such as psychiatric illness and depression[166-169], malaria[170], Buruli ulcer[171], tuberculosis[172,173], HIV/AIDS[174] and diarrhoeal diseases[175-178].

1.9.2 Previous work and current collaboration

The adaptation of EMIC interviews for the study of vaccine acceptance began in 2008 with study of oral cholera vaccine (OCV) acceptance first in Zanzibar[176,179], followed by Kenya[177,180] and the Democratic Republic of Congo[178]. The current study was motivated by an interest in contributing to pandemic preparedness in developing countries by the Initiative for Vaccine Research, WHO. The Maharashtra Association of Anthropological Science (MAAS), a non-governmental organization in Pune, India was selected as a local scientific partner. This research study was developed in partnership with MAAS

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CHAPTER 2

Research aims and objectives

The overall aim of this thesis is to study social and cultural features of acceptance of pandemic influenza vaccines from a community perspective in a developing country setting. Research findings are intended to contribute to state-level and national-level policy in India on improving pandemic preparedness and influenza control.

To achieve the aims of this thesis, research objectives were defined in the study context of Pune, India. Research objectives that have been elaborated in subsequent chapters of the thesis are as follows:

- To examine experience, meaning and behaviour associated with pandemic influenza among urban and rural communities in Pune, India (Chapter 4)
- To determine community awareness, views and hesitancy for nasal and injectable pandemic influenza vaccines (Chapter 5)
- To analyse experience and reasons for vaccination or non-vaccination against H1N1 influenza during the 2009 pandemic (Chapter 5)
- To assess levels of anticipated acceptance of two available influenza vaccines at different levels of cost in urban and rural Pune (Chapter 6)
- To identify social and cultural determinants of anticipated acceptance of pandemic influenza vaccines (Chapter 6)

CHAPTER 3

Study description

3.1 Country and state context

India is the world's second most populous country with over 1.25 billion people and the seventh largest by area[1]. A recent report by the World Bank indicates that India *"has the largest number of poor people in the world, as well as the largest number of people who have recently escaped poverty but are still vulnerable to falling back"*[2]. Although it is categorized as a lower-middle income country[1], India is among the world's fastest growing economies[3]. India has also made progress in life expectancy, education and health[2]. However, despite rapid economic growth and development, income inequality is increasing, gender inequality remains high and society remains highly segmented.

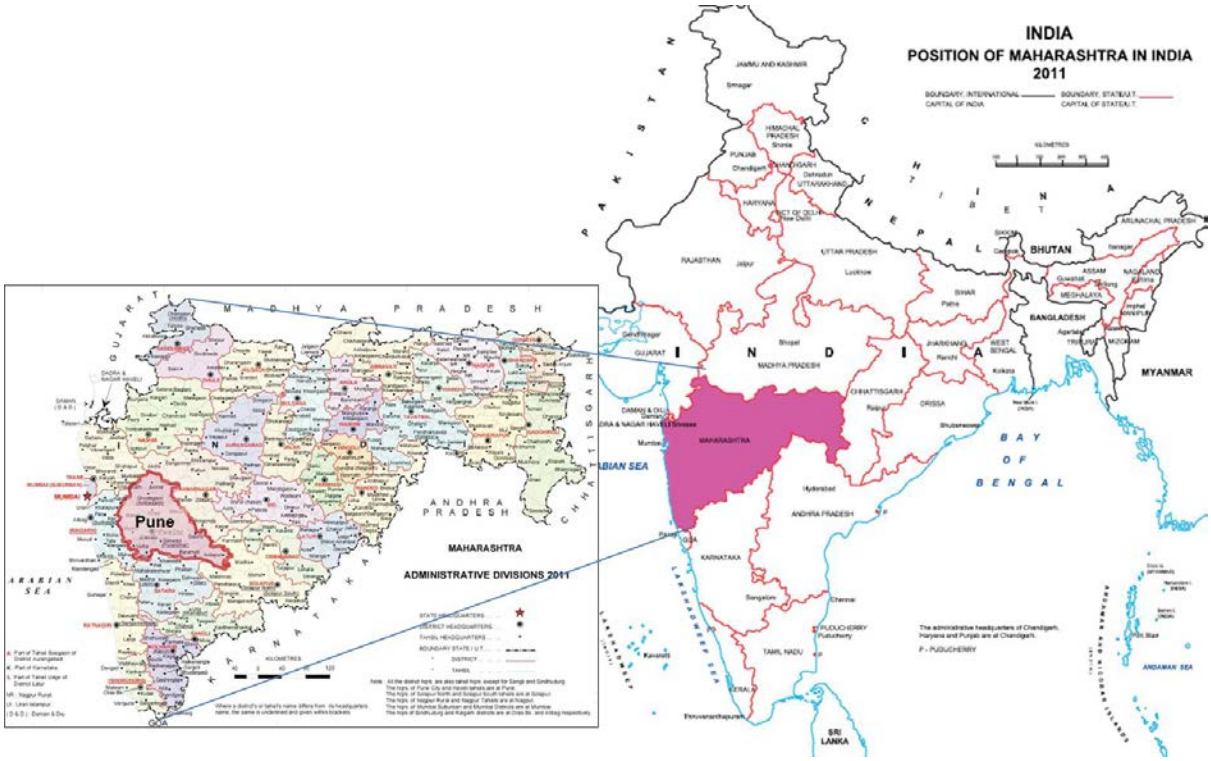

Figure 3-1: Map of India and Maharashtra displaying the location of Pune district[ii]

Source: Adapted from Census of India 2011

[ii] The boundaries and names shown and the designations used on this map do not imply the expression of any opinion whatsoever on the part of the author concerning the legal status of any country, territory, city or area or of its authorities or concerning the definitions of its frontiers or boundaries.

3.1.1 Population and density

The State of Maharashtra, located in Western India, is the second most populous State in the country after Uttar Pradesh[4]. According to the 2011 national census, Maharashtra has a total population of 112,372,972 persons representing 9.3% of India's population[4]. In 2013, Maharashtra comprised of 35 districts[5], of which Thane district with a population of 9.8% was the largest followed by Pune district (8.4%) and Mumbai suburban (8.3%)[4]. The population density of Maharashtra is 365 persons per km^2 as compared to 382 persons per km^2 at the national level[5]. Among districts in Maharashtra, population density is highest in Mumbai suburban (20,980 persons per km^2), followed by Mumbai city (19,652 per km^2) and Thane (1,157 per km^2). Pune district is ranked fourth with 603 persons per km^2.

3.1.2 Sex ratio

Sex ratio, defined as the number of females per 1,000 males, has increased in Maharashtra from 922 in the 2001 census to 925 in the 2011 census[4]. However it falls short of the national sex ratio estimate of 940. The sex ratio for Mumbai and Mumbai suburban are critically low at 838 and 857, respectively. The sex ratio for Pune district (910) also falls below the State average. The sex ratio among 0-6 year-olds is worse; the average for Maharashtra is 883 and for Pune district is 873.

3.1.3 Literacy

Effective literacy was defined in the 2011 census as the ability to read, write and understand at least one language (the definition excludes children under 7 years of age)[4]. By this definition, 82.9% of the population of Maharashtra is considered literate. The literacy rate for men and women in Maharashtra are 89.8% and 75.5%, respectively, which are higher than the national literacy rates of 82.1% and 65.5%. Among districts, the highest literacy rates are found in Mumbai suburban (90.9%) and Nagpur (89.5%). Although Pune district has a relatively high literacy rate (87.2%), it is also home to the largest number of illiterate persons (1,071,181) after Thane (1,354,116) and has a notable gender disparity in literacy rates (92.7% for men vs. 81.1% for women).

3.1.4 Urban-rural features

Of the 9.4 million persons who live in Pune district, 3.7 million (39.1%) live in rural areas and 5.7 million (60.9%) live in urban areas[6]. In comparison to the State, a relatively larger proportion of persons in Pune district live in urban areas (45.2%). Urban-rural inequities have been noted in access to healthcare in Maharashtra[7]. Although the overall healthcare infrastructure in Maharashtra is among the best in the country, a large proportion is catered by the private sector (83.4% based on estimates from 2005) while public expenditure on health by the State is very low[7]. Furthermore, most public health facilities in the State are concentrated in urban areas, making access difficult for rural persons.

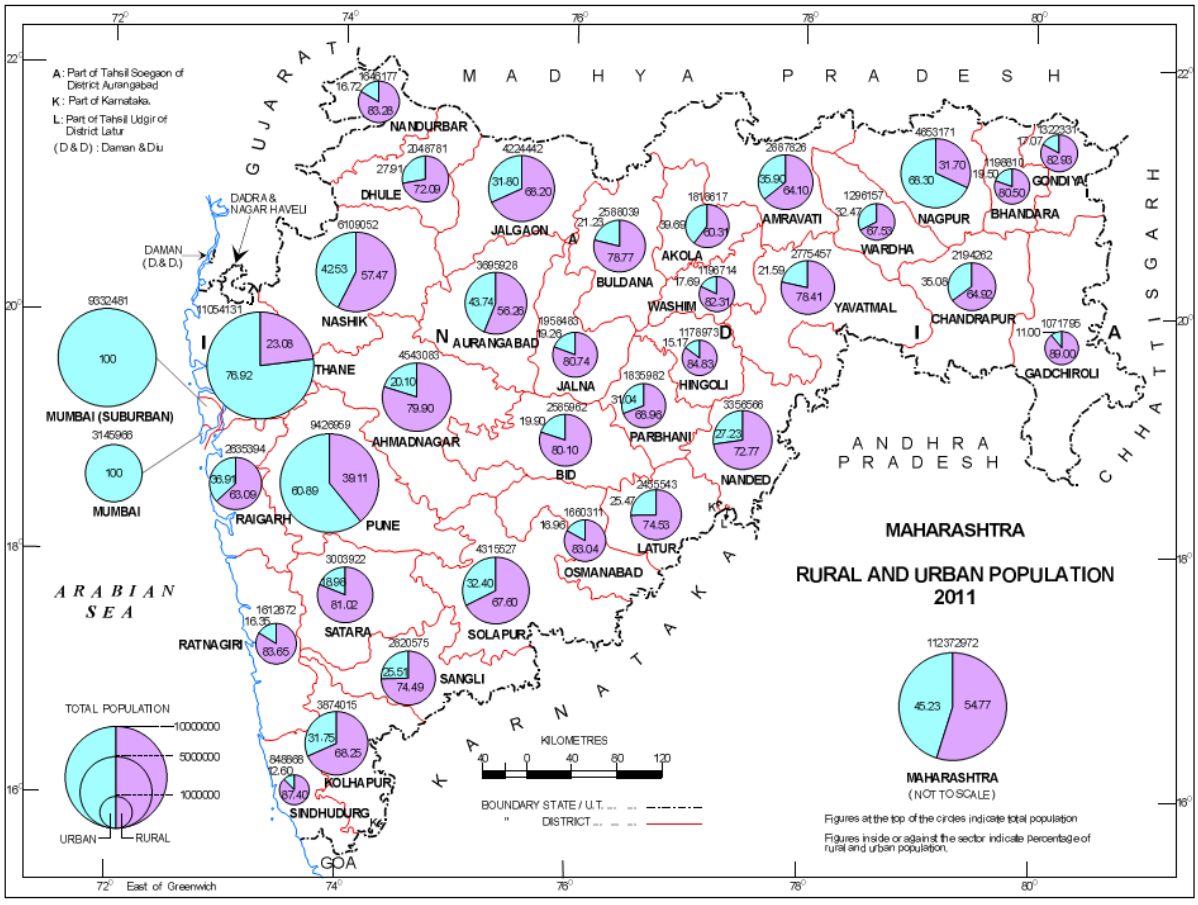

Figure 3-2: Urban-rural population distribution in Maharashtra

Source: Census of India 2011

3.2 Study setting

This study was conducted in Pune district, in Western Maharashtra at the foothills of the Sahyadri mountain range. The district headquarters is Pune city, which has recently witnessed rapid growth. A major laboratory where virological testing was done during the 2009 influenza pandemic in India[8], the National

Institute of Virology, and a large vaccine manufacturer, the Serum Institute of India, that manufactures influenza vaccines following a technology transfer initiative through WHO[9], are both located in Pune.

According to the 2011 census, Pune district is divided into 14 sub-districts[10] (*taluks*). The two urban study sites were located in Pune city. They were: a) densely-populated urban slums in an area known as Sangamwadi, on the extended border of central Pune near Pune railway station and b) middle-income neighbourhoods in an area known as Erandawane that has historically been a middle-income Maharashtrian area that has recently seen an influx of students and working professionals from other states.

Figure 3-3: Urban study sites

Photographs: N. Sundaram

Two rural study sites were also selected for urban-rural comparative interests. Relatively remote villages were chosen in Velhe sub-district that comprises of 124 villages and has a population of 54,516[11]. Maval sub-district which has a population of 377,559 was the second rural site. Villages that were more easily

accessible from Pune city due to their location along a highway were selected from Maval.

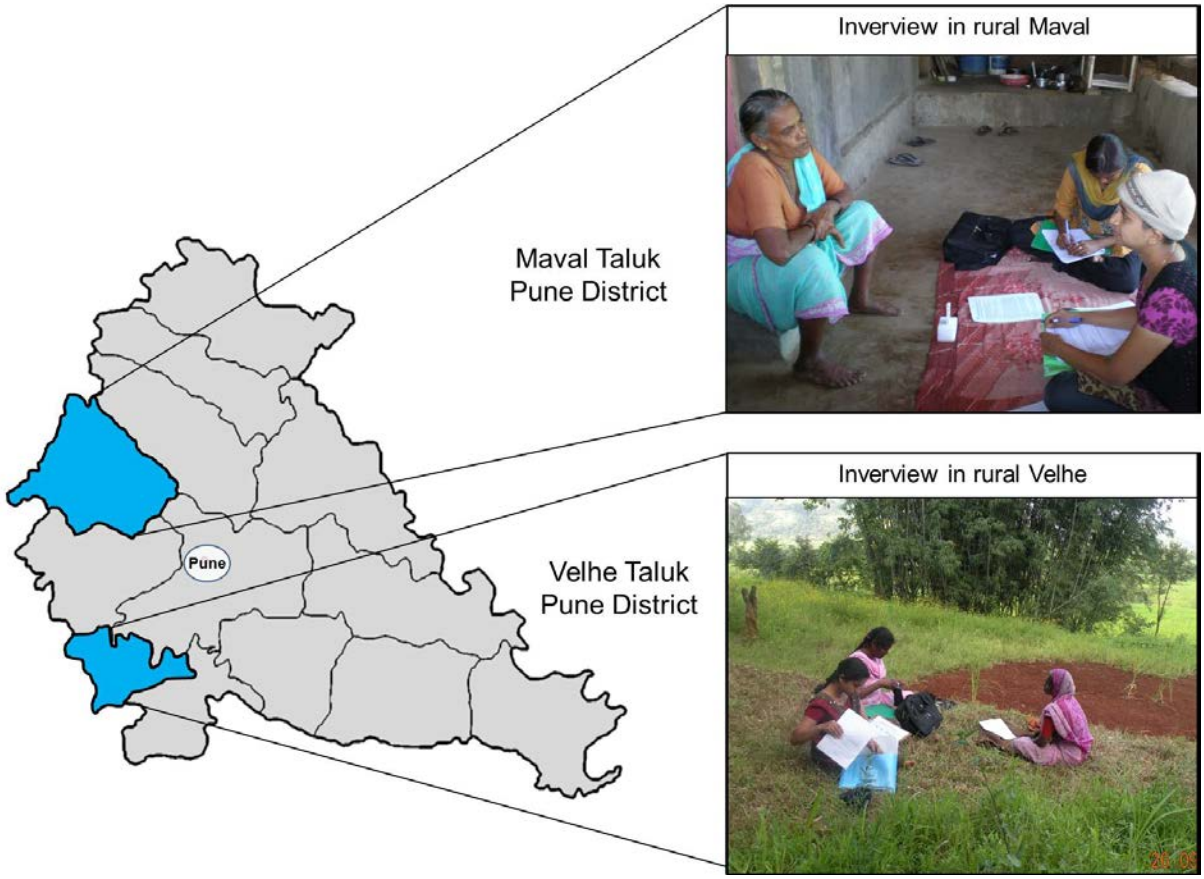

Figure 3-4: Rural study sites

Photographs: N. Sundaram and A. Kudale

3.3 Study design

This thesis is part of a larger project on pandemic influenza and vaccine acceptance in Pune, India[12]. While community study was central to the overall project, additional project components included hospital case studies, policy review and media review. This thesis focuses on the community component; the three research activities listed below were pivotal to the overall study:

1. Formative qualitative research with focus group discussions
2. Cross-sectional cultural epidemiological survey with semi-structured EMIC interviews
3. Case studies among community members for in-depth elaboration on experience with pandemic influenza and vaccination

Details on participant selection, sampling and data collection for each of the research activities are provided in this section. Inclusion criteria for study respondents were adults between 18 and 65 years of age, permanent residence in the study community since 2009 and conversational fluency in Marathi. It was also ensured that respondents had the ability to mentally and physically withstand the interview or discussion.

Formative focus group discussions (FGDs) provided insight on the setting and guided development of questions and categories for semi-structured interviews. A minimum of four FGDs were planned in the urban and rural study areas based on a convenience sample recruited by community leaders or community health volunteers. Separate FGDs were planned for men and women, and one mixed group with both men and women was planned in the urban area. FGDs were conducted by a bilingual senior researcher with a doctoral or masters level degree in social sciences, accompanied by a note taker. The discussions were audio recorded to supplement written notes. Facilitator and respondent characteristics were matched where possible.

Semi-structured interviews (SSIs) were developed based on the explanatory model interview catalogue (EMIC)[13] framework for cultural epidemiology[14]. A total of 400 interviews were planned with 100 interviews from two urban and two rural sites. A minimum sample of 328 was required in order to detect a difference of 0.5 in mean prominence (calculated for cultural epidemiological variables described in the next section on 'data management and approach to analysis'), at a level of 95% significance and 80% power. This calculation was based on a two-sample t test assuming no underlying distribution in the data. An additional 20% of interviews were planned to accommodate potential deficiencies in completed interviews. Households were selected randomly from local voters' lists for each of the study areas. The local registry of voters was the most comprehensive of available records. However, to avoid selection bias of not including persons not registered as voters, the house of the person identified on the voters' list was located but not interviewed. The adjacent house to the right of the one located through the voters' list was instead approached for interview. If no one in that household was eligible or willing to participate, the neighbouring household to the right was approached by interviewers until a

suitable respondent was found. An equal number of men and women, and younger and older adults were interviewed. SSIs were conducted by research assistants working in teams of two, with one person conducting the interview and the other maintaining data records. They received extensive training in interview skills and data management. Interviews were voice recorded for consenting respondents; without consent the data was based solely on interview notes.

In the third stage of the community study, in-depth interviews (IDIs) were planned with a purposively-selected subsample from the SSIs. Respondents with a history of pandemic influenza, with a history of H1N1 influenza vaccination and with a history of not accepting H1N1 vaccine were interviewed. A total of six to eight interviews were planned with each group, with roughly equal numbers from the urban and rural areas. The IDIs were conducted by senior bi-lingual researchers, accompanied by a note taker. Interviews were voice recorded with permission to enhance interview notes.

3.4 Instruments

Instruments for FGDs, SSIs and IDIs were developed during several workshops in Pune with anthropologists and study investigators. SSIs were based on literature review and previous work on vaccine acceptance[15-17]. Instruments were revised based on feedback from other public health experts. They were pilot tested and further revised after translation into Marathi.

The FGD agenda clarified background features of the setting, sociocultural features of influenza and experience during the pandemic of 2009-2010. It covered broad topics on ideas about vaccines including perceived benefits, problems and experience with pandemic influenza vaccines. FGDs also guided the construction of interview questions and coding categories for SSIs.

EMIC interviews were used to examine the distribution of community ideas of illness-related experience, meaning and behaviour (Appendix 8.5). A vignette which described in simple terms a person with characteristic clinical symptoms of influenza, set in the time period of January 2010, was used to provide a focus

for questions of the interview (Appendix 8.6). The sex, age group and residence of the character in the vignette and respondent were matched. This vignette-based approach elicited respondents' views on priority symptoms, perceived causes, help-seeking and prevention of the illness, based on a presentation of the condition, rather than recognition of its name. Responses to open questions were coded followed by questions probing categories that were not mentioned spontaneously. Respondents were also asked about their personal and household experience in the 2009 influenza pandemic. The instrument then assessed willingness to take a vaccine to prevent swine flu, the local term most commonly used for H1N1 disease. Questions related to awareness, preferences, uptake of pandemic influenza vaccines and barriers to vaccine use were also enquired. Complementary components of the data set included categorical and numeric data for quantitative comparative analysis and narrative data for qualitative thematic analysis and elaboration.

The agenda of in-depth interviews focused on actual experience and behaviour during the 2009 pandemic for those who had recovered from pandemic influenza. The experiences and motivations of those took the pandemic H1N1 influenza vaccine, and the views, potential barriers or hesitation among those who did not do so were discussed in detail.

3.5 Data management and approach to analysis

Quantitative and categorical data from semi-structured EMIC interviews were double-entered using range and logic checks in Epi Info v.3.5.3 (CDC, USA). Cultural epidemiological variables specifying categories of distress, perceived causes, help-seeking at home and outside, and prevention were evaluated based on relative importance ascribed to them. Prominence was assigned for each variable in the sets noted above which involved a weighted coding of responses based on whether and how each category was reported by a respondent. Spontaneously mentioned categories received a value of 2; categories reported only on probing received a value of 1, and if not reported at all was assigned a value of 0. A category that was also identified as most important was assigned an additional value of 3. Mean values summarized the prominence of each category with a possible range of 0-5.

Acknowledged differences in urban-rural subcultures, the influence of gender and age on behaviour, and differences in disease burden between age groups[18] and urban or rural residence, are factors that require attention. Comparative analysis would thus focus on the influence of gender, age and urban-rural features on community ideas of sociocultural features of influenza and acceptance of vaccines. Prominence means for categories were compared between groups using the Wilcoxon rank-sum test, while proportions were compared using Fisher's exact test. Univariable and multivariable logistic regression analyses were used to identify determinants of vaccine acceptance. Analysis of quantitative data was performed with SAS V.9.2 (SAS Institute, USA) and STATA V.12 (StataCorp LP, USA).

Qualitative data from FGDs, SSIs and IDIs were entered in a word processor in Marathi using a unicode Devnagari font. After translation into English, transcripts were imported and managed with MAXQDA 11 (VERBI software, Germany). First-level coding was done using deductive approaches. Inductive coding was also applied and a thematic analysis was carried out rooted in the objectives of the study. Page turn times that were noted down by the data recorder during the interview were imported into MAXQDA. This made rapid retrieval of relevant sections of the audio recording possible, facilitating thematic coding and analysis.

Variables from the quantitative data set were imported into MAXQDA to select narratives of particular interest, facilitating integrated analysis of qualitative and quantitative data. Triangulation of data from the different data sources was also carried out as a part of the analytic process.

3.6 Ethical considerations

The study protocol received ethical approval from the Institutional Ethics Committee of the Maharashtra Association of Anthropological Sciences, Pune, WHO Research Ethics Review Committee and the Ethics Commission of Basel. Written informed consent was obtained prior to each interview. No financial or other incentives were given to respondents for participation. Data collected in this study are maintained with utmost confidentiality and were anonymised before analysis and reporting.

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CHAPTER 4

Cultural epidemiology of pandemic influenza in urban and rural Pune, India: a cross-sectional, mixed-methods study*

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Abstract

Objective

To identify and compare sociocultural features of pandemic influenza with reference to illness-related experience, meaning and behaviour in urban and rural areas of India.

Design

Cross-sectional, mixed-methods, cultural epidemiological survey with vignette-based interviews. Semi-structured explanatory model interviews were used to study community ideas of the 2009 influenza pandemic. In-depth interviews elaborated respondents' experience during the pandemic.

Setting

Urban and rural communities, Pune district, western India.

Participants

Survey of urban (n=215) and rural (n=221) residents between 18 and 65 years old. In-depth interviews of respondents with history of 2009 pandemic influenza (n=6).

Results

More urban (36.7%) than rural respondents (16.3%, p<0.001) identified the illness in the vignette as 'swine flu'. Over half (56.7%) believed the illness would be fatal without treatment, but with treatment 96% predicted full recovery. Worry ('tension') about the illness was reported as more troubling than somatic symptoms. The most common perceived causes – 'exposure to a dirty environment' and 'cough or sneeze of an infected person' –were more prominent in the urban group. Among rural respondents, climatic conditions, drinking contaminated water, tension and cultural ideas on humoral imbalance from heat- or cold- producing foods were more prominent. The most widely-reported home-treatment was herbal remedies; more rural respondents suggested reliance on prayer, and symptom relief was more of a priority for urban respondents. Government health services were preferred in the urban communities, and rural residents relied more than urban on private facilities. Preventive measures emphasised were cleanliness, wholesome lifestyle and vaccines, and more urban respondents reported use of masks. In-depth interviews indicated treatment delays during the 2009 pandemic, especially among rural patients.

Conclusions

Although the term was well-known, better recognition of pandemic influenza cases is needed, especially in rural areas. Improved awareness, access to treatment and timely referrals by private practitioners are also required to reduce treatment delays.

Strengths and limitations

- Consideration of community experience, meaning and behaviour to inform effective pre-preparedness and control of pandemic influenza
- Cultural epidemiological methods identify patterns of relevant social and cultural features of pandemic influenza
- Urban and rural perceptions, priorities and illness behaviour have similar and distinctive features that are clarified locally
- Integrated quantitative survey and qualitative ethnographic methods and triangulation effectively clarify relevant community experience for pandemic preparedness
- Findings may change over time and in response to social changes or epidemics; relatively high non-participation rate

4.1 Introduction

Influenza is responsible for substantial mortality and morbidity in all age groups, across the globe[1]. Three pandemics occurred in the previous century in 1918 ('Spanish flu'), 1957 ('Asian flu') and 1968 ('Hong Kong flu'). The 'Spanish flu' is believed to be the single most devastating disease outbreak in human history, resulting in approximately 50 million deaths worldwide[2]. Influenza outbreaks caused by the novel influenza A virus H1N1 strain reached pandemic proportions in 2009 and the first influenza pandemic of the 21st century was declared[3 4]. Although the 2009-2010 (H1N1) influenza pandemic was milder than expected, it is estimated to have been responsible for over 280,000 deaths[5].

Between May 2009 and August 2010, India had recorded 39,977 laboratory confirmed cases and 2113 deaths from H1N1 influenza from 25 states and 6 union territories[6]. The state of Maharashtra bore the highest mortality burden with 767 deaths (36.3% of all H1N1-related deaths). Pune, Maharashtra's second largest city, recorded the first death in the country[7] and was considered a hotspot of the 2009 influenza pandemic in India[8 9].

Pandemics can occur unpredictably and cause widespread disease[10]. Containment of pandemic influenza depends extensively on effectiveness of control measures, which in turn relies fundamentally on the public's willingness to collaborate. In order to foster this support, identifying community priorities and views on illness causation and prevention is critical. The study of cultural concepts of illness which are known to influence community expectations, behaviour and outcomes is necessary for locally relevant and effective pandemic policy planning[11 12]. Examination of community views on the 2009 influenza pandemic is relevant for pandemic preparedness and influenza control.

Although evidence of epidemiological differences in disease burden between urban and rural areas exist in Pune[9], little is known about differences between urban and rural concepts and priorities for influenza control among affected communities. Given differences in urban-rural subcultures in terms of pandemic experiences, help-seeking, disease transmission[9], access to health facilities and living conditions[13], consideration of their commonalities and distinctiveness

should benefit planning for pandemic preparedness. The aim of this study is to examine and compare sociocultural features of pandemic influenza with reference to the distribution of illness-related experience, meaning and behaviour across urban and rural communities in Pune district, India.

4.2 Methods

4.2.1 Setting and study sites

The study was conducted in Pune district, western Maharashtra, India. The district has a population of 9.43 million, of which 5.75 million live in urban and 3.68 million in rural areas[14]. The district headquarters is Pune city, which has recently experienced rapid growth. One out of two major laboratories in India where virological testing was done during the pandemic, National Institute of Virology[15], as well as a large manufacturer of influenza vaccines, Serum Institute of India, are located in Pune.

Two urban study sites were densely-populated informal settlements in an area known as Sangamwadi and the middle-income neighbourhoods in an area called Erandawane in Pune city[16]. The rural sites were in two sub-districts, Velhe and Mawal. Selection was based on their relative accessibility to Pune city. Of 17 villages in Velhe that were designated as relatively inaccessible, 10 were randomly selected for our study. Of 24 villages that were identified as accessible due to the presence of a road adjacent to the village, 10 were randomly selected. The number of persons selected from each village was proportionate to the village population.

4.2.2 Instruments

This study used semi-structured interviews based on the framework of the explanatory model interview catalogue (EMIC)[17] for cultural epidemiology[18] and in-depth interviews. Both interviews were developed in workshops in Pune with anthropologists and public-health experts. Instruments were translated into Marathi and refined based on experience and analysis of pilot-interview data and ethnographic focus group discussion data.

EMIC interviews were used to examine the distribution of community ideas of illness-related experience, meaning and behaviour. After questions about respondent characteristics, a vignette described in simple terms a person with characteristic clinical symptoms of influenza, set in the time period of January 2010. The sex, age group and residence of the character in the vignette and respondent were matched. This vignette-based approach elicited respondents' views on priority symptoms, perceived causes, help-seeking and prevention of the illness, based on presentation of the condition, rather than recognition of its name. Respondents were also asked about their personal and household experience in the 2009 influenza pandemic. Complementary components of the data set included categorical and numeric data for quantitative comparative analysis and narrative data for qualitative thematic analysis and elaboration.

The agenda of in-depth interviews focussed on actual experience and behaviour during the 2009 pandemic.

4.2.3 Study design and sampling

The cross-sectional study required a minimum sample of 328. The sample size calculation is based on the ability to detect a difference of 0.5 in prominence means (calculated for cultural epidemiological variables described in the 'data management and analysis' section) with 95% significance and 80% power for urban-rural comparisons. An additional 20% of interviews were planned to compensate for possible shortfall in completed interviews.

Approximately 100 EMIC interviews were planned at each of the two urban and two rural sites[16]. Households were randomly selected from the local registry of voters. Of available records, voters' lists were the most comprehensive. However, they do not include persons or households not registered as voters. Thus, to avoid selection bias, the household of the person identified on the voters' list was located (but not interviewed) and the adjacent household to the right was approached for interview. Inclusion criteria were ages between 18 and 65 years, residency in Pune, conversational fluency in Marathi and ability to physically and mentally withstand an interview. If no member in the household satisfied the inclusion criteria or if there were no willing respondents, the neighbouring household to the right was approached, until a suitable respondent was found.

An equal balance of men and women, and younger and older adults was maintained.

EMIC interview respondents who indicated having personal or household experience with influenza during the 2009 pandemic were approached for in-depth interviews. These in-depth interviews with directly affected persons supplemented the EMIC interview survey to elaborate findings with narrative accounts of the subgroup of respondents with personal pandemic illness experience.

Research assistants received extensive training in sampling procedures, obtaining informed consent, interviewing and data management during a two-week workshop. They worked in teams of two, one conducting the interview and the other maintaining data records. Two supervisors reviewed data for accuracy and quality. Interviews were voice-recorded with permission.

4.2.4 Data management and analysis

Quantitative data were double-entered into an electronic database using Epi Info 3.5.3 (Centers for Disease Control and Prevention, USA), programmed with logic and range checks. For analysis of sociocultural features of illness, prominence of categories was calculated based on whether a response was spontaneous to an open question (assigned a value of 2) or in response to probing for that category (assigned a value of 1).When a category was identified as most important among all, it was assigned an additional value of 3. Mean prominences were calculated for each category, with a range of 0-5. Through such consideration of prominence, categories were evaluated based on relative importance ascribed to them. Prominence means for categories were compared between urban and rural groups using the Wilcoxon rank-sum test, while proportions were compared using Fisher's exact test. Analysis of quantitative data was done with SAS 9.2 (SAS Institute, USA) and STATA 12 (StataCorp LP, USA).

Narrative data for EMIC and in-depth interviews were entered in a word processor in Marathi using a unicode Devanagari font. After translation into English, data were imported into MAXQDA 11 (VERBI Software, Germany), using techniques for automatic first-level coding for narratives in response to specific

questions. Deductive and inductive coding approaches were applied. Thematic similarities and differences between urban and rural narratives were systematically analysed. Variables from the quantitative data set were imported into MAXQDA to enable selection of narratives of interest, facilitating integrated analysis of quantitative and qualitative data.

4.3 Results

4.3.1 Sample characteristics

Field data were collected between July 2012 and February 2013. Among community members approached for interview, 50 in urban and 10 in rural areas did not satisfy the inclusion criteria and were excluded. A total of 822 persons approached refused to participate, and the refusal rate was higher in urban (76%, n= 681) compared to rural areas (36%, n=141). The reason for refusal indicated by the majority was that they were too busy to participate in the interview. Incomplete interviews (n=35) were excluded from analysis.

Of the 436 completed interviews, approximately half were with women and half were from urban and rural sites (table 4-1). More urban residents were post-graduates, graduates or had higher secondary school education, and more rural respondents had no education. Urban household incomes were higher than rural and more were reported as reliable and dependable. The most commonly reported occupation was agriculture among rural respondents. Self-employment or employment with a private organization was most frequently reported by urban respondents.

Table 4-1: Sample characteristics of study respondents

Socio-demographic features	Overall sample, n=436	Urban sites, n=215	Rural sites, n=221	P values[a]
Gender (%)				
Women	50.7	50.2	51.1	
Age (years)				
Median (interquartile range)[b]	45 (29–55)	45 (28–57)	45 (29–52)	
Household size (number of persons)				
Median (interquartile range)[b]	5 (4–7)	5 (3–6)	5 (4–7)	**
Occupation (%)***[c]				
Agriculture	22.5	0.0	44.3	***

Socio-demographic features	Overall sample, n=436	Urban sites, n=215	Rural sites, n=221	P values[a]
Unskilled labour	7.3	8.4	6.3	
Skilled labour	4.6	6.5	2.7	
Self-employment	9.9	11.6	8.1	
Business	2.1	2.8	1.4	
Service (public)	2.8	2.8	2.7	
Service (private)	9.6	12.1	7.2	
Student	5.0	6.0	4.1	
Housewife	24.1	30.2	18.1	**
Retired	8.7	14.4	3.2	***
Unemployed	3.4	5.1	1.8	
Highest education level attained (%)* [c]**				
No education	21.6	11.6	31.2	***
Less than primary	7.3	7.9	6.8	
Primary school	38.3	33.5	43.0	*
Secondary school	12.8	14.9	10.9	
Higher secondary school	10.3	14.0	6.8	*
Diploma/ Professional course	1.6	2.3	0.9	
Graduation	4.8	9.8	0.0	***
Post-graduation	3.2	6.0	0.5	***
Years of school attended (years)				
Median (interquartile range)[b]	7 (2–11)	10 (5–13)	5 (0–10)	***
Marital status* [c]**				
Single	15.1	18.6	11.8	
Married	77.3	73.0	81.4	*
Widowed	7.6	8.4	6.8	
Religion* [c]**				
Hindu	84.4	74.9	93.7	***
Muslim	3.4	6.5	0.5	***
Christian	1.1	2.3	0.0	*
Neo-buddhist	10.8	15.8	5.9	***
Social category* [c]**				
Scheduled caste or tribe	25.0	38.1	12.2	***
Other backward class	8.3	10.2	6.3	
Open/general category	59.6	41.4	77.4	***
Vimukta jati nomadic tribes	3.4	2.8	4.1	
Undisclosed	3.4	7.0	0.0	***
Monthly household income (Indian Rupees)				
Median (interquartile range)[b]	10000 (5000–17500)	11000 (6000–22500)	7250 (3375–13250)	***
Unable to provide a response (%)[c]	21.6	13.5	29.4	***
Household income reliability (%)[c]				

Socio-demographic features	Overall sample, n=436	Urban sites, n=215	Rural sites, n=221	P values[a]
Reliable and dependable	49.1	60.9	37.6	***
Not reliable and dependable	44.5	35.3	53.4	***
No response	6.4	3.7	9.0	*

[a] * p≤0.05, ** p≤0.01, *** p≤0.001; [b] Wilcoxon test; [c] Pearson Chi^2 or Fisher's exact test

4.3.2 Awareness of pandemic influenza

A third of respondents identified the condition as a respiratory illness (table 4-2) and more urban respondents (36.7% vs. 16.3% rural) identified it as "swine flu". Alternative names for the illness condition such as H1N1 influenza or pandemic flu were seldom used. Towards the end of the interview, those who had not mentioned swine flu were specifically asked if they had heard of it – a majority said they had and only 10.3% of the entire sample (3.3% urban, 17.2% rural) had not.

Illness identification was based on the following themes: physical symptoms, time period indicated in the vignette, and information available on contemporary diseases or ongoing outbreaks. A 45-year old urban woman who identified the illness through symptoms indicated the logic used in identification by stating, *"It must be either dengue or swine flu. It could be chikungunya, if she has joint pain. If there is no joint pain but she is suffering from body ache, then she may have swine flu or dengue. Swine flu is more probable because dengue is characterized by a facial rash while sore throat and cold are the symptoms of swine flu."*

For others, the time period of occurrence defined the condition, *"Since it dates back to two years ago, it must be swine flu because it was on a high two years ago… swine flu is characterised by high fever."* (28 years, rural woman)

The notion of swine flu as a new disease was common and contributed to illness identification. Information provided in the vignette associating the illness with an outbreak (multiple cases in the community) was also noted. The condition was sometimes conflated with dengue fever, inasmuch as a dengue outbreak was ongoing during the period of study interviews. A 65-year old woman stated, *"If the disease was spreading in the neighbourhood then the name would have been mentioned on TV… swine flu, it is also called dengue. It was widespread in Pune - dengue and swine flu - both are the same disease. That one disease has two names."*

More rural respondents were unable to identify the illness by a name (39.8% vs. 20.9% urban). Explanations were similar in both areas: (a) simply not knowing or being uneducated was commonly cited, (b) some indicated that only a doctor can name the illness, not a layman, (c) others displayed confusion between many well-known diseases. For example, a 46-year old rural woman stated, *"Cough leads to TB. There are many different illnesses, isn't it? There are different kinds of fever. Some contract Malaria, while others could suffer from typhoid or dengue. Some people take time to recover. I won't be able to name the illness."*

Table 4-2: Identification of illness presented in the vignette

Illness identified as[a]	Overall sample, n=436	Urban sites, n=215	Rural sites, n=221	P values[b]
Group 1: Respiratory illness	*30.7*	*40.9*	*20.8*	***<0.001***
Swine flu, H1N1 influenza or Pandemic flu	26.4	36.7	16.3	**<0.001**
Seasonal or common flu	1.6	1.9	1.4	0.721
Viral (fever/ infection)	0.5	0.9	0.0	0.243
Common cold	0.9	0.9	0.9	1.000
Combinations of fever, chills, cough	1.4	0.5	2.3	0.216
Group 2: Other specified conditions	*38.8*	*38.1*	*39.4*	*0.844*
HIV/AIDS	3.2	2.8	3.6	0.787
Tuberculosis (TB)	9.6	10.2	9.0	0.746
Typhoid	3.4	1.9	5.0	0.113
Dengue	8.3	11.2	5.4	**0.036**
Malaria	5.3	4.7	5.9	0.670
Other	8.9	7.4	10.4	0.316
Group 3: Unable to specify	*30.5*	*20.9*	*39.8*	***<0.001***
Cannot say or Undecided	30.5	20.9	39.8	**<0.001**

[a] Reported categories analysed as groups have been presented in italicised font.
[b] Fisher's exact test used for cross-site comparison. Bold represents p≤0.05

4.3.3 Perceived seriousness of illness

No urban-rural differences were apparent for severity of the illness: 46.6% of the whole sample said it was very serious and 31.2% serious, but 8.7% thought it was not a serious illness. Remaining respondents were unable to provide a reply. Without treatment, 56.7% believed the illness would be fatal, 38.5% believed the condition would worsen but not necessarily lead to death and less than 1% anticipated a full recovery. With treatment, however, 96.1% predicted

a complete recovery, and less than 2% anticipated fatality or worsening symptoms.

4.3.4 Categories of distress

Social or emotional categories of distress had greater prominence in the urban than in the rural group: distress caused by isolation from others (prominence: urban=1.047, rural=0.742, p<0.001) and sadness or anxiety resulting from the illness (prominence: urban=1.363, rural=1.136, p=0.004). More rural respondents emphasised physical symptoms such as chills (p=0.001), nasal congestion (p<0.001) and breathlessness (p=0.024).

In the overall sample, worry ("tension") was most frequently reported (11.7% of sample) as most troubling among all physical symptoms and social or financial problems from the illness. This was followed by concern about course of illness (8.5%), loss of income (6.7%), costs from transport, food and drugs (6.2%) and interference with social relations (5.7%). The most troubling physical symptoms were identified as cough (5.7%) and fever (5.5%). No urban-rural differences were present in these findings.

4.3.5 Perceived causes

The two most prominent perceived causes, improper sanitation, dirty environment and cough or sneeze of an infected person (airborne transmission) were reported with greater prominence among urban respondents (figure 4-1). Explanations for a dirty environment were similar among all respondents and included references to accumulated filth, poor drainage, open gutters and sewage, open defecation and a general lack of cleanliness in surroundings. Narratives regarding airborne transmission largely referred to breathing in germs or droplets from another person's cough or sputum. However, details were elaborated with reference to other categories by some. For example, *"The germs could enter your body through inhalation while interacting with an infected person. The germs may spread through the air due to sneeze or cough. It also may have been caused due to mosquito bite, exposure to mosquitoes or infected tissue paper present on garbage containers."* (Man, 48 years, urban). No urban-rural differences were present for insect bite - the third most prominently reported cause. Mosquitoes were the most commonly mentioned insect vector.

Drinking contaminated water ranked third in prominence in the rural group and ninth in the urban group. Most urban respondents attributed this cause to germs or dirt in the water. In the rural sites, however, in addition to this explanation, another theme emerged referring to a change in drinking water. This did not refer to contaminants in the water; it had to do with merely drinking water in different places. The narrative of a 35-year-old rural woman illustrates this theme: *"This illness is also caused due to the water, the drinking water… Say we go to a particular village, and drink the water there, and then we go to another village and drink the water over there, some people cannot tolerate the change. Then we catch a cold because of drinking water of different villages."* The perception of a change in water as a cause was reported by approximately 35% of rural, but less than 1% of urban respondents who identified drinking water as a perceived cause.

More rural than urban respondents reported climate or weather as a perceived cause and a few themes underlay its meaning. A majority referred to a change in weather or fluctuations in temperature, as in the following narrative, *"Look at this climate. It happens due to such air, such climate. The climate varies between cold and hot. Sometimes it is hot while sometimes it is cold. This illness is related to the climate hence occurs due to it"* (65-year-old rural man). Others attributed the illness to getting wet in the rain or being exposed to cold weather. Exposure to sunny weather was also reported as a cause, but mainly by rural respondents.

"Tension" was reported as a perceived cause by 44.6%, with greater rural prominence. The term appeared self-explanatory to most and it was often indicated as a cause without further elaboration. When explained, respondents referred to mental worries caused by household and economic pressures leading to illness. A 63-year-old woman elaborated, *"It happens because of worrying; worry could be due to household matters, tension or a difficult financial condition. If nobody is earning or family members are not getting along well with each other, then the person feels dejected and gets the illness."*

Heat or cold in the body was reported with higher prominence at the rural sites, but explained in similar ways in both urban and rural areas. This cause referred to cultural ideas about humoral imbalances leading to illness as a result of

consuming foods that are sour, cold, cold-producing (e.g., yoghurt, cucumber), heat-producing (e.g., chicken, heavily-spiced food), unsuitable (e.g., guava) or oily. Other cultural or supernatural causes such as 'violation of taboo', 'god, fate, *karma*', 'evil eye, sorcery', and causes related to addiction (alcohol, tobacco, contraband drugs) were also emphasised by more rural than urban respondents.

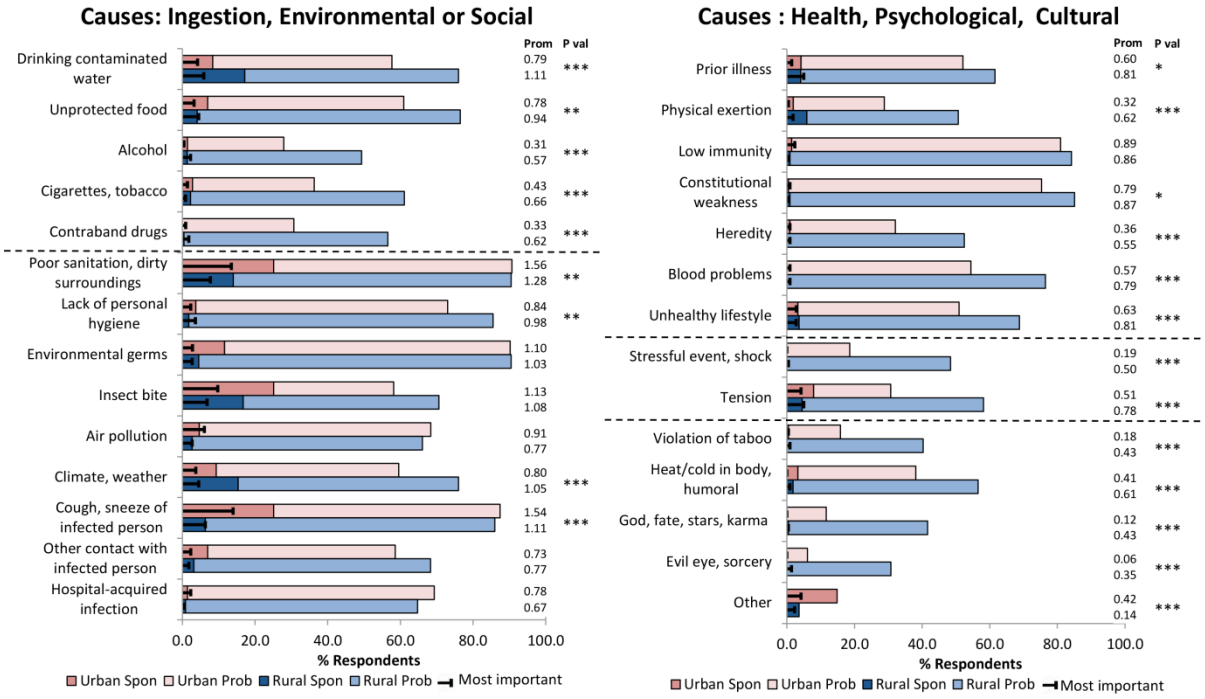

Figure 4-1: Perceived causes

Spon: percentage of respondents who identified the category spontaneously (value=2). Prob: percentage of respondents who identified the category on probing (value=1). Most important: percentage of respondents who identified the category as most important among all others (value=3). Prom: mean prominence scores calculated for each site. Wilcoxon test used to compare prominence scores between sites. *p≤0.05, **p≤0.01, ***p≤0.001.

4.3.6 Help-seeking

4.3.6.1 Home-based treatment

Rural respondents had a higher prominence than urban for prayer among home-based treatments (figure 4-2). Drinking warm liquids and gargling, measures more directly related to alleviation of symptoms, however, had greater prominence among urban respondents. The value of prayer was seldom mentioned spontaneously at either site, but was reported by 61% on probing and highlighted as most important by 13.1% of all respondents.

Herbal remedies were the most prominent category in the overall sample. Accounts included frequent mention of *kadha* - an herbal concoction brewed at

home. The second and third most prominently reported categories were doing nothing and feeding the patient with strength-providing food. Respondents, who suggested no home treatment, typically emphasised the priority of rushing the patient to hospital as quickly as possible.

4.3.6.2 Help-seeking outside the home

Government and private health facilities, and informal help were widely reported outside sources of help seeking (figure 4-2). More urban respondents than rural emphasised the value of government hospitals. Narrative accounts indicated that this preference among urban respondents tended to be specifically for treating swine flu. Rural respondents, however, emphasised the value of private facilities, even though they were acknowledged to be more expensive and hence not always feasible. Narrative data indicated a general preference in both groups for private over government health facilities, inasmuch as they were perceived to be more easily accessible, less crowded with shorter waiting times, and to offer better treatment and quality of care.

Significantly more rural respondents reported relying on local health workers, informal help from friends, neighbours or relatives, traditional healers and faith healers. Although few spontaneously reported visiting a traditional healer (*vaidu*, *jadibooti wala)* or a faith healer, probing revealed that 37.8% and 30.7%, respectively, of all respondents, were likely to. This was usually after visiting an allopathic centre, and if the treatment was ineffective or services inadequate. The order of preference for outside treatment was explained succinctly by a 42-year-old rural man, *"If there is no other option [owing to financial constraints] then he would go to a doctor in the government hospital. If nothing happens there he would go to a private doctor. If there again he feels that nothing is happening, he would then go to the religious leader, bhagat (faith healer) and so on."*

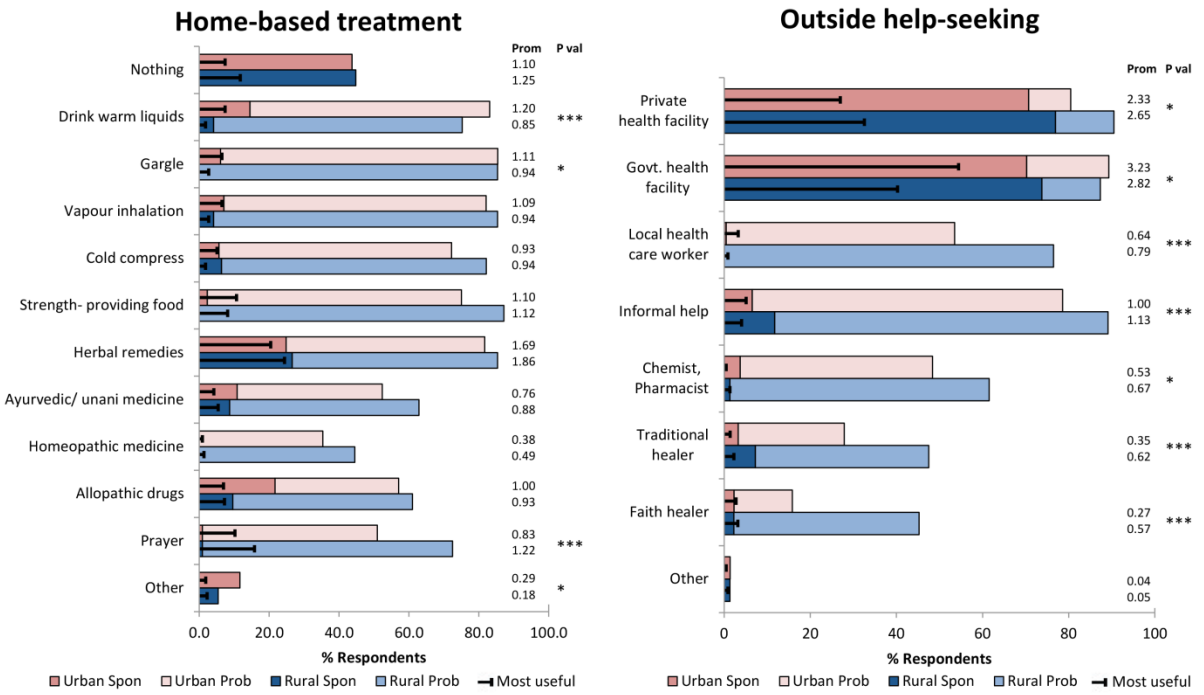

Figure 4-2: Help seeking

Spon: percentage of respondents who identified the category spontaneously (value=2). Prob: percentage of respondents who identified the category on probing (value=1). Most important: percentage of respondents who identified the category as most important among all others (value=3). Prom: mean prominence scores calculated for each site. Wilcoxon test used to compare prominence scores between sites. *p≤0.05, **p≤0.01, ***p≤0.001.

4.3.7 Methods of prevention

For prevention, more urban respondents emphasised the value of wearing masks, and more rural respondents suggested doing nothing, because the future was unpredictable. More rural respondents emphasised the value of ritual purification (*agnihotra* or *dhoop* - a Hindu religious process of purifying the atmosphere with smoke from a specially prepared fire) or protection from supernatural influence, although both were among categories with lowest prominence.

Among overall community ideas about preventing the illness, cleanliness had the highest prominence, followed by a wholesome lifestyle – which referred to a proper diet and exercise – and then vaccines (figure 4-3). Cleanliness referred to both personal hygiene as well as cleanliness of the home and surroundings. Contradictory explanations were provided in the urban and rural areas for physical exercise in illness prevention. Rural respondents emphasised a need to avoid over-exertion from excessive work and exposure to the sun, but urban respondents highlighted the value of regular exercise. Vaccines were mentioned

spontaneously by only 2.5% of respondents, but 89.4% acknowledged its value when probed. Hand washing was seldom mentioned spontaneously or identified as most important and ranked tenth in prominence among all prevention categories. Minimizing exposure to infection and using masks ranked fifth and sixth in prominence, respectively.

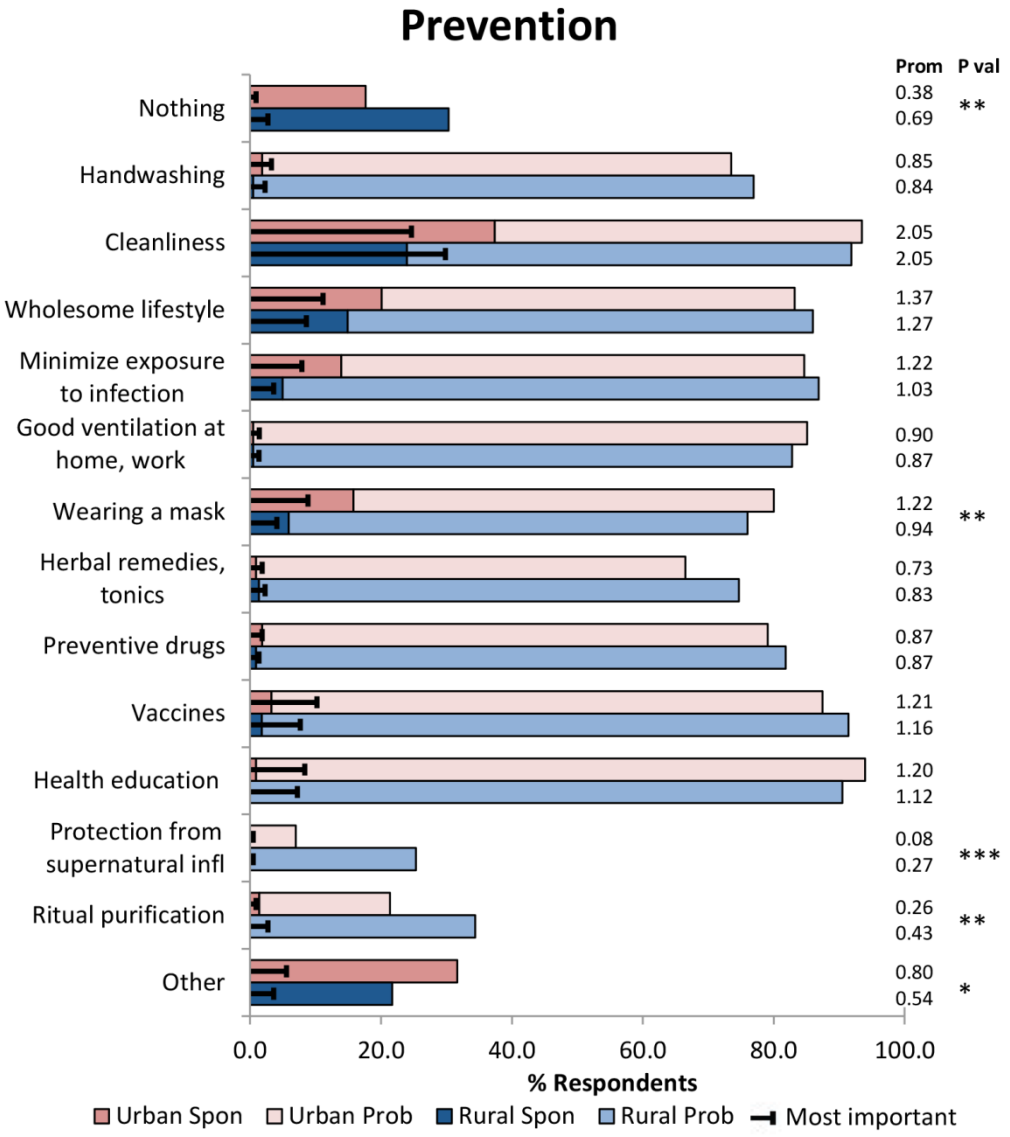

Figure 4-3: Prevention

Spon: percentage of respondents who identified the category spontaneously (value=2). Prob: percentage of respondents who identified the category on probing (value=1). Most important: percentage of respondents who identified the category as most important among all others (value=3). Prom: mean prominence scores calculated for each site. Wilcoxon test used to compare prominence scores between sites. *p≤0.05, **p≤0.01, ***p≤0.001.

4.3.8 Experience with swine flu

Of the 436 persons interviewed, three reported a personal history of swine flu during the 2009 pandemic, and four a family history in the household. Three in-

depth interviews each at the urban and rural sites were conducted among these persons.

In-depth interviews elaborated a typical course of first help seeking at private clinics and a period without adequate treatment before referral to a larger hospital, if they were referred at all. After four days of medication had failed to alleviate symptoms for two of the urban patients, the private-clinic doctor recommended the government-run Naidu hospital; the third urban respondent visited that hospital of her own accord, and all three acknowledged receiving free treatment at the Naidu hospital. Only one rural respondent was referred to a government-run hospital, and that referral came only after 8 days of injections and medication at the private facility. This respondent reported spending INR 25,000–30,000 (approximately USD 600) at the private hospital, compared with free treatment at the government hospital. The other two rural respondents were referred to private hospitals. One of them was transferred to three different private health facilities before receiving antiviral treatment and reported spending INR 500,000 (USD 10,000) on hospital bills, and the other spent 12 days in an intensive care unit, which cost her INR 90,000 (USD 1,900).

Only two of the six respondents provided a valid biomedical explanation for the cause of their swine flu, saying they caught it from other infected persons. Perceived causes reported by the others were getting wet in the rain, addiction to smokeless tobacco, air pollution, eating cold foods and mosquito bite.

4.4 Discussion

This is the first study to examine community-reported experience, meaning and behaviour of pandemic influenza in India using a cultural epidemiological approach. Taking community perceptions into account enables planning that is more responsive to local needs and thereby strengthens trust, authority and effectiveness of public health action[19]. Most studies evaluating pandemic influenza in India have focussed on the burden and clinical response[8 20-24]. A few have considered knowledge, attitudes and practices[25 26]. The scope of interest and methods have been limited in their ability to consider and compare the priority of community ideas based on how they are reported and what they

mean to respondents. Our approach benefits from a design integrating quantitative and qualitative methods for community study.

4.4.1 Improving awareness in general and influenza recognition

The vast majority of respondents were aware of pandemic influenza and considered it a serious illness that required treatment. Although 90% knew about the illness called swine flu, only 26% identified it from the characteristic symptoms (sore throat, cough, runny nose, body ache, fatigue and constant high fever) and setting described in the vignette. Confusion and conflation with other diseases were notable. Despite the priority of treatment during the pandemic outbreak, problems in community identification of risk associated with non-specific symptoms and poor awareness may have compromised timely, appropriate help seeking, diagnosis and treatment. In addition to general awareness, more attention to characteristic presentations, rather than just the name of the pandemic disease, appears warranted. Although common symptoms associated with laboratory-confirmed 2009 H1N1 influenza among patients diagnosed at hospitals in India – fever[20 27] and cough[27] – were the most troubling physical symptoms identified by our study respondents, they did not necessarily relate these symptoms to pandemic influenza in a characteristic case presentation.

Although awareness of biomedically relevant airborne transmission of the illness was widely recognized, other causes were also identified, even by respondents with a history of pandemic influenza. This finding is consistent with another study in India that found high-school students referred to transmission of swine flu through food, water and mosquito bite[26]. Pluralism in the attribution of causes was notable in our study, including psychosomatic ideas about the role of tension and cultural ideas about the impact of humoral imbalances in the body resulting from effects of certain foods (referring to the cultural physiology rooted in concepts of Ayurveda[28]), that co-exist among various environmental, social and ingestion-related ones.

4.4.2 Interventions for control

Pandemic influenza control relies on prevention through vaccination, limiting exposure by promoting hand washing and minimising social contact. Timely

treatment with supportive care and antivirals also are important response measures[29-31].

Priority for vaccination and promoting awareness of non-pharmaceutical interventions

Vaccination is a critical measure for influenza control to prevent spread of the virus and mitigate the impact of the disease[10 30]. Community recognition of vaccination, which was seldom reported spontaneously, was acknowledged by most respondents, but with relatively lower priority than cleanliness and lifestyle. A community-based study in Rajasthan, using self-administered questionnaires, found herbal treatment had been reported as least effective and vaccines as most effective for prevention of swine flu[25]. Inasmuch as our study asked about an illness described in a vignette, rather than a named disease, it was a different approach. While our findings suggest a priority for vaccination based on the influence of ideas about perceived risk [32], further study of anticipated acceptance and actual uptake of vaccines for pandemic influenza in Pune is needed.

Hand washing is an important component of the public health response to influenza, although compliance may be difficult to motivate; effects are modest but enhanced in combination with face masks[33]. These measures are especially important before a vaccine is developed for a specific strain of pandemic influenza. India's pandemic preparedness and response plan for influenza control acknowledges the role of hand washing, social distancing and using masks as recommended non-pharmaceutical interventions[34]. Our study respondents prioritised other non-pharmaceutical forms of prevention (e.g., wholesome lifestyle and health education) for the illness described in the vignette. Respondents' emphasis on a wholesome lifestyle may stem from messages disseminated to communities during the pandemic[35], and additional efforts may be needed to promote community awareness and hand hygiene behaviour. Although they were acknowledged in rural areas, face masks were less of a priority and hence less likely to be used than in urban areas. In any case, promoting non-pharmaceutical interventions appears to be complementary and may enhance vaccination uptake[36].

Medical care and treatment delay

Timely help seeking, supportive care and admission in intensive care units when indicated are critical determinants of survival for patients with serious disease at risk of respiratory failure[37]. Treatment delay of more than two days with antivirals after onset of symptoms has been associated with increased risk of death[38 39], although recent reviews question the role of antivirals for pandemic influenza control[40 41]. During the 2009 pandemic in India, intensive care units or ventilators were not available at all hospitals[42] and antivirals were made available mainly through the public health system[34]. Treatment at government hospitals or private hospitals with adequate facilities enables quicker access to critical care. In our study, in-depth interview elaboration of illness experience for both urban and rural respondents with a history of pandemic influenza was consistent. They had all first consulted a private general practitioner (GP) without improvement in their condition. For these patients, the minimum time lag between first help-seeking at a private facility and referral to a larger hospital was four days. Problematic delay in hospital admission has also been noted in other studies[27]. Our data suggest that lack of awareness on the importance of adequate facilities for treating pandemic influenza, lack of access to such larger hospitals, poor perception of government health facilities, compared with private (reported in other studies too[43-45]), and delayed referrals by private GPs may all lead to delayed treatment, especially for rural respondents.

As a component of the strategy for pandemic disease control, treatment delays may be avoided by a) sensitising the public to the capacity of government facilities for treating pandemic influenza, b) improving access to healthcare in rural areas c) reshaping public perception of the quality of government health facilities and d) training private GPs to identify and quickly refer potential influenza cases to hospitals with required treatment facilities.

4.4.3 Urban-rural differences

Analysis of illness experience showed that urban respondents were relatively more attentive to psychosocial symptoms, and rural respondents were more likely to emphasise somatic symptoms of illness. Reliance on the labour-intensive basis of their agricultural livelihood may explain that. Rural

respondents were also more likely to prioritize environmental causes (climate), limited resources (contaminated food and drinking water) and addictive behaviours. Rural respondents placed relatively more value in traditional cultural responses, both prayer as a home-based response and magico-religious protective measures for prevention. They were also more likely to acknowledge the futility of attempting to prevent the illness. Urban respondents focussed relatively more on measures to alleviate symptoms. The value of a face mask also had higher prominence in the urban areas.

Less overall awareness at rural sites may be explained in part by the lower disease burden[9] and reduced exposure to media in rural areas of Pune during the 2009 pandemic. Rural areas, however, were also affected by rapid spread and mortality as the pandemic progressed[46]. The challenge is especially clear in rural areas to improve awareness of pandemic influenza, including its causation, transmission, prevention and timely appropriate help-seeking. At the urban sites, where pandemic influenza-specific knowledge was more apparent, the need to improve awareness and recognition of cases nevertheless also remains challenging.

4.4.4 Limitations

Data collection commenced two years after the officially-declared end of the pandemic in 2010[47] and recall bias among respondents is a potential limitation of this study. However, extensive media coverage of “swine flu” in Pune during that period and persisting subsequently[48 49] is likely to have maintained public memory of the illness. We also recognize the high refusal rate, particularly in the urban community, as a limitation. Refusals were carefully noted enabling us to document this problem. Although nonparticipation is increasingly problematic for community epidemiological responses, nonparticipation is not necessarily equivalent to nonparticipation bias[50]. Nevertheless, findings must be regarded as suggestive rather than conclusive. Meetings with local leaders in rural areas, prior to data collection, were intended to enlist cooperation. This was not possible at the urban site. Plans for community and professional dissemination of research findings aimed to highlight the value of the study for respondents and thereby motivate their participation.

Findings should be considered with reference to both historical context—reflecting social changes and epidemics—and with reference to regional contexts across India and in other countries. Generalisation from the EMIC survey component of the study is therefore appropriate with reference to similar sociocultural settings, acknowledging differences elsewhere. Nevertheless, we expect the approach and methods for study of sociocultural features reported here to be generalizable and appropriate for consideration where cultural differences indicate the relevance of cross-site differences and the value of comparative study. Complementary qualitative elaboration, which may not be generalizable in other settings, provides locally relevant detail for health services.

4.4.5 Conclusion

Comparison of sociocultural features of urban and rural communities has identified common needs to better distinguish recognition of the illness from names of the condition and particular challenges of access, especially in rural areas. Consideration of community ideas and experience should guide effective planning for pandemic preparedness. The integrated cultural epidemiological approach enhanced by complementary qualitative in-depth interviews indicates a way to proceed. The value of such findings should be enhanced by community dissemination and to health policymakers.

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Contributors
NS was involved in design and coordination of the study, participated in data collection, analysed the data and wrote the manuscript. CS was involved in design and coordination of the study and revised the manuscript. VP was involved in design and coordination of the study, participated in data collection and revised the manuscript. AK was involved in design and coordination of the study, oversaw data collection and revised the manuscript. MGW initiated the study, participated in design and coordination of the study and critically revised and reviewed the manuscript.
All authors have read and approved the final manuscript.

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Competing interests
None

Ethical approval
The study protocol received ethical approval from institutional ethics committee of the Maharashtra Association of Anthropological Sciences, Pune, the WHO Research Ethics Review Committee and the Ethics Commission of Basel. Interviews were conducted after obtaining written informed consent. No financial or other incentives were given to respondents for participation. Data collected in this study is maintained with utmost confidentiality and anonymized for reporting.

Provenance and peer review
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Data sharing statement
No additional data available. All researchers had full access to all of the data in the study and take responsibility for integrity of the data and accuracy of the data analysis.

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CHAPTER 5

Community awareness, use and preference for pandemic influenza vaccines in Pune, India*

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Abstract

Vaccination is a cornerstone of influenza prevention, but limited vaccine uptake was a problem worldwide during the 2009-2010 pandemic. Community acceptance of a vaccine is a critical determinant of its effectiveness, but studies have been confined to high-income countries. We conducted a cross-sectional, mixed-method study in urban and rural Pune, India in 2012-2013. Semi-structured explanatory model interviews were administered to community residents (n=436) to study awareness, experience and preference between available vaccines for pandemic influenza. Focus group discussions and in-depth interviews complemented the survey. Awareness of pandemic influenza vaccines was low (25%). Some respondents did not consider vaccines relevant for adults, but nearly all (94.7%), when asked, believed that a vaccine would prevent swine flu. Reported vaccine uptake however was 8.3%. Main themes identified as reasons for uptake were having heard of a death from swine flu, health care provider recommendation or affiliation with the health system, influence of peers and information from media. Reasons for non-use were low perceived personal risk, problems with access and cost, inadequate information and a perceived lack of a government mandate endorsing influenza vaccines. A majority indicated a preference for injectable over nasal vaccines, especially in remote rural areas. Hesitancy from a lack of confidence in pandemic influenza vaccines appears to have been less of an issue than access, complacency and other sociocultural considerations. Recent influenza outbreaks in 2015 highlight a need to reconsider policy for routine influenza vaccination while paying attention to sociocultural factors and community preferences for effective vaccine action.

5.1 Introduction

Vaccination is a critical tool for controlling influenza. When faced with a pandemic, swift deployment of vaccines is crucial to limiting spread of the disease before the virus acquires increased pathogenicity or antiviral resistance.[1] On 11 June 2009, the World Health Organization (WHO) declared a global influenza pandemic caused by a novel influenza A (H1N1) virus.[2] Efforts were made to ensure adequate supply of vaccines. Yet, lower-than-anticipated uptake of the vaccine was a notable problem, even among high risk groups.[3-7] Studies exploring vaccine hesitancy and reasons for poor uptake that limit effectiveness of a pandemic response have been largely restricted to high-income settings.[8-11] Despite acknowledged cross-cultural differences in public response to pandemic influenza and need for country-specific studies,[12,13] few have been conducted in lower income settings.

A large burden of 2009 H1N1 influenza was borne by low-income countries.[14,15] India reported 39,977 cases and 2,113 deaths from H1N1 influenza between May 2009 and August 2010.[16] These numbers, which refer to laboratory-confirmed cases, are likely underestimated. The city of Pune, which suffered high morbidity and mortality,[17-19] is incidentally home to a large vaccine manufacturer, Serum Institute of India Ltd. Inactivated influenza vaccine (IIV, injectable administration) and live attenuated influenza vaccine (LAIV, nasal administration) were available for public purchase in Pune during the 2009 pandemic.[20] While IIVs alone are licensed for certain groups (children under 2 years, persons 50 years and above and pregnant women), both types of vaccines are considered efficacious and safe for the larger population.[21-27]

Demand for vaccines varied widely in India. In some cases, influenza vaccines were eagerly sought[28,29] but at other times there were few takers.[30,31] This variability highlights the importance of understanding community acceptance and facilitators and barriers for vaccine uptake. Although nasally administered LAIV is generally considered less invasive than IIV by health professionals, and it was available at a lower cost than IIVs in Pune, it is nonetheless a relatively new form of vaccine administration in India and questions arise about its community acceptability for influenza vaccination. Addressing questions about community preferences for one or other vaccine is likely to contribute to our understanding

of vaccine hesitancy or confidence in their sociocultural context, which are critical determinants of effective influenza vaccine action.

Acknowledging sociocultural differences and differences in access to health services in urban and rural communities, we conducted a mixed-method study in low-resource and middle-income urban areas, and in accessible and remote rural areas of Pune, India.[32] The first part of the study exploring community understanding and experience of pandemic influenza has recently been reported.[33] In this paper, we focus on the community-perceived role of vaccines with the objectives of (a) determining community awareness and views of pandemic influenza vaccination, (b) analysing experience and reasons for vaccination or non-vaccination against H1N1 influenza during the 2009 pandemic and (c) clarifying community perceptions and preferences for either injectable or nasal influenza vaccines. A review of experience and community perceptions of vaccines for pandemic influenza in India provides a unique opportunity to inform planning for other immunization initiatives and recurring influenza outbreaks.

5.2 Results

5.2.1 Sample characteristics

Focus groups discussions (FGDs) were conducted in July 2012, semi-structured interviews (SSIs) from August to December 2012 and in-depth interviews (IDIs) between March and April 2013. Five FGDs (each with 5-6 participants), 12 IDIs and 436 SSIs have been analysed (Table 5-1). Among SSI respondents, those from the urban sites had received more education and had higher incomes; more details have been reported elsewhere.[33]

5.2.2 Awareness of vaccines: in general and for pandemic influenza

Awareness of the role of vaccines in preventing illnesses was noted: *"A vaccine is given for prevention of an illness which we may get in the future" (man, rural FGD)*. However, confusion about the preventive versus curative aspect of vaccines was also noted among some respondents. For example, a 65-year-old rural woman stated: *"[By taking the vaccine] the illness could have been prevented and she would have got cured" (SSI)*.

Vaccines were sometimes distinguished by their mode of delivery. *"It is an injection and it has medicine in it" (27 years, rural woman, IDI)*. They were also explained by terms appropriate for other vaccines that respondents were familiar with. A woman during a FGD in a rural area explained her idea of a vaccine by stating: *"We call it dose - triple, polio".*

Some respondents thought vaccines were relevant only for children and expressed concern about their use for adults. *"All children are vaccinated. But adults are not vaccinated. I think the vaccine is effective for ages 1 to 5. We don't have experience with vaccines being effective at later ages" (man, rural FGD)*.

Over a quarter of respondents said they were aware of a vaccine administered as a nasal spray for swine flu (Table 5-2). There was a significant difference in awareness based on age group (the younger age group of 18-45 years had higher awareness than the older age group of 46-65 years) and area of residence, with highest awareness in the urban middle-income area (47.1%) and lowest in the rural remote area (8.3%). Slightly fewer respondents (23.4%) reported awareness of an injectable vaccine to prevent swine flu.

When respondents were asked whether they had received advice regarding vaccines for swine flu from their health care providers, 15.8% of respondents reported that they had (Table 5-2). A larger percentage of these respondents were from the younger age group and from the urban sites.

5.2.3 Views on benefits and problems with pandemic influenza vaccines

Respondents were asked whether they thought a vaccine could have prevented swine flu. Most (94.7%) said yes, and significantly more who said yes were from the younger age group (97.3%) compared to the older age group (92.0%, p=0.017).

An analysis of narratives indicated confidence and trust in vaccines by a large percentage of respondents. A 47-year-old man who was confident of the benefits of a pandemic influenza vaccine stated: *"[If he had taken the vaccine] he would have been protected. Swine flu can happen only to those who have not taken the vaccine" (rural SSI)*. A few raised concerns about the efficacy of pandemic

influenza vaccines, while maintaining their support of vaccines in general. For example, an urban woman said:

"Getting vaccinated is definitely a good thing but I am not sure whether this vaccine is a proven one like other vaccines. I knew 100 percent about the vaccines that were given in early times but is there any data available for this new vaccine which proves that those who have taken it have not got swine flu? If someone asks me to take it, I won't deny. I would believe in it and would go for it" (45 years, SSI).

Some who thought reported vaccines were helpful nevertheless had a fatalistic attitude towards the illness that did not preclude the vaccine. A 57-year-old urban woman explained: *"The illness will happen anyhow if it has to happen but there is no harm in taking the vaccine" (SSI).*

Others, however, suggested that destiny made any precaution including vaccines irrelevant: *"It will happen if it is destined to happen even if she maintains cleanliness or takes any other precaution" (56 yr, woman, rural SSI)*. Very few distrusted the vaccine itself or had serious safety concerns.

Respondents were also specifically asked whether they knew of any problems with either the nasal or injectable pandemic influenza vaccines. Almost half (48.2%) said that nasal vaccines did not cause any problems and a majority (56.7%) said the same about injectable vaccines. Men were more likely than women to say there was no problem with pandemic influenza vaccines, and that perception was applicable to both nasal (57.7% men, 38.9% women, $p<0.001$) and injectable (65.1% men, 48.4% women, $p<0.001$) vaccines. A third of respondents were unable to say whether nasal or injectable vaccines caused any problems. The main anticipated problems for the nasal vaccine were discomfort or irritation in the nose and throat (12.8%) and runny nose or sneezing (4.4%). For injectable vaccines, identified problems included pain or swelling (8.9%) and fever or chills (3.7%). Only one person anticipated a serious adverse effect of the vaccines, and this person who lived in the urban low-resource area, said death might result from receiving the vaccine.

5.2.4 Experience with pandemic influenza vaccines

Of the 436 SSI respondents, 8.3% reported having personally received a pandemic influenza vaccine and 10.6% said someone else in their household had taken it (Table 5-2). The urban middle-income area had the highest proportion of vaccine acceptors, while the remote rural area had the lowest proportion. The more accessible rural area had more vaccine acceptors than the low-resource urban area.

5.2.5 Reasons for vaccine use

Narratives of those who had indicated household experience with the pandemic influenza vaccine (either personal use or someone else in the household who received it), were analysed to identify key reasons for vaccine uptake. Salience, social and medical influences, and the influence of media were discussed.

Salience of pandemic influenza: exposure to serious a swine flu-related illness or death

The decision to vaccinate for pandemic influenza was strongly motivated by having seen someone suffer from the illness or having heard of a death from swine flu. A 31-year-old urban woman explained: *"My sister's colleague's son suffered from it. He is alive but his friend who used to play with him died. When I heard about this, I became seriously concerned and I vaccinated my son" (IDI).* A rural woman who had taken the vaccine explained that fear drove her to action after a pregnant woman in her village had died from swine flu:

"After one lady died and my son had swine flu, everyone was scared. They felt that if this continues, everyone in the village would die. Nobody from the government came here so members of a youth group called a private doctor so that our villagers would get the vaccine" (45 years, IDI).

She also recounted her experience at the hospital while caring for her son with suspected swine flu illness as follows:

"I observed that when a person was admitted with breathlessness, that person would die immediately. Yes, I have seen such people in Sassoon hospital. Once the person was taken inside the ICU, only their dead body would come out. People were therefore preoccupied with fear."

Social influence

Conduct of free vaccination camps in one's neighbourhood or at school were reported as reasons for taking the vaccine. In a village where a vaccination camp was conducted, peer effects seemed to motivate vaccine uptake. A 45-year-old rural woman explained: *"Everyone in the village took the vaccine, so I also took it to prevent anything before it happens" (IDI)*.

Medical influence

Recommendation by a health care provider in the family influenced vaccine uptake for some. An urban woman explained her reasons for taking the vaccine as follows: *"The epidemic was at a peak and my nephew is a doctor. He was giving the vaccine to his friends and relatives. He is our close relative and we trust that he will not cheat us." (65 yr, IDI).* Other connections with the health system, such as working in a hospital, also influenced vaccine uptake. An urban woman said: *"I took the vaccine. I work as a security guard in a private hospital. It was given free of cost in our hospital. (33 yr, SSI)*

Influence of media

Information from media reports was an important factor for people who actively sought the vaccine. An urban man explained: *"When I read the newspapers, I understood its seriousness, and thought that I should not waste time and therefore took the vaccine immediately" (64 yr, IDI)*. But they acknowledged the importance of information on where they could get vaccinated from pamphlets from provided by the Pune Municipal Corporation or volunteers who came door-to-door. However, it was often noted that while the media was a useful source of information, doctors were consulted before taking the vaccine: *"The media was discussing availability of vaccines. But we didn't rely on the media, we always consulted doctors" (37 yr, urban IDI).*

5.2.6 Reasons for vaccine non-use

When SSI-respondents were asked why they or anyone in their household had not taken the vaccine for swine flu, several common reasons were reported (Table 5-3).

Low perceived risk

A majority (55.0%) indicated low risk attributed to influenza or a sense that they were not personally at risk. Men were more likely to say that than women. Common accounts referred to the following points: First, if there were no cases of swine flu in the respondent's neighbourhood, a vaccine seemed unnecessary. In the urban areas, this was explained largely in terms of a lack of observable symptomatic cases in the neighbourhood: *"If somebody from our housing society gets swine flu, then I would go and take it. If there are no such cases around, then why should I take the vaccine?" (57 yr, urban woman, IDI)*. Similar explanations were noted in the rural area, but complemented by assertions that swine flu was an urban problem that had not reached rural areas. A readily apparent epidemic was required to convince people of the salience of the illness. A man articulated this sentiment metaphorically: *"Suppose, there is a violent and rampant dog biting everyone, only then will a concerted effort be made to kill him. Similarly, in the absence of an epidemic, people will not take the vaccine." (rural FGD)*. Second, the respondent's idea that personal strength and good health would confer protection from illness was mainly reported by men. For example: *"We don't need the vaccine. I am physically fit, I am a sportsman; mostly we won't get it" (26 yr, rural man, SSI)*. Women frequently referred to reduced chances of contracting the illness because they stayed at home: *"Men are exposed to the outside, but we are always at home, hence we do not consider ourselves at risk of catching the illness" (27 yr, urban woman, SSI)*. Faith in God as a basis for perceived protection was also mentioned. *"We believe in our god. We believed that we won't ever get swine flu, and we haven't" (35 yr, urban man, SSI)*. Lastly a low priority for prevention, due to confidence in effective treatment was also noted: *"When there are illnesses in the rural areas, then a cure is made available there. Nobody takes prior care" (25 yr, rural woman, SSI).*

Other preventive measures make vaccines unnecessary

Adequacy of other preventive measures apart from vaccines was reported by 15.8% as a reason for not taking the vaccine, more so by urban than rural respondents ($p<0.001$). Widely mentioned alternative preventive measures included the use of face masks (often referred to tying a handkerchief around the nose and mouth), maintaining personal hygiene, keeping surroundings clean and avoiding crowds. Some also referred to the use of preventive drugs,

specifically mentioning antiviral drugs: *"We did not feel the need to take it since there were other things like masks and Tamiflu" (24 yr, urban man, SSI)*. A few also mentioned herbal preventive measures: *"We used prevention measures – wearing a mask, using camphor and nilgiri [eucalyptus] oil. So, we did not feel the need to take the vaccine" (33 yr, urban man, SSI)*.There was also infrequent mention of chanting of prayer and ritual purification *('agnihotra')*.

Lack of information about the vaccine

Some (11.7%) respondents were unaware of the existence of a vaccine against pandemic influenza. The largest proportion of such respondents was from the rural remote area, followed by the urban low-resource area and the lowest proportion was from the urban middle-income area. A rural woman explained: *"Two years ago when there was an outbreak of swine flu, we were not even aware that there was a vaccine for swine flu" (28 yr, SSI).* This reason was often mentioned in combination with problematic access, i.e., not knowing where to obtain the vaccine.

Problems with access and cost

Difficulties relating to obtaining the pandemic influenza vaccine were noted by 14.7% of SSI respondents, with significantly more from rural than urban areas. The most frequently mentioned problem was that the vaccine was not delivered to the respondents' neighbourhoods. Rural respondents expected that important interventions would be delivered by government health workers. They were not sure how or where to get a vaccine if it was not brought to their villages. A rural woman explained why she did not take the vaccine as follows: *"The most important reason was that the vaccine did not come here, and we do not know where to go and get it" (35 yr, SSI)*. Another problem for accessing the vaccine was not having a clinic nearby. A few respondents also noted the vaccine was available only for children and not adults. A 22-year-old woman who also drew a parallel with polio vaccine campaigns said: *"It hasn't come here yet. For children up to 5 years they come to give the polio vaccine. For swine flu also they came here to vaccinate children but not adults" (urban SSI)*.

A few noted unavailability of the vaccine during the pandemic as a reason: *"There was no vaccine at that time when the illness more widespread. The vaccine came*

later" (46 yr, urban man, SSI). Nine respondents indicated that they wished to take the vaccine but were unable to do so as it was out of stock due to high demand. Seven respondents said they had no time to spare to go and get the vaccine.

Financial constraints as a reason for not taking the vaccine were reported by 5%. Among these respondents, many stated that they would have taken it if the government had provided the vaccine for free or at a discounted price.

Insufficient indication of vaccine priority

Some respondents explained that health care providers, the government or people they knew had not clearly indicated the importance of vaccination or encouraged it. An urban woman stated: *"No one forced me or urged me to take the vaccine. No one asked me to come along to take it. Had someone urged me, I would have taken it. Neither the doctor nor family members urged me" (57 yr, SSI).* The lack of a mandate by the government for pandemic influenza vaccination was also indicated as a reason by some: *"The government did not carry out any promotional activities and there was no compulsion by the government to take the vaccine" (62 years, rural man, RM223).*

Other concerns

Four respondents expressed concerns about vaccine effectiveness; four indicated a general avoidance of medication, and one mentioned a fear of adverse reactions. No one indicated other concerns about the vaccine or type of administration as a reason for not having taken the vaccine.

5.2.7 Preference for injectable or nasal vaccine

Data indicate a strong preference for injectable over nasal vaccines. Twice as many respondents reported preference for an injectable vaccine and considered it safer (Table 5-4). Among those who considered a nasal vaccine safer, more were from the urban middle-income area, followed by the accessible rural area, the urban low resource and finally the rural remote area. When respondents were asked which vaccine they considered more powerful, 44.3% opted for the injectable and 32.6% for the nasal. Those who reported no specific preference for either vaccine referred to (a) a sense of urgency in obtaining whichever vaccine was available, (b) prioritizing convenience and getting the vaccine that

was most easily available, (c) the need to follow a doctor's advice and to not question what the doctor recommends, or (d) lack of their own opinion due to lack of experience with this new illness. Main themes that emerged from the narrative data of SSIs and IDIs in explaining preference for either the injectable vaccine or the nasal vaccine are described in the next section, with narratives quoted in Table 5-5.

5.2.7.1 Reasons for preferring an injectable vaccine

Injectable vaccine considered more powerful than nasal one

A commonly cited reason for preferring an injectable vaccine was that the vaccine would be directly absorbed in the blood and thus more effective. This account was frequently described in contrast to nasal vaccines, which were perceived as ineffective because they were likely to be expelled easily while breathing, and fail to reach all parts of the body. Ideas that injections work faster and had a longer duration of protection than nasal vaccines were also suggested to explain preferences. A few respondents said pain from an injection was an indication of its power.

Fear of side effects from a nasal vaccine

Many referred to fear of side effects from the nasal vaccine as a reason they preferred the injectable one. The numerous perceived side effects from nasal vaccines that were mentioned included irritation in the throat, burning sensation in the eyes, sneezing, pain in the nose, vomiting, breathlessness, a tingling sensation or numbness in the head, a bitter taste in the mouth and general discomfort. Others, who were unable to identify specific side effects, referred merely to being unable to tolerate a nasal vaccine.

Experience and familiarity with injections

Past experience and familiarity with injections compared to a relatively new nasal vaccine was another major reason for preferring injectable vaccines. Many respondents had an implicit trust in injections. Conversely, absence of familiarity and fear of relatively unknown nasal vaccines were frequently reported as reasons for preferring injectable vaccines.

Favourable attitude towards injections and preference regardless of perceived efficacy

A favourable attitude towards injections in general was observed and while this is linked to the theme of perceiving an injectable vaccine as powerful, it was qualitatively distinct in that injections were considered a panacea for all illnesses and the best form of administering any drug. A 65-year-old man explained: *"Now suppose you want to take a vitamin supplement. You get it in the form of tablets, injections and liquid. But, of these, the injection spreads throughout the body" (urban SSI)*. On a similar note, a rural woman said: *"Weakness reduces on administering the injection...one feels better after taking them" (47 yr, SSI)*. A few respondents reported preference for an injectable vaccine, despite their belief that nasal vaccines were more effective.

5.2.7.2 Reasons for preferring a nasal vaccine

Nasal vaccine considered more powerful than an injectable one

Those who preferred a nasal vaccine believed in the superior power of nasal vaccines to reach all parts of the body through one's breathing. Immediacy of effect was also noted. Administration through the nose was a perceived advantage because that was also the point of entry for germs causing swine flu. Some referred to physical sensations after receiving the vaccine as an indication of the vaccine doing its job. This was considered a desirable side effect of nasal vaccines. On a similar note, the idea that the nasal vaccine can spread to the brain was lauded as a measure of its powerfulness by a few who explained their preference for nasal vaccines. However, the same point was regarded as an adverse effect for those shunning the nasal vaccine.

Safety concerns for injectable vaccines and fear of needles

Some preferred a nasal vaccine due to concern about the safety of needles, which might have been previously used. This concern was noted only by urban respondents. Pain or swelling from an injection was a reason for preferring a nasal vaccine, but stated only by a few.

5.3 Discussion

Findings suggest trust in vaccines in general and for pandemic influenza vaccines in rural and urban communities of Pune district. A clear understanding of the

rationale, however, of vaccines designed primarily for healthy individuals to prevent disease was lacking. Many respondents suggested no need for a pandemic influenza in the absence of fever or symptoms. A news report in Pune during the pandemic exemplifies the misconception. A young man suffering from symptoms of influenza who purchased a LAIV from a pharmacy and had it administered in a hospital subsequently died.[34] Some respondents thought vaccines were only relevant for children and irrelevant for adults. Data from rural Pune during and after the pandemic suggest that incidence of hospitalized H1N1 influenza was highest among 5-29 year olds.[35] Both the epidemiology and our findings suggest the need for promoting awareness of the public and health care providers of the value of vaccination for adults, and awareness of contraindications and precautions for vaccination.[21]

Awareness of the role of vaccines in preventing pandemic influenza was relatively low at 25%. A study in Bareilly, Uttar Pradesh, during the pandemic reported awareness of vaccines against swine flu among 47% of studied school students.[36] Notwithstanding low awareness in our study, most respondents, when asked about pandemic influenza vaccines, reported them as potentially helpful in preventing swine flu. Problems or side effects of the vaccine were mostly localized and seldom reported as a barrier to vaccine uptake. This is unlike studies from other countries[9,10,37] or studies in India among health care workers[38,39] where perceived side effects from the vaccine were reported as a deterrent to influenza vaccination intention. Although for the majority a vaccine with fewer side effects was preferred, the finding that for some, a localized reaction or physical sensation after vaccination was an indicator of vaccine efficacy and hence desirable, was unique to our study. It is also interesting to note that some considered an injection as less invasive than a nasal vaccine. It was said that *"one does not feel anything or one feels good"* after taking an injection, while nasal vaccines were perceived to have many more potential side effects. Fear of injections was noted by just a few and concerns about re-use of needles for injectable vaccines were reported largely in the urban middle-income area.

Study findings show a majority community preference for injectable compared to nasal vaccines. Excessive, often unnecessary use of injections has been documented in India[40] and in other parts of Asia.[41,42] The placebo effect offered

by injections has provided an argument for widely using injections in India and is often demanded by patients. A study by Greenhalgh[43] in 1987 questioned blind faith in injections, and our findings suggest that these perceptions continue to hold true. While inactivated injectable vaccines are required for special groups, live-attenuated vaccines offer practical advantages for control of pandemics the general population in a country as highly populated as India. They are easier to administer and easier to produce larger quantities at lower cost.[20] Our findings suggest lack of community familiarity, rather than confidence, with this relatively new form of vaccine administration. Respondents from the urban middle-income area were more aware of nasal vaccines and more likely to consider them as the safer vaccine. Thus, gaining public support is not likely to pose a problem if implemented with effective communication and engagement. The success of the oral polio vaccine campaign in India demonstrates good prospects for widespread public acceptance of this new form of vaccine administration. Paterson and Larson recommend public engagement by building trust and learning about public concerns to be addressed,[44] and by communicating openly, honestly and proactively with the public and other stakeholders.[45] Our study identified the following key concepts that study communities attributed to the vaccine they preferred, either nasal or injectable, that should be well-understood and convincing, namely, the: ability of the vaccine to spread to all parts of the body and immediacy of effect. Properties of the vaccine itself – whether it was live attenuated or inactivated – were never mentioned spontaneously or questioned by any respondents. It is likely not a distinction of practical significance for respondents.

Findings suggest a blurring of urban-rural distinctions in the rapidly urbanizing Pune district. Notwithstanding highest awareness and vaccine uptake in the urban middle-income area, awareness of nasal influenza vaccines, belief in safety of nasal compared to injectable vaccines and use of pandemic influenza vaccine were reported by more respondents from the accessible rural area than from the low-resource urban area. The urban-rural dichotomy may be superseded by other factors with regard to vaccine policy and planning in such rapidly urbanizing settings[46] where people in accessible rural areas may have higher incomes and better access to information than persons in urban slums. More men than women had confidence in the power of nasal vaccines and

anticipated no problems with pandemic influenza vaccines; yet they were also more likely to perceive a low risk for themselves in getting swine flu. Age-specific differences in awareness of nasal vaccines and in the ability of vaccines to prevent influenza indicate a need to inform older segments of the population. The reported swine flu vaccine uptake rate was 8.3% in our study, but limitations in production and access may help explain the low figure. Vaccines were only available many months into the pandemic.[47,48] There was no state-wide initiative for mass vaccination in Maharashtra although the Pune Municipal Corporation provided vaccines without charge to health care workers towards the end of the pandemic.[49] Furthermore, some hospitals and groups conducted their own vaccination camps. The nature of vaccine uptake varied. It was passive acceptance for some when the vaccine was made available in their neighbourhood, and active demand for others who made an effort to go and get it themselves.[50] The Indian Medical Association and Indian Academy of Pediatrics officially recommended the pandemic influenza vaccine,[51] but individuals had to purchase it privately. The public health dissemination strategy for communication information from the state about vaccine recommendations was unclear. The media played a major role in public communication, but this did not appear to be state-directed. Furthermore, the response to the pandemic by the state government seemed to focus on treatment with antivirals rather than preventive measures.

The influence of salience of the illness from personal experience with cases or deaths in the neighbourhood was a powerful motivator for vaccine uptake in our study. A similar finding was reported by SteelFisher et al[10] in a study done in the United States of America (USA). A study using self-administered questionnaires among health care workers in Pune noted “self-protection against illness” as the main reason for accepting H1N1 influenza vaccination.[52] Inasmuch as we surveyed community residents, we were able to identify additional practical reasons for vaccine acceptance, such as health system affiliation, health care provider recommendation, influence of peers and media impact.

A majority considered the illness as very serious or serious.[33] Nevertheless, some who acknowledged the seriousness did not consider themselves to be personally at risk. According to the health belief model, without perceived

personal risk, considering an illness as serious may not translate into protective behaviour.[53] Gendered explanations of perceived personal risk were notable. Men regarded themselves as too strong to catch the illness (a 'man of steel' perception) and women considered themselves at reduced risk from being homebound. The above findings on low risk perception for oneself along with the belief that it was an urban but not a rural problem, suggest an optimism bias[54] where people consider themselves unlikely to catch an illness that they consider serious for others.

Access was a barrier because of community expectations that a vaccine, if relevant, would be delivered through a campaign in one's neighbourhood. Such expectations may be a result of community experience with the vertical polio vaccination programme in India. A clear message from the government endorsing pandemic influenza vaccines, which the community indicated was lacking in the 2009 influenza pandemic, may promote vaccine uptake. Education of health care providers needs to ensure they make appropriate recommendations of vaccines. With respect to the SAGE Working Group framework of vaccine hesitancy, [55] our findings indicate that lack of confidence in pandemic influenza vaccines may not be a serious problem for uptake, but convenient access, complacency, and other sociocultural considerations take precedence.

5.3.1 Dissemination activities

Community engagement was central to the study design. On completion of data collection and analysis, insights and information gained from the study were disseminated back to urban and rural study communities. The information-sharing and open dialogue was attended by community members and village and sub-district policy makers in November 2014. This was accompanied by a health education and awareness activity guided by study findings that community members had requested during data collection. Further technical details and implications for local policy were shared at a meeting that invited policy makers and public health professionals from Pune.

5.3.2 Strengths

The need and value in engaging the public in vaccination initiatives has been well-established.[44,56,57] Recently documented challenges of introducing new vaccines in India,[58-60] highlight the importance of studies that focus on understanding community perceptions, underlying issues and contextual influences that may influence vaccine acceptance. To the best of our knowledge, our study is the first to explore community views, preferences and uptake of pandemic influenza vaccination in India. One other study considered community perceptions of influenza during the pandemic in India,[61] but was limited in its study of views of vaccines. Multiple methods used in our study – focus group discussions, semi-structured interviews and in-depth interviews – made triangulation of results possible. Quantitative survey findings indicated not only what the issues are but the relative frequency of particular perceptions and priorities; qualitative narrative data from SSIs helped explain what these ideas meant and IDIs enriched qualitative detail.

5.3.3 Limitations

The study was designed to provide relevant information and guidance in a local cultural context. Generalizations for other parts of the country must therefore be made with caution. The survey was cross-sectional, and community views and perceptions are subject to change over time and in response to other social or policy changes. Vaccine uptake was documented through self-report and the idea of a preventive vaccine was not clearly appreciated by some respondents. We did not confirm whether respondents who said they had taken a pandemic influenza vaccine actually did. By assuring participants that there were no right or wrong answers, assuring confidentiality, and presenting interviewers as independent researchers we attempted to minimize response bias. A relatively high non-participation rate for the SSIs in the urban sites (76%) was a limitation and is increasingly problematic for community epidemiological studies. There is a possibility of recall bias since data collection for this study began two years after the officially declared end of the pandemic in 2010.[62] Persisting media coverage of swine flu and consideration of vaccines, however, even during our data collection ensured a public memory of the illness and its control.

5.3.4 Conclusion

This study has elucidated cultural perceptions and ideas about the value of vaccines for pandemic influenza among urban and rural communities of Pune, India, which have practical implications for pandemic influenza control. In the 2009-2010 influenza pandemic, a community mass vaccination was not conducted in Pune. People had to pay the full price for a vaccine and display considerable initiative to obtain it. Our study examined reasons for use and non-use of influenza vaccines in this context largely through qualitative approaches. Policy implications from study findings highlight good prospects for use of influenza vaccines for pandemic control given community trust in vaccines. If a mass vaccination is planned for influenza control in the future, the following may help enhance vaccination coverage: (1) Increase community awareness about influenza vaccines, (2) Emphasise their relevance for adults, (3) Emphasise risk for urban and rural communities, men and women, (4) Promote vaccination through health care providers, community leaders and government endorsement, (5) Deliver the vaccine to communities while keeping vaccine cost affordable, (6) If nasal vaccines are considered, they need to be accompanied by effective communication and engagement prior to vaccine implementation, (6) Plans should consider differences within urban (slum vs. middle-income) and rural (accessible vs. remote) communities and cater to these sub-populations based on their specific sociocultural features and community ideas. Questions about use of vaccines for control of seasonal influenza among high-risk groups and the general population also require further consideration and study. This is especially relevant in the light of recent large outbreaks of H1N1 influenza,[63,64] which is now considered a seasonal strain. Lack of priority for routine use of influenza vaccines at present[65] and ability to locally-produce vaccines in Pune, suggest that reconsideration of policy, and sociocultural community studies are needed to guide further development of vaccine policy for effective action.

5.4 Methods

5.4.1 Study area

This study was conducted in Pune district, a focus of the 2009-2010 (H1N1) influenza pandemic in India. The district had a large number of cases and

recorded the country's first death from H1N1 influenza in 2009. Study sites were selected in urban and rural areas. Two urban sites were low-resource densely populated (slum) settlements in Sangamwadi and middle-income neighbourhoods of Erandawane in Pune city. The rural sites comprised villages in Mawal subdistrict that were more accessible to Pune city due to their location along a highway and more remote villages in Velhe subdistrict that were relatively difficult to access. Further details on setting are reported elsewhere.[32,33]

5.4.2 Study design

A mixed-methods, cross-sectional and community-based study was conducted in urban and rural areas of Pune district. The present analysis focuses on community awareness, preference and use of vaccines to prevent pandemic influenza, and primarily had a qualitative focus. We employed multiple methods including focus group discussions, cultural epidemiological semi-structured interviews integrating qualitative and quantitative data, and qualitative in-depth interviews. Formative focus group discussions (FGDs) provided insight on the setting and guided development of questions and categories of semi-structured interviews (SSIs). SSIs were developed based on the explanatory model interview catalogue (EMIC)[66] framework for cultural epidemiology[67] to obtain representative distributions of perceptions of pandemic influenza and the role of vaccines. Additional in-depth interviews (IDIs) were conducted to gain a deeper understanding of experiences and motivations of those who took the pandemic H1N1 influenza vaccine, and the views, potential barriers or hesitation among those who did not do so.

5.4.3 Instruments and respondent selection

Inclusion criteria for FGDs, SSIs and IDIs were resident adults (18-65 years) in the community with conversational fluency in Marathi and ability to mentally and physically withstand the interview or discussion.

Respondents for SSIs were randomly selected from voters' lists for each of the study areas.[33] Voters' lists, which were the most comprehensive of available records, were obtained for each of the study areas. One hundred and ten households were randomly selected for each area using a random number

generator. To avoid selection bias inherent to use of voters' lists, selected households were located but not interviewed. The neighbouring household to the right was approached for interview instead. If no member of the household satisfied the inclusion criteria or if there were no willing participants, the adjacent household to the right was approached, until a suitable respondent was found. An equal balance of men and women and younger (18-45 years) and older (46-65 years) age groups was maintained. Questions related to awareness, preferences, uptake of pandemic influenza vaccines and barriers to vaccine use were considered for this report. Quantifiable coded responses were collected and any quantitative data presented in this report came from the analysis of SSIs. Specific questions that the coded responses correspond to have been included as footnotes to the tables. Narratives in response to open questions in the SSIs complement the quantitative data. IDIs were conducted with a purposively-selected subsample from the SSIs. The IDIs provided accounts enriched by context and reasons for vaccine use or non-use. FGDs were conducted in urban and rural study areas based on a convenience sample recruited by community leaders or community health volunteers. The FGD agenda covered similar broad topics on ideas about vaccines including perceived benefits, problems and use of pandemic influenza vaccines.

We designed instruments for all three methods during several workshops based on a literature review and previous work on vaccine acceptance.[68-70] Instruments were revised based on feedback from other experts and public health professionals. Instruments were pilot tested and further revised after translation into Marathi.

5.4.4 Data collection

Research assistants conducting the SSIs had Masters-level qualifications in social sciences, were native Marathi speakers and received training in interview skills and data management. They worked in pairs with one person conducting the interview and the other maintaining data records. SSIs lasted for 45 minutes on average. Data sheets were checked for accuracy and discrepancies resolved while in the field.

FGDs and IDIs were conducted by one of two bi-lingual senior researchers with doctoral and masters-level degrees in social sciences, accompanied by a note taker. The average duration of FGDs was 1 hour and IDIs was 40 minutes. Facilitators and note takers discussed impressions and compared notes after each FGD and IDI.

Interviewer and respondent characteristics were matched where possible. For example, a female facilitator conducted focus groups with women. Researchers did not have a prior relationship with study participants. All interviews and discussion were conducted in Marathi. FGDs, SSIs and IDIs were audio recorded with participants' consent.

5.4.5 Data management and approach to analysis

5.4.5.1 Qualitative analysis

Narrative data from SSIs were first entered in a word processor in Marathi and then translated into English. Supervisors regularly checked transcriptions and translations for quality. FGD and IDI transcripts were translated into English and entered in a word processor on an ongoing basis while constantly monitoring data quality with reference to study objectives.

FGDs, narrative data from SSIs and IDI data were imported into MAXQDA v.11 (VERBI Software, Germany) for data management and analysis. Analysis was rooted in the objectives of this paper. Thematic coding was done using a deductive approach for first-level coding. Inductive coding was used for secondary and tertiary level codes. Qualitative data collected from the three different methods were regarded as complementary in this analytic process of triangulation.

5.4.5.2 Quantitative analysis

Quantitative data from SSIs were entered by the interview team into Epi Info v. 3.5.3 (CDC, USA). For double-entry verification, a second entry of quantitative data was done independently by a member of another team. Questions that required affirmation or negation were coded on a four point Likert scale, ranging from a clear yes or no (values of 3 or 0), to a qualified yes or no (values of 2 or 1) for responses. Variables with few qualified responses were dichotomised for

analysis. To assess the influence of gender, area of residence and age on views and vaccine uptake, systematic comparisons were analysed for age group, sex and study area. Significant differences at the 0.05 level have been presented in this paper, using Fisher's exact test to compare proportions across different groups. Quantitative variables were also imported into MAXQDA to review narratives of interest based on quantitative associations, thus facilitating integrated analysis of quantitative and qualitative data. Data analysis was done with STATA v. 12.1 (StataCorp, USA) and SAS v. 9.3 (SAS Institute Inc., USA).

5.4.6 Ethical considerations

The Institutional Ethics Committee of the Maharashtra Association of Anthropological Sciences, Pune, the Ethics Commission of Basel and the WHO Research Ethics Review Committee provided ethical approval for this study. Written informed consent was obtained prior to conduct of interviews and FGDs. No financial or other incentives were provided to participants.

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Table 5-1: Summary of sample characteristics

	Number of participants		
	Focus group discussion (FGD)[a], n=28	**Semi-structured interview (SSI), n=436**	**In-depth interview (IDI), n=12**
Age[b]			
18-25	5	76	1
26-35	5	85	5
36-45	5	62	2
46-55	4	119	1
56-65	3	94	3
Sex			
Female	13	221	10
Male	15	215	2
Site			
Urban	10	215	6
Rural	18	221	6
Area			
Urban middle-income	5	102	5
Urban low-resource	5	113	1
Rural more accessible	6	113	6
Rural less accessible	12	108	0

[a] Five focus groups were conducted, each with 5-6 participants. Two focus groups were conducted with women, two with men and one with both men and women.
[b] Specific ages for one focus group with 6 participants at the rural site were not collected. Hence, the total number of participants categorized by age for the focus groups does not add up to 28.

Table 5-2: Awareness, health care provider recommendation and use of pandemic influenza vaccines

	Overall (%)	Age group (%)[a]				Area of residence (%)						Sex (%)		
	n = 436	**Younger** *n = 223*	**Older** *n = 213*	**P value[b]**		**Urban middle-income** *n = 102*	**Urban low-resource** *n = 113*	**Rural more accessible** *n = 113*	**Rural less accessible** *n = 108*	**P value[b]**		**Female** *n = 221*	**Male** *n = 215*	**P value[b]**
Awareness of vaccines to prevent swine flu														
Nasal vaccine[c]	26.6	31.4	21.6	**0.023**	*	47.1	25.7	26.6	8.3	**<0.001**	***	25.8	27.4	0.745
Injectable vaccine[d]	23.4	26.0	20.7	0.213		28.4	26.6	17.7	21.3	0.221		21.7	25.1	0.429
Recommendation by health care provider														
To take a swine flu vaccine[e]	15.8	20.6	10.8	**0.006**	**	23.5	20.4	13.3	6.5	**0.002**	**	13.1	18.6	0.149
Uptake of swine flu vaccine														
Personal use[f]	8.3	9.4	7.0	0.389		13.7	6.2	9.7	3.7	**0.049**	*	5.9	10.7	0.082
Others in household[g]	10.6	NA	NA			19.6	7.1	14.2	1.9	**<0.001**	***	NA	NA	

[a] Younger age group: 18-45 years, Older age group: 46-65 years; NA: Not applicable

[b] Fisher's exact test was used to compare proportions across age groups, area of residence and sex: *p≤0.05, **p≤0.01, ***p≤0.001

[c] Frequency of affirmative responses to the question: "Are you aware of a vaccine that is sprayed into a person's nose to protect against swine flu?"

[d] Frequency of affirmative responses to the question: "Are you aware of a vaccine that is injected into a person's upper arm to protect against swine flu?"

[e] Frequency of affirmative responses to the question: "Has your health care provider ever recommended your taking a vaccine to protect against swine flu?"

[f] Frequency of affirmative responses to the question: "Have you ever taken a vaccine to prevent swine flu?"

[g] Frequency of affirmative responses to the question: "Has anyone else in your household ever taken a vaccine to prevent swine flu?"

All questions were enquired in the local language, Marathi, and translations have been provided here.

Table 5-3: Reasons for non-use of pandemic influenza vaccines

Reasons for not taking the pandemic influenza vaccine (personally or for someone in the household)[a]	**Overall (%)**	**Area of residence (%)**						**Sex (%)**			
		Urban middle-income	**Urban low-resource**	**Rural more accessible**	**Rural less accessible**	**p value**[b]		**Female**	**Male**	**p value**[b]	
	n = 436	*n = 102*	*n = 113*	*n = 113*	*n = 108*			*n = 221*	*n = 215*		
Low risk attributed to influenza	55.0	46.1	57.5	60.2	55.6	0.190		49.8	60.5	**0.027**	*
Sufficient precautionary measures already taken	15.8	29.4	25.7	6.2	2.8	**0.000**	***	15.8	15.8	1.000	
Access (where and how to get it)	14.7	7.8	9.7	17.7	23.1	**0.005**	**	11.8	17.7	0.104	
Unaware of vaccine	11.7	2.0	13.3	12.4	18.5	**0.001**	***	12.7	10.7	0.554	
Cost of vaccine	5.0	4.9	8.0	3.5	3.7	0.442		5.9	4.2	0.513	

[a] Response to the question: "For you or anyone in your household who did not take the vaccine for swine flu, were there any particular reasons not to take it? Can you explain why some (or all) did not take it?" were coded into categories described in the table. Multiple categories could have been mentioned and coded for each respondent. 7.3% of respondents did not provide a reason. Categories reported by less than 5% are not presented. They included: lack of encouragement by health care provider (3.9%), other miscellaneous (3.4%), vaccine shortage due to high demand (2.1%), no time to take the vaccine (1.6%), doubts about vaccine effectiveness (0.9%), and general avoidance of medication (0.9%).

[b] Fisher's exact test was used to compare proportions across area of residence and sex: *p≤0.05, **p≤0.01, ***p≤0.001. No differences were observed across age groups and they have hence not been presented.

Table 5-4: Preference for injectable or nasal pandemic influenza vaccine

	Overall	Age group			Area of residence					Sex		
	n = 436	Younger *n = 223*	Older *n = 213*	p value[a]	Urban-middle income *n = 102*	Urban low-resource *n = 113*	Rural more accessible *n = 113*	Rural less accessible *n = 108*	p value[a]	Female *n = 221*	Male *n = 215*	p value[a]
More powerful vaccine (%)[b]												
Neither	0.0	0.0	0.0		0.0	0.0	0.0	0.0		0.0	0.0	
Both equal	3.0	2.7	3.3		2.9	3.5	1.8	3.7		3.6	2.3	
Injection	44.3	44.4	44.1		42.2	51.3	40.7	42.6		45.2	43.3	
Nasal spray	32.6	36.3	28.6		33.3	31.0	37.2	28.7		26.2	39.1	**
Cannot say	20.2	16.6	23.9		21.6	14.2	20.4	25.0		24.9	15.3	*
Safer vaccine (%)[c]												
Neither	0.7	0.5	0.9		0.0	0.9	0.0	1.9		0.9	0.5	
Both equal	9.6	11.7	7.5		9.8	5.3	14.2	9.3		12.2	7.0	
Injection	57.1	54.7	59.6		46.1	64.6	54.9	62.0	*	55.2	59.1	
Nasal spray	27.5	29.6	25.4		42.2	24.8	25.7	18.5	**	25.8	29.3	
Cannot say	5.0	3.6	6.6		2.0	4.4	5.3	8.3		5.9	4.2	
Personal preference (%)[d]												
No preference	11.2	8.1	14.6	*	9.8	6.2	10.6	18.5	*	12.7	9.8	
Injection	58.5	59.2	57.8		52.9	65.5	54.9	60.2		59.3	57.7	
Nasal spray	30.3	32.7	27.7		37.3	34.5	28.3	21.3		28.1	32.6	

[a] Fisher's exact test was used to compare proportions across age groups, area of residence and sex, *p≤0.05, **p≤0.01, ***p≤0.001

[b] Frequency of responses to the question: "Do you think either of these vaccines (the nasal spray or the injection) would be more powerful and better able to protect you against swine flu? … Why?"

[c] Frequency of responses to the question: "Which one of these vaccines (nasal spray or injection) do you think would be safer for you? … Why?"

[d] Frequency of responses to the question: "If you could choose either of these vaccines to protect yourself against swine flu, which one would you prefer, the nasal spray or the injection? … Why?"

All questions were enquired in the local language, Marathi, and translations have been provided here.

Table 5-5: Reasons for preferring an injectable vaccine or a nasal vaccine for pandemic influenza

A) Reasons for preferring an injectable vaccine

Theme	*Illustrative quote*
Perceived powerfulness of vaccine	
Injectable vaccine spreads through the body from absorption in the blood	*"In our village it is believed that the medicine reaches the whole body only through an injection" (29 yr, rural woman)*
Injectable vaccine spreads faster in the body	*"An injectable vaccine spreads all over quickly. The nasal one takes time while the injection spreads faster" (23 yr, urban man)*
Injectable vaccine has longer lasting effects	*"Injectable vaccine because its effect will last for long" (31 yr, rural man)*
Nasal vaccine may be expelled while breathing, sneezing or in mucus	*"The injectable vaccine allows the medicine to disperse internally. The medicine if administered through the nasal route will get expelled through breath. It won't go inside" (64 yr, rural man)*
Nasal vaccine may not reach all parts of the body	*"Injectable vaccine is better because the nasal vaccine will travel with the breath and only reach the lungs while the injectable one will circulate through the blood in the entire body" (60 yr, rural man)*
Pain caused by injectable vaccine is an indication of its powerfulness	*"Actually, pain at the injection site is considered as good sign" (rural woman, FGD)*
Side effects or safety concerns of alternative	
Fear of numerous side effects from nasal vaccine	*"If given in the nose then it creates irritation in the throat, and the whole mouth becomes bitter" (46 yr, rural woman)*
Familiarity and trust	
Past experience and familiarity with injections	*"I will prefer the injectable vaccine since we are used to taking injections. We have never taken it through the nose" (27 yr, urban man)*
Implicit trust in injections	*"Injection- all I can understand is that, it will be effective when we take it" (50 yr, woman)*
Fear of relatively unknown nasal vaccine	*"A person fears taking it through the nose. There is no fear in an injection. I fear the nasal one" (48 yr, rural woman)*

B) Reasons for preferring a nasal vaccine

Theme	*Illustrative quote*
Perceived powerfulness of vaccine	
Nasal vaccine can reach all parts of the body through breath	*"[I prefer] nasal as when we breathe it reaches the whole body. Injection does not affect the body so fast" (59 years, urban woman)*
Nasal vaccine has a more immediate effect	*"Will take it through the nose. It will have an immediate effect" (50 yr, rural woman)*
Nasal vaccine is administered through the nose where germs enter	*"Nasal [is preferred] because we would have the disease through there…Its effect would be more than injectable" (21 yr, rural man)*
Nasal vaccine has desirable side effects indicative of vaccine doing its job	*"Nasal administration must cause tingling and stinging….You don't feel anything after taking the injectable vaccine but you can feel the medicine going inside and also the stinging caused when administered through the nose" (47 yr, rural man)*
Side effects or safety concerns of alternative	
Fear of needles or pain caused by injectable vaccines	*"The nasal one is better. With an injection, there is inflammation or pain later" (57 yr, urban man)*
Concerns regarding potential re-use of needles in injectable vaccines	*"There is a risk associated with the injection because an already used syringe may be used again, unlike in case of a nasal vaccine which I think spreads in the entire body in the vapour form" (65 yr, urban man)*

Table 5(A) lists main themes and illustrative quotes distilled from respondent narratives regarding why an injectable vaccine was preferred over a nasal one. Narratives data from focus group

discussions and open questions in semi-structured interviews were analysed thematically. Explanations provided were either perceived advantages of the injectable vaccine (text in black) or perceived disadvantages of the nasal vaccine (text in red). Similarly, in Table 5(B), explanations for preference of the nasal vaccine were due to either perceived benefits of the nasal vaccine (text in black) or perceived disadvantages of the injectable vaccine (text in red). As a part of the analysis, themes were grouped under broad domains of perceived powerfulness (or efficacy), side effects or safety concerns and familiarity, trust.

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CHAPTER 6

Sociocultural determinants of anticipated acceptance of pandemic influenza vaccine in Pune, India: a community survey using mixed-methods*

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Abstract

Background

Community willingness to accept vaccines is a neglected component of pandemic preparedness. Despite an acknowledged need for such studies, few have been done in lower income countries. This study investigated community priority and determinants of pandemic influenza vaccine acceptance in Pune, India.

Methods

A cross-sectional, mixed-methods study used semi-structured explanatory model interviews to assess anticipated acceptance of nasal and injectable vaccines at different levels of cost among 436 urban and rural community residents. Sociocultural determinants of anticipated vaccine acceptance were identified using logistic regression models.

Results

Over 93% anticipated accepting a vaccine at no-cost, 91.2% at INR 75, 87.8% at INR 150 and 74.1% at INR 500. Some respondents preferred low-cost vaccines over free vaccines. Illness-related concerns about social isolation, contaminants (e.g., germs or dirt) identified as perceived causes, private-hospital or traditional-healer help seeking, and income were positively associated with anticipated acceptance. Humoral imbalances as perceived cause, drinking warm liquids as home remedy and age were negatively associated.

Conclusions

High acceptability of pandemic influenza vaccines indicates good prospects for mass vaccination. It appeared that confidence was higher in the vaccines than in the health system delivering them. Sociocultural determinants influencing anticipated vaccine acceptance should be considered in vaccination programmes.

Keywords

Cultural characteristics, Influenza, Pandemics, Public participation, Social characteristics, Vaccination

6.1 Introduction

The outbreak of novel influenza A (H1N1) was declared the first influenza pandemic of the 21st century by the World Health Organization (WHO) in June 2009. Although the 2009 influenza pandemic turned out to be less severe than expected, it nevertheless imposed a substantial worldwide burden, notable for mortality affecting children and young adults.[1] Pune, located in Maharashtra, was considered a focus of the 2009 influenza pandemic in India, and Maharashtra recorded 36% of H1N1-related deaths in the country.[2]

Vaccines are a cornerstone of influenza control. Available vaccines include intramuscularly injected inactivated influenza vaccine (IIV) and intranasally administered live attenuated influenza vaccine (LAIV).[3] Both are considered safe and efficacious. Although vaccines are not necessarily immediately available in case of a pandemic, they are essential to limit spread and mitigate severity.[1]

The Pandemic Preparedness and Response Plan for India, acknowledges vaccines as the "best preventive strategy to combat a pandemic".[4] Vaccine safety, efficacy and manufacturing capability are necessary for pandemic preparedness. A Pune-based company, enabled by a WHO technology transfer initiative to strengthen the capacity of developing countries, can produce pandemic influenza vaccines.[5] Community willingness to accept vaccines is an additional often-neglected component of effective vaccine policy and action, and social and cultural features of illness that are known to influence vaccine acceptance therefore require careful consideration.

Poor uptake of influenza vaccines during the 2009 pandemic was a problem noted worldwide.[6,7] Although determinants of pandemic influenza vaccine acceptance have been studied, relatively little research has focussed on low-and-middle-income countries. Acknowledged differences between countries in their pandemic response, and social and cultural influences on behaviour highlight the need for country-specific studies.[7]

To our knowledge, only two studies have examined determinants of pandemic influenza vaccine acceptance in India, and they were convenience samples among healthcare workers[8] and medical students.[9] We undertook this study to

investigate the priority and factors determining vaccination intentions among the general population in Pune. The study aims to determine the level of community interest in accepting vaccines against pandemic influenza at varying levels of cost. We further aim to assess social and cultural determinants of anticipated acceptance of pandemic influenza vaccines.

6.2 Methods

6.2.1 Study design and setting

This cross-sectional survey was conducted between July-December 2012 in two urban and two rural areas of Pune district, India. Selected urban sites comprised low-resource densely populated settlements and middle-income neighbourhoods in Pune city. The rural sites were remote villages in Velhe subdistrict that were difficult to access and relatively accessible villages in Maval subdistrict.

Households were randomly selected from the local registry of voters in each of the four study sites. Eligibility criteria for participants included: ages between 18-65 years, residence in Pune, fluency in Marathi and ability to withstand a 45-minute interview. An equal number of men and women and younger (18-45 years) and older (46-65 years) persons were interviewed. Further details of the study setting and sampling are available elsewhere.[10]

6.2.2 Instruments

Interviews based on the framework of the explanatory model interview catalogue (EMIC)[11] are a principal tool for cultural epidemiological research.[12] The semi-structured EMIC interview for this study was developed in a workshop with study investigators and public health experts.

Sex, site and age-matched vignettes describing a person with influenza symptoms, set in January 2010, provided a focus for questions of the interview. Prior ethnographic research guided categories for coding illness experience, meaning and behaviour. Responses to open questions were coded followed by questions probing categories that were not mentioned spontaneously. The instrument then assessed willingness to take a vaccine to prevent swine flu, the local term most commonly used for H1N1 disease. Vaccine acceptance questions

were posed at four different prices for both nasal and injectable pandemic influenza vaccines: *free* as in the case of many immunization campaigns; *low*, corresponding to a subsidized price of half the market rate (INR 75 for nasal; INR 250 for injectable vaccine), *medium*, the market price of influenza vaccines in Pune during the 2009 pandemic (INR 150 for nasal; INR 500 for injectable vaccine) and *high*, an inflated price of double the market rate (INR 300 for nasal; INR 1000 for injectable vaccine), based on a 'black market rate' for vaccines in short supply as they were early in the Pune pandemic. Each price level was questioned separately. Responses were recorded on a four point Likert scale, ranging from "yes" (clear positive response), "possibly" (qualified positive response), "uncertain" (qualified negative response) and "no" (clear negative response).

Complementary numeric and narrative data were collected in an integrated data set. Interviews were conducted in Marathi by an interviewer and a data recorder. Interviews were voice recorded with permission to enhance interview notes.

6.2.3 Data management and analysis

Quantitative and categorical data were double-entered using range and logic checks in Epi Info v.3.5.3 (CDC, USA).

Outcome variables

Eight different outcomes were examined: anticipated nasal and injectable influenza vaccine acceptance each at four different prices of *free, low, medium, high.* Each outcome variable was dichotomised as 1 ('vaccine acceptance') or 0 ('non acceptance').

Explanatory variables

Explanatory variables included cultural epidemiological variables specifying categories of distress, perceived causes, help-seeking at home and outside, and prevention. Perceptions of vaccines, awareness of illness and sociodemographic characteristics were also considered. Selective variables were grouped to represent coherent themes. Prominence was assigned for each variable in the sets noted above based on whether and how each category was reported by a respondent. Spontaneously mentioned categories received a value of 2;

categories reported only on probing received a value of 1, and if not reported at all was assigned a value of 0. A category that was also identified as most important was assigned an additional value of 3. Mean values summarized the prominence of each category with a possible range of 0-5.

Statistical analyses

Fisher's exact test was used to compare proportions across different classification groups and the Cochran's Q test to compare probabilities of anticipated acceptance of free and low cost vaccines.

To identify sociocultural and sociodemographic determinants of anticipated influenza vaccine acceptance, logistic regression analyses were performed. As a first step, bivariate associations between explanatory variables and each of the outcomes were analysed. These variables were then adjusted for sex, age and area of residence. Variables with $p<0.2$ from this analysis were selected for multivariable *focal* models. Focal models comprised of specific sets of variables such as perceived causes, prevention, etc. and provided insight into the influence of specific sets of sociocultural variables on anticipated influenza vaccine acceptance. Finally, a multivariable *comprehensive* model containing variables from all focal models with $p<0.2$ was developed for each outcome. Variables with $p<0.1$ were retained in the models while assessing relative quality of the model using the Akaike Information Criterion corrected for sample size (AICc). This stepwise variable reduction strategy was done in SAS v.9.3 (SAS Institute Inc., USA). Relative goodness of fit between various focal and comprehensive models were compared using Δ(AICc) which represents the difference in AICc between each model and the model with the lowest AICc for each outcome. Models with lower Δ(AICc) are considered better in explaining acceptance. Regression coefficients and two-tailed p-values are reported. Statistical significance is defined at the level of 5%.

Qualitative data for integrated analysis

Narrative data helped explain the nature of explanatory variables and identified associations. Narratives were translated into English and entered in a word processor. Transcripts were managed with MAXQDA 11 (VERBI software, Germany), and were coded thematically using primarily deductive approaches.

Variables from the quantitative data set were also imported into MAXQDA to select narratives of particular interest, facilitating integrated analysis of qualitative and quantitative data.

6.3 Results

A total of 436 interviews were completed in four study areas. The sample consisted of 50.7% women and 51.2% from the younger age group. Median household size was 5 persons. Median monthly household income among 342 respondents who stated their income was INR 10 000. Regarding the highest level of education, 20% had higher education, 12.8% secondary school and 38.3% primary school; 7.3% had not completed primary school, and 21.6% had no education.

6.3.1 Anticipated pandemic influenza vaccine acceptance

Anticipated acceptance of no-cost nasal and injectable vaccines was over 93% (Table 6-1). A few who were willing to take a free vaccine, nevertheless, noted concerns:

> *If available free of cost, we will definitely take it. But, we need assurance that a real vaccine is being given. We are not as educated as city people, so we are a little scared. I will make sure that the people who are vaccinating are doctors (rural woman, 27 years).*

In general, anticipated acceptance declined as vaccine price increased. An exception was the urban middle-income area, where acceptance rates at the low price (96% nasal, 95% injectable) were higher than the free vaccine (88% nasal, 87% injectable). A 60-year-old urban woman questioned the efficacy of a no-cost vaccine: *"If they give it for free, it will not be effective, so I will not take it."* Other respondents elaborated concerns about corruption and a lack of trust in government initiatives:

> *If it is free then its quality is reduced. If the government is giving it, that means there is a scandal. If we instead pay 500 rupees, there is a psychological reassurance that one has taken the medicine. We do not trust government schemes as the vaccine may be filled with water. So it is better to take it from a private practitioner since we can afford it. The*

> *urban population has lost faith and trust (urban middle-income area, woman, 50 years).*

Few respondents, however, had more faith in public than private services. Referring to experience in the 2009 pandemic, an urban man explained:

> *The vaccine was not being given through the government. It was available only through private providers, which is not guaranteed. We will take it if the government provides it, for that is guaranteed (65 years).*

Younger age group respondents were significantly more likely to accept nasal and injectable vaccines at all prices. Anticipated vaccine acceptance was highest at the remote rural area and lowest in the urban middle-income area when the vaccine was offered for free, but this pattern was reversed for the injectable vaccine priced at INR 500. Acceptance rates of men and women were similar except for the medium and high-priced injectable vaccines, where more men than women reported anticipated acceptance (medium price: women 67.4%, men 80.9%, p=0.001; high price: women 56.1%, men 67.4%, p=0.018).

Each respondent's pattern of acceptance at different levels of cost was analysed to determine whether acceptance was motivated by lower cost. For the nasal vaccine, 14.0% of respondents were less likely to accept as cost increased—35.6% for the injectable vaccine. Cost was not a factor for the 76.3% (nasal) and 53.8% (injectable) who anticipated acceptance at all prices and for the 3.5% (nasal) and 1.4% (injectable) who refused the vaccine at all prices. For some respondents, price appeared to be a counter incentive (6.3% for nasal and 10.6% for injectable vaccines), who anticipated purchasing the high-priced vaccine despite refusing lower-priced vaccines or were willing to buy higher-priced vaccines, though refusing the free vaccine. A 46-year-old woman, who considered the injectable vaccine priced at INR 500 unaffordable, explained why she would purchase it at INR 1000 if there was high demand: *"If the epidemic spreads very much, everywhere, then one would take it".*

6.3.2 Determinants of anticipated influenza vaccine acceptance

Multivariable focal models examined the influence of specific sets of sociocultural features of illness (i.e., patterns of distress, perceived causes, home treatment,

help-seeking outside home, prevention and other ideas about illness and vaccines) and sociodemographics on anticipated vaccine acceptance (Table 6-2). Focal models were examined for three different outcomes: high-priced nasal, medium-priced injectable and high-priced injectable vaccine acceptance. Other outcomes lacked sufficient variability for multivariable analysis. Based on Δ(AICc) values, among nasal medium price models, almost all sociocultural focal models explained acceptance better than the exclusively sociodemographics model. For the injectable high price outcome, the focal model with only sociodemographics explained acceptance better than any of the sociocultural models. For all outcomes, the comprehensive model, which combines sociocultural and sociodemographic variables from all focal models, explained acceptance best (Tables 6-3—6-5). Several variables (e.g., use of facemasks or preventive drugs in prevention, illness identification) adjusted only for sociodemographics were associated with vaccine acceptance, but did not remain significant when adjusted for additional explanatory variables (see Supplementary table).

Sociodemographic features

Increase in age was strongly negatively associated with anticipated acceptance. In contrast, income was a positive predictor at the highest price level.

Patterns of distress

Reduced social contact as a troubling feature of the illness was positively associated with acceptance. Narratives indicate the nature of concerns about the social impact of the illness:

> *It will affect him socially because people tend to avoid contact with such a person. He will feel bad that he is unable to interact with people or his family due to the illness. He will feel isolated. Others would ask him to keep away. (rural man, 60 years)*

Identification of loss of income and illness expenses were financial concerns associated with less likely acceptance.

Perceived causes

Perceived causes that were positively associated with anticipated vaccine acceptance were consumption of contaminated water or food, dirty surroundings

or improper sanitation and cough or sneeze of an infected person. Belief that the pandemic vignette illness was caused by another prior illness, by traditional medical ideas about the role of humoral imbalance or an unhealthy lifestyle was negatively associated.

Help-seeking

The priority of both private hospital and traditional healer help-seeking was positively associated with vaccine acceptance in all comprehensive models. Narratives indicate that traditional healers (referring to ayurvedic medicine providers or herbalists) were usually mentioned as a source of help secondary to allopathic doctors. A reported priority of home-remedies, such as drinking warm liquids, was negatively associated.

Other ideas about vaccines

Greater regard for safety of injectable compared with nasal vaccines was positively associated with injectable vaccine acceptance. Those who identified particular problems with the injectable vaccine were no less likely to anticipate acceptance than those who asserted there were “no problems”, but those who could not say whether there were problems were less likely to anticipate acceptance.

6.4 Discussion

This study was motivated by an interest in enhancing pandemic preparedness in a developing country with influenza vaccine production ability, by focusing on the user dimension of a vaccine intervention. High anticipated acceptance indicates community interest and acceptability of pandemic influenza vaccines. Anticipated acceptance for no-cost vaccines noted in our study (over 93%), are much higher than rates in other settings, such as Hong Kong (45%),[13] United States (US; 50%),[14] Australia (54%)[15] and Malaysia (70%)[16]. During the 2009 pandemic, access was difficult in India as vaccines were not actively made available to the general population. This is in contrast to many high-income countries where low confidence in influenza vaccines was a major obstacle. Findings suggest good prospects for community acceptance of influenza vaccines for pandemic control.

In addition to acceptance of free vaccines, this study clarified community willingness to purchase a vaccine, which is probably a better indication of behaviour in settings where the vaccine is only provided at some cost. Lower anticipated acceptance at higher prices indicates that at some level cost is clearly a barrier, particularly for women and persons from the remote rural area. Some level of subsidy would therefore be needed to implement effective mass vaccination in the framework of pandemic control. Although concerns about the epidemic increased the priority for purchase of high-priced vaccines, whether or not people would actually be able to afford them is another matter, as field experience suggests

Contrary to expectations, free influenza vaccines were less valued than those with costs for some respondents, mostly from the urban middle-income area. This resulted from an explicitly stated lack of trust in government services, and scepticism about the quality of a free vaccine. Research from the US has noted that people often overreact to 'free' products as though zero price meant not only no cost, but also an increased value of the product.[17] We found the opposite phenomenon as some were suspicious of a no-cost vaccine. Furthermore, confidence in the health systems delivering the vaccine appears lower than confidence in the vaccine itself. This finding is supported by a recent study which notes that among persons reporting a lack of confidence in immunization services, persons from India had relatively low vaccine hesitancy, compared to other countries.[18]

Regression models that incorporated sociocultural features of illness explained influenza vaccine acceptance better than those with only sociodemographics. Identified sociocultural determinants provide data to enhance vaccine coverage and effectiveness of vaccine action in an actual campaign. However, as hypothesised, at the price of INR 1000—which is high given median household income and household size—sociodemographics, including income, explained acceptance best.

Although influenza is not considered a traditionally stigmatized disease, like leprosy[19] or AIDS,[20] stigmatization of collectives has been noted,[21] which can

hinder control efforts.[22] In our study, fear of social isolation or interference with relationships positively influenced acceptance. In this sociocultural context, anticipated stigma translated into anticipated vaccine acceptance.
Perceived causes influence vaccination intention and should be assessed while planning vaccination initiatives. Among perceived causes, those related to contaminants were positively associated with vaccine acceptance, including highly-relevant causes for influenza such as cough or sneeze of infected persons and biomedically less-relevant ones such as contaminated food and unclean surroundings. Those who believed in explanations unrelated to contaminants, such as cultural ideas about heat or cold in the body resulting in humoral imbalances were less likely to anticipate vaccine purchase.

Interestingly, seeking counsel from traditional healers was complementary to vaccine acceptance. They are viewed as complementary rather than competing sources of help. This may be partly explained by the fact that the Ministry of Health and Family Welfare (MOHFW), India, promoted ayurvedic interventions for prevention and treatment of H1N1 influenza alongside recommendations to visit hospitals.[23,24] Reporting of private hospitals to seek care may be an indication of financial ability, as these are typically more expensive than public services, or may be an indication of priority for managing influenza, as private services are perceived to provide better quality. The prominence of symptomatic relief through home remedies may have indicated a less serious condition, discouraging acceptance of the vaccine costing INR 500.

Relatively minor problems with the vaccine, such as pain or fever, were spontaneously identified by respondents. Identification of problems with the vaccine did not negatively influence anticipated acceptance, but reporting uncertainty in identifying problems did. “Cannot say” may be a cultural response for larger concerns that, although not articulated, may discourage vaccine acceptance.

In contrast to studies among the general public in the United Kingdom[25] and US,[14] in our study, older respondents were less likely than younger persons to intend to take pandemic influenza vaccines. Observed generational differences in anticipated acceptance highlight the need to communicate the value of influenza

vaccines for older adults, and perhaps target younger adults as early adopters in the context of a vaccination campaign.

6.4.1 Context of vaccine policy

H1N1 influenza, now considered a seasonal strain, has caused approximately 35 000 cases in India this year as of April 2015.[26] Control strategies have focussed on treatment with antivirals and non-pharmaceutical interventions such as encouraging handwashing, cough etiquette, and avoiding contact with infected persons.[27] The MOHFW currently recommends vaccination for healthcare workers, but not the public.[28] Vaccination is not advocated for indicated high-risk groups, such as individuals over 65 years, under-five-year olds, and pregnant women either. The rationale behind this policy decision is unclear, especially as a large percentage of deaths have been reported among people with comorbidities.[29] Furthermore, India has the capacity to produce influenza vaccine.[5] Literature from other countries suggests previous experience with seasonal influenza vaccination is a major determinant of pandemic vaccine uptake.[14,15] Thus, implementation of policy for seasonal influenza vaccination in India for high-risk groups, would not only decrease morbidity and mortality, but also contribute to pandemic preparedness by ensuring upkeep of facilities for influenza vaccine manufacture,[30] and improving vaccine uptake in case of a pandemic.

6.4.2 Limitations

Actual vaccine acceptance rates are usually lower than anticipated rates, and it was not possible to estimate their relationship to actual uptake in this study since there was no public mass vaccination campaign during the 2009 pandemic in India. Anticipated rates are thus only a guide and indication of community priority rather than a perfect prediction. Data collection began two years after the pandemic potentially contributing to recall bias. Ongoing outbreaks of H1N1 influenza nevertheless may have preserved public memory of the illness.

6.4.3 Conclusion

Our findings indicate community confidence in vaccines for influenza in a seriously affected city of India, in contrast with hesitancy in Euro-American settings, suggests good prospects for vaccine strategies in government planning for influenza control. Our cultural epidemiological study clarified sociocultural

determinants of anticipated pandemic influenza vaccine acceptance in Pune. Identified associations were explained by complementary narratives from an integrated design in a mixed-methods approach. By assessing vaccine confidence and determinants of anticipated use, this study highlights the value of social and cultural determinants and community study for influenza vaccine policy and implementation.

Authors' contributions

All authors participated in study design. NS, CS1, LG, CS2 and MGW conceived the plan for analysis. NS, VP, SJ and AK coordinated the study and participated in data collection. LG and CS2 provided statistical guidance. NS analysed the data and drafted the manuscript. NS, CS1 and MW critically revised the manuscript. All authors reviewed and revised the manuscript for intellectual content, and all authors have approved the final manuscript. NS and MGW are guarantors of the paper.

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Competing interests

None declared

Ethical approval

Ethical approval for this study was received from the Institutional Ethics Committee of the Maharashtra Association of Anthropological Sciences, Pune, the Ethics Commission of Basel and the WHO Research Ethics Review Committee. Participants were not given incentives for participation and written informed consent was obtained prior to the interview. All data were anonymized for analysis and maintained confidentially.

Table 6-1: Anticipated pandemic influenza vaccine acceptance at different prices among community residents of Pune: comparison of age groups and areas of residence

Vaccine price	*Anticipated vaccine acceptance (%)*								
	Overall	**Age group**			**Area of residence**				
	n=436	18-45 years *n=223*	46-65 years *n=213*		Urban middle-income *n = 102*	Urban low-resource *n = 113*	Rural remote *n = 108*	Rural accessible *n = 113*	
Nasal vaccine									
Free (INR 0; USD 0)	93.1	97.8	88.3	***	88.2[a]	95.6	97.2	91.2	*
Low (INR 75; USD 1.4)	91.2	96.8	85.2	***	96.0[a]	91.8	89.8	87.6	NS
Medium (INR 150; USD 2.8)	87.8	93.7	81.7	***	92.2	90.3	87.0	82.3	NS
High (INR 300; USD 5.6)	82.6	89.7	75.1	***	87.3	79.7	84.3	79.7	NS
Injectable vaccine									
Free (INR 0, USD 0)	94.5	97.8	91.1	**	87.3[b]	95.6	100.0	94.7	***
Low (INR 250; USD 4.7)	91.3	94.6	87.8	*	95.1[b]	87.5	90.7	92.0	NS
Medium (INR 500; USD 9.3)	74.1	77.1	70.9	NS	84.3	70.8	67.6	74.3	*
High (INR 1000; USD 18.7)	61.7	70.4	52.6	***	67.7	57.5	61.1	61.1	NS

Fisher's exact test was used to compare proportions across age groups and area of residence: NS: Not significant, p>0.05, *p≤0.05, **p≤0.01, ***p≤0.001;

Cochran's Q test for matched subjects used to compare proportions between free and low price vaccine acceptance.

[a] Cochran's Q test, p-value=0.05, exact p=0.092

[b] Cochran's Q test, p-value=0.03, exact p=0.057

INR: Indian Rupee, USD: United States dollar, average exchange rate for 2012: 1 INR=0.0187 USD

Table 6-2: Adjusted analysis (focal models) of social and cultural determinants of anticipated pandemic influenza vaccine acceptance in Pune, India

	Nasal, high price (INR 300)			Injectable, medium price (INR 500)			Injectable, high price (INR 1000)		
Focal models	Coefficient (95% CI)[a]	P value[b]	Δ(AICc)[c]	Coefficient (95% CI)[a]	P value[b]	Δ(AICc)[c]	Coefficient (95% CI)[a]	P value[b]	Δ(AICc)[c]
Patterns of distress			**16.36**			32.73			33.62
Vomiting, Nausea	0.37 (-0.25 to 1.02)	0.241		0.28 (-0.23 to 0.78)	0.281		0.36 (-0.09 to 0.81)	0.112	
Diarrhoea, appetite loss, abdominal pain	0.49 (-0.21 to 1.19)	0.167							
Headache	0.23 (-0.32 to 0.77)	0.418							
Breathlessness	-0.53 (-0.99 to -0.08)	**0.022**							
Redness or rash	0.33 (-0.27 to 0.94)	0.278							
Social isolation and interference	0.34 (0.02 to 0.66)	**0.038**		0.28 (0.03 to 0.54)	**0.030**				
Sadness, tension				0.10 (-0.09 to 0.29)	0.322		0.11 (-0.05 to 0.28)	0.171	
Costs, lost income	-0.19 (-0.40 to 0.03)	0.093							
Perceived causes			**17.62**			**22.30**			27.41
Contaminated water, unsafe food	0.24 (-0.05 to 0.52)	0.103		0.15 (-0.08 to 0.37)	0.197		0.12 (-0.07 to 0.30)	0.229	
Humoral imbalance, lifestyle	-0.26 (-0.55 to 0.04)	0.087		-0.25 (-0.52 to 0.02)	0.074				
Prior illness	-0.25 (-0.52 to 0.01)	0.062							
Dirty surroundings, improper sanitation				0.13 (-0.1 to 0.35)	0.274		0.23 (0.03 to 0.43)	**0.028**	
Lack of personal hygiene				0.39 (-0.02 to 0.81)	0.063				
Environmental germs				0.08 (-0.30 to 0.46)	0.692		0.10 (-0.23 to 0.42)	0.564	
Insect bite							0.13 (-0.05 to 0.3)	0.149	
Air pollution	0.14 (-0.21 to 0.49)	0.425					0.24 (-0.02 to 0.5)	0.069	
Cough or sneeze of infected person	0.24 (-0.09 to 0.57)	0.149		0.45 (0.16 to 0.74)	**0.003**		0.21 (0.01 to 0.42)	**0.041**	
Other contact	0.33 (-0.11 to 0.76)	0.139		0.15 (-0.17 to 0.47)	0.370				
Hospital-acquired	0.07 (-0.39 to 0.53)	0.773							
Self-treatment at home			**19.82**			31.36			32.59
Do nothing at home							0.14 (-0.01 to 0.28)	0.061	
Drink warm liquids				-0.23 (-0.47 to 0.01)	0.061				
Ayurvedic remedies	0.31 (-0.02 to 0.65)	0.069		0.26 (-0.02 to 0.53)	0.065				
Allopathic drugs	0.16 (-0.12 to 0.44)	0.250		0.13 (-0.09 to 0.35)	0.240				
Help-seeking outside home			**18.30**			29.77			27.33
Private hospital	0.20 (0.03 to 0.37)	**0.023**		0.13 (-0.01 to 0.28)	0.071		0.19 (0.01 to 0.38)	**0.041**	
Government hospital							-0.02 (-0.19 to 0.14)	0.793	
Informal help from friend or relative				-0.28 (-0.53 to -0.02)	**0.036**				
Traditional healer	0.29 (-0.06 to 0.65)	0.108		0.30 (-0.02 to 0.62)	0.064		0.24 (-0.05 to 0.52)	0.101	
Prevention			**17.69**			31.60			29.73
Ritual purification, supernatural forces				0.15 (-0.09 to 0.40)	0.224				

	Nasal, high price (INR 300)			Injectable, medium price (INR 500)			Injectable, high price (INR 1000)		
Focal models	Coefficient (95% CI)[a]	P value[b]	Δ(AICc)[c]	Coefficient (95% CI)[a]	P value[b]	Δ(AICc)[c]	Coefficient (95% CI)[a]	P value[b]	Δ(AICc)[c]
Handwashing	0.24 (-0.21 to 0.68)	0.303					0.24 (-0.07 to 0.56)	0.130	
Cleanliness	0.13 (-0.05 to 0.31)	0.168					0.13 (-0.01 to 0.28)	0.073	
Wholesome lifestyle	-0.19 (-0.40 to 0.02)	0.082							
Wearing a mask	0.29 (-0.05 to 0.63)	0.091		0.25 (-0.02 to 0.53)	0.072		0.22 (-0.01 to 0.45)	0.058	
Herbal remedies				0.11 (-0.25 to 0.48)	0.543				
Preventive drugs	0.34 (-0.19 to 0.86)	0.207		0.28 (-0.17 to 0.74)	0.225				
Vaccines				0.17 (-0.10 to 0.45)	0.212				
Health education							0.26 (-0.01 to 0.54)	0.060	
Other ideas about illness and vaccines			21.90			31.07			27.60
Seriousness of illness							0.16 (-0.05 to 0.37)	0.142	
Vaccine would prevent swine flu				0.34 (-0.00 to 0.67)	0.052		0.28 (-0.05 to 0.62)	0.098	
Awareness of nasal vaccines				0.09 (-0.12 to 0.30)	0.398				
Household experience with swine flu vaccine				0.19 (-0.15 to 0.53)	0.283				
Inj vaccine safer vs. no preference				0.70 (0.07 to 1.33)	**0.030**[d]				
Nas vaccine safer vs. no preference				0.71 (-0.01 to 1.43)	0.052[d]				
Inj vaccine more powerful vs. no preference	-0.38 (-1.03 to 0.28)	0.261[e]							
Nas vaccine more powerful vs. no preference	0.32 (-0.44 to 1.08)	0.409[e]							
Nas vaccine: cannot say vs. no problem				0.64 (-0.44 to 1.72)	0.246[f]		0.31 (-0.62 to 1.24)	0.511[g]	
Nas vaccine: problem specified vs. no problem				0.12 (-0.60 to 0.84)	0.736[f]		0.52 (-0.11 to 1.15)	0.106[g]	
Inj vaccine: cannot say vs. no problem	-0.32 (-0.92 to 0.27)	0.289[h]		-1.22 (-2.26 to -0.18)	**0.022**[i]		-0.92 (-1.82 to -0.01)	**0.047**[j]	
Inj vaccine: problem specified vs. no problem	-0.68 (-1.42 to 0.05)	0.069[h]		-0.45 (-1.27 to 0.36)	0.276[i]		-0.43 (-1.17 to 0.30)	0.249[j]	
Sociodemographics			21.70			24.23			24.48
Not currently married							0.38 (-0.17 to 0.93)	0.176	
Minority social category							-0.23 (-0.72 to 0.26)	0.356	
Occupation: Agriculture vs. reference				-0.67 (-1.47 to 0.13)	0.101[k]				
Occupation: Employed vs. reference				0.29 (-0.31 to 0.89)	0.351[k]				
Income: over INR 10,000 vs. under	0.38 (-0.27 to 1.03)	0.253[l]		0.58 (-0.01 to 1.16)	0.055[m]		0.90 (0.38 to 1.42)	**0.001**	
Income: cannot say vs. under INR 10,000	-0.31 (-1.02 to 0.40)	0.392[l]		0.01 (-0.61 to 0.62)	0.985[m]		-0.02 (-0.60 to 0.55)	0.937	
Identifying illness as swine flu	0.64 (-0.12 to 1.40)	0.100		0.97 (0.31 to 1.63)	**0.004**				
Sex (male vs. female)	-0.01 (-0.54 to 0.52)	0.972		0.56 (0.06 to 1.06)	**0.029**		0.41 (-0.01 to 0.84)	0.058	
Age	-0.03 (-0.05 to -0.01)	**0.001**		-0.01 (-0.03 to 0.01)	0.329		-0.04 (-0.05 to -0.02)	**<0.001**	
Urban low-resource vs. middle-income area	-0.61 (-1.41 to 0.19)	0.133[n]		-0.80 (-1.54 to -0.07)	**0.032**[o]		-0.19 (-0.84 to 0.47)	0.572[p]	
Rural remote vs. urban middle-income area	0.08 (-0.80 to 0.95)	0.859[n]		-0.02 (-0.98 to 0.94)	0.964[o]		0.10 (-0.57 to 0.77)	0.767[p]	
Rural accessible vs. urban middle-income area	-0.60 (-1.41 to 0.20)	0.143[n]		-0.24 (-1.01 to 0.53)	0.544[o]		-0.26 (-0.88 to 0.37)	0.423[p]	

Focal models considered for three different outcome variables: nasal high price vaccine (INR 300), injectable medium price (INR 500) and injectable high price vaccines (INR 1000). All variables included for each focal model have been presented. Each focal model was adjusted for age, sex and area of residence, which have been presented in the model containing only sociodemographic characteristics.

[a] Logistic regression coefficient with 95% confidence interval

[b] Bold values indicate p≤0.05

[c] Difference in corrected Akaike's Information Criterion [Δ(AICc)] between focal each model and the respective comprehensive model that had the lowest AICc and was assigned a value of zero (comprehensive model described in Table 6-3 for 'nasal high price', Table 6-4 for 'injectable medium price' and Table 6-5 for 'injectable high price'). Model with lower Δ AICc) values are considered better fitted than those with higher values. Bold values indicate models better than sociodemographics alone

[d] Variable with 3 categories, overall p=0.073

[e] Variable with 3 categories, overall p=0.090

[f,g,l] Variable with 3 categories, overall p>0.2

[h] Variable with 3 categories, overall p=0.167

[i] Variable with 3 categories, overall p=0.072

[j] Variable with 3 categories, overall p=0.134

[k] Variable with 3 categories, overall p=0.064; Reference group for baseline comparison was those who were students, housewives, retired or unemployed

[m] Variable with 3 categories, overall p=0.137

[n] Variable with 4 categories, overall p=0.172

[o] Variable with 4 categories, overall p=0.103

[p] Variable with 4 categories, overall p>0.2

Inj: Injectable; INR: Indian rupees, average exchange rate for 2012: 1 INR=0.0187 USD; Nas: Nasal

Table 6-3: Multivariable analysis (comprehensive model) of determinants of anticipated nasal pandemic influenza vaccine acceptance at the high price (INR 300)

Explanatory variables[a]	Coefficient (95% CI)[b]	P value[c]
Patterns of distress		
Diarrhoea, appetite loss, abdominal pain	0.65 (-0.06 to 1.36)	0.073
Breathlessness	-0.43 (-0.90 to 0.03)	0.069
Social isolation and interference	0.44 (0.10 to 0.79)	**0.012**
Costs, lost income	-0.24 (-0.47 to -0.02)	**0.037**
Perceived causes		
Contaminated water, unsafe food	0.30 (0.0002 to 0.59)	**0.050**
Humoral imbalance, lifestyle	-0.36 (-0.68 to -0.05)	**0.023**
Prior illness	-0.32 (-0.62 to -0.02)	**0.037**
Help-seeking		
Ayurvedic remedies at home	0.36 (-0.01 to 0.73)	0.053
Private hospital	0.19 (0.01 to 0.37)	**0.037**
Traditional healers	0.47 (0.08 to 0.85)	**0.017**
Prevention		
Maintaining cleanliness	0.16 (-0.03 to 0.35)	0.101
Sociodemographics		
Sex (male vs. female)	0.26 (-0.31 to 0.83)	0.376
Age	-0.05 (-0.07 to -0.02)	**<0.001**
Area of residence		0.148
Urban low-resource vs. middle-income	-0.36 (-1.23 to 0.52)	0.424
Rural remote vs. urban middle-income	-0.09 (-0.97 to 0.78)	0.837
Rural accessible vs. urban middle-income	-0.86 (-1.72 to -0.003)	**0.049**

[a]Variables identified in focal models (p<0.2) included in comprehensive model
[b] Logistic regression coefficient with 95% confidence interval
[c] Bold values indicate p<0.05
INR: Indian rupees, average exchange rate for 2012: 1 INR=0.0187 USD

Table 6-4: Multivariable analysis (comprehensive model) of determinants of anticipated injectable pandemic influenza vaccine acceptance at the medium price (INR 500)

Explanatory variables[a]	Coefficient (95% CI)[b]	P value[c]
Patterns of distress		
Social isolation and interference	0.25 (-0.01 to 0.52)	0.058
Perceived causes		
Contaminated water, unsafe food	0.19 (-0.04 to 0.43)	0.105
Humoral imbalance, lifestyle	-0.29 (-0.57 to -0.004)	**0.047**
Lack of personal hygiene	0.43 (-0.02 to 0.88)	0.059
Cough or sneeze of infected person	0.34 (0.03 to 0.64)	**0.032**
Help-seeking		
Drink warm liquids at home	-0.38 (-0.66 to -0.11)	**0.007**
Private hospital	0.18 (0.02 to 0.33)	**0.025**
Other ideas about illness and vaccines		
Illness identified as swine flu	0.75 (-0.04 to 1.54)	0.062
Comparative vaccine safety		0.087
Inj vaccine: safer vs. no preference	0.72 (0.08 to 1.37)	**0.029**
Nas vaccine: safer vs. no preference	0.63 (-0.13 to 1.38)	0.102
Problems with injectable vaccine		**0.015**
Cannot say vs. no problem	-0.79 (-1.33 to -0.26)	**0.004**
Problem specified vs. no problem	-0.39 (-1.14 to 0.37)	0.318
Sociodemographics		
Sex (male vs. female)	0.48 (-0.02 to 0.98)	0.060
Age	-0.01 (-0.03 to 0.01)	0.475
Area of residence		0.265
Urban low-resource vs. middle-income	-0.74 (-1.55 to 0.07)	0.075
Rural remote vs. urban middle-income	-0.73 (-1.51 to 0.06)	0.069
Rural accessible vs. urban middle-income	-0.57 (-1.37 to 0.23)	0.161

[a]Variables identified in focal models (p<0.2) included in comprehensive model

[b] Logistic regression coefficient with 95% confidence interval

[c] Bold values indicate p<0.05

Inj: Injectable; INR: Indian rupees, average exchange rate for 2012: 1 INR=0.0187 USD; Nas: Nasal

Table 6-5: Multivariable analysis (comprehensive model) of determinants of anticipated injectable pandemic influenza vaccine acceptance at the high price (INR 1000)

Explanatory variables[a]	Coefficient (95% CI)[b]	P value[c]
Perceived causes		
Dirty surroundings, improper sanitation	0.26 (0.05 to 0.47)	**0.014**
Help-seeking		
Do nothing at home (go directly to hospital)	0.13 (-0.03 to 0.28)	0.101
Private hospital	0.26 (0.12 to 0.40)	**<0.001**
Other ideas about illness and vaccines		
Problems with injectable vaccine		**0.003**
Cannot say vs. no problem	-0.83 (-1.31 to -0.34)	**0.001**
Problem specified vs. no problem	-0.06 (-0.72 to 0.61)	0.871
Sociodemographics		
Income under INR 10,000/month(ref)		**0.002**
Over INR 10,000 vs. under	0.98 (0.44 to 1.51)	**<0.001**
Cannot say vs. under INR 10,000	0.17 (-0.43 to 0.76)	0.579
Sex (male vs. female)	0.28 (-0.17 to 0.73)	0.222
Age	-0.04 (-0.05 to -0.02)	**<0.001**
Area of residence		0.726
Urban low-resource vs. middle-income	0.03 (-0.65 to 0.7)	0.941
Rural remote vs. urban middle-income	0.23 (-0.45 to 0.92)	0.506
Rural accessible vs. urban middle-income	-0.15 (-0.80 to 0.51)	0.662

[a] Variables identified in focal models (p<0.2) included in comprehensive model
[b] Logistic regression coefficient with 95% confidence interval
[c] Bold values indicate p<0.05
INR: Indian rupees, average exchange rate for 2012: 1 INR=0.0187 USD

Supplementary table: Association between each explanatory variable and anticipated pandemic influenza vaccine acceptance

Explanatory variables[a]	Nasal medium price (INR 150)		Nasal high price (INR 300)		Injectable medium price (INR 500)		Injectable high price (INR 1000)	
	Est[b]	***P val***[c]	***Est***[b]	***P val***[c]	***Est***[b]	***P val***[c]	***Est***[b]	***P val***[c]
Patterns of distress								
Vomiting, nausea	1.04	0.001	0.68	0.017	0.34	0.178	0.37	0.103
Diarrhoea, appetite loss, abdominal pain	0.49	0.186	0.66	0.048	0.06	0.802	0.10	0.651
Headache	-0.03	0.931	0.39	0.146	0.11	0.605	0.20	0.312
Breathlessness	-0.35	0.160	-0.36	0.096	0.12	0.579	0.10	0.598
Redness or rash	0.78	0.017	0.54	0.047	0.12	0.609	-0.15	0.458
Complications in lungs, liver	0.56	0.065	0.18	0.483	0.26	0.237	0.16	0.406
Concern about course of illness	0.25	0.178	0.05	0.712	0.04	0.754	-0.02	0.816
Social isolation and interference	0.37	0.044	0.34	0.028	0.31	0.014	0.12	0.217
Sadness, tension	0.04	0.731	0.06	0.575	0.12	0.194	0.12	0.157
Costs, lost income	-0.18	0.154	-0.16	0.136	-0.02	0.806	-0.05	0.595
Perceived causes								
Contaminated water, unsafe food	0.36	0.036	0.26	0.054	0.17	0.114	0.16	0.095
Shock, tension	-0.12	0.389	-0.09	0.431	-0.17	0.115	-0.05	0.657
Humoral imbalance, lifestyle	0.15	0.469	-0.20	0.174	-0.20	0.133	-0.10	0.420
Prior illness	-0.02	0.914	-0.26	0.051	-0.09	0.484	0.02	0.855
Dirty surroundings, improper sanitation	0.04	0.778	0.02	0.874	0.19	0.099	0.27	0.008
Lack of personal hygiene	0.13	0.606	0.18	0.386	0.47	0.024	0.19	0.234
Environmental germs	0.70	0.040	0.05	0.823	0.32	0.139	0.23	0.184
Insect bite	0.03	0.820	0.11	0.350	0.00	0.986	0.11	0.170
Air pollution	0.26	0.225	0.27	0.141	0.00	0.988	0.30	0.027
Cough or sneeze of infected person	0.29	0.146	0.34	0.036	0.50	0.001	0.20	0.054
Other contact	0.19	0.396	0.38	0.072	0.21	0.193	0.07	0.640
Hospital-acquired	0.16	0.563	0.31	0.185	0.20	0.329	0.07	0.679
Home-based treatment								
Do nothing at home	-0.03	0.777	0.07	0.430	0.10	0.242	0.14	0.060
Drink warm liquids	0.03	0.873	-0.04	0.755	-0.22	0.075	-0.05	0.659
Ayurvedic remedies	0.66	0.006	0.35	0.043	0.26	0.054	0.12	0.264
Allopathic drugs	0.37	0.057	0.22	0.138	0.17	0.143	0.12	0.231
Prayer	-0.15	0.175	-0.08	0.433	-0.07	0.402	-0.10	0.235
Help-seeking outside home								
Private hospital	0.17	0.080	0.19	0.031	0.13	0.074	0.21	0.001
Government hospital	-0.05	0.563	0.03	0.705	-0.03	0.597	-0.11	0.055
Local health worker	0.44	0.143	-0.04	0.823	-0.01	0.971	0.04	0.823
Informal help from friend or relative	0.01	0.966	0.01	0.970	-0.26	0.045	-0.14	0.270
Traditional healer	0.45	0.057	0.27	0.144	0.26	0.110	0.22	0.110
Prevention								
Ritual purification, supernatural forces	0.02	0.892	0.09	0.496	0.18	0.160	0.08	0.380
Handwashing	0.21	0.415	0.34	0.134	0.05	0.753	0.30	0.074
Cleanliness	0.21	0.054	0.15	0.087	0.09	0.243	0.12	0.071
Wholesome lifestyle	0.10	0.493	-0.19	0.067	0.08	0.433	0.09	0.344
Wearing a mask	0.90	0.001	0.37	0.035	0.34	0.018	0.22	0.059
Herbal remedies	0.55	0.059	0.27	0.223	0.30	0.126	0.10	0.510
Preventive drugs	1.23	<0.001	0.47	0.076	0.52	0.024	0.11	0.546
Vaccines	0.18	0.390	0.20	0.272	0.24	0.090	-0.04	0.694
Health education	0.05	0.797	-0.07	0.633	0.04	0.797	0.25	0.072
Ideas about illness, vaccines								
Seriousness of illness	0.06	0.672	0.04	0.775	0.07	0.544	0.17	0.105
Vaccine would prevent swine flu	0.41	0.023	0.14	0.435	0.39	0.019	0.33	0.050

Explanatory variables[a]	Nasal medium price (INR 150)		Nasal high price (INR 300)		Injectable medium price (INR 500)		Injectable high price (INR 1000)	
	Est[b]	***P val***[c]	***Est***[b]	***P val***[c]	***Est***[b]	***P val***[c]	***Est***[b]	***P val***[c]
Awareness of nasal vaccines	0.19	0.177	0.13	0.249	0.14	0.151	0.02	0.773
Inj vaccine more powerful vs. no preference	-0.07	0.849	-0.34	0.297	0.14	0.611	0.05	0.841
Nas vaccine more powerful vs. no preference	0.84	0.064	0.33	0.386	0.32	0.302	-0.25	0.376
Inj vaccine safer vs. no preference	0.06	0.880	0.37	0.292	0.65	0.034	0.26	0.388
Nas vaccine safer vs. no preference	0.42	0.393	0.50	0.226	0.61	0.084	-0.11	0.730
Nas vaccine: cannot say vs. no problem	-1.56	<0.001	-0.30	0.330	-0.55	0.034	-0.53	0.026
Nas vaccine: problem specified vs. no problem	-1.39	0.002	-0.03	0.933	-0.04	0.911	0.34	0.234
Inj vaccine: cannot say vs. no problem	-1.16	0.001	-0.27	0.368	-0.76	0.003	-0.75	0.001
Inj vaccine: problem specified vs. no problem	-1.04	0.023	-0.66	0.076	-0.27	0.452	-0.14	0.655
Household experience with swine flu vaccine	0.16	0.440	0.11	0.507	0.24	0.133	0.05	0.693
Sociodemographics								
Not currently married	-0.14	0.709	-0.16	0.617	0.21	0.489	0.41	0.134
Living in a joint family	0.40	0.189	0.23	0.387	0.15	0.518	0.12	0.565
Household size	0.12	0.070	0.05	0.297	0.05	0.273	0.03	0.368
Self as household head	0.73	0.082	0.36	0.307	0.26	0.418	0.04	0.895
Occupation: Agriculture vs. reference[d]	-0.89	0.079	-0.33	0.478	-0.65	0.109	-0.11	0.763
Occupation: Employment vs. reference[d]	-0.51	0.200	0.13	0.691	0.32	0.288	0.07	0.778
Income: Over INR 10,000 vs. under INR 10,000	0.24	0.537	0.42	0.206	0.62	0.034	0.94	<0.001
Income: Cannot say vs. under INR 10,000	-0.39	0.336	-0.33	0.366	-0.12	0.696	0.02	0.951
Minority social category	-0.28	0.426	0.15	0.633	-0.34	0.209	-0.36	0.144
Identifying illness as swine flu	0.43	0.346	0.69	0.074	0.99	0.003	0.20	0.440
Sex (male vs. female)[e]	0.45	0.134	0.09	0.709	0.72	0.001	0.48	0.015
Age[e]	-0.03	0.003	-0.04	<0.001	-0.02	0.026	-0.03	<0.001
Urban low-resource vs. middle-income area[e]	-0.24	0.626	-0.56	0.139	-0.80	0.020	-0.43	0.127
Rural remote vs. urban middle-income area[e]	-0.56	0.230	-0.25	0.536	-0.95	0.006	-0.29	0.324
Rural accessible vs. urban middle-income area[e]	-0.93	0.036	-0.56	0.139	-0.62	0.075	-0.29	0.315

[a] Four different outcome variables: nasal medium price (INR 150), nasal high price (INR 300), injectable medium price (INR 500) and injectable high price (INR 1000) vaccine acceptance. Association between each individual variable and outcome, adjusted for sex, age and area have been presented. Continuous variables associated with p<0.20 to at least one of the outcomes or categorical variables for which at least one level differs from the reference level with p< 0.20 for one of the outcomes are documented. Continuous explanatory variables and categorical explanatory variables with overall p<0.20 in an association were included in focal models.

[b] Est: Logistic regression coefficient. Shades of green indicate variables positively associated with outcome and shades of red indicate variables negatively associated with outcome.

[c] P val: P value. Darkest shade: p<0.01, Middle shade: p<0.05, Light shade: p<0.20

[d] Reference group for baseline comparison was those who were students, housewives, retired or unemployed

[e] Adjustment variables used for each association presented. Here, unadjusted estimates of these variables are given

Inj: Injectable; INR: Indian rupees, average exchange rate for 2012: 1 INR=0.0187 USD; Nas: Nasal

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CHAPTER 7

Discussion

A WHO guidance document emphasises the importance of pandemic preparedness as follows[1]:

> *"Influenza pandemics are unpredictable but recurring events that can have severe consequences on human health and economic well-being worldwide. Advance planning and preparedness are critical to help mitigate the impact of a global pandemic".*

The emergence of pandemic influenza, the virus subtype and its impact are currently unpredictable. The highly pathogenic H5N1 influenza virus was considered a likely candidate, but in 2009, the H1N1 subtype unexpectedly emerged to reach pandemic proportions[2]. Although the 2009 pandemic was less severe than expected, it is neither indicative of the severity of any future pandemics, nor does it change the risk of another pandemic emerging[3]. Taubenberger and Morens summarize decades of influenza research by stating[4]:

> *"As our understanding of influenza viruses has increased dramatically in recent decades, we have moved ever further from certainty about the determinants of, and possibilities for, pandemic emergence".*

Preparedness for pandemic influenza is thus critical. These efforts are doubly-useful for managing seasonal influenza and for improving health systems in general. Major steps have been taken towards this end with setting up of global surveillance for early detection of potential pandemic viruses[5], stockpiling of antivirals[6], increasing surge capacity of hospitals, and creating detailed pandemic preparedness plans that outline non-pharmaceutical interventions for use in early stages of a pandemic[1]. However, as cases increase beyond the surge capacity of hospitals and anti-viral resistance emerges, the logistical, social and economic consequences, in addition to the medical burden of disease, become extremely challenging. Pandemic control therefore relies heavily on production and use of vaccines, which remain the cornerstone of influenza control.

Community acceptance of vaccines is a critical determinant for effective pandemic influenza vaccine action. This thesis focuses on community acceptance of influenza vaccines while examining social and cultural features of the illness. Research was conducted in a lower-income country, India, where such studies are lacking. The thesis aims to describe urban and rural community understanding of pandemic influenza in Pune, in terms of experience, meaning, behavioural response and ideas on prevention. Identified sociocultural features of pandemic influenza were used to explain anticipated acceptance of vaccines. Community interest in pandemic influenza vaccines was assessed as well as preferences, experience and reasons for use or non-use of vaccines during the 2009 influenza pandemic. Hereinafter a discussion of findings from previous chapters and implications for policy, methodological considerations, future directions and practical implications are presented and discussed.

7.1 Community-reported priorities in contrast to professional priorities

Community ideas on influenza illness prevention, causes and burden did not always coincide with professional ideas of the disease and its control. For example, the community prioritized cleanliness and a wholesome lifestyle above vaccination (Chapter 4). Notwithstanding importance of community-indicated preventive measures, for rapid control of pandemic influenza, vaccination takes precedence for public health professionals[7]. Similarly, prevention, management and treatment of physical symptoms are more of a public health priority for pandemic influenza control, than emotional burden from the illness, which was prioritised by the community. Some community ideas on cause of the illness, such as humoral imbalances in the body, tension and magico-religious causes, also differed from professional concepts. Generating community interest in control interventions becomes problematic when there is a lack of concordance in concepts of disease etiology. Dissonance between professional and community priorities may affect the perceived relevance of public health recommendations and limit their value in control. Local sociocultural ideas of illness and community priorities thus require understanding to improve communication with the public, and in planning vaccine interventions[8]. Acknowledgement of similarities and

differences between professional and community-reported burden of influenza, and community ideas and priorities for control, are therefore necessary for effectiveness of control measures. On the public health response to the 2009 influenza pandemic, Larson and Heymann provide a reminder of the need to:

> *"…maintain perspective about other health concerns of the public. These concerns will be present for the long term, well after the current influenza A (H1N1) pandemic has resolved".*[9]

7.2 Value and ways of studying sociocultural features of illness in explaining vaccine acceptance

Incorporation of local sociocultural features of illness, such as meaning and behaviour, explained anticipated vaccine acceptance better than sociodemographic and economic characteristics alone. Pre-intervention assessments of community acceptance of influenza vaccines should thus not only consider social epidemiology[10], but also sociocultural features of illness to better predict anticipated acceptance. A similar finding has been reported in studies considering anticipated acceptance of oral cholera vaccines in Kenya[11] and Zanzibar[12]. However, this is only applicable to lower-cost vaccines as economic considerations become primary predictors of vaccine acceptance for higher-priced vaccines.

In addition to the explanatory power provided by sociocultural features of illness in predicting vaccination behaviour, they may also aid communication and improve effectiveness of other community interventions. Health education is a prime example. In their critique of conventional forms of health education, Lloyd et al. highlight how messages "from the top" are often misinterpreted when they reach target populations[13]. As a solution, they propose understanding day-to-day community experiences with the illness, to effectively communicate messages of educational value. Study findings were utilised by the research team to better communicate with communities during a dissemination that was conducted on completion of the study. More details are provided in section 7.7 on methodological implications.

While Chapter 6 relied on empiricism and identification of patterns of behaviour and associations through largely quantitative methods, in Chapter 5, principally qualitative analytic methods were used to study vaccine hesitancy and acceptance. The two approaches represent complementary ways of knowing and are both valuable inasmuch as they answer different questions and provide different perspectives to the same question. For example, we reasonably expect perception of causes to influence vaccination decisions but respondents may not be able to articulate it as such. By relying on empiricism, we are not limited to self-reported accounts alone to identify relevant patterns of behaviour. On the other hand, the immediate influence of social norms and peer pressure, or other surprising respondent insights from an actual vaccination decision would not have been revealed without ethnographic research.

7.3 Distinguishing anticipated and actual vaccine acceptance

Determinants of anticipated pandemic influenza vaccine acceptance (Chapter 6) differed from reasons for actual vaccine use during the 2009 pandemic (Chapter 5). The main reason behind the differences may lie in the nature of vaccine acceptance, which may be characterised as passive acceptance when considering determinants of anticipated acceptance and active demand when considering actual reasons for use of vaccine during the 2009 pandemic. Nichter[14] defines demand and acceptance as follows:

> *"Active demand entails adherence to vaccination programs by an informed public which perceives the benefits of and need for specific vaccinations. Passive acceptance denotes compliance: passive acceptance of vaccinations by a public which yields to the recommendations and social pressure, if not prodding, of health workers and community leaders."*

Vaccines were not available during the first phase of the 2009 pandemic in India and the Indian government subsequently imported influenza A (H1N1) vaccines from Sanofi-Pasteur in March 2010[15,16]. Locally-manufactured vaccines were additionally made available from June of 2010[17,18]. Vaccines were recommended by the government[19] but were not promoted or provided to the public through government campaigns. Persons who *actually took* a pandemic influenza vaccine displayed considerable initiative in getting it, either through private purchase or through attendance at ad-hoc vaccination drives. Those who *anticipated*

accepting a vaccine in our study, on the other hand, noted willingness or compliance in the context of a vaccination campaign. An underlying expectation was that the vaccine would be brought to them and actively provided. Both anticipated acceptors and actual acceptors demonstrated confidence in the vaccine; however, determinants of acceptance varied.

7.4 Treatment-seeking and health system considerations

An implicit hierarchy in perceptions of health services with private services ranking above government facilities was noted in our study and in other studies in India[20-22]. Reports of treatment-seeking at private hospitals were also positively associated with anticipated vaccine acceptance in our study (Chapter 6). Respondents who indicated use of private health services may represent proactive health-seeking persons with the ability to afford higher cost services. Respondents from our study who had experienced influenza during the 2009 pandemic reported first help-seeking at a private health facility where treatment delays were noted (Chapter 4). Treatment costs were high in private hospitals (up to USD 10,000), compared to free treatment at government hospitals. Ironically, a case-control study done in Tamil Nadu, India, using surveillance data of laboratory-confirmed H1N1 patients found that treatment in private hospitals was associated with death[23]. Thus, patients who paid high treatment costs either from lack of knowledge about the alternatives, or lack of access as in the case of rural respondents in our study, or pursuant to an active attempt to secure better quality of care, may have had poorer outcomes. This suggests a need for better coordination with, and regulation of, private health services in India. While this is true in general, it is especially important during a pandemic where the potential for exploitation of vulnerable persons is higher. It also exposes shortcomings in the public health system, which in addition to being absent in many areas and thus inaccessible to many segments of the population, has also gained a reputation for inefficiency and poor quality. The need for improving public health services, regulation of private services and coordination within the health system is critical in this setting.

7.5 Vaccine hesitancy around the world and need for local study

The second of six strategic objectives of the Global Vaccine Action Plan (GVAP), endorsed by 194 member states of the World Health Assembly in May 2012, calls for: *"Individuals and communities to understand the value of vaccines and demand immunization as both their right and responsibility"* (Text box 7-1)[24]. This represents a change in paradigm in provision of health services that traditionally focussed more on supply rather than on demand[25]. While emphasising demand-generation for vaccines, GVAP discusses tackling vaccine hesitancy through improved communication, advocacy to counteract anti-vaccine groups, community participation and improving quality of services[24].

Figure 7-1: Six strategic objectives for achievement of goals of the Decade of Vaccines

Source: WHO Global vaccine action plan (2011-2020)[24]

Vaccine hesitancy for pandemic influenza vaccines was relatively low in our study compared to that observed in higher-income settings. Vaccination intentions for pandemic H1N1 vaccines among the general population in other countries were 50% in USA[26], 56% in UK[27], 61% in France[28], 53% in Greece[29], 45% in Hong Kong[30] and 54% in Australia[31]. Much higher anticipated acceptance (93%) was reported in our study in India (Chapter 6). Lack of vaccine availability and convenient access, and lack of a clear policy for influenza vaccination in the general population (discussed further in the next section) largely limited uptake. Comments from experts at a conference on public confidence in vaccines indicated that the main reason behind low vaccination coverage in developing countries was lack of government support[32]. A proposed solution to overcome this problem was to generate public demand for vaccines. It is hoped that community interest in vaccines to prevent 'swine flu' in our study would set the stage for initiating discussions regarding routine influenza vaccination policy in India.

The example above supports a traditional generalisation between developed and developing countries with the former thought to have access to vaccines but hesitancy in accepting them, and the latter thought to have confidence in vaccines but limited access to them. While this may be true to some extent, such dichotomisation would be oversimplifying a complex issue. The risk lies in assuming low vaccine hesitancy in settings where vaccine access is the main barrier, and not paying attention to vaccine hesitancy in these settings. History has proven this to be a major oversight, exemplified by vaccine boycotts and poor uptake of life-saving vaccines in many developing settings[33-36]. In our study too, aspects of vaccine hesitancy were documented although they did not necessarily disqualify acceptance. Furthermore, other studies conducted among healthcare providers and medical students in India indicate lower confidence and anticipated uptake of influenza vaccines, due to concerns of safety and efficacy[37,38], similar to that reported for Euro-American settings. Hesitancy among paediatricians in India in recommending influenza vaccines due to safety and efficacy concerns has also been noted[39]. It is thus critical to monitor vaccine hesitancy in lower-income settings, in different segments of the population, and even when current acceptance appears high, to avoid failing to address questions or concerns that may potentially erupt into crises of breakdown in

vaccine confidence and trust[40]. This thesis contributes to a growing body of knowledge and expertise on identifying and responding to vaccine hesitancy to improve vaccine uptake.

During the influenza epidemic of 1847 in Britain, William Farr demonstrated that increases in mortality observed for diseases such as pneumonia and asthma were attributable to influenza[41]. In an attempt to convince others to look beyond the narrow constraints of local disease and to adopt a wider view of disease burden he is known to have said:

> *"…there is a strong disposition among some English practitioners not only to localize disease but to see nothing but the local disease. Hence, although it is certain that the high mortality on record was the immediate result of the epidemic of influenza, the deaths referred to that cause are only 1,157."*

Farr's insights have helped shape the field of epidemiology[42] and advances have been moving steadily towards analysis of diseases and their distributions on a global scale. Our understanding of disease and disease control has benefited tremendously from these advancements. However, there also remains a place and a need for local study. Some global questions may not have easily generalizable answers. What factors influence influenza vaccine hesitancy and acceptance in local settings is one such question.

Recognising the importance of community and context, WHO guidelines specifically indicate incorporation of values such as perspectives of the population and sensitivity to local contexts when making recommendations for health interventions[43]. Although research suggests that these values are not yet being incorporated when WHO develops recommendations for member states[44], recognition of the importance of community and context brings us a step closer towards finding local answers to global questions. This thesis is a contribution to that endeavour.

7.6 Context of influenza vaccination policy

Community understanding of influenza and vaccines, reasons for use or non-use of vaccines during the 2009 pandemic, and determinants of anticipated uptake of influenza vaccines in the context of mass vaccination have been explored in the previous chapters to identify practical suggestions for effective vaccine

implementation. This research and other specialized research activities that are currently ongoing in India with regard to dynamics of influenza seasonality for enhancing protection through vaccination[45,46], characterising disease burden[47-49] and costs of respiratory infections[50] are based on an assumed value of influenza vaccination. Acknowledgement of the value of influenza vaccination through national recommendations and policy is imperative to lending practical value and usefulness to the findings resulting from such research activities.

7.6.1 Influenza vaccination policy around the world

The WHO position paper on vaccines for influenza recommends annual vaccination, particularly for high-risk groups[51]. In addition to a vaccination policy for high-risk groups, in 2008, the United States endorsed a universal paediatric influenza vaccination policy, becoming the first country in the world to do so[52]. In light of disease burden and transmission, the new recommendation stated that annual vaccination be administered to all children between 5-18 years of age[53]. In 2013, the United Kingdom also began implementation of routine influenza immunization to all children aged 2-16 years, in addition to clinical risk groups[54].

7.6.2 Influenza vaccination policy in India

The Pandemic Preparedness and Response Plan (PPRP) that was prepared by the Government of India for managing the 2009 pandemic, emphasises the importance of vaccination as the *"best preventive strategy to combat a pandemic"* while acknowledging lack of vaccine availability during the first wave of the pandemic[19]. The plan indicates that high-risk populations and those providing essential services would be prioritised for vaccination, followed by the rest of the population. Vaccinating the entire population is indicated as desirable in case of sufficient vaccine availability, while recognising that this scenario may be unlikely.

The PPRP further highlights a lack of priority or policy recommendations for seasonal influenza vaccination in India due to insufficient knowledge of seasonal influenza disease burden in the country. The plan emphasises the need for an effective influenza surveillance network to provide burden data to thereafter facilitate public private partnerships between local vaccine manufacturers and

the government. The plan also indicates the value of seasonal influenza vaccine production in upkeep of facilities for pandemic preparedness and notes that the *"Drug Controller General and the ICMR (Indian Council of Medical Research) would facilitate in establishing this capacity at the earliest".* The government promise of robust influenza surveillance systems after the 2009 influenza pandemic, however, has remained unfulfilled as evidenced by the influenza outbreak in early 2013 when high mortality rates were documented but disease burden was difficult to ascertain[55]. Furthermore, well-laid-out plans to deal with recurrent influenza outbreaks are notably missing.

7.6.3 Recent seasonal influenza outbreaks in India

The influenza A (H1N1) virus that caused the pandemic in 2009-2010 currently circulates as a seasonal influenza strain in India. Mortality and morbidity caused by this virus strain has persisted beyond the officially declared end of the pandemic[56]. An influenza A (H1N1) outbreak in northern and western India between 1 January and 24 February 2013 caused 2,267 laboratory-confirmed cases and had a greater case fatality rate than during the 2009 pandemic[57]. During this outbreak, high mortality was noted among apparently healthy people without comorbidities or underlying conditions[55]. In 2015, large outbreaks caused by influenza A (H1N1) were once again documented in India[58]. As of 5 April 2015, approximately 35,000 cases and 2,123 deaths have been recorded[59]. A large proportion of these H1N1 influenza-related deaths have been among pregnant women and persons with comorbidities[60,61].

7.6.4 Hesitancy in influenza vaccination recommendations

In the latest available online update on influenza A (H1N1) published by the Indian Ministry of Health and Family Welfare (MOHFW), vaccination has been recommended for health care workers, but not the public[62]. Recommendations for vaccination of high-risk groups are also notably absent, although a document detailing the epidemiology of seasonal influenza on the same website indicates the elderly, pregnant women, young children and people with co-morbidities as high-risk groups[63]. Moreover, in a statement to the public titled "Do's and Dont's" published on the MOHFW website and also presumably circulated widely, MOHFW inform[64] (Figure 7-2, in Appendix 8.1):

> *"People with certain chronic medical conditions, adults 65 years or older, children younger than 5 years old and pregnant women are at higher risk for severe illness."*

However, there is no mention of vaccines that offer a reliable means of protection for these high-risk groups. Thus, seriousness of the illness for high-risk groups has been acknowledged, with a marked hesitancy in recommending vaccines.

7.6.5 Willingness to promote alternative means of prevention

The conservatism applied by the MOHFW in recommending vaccines is not extended to recommendation of ayurvedic, unani and homeopathic prevention methods[65], most of which are untested. The National Health Portal website hosted by the MOHFW, details ayurvedic perspectives on prevention of swine flu illustrated in Figure 7-3 (in Appendix 8.1)[66]. Particularly curious recommendations for preventing swine flu include: *"high level of mental strength with fearlessness", "maintenance of self-restraint and celibacy", and "prevention of waking at night"*. Potential reasons for this policy encouraging prevention through traditional medicine include: the convenience of a recommendation that does not require additional planning, infrastructure or implementation by the government, known cultural acceptance of traditional forms of medicine, and political motivations[67].

7.6.6 Need for a coordinated and focussed national response to seasonal influenza

Experts with decades of research on influenza virus evolution acknowledge insufficient scientific knowledge at present to identify when and where the novel 2009 influenza A (H1N1) virus originated or in which species the re-assortment took place, although evolution in swine is a likely hypothesis[68]. Yet, the National Health Portal that promises to be the *"gateway to authentic health information"* states: *"This virus infects the wind pipe (respiratory tract) of pigs and later it gets transmitted to human beings"* (Figure 7-4, in Appendix 8.1)[69], implying a direct transmission of the virus from pigs to humans. Publication of scientifically unestablished and misleading facts about influenza by the MOHFW is a cause for concern and is indicative of confusion and a lack of coordination in the national response to influenza. The lack of focus, practicality and accuracy of government

guidelines for treating seasonal influenza during the 2015 outbreaks has also been noted by paediatricians in India[70]. Furthermore, neglect of vaccination policy for endemic influenza makes preparedness for pandemic influenza difficult and ineffective[71].

In conclusion, it is unclear why MOHFW hesitates to recommend vaccination, especially for high-risk individuals. The Indian Academy of Pediatrics (IAP) holds a slightly different view and recommends seasonal influenza vaccination only for "high risk children"[i] in their position paper on influenza vaccination[72]. Lack of sufficient data on burden and target groups for India has been cited as a reason for not recommending routine use of seasonal influenza vaccines[72]. A systematic review and meta-analysis estimated that over 400,000 children under five years of age die each year of pneumonia in India, and that 6.5% of these death are due to influenza[73]. Individual studies in India have also demonstrated a high burden of influenza and recommend the use of existing data to initiate discussions about influenza vaccine policy recommendations at the national level[47,49,74]. It was also hoped that the experience of the 2009 pandemic would encourage policy discussions and articulation of policy for control of endemic influenza, but this was not the case[75]. In our study, communities noted lack of government endorsement as a reason for non-use of influenza vaccines (Chapter 5). Policy response to current influenza outbreaks appears confused and not entirely evidence-based. Slow vaccine introduction has been described as a characteristic of vaccination history in India[76]. Unfortunately, the cost of lethargy in influenza control policies in India is paid by thousands of potentially vaccine-preventable deaths every year.

7.7 Methodological implications

Ethnographic methods with focus group discussions and in-depth interviews, and a survey using semi-structured interviews were employed in this study. Multiple methods used in the study allowed for triangulation of data and analysis of aims

[i] It is not entirely clear what the group of "high risk children" as stated in the position paper by the IAP means. One of the categories listed in this group is "laboratory personnel and health care workers" who definitely cannot be children. This is therefore most likely an error.

from different perspectives. The study capitalised on the strengths of both qualitative and quantitative approaches, and integration of these approaches, which lies at the heart of cultural epidemiology.

This study benefited from previous experience studying OCV acceptance in Kenya, Zanzibar and the Democratic Republic of Congo using EMIC interviews. This study tried to overcome shortcomings that were discovered during field experience in the OCV studies. For example, more ethnography was conducted to provide detailed insight and to explain identified associations. To gain a better understanding of the topic, additional stakeholders such as policy makers, clinicians and media persons were interviewed, and an analysis of media reports and policy documents was undertaken. These additional research activities, including analysis of findings on common influenza, are currently ongoing. Although beyond the scope of this thesis, findings are intended to be published soon. Innovations in automated coding of audio files and use of tablet computing for conducting a mixed-methods interview was an offshoot research activity from this study[77].

Relevant OCV studies with which the author of this thesis was directly involved in have been presented as Appendices[ii]. A comparison of sociocultural features of

[ii] On a slightly less-relevant but nevertheless interesting note, the connection between influenza and cholera dates further back from this thesis, to the 1800's, due to the tendency of both diseases to cause large outbreaks. An English physician, Theophilus Thompson, known for his writings on influenza noted[78]: *"nothing in the history of the succession of epidemics is of more impressive interest that the intercurrency of influenza and cholera".* (The author of this thesis is equally fascinated by the intercurrency of influenza and cholera vaccine acceptance!) This statement was made by Thompson before the discovery of the germ theory of disease when the notion that influenza and cholera were linked was popular. In fact, influenza in the early 1800s was considered an inconvenience rather than a particularly terrifying disease. Epidemic outbreaks in the 1830s and 1840s, and William Farr's recording of disease burden changed that perception[41]. An editorial in *The Times* on 10 February 1848 brought attention to the seriousness of influenza by comparing it to cholera as follows[78]:

> *In this climate of chills and catarrhs we account a cold the natural death of an Englishman, and view an increased mortality under this head only as an extraordinary number of fashionable departures…Nothing has imparted so much terror to the influenza as the hint that it preceded the cholera—a much less destructive visitation.*

cholera in the three countries is presented in Appendix 8.2, a study using meta-analytic techniques to synthesise common and distinctive determinants of OCV acceptance across the three settings in Sub-Saharan Africa is presented in Appendix 8.3, and an assessment of sociocultural determinants of anticipated OCV acceptance in Western Kenya is presented in Appendix 8.4.

7.7.1 Community participation and engagement

The value of community engagement and participation has been acknowledged in many examples of successful disease control programmes[79]. The goal of community participation either as a means to an end (the objective is to control a specific disease and community participation enables this) or an end in itself (the objective is empowerment of communities to make autonomous choices regarding priorities and health) has been debated.

The primary purpose of the OCV research study in Kenya and the present study in India was to collect information. No financial or other incentives were provided to participants. Yet, in both studies, a majority of participants spontaneously mentioned their appreciation for being listened to and indicated having found the process meaningful. Back in 1986, Tanner et al. emphasised the need to *"listen to the people"* prior to, or during programme development[80]. Another surprising observation was respondents' reports of feeling informed and increased awareness after the interview process despite our careful attempts to listen, but not advise. Information gathering in itself was a form of community mobilization.

After completing the field research and initial analysis, a community dissemination was conducted in Pune in November 2014 to share study findings. This was often requested during the interviews, but could not be provided at the time as research staff was not qualified to provide advice and to maintain integrity of the study. In consultation with local health experts and officials, insights and information gained from the study were presented to urban and rural study communities at their respective study sites after data collection. A dissemination workshop was also held in Pune for various levels of policy makers. Officials from the central government, municipality and subdistricts participated. A brochure for community residents and a policy brief for policy makers was prepared, distributed and discussed at these events. Feedback received from the

dissemination was useful in improving analysis and distilling relevant findings. Conducting the dissemination early enough to allow incorporation of feedback into analysis was a useful approach and is thus recommended.

Other studies have noted challenges in community participation in low-resource settings[81]. We had greater participation from wider and more representative community members during the dissemination activities in Kenya than in India. Although this may be due to several factors, more hierarchical and rigid social structures in India are likely to have also played a role in limiting participation. A study in Tamil Nadu, India, found that community-directed treatment for lymphatic filariasis was less successful (in terms of outcomes and community satisfaction) than health services treatment; and this approach was deemed unsuitable given the local social and cultural context[82]. Notwithstanding the need and crucial role played by community-based research and community engagement, there is also the need to consider the nature and approach for community participation based on the sociocultural milieu.

7.7.2 Limitations

Limitations of this particular research study and strategies to mitigate potential limitations have been discussed in earlier chapters of this thesis. An overall limitation has been in finding generalizable answers for influenza vaccine acceptance and broader questions of vaccine hesitancy. Determinants may have opposite effects in different settings and are hence difficult to generalise. For example, higher education has been associated with higher and lower rates of hesitancy[83]. The powerful influence of culture and context on human behaviour and beliefs may make local study more relevant than generalizability.

Another limitation is relating anticipated to actual vaccine acceptance. It was not possible to estimate this relationship in our study as there was no public mass vaccination initiative during the 2009 pandemic in India. Although we identified reasons for use among community members who had history of pandemic influenza vaccination, they represented a group of active vaccine-seekers and were relatively few in number. Anticipated rates, which we expect to be higher than actual rates if there were to be a vaccine implementation[84], are thus a guide and indication of community priority rather than a perfect prediction.

7.8 Future research

Conclusions presented in this thesis for pandemic influenza vaccines may reasonably apply to seasonal influenza vaccines, inasmuch as community members did not distinguish between concepts of epidemic versus pandemic disease and were largely only familiar with the concept of “swine flu”. However, key differences including need for annual vaccinations for seasonal influenza, compared to one-time vaccinations in case of a pandemic, and the current applicability of seasonal vaccination for high-risk individuals rather than the general population in India, make specific study of seasonal influenza vaccine hesitancy and acceptance necessary topics for future research.

Information gathering in itself as a form of community mobilization was touched upon earlier in this chapter. Experience in the field prompted the question of the effect that conducting a sociocultural assessment of illness and ideas about a vaccine could have on vaccine uptake. Asking questions and active listening may have a significant influence on health-promoting behaviour, perhaps even more than passively provided recommendations ‘from the top’. We have no concrete evidence for this yet, but measuring the impact of a sociocultural assessment on vaccine uptake warrants study.

A generic tool to assess contextual and individual sociocultural aspects contributing to vaccine hesitancy and other access-related and economic-related barriers is needed to document vaccine acceptance. Absence of standardised and validated tools to measure vaccine hesitancy and its determinants, especially in lower income countries, have been noted as a limitation of current research[83]. They have been noted as especially lacking in lower income countries. Routine monitoring of vaccine hesitancy through survey, followed by in-depth qualitative research to understand the nature of hesitancy has also been recommended[85]. Validation of such generic survey tools is needed not only for their ability to collect relevant information across varied settings. Validation of the usefulness of findings in guiding and improving vaccination outcomes is also required.
A primary driver of vaccine policy is economic considerations. A global review of studies estimating costs of influenza illness or cost-effectiveness of influenza vaccine conducted in 2013 found that no studies had been conducted in low and lower-middle income countries[86]. The authors thereafter estimated costs of ARIs

in Northern India[50], however more specific economic evaluations for influenza and vaccine cost-effectiveness are lacking. Economic data is influential in supporting vaccine policy[87] and such research for influenza vaccination is needed in India.

Poor worldwide uptake of influenza vaccination has resulted in the trial of various interventions, including vaccination mandates for healthcare workers and provision of financial or other incentives[88]. Behavioural economics, a field that extends the microeconomic models of rational-choice to emphasize the social, psychological and emotional aspects of decision-making, including the importance of context and environment, is an innovative perspective with applicability in study of vaccine hesitancy and acceptance. Theory holds that humans are not always rational decision makers; however, certain departures from rationality are systematic and predictable. Daniel Kahneman's seminal work, *Thinking, Fast and Slow*[89], refers to cognitive biases that humans are prone to. For example, individuals tend to have excessive loss aversion, resulting from weighting losses and gains asymmetrically. This may lead to individuals preferring to maintain status quo, even if unfounded, rather than making an active decision. Individuals also have trouble thinking statistically and are prone to common errors in probabilistic thinking. This may have implications for vaccination decisions, such as being overly optimistic about disease and disregarding need for prevention. How choices are framed also affect acceptance or rejection, even when both choices represent the same probabilities. Thaler and Sunstein's recommendation of use of nudges and improving choice architecture to address problems[90] is another useful approach in tackling vaccine hesitancy. They refer to peer group norms and social cues that may exert strong, unrealized influences upon preferences. Some of these aspects such as peer group norms and optimism bias were touched upon in our work. Further research is needed through integration of insights and frameworks from behavioural economics to develop innovative solutions to improve vaccine uptake even in lower-income countries.

7.9 Practical implications and conclusions

Study findings highlight the following recommendations for policy and practice in Pune, India.

- High anticipated uptake and community interest in vaccines to prevent pandemic influenza suggest good prospects for use of influenza vaccines for pandemic control
- There is need for a clearly-defined and evidenced-based policy for pandemic influenza vaccination in India
- After such a policy has been implemented, the following considerations may help increase influenza vaccine coverage in the context of mass vaccination:

Awareness

  - Improving community awareness about the illness, prevention and causes
  - Emphasising relevance of vaccines for adults and the elderly
  - Emphasising risk for urban and rural communities, men and women

Access and economic considerations

  - Delivering the vaccine to communities, especially in rural areas, where this is expected
  - Providing vaccines at no cost or at a low cost to ensure equitable access for all
  - Providing vaccines at some cost, but not free, in higher-income urban areas

Programmatic considerations

  - Introducing nasal vaccines with effective communication regarding their efficacy and safety to address community concerns
  - Engaging with communities and leaders prior to a vaccine campaign to ensure cooperation and to alleviate potential concerns
  - Use of behavioural nudges: emphasising seriousness of condition and cases, without scaremongering; indicating descriptive social norms

Health system considerations

  - Government commitment and acknowledgement of priority for vaccination
  - Training of health care providers to recommend vaccines

Considering setting-specific differences with urban and rural areas when drawing up plans

7.10 Conclusion

This thesis investigates illness-related experience, meaning and behaviour for pandemic influenza, and sociocultural determinants of acceptance for pandemic influenza vaccines in Western India. It also addresses oral cholera vaccine acceptance across three settings in Africa: Zanzibar, Western Kenya and Southeastern Democratic Republic of Congo. In addition to providing practical suggestions for effective vaccine implementation, this thesis indicates an approach to study the influence of community determinants on disease control interventions, and an approach to promote awareness and use through community engagement. In conclusion, this work is a contribution to global advances in the study of vaccine hesitancy and it underscores the value of sociocultural study and community preferences in planning effective vaccine action.

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CHAPTER 8

Appendix

8.1 Figures from Chapter 7, Discussion

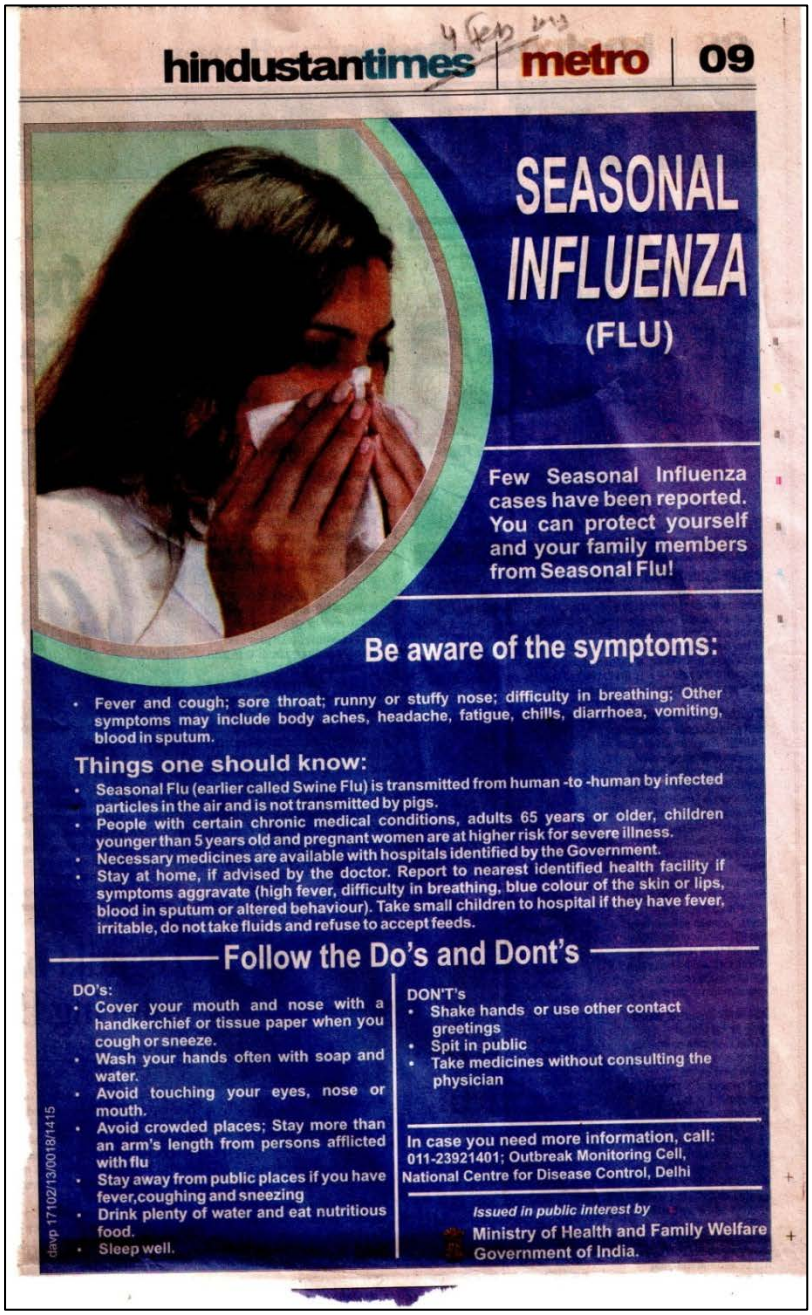
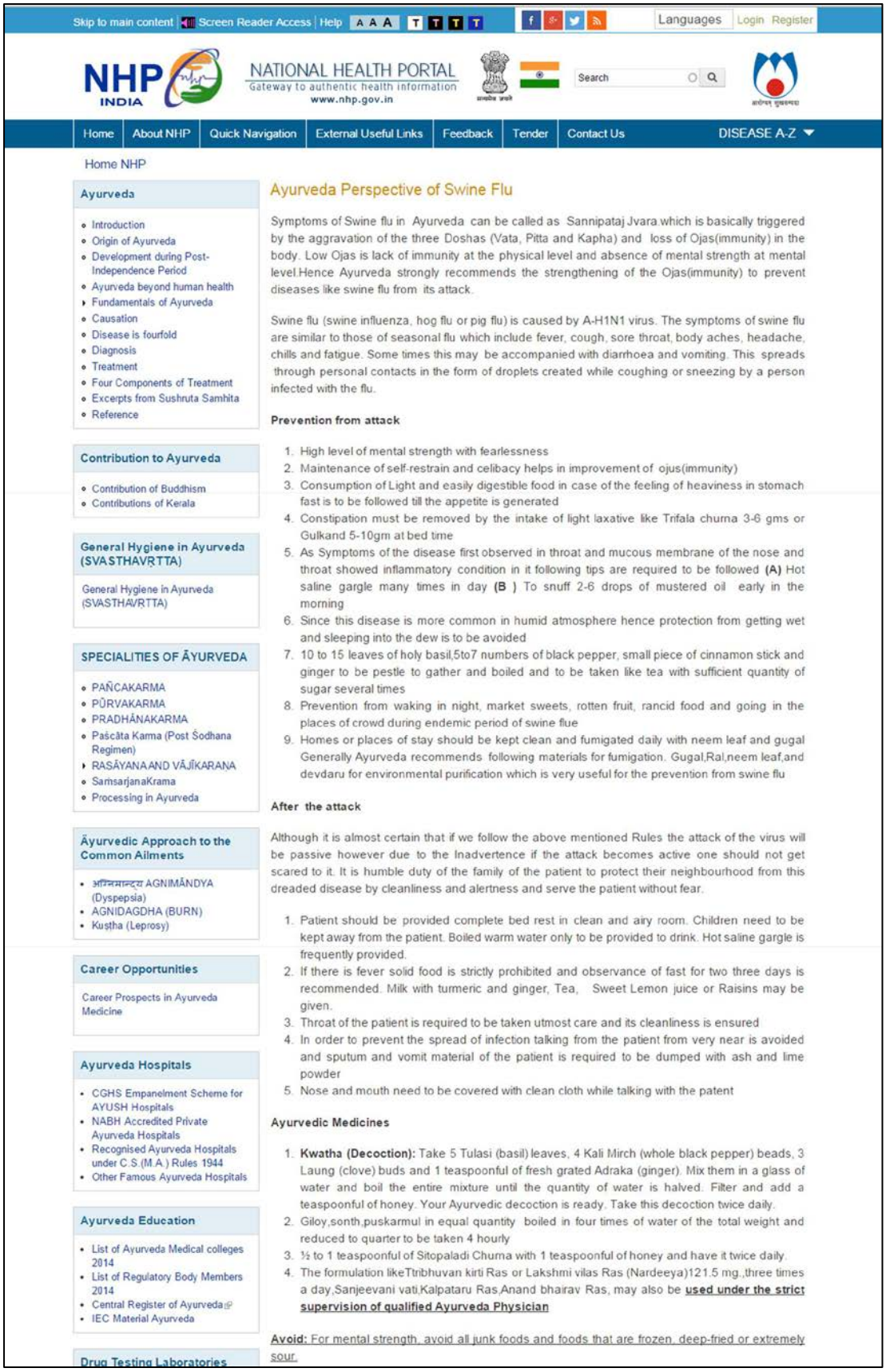


Figure 7-2: "Do's and Don'ts" for the community regarding seasonal influenza

Posted on the website of the Ministry of Health and Family Welfare, Government of India (24 April 2015)[64]



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Home NHP

Ayurveda

- Introduction
- Origin of Ayurveda
- Development during Post-Independence Period
- Ayurveda beyond human health
- Fundamentals of Ayurveda
- Causation
- Disease is fourfold
- Diagnosis
- Treatment
- Four Components of Treatment
- Excerpts from Sushruta Samhita
- Reference

Contribution to Ayurveda

- Contribution of Buddhism
- Contributions of Kerala

General Hygiene in Ayurveda (SVASTHAVṚTTA)

General Hygiene in Ayurveda (SVASTHAVRTTA)

SPECIALITIES OF ĀYURVEDA

- PAÑCAKARMA
- PŪRVAKARMA
- PRADHĀNAKARMA
- Paścāta Karma (Post Śodhana Regimen)
- RASĀYANA AND VĀJĪKARANA
- SamsarjanaKrama
- Processing in Ayurveda

Āyurvedic Approach to the Common Ailments

- अग्निमान्द्य AGNIMĀNDYA (Dyspepsia)
- AGNIDAGDHA (BURN)
- Kuṣṭha (Leprosy)

Career Opportunities

Career Prospects in Ayurveda Medicine

Ayurveda Hospitals

- CGHS Empanelment Scheme for AYUSH Hospitals
- NABH Accredited Private Ayurveda Hospitals
- Recognised Ayurveda Hospitals under C.S.(M.A.) Rules 1944
- Other Famous Ayurveda Hospitals

Ayurveda Education

- List of Ayurveda Medical colleges 2014
- List of Regulatory Body Members 2014
- Central Register of Ayurveda
- IEC Material Ayurveda

Drug Testing Laboratories

Ayurveda Perspective of Swine Flu

Symptoms of Swine flu in Ayurveda can be called as Sannipataj Jvara which is basically triggered by the aggravation of the three Doshas (Vata, Pitta and Kapha) and loss of Ojas(immunity) in the body. Low Ojas is lack of immunity at the physical level and absence of mental strength at mental level.Hence Ayurveda strongly recommends the strengthening of the Ojas(immunity) to prevent diseases like swine flu from its attack.

Swine flu (swine influenza, hog flu or pig flu) is caused by A-H1N1 virus. The symptoms of swine flu are similar to those of seasonal flu which include fever, cough, sore throat, body aches, headache, chills and fatigue. Some times this may be accompanied with diarrhoea and vomiting. This spreads through personal contacts in the form of droplets created while coughing or sneezing by a person infected with the flu.

Prevention from attack

1. High level of mental strength with fearlessness
2. Maintenance of self-restrain and celibacy helps in improvement of ojus(immunity)
3. Consumption of Light and easily digestible food in case of the feeling of heaviness in stomach fast is to be followed till the appetite is generated
4. Constipation must be removed by the intake of light laxative like Trifala churna 3-6 gms or Gulkand 5-10gm at bed time
5. As Symptoms of the disease first observed in throat and mucous membrane of the nose and throat showed inflammatory condition in it following tips are required to be followed **(A)** Hot saline gargle many times in day **(B)** To snuff 2-6 drops of mustered oil early in the morning
6. Since this disease is more common in humid atmosphere hence protection from getting wet and sleeping into the dew is to be avoided
7. 10 to 15 leaves of holy basil,5to7 numbers of black pepper, small piece of cinnamon stick and ginger to be pestle to gather and boiled and to be taken like tea with sufficient quantity of sugar several times
8. Prevention from waking in night, market sweets, rotten fruit, rancid food and going in the places of crowd during endemic period of swine flue
9. Homes or places of stay should be kept clean and fumigated daily with neem leaf and gugal Generally Ayurveda recommends following materials for fumigation. Gugal,Ral,neem leaf,and devdaru for environmental purification which is very useful for the prevention from swine flu

After the attack

Although it is almost certain that if we follow the above mentioned Rules the attack of the virus will be passive however due to the Inadvertence if the attack becomes active one should not get scared to it. It is humble duty of the family of the patient to protect their neighbourhood from this dreaded disease by cleanliness and alertness and serve the patient without fear.

1. Patient should be provided complete bed rest in clean and airy room. Children need to be kept away from the patient. Boiled warm water only to be provided to drink. Hot saline gargle is frequently provided.
2. If there is fever solid food is strictly prohibited and observance of fast for two three days is recommended. Milk with turmeric and ginger, Tea, Sweet Lemon juice or Raisins may be given.
3. Throat of the patient is required to be taken utmost care and its cleanliness is ensured
4. In order to prevent the spread of infection talking from the patient from very near is avoided and sputum and vomit material of the patient is required to be dumped with ash and lime powder
5. Nose and mouth need to be covered with clean cloth while talking with the patent

Ayurvedic Medicines

1. **Kwatha (Decoction):** Take 5 Tulasi (basil) leaves, 4 Kali Mirch (whole black pepper) beads, 3 Laung (clove) buds and 1 teaspoonful of fresh grated Adraka (ginger). Mix them in a glass of water and boil the entire mixture until the quantity of water is halved. Filter and add a teaspoonful of honey. Your Ayurvedic decoction is ready. Take this decoction twice daily.
2. Giloy,sonth,puskarmul in equal quantity boiled in four times of water of the total weight and reduced to quarter to be taken 4 hourly
3. ½ to 1 teaspoonful of Sitopaladi Churna with 1 teaspoonful of honey and have it twice daily.
4. The formulation likeTtribhuvan kirti Ras or Lakshmi vilas Ras (Nardeeya)121.5 mg.,three times a day,Sanjeevani vati,Kalpataru Ras,Anand bhairav Ras, may also be **used under the strict supervision of qualified Ayurveda Physician**

Avoid: For mental strength, avoid all junk foods and foods that are frozen, deep-fried or extremely sour.

Figure 7-3: Recommendations for Ayurvedic remedies to prevent swine flu

Source: National Health Portal, MOHFW, Government of India (2014)[66]

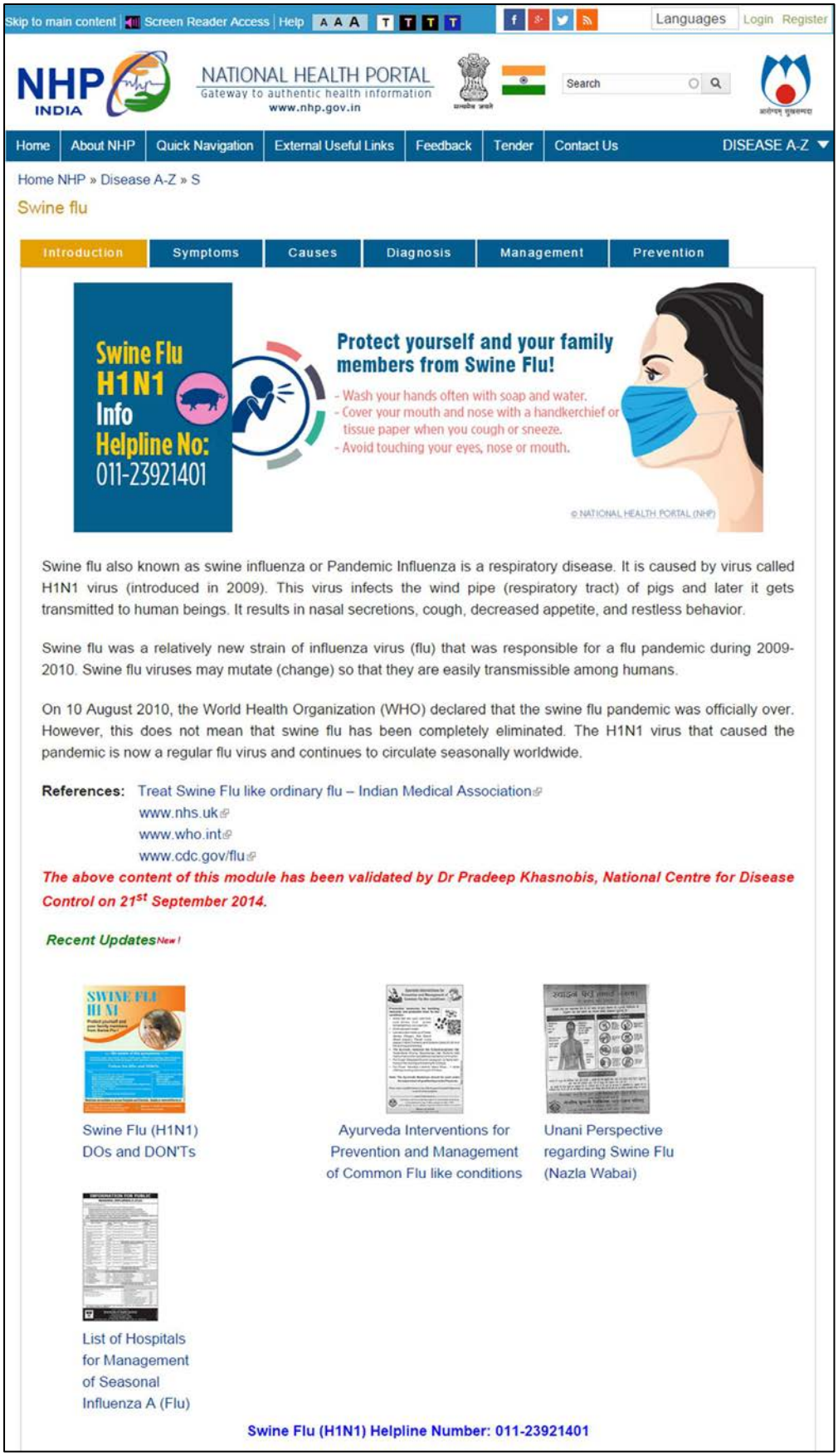

Figure 7-4: Incorrect information about the direct transmission of swine flu from pigs

Source: National Health Portal, MOHFW, Government of India (2014)[69]

8.2 Comparing sociocultural features of cholera in three endemic African settings*

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Comparing sociocultural features of cholera in three endemic African settings

Christian Schaetti[1,2], Neisha Sundaram[1,2], Sonja Merten[1,2], Said M Ali[3], Erick O Nyambedha[4], Bruno Lapika[5], Claire-Lise Chaignat[6], Raymond Hutubessy[7] and Mitchell G Weiss[1,2*]

Abstract

Background: Cholera mainly affects developing countries where safe water supply and sanitation infrastructure are often rudimentary. Sub-Saharan Africa is a cholera hotspot. Effective cholera control requires not only a professional assessment, but also consideration of community-based priorities. The present work compares local sociocultural features of endemic cholera in urban and rural sites from three field studies in southeastern Democratic Republic of Congo (SE-DRC), western Kenya and Zanzibar.

Methods: A vignette-based semistructured interview was used in 2008 in Zanzibar to study sociocultural features of cholera-related illness among 356 men and women from urban and rural communities. Similar cross-sectional surveys were performed in western Kenya (n = 379) and in SE-DRC (n = 360) in 2010. Systematic comparison across all settings considered the following domains: illness identification; perceived seriousness, potential fatality and past household episodes; illness-related experience; meaning; knowledge of prevention; help-seeking behavior; and perceived vulnerability.

Results: Cholera is well known in all three settings and is understood to have a significant impact on people's lives. Its social impact was mainly characterized by financial concerns. Problems with unsafe water, sanitation and dirty environments were the most common perceived causes across settings; nonetheless, non-biomedical explanations were widespread in rural areas of SE-DRC and Zanzibar. Safe food and water and vaccines were prioritized for prevention in SE-DRC. Safe water was prioritized in western Kenya along with sanitation and health education. The latter two were also prioritized in Zanzibar. Use of oral rehydration solutions and rehydration was a top priority everywhere; healthcare facilities were universally reported as a primary source of help. Respondents in SE-DRC and Zanzibar reported cholera as affecting almost everybody without differentiating much for gender, age and class. In contrast, in western Kenya, gender differentiation was pronounced, and children and the poor were regarded as most vulnerable to cholera.

Conclusions: This comprehensive review identified common and distinctive features of local understandings of cholera. Classical treatment (that is, rehydration) was highlighted as a priority for control in the three African study settings and is likely to be identified in the region beyond. Findings indicate the value of insight from community studies to guide local program planning for cholera control and elimination.

Keywords: Endemic cholera, Sociocultural features, Community study, Eastern Africa

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Background

Cholera is an ancient enteric disease that originated from the Ganges delta [1]. It is caused by the bacterium *Vibrio cholerae* that exists in the aquatic environment independent from human hosts [2,3]. *V. cholerae* produces an enterotoxin, which is the direct cause of acute watery diarrhea in humans. Cholera is characterized by loss of large volumes of rice-water-like stool leading to severe dehydration and concurrent electrolyte depletion [4]. Case fatality rates without treatment may reach 50% [5]. Timely administration of oral rehydration solutions or infusions is the principal treatment [6].

Global cholera burden and sub-Saharan Africa as a hotspot

Cholera case estimates officially reported to the World Health Organization (WHO) ranged between 190,000 and 320,000 for the years 2008, 2009 and 2010, and between 5,000 and 7,500 deaths were reported [7-9]. These figures, however, are highly under-reported because of limitations in surveillance, including case definitions, and also fear of trade-related and travel-related sanctions; they likely represent less than 10% of the true burden [10]. A recent study estimated the number of people at risk of endemic cholera globally at 1.4 billion, with an annual burden of endemic cholera of 2.8 million cases and 91,000 deaths [11]. Cholera thrives mostly in low-income and middle-income countries in Africa, Asia and the Caribbean [12].

According to the latest estimates, 39% of the population in sub-Saharan Africa lived without safe water in 2010 (vs 51% in 1990), with an urban share of 17% and a rural share of 51% [13]. Use of improved sanitation in the same region has been increasing from 26% to 30% since 1990. Similar to the estimates on water supply, there is also an urban/rural divide: 43% of urban people benefited from improved sanitation in 2010 versus only 23% in rural areas.

The public health burden of cholera is still intolerable in sub-Saharan Africa despite the above noted progress in the provision of safe water and sanitation. Consequently, and because of the recent huge outbreaks in Zimbabwe, Pakistan and Haiti, the 64th World Health Assembly adopted a new resolution in 2011 to strengthen the global fight against cholera [14].

The WHO recommends provision of sufficient, safe water and adequate sanitation and hygiene (WASH) as the mainstay to prevent cholera [15]. Official recommendations also include the use of oral cholera vaccines (OCVs) as a supplementary public health tool for preemptive or reactive control of cholera outbreaks [16].

Professional versus community-reported burden of cholera

The burden of cholera may be characterized with reference to professional indicators, and it may also be studied with reference to the local vantage point of community experience. The public health importance of cholera with reference to professional indicators has been extensively studied (that is, disease-related morbidity and mortality, characterization and distribution of pathogens, classical epidemiologic risk factors, economic costs and so on) [2-4,11,17-19]. It is widely recognized that cholera can spread rapidly and easily within countries (for example, Kenya [20]) and across continents. Official WHO policy recommends the development of 'national and subregional action plans that include cross-border collaboration […] to enhance multidisciplinary prevention, and preparedness and response activities' for effective cholera control [15].

In contrast with public health professionals, communities may prioritize other issues. Lay people may care more about illness-related costs than morbidity, and they may perceive the risk of illness with reference to their local rather than regional experiences. Community perceptions of the causes of illness may also differ from professional concepts, and this may affect their perceived relevance and value of recommended strategies for control. Neglecting or underestimating local sociocultural aspects of cholera and priorities for control may limit the effectiveness of interventions and control programs [21-23]. This point has been elaborated in a review of social science research on neglected tropical diseases of poverty, which highlights the 'importance of community participation for the successful introduction, acceptability, and adherence of innovative vector control interventions and new drugs and diagnostics' [24].

Notwithstanding the acknowledged importance of community-based studies, there are very few in Africa. Some have considered questions about perceived vulnerability and social and environmental aspects of cholera [23,25], but systematic assessment of cholera-related experience, meaning and behavior is lacking. In response to this dearth of community-based research, three sociocultural field studies were undertaken in a WHO initiative to examine local urban and rural features of cholera and community willingness to accept an OCV in eastern Africa. A project in Zanzibar (Tanzania) examined sociocultural features of cholera with a semistructured interview and estimated anticipated acceptance and uptake of OCVs in endemic areas in 2008/2009 [26]. Two additional surveys using an almost identical instrument were conducted in 2010 in endemic settings in western Kenya and southeastern Democratic Republic of Congo (SE-DRC). These three databases on community views of cholera have been analyzed with a focus on site-specific similarities and differences [27,28] (Merten S, Manianga C, Weiss MG, Lapika B, unpublished data). A second set of analyses has examined sociocultural determinants of anticipated OCV acceptance

in all three settings [29-31], and of OCV uptake in Zanzibar [32,33].

The aim of the present work is to review and systematically compare local cholera-related recognition, risk perceptions, experience, and meaning in endemic African settings. Knowledge of prevention, help-seeking behavior and perceived vulnerabilities are also considered. Data come from the three cross-sectional interview-based surveys mentioned above. Particular attention is given to site (that is, urban vs rural) and gender-specific features. Given the vastness of eastern Africa, it is expected that some features may be common while others may be locally distinctive, and that a systematic assessment of their distribution in cholera-endemic communities is likely to be relevant for informing a regionally tailored cholera control strategy.

Methods

Study settings by country

Study sites for the survey in Zanzibar were chosen in 2008 based on a review of the local cholera burden and deliberations between the Ministry of Health and mass vaccination campaign implementers. Study sites in western Kenya and SE-DRC were selected in 2010 based on (i) epidemiological data collected from recent cholera outbreaks, (ii) comparability of urban and rural sites with reference to the survey sites in Zanzibar and (iii) considerations regarding the security of the research team (SE-DRC) and accessibility (western Kenya). The following is a brief description of the urban and rural study sites in each setting, including the national and local cholera situation and related control activities around the time of the surveys. More details can be found in the individual publications mentioned previously.

SE-DRC: Katanga province, southeastern Democratic Republic of Congo

The survey took place in Kasenga district, in DRC's southeastern Katanga province. The first waves of the current seventh cholera pandemic reached DRC in 1974 (then called Zaïre). DRC has reported outbreaks of cholera every year since 1990. The eastern part of the country, which borders the African great lakes region, has traditionally been a focus of cholera, and Katanga province is among the four most affected provinces [34,35]. In 2010, 13,884 cases were reported by the WHO for DRC [9]. In 2011, the United Nations Office for the Coordination of Humanitarian Affairs (OCHA) reported 22,233 cases, with 2,701 cases (12%) coming from Katanga province [36]. In the absence of a proper water and sanitation infrastructure in the area, cholera transmission dynamics and severity of outbreaks are mainly driven by environmental (for example, seasonal rainfall, the El Niño phenomenon) and human factors, such as travel and trade [37].

Primary healthcare in DRC is in principle free, but user fees in the form of a low flat rate or full cost recovery have also been introduced in certain areas [38]. Even if no formal user fees are expected, patients will rarely be treated anywhere in the country if they do not pay informal fees; this and the fact that health centers are often out of stock and understaffed reflects the poor state of the public healthcare system in DRC.

Cholera control activities have been mainly reactive with a focus on patient treatment in the epidemic-prone lakes region. Public awareness and information campaigns have been conducted after outbreaks in bigger cities in southern Katanga region (that is, Lubumbashi, Mbuji-Mayi, and so on) [34]. Outbreak response usually includes setting up of treatment centers organized by governmental and non-governmental institutions.

The small town of Kasenga, located 208 km east of the provincial capital Lubumbashi, was chosen as the urban site. Kasenga is situated on the Luapula River that shares a border with Zambia. Kasenga is divided into eight districts (known as 'quarters') with a total population of 27,000 inhabitants on a surface area of 10 km^2. The town is predominantly populated by Bemba-speaking people. Kasenga is the terminus for land and water transportation systems in the area, including buses from Lubumbashi and boats from Pweto, located north of Kasenga on Lake Mweru. Residents of Kasenga depend mainly on three means of livelihood: agriculture, fishing, and commerce. The urban site in SE-DRC was in a quarter of Kasenga called Mwalimu, which was inhabited by approximately 10,300 inhabitants and is characterized by a high density of buildings. No sanitation is available and a water supply that works only sporadically has been installed only in the last few years.

The island of Nkolé, situated approximately 120 km downstream from Kasenga in Lake Mweru, was chosen as the rural site. Approximately 7,000 mostly Bemba people live in Nkolé; they are mainly engaged in agriculture and fisheries. One part of the population is seasonally migrating to cultivate their fields along the river between November and March when fishing is usually prohibited.

Availability of sound data on cholera morbidity is a problem in the area. A manual review of case registers over the last 3 years at the health posts serving both study sites confirmed the seasonal influence as there were more cholera episodes during the rainy season. Kasenga was itself identified as 'sanctuary' for cholera outbreaks among six other cities in eastern DRC [39]. The true cholera burden, however, is likely to be higher because of underreporting due to the limited accessibility of health services during the rainy season and due to rumors accompanying cholera outbreaks in the past.

Western Kenya: Nyanza province

Both survey sites in Kenya were in Nyanza province, which borders Lake Victoria. The Lake Victoria region has been regularly affected by the current cholera pandemic since 1977/1978. Cholera outbreaks have disproportionately affected Nyanza province in recent years in comparison to the rest of Kenya [40]. More than 14,000 cholera-related hospital admissions were reported in the province in 1997/1998, with a case fatality rate (CFR) of 4% [41]. Another large cholera outbreak started in late 2007 in the aftermath of post-election violence, causing high mortality rates [42]. In 2009, more than 11,000 countrywide cases were reported to the WHO [8].

Apart from public healthcare facilities, there are private healthcare facilities owned by different stakeholders, including multinationals such as the Aga Khan Foundation, faith-based organizations and individuals. They are thought to offer better services but are very expensive (minimum of KES500 per visit). After the large outbreak of 2009, control activities in the affected areas entailed health talks given to the communities. The health talks were intended to promote awareness of cholera, its mode of transmission, prevention and clinical presentations.

Cholera treatment centers (CTCs) are organized only during an outbreak and all the services are supposed to be free of charge. Private healthcare facilities too are not permitted to charge for treating cholera, according to government policy.

Urban interviews were performed in the provincial capital Kisumu, which is the third largest city in Kenya. In 2004, about 60% of Kisumu's population lived in slums [43]. Migration into Kisumu from surrounding districts has been predominantly motivated by better resources and employment opportunities. Migrants are most likely to settle in the already impoverished slum areas.

The urban site was Nyalenda A, a slum in West Kolwa location of Kisumu district, characterized by a high population density (23,731 residents living on a 2.8 km^2 surface area in 1999), poor planning, insufficient infrastructure and a severe shortage of basic facilities such as sanitation, safe water, sewerage and electricity [44]. Only one dispensary and one private clinic served this community at the time of the study. Disposal of solid waste is a major problem. The rural site in Siaya district comprised nine villages in the Kakum Kombewa sublocation. According to a 2007 survey, 3,729 people lived in 1,013 households in the study area [45]. No healthcare facility was available to villagers in the rural site in early 2010. Since then, however, three dispensaries have been constructed [46]. Access to the Siaya district hospital is difficult because of irregular motorized transport. A survey conducted in 2007 revealed that almost every homestead of Kakum Kombewa was dependent on water from unprotected sources and latrine coverage was 74% [45].

Zanzibar archipelago, Tanzania

The survey in Zanzibar, which is an archipelago 50 km off the coast of mainland Tanzania, was performed on its two major islands, Unguja and Pemba. Approximately 1.2 million people live in Zanzibar, which is a major tourist destination. It is believed that cholera reached Zanzibar as early as 1821 during the first pandemic [1], with subsequent outbreaks in later pandemics. In the current pandemic, cholera was reported for the first time in 1978 [47]. More than 13 outbreaks followed since then and the annual incidence rate reached 0.5 per 1,000 population between 1997 and 2007 [48]. Outbreaks usually follow a seasonal pattern (that is, they occur during flooding in the rainy season), and cholera incidence on the archipelago was shown to be positively influenced by rainfall and temperature [49]. Estimates from the Ministry of Health reported a total of 48 cases with a cholera diagnosis admitted to healthcare facilities in 2008, 736 cases in 2009 and 248 cases in 2010 [50-52].

The public healthcare system in Zanzibar is divided into three levels: primary, secondary and tertiary. Each of the two islands constitutes a zone, headed by a zonal medical officer. Over 100 primary healthcare units serve the population; these units are open during the day to outpatients, provide basic services and are within easy reach for over 90% of the population. Four primary healthcare centers (two per zone) operate on a 24-h basis. These centers can admit up to 30 patients.

Cholera is a recognized priority disease in Zanzibar and control activities follow national guidelines [53]. Once an outbreak has been declared, a concerted response follows that usually involves deployment of cholera treatment kits, personnel for outbreak investigation, clinical treatment and follow-up activities. CTCs are set up in government health facilities or schools close to communities where the outbreak has occurred. Medical treatment (that is, infusions, antibiotics, oral rehydration solution (ORS)) for suspected cholera patients is free; affected families mainly incur direct costs to feed the patient [19].

Chumbuni, in Urban district on Unguja Island, was selected as the urban study site for the survey; Mwambe, a village in Mkoani district on Pemba Island, was the rural study site. Chumbuni was inhabited by approximately 11,000 people at the time of the study [27]. This periurban slum-like extension of the capital of Zanzibar is characterized by a high population density of 15,300 people/km^2 and brick houses with corrugated roofs. Mwambe was less densely populated (800 people/km^2), with a population of approximately 8,000 people living

in mud houses with thatched roofs in widely scattered hamlets.

Survey design and instrument

The survey in Zanzibar was conducted from June to August 2008 in collaboration with the Ministry of Health and the Public Health Laboratory, Ivo de Carneri; the survey was followed by a mass vaccination campaign in early 2009. The survey in western Kenya was performed from March to May 2010 in collaboration with Maseno University, Kisumu. The survey in SE-DRC was conducted from August to September 2010 along with researchers from the Universities of Kinshasa and Lubumbashi.

A semistructured explanatory model interview based on the Explanatory Model Interview Catalogue (EMIC) framework [54] was used in all three settings. Each version was developed and adapted to the local context (see Additional files 1, 2, 3).

A random sample of adults was interviewed in each survey. The interview was introduced with a vignette telling the respondents a story about a local person with the key signs and symptoms of cholera. The vignette used in Zanzibar is available as an additional file in Schaetti *et al*. [27]. It was the basis for adaptation and use of vignettes in western Kenya and SE-DRC. Variables elicited from responses to questions about the condition depicted in the vignette were related to several domains: identification; perceived seriousness, fatality and past personal and household episodes of cholera; illness-related experience (operationalized as patterns of distress indicating priority symptoms and concerns about the illness); meaning (perceived causes); priorities for prevention (for example, hygiene and sanitation); behavior (help seeking at home and outside the household); and perceived vulnerability to the illness. Sociodemographic characteristics were also recorded. Interviews were conducted in Kiswahili (in all three settings), and additionally in CiBemba (SE-DRC) and Dholuo (western Kenya).

Ethics statement

Ethics approval to conduct interviews was obtained by each individual study from the following review bodies: WHO Research Ethics Review Committee (western Kenya, Zanzibar), the University of Kinshasa (SE-DRC), the Kenya Medical Research Institute (western Kenya) and the Ministry of Health Ethics Committee of Zanzibar (Zanzibar). All participants had provided written informed consent prior to being interviewed.

Approach to analysis

Interview items were analyzed according to both frequency and prominence. Calculation of the prominence was based on whether a category was mentioned spontaneously by the respondent in response to an open-ended question (assigned value of 2), only probing specific categories (assigned value of 1), and accounting for whether it was identified as paramount among all reported categories (additional value of 3). Each domain is presented in a table by setting, divided into panels for overall results, urban and rural site comparisons and gender comparisons. The three most prominent categories for each setting and any category with a significant difference between site and between genders are presented for the domains of illness experience, meaning, knowledge of prevention and behavior. Cross-setting comparisons of the three most prominent categories and site and gender comparisons were performed using the non-parametric Wilcoxon or Kruskal-Wallis test for ranked prominence data and the χ^2 or Fisher's exact test for proportions. More detailed and comprehensive data stratified by site for western Kenya and Zanzibar have been published elsewhere [27,28].

Results

Sample characteristics

Approximately equal numbers of men and women from urban and rural sites were interviewed in SE-DRC (n = 360), western Kenya (n = 379) and Zanzibar (n = 356). Detailed sample characteristics for all three settings have been presented elsewhere [27,29,31]. In summary, the community samples in all settings were mostly engaged in agriculture (>25%). This occupation was more frequent in the rural sites except in SE-DRC, where the rural site was a fishing village. Fishing was the major activity of 16.4% of people in SE-DRC (only men) and of 7.3% in Zanzibar (all men except one woman), primarily from the rural sites. Self-employment (that is, informal business, petty trading, and so on) was also an important occupation reported by more than 17% across all settings. Mean age was comparable across settings, varying between 32.8 and 38.8 years. Men were on average older than women in SE-DRC and Zanzibar, and rural people in western Kenya were older than urban people. Average household size was lowest in western Kenya (mean of 4.5) and higher in SE-DRC (6.2) and Zanzibar (6.8). Respondents in western Kenya and SE-DRC were predominantly Christian and respondents in Zanzibar were Muslim. Between 69% (Zanzibar) and 88% (western Kenya, SE-DRC) reported to have completed primary or secondary school. Men and urban respondents were better educated across all settings. A reliable income was reported least in SE-DRC (35.3%), and higher in western Kenya (47.8%) and Zanzibar (55.9%).

Identification, perceived seriousness, fatality and past experience of cholera

The condition described in the cholera vignette was identified as cholera in local terms by 96% of respondents in SE-

DRC, by 75% in western Kenya and by 88% in Zanzibar (P <0.001) (Table 1). There were no gender differences in illness recognition, and only a site difference in SE-DRC and Zanzibar. Almost every respondent in SE-DRC was afraid of death due to cholera; fewer respondents in western Kenya (50%) and Zanzibar (78%) expected a fatal outcome (P <0.001). Cholera was reported as 'very serious illness' by >8 out of 10 respondents in all settings. Almost half of the interviewed people in SE-DRC (44.4%) reported having witnessed a cholera episode within the household, and more so in the urban site. Among the 22.4% of respondents reporting this in western Kenya, urban residents and men were more prevalent; there was no gender difference in SE-DRC and Zanzibar. More rural residents were among the 15.5% who reported household episodes in Zanzibar.

Patterns of distress: priority symptoms and psychosocial impact

Excluding symptoms that were mentioned in the vignette (that is, muscle cramps, vomiting, frequent and large amounts of rice-water-like stool), weakness was identified as the most prominent symptom in all settings (see Additional file 4). Unconsciousness (SE-DRC, Zanzibar) and sunken eyes (all three settings), which are signs of dehydration, were also prominently reported. Somatic symptoms were mainly differentiated between urban and rural sites in SE-DRC and Zanzibar. In SE-DRC, where urban community residents have more experience with cholera, signs of dehydration and rectal pain received greater prominence than in the rural site. In western Kenya, lack of awareness about additional symptoms for cholera, coded as 'cannot say,' was significantly higher than in SE-DRC and Zanzibar, and with a higher prominence in the rural site.

Cholera was perceived as having a significant impact on people's lives in all three settings (Table 2). The social impact of cholera was mainly characterized by financial concerns that were manifested by people reporting loss of family income and interference with work-related activities in all three settings, albeit with significantly differing prominences. Men in SE-DRC and Zanzibar reported more negative influences of cholera on the household economy. In western Kenya, direct costs related to cholera

Table 1 Identification, seriousness, fatality and past episodes of cholera in endemic areas of three African settings

Category	SE-DRC, n = 360			Western Kenya, n = 379			Zanzibar, n = 356		
Overall	%			%			%		
Identification of illness[a]***	96.4			75.2			88.2		
Seriousness[b]***	81.1			91.3			96.6		
Expected fatal outcome without treatment[c]***	99.7			49.9			77.5		
Past household episodes***	44.4			22.4			15.5		
Past personal episodes*	8.3			11.6			5.3		
Site comparison	Urban, %	Rural, %	*P* value	Urban, %	Rural, %	*P* value	Urban, %	Rural, %	*P* value
Identification of illness[a]	**93.9**	**98.9**	**0.020**	72.6	77.8	0.285	**95.5**	**80.8**	**<0.001**
Seriousness[b]	**85.6**	**76.7**	**0.030**	91.6	91.0	0.832	95.0	98.3	0.084
Expected fatal outcome without treatment[c]	99.4	100.0	0.317	**60.0**	**39.7**	**<0.001**	**84.4**	**70.6**	**0.002**
Past household episodes	**52.2**	**36.7**	**0.004**	**27.4**	**17.5**	**0.044**	**6.7**	**24.3**	**<0.001**
Past personal episodes	7.7	8.9	0.703	13.2	10.1	0.423	**2.8**	**7.9**	**0.035**
Gender comparison	Female, %	Male, %	*P* value	Female, %	Male, %	*P* value	Female, %	Male, %	*P* value
Identification of illness[a]	97.8	95.0	0.170	78.8	71.5	0.122	88.3	88.1	>0.999
Seriousness[b]	79.0	83.2	0.295	91.2	91.4	0.907	96.1	97.2	0.577
Expected fatal outcome without treatment[c]	99.5	100.0	0.320	52.9	46.8	0.151	74.9	80.2	0.257
Past household episodes	43.1	45.8	0.563	**15.5**	**29.6**	**0.003**	12.9	18.1	0.172
Past personal episodes	7.8	8.9	0.680	**8.3**	**15.1**	**0.053**	3.4	7.3	0.104

'Overall': comparison between settings based on the χ^2 test (identification of illness and personal episodes) and Kruskal-Wallis test (seriousness, fatality and household episodes), *P <0.05, ***P <0.001. 'Site comparison' and 'Gender comparison': figures in bold designate significant differences at P <0.05 based on the Fisher's exact test (identification of illness and personal episodes) and Wilcoxon test (seriousness, fatality and household episodes). Data for Southeastern Democratic Republic of Congo (SE-DRC) in 'Overall' section from Merten *et al.* [31]. Data for western Kenya in 'Site comparison' section from Nyambedha *et al.* [28]. Data for Zanzibar in 'Overall' and 'Site comparison' sections from Schaetti *et al.* [27].

[a]Identified as cholera in local language based on vignette.

[b]Coded as 'very serious'.

[c]Coded as 'usually fatal without treatment'.

Table 2 Comparison of the psychosocial impact of cholera in endemic areas of three African settings, by site and gender

Category	SE-DRC, n = 360					Western Kenya, n = 379					Zanzibar, n = 356				
Overall	Total reported		Prominence			Total reported		Prominence			Total reported		Prominence		
Interference with work/daily activities***	**96.9**		**1.64**			**98.7**		**2.19**			**96.9**		**2.35**		
Loss of family income***	**92.5**		**2.41**			**96.3**		**2.63**			**95.5**		**2.13**		
Sadness, anxiety, worry***	**97.8**		**2.70**			**98.2**		**1.84**			**97.5**		**1.89**		
Site comparison	Urban		Rural			Urban		Rural			Urban		Rural		
	Total reported	Prominence	Total reported	Prominence	*P* value	Total reported	Prominence	Total reported	Prominence	*P* value	Total reported	Prominence	Total reported	Prominence	*P* value
Costs (transport, food, drugs)	87.8	1.40	94.4	1.42	0.575	**97.9**	**1.51**	**87.3**	**1.28**	**<0.001**	97.2	2.07	96.0	1.67	0.142
Disruption of health services	68.9	0.96	71.7	0.84	0.229	55.3	0.57	51.9	0.58	0.627	**48.0**	**0.54**	**88.1**	**0.94**	**<0.001**
Interference with social relationships	**67.2**	**1.12**	**86.7**	**1.56**	**<0.001**	84.2	1.35	78.8	1.33	0.379	**65.4**	**0.82**	**74.6**	**1.28**	**<0.001**
Loss of family income	91.1	2.57	93.9	2.25	0.174	**97.9**	**2.94**	**94.7**	**2.31**	**<0.001**	98.3	2.11	92.7	2.16	0.463
Sadness, anxiety, worry	**97.8**	**2.43**	**98.3**	**2.96**	**<0.001**	100.0	1.90	96.3	1.78	0.064	**100.0**	**2.06**	**94.9**	**1.72**	**<0.001**
Gender comparison	Female		Male		*P* value	Female		Male		*P* value	Female		Male		*P* value
	Total reported	Prominence	Total reported	Prominence		Total reported	Prominence	Total reported	Prominence		Total reported	Prominence	Total reported	Prominence	
Disruption of health services	69.6	0.88	70.9	0.92	0.754	**46.9**	**0.47**	**60.5**	**0.69**	**0.004**	73.2	0.78	62.7	0.69	0.051
Interference with work/daily activities	**95.0**	**1.46**	**98.9**	**1.82**	**0.005**	98.5	2.07	98.9	2.32	0.085	95.5	2.36	97.2	2.33	0.704
Loss of family income	94.5	2.55	90.5	2.27	0.112	96.4	2.74	96.2	2.51	0.178	**93.9**	**1.96**	**97.7**	**2.31**	**0.007**

Categories ordered alphabetically, except for 'cannot say'. Total reported = percentage of categories reported spontaneously and upon probing. 'Prominence' = mean prominence of categories based on how reported (spontaneous = 2, probed = 1, most troubling = 3). 'Overall': figures in bold designate top three prominent categories; comparison between settings based on the Kruskal-Wallis test, *** P <0.001. 'Site comparison' and 'Gender comparison': figures in bold designate significant differences at P <0.05 based on the Wilcoxon test. Data for Southeastern Democratic Republic of Congo (SE-DRC) in 'Overall' section from Merten *et al.* [31]. Data for western Kenya in 'Site comparison' section from Nyambedha *et al.* [28]. Data for Zanzibar in 'Site comparison' section from Schaetti *et al.* [27].

episodes were not a priority overall, but a distinct urban concern.

Perceived causes

Problems with unsafe drinking water and a dirty environment in general, were the most common perceived causes for cholera in all settings (Table 3). However, locally embedded explanations (for example, witchcraft) were still widespread, especially in rural areas (SE-DRC and Zanzibar). Lack of latrines was also a prominent perceived cause in western Kenya (not elicited in Zanzibar). There were site differences in 10 out of 12 categories in Zanzibar, while only 3 categories in SE-DRC and 4 categories in western Kenya had significant urban/rural differences. A dirty environment was often reported more in urban sites of western Kenya and Zanzibar, which may reflect conditions that residents are unable to control. Flies were particularly prominent in Zanzibar, without differentiation between site and gender. Flies, which can act as disease vectors for cholera, were mostly mentioned in connection with food handling in Zanzibar.

Knowledge of prevention and priority of hygiene and sanitation

Safe food and water and vaccines were prioritized for prevention in SE-DRC (Table 4). Although safe water was also a priority in western Kenya, respondents in western Kenya and Zanzibar identified sanitation issues (stool and garbage disposal) as priorities for prevention. Health education was reported with equal priority across all settings ($P = 0.925$). Differing ideas on prevention between sites and between men and women existed mainly in western Kenya, and least often in SE-DRC. Vaccination as a preference was not reported differently between sites and gender.

Help-seeking behavior

Use of ORS and rehydration in general was a top priority for home-based treatment of cholera patients in all three settings (Table 5). Self-administration of drugs was an additional prominent treatment option in SE-DRC (mainly antibiotics) and western Kenya (tetracycline and metronidazole (Flagyl®) most frequently mentioned). Herbal treatment was the most prominent option in Zanzibar, with a rural preference. Less commonly reported practices were praying, which showed a higher prominence in urban than rural western Kenya, and drinking alcohol. The latter category, which was not elicited in the Muslim society of Zanzibar, was higher among men than women in SE-DRC and western Kenya.

Healthcare facilities were universally mentioned in all three settings (Table 6), with an urban preference in western Kenya and Zanzibar and a rural preference in SE-DRC based on the assessment of the most preferred health provider. Other help-seeking practices were far less common: advice from friends and colleagues was the second most prominent category in western Kenya and Zanzibar, also preferred more by rural and male respondents. Visiting pharmacies/or purchasing over-the-counter drugs was the third most prominent category across all settings; it had the highest priority in western Kenya and was reported with a significantly higher prominence in rural than in urban Zanzibar.

Vulnerability to the illness

Respondents in SE-DRC reported cholera as a condition affecting almost everybody (>84%) without differentiating much between sex, age and class (Table 7). This percentage was a little lower in Zanzibar (>74%). Respondents in western Kenya differentiated more between women and men and identified children and the poor as most vulnerable to cholera.

Discussion

Based on data from almost 1,100 interviews in 3 endemic settings, this paper represents the first systematic study of the nature and distribution of local sociocultural features of cholera in urban and rural communities at high risk in eastern Africa. The following points may be worth considering in planning local educational activities to increase public awareness of interventions for cholera control, and to advise communities of practical ways of preventing cholera and managing cases. Study findings may also be used to promote advocacy among decision makers for investment in strategies and action for better control or elimination of cholera.

Implications for regional cholera control policy and action

This study identified more differences between urban and rural communities than between men and women across all domains. This suggests a need for an approach in program planning that is sensitive to setting-specific disparities in all three settings. Findings also indicate that local terms for cholera are recognized and adequately understood in all settings by over three-quarters of the surveyed populations. Use of these terms in health education and control activities is advisable.

There is a past collective experience and memory of cholera-related symptoms in all settings. In SE-DRC, where poverty levels are higher and the public health system is weaker than the other settings, people rely heavily on social networks since income-generating activities are less available. Thus, social networks may be more important in SE-DRC (and probably also in DRC in general) in order to meet needs. Cholera causes primarily a considerable economic impact in all settings represented by fears of absence from work or income-generating activities and reported loss of family income.

Table 3 Comparison of perceived causes for cholera in endemic areas of three African settings, by site and gender

Category	SE-DRC, n = 360					Western Kenya, n = 379					Zanzibar, n = 356				
Overall	Total reported		Prominence			Total reported		Prominence			Total reported		Prominence		
Dirty environment***	**93.3**		**1.83**			**96.3**		**1.97**			**97.8**		**2.99**		
Drinking contaminated water***	**94.7**		**2.68**			**95.5**		**2.21**			**95.2**		**1.65**		
Eating unprotected/ spoiled food***	**94.7**		**1.94**			93.1		1.75			94.9		1.44		
Flies*	95.3		1.44			96.0		1.30			**96.9**		**1.60**		
Lack of latrines[a]***	93.3		1.72			**95.8**		**1.79**			NA		NA		
Site comparison	Urban		Rural		*P* value	Urban		Rural		*P* value	Urban		Rural		*P* value
	Total reported	Prominence	Total reported	Prominence		Total reported	Prominence	Total reported	Prominence		Total reported	Prominence	Total reported	Prominence	
Contact with contaminated water	84.4	1.17	89.4	1.12	0.657	55.8	0.64	63.0	0.75	0.115	**85.5**	**1.07**	**91.0**	**1.58**	**<0.001**
Dirty environment	91.7	1.83	95.0	1.82	0.631	**97.9**	**2.29**	**94.7**	**1.63**	**<0.001**	**99.4**	**3.68**	**96.0**	**2.30**	**<0.001**
Drinking contaminated water	**93.3**	**2.34**	**96.1**	**3.02**	**<0.001**	97.4	2.18	93.7	2.23	0.778	96.1	1.65	94.4	1.66	0.384
Eating forbidden food	20.6	0.23	13.3	0.15	0.094	11.6	0.12	14.8	0.15	0.365	**27.4**	**0.27**	**54.8**	**0.48**	**<0.001**
Eating soil	**53.9**	**0.65**	**41.7**	**0.45**	**0.006**	60.0	0.60	52.4	0.52	0.136	**36.9**	**0.37**	**48.6**	**0.49**	**0.023**
Eating unprotected/ spoiled food	92.8	1.89	96.7	1.99	0.100	95.3	1.75	91.0	1.74	0.432	**95.5**	**1.60**	**94.4**	**1.27**	**<0.001**
Flies	93.3	1.37	97.2	1.52	0.236	**96.3**	**1.35**	**95.8**	**1.25**	**0.004**	99.4	1.62	94.4	1.58	0.163
God's will	40.0	0.56	42.2	0.55	0.668	8.9	0.09	7.4	0.07	0.586	**93.3**	**1.22**	**86.4**	**1.83**	**0.001**
Malaria	26.1	0.30	20.0	0.21	0.115	19.5	0.21	24.9	0.25	0.243	**15.1**	**0.15**	**48.0**	**0.49**	**<0.001**
Witchcraft	**47.8**	**0.64**	**69.4**	**0.86**	**<0.001**	9.5	0.09	11.6	0.12	0.494	**20.7**	**0.21**	**45.8**	**0.50**	**<0.001**
Worms	36.1	0.39	36.7	0.39	0.976	**23.2**	**0.24**	**39.7**	**0.40**	**0.001**	**13.4**	**0.13**	**46.9**	**0.47**	**<0.001**
Cannot say	4.4	0.11	3.9	0.14	0.638	**2.1**	**0.42**	**11.6**	**0.77**	**0.005**	**1.1**	**0.02**	**13.6**	**0.27**	**<0.001**
Gender comparison	Female		Male		*P* value	Female		Male		*P* value	Female		Male		*P* value
	Total reported	Prominence	Total reported	Prominence		Total reported	Prominence	Total reported	Prominence		Total reported	Prominence	Total reported	Prominence	
Dirty environment	92.3	1.77	94.4	1.89	0.251	**96.9**	**1.84**	**95.7**	**2.10**	**0.043**	97.8	2.91	97.7	3.07	0.334
Eating soil	51.9	0.61	43.6	0.49	0.092	**45.4**	**0.45**	**67.6**	**0.68**	**<0.001**	43.6	0.44	41.8	0.42	0.772
Cannot say	5.0	0.15	3.4	0.10	0.620	7.7	0.65	5.9	0.54	0.476	**11.2**	**0.22**	**3.4**	**0.07**	**0.005**

Categories ordered alphabetically, except for 'cannot say'. 'Total reported' = percentage of categories reported spontaneously and upon probing. 'Prominence' = mean prominence of categories based on how reported (spontaneous = 2, probed = 1, most important = 3). 'Overall': figures in bold designate top three prominent categories; comparison between settings based on the Kruskal-Wallis test, *P <0.05, ***P <0.001. 'Site comparison' and 'Gender comparison': figures in bold designate significant differences at P <0.05 based on the Wilcoxon test. Data for Southeastern Democratic Republic of Congo (SE-DRC) in 'Overall' section from Merten *et al*. [31]. Data for western Kenya in 'Site comparison' section from Nyambedha *et al.* [28]. Data for Zanzibar in 'Site comparison' section from Schaetti *et al.* [27].
[a]Not elicited in Zanzibar.

Table 4 Comparison of prevention options for cholera in endemic areas of three African settings, by site and gender

Category	SE-DRC, n = 360					Western Kenya, n = 379					Zanzibar, n = 354				
Overall	Total reported		Prominence			Total reported		Prominence			Total reported		Prominence		
Health education	92.5		1.75			**98.9**		**1.89**			**95.5**		**1.90**		
Safe disposal of garbage***	95.0		1.79			97.9		1.61			**98.6**		**2.09**		
Safe disposal of stool***	93.9		1.53			**97.9**		**1.81**			**98.3**		**2.09**		
Safe food***	**95.3**		**1.92**			98.4		1.67			97.5		1.66		
Safe water***	**93.3**		**2.06**			**98.2**		**1.93**			96.9		1.74		
Vaccines***	**87.2**		**2.00**			87.9		1.15			86.2		1.20		
Site comparison	Urban		Rural			Urban		Rural			Urban		Rural		
	Total reported	Prominence	Total reported	Prominence	*P* value	Total reported	Prominence	Total reported	Prominence	*P* value	Total reported	Prominence	Total reported	Prominence	*P* value
Health education	90.0	1.80	95.0	1.71	0.371	**98.9**	**2.27**	**98.9**	**1.51**	**<0.001**	96.6	1.93	94.3	1.88	0.581
Preventive drugs	59.4	0.87	65.0	1.04	0.331	**86.3**	**1.05**	**91.5**	**1.20**	**0.049**	**83.7**	**1.01**	**88.6**	**1.18**	**0.040**
Protection from supernatural influence[a]	**10.6**	**0.13**	**5.0**	**0.05**	**0.047**	**7.4**	**0.09**	**21.7**	**0.22**	**<0.001**	NA	NA	NA	NA	NA
Safe disposal of garbage	93.9	1.71	96.1	1.87	0.154	98.4	1.53	97.4	1.69	0.257	**99.4**	**2.51**	**97.7**	**1.66**	**<0.001**
Safe disposal of stool	91.7	1.53	96.1	1.54	0.911	**97.4**	**1.66**	**98.4**	**1.96**	**0.026**	99.4	1.96	97.2	2.21	0.301
Safe food	94.4	1.86	96.1	1.98	0.298	**98.9**	**1.76**	**97.9**	**1.58**	**0.002**	**98.3**	**1.78**	**96.6**	**1.53**	**0.001**
Gender comparison	Female		Male			Female		Male			Female		Male		
	Total reported	Prominence	Total reported	Prominence	*P* value	Total reported	Prominence	Total reported	Prominence	*P* value	Total reported	Prominence	Total reported	Prominence	*P* value
Health education	91.7	1.66	93.3	1.84	0.361	98.5	1.87	99.5	1.92	0.571	**95.5**	**1.72**	**95.4**	**2.10**	**0.014**
Protection from supernatural influence[a]	**5.0**	**0.05**	**10.6**	**0.13**	**0.044**	13.4	0.14	15.7	0.17	0.533	NA	NA	NA	NA	NA
Safe disposal of garbage	95.6	1.78	94.4	1.79	0.500	**97.4**	**1.52**	**98.4**	**1.70**	**0.026**	98.9	2.13	98.3	2.05	0.906
Safe food	94.5	1.98	96.1	1.86	0.206	98.5	1.69	98.4	1.65	0.888	**98.3**	**1.78**	**96.6**	**1.53**	**0.013**
Safe water	92.3	2.15	94.4	1.98	0.159	**98.5**	**2.04**	**97.8**	**1.82**	**0.019**	97.2	1.77	96.6	1.71	0.926

Categories ordered alphabetically. 'Total reported' = percentage of categories reported spontaneously and upon probing. 'Prominence' = mean prominence of categories based on how reported (spontaneous = 2, probed = 1, most useful = 3). 'Overall': figures in bold designate top three prominent categories; comparison between settings based on the Kruskal-Wallis test, *** P <0.001. 'Site comparison' and 'Gender comparison': figures in bold designate significant differences at P <0.05 based on the Wilcoxon test. Data for Southeastern Democratic Republic of Congo (SE-DRC) in 'Overall' section from Merten *et al.* [31]. Data for western Kenya in 'Site comparison' section from Nyambedha *et al.* [28].

[a]Not elicited in Zanzibar.

Table 5 Comparison of home-based self-treatment options for cholera in endemic areas of three African settings, by site and gender

Category	SE-DRC, n = 360					Western Kenya, n = 379					Zanzibar, n = 356				
Overall	Total reported		Prominence			Total reported		Prominence			Total reported		Prominence		
Drinking water/liquids***	**55.6**		**0.86**			**89.4**		**2.00**			**69.1**		**1.32**		
Herbal treatment***	50.3		0.84			33.2		0.62			**66.3**		**1.79**		
ORS***	**92.8**		**3.26**			**87.1**		**2.20**			**66.3**		**1.45**		
Self-administered drugs***	**56.1**		**1.19**			**73.9**		**1.89**			58.4		1.30		
Site comparison	Urban		Rural		*P* value	Urban		Rural		*P* value	Urban		Rural		*P* value
	Total reported	Prominence	Total reported	Prominence		Total reported	Prominence	Total reported	Prominence		Total reported	Prominence	Total reported	Prominence	
Doing nothing at home	5.6	0.09	10.6	0.24	0.109	**0.5**	**0.03**	**5.3**	**0.12**	**0.020**	**27.9**	**1.25**	**19.8**	**0.53**	**0.005**
Drinking water/liquids	**66.7**	**1.07**	**44.4**	**0.64**	**<0.001**	87.9	1.93	91.0	2.07	0.493	**68.7**	**1.58**	**69.5**	**1.05**	**0.006**
Herbal treatment	50.0	0.79	50.6	0.89	0.912	30.0	0.61	36.5	0.63	0.292	**49.7**	**1.29**	**83.1**	**2.31**	**<0.001**
Prayers	44.4	0.80	50.6	0.74	0.497	**51.1**	**0.68**	**32.3**	**0.37**	**<0.001**	55.9	0.74	47.5	0.73	0.229
Self-administered drugs	**48.3**	**1.03**	**63.9**	**1.36**	**0.006**	76.8	1.95	70.9	1.83	0.251	**44.7**	**1.03**	**72.3**	**1.57**	**<0.001**
Gender comparison	Female		Male		*P* value	Female		Male		*P* value	Female		Male		*P* value
	Total reported	Prominence	Total reported	Prominence		Total reported	Prominence	Total reported	Prominence		Total reported	Prominence	Total reported	Prominence	
Alcoholic drink[a]	**4.4**	**0.05**	**11.2**	**0.12**	**0.019**	**4.1**	**0.06**	**10.8**	**0.14**	**0.014**	NA	NA	NA	NA	NA
Herbal treatment	47.0	0.78	53.6	0.91	0.147	**25.8**	**0.42**	**41.1**	**0.83**	**0.001**	70.9	1.92	61.6	1.67	0.149
ORS	91.7	3.27	93.9	3.26	0.790	**90.2**	**2.38**	**83.8**	**2.01**	**0.017**	65.4	1.36	67.2	1.53	0.492
Self-administered drugs	**50.3**	**1.07**	**62.0**	**1.32**	**0.023**	69.6	1.87	78.4	1.91	0.585	61.5	1.35	55.4	1.25	0.363

Categories ordered alphabetically. 'Total reported' = percentage of categories reported spontaneously and upon probing. 'Prominence' = mean prominence of categories based on how reported (spontaneous = 2, probed = 1, most helpful = 3). 'Overall': Figures in bold designate top three prominent categories; comparison between settings based on the Kruskal-Wallis test, *** *P* <0.001. 'Site comparison' and 'Gender comparison': Figures in bold designate significant differences at *P* <0.05 based on the Wilcoxon test. Data for Southeastern Democratic Republic of Congo (SE-DRC) in 'Overall' section from Merten *et al.* [31]. Data for western Kenya in 'Site comparison' section from Nyambedha *et al.* [28]. Data for Zanzibar in 'Site comparison' section from Schaetti *et al.* [27].

[a]Not elicited in Zanzibar.

ORS oral rehydration solution.

Table 6 Comparison of outside help-seeking options for cholera in endemic areas of three African settings, by site and gender

Category	SE-DRC, n = 360					Western Kenya, n = 379					Zanzibar, n = 356				
Overall	Total reported		Prominence			Total reported		Prominence			Total reported		Prominence		
Faith healers	**19.4**		**0.31**			18.5		0.23			14.9		0.18		
Healthcare facility	**100.0**		**4.79**			**100.0**		**4.76**			**100.0**		**4.64**		
Informal help***	13.6		0.18			**54.6**		**0.72**			**55.9**		**0.86**		
Pharmacy/OTC***	**19.4**		**0.20**			**59.1**		**0.70**			**34.0**		**0.36**		
Site comparison	Urban		Rural		*P* value	Urban		Rural		*P* value	Urban		Rural		*P* value
	Total reported	Prominence	Total reported	Prominence		Total reported	Prominence	Total reported	Prominence		Total reported	Prominence	Total reported	Prominence	
Healthcare facility	**100.0**	**4.69**	**100.0**	**4.90**	**0.001**	**100.0**	**4.87**	**99.5**	**4.65**	**0.005**	**100.0**	**4.87**	**100.0**	**4.41**	**<0.001**
Informal help	15.6	0.22	11.7	0.13	0.263	**44.2**	**0.54**	**65.1**	**0.90**	**<0.001**	**38.5**	**0.52**	**73.4**	**1.21**	**<0.001**
Pharmacy/OTC	20.6	0.22	18.3	0.18	0.546	55.3	0.61	63.0	0.79	0.072	**27.4**	**0.27**	**40.7**	**0.44**	**0.007**
Traditional healers	9.4	0.14	4.4	0.09	0.075	12.1	0.16	17.5	0.19	0.187	**3.9**	**0.04**	**9.6**	**0.12**	**0.031**
Gender comparison	Female		Male		*P* value	Female		Male		*P* value	Female		Male		*P* value
	Total reported	Prominence	Total reported	Prominence		Total reported	Prominence	Total reported	Prominence		Total reported	Prominence	Total reported	Prominence	
Healthcare facility	100.0	4.77	100.0	4.82	0.976	100.0	4.79	100.0	4.72	0.475	**100.0**	**4.77**	**100.0**	**4.51**	**0.013**
Informal help	10.5	0.12	16.8	0.23	0.078	**49.5**	**0.62**	**60.0**	**0.83**	**0.026**	**50.8**	**0.69**	**61.0**	**1.03**	**0.014**
Traditional healers	5.0	0.08	8.9	0.15	0.159	**10.3**	**0.12**	**19.5**	**0.22**	**0.014**	7.8	0.08	5.6	0.07	0.418

Categories ordered alphabetically. 'Total reported' = percentage of categories reported spontaneously and upon probing. 'Prominence' = mean prominence of categories based on how reported (spontaneous = 2, probed = 1, most helpful = 3). 'Overall': figures in bold designate top three prominent categories; comparison between settings based on the Kruskal-Wallis test, *** *P* <0.001. 'Site comparison' and 'Gender comparison': figures in bold designate significant differences at *P* <0.05 based on the Wilcoxon test. Data for Southeastern Democratic Republic of Congo (SE-DRC) in 'Overall' section from Merten *et al*. [31]. Data for western Kenya in 'Site comparison' section from Nyambedha *et al.* [28]. Data for Zanzibar in 'Site comparison' section from Schaetti *et al.* [27].
OTC over-the-counter drugs.

Table 7 Perceived vulnerability to cholera in endemic areas of three African settings

Category	SE-DRC, n = 360	Western Kenya, n = 379	Zanzibar, n = 356
Sex			
No differentiation	90.6	63.6	87.1
Women more vulnerable	6.9	24.5	10.4
Men more vulnerable	2.5	11.9	2.5
Age			
No differentiation	84.4	26.9	79.5
Adults more vulnerable	8.1	22.4	8.1
Children more vulnerable	7.5	50.7	12.4
Class			
No differentiation	86.3	44.9	74.4
Rich more vulnerable	0.6	2.9	0.0
Poor more vulnerable	13.1	52.2	25.6

SE-DRC Southeastern Democratic Republic of Congo.

Indirect costs were reported more than direct costs, probably reflecting the fact that the latter are usually covered by the healthcare system (during CTCs) or by non-governmental organizations in all three settings. In Zanzibar, laboratory-confirmed cholera patients reported almost three-quarters of private costs as indirect costs [19]. Differences in costs anticipated between rural and urban areas (different options for generating income) and genders (men more often generating a cash income) were not consistent across all settings.

In line with the high recognition of the clinical vignette and the reported severity and help seeking, infectious pathways of cholera are widely acknowledged, even though local causal explanations continue to coexist in all settings. The predominance of environmental and sanitation-related factors and ingestion of contaminated water or food hygiene as perceived causes points to interventions needed in infrastructure. Because of this relatively high overlap between biomedical facts and local ideas about cholera, future community interventions may preferably address environmental and infrastructural issues, rather than solely reemphasize education about causes of cholera. It cannot be ruled out, however, that for those who subscribe to traditional causes such as sorcery (primarily in DRC), classical control activities may not be sufficient.

The three settings differ considerably in terms of water supply and sanitation infrastructure. Use of improved drinking water sources (45%) and improved sanitation (24%) was lowest in 2010 in DRC [13]; the same indicators were higher in Kenya (59%, 32%) and Zanzibar (53%, 53%; numbers for Tanzania). Despite this relative variation, but in line with the commonly prioritized environmental and water and food-related perceived causes, the most prominent prevention options referred to infrastructural aspects (water and sanitation) in all settings.

Similar to the prominence of biomedical meanings, overall help seeking at home reflected a relatively high awareness about professional cholera treatment in all three settings. Rehydration to treat patients at home was prominently reported in all three settings. Antibiotics were the third most prominent treatment option in SE-DRC and western Kenya. They were more prominent in rural areas in SE-DRC and Zanzibar, even though rural villagers are generally poorer and antibiotics have to be purchased. This may be a consequence of limited access to health facilities in the rural areas, while at the same time indicating the availability of antibiotics in remote areas. This suggests that future interventions should primarily focus on rehydration, but also reconsider the role of antibiotics and their potential of being used inappropriately. Antibiotics are part of the treatment regimen as the WHO recommends antibiotics for severe cases [55] (though some recommend it also for moderate cases [56]), but indiscriminate use may jeopardize their effectiveness and was shown to induce resistance [57]. Antibiotic use also means out-of-pocket expenditures that may be better used for purchasing ORS packets or salt and sugar for home-made oral rehydration solutions.

Herbal treatment, which is still important today for diarrhea management in many African settings despite westernization and modernization, may potentially conflict with effective cholera treatment. Herbs were among the most important self-help options in rural Zanzibar; this may call for more emphasis about their potential to delay initiation of rehydration and the use of ORS. The lower priority for herbal treatment in SE-DRC and western Kenya may suggest less attention is needed in that regard for effective information, health education and communication campaigns.

While limited accessibility to health posts or CTCs may still hinder patients or caretakers from seeking care for cholera, the consistent and pronounced priority for professional treatment of cholera across the three settings is another important finding for policy makers in the region. The underutilization of health services may be explained by various factors, such as distance, perceived quality of care, competing obligations, recognition of a need for treatment, and so on. Further study of the role of these reasons locally would be relevant for cholera control.

Concerning questions about the vulnerability of some segments of the population to cholera, in western Kenya respondents were more likely to acknowledge differences. They were consistently less likely than respondents in the other settings to report 'no differentiation,' and they more frequently identified women or men, adults or children, and the poor as more vulnerable. The findings suggest both greater cultural sensitivity to vulnerability in general,

and a tendency to generalize the vulnerability of women and children to cholera. Respondents at the other settings were less likely to distinguish the vulnerability of these specific subgroups. In the comparison of SE-DRC and western Kenya, this may reflect less access to health services and lower levels of overall development, which affect everyone. In Zanzibar, the finding may reflect less emphasis on vulnerability in health policy. However, this is unclear and the reasons for acknowledging the vulnerability of some groups require further study. In any case, the relative priority of the needs of the general population and of specific subgroups requires consideration in cholera control and for strategies to integrate services in the general health system. Acknowledgement of children and pregnant women as high-risk groups that should be prioritized for cholera vaccines [58] suggest more attention to the relative vulnerability of subgroups would be appropriate in health education in SE-DRC and Zanzibar.

Vaccination has also been recommended by the WHO as an additional measure to WASH in epidemic and endemic situations [16]. Although no vaccination campaigns have been conducted in the study sites before the surveys, the use of vaccines for prevention was identified by a majority in all settings and it received the highest priority in SE-DRC. Vaccine action was a matter of sufficient priority for the government of Zanzibar that it conducted an OCV mass vaccination campaign in 2009. Additional analyses on community demand for oral cholera vaccination confirm a high regard for vaccination with anticipated acceptance rates above 93% in the three surveys [29-31]. While an analysis of sociocultural determinants of anticipated OCV acceptance across the three settings using meta-analytical techniques is in preparation, the descriptive findings presented here indicate good prospects for future vaccination campaigns in the region. It should be noted, however, that a high acceptability, constituting only one component of access to health (care), does not directly relate to a high effectiveness. Unlike other multicountry comparisons of people's ideas about illness and willingness to receive a not-yet-existing vaccine [59,60], finhdings from this study are directly relevant for public health practice. Two cholera vaccines are available and prequalified by the WHO, and planning is underway to increase their use in populations at risk [61].

This study is limited by the fact that findings are based on cross-sectional surveys, which do not take into account the possibility of changes in the studied domains over time. The strengths of this three-country comparison lie in the use of three individual community surveys that were planned and implemented in a highly consistent manner. All surveys used the same, although locally adapted, interview schedule; this enabled maximum comparability in the analysis of sociocultural features of cholera across the three settings.

Conclusions

Based on this comprehensive review of local understandings of cholera-related diarrhea and priorities for cholera control in southeastern Democratic Republic of Congo, western Kenya and Zanzibar, local program planners are encouraged to intensify control activities in this region. Sustainable cholera control, let alone elimination, is only possible through improvements in the local water supply and sanitation infrastructure. Due to political and economic realities in the region, which are improving much too slowly, control of cholera continues to depend mostly on response activities (that is, ensuring timely rehydration through local treatment centers) in the foreseeable future. This study indicates that such an approach is likely to be very effective in areas with endemic cholera in eastern Africa. At the same time, regional decision makers may also consider using vaccines in populations at risk of recurrent cholera outbreaks; such intermediate activities would help mitigate morbidity and mortality while programs for improving water and sanitation are underway.

Additional files

Additional file 1: EMIC interview for study of community views of cholera in southeastern Democratic Republic of Congo.

Additional file 2: EMIC interview for study of community views of cholera in western Kenya.

Additional file 3: EMIC interview for study of community views of cholera in Zanzibar.

Additional file 4: Comparison of priority symptoms for cholera in endemic areas of three African settings, by site and gender.

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

Conception and design of the study: CS, NS, SM and MGW. Analysis of data: CS, NS and SM. Writing of manuscript: CS, NS, SM and MGW. Revision of manuscript: all authors. All authors read and approved the final manuscript.

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8.3 Sociocultural determinants of anticipated oral cholera vaccine acceptance in three African settings: a meta-analytic approach*

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Abstract

Background: Controlling cholera remains a significant challenge in Sub-Saharan Africa. In areas where access to safe water and sanitation are limited, oral cholera vaccine (OCV) can save lives. Community acceptance of vaccines, however, is critical. This study identifies and compares sociocultural determinants of anticipated OCV acceptance across Southeastern Democratic Republic of Congo, Western Kenya and Zanzibar.

Methods: Cross-sectional studies were conducted using similar but locally-adapted semistructured interviews among 1095 respondents in three African settings. Logistic regression models identified sociocultural determinants of OCV acceptance from these studies in endemic areas of Southeastern Democratic Republic of Congo (SE-DRC), Western Kenya (W-Kenya) and Zanzibar. Meta-analytic techniques highlighted common and distinctive determinants in the three settings.

Results: Anticipated OCV acceptance was high in all settings. More than 93% of community respondents overall indicated interest in a no-cost vaccine. Higher anticipated acceptance was observed in areas with less access to public health facilities. In all settings awareness of cholera prevention methods (safe food consumption and garbage disposal) and relating ingestion to cholera causation were associated with greater acceptance. Higher age, larger households, lack of education, social vulnerability and knowledge of oral rehydration solution for self-treatment were negatively associated. Setting-specific determinants of acceptance included reporting a reliable income (W-Kenya and Zanzibar, not SE-DRC). In SE-DRC, intention to purchase an OCV appeared unrelated to ability to pay. Rural residents were less likely than urban counterparts to accept an OCV in W-Kenya, but more likely in Zanzibar. Prayer as a form of self-treatment was associated with vaccine acceptance in SE-DRC and W-Kenya, but not in Zanzibar.

Conclusions: These cholera-endemic African communities are especially interested in no-cost OCVs. Health education and attention to local social and cultural features of cholera and vaccines would likely increase vaccine coverage. High demand and absence of insurmountable sociocultural barriers to vaccination with OCVs indicate potential for mass vaccination in planning for comprehensive control or elimination.

Keywords

Vaccine acceptance; Cholera vaccine; Social determinants; Cultural epidemiology; Meta-analysis; Africa

Background

Cholera results from ingesting pathogenic strains of the bacterium *Vibrio cholerae* in contaminated water or food [1]. Although cholera should not be fatal, if untreated, case-fatality ratios for severe cholera may be as high as 50% [2]. An estimated 1.4 billion people are at risk for cholera in endemic countries [3]. Controlling cholera remains a significant challenge in Sub-Saharan Africa. Access to safe water and sanitation remain low in the region, about 61% and 30%, respectively [4]. Needed development requires major investments in infrastructure that proceed very slowly.

In the interim, oral cholera vaccines (OCVs) can save lives in epidemics and endemic areas. The World Health Organization (WHO) recommends OCVs as a short-term control strategy for high-risk populations to complement long-term water and sanitation improvements [5]. Two safe OCVs — Shanchol™, with a protective efficacy of 66% [6], and Dukoral®, with 79% direct protection [7] — are currently available for international use. Efficacy is not enough, however, for vaccines to be effective. People must also be willing to accept them. Local social and cultural ideas about illness, vaccines and community preferences are critical considerations. Past programme experience provides valuable lessons that underscore the priority of social and cultural aspects of vaccine acceptance and effective vaccine action [8-11]. A recent review of vaccine hesitancy suggests community effectiveness may depend on particular features of setting, health problem and vaccine [12].

Studies of sociocultural aspects of cholera [13-15] were undertaken in three cholera-endemic settings in Africa. A comparison of sociocultural features of cholera from these three studies have been reported by Schaetti and colleagues [16], and sociocultural determinants of anticipated OCV acceptance in each setting were also studied [15,17,18]. The analysis reported here compares determinants of anticipated OCV acceptance across the three settings in Democratic Republic of Congo, Kenya and Zanzibar. Common and distinctive sociocultural features of endemic settings that may affect uptake and effectiveness of OCVs in cholera-endemic areas of Sub-Saharan Africa are presented.

Methods

Meta-analytic techniques were used to synthesise and compare data on sociocultural features of illness and anticipated OCV acceptance from research studies with comparable designs in three settings: Southeastern DRC (SE-DRC) [15], Western Kenya (W-Kenya [18] and Zanzibar [17].

Setting

In SE-DRC, the study was conducted in Kasenga district of Katanga province. In Western Kenya, it was conducted in Kisumu and Siaya districts of Nyanza province, located on the banks of Lake Victoria. In Zanzibar, a semi-autonomous part of the United Republic of Tanzania, study sites were located on Unguja and Pemba Islands. Zanzibar is the only one of the three settings where a mass OCV vaccination was implemented [7], but study data analysed here were collected before the mass vaccination.

In the years 2008 and 2009 a total of 53, 049 cholera cases were reported to the WHO from DRC, 14,516 cases were reported from Kenya and 10,611 cases for Tanzania [19,20]. Reported cholera cases are estimated to represent only a fraction of the actual cases due to substantial underreporting [21,22]. All three settings lack universal access to safe water and sanitation.

Individual study design and data collection

Data for the current analysis are from three cross-sectional studies of adults in the general population who were interviewed. Similar, but locally adapted semi-structured EMIC (Explanatory Model Interview Catalogue) interviews [23] were used at each setting. Patterns of distress, perceived causes, help-seeking and methods of prevention associated with a cholera-like illness (presented to respondents using a clinical vignette describing a person with cardinal cholera symptoms) were assessed based on a cultural epidemiological framework [24]. Quantitative and narrative data were collected. The instrument also assessed respondents' willingness to accept OCVs at different prices: 'free' as in the case of many mass vaccination campaigns; 'low cost', approximately USD 1; 'medium cost', USD 4-5 and 'high cost', USD 8-11. OCV prices were stated in the near-equivalent local currency as price per vaccine course. Data collection proceeded from June through August 2008 in Zanzibar, March through May 2010 in Kenya, and August through September 2010 in SE-DRC. Further details on sampling and data collection are provided in published reports of these studies [15,17,18,25].

Approach to analysis

In each setting, prominence scores were calculated for sociocultural variables (e.g., categories of distress and perceived causes) depending on how they were reported. A category reported spontaneously by the respondent received a higher prominence (value=2) than responses provided only on probing (value=1); if a category was identified as most important among all categories, a value of 3 was added. Mean prominence, which encompasses more information than a mere 'yes' or 'no', was calculated for each variable and used in analysis. SAS statistical software, version 9.2 (SAS Institute Inc., USA), was used.

Univariable logistic regressions were done for each setting. Anticipated OCV acceptance at each price level were outcome variables for analysis of sociocultural and sociodemographic explanatory variables.

Meta-analytic techniques were employed to combine and compare associations between OCV acceptance and explanatory variables at the three settings. Variables with consistent combined estimates ($p<0.1$) and lacking heterogeneity ($p>0.1$) were selected and individually adjusted for core sociodemographic features. A fixed-effects meta-analysis of the adjusted estimates was done, and results are presented in forest plots, generated using STATA, version 10.1 (StatCorp LP, TX, USA). Figures 2 and 3 in this report display multiple forest plots, and each is an individual model. Variables whose association with anticipated OCV acceptance showed heterogeneity at a level of $p<0.1$ between the settings

and a significant association in at least one of the settings ($p<0.05$) are presented in tables. These variables were not meta-analysed owing to significant heterogeneity.

It should be noted that our analysis refers exclusively to anticipated acceptance or non-acceptance, rather than vaccine coverage.

Ethics statement

Ethical approval was obtained from the Ministry of Health Ethics Committee of Zanzibar for the study conducted in Zanzibar, Kenya Medical Research Institute for the study in W-Kenya and from the University of Kinshasa for the study conducted in SE-DRC. Furthermore, ethical approval was obtained for all three studies from the WHO Research Ethics Review Committee. All participants provided written informed consent before they were interviewed.

Results

Data from a total of 1095 respondents were analysed—360 from SE-DRC, 379 from W-Kenya and 356 from Zanzibar. Sample characteristics have been presented in reports of these studies [16].

Anticipated OCV acceptance

High anticipated OCV acceptance rates (>93%) were found in all settings when offered for free (Fig. 1), and acceptance decreased with increasing cost. W-Kenya had the highest number of respondents willing to take the low-price and no-cost vaccine, while SE-DRC had the greatest number willing to purchase the medium-price and high-price OCVs. Zanzibar had the lowest anticipated OCV acceptance at all prices.

Common determinants of OCV acceptance across all three settings

Near universal (>95%) anticipated acceptance reported for the no-cost and low price OCV at some sites, made it unnecessary to further consider determinants at these cost-levels. The medium price (USD 4-5) model approximates the cost for a full-course of Shanchol™ (USD 1.85 per dose [26,27] = USD 3.70 for 2 doses). The high price (USD 8-10) model reflects the cost of Shanchol along with other programmatic and indirect costs. The high price also crudely approximates the market price for Dukoral™ (USD 5.25 per dose [26]), which was used for mass vaccination in Zanzibar.

Sociodemographic determinants

Similar sociodemographic variables were significantly associated with anticipated OCV acceptance at the medium price of USD 4–5(Fig. 2) and high price of USD 8–11 (Fig. 3). Increasing age and living in a larger household were associated with decreasing willingness to accept an OCV. Lack of education was a predictor of OCV non-acceptance at the high price. It was marginally significant at the medium price ($p=0.06$, not represented in Fig. 2).

Sociocultural determinants

Sociocultural variables associated with anticipated OCV acceptance at the medium price were distinct from the high price. Only two were significantly associated at the high

price, compared to six at the medium price. The following sociocultural determinants were common to all settings:

Attention to garbage disposal and consumption of safe food as measures to prevent cholera were predictors of OCV acceptance (Fig. 2).

Those identifying worms (Fig. 3) or the cultural practice of eating soil (Fig. 2) as causes of cholera were more likely to accept OCVs. Narrative accounts related the practice of eating soil to the fact that it is unclean, even though the practice may be culturally acceptable, especially for women. Eating unhygienic substances produced worms in the stomach. Respondents explained that they were trapped in an unclean environment, and though aware of the importance of hygiene, they felt there was little they could do to prevent cholera.

Knowledge of ORS for home-treatment of cholera was negatively associated with OCV acceptance at the high price (Fig. 3).

Identification of physical symptoms of dehydration such as loose skin and confused thinking were negatively associated with OCV acceptance (Fig. 2).

Social vulnerability

Respondents with more prominent concern about the effects of cholera on social relationships with others were less likely to anticipate purchasing OCV in all settings. The association was clearest in SE-DRC (Fig. 2).

Setting-specific determinants of OCV acceptance

Sociocultural features of vaccine acceptance that were significantly heterogeneous across the three settings at the medium and high prices are presented in Tables 1 and 2.

SE-DRC

In SE-DRC, additional aspects of social vulnerability were apparent. 'Fear of infecting others' and 'interference of cholera with work and daily activities' were negatively associated with high-price OCV acceptance. These issues indicate a link between social vulnerability and lack of confidence in ability to pay for an OCV in SE-DRC. Psychological and personal emotional impact of cholera with reference to sadness and anxiety, on the other hand, was positively associated with OCV acceptance at the high price.

Zanzibar

Acknowledging the social disapproval of others in response to cholera was positively associated with acceptance of the medium-price vaccine in Zanzibar. Another cultural meaning of cholera, however—witchcraft as a perceived cause—was associated with non-acceptance of the medium-price OCV. Prayer was significantly associated with high-price OCV acceptance at both SE-DRC and W-Kenya, but not Zanzibar.

W-Kenya

Reporting a regular and dependable household income was positively associated with OCV acceptance in W-Kenya and Zanzibar. Narratives in W-Kenya included repeated community requests for a no-cost vaccine to provide access to everyone [18]. In W-Kenya, acceptance was less in the rural site for both medium- and high-priced OCVs.

Discussion

Experience with OCV in vaccination campaigns has been steadily increasing [28]. To the best of our knowledge, this analysis is the first review of common and distinctive sociocultural determinants of anticipated OCV acceptance across multiple settings in Africa. Comparable research methods enabled a systematic meta-analytic approach. The findings identified patterns that would be unapparent in the individual studies. The quantitative associations, derived and presented through forest plots, show how priority symptoms, perceived causes and options for help-seeking may influence OCV acceptance positively or negatively. Some factors have common effects across sites and others are setting-specific, indicating the value of local study to enable locally effective vaccine action. Although our methods are not a traditional meta-analysis, use of meta-analytic techniques highlight key sociocultural determinants common to three African settings and the importance of studying them.

Although anticipated acceptance may not perfectly reflect actual acceptance, observed priority for OCVs indicate that these communities desire benefits from such vaccination initiatives. The finding that fewer determinants of anticipated acceptance were identified for the high priced vaccine (two), compared with the medium price (six), clearly shows that increased cost imposes an economic barrier making other features of acceptance and demand irrelevant.

Paradoxically, SE-DRC has the greatest number willing to purchase the medium-price and high-price OCVs. People in W-Kenya and Zanzibar are economically better off as seen from gross domestic product per capita [29] and self-reported reliability of income among study respondents [16]. The seeming contradiction of greatest willingness to purchase OCVs among those with least economic resources may be explained by the serious trouble caused by cholera in SE-DRC, where public health facilities are often inaccessible or non-functional. Another point worth noting is that vaccines in SE-DRC are usually provided for free. The ability to pay is often overestimated when the scenario is hypothetical and respondents do not have to actually make the payment from their own pockets [30,31]. The finding indicates community priority for a desired vaccine, rather than capacity to pay or prospects for effective uptake at the high price. Zanzibar has the lowest anticipated OCV acceptance at all prices. This may be an unintended consequence of a more accessible and effective public health system there compared to the other settings. Cholera camps instituted during an outbreak are accessible to most of the population who anticipate a fairly rapid response from local authorities [17]. Hence, the priority to pay for a vaccine may be reduced when timely life-saving treatment is assumed to be readily available compared with SE-DRC, where such confidence in lacking.

When vaccine price is high, motivation to purchase appears low among those with knowledge of feasible treatment options such as ORS. Vaccination and ORS seem to be competing interventions in the public mind. Zwisler et al. [32] found substantial satisfaction with ORS in treating diarrhoea among caregivers in Kenya and likely re-use of ORS in treatment if it had ever been used before. The marginal value of an OCV that users consider

costly may be more limited in areas where ORS is well-known and widely used. Furthermore, priority for treatment may be valued more highly than prevention.

All study respondents were adults, and anticipated OCV acceptance was higher among younger adults. Lack of education in our study was associated with OCV non-acceptance. Other studies report a significant positive association between education and cholera-related knowledge [33]. Youth and better educated community residents may be a resource for vaccination campaigns to mobilize for community awareness of the benefits of vaccines.

Household size imposes economic constraints; more mouths to feed leaves less money available for other expenses, even if desired, including vaccines. OCVs are especially important for larger households which are more likely to be crowded and burdened by limited sanitation. Sharing a latrine with many households is a reported risk factor for cholera in Kenya [34]. Economic limitations affecting the most vulnerable segments of the community with the least resources highlights the priority of making OCVs available without cost to users. If provided at a low cost, incentives or discounts for larger families may increase vaccine uptake.

Contrary to expectations, knowledge of dehydration symptoms decreased the priority of OCVs for prevention. Symptoms of dehydration, which are clearly related to cholera for health professionals, do not seem to be core features of a vaccine-preventable formulation of cholera in the community. Symptoms of dehydration may be linked in local perceptions to other forms of diarrhoea making a “cholera” vaccine less relevant. Although most respondents in the three studies identified the illness of the vignette as cholera or its local language equivalent (>85%) [14,15,18], its link to dehydration appears less well understood.

In SE-DRC, social and economic vulnerability are interrelated, and both may constrain access to vaccines for those who may need it most. In Zanzibar, cholera-related stigma appears to motivate OCV acceptance, presumably to avoid stigma. However, vaccine acceptance was impeded by local magico-religious ideas, possibly reflecting a conflict between public health and interests of local healers.

In Zanzibar, religious influences appear less enabling for OCV acceptance. Although no active resistance from religious leaders is foreseen in Zanzibar, engaging religious leaders for vaccine action in all settings is important to build alliances and pre-empt opposition that may affect uptake [35], as indicated by notable opposition to polio vaccines in Nigeria [9,36]. On the other hand, prayer and religious influences of a predominantly Christian population in SE-DRC and W-Kenya may promote vaccine use.

In W-Kenya, lower anticipated acceptance at the rural compared to the urban site, may result from urban-rural income disparities in W-Kenya, which was the only setting where fewer rural than urban respondents reported reliable and dependable incomes ($p<0.001$) [18]. Access and uptake would appear to be more sensitive there to the effect of cost. In Zanzibar, however, rural respondents were more likely to accept the high-price OCV. These findings suggest that urban-rural differences in vaccine acceptance may vary across settings based on local conditions and priorities.

Data for this analysis were collected between 2008 and 2010 during a period of high cholera burden in all three settings. More recent WHO data indicate a persisting cholera burden in SE-DRC (33, 661 cases), however, United Republic of Tanzania reported fewer cases (286), and Kenya reported no cases of cholera in 2012 [37]. The decline in cholera cases in Kenya was attributed to effectiveness of water, sanitation and hygiene (WASH) interventions by public health officials (Personal communication, Public Health Officials in Kisumu and Siaya. Conversations during a dissemination activity conducted by the research team at study sites in Western Kenya, 2013). Zanzibar appears to have benefitted from the OCV campaign that was undertaken there. While OCVs are not indicated in settings with no more cholera, findings of this study and community priority for preventing cholera remain relevant not only for consideration in future outbreaks but also for implementation of other WASH interventions.

The community perspective is relevant not only for OCVs but also for consideration of hesitancy, demand, access and other community-related determinants of vaccine effectiveness. A rapid assessment of such community interests can be expected to contribute to the effectiveness of vaccine action. Based on experience with this approach for community assessment, development and validation of rapid assessment tools are needed to demonstrate the usefulness of the approach for enhancing uptake in programme settings.

Conclusion

The identified sociocultural determinants of OCV acceptance show that cost constraints are an essential consideration for effective use of OCVs. Paradoxically, awareness and appreciation of the value of treatment with ORS was associated with less enthusiasm for the OCV, and the setting with best prospects for treatment showed least interest in prevention with OCV. Findings indicated community interest and demand for cholera interventions. The absence of major sociocultural barriers to vaccination with OCVs suggest good prospects for translating vaccine efficacy into programme effectiveness in epidemic and endemic settings where vaccines have a role to play in control and elimination of cholera.

Abbreviations

OCVs, Oral cholera vaccines; WHO, World Health Organization; SE-DRC, Southeastern Democratic Republic of Congo; W-Kenya, Western Kenya; EMIC, Explanatory Model Interview Catalogue; ORS, Oral rehydration solution; USD, United States dollars

Competing interests

The authors have no conflicts of interest to declare.

Authors' contributions

Conception and design of study: NS, CS1, SM, CS2 and MGW. Analysis of data: NS, CS1 and CS2. Writing of manuscript: NS, CS1, SM and MGW. Critical review and revision of manuscript: all authors. All authors have approved the final manuscript.

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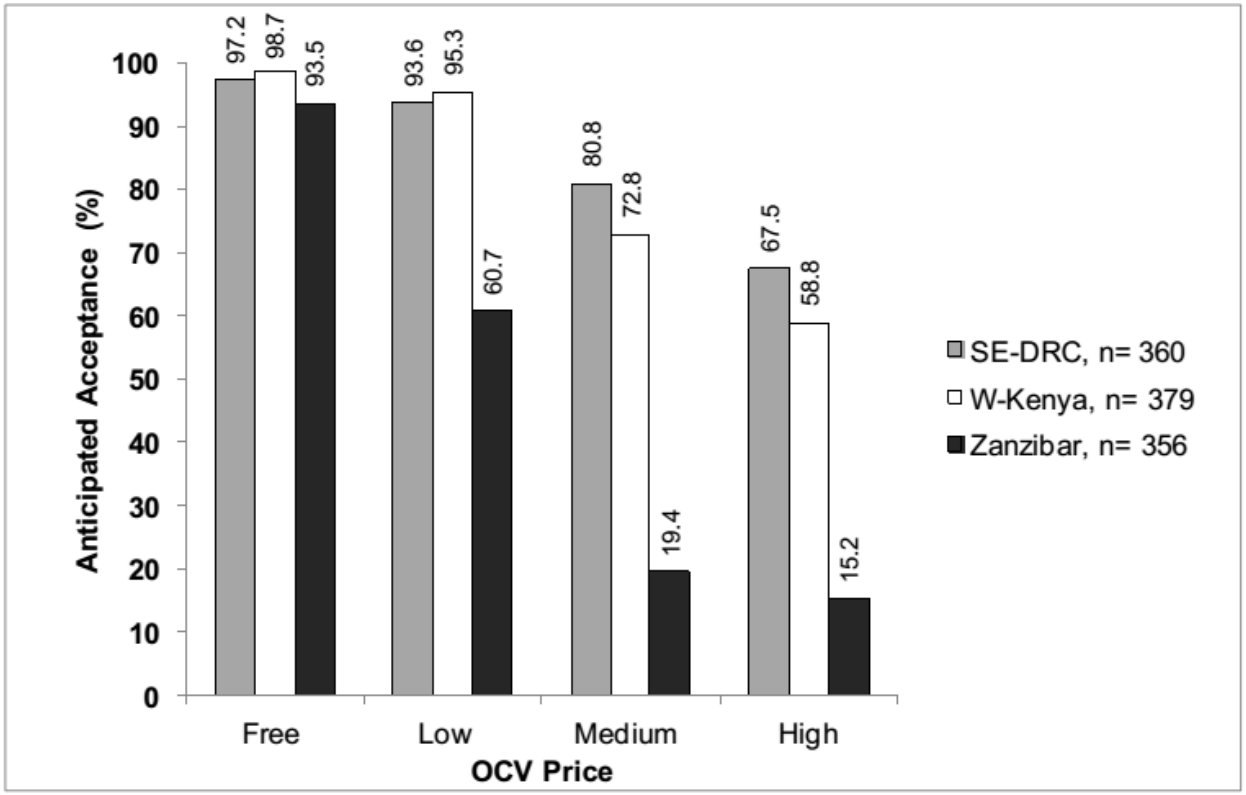

Figure 1. Anticipated oral cholera vaccine acceptance rates in three African settings at different price levels

OCV prices were stated to respondents in the local currency which was approximately equal to USD 1 (low price), USD 4–5 (medium price) and USD 8–11 (high price). Y-axis denotes percentage of respondents who provided an affirmative response when asked whether they would be likely to purchase the vaccine at the stated price.

For data source refer to Merten et al.[14], Sundaram et al. [17] and Schaetti et al. [16].

OCV: Oral cholera vaccine; SE-DRC: Southeastern Democratic Republic of Congo; W-Kenya: Western Kenya

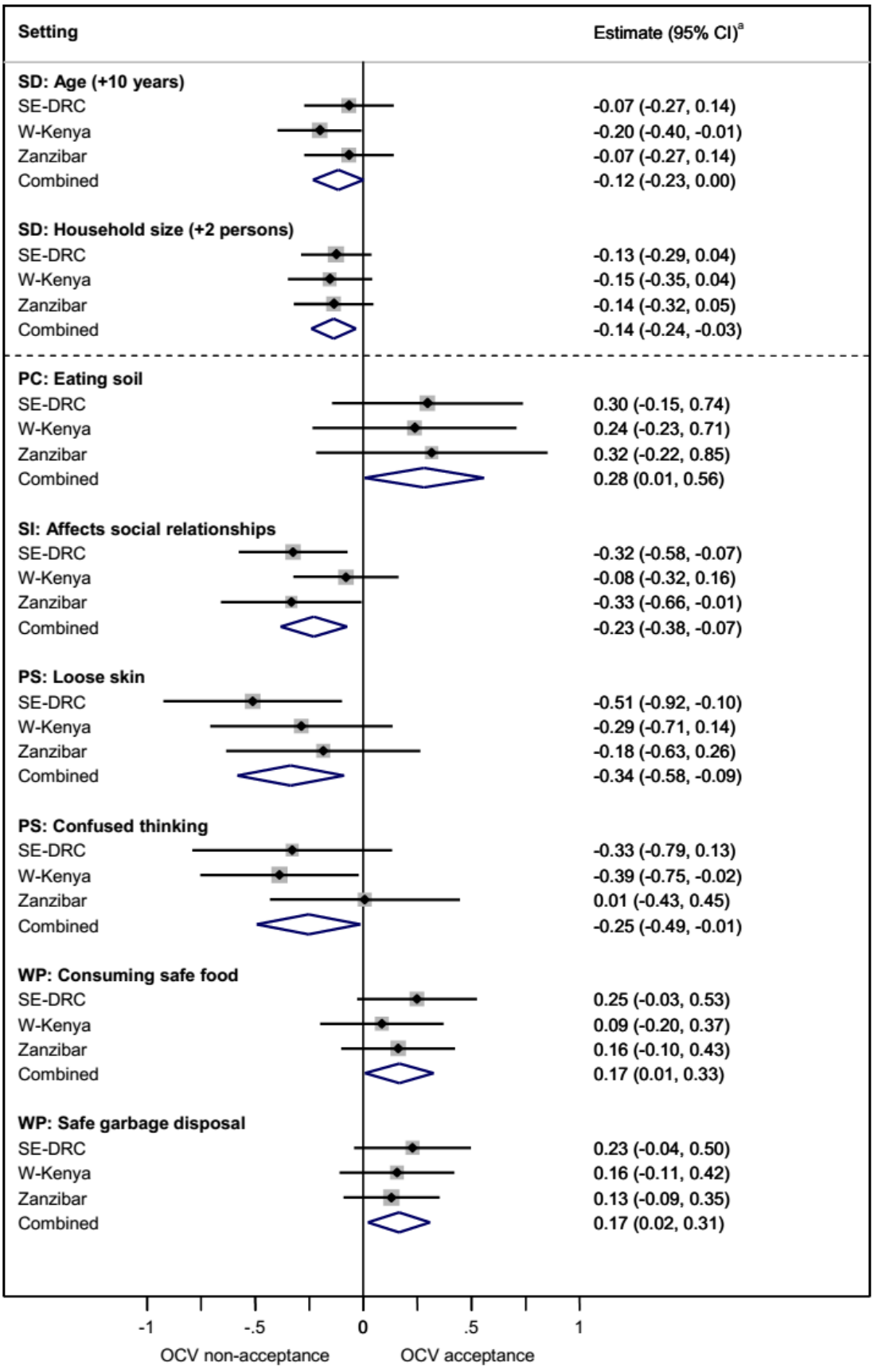
Setting
Estimate (95% CI)[a]
SD: Age (+10 years)
SE-DRC
-0.07 (-0.27, 0.14)
W-Kenya
-0.20 (-0.40, -0.01)
Zanzibar
-0.07 (-0.27, 0.14)
Combined
-0.12 (-0.23, 0.00)
SD: Household size (+2 persons)
SE-DRC
-0.13 (-0.29, 0.04)
W-Kenya
-0.15 (-0.35, 0.04)
Zanzibar
-0.14 (-0.32, 0.05)
Combined
-0.14 (-0.24, -0.03)
PC: Eating soil
SE-DRC
0.30 (-0.15, 0.74)
W-Kenya
0.24 (-0.23, 0.71)
Zanzibar
0.32 (-0.22, 0.85)
Combined
0.28 (0.01, 0.56)
SI: Affects social relationships
SE-DRC
-0.32 (-0.58, -0.07)
W-Kenya
-0.08 (-0.32, 0.16)
Zanzibar
-0.33 (-0.66, -0.01)
Combined
-0.23 (-0.38, -0.07)
PS: Loose skin
SE-DRC
-0.51 (-0.92, -0.10)
W-Kenya
-0.29 (-0.71, 0.14)
Zanzibar
-0.18 (-0.63, 0.26)
Combined
-0.34 (-0.58, -0.09)
PS: Confused thinking
SE-DRC
-0.33 (-0.79, 0.13)
W-Kenya
-0.39 (-0.75, -0.02)
Zanzibar
0.01 (-0.43, 0.45)
Combined
-0.25 (-0.49, -0.01)
WP: Consuming safe food
SE-DRC
0.25 (-0.03, 0.53)
W-Kenya
0.09 (-0.20, 0.37)
Zanzibar
0.16 (-0.10, 0.43)
Combined
0.17 (0.01, 0.33)
WP: Safe garbage disposal
SE-DRC
0.23 (-0.04, 0.50)
W-Kenya
0.16 (-0.11, 0.42)
Zanzibar
0.13 (-0.09, 0.35)
Combined
0.17 (0.02, 0.31)
-1
-.5
0
.5
1
OCV non-acceptance
OCV acceptance

Figure 2. Sociocultural determinants of anticipated OCV acceptance at USD 4-5 (medium price) common to all settings

Forest plots depict the influence of socio-demographic and socio-cultural variables on anticipated oral cholera vaccine acceptance at the medium price (USD 4–5) in three African settings. The weight of the study from each setting is represented by the area of the box whose centre represents the point estimate of effect from that study. The combined summary estimate of all three studies is represented by the centre of the diamond figure whose left and right extremes represent the corresponding confidence interval.

[a] Logistic regression coefficient with 95% confidence interval. Estimates have been adjusted for core socio-demographic features.

SD: Socio-demographics; PC: Perceived causes of cholera; SI: Social impact of cholera; PS: Physical symptoms identified for cholera; WP: Ways to prevent cholera; OCV: Oral cholera vaccine; SE-DRC: Southeastern Democratic Republic of Congo; W-Kenya: Western Kenya

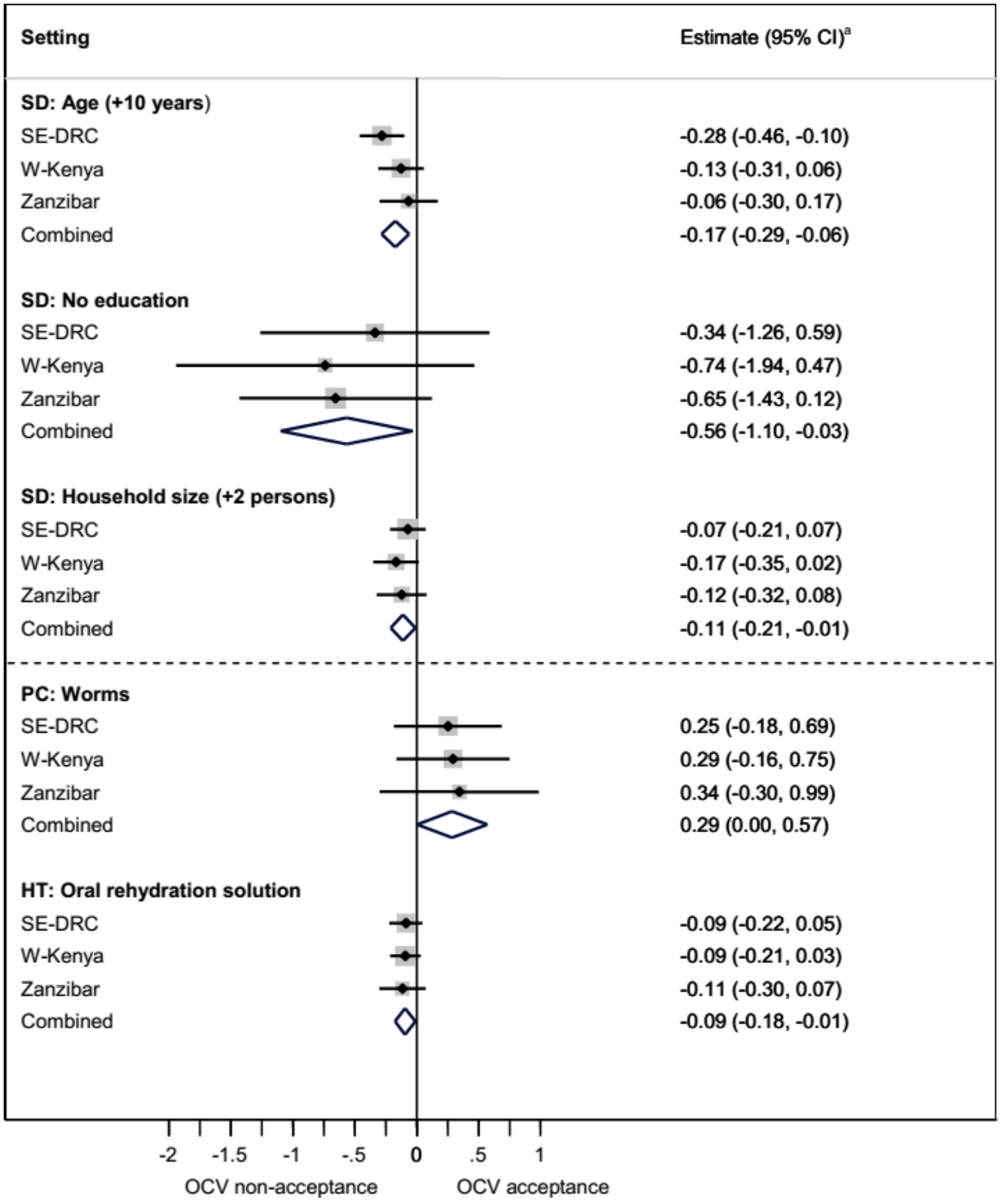

Figure 3. Sociocultural determinants of anticipated OCV acceptance at USD 8-11 (high price) common to all settings

Forest plots depict the influence of socio-demographic and socio-cultural variables on anticipated oral cholera vaccine acceptance at the high price (USD 8–11) in three African settings. The weight of the study from each setting is represented by the area of the box

whose centre represents the point estimate of effect from that study. The combined summary estimate of all three studies is represented by the centre of the diamond figure whose left and right extremes represent the corresponding confidence interval.

[a] Logistic regression coefficient with 95% confidence interval. Estimates have been adjusted for core socio-demographic features.

SD: Socio-demographics; PC: Perceived causes of cholera; HT: Home-based treatment, anticipated use of oral rehydration solution as a first-step at home in treating cholera; OCV: Oral cholera vaccine; SE-DRC: Southeastern Democratic Republic of Congo; W-Kenya: Western Kenya

Table 1. Sociocultural features of OCV acceptance heterogeneous across the three settings at USD 4-5 (medium price)

Features[a]	Heterogeneity p-value	Setting-specific estimates (95% CI)[b] SE-DRC	W-Kenya	Zanzibar
Vulnerability: Poor perceived more vulnerable	0.048	**1.38 (0.18, 2.58)**	-0.24 (-0.71, 0.23)	-0.06 (-0.67, 0.55)
Stigma: Others make patient feel ashamed	0.079	0.08 (-0.18, 0.33)	-0.12 (-0.33, 0.08)	**0.24 (0.00, 0.48)**
Physical symptom: Loss of appetite	0.069	-0.01 (-0.27, 0.25)	**-0.54 (-0.90, -0.17)**	-0.13 (-0.58, 0.31)
Physical symptom: Unconsciousness	0.032	**-0.26 (-0.47, -0.05)**	-0.03 (-0.28, 0.22)	0.12 (-0.07, 0.30)
Perceived cause: Witchcraft	0.048	0.24 (-0.11, 0.59)	0.28 (-0.50, 1.06)	**-0.60 (-1.19, -0.01)**[c]
Regular, dependable income	0.002	-0.21 (-0.75, 0.34)	**1.02 (0.53, 1.50)**	**0.98 (0.39, 1.56)**[c]
Married	0.018	-0.25 (-0.96, 0.46)	0.24 (-0.22, 0.70)	**1.37 (0.49, 2.24)**[c]
Rural vs. urban site	0.049	0.11 (-0.42, 0.63)	**-0.63 (-1.09, -0.17)**	0.12 (-0.40, 0.65)

Sociocultural and sociodemographic features that are heterogeneously associated with oral cholera vaccine acceptance across three endemic African settings at the medium price of USD 4-5

[a] Variables with heterogeneity (p-value < 0.1) and a significant estimate (p<0.05) in at least one of the settings are presented

[b] Setting-specific logistic regression coefficient with 95% confidence interval

[c] Individual estimates for Zanzibar already presented in Schaetti et al [16].

Figures in bold represent associations with p<0.05 for individual settings

SE-DRC: Southeastern Democratic Republic of Congo; W-Kenya: Western Kenya

Table 2. Sociocultural features of OCV acceptance heterogeneous across the three settings at USD 8-11 (high price)

Features[a]	Heterogeneity p-value	Setting-specific estimates[b] SE-DRC	W-Kenya	Zanzibar
Emotional impact: Sadness, anxiety, worry	0.046	**0.18 (0.03, 0.34)**	-0.14 (-0.35, 0.07)	0.14 (-0.13, 0.40)
Social impact: Fear of infecting others	0.009	**-0.33 (-0.57, -0.08)**	0.02 (-0.18, 0.22)	0.23 (-0.04, 0.50)[c]
Social impact: Interference with work/daily activities	0.064	**-0.31 (-0.52, -0.10)**	-0.04 (-0.19, 0.11)	0.01 (-0.19, 0.22)
Physical symptom: Pus in stool	0.033	-0.18 (-0.54, 0.18)	0.08 (-0.24, 0.41)	**0.75 (0.15, 1.36)[c]**
Physical symptom: Nausea	0.098	**-0.50 (-0.89, -0.1)**	-0.23 (-0.65, 0.19)	0.31 (-0.31, 0.93)
Home treatment: Prayers	0.008	**0.38 (0.13, 0.63)**	**0.39 (0.09, 0.69)**	-0.24 (-0.58, 0.11)[c]
Regular, dependable income	<0.001	-0.31 (-0.77, 0.14)	**0.92 (0.49, 1.34)**	**0.94 (0.29, 1.59)[c]**
Married	0.006	-0.45 (-1.05, 0.15)	0.18 (-0.24, 0.60)	**1.51 (0.46, 2.56)[c]**
Rural vs. urban site	0.002	-0.03 (-0.47, 0.42)	**-0.67 (-1.08, -0.25)**	**0.64 (0.04, 1.23)[c]**

Sociocultural and sociodemographic features that are heterogeneously associated with oral cholera vaccine acceptance across three endemic African settings at the high price of USD 8–11

[a] Variables with heterogeneity (p-value < 0.1) and a significant estimate (p<0.05) in at least one of the settings are presented

[b] Setting-specific logistic regression coefficient with 95% confidence interval

[c] Individual estimates for Zanzibar already presented in Schaetti et al [16].

Figures in bold represent associations with p<0.05 for individual settings; SE-DRC: Southeastern Democratic Republic of Congo; W-Kenya: Western Kenya

8.4 Socio-cultural determinants of anticipated acceptance of an oral cholera vaccine in Western Kenya*

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Socio-cultural determinants of anticipated acceptance of an oral cholera vaccine in Western Kenya

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SUMMARY

Determinants of anticipated acceptance of an oral cholera vaccine (OCV) were studied in urban and rural communities of Western Kenya. An explanatory model interview administered to 379 community residents assessed anticipated vaccine acceptance at various prices from no cost to full-cost recovery, socio-cultural features of cholera and social characteristics. Nearly all (99%) residents indicated willingness to accept a no-cost OCV, 95% at a price of US$ 0·8, 73% at US$ 4·2 and 59% at US$ 8·4. Logistic regression models analysed socio-cultural determinants of anticipated OCV acceptance. Prominence of non-specific symptoms for cholera was negatively associated with acceptance. A cholera-specific symptom (thirst), self-help referring to prayer, income and education were positively associated. In the high-cost model, education was no longer significant and reliance on herbal treatment was a significant determinant of vaccine non-acceptance. Findings suggest high motivation for OCVs, if affordable. Socio-cultural determinants are better predictors of anticipated acceptance than socio-demographic factors alone.

Key words: Cholera, Kenya, oral cholera vaccine, social and cultural determinants, vaccine acceptance.

INTRODUCTION

Among infectious diseases, diarrhoeal diseases rank as the third leading cause of mortality and morbidity in low- and middle-income countries [1]. It is estimated that diarrhoeal diseases account for 1·78 million deaths per year and 58·7 million disability-adjusted life years. Cholera, a rapidly dehydrating diarrhoeal disease, is estimated to cause the death of 100 000–130 000 persons and account for 3–5 million cases per year [2]. Kenya suffers from a high burden of cholera, having reported 11 425 cases and 264 deaths in 2009 [3].

Cholera transmission is closely associated with environmental conditions, spread by faecal contamination of water and food [4]. Access to safe water and

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adequate sanitation are fundamentals of cholera prevention. In many countries, however, implementing relevant measures has proved difficult and slow [2, 5]. Furthermore, improvements may not reach the most vulnerable populations, such as those living in slums and remote rural areas, in the near future [5]. Vaccines may therefore have a critical role as a provisional public health tool in cholera control in these communities. In 2005, the World Health Organization (WHO) first suggested oral cholera vaccines (OCVs) be used in cholera-endemic areas as a supplementary control strategy [6] and they strengthened that recommendation in 2010 [4].

Two OCVs are currently pre-qualified by the WHO for international use. Both Dukoral® (Crucell, The Netherlands), containing recombinant cholera toxin B subunit and killed whole-cell *V. cholerae* O1, and Shanchol™ (Shantha Biotechnics Ltd, India), containing killed *V. cholerae* O1 and O139, have been shown to be efficacious in endemic settings [7, 8]. Although safety, efficacy and an efficient health system to distribute the vaccine are critical, understanding cultural preferences and the willingness of communities to accept the vaccine are also essential. Assessing socio-cultural features of the illness and willingness to accept a vaccine indicate perceived need, demand and cultural barriers that may reduce coverage in a vaccine campaign. Notwithstanding recognized value of such research [9, 10], studies have been largely confined to high-income countries [11, 12]. Cholera vaccine acceptance studies focus mainly on socio-demographics and willingness to pay [13–15], while studies that have considered socio-cultural aspects of cholera have concentrated on Asia [16, 17]. Research is lacking on cultural dimensions and social determinants of cholera vaccine acceptance in Kenya.

This study was conducted in Nyanza province of Western Kenya due to the disproportionately high number of cholera cases reported there compared to the rest of Kenya [18]. Two large cholera outbreaks occurred there in 1997–1998 and 2008 that accounted for 43–47% and 72%, respectively, of all cholera cases in Kenya [19, 20]. Urban and rural sites were chosen because they differ significantly in terms of environmental conditions, population density, residents' income and occupation; the implication being that the findings from one setting may not be attributable to the other. Cultural epidemiological methods [21] were employed to understand community experience, meaning and behaviour with a cholera-like illness. The objectives of this paper are to (*a*) assess community willingness to accept an OCV in urban and rural populations in Western Kenya, (*b*) analyse socio-cultural determinants of anticipated OCV acceptance and (*c*) clarify the role of socio-cultural features of illness in explaining anticipated OCV acceptance by comparing models that consider socio-cultural determinants with exclusively socio-demographic models.

METHODS

Setting

This study was conducted at both urban and rural sites in Nyanza province, Western Kenya, where cholera is considered endemic. The urban site at Nyalenda A, Winam division, Kisumu district is a heavily populated informal settlement and the rural site is comprised of villages at Kakum Kombewa sub-location, Boro division, Siaya district.

The urban site covers an area of 2·8 km², has 23 731 residents and a population density of 8475 persons/km² [22]. The majority of residents do not have access to piped water and largely rely on shallow wells that are subject to a high level of contamination due to the predominance of pit latrines [22, 23]. There are no government health facilities in Nyalenda A and private health services involve higher costs to be borne.

The rural site is comprised of nine villages at Kakum Kombewa with a population density of around 270 individuals/km² [24]. Main sources of water in this region are untreated streams and boreholes. The majority (73%) of the population have access to latrines; however, over 24% of these are in a poor state and hence not used [24]. Lack of public transport makes access to Siaya district hospital, which is located about 15 km away, difficult.

Study design and sampling

This cross-sectional study required a minimum sample size of 328 to allow for cross-site comparisons with 95% significance and 80% power [25]. Men and women from the general population between the ages of 18 and mid-60s were included.

At the urban site, only an estimate of the population size was obtainable, hence, systematic probability sampling was done. The area was divided into seven roughly equal segments and every fifth household was approached to get a total of 28 households

per segment. At the rural site, detailed household lists were accessible through community health workers. A specific number of households per village, proportional to the total number of households in that village, which had been identified in advance through random selection, were approached. At both sites, one willing adult of the household was interviewed; selection was made to maintain a roughly equal balance between men and women. When more than one eligible adult was available, we asked them to decide whom we should interview. If a household had no suitable, willing candidate, the neighbouring household was approached.

Instrument and data collection

This study used a semi-structured explanatory model interview based on the framework of the Explanatory Model Interview Catalogue (EMIC) for cultural epidemiology [26]. It was developed for the study of cholera to assess locally valid features of illness-related experience, meaning and behaviour from the perspective of community residents [27]. The illness was introduced to participants using a clinical vignette that described a person with physical symptoms of cholera. Respondents were asked what they would call such an illness and the term for the illness provided by the respondent was used when asking further questions. In addition to questions on socio-cultural features of illness (i.e. physical symptoms, social impact, perceived causes, help-seeking behaviour), the interview also included questions on respondents' socio-demographic characteristics and their ideas on general vaccination. Quantitative and qualitative data were both collected.

Respondents were also asked if they would be willing to take a vaccine that is swallowed to prevent cholera. Details of efficacy and duration of protection were not discussed. OCV acceptance questions were posed at four different prices: 'high', based on estimated full production cost recovery for manufacture of two doses of Dukoral (KES 650/US$ 8·4)†; 'medium', which is half the high price (KES 325/US$ 4·2); 'low', close to the US$ 1 price that is considered a realistic vaccine price for low- and middle-income countries (KES 65/US$ 0·8) [16] and 'free', fully subsidized as in the case of many immunization campaigns.

† Exchange rate: Kenya shilling (KES) 1 = US$ 0·01287 as of 1 March 2010 (www.oanda.com).

Interviews were conducted between March and May 2010, in Kiswahili, Dholuo and English. Interviewers received extensive training in sampling procedures, interviewing and obtaining informed consent. The interviewers were science or social science graduates from Maseno University and introduced themselves accordingly. Interviews were voice-recorded with permission.

Data management and analysis

EMIC interview data were double-entered using Epi Info software version 3.5.1 (Centers for Disease Control and Prevention, USA), programmed with logic and range checks. For analysis of socio-cultural features of illness, prominence of categories was calculated based on whether a response was reported spontaneously (assigned value of 2) or after probing (assigned value of 1). When a category was identified as most important among all others, it was assigned an additional value of 3. A mean prominence was then calculated for each category. Through this method of prominence calculation, categories were evaluated based on relative importance ascribed to them by local cultural ideas.

Logistic regression analyses were done to empirically identify socio-cultural determinants (i.e. socio-cultural features of illness and socio-demographic characteristics) associated with anticipated OCV acceptance at various prices. Dichotomized anticipated OCV acceptance variables, reflecting vaccine acceptance or non-acceptance, were used as outcome variables. Separate regression analyses were performed for anticipated OCV acceptance at the medium price and at the high price, but not for the low price or no-cost models as acceptance rates over 95% did not allow for it.

In crude analysis, associations between OCV acceptance and explanatory variables that were reported by 5–95% of respondents were analysed. Variables with $P<0·2$ were considered for multivariate analysis. 'Focal' models of socio-cultural features of illness for specific groups of variables (i.e. related to physical symptoms, social impact, perceived causes, help-seeking), adjusted for socio-demographic variables, were run. Focal models for socio-demographic factors alone were also considered. Interaction of site with each of the variables was tested and site-interaction terms with $P<0·1$ were included. To estimate the combined influence of all categories identified in the focal models on

anticipated OCV acceptance, a 'comprehensive' model was calculated using variables with $P<0{\cdot}2$ and site-interaction terms with $P<0{\cdot}1$ from focal models. Corrected Akaike's Information Criterion (AICc) values were computed to compare relative goodness of fit in various focal and comprehensive regression models. Δ(AICc) which represents the difference in AICc between each model and the model with the lowest AICc, was used to make this comparison. Models with lower Δ(AICc) values are considered better in explaining OCV acceptance than those with higher values. Quantitative analysis was done with SAS version 9.2 (SAS Institute Inc., USA).

Narrative accounts were translated into English and entered in word processor software. Additional detail from key questions of the interview was added by transcribing relevant voice records. Typed data were then imported into MAXQDA version 10 (VERBI Software, Germany) for qualitative data management and analysis. Text segments were thematically coded based on the interview structure. Variables were imported into MAXQDA to enable the selection of narrative records of interest based on results from the quantitative analysis. This approach enabled integrated analysis of quantitative and qualitative data.

Ethical considerations

The study protocol received ethical approval from the Kenya Medical Research Institute and the WHO Research Ethics Review Committee. Interviews were conducted after obtaining written informed consent. No financial or other incentives were provided to respondents. Data collected in this study was maintained with utmost confidentiality and anonymized for reporting.

RESULTS

Sample characteristics

Of 379 respondents interviewed, 50% were from the urban site and 51% were female (Table 1). All respondents at the rural site and 96·8% at the urban site identified Christianity as their religion. The median personal monthly income was KES 2500 (US$ 32) at the urban site and KES 1000 (US$ 13) at the rural site ($P=0{\cdot}01$). Significantly more respondents at the urban site reported a dependable source of income. Self-employment (e.g. petty trading and skilled labour) was the most frequently mentioned primary occupation at the urban site; and agriculture at the rural site. Urban respondents were better educated: more in the urban sample had a secondary education or higher; more in the rural sample had no education. The rural site had significantly more individuals living within a household than at the urban site.

Past experience with vaccination and general ideas on vaccines

Two-thirds (66·8%) of all respondents reported having personally received a vaccination in the past. Fewer respondents reported prior vaccination experience at the rural (51·3%) than at the urban (82·1%, $P<0{\cdot}001$) site.

All but four respondents (98·9%) stated that in their experience, vaccines were helpful. The idea that vaccines were beneficial in preventing disease was reported pervasively. More knowledgeable respondents provided accounts with a scientific basis, such as, 'Vaccines are helpful; they boost the immune system and prevent future infections' (urban woman, 22 years). There also seemed to be a high level of confidence in the protective effect of vaccines, as seen in this narrative, 'I rarely get sick because I was vaccinated' (urban man, 30 years).

When asked whether some vaccines were also likely to cause problems, 27·7% of the respondents agreed; pain at the injection site, infection/abscess, fever and disability were frequently cited problems. Of respondents who believed that vaccines were not likely to cause problems, there was a significant difference in terms of site ($P=0{\cdot}036$) and gender ($P=0{\cdot}007$), with more women and more urban respondents espousing this view.

Anticipated OCV acceptance

Almost all respondents (98·7%) reported an interest in accepting an OCV if it were to be made available free of charge (Fig. 1). At the low price, 95·3% respondents were willing to accept the vaccine. At the medium and high prices, 72·8% and 58·8% respondents, respectively, were interested in the vaccine. More urban than rural respondents were willing to accept an OCV at the medium ($P=0{\cdot}008$) and high ($P=0{\cdot}002$) prices. Anticipated OCV acceptance rates between men and women were similar.

Table 1. *Socio-demographic characteristics of study respondents*

	Overall ($n=379$)	Urban ($n=190$)	Rural ($n=189$)	P value[d]
Gender (%)				
Female	51·2	52·1	50·3	
Age (years)				
Mean (S.D.)[a]	32·8 (13·1)	28·9 (10·1)	36·8 (14·5)	***
Median (range)[b]	29 (18–69)	25 (18–63)	33 (18–69)	***
Household size (persons)				
Mean (S.D.)[a]	4·5 (2·3)	4·3 (2·1)	4·7 (2·6)	*
Main occupation (%)[c]				
Agriculture	25·3	1·6	49·2	***
Self-employed	26·6	36·8	16·4	***
Formal employment	12·4	16·8	7·9	*
Housewife	9·0	14·7	3·2	***
Casual labourer	9·2	12·1	6·3	
Student	5·5	6·3	4·8	
Not active/retired	9·5	10·0	9·0	
Highest education level attended (%)[c]				
No education	3·7	0·5	6·9	***
Primary school	50·1	44·7	55·6	*
Secondary school	37·7	46·8	28·6	***
Vocational school	1·8	0·0	3·7	**
College and above	6·6	7·9	5·3	
Household income (%)[c]				
Regular and dependable	47·8	66·8	28·6	***

S.D., Standard deviation.
[a] t test.
[b] Wilcoxon test.
[c] Fisher's exact test. Only categories with overall reported percentages $>1·5\%$ are displayed.
[d] P value obtained from a comparison between the urban and rural site; * $P\leqslant 0·05$; ** $P\leqslant 0·01$; *** $P\leqslant 0·001$.

Narrative accounts demonstrate an active demand for cholera vaccines. A sense of urgency in obtaining cholera vaccines was communicated as follows:

We have a water problem because there is a lot of pollution in the water and water points are scarce. We are also far from the hospital in Siaya. So I ask, when will this vaccine come? Or will you just disappear after the research? We really need the vaccine (rural man, 32 years).

A highly mentioned reason for willingness to purchase an OCV was that it would be more cost-effective than spending money on cholera treatment in the future.

Vaccine cost was a critical point of consideration for many respondents. While requesting a free vaccine, a 35-year-old rural woman explained:

If a vaccine is introduced, let it be free of charge so that it can help everyone. If it is brought with a price, others will die if they cannot afford it.

However, demand for a vaccine was high enough for respondents to offer suggestions that could enable vaccine purchase, even if it could not be availed for free.

If you bring the vaccine, tell us in advance so that we have enough time to collect money to pay for it. If you come without notice, we may not have the money ready (rural woman, 26 years).

The idea that health was more important than money was widespread and many stated: 'You cannot compare your life to money.'

Determinants of anticipated OCV acceptance at the medium price and high price

Focal regression models considered specific groups of explanatory variables in explaining anticipated OCV acceptance at the medium and high prices (Tables 2 and 3). As per their Δ(AICc) values, at the medium price, 'somatic symptoms' and 'self-treatment at home' models explained acceptance better than the focal model with only socio-demographic

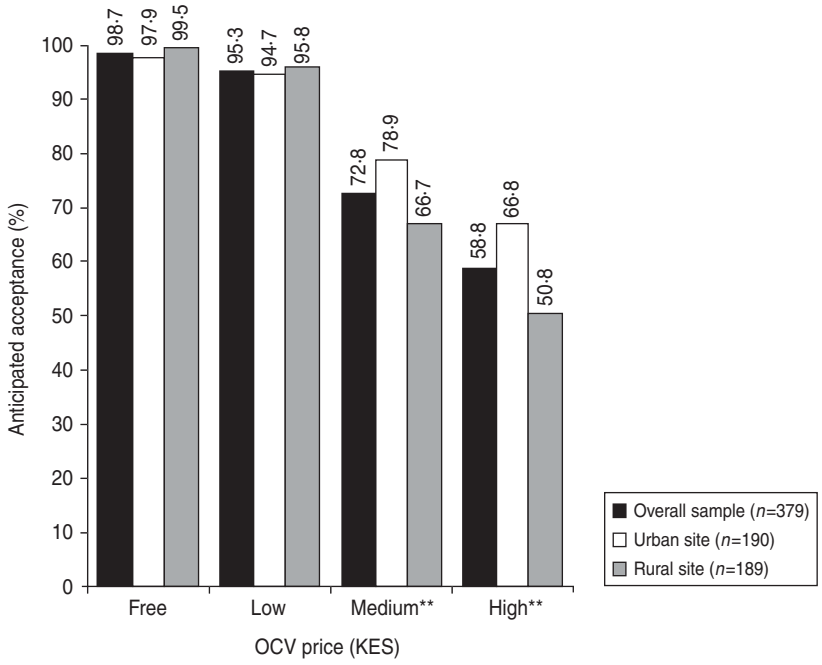

Fig. 1. Anticipated oral cholera vaccine (OCV) acceptance at different prices among urban and rural residents of Western Kenya. OCV price mentioned in Kenya shillings (KES) to respondents: low (KES 65/US$ 0·8), medium (KES 325/US$ 4·2), and high (KES 650/US$ 8·4) (exchange rate: KES 1 = US$ 0·01287). Y axis denotes percentage of respondents who provided a favourable response when questioned on whether they were likely to buy the vaccine at the stated price. Fisher's exact test was used for comparison of percentages between the two sites. ** $P \leqslant 0{\cdot}01$.

characteristics. At the high price, all socio-cultural focal models were better than the exclusively socio-demographic model. Comprehensive models, which combined significant variables from all focal models, explained OCV acceptance best.

Most variables that were significant in the focal models remained so in the comprehensive models. Socio-cultural determinants identified in the comprehensive models that were associated with anticipated OCV acceptance at the medium price and the high price are shown in Tables 4 and 5, respectively. Although different explanatory variables were identified in the analyses at the two price levels, they refer to coherent themes explaining anticipated OCV acceptance: specificity of symptoms for cholera, level of education, restricted preference for treatment and financial viability.

Identification of physical symptoms that were unrelated to cholera such as bloody stool, and non-specific for cholera such as loss of appetite and confusion, were negatively associated with OCV acceptance. A cholera-specific symptom of being 'very thirsty' was positively associated.

Having attended secondary school was positively associated with OCV acceptance at the medium price. However, this did not remain significant at the high price.

With an increase in price of the vaccine from medium to high, the reporting of herbal treatment as a home remedy became significantly negatively associated with acceptance. In contrast, the reporting of prayer as a form of self-treatment at home was positively associated with OCV acceptance at both prices. An analysis of qualitative accounts revealed that prayer and medical interventions are considered complementary forms of treatment, carried out in parallel. Prayer and medicine are believed to have different, but non-conflicting roles, in treatment. 'Prayer must be conducted to have God's intervention while pharmacy drugs help in controlling the situation' (urban woman, 22 years). However, medical help was often implicitly assigned a greater priority while prayer was recommended in addition. Even a respondent who stated, 'Prayer helps because God is above everything, even above drugs', further mentioned that she would first give the patient water and drugs to combat diarrhoea, and thereafter pray.

Household income and household size significantly influenced OCV acceptance. The former was

Table 2. *Multivariate analysis (focal models) of socio-cultural determinants of anticipated oral cholera vaccine acceptance at the medium price (US$ 4·2) and assessment of models*

Focal models[a]	Coefficient (95% CI)[b]	*P* value[c]	Int[d]	Δ(AICc)[e]
Patterns of distress: somatic symptoms				**3·25**
Bloody stool (urban site)	0·35 (−0·30 to 1·00)	0·288		
Bloody stool (rural site)	−0·43 (−0·75 to −0·11)	**0·008**	*	
Very thirsty	0·61 (0·02 to 1·21)	**0·044**		
Loss of appetite	−0·73 (−1·16 to −0·31)	**0·001**		
Palpitations	−0·08 (−0·41 to 0·26)	0·652		
Confusion	−0·52 (−0·92 to −0·12)	**0·012**		
Patterns of distress: social impact				22·6
Fear of infecting others	0·17 (−0·10 to 0·45)	0·217		
Perceived causes				24·43
Eating soil	0·09 (−0·41 to 0·60)	0·723		
Malaria	−0·29 (−0·87 to 0·28)	0·318		
Violation of taboo/tradition	−0·17 (−0·59 to 0·26)	0·437		
Other causes (urban site)[f]	0·13 (−0·28 to 0·54)	0·527		
Other causes (rural site)[f]	−0·37 (−0·64 to −0·09)	**0·010**	*	
Cannot say	−0·15 (−0·34 to 0·05)	0·137		
Self-treatment at home				**17·27**
Drinking more water or liquids	0·11 (−0·06 to 0·28)	0·212		
Herbal treatment	−0·23 (−0·44 to −0·01)	**0·040**		
Prayers	0·43 (0·07 to 0·79)	**0·021**		
Drink with alcohol	0·53 (−0·24 to 1·31)	0·178		
Socio-demographics[g]				22·08
Primary school *vs.* no education	0·58 (−0·57 to 1·73)	0·325		
Secondary school *vs.* no education	1·02 (−0·17 to 2·22)	0·093		
Regular and dependable household income (urban site)	1·54 (0·79 to 2·30)	**<0·001**		
Regular and dependable household income (rural site)	0·12 (−0·58 to 0·82)	0·739	**	
Household size	−0·07 (−0·17 to 0·03)	0·189		
Occupation: housewife, student, retired[h]	−0·26 (−0·98 to 0·46)	0·474		
Occupation: self-employed, formally employed, casual labour[h]	0·23 (−0·42 to 0·88)	0·479		
Gender (male *vs.* female)	0·25 (−0·26 to 0·76)	0·330		
Site (rural *vs.* urban)	0·36 (−0·35 to 1·07)	0·316		

[a] Each of the four focal models (somatic symptoms, social impact, perceived causes, self-treatment at home) were adjusted for socio-demographic characteristics.

[b] Logistic regression coefficient with 95% confidence interval.

[c] Bold values indicate $P \leqslant 0{\cdot}05$.

[d] Interaction with site: refers to rural compared to urban site, with urban site as the baseline. Site-specific effects on variables considered only if $P < 0{\cdot}1$ for site-interaction term. * $P \leqslant 0{\cdot}05$, ** $P \leqslant 0{\cdot}01$.

[e] Difference in corrected Akaike's Information Criterion [Δ(AICc)] between each model and the model with the lowest AICc. Comprehensive model (Table 4) had the lowest AICc and was assigned a value of zero. Models with lower Δ(AICc) values are considered better fitted than those with higher values. Bold values indicate models that are better than the model containing only socio-demographic characteristics.

[f] 'Other causes' refers to responses that could not be coded within designated categories of the interview. The variety of responses coded under 'other causes' included contact with infected persons, unprotected sexual intercourse, cold weather, mosquitoes, breathing in contaminated air and eating cold food.

[g] Variables with which each focal model was adjusted.

[h] Compared with the occupation of agriculture.

Table 3. *Multivariate analysis (focal models) of socio-cultural determinants of anticipated oral cholera vaccine acceptance at the high price (US$ 8·4) and assessment of models*

Focal models[a]	Coefficient (95% CI)[b]	*P* value[c]	Int[d]	Δ(AICc)[e]
Patterns of distress: somatic symptoms				**11·9**
Abdominal pain/discomfort	0·30 (−0·01 to 0·60)	0·055		
Loss of appetite	−0·63 (−1·03 to −0·23)	**0·002**		
Weakness	−0·12 (−0·35 to 0·12)	0·319		
Palpitations	0·07 (−0·25 to 0·39)	0·669		
Confusion (urban site)	0·21 (−0·41 to 0·83)	0·502		
Confusion (rural site)	−1·02 (−1·66 to −0·39)	**0·002**	**	
Perceived causes				**32·22**
Other causes (urban site)[f]	0·08 (−0·30 to 0·46)	0·691		
Other causes (rural site)[f]	−0·35 (−0·63 to −0·08)	**0·013**	†	
Self-treatment at home				**24·08**
Drinking more water or liquids	0·07 (−0·10 to 0·23)	0·421		
Herbal treatment	−0·27 (−0·48 to −0·06)	**0·010**		
Oral rehydration solution	−0·12 (−0·26 to 0·02)	0·094		
Prayers	0·43 (0·11 to 0·76)	**0·009**		
Socio-demographics[g]				33·54
Primary school *vs.* no education	0·58 (−0·61 to 1·77)	0·339		
Secondary school *vs.* no education	0·78 (−0·43 to 1·99)	0·209		
Regular and dependable household income	0·72 (0·25 to 1·18)	**0·002**		
Household size	−0·07 (−0·17 to 0·02)	0·122		
Occupation: housewife, student, retired[h]	−0·12 (−0·80 to 0·55)	0·716		
Occupation: self-employed, formally employed, casual labour[h]	0·02 (−0·58 to 0·62)	0·950		
Gender (male *vs.* female)	0·33 (−0·12 to 0·78)	0·153		
Site (rural *vs.* urban)	−0·34 (−0·87 to 0·20)	0·216		

[a] Each of the three focal models (somatic symptoms, perceived causes, self-treatment at home) were adjusted for socio-demographic characteristics.
[b] Logistic regression coefficient with 95% confidence interval.
[c] Bold values indicate $P \leqslant 0{\cdot}05$.
[d] Interaction with site: refers to rural compared to urban site, with urban site as the baseline. Site-specific effects on variables considered only if $P < 0{\cdot}1$ for site-interaction term. † $P < 0{\cdot}1$, ** $P \leqslant 0{\cdot}01$.
[e] Difference in corrected Akaike's Information Criterion [Δ(AICc)] between each model and the model with the lowest AICc. Comprehensive model (Table 5) had the lowest AICc and was assigned a value of zero. Models with lower Δ(AICc) values are considered better fitted than those with higher values. Bold values indicate models that are better than the model containing only socio-demographic characteristics.
[f] 'Other causes' refers to responses that could not be coded within designated categories of the interview. The variety of responses coded under 'other causes' included contact with infected persons, unprotected sexual intercourse, cold weather, mosquitoes, breathing in contaminated air and eating cold food.
[g] Variables with which each focal model was adjusted.
[h] Compared with the occupation of agriculture.

positively associated while an increasing household size was negatively associated.

Site-specific interactions were not observed for any variables at the high price and were present for just one variable at the medium price.

DISCUSSION

Findings from this study indicate high levels of acceptance for an OCV among urban and rural residents in Western Kenya. Quantitative and narrative analysis showed that respondents perceive a general benefit from immunization. The extensive interest and demand for OCVs indicates a likelihood of good coverage during mass vaccination initiatives. The study also showed that 91·3% of the respondents considered the illness as very serious and 96·3% believed that it had life-threatening consequences. The prospect of an effective vaccine campaign is further supported by this data given the widely acknowledged

Table 4. *Multivariate analysis* (*comprehensive model*) *of socio-cultural determinants of anticipated oral cholera vaccine acceptance at the medium price* (*US$ 4·2*)

Explanatory variables	Coefficient (95% CI)[a]	*P* value[b]
Patterns of distress: somatic symptoms		
Bloody stool	−0·29 (−0·56 to −0·01)	**0·042**
Very thirsty	0·57 (−0·01 to 1·15)	**0·054**
Loss of appetite	−0·77 (−1·19 to −0·34)	**<0·001**
Confusion	−0·54 (−0·94 to −0·13)	**0·009**
Perceived causes		
Other causes[c]	−0·16 (−0·38 to 0·07)	0·166
Self-treatment at home		
Herbal treatment	−0·16 (−0·37 to 0·06)	0·153
Prayers	0·46 (0·09 to 0·82)	**0·015**
Socio-demographics		
Primary school *vs*. no education	0·70 (−0·60 to 2·00)	0·291
Secondary school *vs*. no education	1·37 (0·03 to 2·71)	**0·045**
Regular and dependable household income	0·93 (0·40 to 1·46)	**0·001**
Household size	−0·10 (−0·21 to 0·01)	0·063

[a] Logistic regression coefficient with 95% confidence interval.
[b] Bold values indicate $P \leqslant 0{\cdot}05$.
[c] 'Other causes' refers to responses that could not be coded within designated categories of the interview. The variety of responses coded under 'other causes' were contact with infected persons, unprotected sexual intercourse, cold weather, mosquitoes, breathing in contaminated air and eating cold food.

Table 5. *Multivariate analysis* (*comprehensive model*) *of socio-cultural determinants of anticipated oral cholera vaccine acceptance at the high price* (*US$ 8·4*)

Explanatory variables	Coefficient (95% CI)[a]	*P* value[b]	Int[c]
Patterns of distress: somatic symptoms			
Abdominal pain/discomfort	0·27 (−0·04 to 0·58)	0·085	
Loss of appetite	−0·64 (−1·04 to −0·23)	**0·002**	
Confusion (urban site)	0·19 (−0·46 to 0·83)	0·568	
Confusion (rural site)	−1·08 (−1·73 to −0·42)	**0·001**	**
Self-treatment at home			
Herbal treatment	−0·27 (−0·48 to −0·06)	**0·012**	
Oral rehydration solution	−0·11 (−0·25 to 0·03)	0·113	
Prayers	0·42 (0·09 to 0·74)	**0·013**	
Socio-demographics			
Gender (male *vs*. female)	0·39 (−0·09 to 0·87)	0·107	
Site (rural *vs*. urban)	0·73 (−0·17 to 1·62)	0·111	
Primary school *vs*. no education	0·95 (−0·41 to 2·31)	0·172	
Secondary school *vs*. no education	1·28 (−0·12 to 2·67)	0·074	
Regular and dependable household income	0·81 (0·31 to 1·30)	**0·001**	
Household size	−0·11 (−0·21 to −0·01)	**0·031**	

[a] Logistic regression coefficient with 95% confidence interval.
[b] Bold values indicate $P \leqslant 0{\cdot}05$.
[c] Interaction with site: refers to rural compared to urban site, with urban site as the baseline. Site-specific effects on variables considered only if $P < 0{\cdot}1$ for site-interaction term. **$P \leqslant 0{\cdot}01$.

observation that perceived severity of a disease is closely associated with likelihood of vaccine uptake [10, 28].

This study demonstrated that socio-cultural determinants explained anticipated vaccine acceptance better than socio-demographic factors alone. Identification of such socio-cultural determinants of OCV acceptance provides data relevant to ensure better coverage in an actual campaign. Past cholera control campaigns that have faced severe community resistance [29], and free treatment initiatives for other diseases that were rejected [30], further underscores the importance of paying attention to local socio-cultural environments prior to interventions. Community studies are necessary to plan and prepare for vaccine campaigns [31]. This study provides an approach to integrate qualitative and quantitative empirical data, explain local cultural concepts of illness and guide disease control.

Several determinants of anticipated OCV acceptance were notable. Thirst, a cholera-specific symptom, was associated positively with acceptance. Non-specific physical symptoms for cholera were associated with a lower priority for the vaccine. Bloody stool, a characteristic symptom of other diarrhoeal illnesses, such as shigellosis, amoebic dysentery, campylobacteriosis, etc., was also negatively associated with OCV acceptance. The ability to discern cholera symptoms from symptoms of other diarrhoeal illnesses argues for a high level of awareness in the community. These findings also indicate that efforts to promote community awareness during control interventions need to highlight cholera-specific symptoms. Furthermore, given the definitive ideas of cholera possessed by the community, non-specific reference to diarrhoeal illness may lead to unreasonable expectations that the OCV will prevent all diarrhoea, leading to disappointment and possible discrediting of a useful vaccine.

Education was a predictor of vaccine acceptance. Interestingly, health education was reported as the most useful method of preventing cholera by the majority of respondents, and was frequently requested. A similar finding was reported from a study in Pakistan where education and knowledge about vaccines were associated with vaccine uptake [32]. These findings highlight the value of education and promoting health awareness in cholera control. However, at the high price, secondary school education was no longer significantly associated with OCV acceptance, indicating that education too has the ability to influence acceptance only to a certain extent. Above a certain price, economic factors may play a more prominent role in influencing OCV acceptance.

At the high price, self-help with herbal treatment was a significant negative determinant of acceptance. It appears that higher cost of the vaccine makes alternative, less expensive forms of treatment preferable. This finding is consistent with other literature in Kenya noting that the high cost of conventional Western drugs often makes them inaccessible, thereby promoting reliance on traditional remedies [33]. Pluralistic health-seeking practices, including traditional remedies, are widely used in other African countries [34]; however, in our study they appear to compete with biomedical interventions, especially when the higher cost of vaccine becomes a barrier.

The priority of prayer, on the other hand, was complementary to vaccine interventions – an additional, rather than alternative source of help. Other studies suggest religious beliefs may be antagonistic to vaccine intervention [35, 36]. A study in Benin found that vaccination was rejected in some religious communities because they believed that they 'require only prayer to protect and heal them in times of illness' [37]. The finding in Kenya, that reporting self-help with prayer was significantly associated with OCV acceptance, suggests a possible role played by religious institutions in encouraging the use of biomedicine. Although religious sectarian differences may influence the perceived benefits of medical interventions, we found no differences in anticipated OCV acceptance in members of the Legio Maria church, which some studies suggest may promote faith healing and reject biomedicine [38], and members of other church groups.

Financial viability, based on reporting a regular household income and a smaller household size, influenced OCV acceptance. While this finding is what would be expected for relatively high-priced vaccines, it underscores the importance of keeping costs reasonable. Furthermore, as the price of OCV was increased, determinants that had influenced vaccine acceptance at a lower price, such as education, were no longer relevant. The increasing price levels of OCV were introduced to provide an indication of priority and demand for the vaccine. Findings suggest that regardless of priorities and commitment to obtain an OCV, above a certain price it was simply beyond the means of many. In this study, the high price was the threshold. Hence, a full-cost recovery model with Dukoral may not be considered in this

setting. However, it may be considered for OCVs that can be produced at a far lower cost, such as Shanchol [39].

Analysis of OCV acceptance did not reveal significant site-specific determinants; socio-cultural factors influencing OCV acceptance for urban and rural residents were similar. However, enthusiasm for an OCV was significantly higher in urban than rural respondents at the medium and high prices. This may be explained by the presence of greater disposable income and better education as has been observed in another vaccine study [32] or by higher perceived risk and vulnerability to the disease. In this study, both hypotheses remain plausible, as the urban respondents have better incomes and education than their rural counterparts. They also may attach a greater priority to receiving an OCV given the more crowded and unsanitary conditions that they have to contend with.

The main limitation of this study is the ability to relate anticipated acceptance with actual acceptance in the context of a vaccine campaign. Recognizing that there is a difference between what people say and what they actually do [40] anticipated acceptance may not perfectly guide actual acceptance. Inasmuch as this study provided a community assessment of vaccine demand and findings on predictors of OCV acceptance which support reasonable expectations (e.g. secondary school education was a predictor for OCV acceptance), further research addressing the nature of the relationship between anticipated and actual acceptance is needed. It also remains to be seen whether the predictors of anticipated OCV acceptance would remain significant in the context of an actual mass vaccination campaign.

Further research could include an assessment of whether findings from this study may be generalized across other settings. At some level we expect broad similarities in factors influencing OCV acceptance; however, particular priorities may be culture-specific. It would be fruitful to develop a framework for vaccine acceptance by conducting more such studies in different settings to explain common features and context-specific differences.

In conclusion, this study found high levels of interest for an OCV in community residents in Western Kenya, although vaccine cost was revealed as a critical consideration. Socio-cultural factors played an important role in anticipated OCV acceptance and specific determinants were identified. This research also provides an approach for the study of socio-cultural determinants and barriers to vaccine acceptance in other settings.

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DECLARATION OF INTEREST

None.

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Respiratory illness prevention study: Explanatory Model Interview Catalogue (EMIC)

The Maharashtra Association of Anthropological Sciences – Centre for Health Research and Development (MAAS-CHRD)
and Swiss Tropical & Public Health Institute
with collaboration and support of
The World Health Organization

English – Marathi version (Final) – 27 August 2012

Date of interview (dd-mm-yyyy)	__ __ - __ __ - __ __ __ __	**EMIC ID:** [U,R][D,N / V,M]###	__ __ __ __ __

Site identification

	Tick one only:	
Site	1 Urban	2 Rural

Name of setting in urban site/ Name of village in rural site:

	Tick one only:	
Area	DMH area	Velhe Taluka
	NH area	Maval Taluka

Place of interview	1 Household	2 Field	98 Other, *specify*_____

General information

Start time of interview (hh:mm)	:		*Tick one only:*
		Sex	*F* Female / *M* Male

"*Thank you for agreeing to participate in this study. As we begin, we would like to ask you a few questions about your background.*" **या अभ्यासामध्ये सहभागी होण्यास आपण तयार झाला त्याबद्दल धन्यवाद. मुलाखतीला सुरुवात करताना आम्ही काही प्रश्न तुमच्याबद्दल व तुमच्या कुटुंबाबद्दल विचारणार आहोत.**

Approximate age (in years)
"How old are you?"
तुमचे वय किती/ काय आहे?

	years

Tick one based on the reply to the age question

Age group	*1* 18-45 yrs	*2* 46-65 yrs

1 Socio- economic and demographic information

Marital status

1.1 *"Are you currently married?"* **तुम्ही विवाहित आहात का**?

Tick one only:

1 Never married	*2* Married	*3* Separated	*4* Divorced	*5* Living together	*6* Widowed	*99* Cannot say

Type of family

1.2 *"What is the relationship of all of the people who currently stay with you in this household?"*
सध्या तुमच्या घरात जी माणसे राहतात त्यांचे तुमच्याशी काय नाते आहे?

Tick one only:

1 Single person	*2* Nuclear family	*3* Joint family/ Extended family

Other detail: _____

Household size

1.3 *"How many people altogether are currently staying in your household?"* **सध्या तुमच्या घरात एकूण किती जण राहतात?**

"How many of these people are under 5 years-of-age?" **त्यातील किती जण ५ वर्षाखालील आहेत ?**

	Persons
	Children (<5 yrs)

1.4 *"What is your relationship to the household head?"* **या घराच्या कुटुंबप्रमुखाशी तुमचे काय नाते आहे** ?

("Respondent is household head's_____?", "तुम्ही कुटुंबप्रमुखाचे_____?")

Tick one only:

1 Self	*2* Wife / Husband	*3* Mother / Father	*4* Sister / Brother	*5* Daughter/ Son	*6* Daughter-in-law / Son-in-law	*98* Other, *specify*:_____

Tick sex of household head:

Sex	F	M

Education

1.5 *"Have you ever attended school?"* **तुमचे शिक्षण किती झाले आहे**? **तुम्ही कधी शाळेत गेला आहात काय**?

1 Yes	*2* No	*99* Cannot say/ Undisclosed

{If "yes", enquire further, otherwise go to Q 1.8}

Years of education

Fill in number of years OR tick the box if undisclosed:

1.6 *"How many years of education have you had in total?"* **तुमचे शिक्षण एकूण किती वर्ष झाले आहे**?

	years		Cannot say/ Undisclosed

1.7 *"What is the highest standard/level that you have completed in school or college?"* **तुमचे शालेय / कॉलेज शिक्षण कुठपर्यंत झाले आहे**?

Tick one only:

1 Less than primary	*2* Primary school 4th std	*3* Secondary 10th std	*4* Higher secondary 12th	*5* Diploma course/ Professional course (Computers, Typing etc.)
6 Graduation (Degree, BA, B.Com, etc.)	*7* Post-graduation (Masters degree, MA, M.Com, etc.)	*98* Other, *specify*_____		

Other detail: _____

Main occupational status

1.8 *"What is your main occupation?"* **तुम्ही काय काम करता** ? **तुमचा मुख्य व्यवसाय काय आहे**?

Occupation

1 Agriculture	6 Service (public sector)	11 Retired
2 Unskilled labour	7 Service (private sector)	12 Unemployed
3 Skilled labour	8 Professional, specify_____	98 Other, specify_____
4 Self-employment (small business, petty trade)	9 Student	99 Cannot say
5 Business (other)	10 Housewife	

Enter the number of the category of occupation that fits best, one only: ☐

Other detail:_____

1.9 ***Income***

*For a & c, enter monthly **OR** annual income **but not both**, as reported, **OR** tick "Cannot say"* *(b & d)Tick one only:*

a) "What is your monthly personal income?" **तुमचे स्वतःचे / वैयक्तिक मासिक उत्पन्न किती आहे?**

Rs /month ☐ /year ☐ ☐ Cannot say

{If response to Q 1.9 (a) is "zero", then go to Q 1.9 (c)}

b) "Is your personal income reliable and dependable?" **तुमचे स्वतःचे / वैयक्तिक उत्पन्न नियमित आणि ठराविक आहे का?**

1 Yes	2 No	*99* Cannot say

c) "What is your monthly household income?" **तुमच्या कुटुंबाचे मासिक उत्पन्न किती आहे?**

Rs /month ☐ /year ☐ ☐ Cannot say

d) "Is your household income reliable and dependable?" **तुमच्या कुटुंबाचे उत्पन्न नियमित आणि ठराविक आहे का?**

1 Yes	2 No	99 Cannot say

Other detail:_____

_____

_____

Religion

1.10 *What is your religion?* **तुमचा धर्म कोणता आहे?**

Tick one only:

1 Hindu	*2* Muslim	*3* Christian	*4* Sikh	*5* Neo-Buddhist	*98* Other, specify _____	*99* Undisclosed

Denomination / other detail: _____

Social category

1.11 *What social category do you belong to?* **तुम्ही कोणत्या सामाजिक प्रवर्गात / कॅटेगरीमध्ये येता?**

Tick one only:

1 Scheduled caste/ Scheduled tribe	*2* Other backward class	*3* Open / general category	*98* Other, specify _____	*99* Undisclosed

Other detail:_____

* An abridged version of the EMIC interview used in the study is presented here. An additional section (section 2) with questions on common influenza has not been presented as it was beyond the scope of the thesis.

Introduction to vignettes

"Now we would like to talk to you about a few health problems that affect people in your community. We want to understand how you think about them. It is your ideas that we are interested in, so please don't feel shy to tell us your personal opinion. You may recognize these problems, or perhaps they may be unfamiliar. In either case we would like to understand your ideas." **आता आपण तुमच्या भागातील लोकांवर परिणाम करणाऱ्या काही आरोग्य प्रश्नांवर बोलुयात. तुम्ही या प्रश्नांबद्दल कसा विचार करता हे आम्हाला जाणून घ्यायचे आहे. तुमचे विचार आमच्यासाठी महत्वाचे आहेत त्यामुळे तुम्ही मोकळेपणाने बोलावे अशी आमची इच्छा आहे. तुम्हाला या आरोग्य प्रश्नांबद्दल कदाचित माहिती असेल किंवा नसेल तरीही आम्हाला या आरोग्य प्रश्नांबद्दलच्या तुमच्या कल्पना जाणून घेण्याची इच्छा आहे.**

3 Vignette P

"Now I would like to talk to you about someone else. [Prakash / Pradnya / Prabhakar / Pratibha] (P) had a different health problem. Let me tell you about it." **आता आम्ही तुम्हाला दुसऱ्या एका व्यक्तीबद्दल सांगणार आहे. [प्रकाश/ प्रज्ञा/ प्रभाकर/ प्रतिभा] [पी] ला एक दुसरा आरोग्याचा त्रास / आजार आहे.**

{Replace P with the name in the vignette for each of the questions that follow. येथून पुढील प्रश्नांमध्ये "पी" ऐवजी व्हिनियेटचे असलेले नाव संबोधूनच प्रश्न विचारावेत.}

{Read the vignette aloud. *See attached sheet.***}**

3.1 *"What do you think is the problem that [P] had? What is the name of this disease? (By what name would you describe the condition to someone else?)"* **तुमच्या मते [पी] ला कोणता त्रास/ समस्या असावी? या आजाराचे नाव काय आहे? जर तुम्हाला दुसऱ्या कोणाला तरी [पी] च्या या आजाराबद्दल सांगायचे असेल तर तुम्ही कोणत्या नावाने सांगाल?**

Specify name, summary term or short description in respondent's own words. If 'other', specify term and explain here: **मुलाखत देणाऱ्याने सांगितलेले आजाराचे नाव त्यांच्याच शब्दात लिहावे. जर खालील पर्याय सोडून इतर नाव असेल तर तसे स्पष्ट लिहावे.**

***Narrative**: _____

_____

_____

Name of illness/ disease		
1 Common cold	*6* Swine flu/ H1N1 Influenza/ Pandemic flu	*11* Dengue
2 Fever (nonspecific)	*7* Viral (infection / fever)	*12* Malaria
3 Fever and chills	*8* HIV/AIDS	*13* Diptheria
4 Cold and cough	*9* Tuberculosis (TB)	*98* Other, specify:_____
5 Common flu / Seasonal flu	*10* Typhoid	*99* Cannot say / Undecided

***Code only one name** from the above-numbered list. If multiple answers are provided by the respondent, ask them to choose one answer that they consider most likely, and code that name here. If respondent cannot identify a single best category, code "Cannot say*

वरील पर्यायांपैकी केवळ एकच पर्याय कोड करा. जर मुलाखत देणाऱ्याने एकापेक्षा जास्त उत्तरे/ पर्याय निवडले असतील तर त्यांना सगळ्यात जास्त शक्यता कोणत्या आजाराची असेल हे विचारून त्याप्रमाणे कोड करा. जर मुलाखत देणाऱ्याला एकही पर्याय निवडता आला नाही तर 'Cannot Say' कोड करा

{In the questions that follow use the name identified for this disease instead of referring to "disease," and use the name of the person mentioned in the vignette instead of "P." येथून पुढील प्रश्नांमध्ये मुलाखत देणाऱ्याने सांगितलेलेच आजाराचे नाव वापरून तसेच "पी" ऐवजी व्हिनियेटचे असलेले नाव संम्बोधूनच प्रश्न विचारावेत.}

3.2 *"Can you think of any other symptoms that [P] is likely to experience besides the ones we have already mentioned?"* **आम्ही आधी जी लक्षणं सांगितली ती सोडून [पी] ला अजून इतर काही लक्षणे जाणवली असतील असे तुम्हाला वाटते का**?

Summarize the respondent's account of problem in his/her own words:

***Spontaneous narrative**: _____

_____

_____

Based on the respondent's account tick problems that are mentioned under the Spon column indicating a spontaneous response to the open-ended question above. Probe for any categories not mentioned and tick in the Prob column. If a category is not reported spontaneously or in response to probe, make a cross in the prob column. If no physical symptoms are reported spontaneously, tick "Cannot say" in the spon column.

Physical symptoms	Spon	Prob
1 Extreme coldness (chills, shivering) **थंडी, हुडहुडी भरणे**		
2 Headache **डोकेदुखी**		
3 Fever **ताप**		
4 Sore throat **घसा दुखणे, खवखवणे**		
5 Runny nose **नाक वाहणे/ सर्दी**		
6 Body ache **अंग दुखणे**		
7 Cough **खोकला**		
8 Sneezing **शिंका येणे**		
9 Nasal congestion **नाक चोंदणे**		
10 Breathlessness **दम लागणे**		
11 Vomiting **उलटी होणे**		

Physical symptoms	Spon	Prob
12 Diarrhoea **जुलाब/ हगवण**		
13 Loss of appetite **भूक न लागणे**		
14 Abdominal pain **पोटात दुखणे**		
15 Nausea **मळमळ**		
16 Irritated, watering eyes **डोळयातून पाणी येणे/ डोळे चुरचुरणे**		
17 Extreme fatigue (or weakness) **थकवा,अशक्तपणा**		
18 Redness or rash **अंग लालसर होणे**		
19 Joint pain **सांधेदुखी**		
20 Complications in lungs, liver etc. **फुप्फुस किंवा यकृतात बिघाड/ गुंतागुंत**		
98 Other **इतर**, specify _____		
99 Cannot say **सांगता येत नाही**		

***Probed narrative**: _____

_____

_____

3.3 *"How do you think that this [disease] will affect [P] socially, emotionally and financially in [his/her] daily life?"* **या [आजारामुळे] [पी] च्या रोजच्या जीवनात कोणते सामाजिक, भावनिक आणि आर्थिक परिणाम होऊ शकतील असे तुम्हाला वाटते**?

Summarize the respondent's account of problem in his/her own words:

***Spontaneous narrative**: _____

_____

_____

Based on the respondent's account tick problems that are mentioned under the Spon column indicating a spontaneous response to the open-ended question above. Probe for any categories not mentioned and tick in the Prob column. If a category is not reported spontaneously or in response to probe, make a cross in the prob column. If no psychosocial problems are reported spontaneously, tick "Cannot say" in the spon column.

Psychosocial problems	Spon	Prob
Social impact		
21 Isolation from others **इतर लोकांपासून वेगळे राहावे लागणे**		
22 Fear of infecting others **इतर लोकांना आपल्यामुळे आजार होईल ही भीती**		
23 Interference with work/daily activities **दैनंदिन कामात अडथळे**		
24 Interference with social relations **समाजातील संबंधांवर/ वावरावर परिणाम**		
Emotional impact		
25 Sadness, anxiety, **दुःख, चिंता**		
26 Concern about course of illness **आजाराचे काय होईल ही काळजी**		
27 Tension, worry **टेन्शन, काळजी**		

	Spon	Prob
Financial impact		
28 Costs (transportation, foods, drugs) **आजारामुळे होणारा खर्च**		
29 Loss of personal/ family income **स्वतःच्या/ कुटुंबाच्या उत्पन्नाचे नुकसान**		
Miscellaneous		
100 Other **इतर**, specify:_____		
101 Cannot say / None		

***Probed narrative**: _____

_____

_____

3.4 *"Among all these problems or perhaps something else--considering not only physical symptoms but also emotional, social or financial problems--which one do you consider the single most troubling?"* **ह्या सगळ्यात किंवा आणखी इतर समस्यांपैकी म्हणजे फक्त शारीरिक त्रासच नव्हे तर सामाजिक, भावनिक आणि आर्थिक समस्यांमधून कुठलं <u>एक लक्षण किंवा समस्या</u> तुम्हाला सगळ्यात जास्त त्रासदायक वाटते?**

***Narrative**: _____

_____

_____

*Code the most troubling category from list of **physical symptoms or psychosocial problems in questions 3.2 and 3.3**. If respondent cannot identify any single category or cannot say, code "0"* ☐

3.5 *"How serious is this [disease] for [P]?"* **[पी] साठी हा आजार कितपत सिरीअस असेल असे तुम्हाला वाटते?**

Tick one only:

2 Very serious	*1* Serious	*0* Not serious	*99* Cannot say

Narrative: _____

_____

_____

3.6 *"How long do you think this [disease] for [P] is likely to have lasted without treatment?"* **औषधोपचार घेतले नाहीत तर [पी] चा आजार किती दिवस तसाच राहू / टिकू शकतो असं तुम्हाला वाटते ?**

Tick one only:

4 Greater than 1 mo	*3* Up to 1 mo	*2* Up to 2 wks	*1* Up to 1 wk	*0* Less than 3 days	99 Cannot say

Narrative:_____

_____

_____

3.7 *"If [P] takes no outside treatment, what do you think is the most likely health outcome of this [disease]?"* **जर [पी] ने बाहेरून <u>औषधोपचार घेतले नाहीत</u> तर या आजारामुळे त्याच्या आरोग्यावर काय परिणाम होईल/ होतील असं तुम्हाला वाटतं?**

Tick one only:

3 Fatal	*2* Worsening but not fatal	*1* Recovery	*99* Cannot say

Narrative:_____

_____

_____

3.8 "If [P] gets appropriate treatment what do you think is the most likely health outcome of this [disease]?" **जर [पी] ने योग्य <u>औषधोपचार घेतले</u> तर या आजारामुळे त्याच्या आरोग्यावर काय परिणाम होईल/ होतील असं तुम्हाला वाटतं?**

Tick one only:

3 Fatal	*2* Worsening but not fatal	*1* Recovery	*99* Cannot say

Narrative:_____

_____

_____

3.9 *"As I mentioned earlier, people may explain health problems like this in various ways. Everyone does not explain such problems or their causes the same way. That is okay and there is nothing wrong with that. We recognize that various people each have their own ideas, and we would like to know what you think has caused [P]'s problem?"* **आधी आम्ही सांगितल्याप्रमाणे, आपल्यापैकी प्रत्येकजण आपल्याला होणारा आरोग्यविषयक त्रास/ आजारांची कारणे वेगवेगळ्या पद्धतीने सांगू शकतो. प्रत्येकाची आपल्याला होणाऱ्या त्रासाबद्दल/ आजाराबद्दल सांगण्याची पद्धत एक सारखी नसते. हे बरोबर असून त्यात चुकीचे असे काहीही नाही. प्रत्येक माणसाच्या आजारपणाबद्दलच्या अशा स्वतःच्या काही कल्पना असतात, विचार असतात जे आम्हाला जाणून घ्यायचे आहेत तुम्हाला काय वाटतं [पी] ला ही समस्या/ त्रास/ आजार कोणत्या कारणांमुळे झाला असावा?**

Summarize the respondent's ideas about causes in his/her own words:

***Spontaneous narrative**: _____

_____

_____

Based on the respondent's account tick perceived causes that are mentioned under the Spon column indicating a spontaneous response to the open-ended question above. Probe for any categories not mentioned and tick in the Prob column. If a category is not reported spontaneously or in response to probe, make a cross in the prob column. If no perceived causes are reported spontaneously, tick "Cannot say" in the spon column.

Perceived causes	Spon	Prob
Ingestion		
1 Drinking contaminated water **दुषित पाणी पिणे**		
2 Eating unprotected/spoiled/ contaminated food **दुषित/ न झाकलेले/ नासलेले, खराब, अस्वच्छ अन्न खाणे**		
3 Drinking alcohol **दारू पिणे**		
4 Smoking cigarettes/ beedis, Consuming tobacco/ mishri **बिडी/ सिगारेट ओढणे, तंबाकू खाणे, मिश्री लावणे**		
5 Consuming contraband drugs **चरस, गांजा, अफू सेवन करणे**		
Health and Illness		
6 Prior illness **पूर्वीचा आजार**		
7 Physical exertion **शारीरिक श्रम/ कष्ट**		
8 Low immunity **प्रतिकारशक्ती कमी असणे**		
9 Constitutional weakness **अशक्त प्रकृती**		
10 Heredity **अनुवंशिकता**		
11 Blood problems (*raktha dhosh*) **रक्तात दोष**		
Psychological		
12 Stressful event/ shock **दुःखदायक घटना, धक्का**		
13 Tension- mind, thoughts, worry **टेन्शन, चिंता**		
Environmental / Social		
14 Improper sanitation, dirty surroundings **अस्वच्छ, घाण परिसर**		

Perceived causes	Spon	Prob
15 Lack of personal hygiene **वैयक्तिक अस्वच्छता**		
16 Environmental germs, infection **वातावरणातून जंतूंचा प्रादुर्भाव / संसर्ग**		
17 Insect bite **कीटक/किडा चावणे**		
18 Air pollution **वायू प्रदूषण**		
19 Climate, weather- hot/ cold **हवामानात बदल**		
20 Air borne: cough / sneeze of infected person **हवेतून प्रादुर्भाव: आजारी व्यक्तीच्या खोकला किंवा शिंकेतून**		
21 Other contact with infected person **आजारी व्यक्तीच्या संपर्कात आल्यामुळे (हवेतून प्रादुर्भाव सोडून)**		
22 Hospital-acquired infection **दवाखाना / हॉस्पिटल मधून संसर्ग**		
Cultural and supernatural		
23 Violation of taboo/ misbehaviour **धार्मिक रितीरिवाज न पाळणे/ निशिद्ध गोष्टी करणे**		
24 Heat/ cold in body, humoral **उष्ण/ थंड, वात पित्त, कफ - प्रकृतिदोष**		
25 God, fate, stars, karma **देव, नशीब, ग्रह, कर्म**		
26 Evil eye, sorcery **करणी, जादूटोणा**		
Miscellaneous		
27 Unhealthy lifestyle **अयोग्य / अपार्यकारक जीवनपद्धती**		
98 Other, **इतर** specify _____		
99 Cannot say **सांगता येत नाही**		

***Probed narrative**: _____

_____

_____

3.10 *"Which one of these causes that you have mentioned, or perhaps something else, do you consider the single most important cause?"* **या सर्व किंवा आणखी काही कारणांमधील कुठले <u>एक कारण</u> तुम्हाला सर्वात जास्त महत्वाचं वाटते?**

***Narrative**: _____

_____

_____

Code the most important category from the above-numbered list of perceived causes: ☐

3.11 *"Would someone like [P] with this [disease] use home-remedies before looking for treatment or help outside their homes? If so, what are they most likely to do at home?"* **[पी] सारखा आजार झालेली व्यक्ती बाहेर उपचार घेण्याआधी काही घरगुती उपाय / उपचार करेल का? (हो असल्यास) ते कोणकोणते घरगुती उपाय / उपचार करतील?**

Summarize the respondent's account of home-based treatment in his/her own words:

***Spontaneous narrative**: _____

_____

_____

Based on the respondent's account tick categories of home-based treatment that are mentioned under the Spon column indicating a spontaneous response to the open-ended question above. Probe for any categories not mentioned and tick in the Prob column. If a category is not reported spontaneously or in response to probe, make a cross in the prob column. If no categories of home-based help are reported spontaneously, tick "Cannot say" in the spon column.

Home-based treatment	Spon	Prob
1 Nothing काहीच नाही		
2 Drink warm liquids **गरम पेये पिणे**		
3 Gargling **गुळण्या करणे**		
4 Vapour inhalation **वाफ घेणे**		
5 Cold compress **गार पाण्याच्या पट्ट्या ठेवणे**		
6 Strength-providing foods **ताकद वाढवणारे पदार्थ खाणे**		
7 Herbal remedies (roots, bark, leaves, flowers) **वनौषधी/ औषधी वनस्पती (कंद, मुळे, पाने, फुले), काढा इत्यादींचा वापर करणे**		
8 Self-prescribed ayurvedic/unani medicines **स्वतःहून आयुर्वेदिक/ युनानी औषधे घेणे**		
9 Self-prescribed homeopathic medicines **स्वतःहून होमिओपॅथी औषधे घेणे**		
10 Self-prescribed allopathic drugs **स्वतःहून ॲलोपॅथी औषधे घेणे**		
11 Prayers, *pooja, bhajan* **प्रार्थना, पूजा, भजन करणे**		
98 Other **इतर,** specify:_____		
99 Cannot say **सांगता येत नाही**		

***Probed narrative**: _____

_____

_____

3.12 *"Which one of all these things people do at home, or perhaps something else, do you think is likely to be most helpful?"* **या सर्व घरगुती उपाय / उपचारांपैकी कोणता <u>एक उपाय / उपचार</u> सर्वात जास्त गुणकारी/ सहाय्यकारी होईल असं तुम्हाला वाटतं?**

***Narrative**: _____

_____

_____

Code the most helpful category from the above-numbered list of home-based treatments: ☐

3.13 *"Where will someone like [P] usually go to seek help/ treatment outside [his/her] home?"* **[पी] सारखी व्यक्ती औषधोपचार घेण्यासाठी घराबाहेर कोठे व कोणाकडे जाईल/ जाऊ शकते असं तुम्हाला वाटते?**

Summarize the respondent's account of outside treatment in his/her own words:

***Spontaneous narrative**: _____

_____

_____

Based on the respondent's account tick categories of outside help seeking that are mentioned under the Spon column indicating a spontaneous response to the open-ended question above. Probe for any categories not mentioned and tick in the Prob column. If a category is not reported spontaneously or in response to probe, make a cross in the prob column. If no categories of outside help seeking are reported spontaneously, tick "Cannot say" in the spon column.

Outside help-seeking	Spon	Prob
1 No outside help **बाहेरून कुठलीही मदत न घेणे**		
2 Private health facility / doctor **खाजगी दवाखाना, हॉस्पिटल, डॉक्टर**		
3 Government health facility / doctor **सरकारी दवाखाना, हॉस्पिटल, डॉक्टर**		
4 Local health-worker **स्थानिक आरोग्य कर्मचारी**		
5 Informal help from a friend, neighbour or relative **मित्र,शेजारी किंवा नातेवाईकांकडून मदत मागणे/घेणे**		
6 Consult with a chemist or pharmacist **औषध विक्रेत्याचा /केमिस्टचा सल्ला घेणे**		
7 Traditional healers (*vaidu, jhadi-booti wala*) **पारंपारिक वैदू, हकीम, जडी-बुटीवाला**		
8 Faith healers (*devrishi, bhagat*) **देवऋषी, भगत**		
98 Other, **इतर** specify:_____		
99 Cannot say **सांगता येत नाही**		

***Probed narrative**: _____

_____

_____

3.14 *"Which one of all these sources of help [P] might consult do you think is likely to be most helpful?"* **या सगळ्या आरोग्य सुविधांपैकी व सर्व व्यक्तींमध्ये <u>कोणा एकाची मदत</u> सर्वात जास्त होऊ शकेल असं तुम्हाला वाटतं?**

***Narrative**: _____

_____

_____

Code the most helpful category from the above-numbered list of outside help-seeking: ☐

3.15 *"Is there anything that could have been done that might have prevented [P]'s [disease]?"* **[पी] ला हा आजार होऊ नये म्हणून काही करता आलं असतं असं तुम्हाला वाटतं का? या आजाराला प्रतिबंधक उपाय/ उपचार म्हणून काय करता आले असते असं तुम्हाला वाटतं ?**

Summarize the respondent's account of prevention options in his/her own words:

***Spontaneous narrative**: _____

_____

_____

Based on the respondent's account tick categories of prevention that are mentioned under the Spon column indicating a spontaneous response to the open-ended question above. Probe for any categories not mentioned and tick in the Prob column. If a category is not reported spontaneously or in response to probe, make a cross in the prob column. If no categories of prevention are reported spontaneously, tick "Cannot say" in the spon column.

Prevention	Spon	Prob
1 Nothing **काहीच नाही**		
2 Handwashing **हात धुणे**		
3 Cleanliness **स्वच्छता**		
4 Wholesome lifestyle (diet / rest / exercise) **आरोग्यदायक जीवन पद्धती (आहार/ आराम/ व्यायाम)**		
5 Minimize exposure to infection (crowds, infected persons, shared utensils etc.) **संसर्गापासून शक्य तितका बचाव करणे (गर्दी, आजारी व्यक्ती, उष्टी भांडी इ. टाळणे)**		
6 Good ventilation at home and work **घर आणि कामाच्या ठिकाणी खेळती हवा, वायुवीजन**		
7 Wearing a mask **मास्क घालणे**		
8 Herbal remedies (*Nilgiri tel*, camphor), tonics, immunity boosters (*Chywanprash*, vitamins, etc.) **औषधी वनस्पतींद्वारे उपचार (निलगिरी तेल, कापूर) टॉनिक्स, प्रतिकारशक्ती वाढवणारी औषधे (च्यवनप्राश, जीवनसत्वे, इ.)**		
9 Preventive drugs **प्रतिबंधात्मक औषधे**		
10 Vaccines **लसी**		
11 Health education to reduce transmission **संसर्ग टाळण्यासाठी आरोग्य शिक्षण**		
12 Protection from supernatural influence (*tabiz* etc.) **अमानवी शक्तींपासून/ बाधेपासून बचाव**		
13 Ritual purification (*agnihotra, dhoop* etc.) **विधीशास्त्र/ पारंपारिक पद्धतीने शुद्धी (आग्निहोत्र, धूप)**		
98 Other, **इतर** specify:_____		
99 Cannot say **सांगता येत नाही**		

***Probed narrative**: _____

_____

_____

3.16 *"Which one of these ways of preventing the [disease] do you think is likely to be most useful?"* **या सर्वांपैकी सर्वात जास्त उपयोगी/ प्रभावी प्रतिबंधक उपाय कोणता असेल असं तुम्हाला वाटतं**?

***Narrative**: _____

_____

_____

Code the most useful method from the above-numbered list of preventive measures: ☐

4 Influenza vaccine questions

"Here is an update of the story of [P] who fell ill in January 2010. As suggested, [he/she] did visit a doctor at a hospital. After consulting with the doctor [he/she] was informed that [he/she] had the Swine flu/ H1NI Influenza. Now we have a few more questions for you..." **[पी'] जो जानेवारी २०१० मध्ये आजारी पडला होता त्याला दिलेल्या सल्ल्यानुसार तो जेव्हा डॉक्टरांकडे गेला तेव्हा डॉक्टरांनी त्याला सांगितले की त्याला स्वाईन फ्लू झाला आहे. आता तुम्हाला त्याबद्दल काही प्रश्न विचारणार आहे.**

4.1 Awareness of Swine flu and vaccine

{If Swine flu was identified for either vignette, tick the following box and go to 4.1 c}

a) Swine flu identified previously	*3* Yes	*0* No

b) *"Have you heard about the health problem called Swine flu?"* **तुम्ही या स्वाईन फ्लू आजाराबद्दल ऐकले आहे का**?

Tick one only:

3 Yes	*2 Possibly*	*1 Uncertain*	*0 No*

***Narrative**: _____

_____

_____

c) *"If [P] had taken a vaccine, do you think that would have protected [him/her] from getting the Swine flu?"* **जर [पी] ने लस घेतली असती तर [तो/ ती] स्वाईन फ्लू होण्यापासून स्वतःचा बचाव करू शकला असता/ शकली असती असे तुम्हाला वाटते का?**

Tick one only:

3 Yes	*2 Possibly*	*1 Uncertain*	*0 No*

***Narrative**: _____

_____

_____

4.2 *"Are you aware of a vaccine that is sprayed into a person's nose to protect against Swine flu*?" **तुम्हाला अशा कुठल्या लसीबद्दल माहिती आहे का, की जी स्वाईन फ्लूपासून बचावासाठी नाकावाटे दिली जाते?**

Tick one only:

3 Yes	*2 Possibly*	*1 Uncertain*	*0 No*

***Narrative**: _____

_____

_____

4.3 *"Are you aware of a vaccine that is injected into a person's upper arm to protect against Swine flu?"* **तुम्हाला अशा कुठल्या लसी बद्दल माहिती आहे का, की जी स्वाईन फ्लूपासून बचावासाठी दंडावर टोचली जाते?**

Tick one only:

3 Yes	*2 Possibly*	*1 Uncertain*	*0 No*

***Narrative**: _____

_____

_____

4.4 *"Do you think either of these vaccines (the nasal spray or the injection) would be more powerful and better able to protect you against Swine flu? … Why?"* **स्वाईन फ्लू पासून बचावासाठी या पैकी कोणती लस (नाका वाटे दिली जाणारी किंवा इंजेक्शन) अधिक जास्त परिणामकारक असेल असे तुम्हाला वाटते? ...का?**

Tick one only:

3 Nasal spray more powerful	*2 Injection more powerful*	*1 Both equally powerful*	*0 Neither powerful*	*99 Cannot say*

***Narrative**: _____

_____

_____

4.5 *"If you could choose either of these vaccines to protect yourself against Swine flu, which one would you prefer, the nasal spray or the injection? … Why?"* **जर स्वाईन फ्लूच्या बचावा साठी तुम्हाला ह्या पैकी एका लसीची निवड करायची असती तर तुम्ही कोणती लस निवडली असती, नाकावाटे दिली जाणारी किंवा इंजेक्शन द्वारे? ...का?**

Tick one only:

2 Nasal spray preferred	*1 Injection preferred*	*0 No preference indicated*

***Narrative**: _____

_____

_____

"Both vaccines, the spray and the injection, that we were asking about are currently available to protect against Swine flu. Both are considered safe, and they protect against Swine flu for a year or more." **स्वाईन फ्लू पासून बचावासाठी आम्ही ज्या लसींबद्दल विचारत आहोत, म्हणजे नाकावाटे दिली जाणारी आणि इंजेक्शनद्वारा दिली जाणारी या दोन्ही लसी सध्या बाजारामध्ये उपलब्ध आहेत. या दोन्ही लसी सुरक्षित आहेत आणि स्वाईन फ्लू पासून एखादे वर्ष किंवा त्याहून जास्ती काळासाठी लस घेणाऱ्याचा बचाव करतात.**

{If the respondent had indicated a preference in question 4.5 for nasal spray, or indicated no preference, then proceed directly with questions about the nasal spray vaccine in the left-hand column below before asking about acceptance of the injectable vaccine in the right-hand column. If the respondent indicates a preference for the injectable vaccine, proceed directly with questions in the right-hand column before questions about acceptance of the nasal spray vaccine in the left-hand column.}

Nasal spray vaccine acceptance	**Injectable vaccine acceptance**
{Skip this introduction if you ask first about the nasal spray vaccine.} *"If only the nasal spray vaccine is available, and it is not possible to get the injectable vaccine, we would like to know if you would consider it."* **इंजेक्शनद्वारे दिली जाणारी लस मिळणे शक्य नसेल आणि नाकावाटे दिली जाणारी लसच उपलब्ध असेल तर तुम्ही ती घ्याल का या बद्दल आम्हाला जाणून घ्यायचे आहे.**	***{Skip this introduction if you ask first about the injectable vaccine.}*** *"If only the injectable vaccine is available, and it is not possible to get the nasal spray vaccine, we would like to know if you would consider it."* **नाकावाटे दिली जाणारी लस मिळणे शक्य नसेल आणि इंजेक्शनद्वारे दिली जाणारी लसच उपलब्ध असेल तर तुम्ही ती घ्याल का या बद्दल आम्हाला जाणून घ्यायचे आहे.**
4.6 *" The current market price of the **nasal spray** vaccine is Rs. 150. Would you pay that price to take it?"* **नाकावाटे दिल्या जाणाऱ्या लसीची सध्याची बाजारातील किंमत १५० रुपये असेल तर तुम्ही ती घ्याल का?** *Tick one only:* *3 Yes* | *2 Possibly* | *1 Uncertain* | *0 No* ***Narrative**:_____ _____	4.6 *" The current market price of **the injectable** vaccine is Rs. 500. Would you pay that price to take it?"* **इंजेक्शनद्वारे दिल्या जाणाऱ्या लसीची सध्याची बाजारातील किंमत ५०० रुपये असेल तर तुम्ही ती घ्याल का?** *Tick one only:* *3 Yes* | *2 Possibly* | *1 Uncertain* | *0 No* ***Narrative**:_____ _____
{If "yes," then go to question 4.8 directly below.}	**{If "yes," then go to question 4.8 directly below.}**

Nasal spray vaccine acceptance	Injectable vaccine acceptance
4.7 *" If the Government were to make the **nasal spray** vaccine available at a subsidized cost, Rs 75, would you pay that much to take it?"* **जर सरकारने नाकावाटे दिली जाणारी लस सवलतीच्या किंमतीत म्हणजे ७५ रुपयाला उपलब्ध केली तर तुम्ही ती घ्याल का?** *Tick one only:* *3 Yes* | *2 Possibly* | *1 Uncertain* | *0 No* ***Narrative**:_____	4.7 *" If the Government were to make the **injectable** vaccine available at a subsidized cost, Rs. 250, would you pay that much to take it?"* **जर सरकारने इंजेक्शनद्वारे दिली जाणारी लस सवलतीच्या किंमतीत म्हणजे २५० रुपयांना उपलब्ध केली तर तर तुम्ही ती घ्याल का?** *Tick one only:* *3 Yes* | *2 Possibly* | *1 Uncertain* | *0 No* ***Narrative**:_____
4.8 *" If the Government were to make the **nasal spray** vaccine available free of cost, would you take it?"* **जर सरकारने नाकावाटे दिली जाणारी लस मोफत उपलब्ध केली तर तुम्ही ती घ्याल का?** *Tick one only:* *3 Yes* | *2 Possibly* | *1 Uncertain* | *0 No* ***Narrative**:_____	4.8 *" If the Government were to make the i**njectable** vaccine available free of cost, would you take it?"* **जर सरकारने इंजेक्शनद्वारे दिली जाणारी लस मोफत उपलब्ध केली तर तर तुम्ही ती घ्याल का?** *Tick one only:* *3 Yes* | *2 Possibly* | *1 Uncertain* | *0 No* ***Narrative**:_____
4.9 *"In 2010, when everyone was very concerned about Swine flu and wanted to get a vaccine, this high demand led to a shortage in supplies of **nasal spray** vaccines. As a result, they could be obtained only at very high prices. If there were another outbreak of Swine flu, and the **nasal spray** vaccine could only be purchased by paying Rs. 300, would you buy it?"* **२०१० मध्ये अशी परिस्थिती आली होती की स्वाईन फ्लू मुळे सगळे काळजीत पडले होते आणि सगळ्यांना लस घ्यायची इच्छा होती त्यामुळे या नाकावाटे दिल्या जाणाऱ्या लसीला खूप मागणी वाढली आणि पुरवठ्यामध्ये तुटवडा निर्माण झाल्यामुळे पुरेशा लसी उपलब्ध नव्हत्या. ह्यामुळे या लसी जास्ती किमतीने विकल्या जात होत्या.जर पुन्हा एखादी स्वाईन फ्लूची साथ आली आणि नाकावाटे दिली जाणारी लस ३०० रुपयाला विकत घ्यावी लागणार असेल तर तुम्ही अशी लस विकत घ्याल का?** *Tick one only:* *3 Yes* | *2 Possibly* | *1 Uncertain* | *0 No* ***Narrative**:_____	4.9 *"In 2010, when everyone was very concerned about Swine flu and wanted to get a vaccine, this high demand led to a shortage in supplies of **injectable** vaccines. As a result, they could be obtained only at very high prices. If there were another outbreak of Swine flu, and the **injectable** vaccine could only be purchased by paying Rs. 1000, would you buy it?"* **२०१० मध्ये अशी परिस्थिती आली होती की स्वाईन फ्लू मुळे सगळे काळजीत पडले होते आणि सगळ्यांना लस घ्यायची इच्छा होती त्यामुळे इंजेक्शनद्वारे दिल्या जाणाऱ्या लसीला खूप मागणी वाढली आणि पुरवठ्यामध्ये तुटवडा निर्माण झाल्यामुळे पुरेशा लसी उपलब्ध नव्हत्या. ह्यामुळे या लसी जास्ती किमतीने विकल्या जात होत्या.जर पुन्हा एखादी स्वाईन फ्लूची साथ आली आणि इंजेक्शनद्वारे दिली जाणारी लस १००० रुपयाला विकत घ्यावी लागणार असेल तर तुम्ही अशी लस विकत घ्याल का?** *Tick one only:* *3 Yes* | *2 Possibly* | *1 Uncertain* | *0 No* ***Narrative**:_____
{If questions about the injectable vaccine were not already asked, proceed with question 4.6 in the right-hand column. Otherwise proceed with question 4.10 below.}	**{If questions about the nasal spray vaccine were not already asked, proceed with question 4.6 in the left-hand column. Otherwise proceed with question 4.10 below.}**

4.10 *"Who in your family would you vaccinate against Swine flu, as a priority?"* **तुमच्या कुटुंबामध्ये तुम्ही कोणाला प्राधान्याने स्वाईन फ्लू प्रतिबंधक लस द्याल?**

Tick all that apply OR tick only "No one" OR tick only "Cannot say." ***Do not probe.***

1 Children	*2* Adults	*3* Elderly	*4* Persons with a chronic illness	*5* Pregnant women	*6* No one	*98* Other, specify_____	*99* Cannot say

Narrative:_____

_____

_____

5 Pandemic experience

5.1 "In general, who is most likely to get Swine flu? Is it men or women? Adults or children? Urban residents or rural residents? Rich, poor or middle class people?" Why? **साधारणपणे कोणाला स्वाईन फ्लू होण्याचा संभव/ शक्यता जास्त आहे? का? स्त्री की पुरुष? प्रौढ व्यक्ती का लहान मुले? शहरात राहणारे लोक का ग्रामीण भागात राहणारे? श्रीमंत, मध्यमवर्गीय का गरीब लोक?**

Tick one response only for each of the following three questions:

Sex	*1* Men	*2* Women	*3* Neither
Age	*1* Adults	*2* Children	*3* Neither
Area	*1* Urban	*2* Rural	*3* Neither

Tick all that apply OR "All/None"

Social class	*1* Rich	*2* Poor	*3* Middle class	*4* All / None

***Narrative**:_____

_____

_____

5.2 *"Did you or anyone in your household have Swine flu during the pandemic in 2009/2010?"* **तुम्हाला किंवा तुमच्या घरातील इतर कोणाला २००९-१० च्या बहुतेक देशामध्ये आलेल्या अशा सार्वदेशिक साथी मध्ये स्वाईनफ्लू झाला होता का?**

Tick all that apply:

1 Self	*2* Children (<14 yrs)	*3* Elderly (>65)	*4* Others in household (15 – 65 yrs)	*5* No one got it	*99* Cannot say

Narrative:_____

_____

_____

5.3 *"Did you or anyone in your household have Swine flu during the recent outbreak this year, in March- April 2012?"* **यंदाच्या मार्च - एप्रिल २०१२ च्या साथी मध्ये तुम्हाला किंवा तुमच्या घरात कोणाला स्वाईनफ्लू झाला होता का?**

Tick all that apply:

1 Self	*2* Children (<14 yrs)	*3* Elderly (>65)	*4* Others in household (15 – 65 yrs)	*5* No one got it	*99* Cannot say

Narrative:_____

_____

_____

{If neither the respondent nor anyone in the family had Swine flu (Q 5.2 or Q 5.3), go to Q 5.6.}

5.4 *"What did you or your family do at home for this (these) person(s) with Swine flu in either outbreak?"* **स्वाईनफ्लू झालेल्या व्यक्तीसाठी तुम्ही किवा घरातील इतरांनी कोणते घरगुती उपचार केले ?**

Based on the respondent's account tick home-based treatment categories in the appropriate *column indicating a* spontaneous *response to the open-ended question above. Tick all that apply* ***OR*** *tick only "Nothing,"* ***OR*** *tick only "Cannot say."* ***Do not probe further.***

Home-based treatment	**2009-2010 Pandemic**	**2012 Outbreak**
1 Nothing **काहीच नाही**		
2 Drink warm liquids **गरम पेये**		
3 Gargling **गुळण्या करणे**		
4 Vapour inhalation **वाफ घेणे**		
5 Cold compress **गार पाण्याच्या पट्ट्या ठेवणे**		
6 Strength-providing foods **ताकद वाढवणारे पदार्थ खाणे**		
7 Herbal remedies (roots, bark, leaves, flowers) **वनौषधी/ औषधी वनस्पती (कंद, मुळे, पाने, फुले), काढा इत्यादींचा वापर करणे**		
8 Self-prescribed ayurvedic/unani medicines **स्वतःहून आयुर्वेदिक/ युनानी औषधे घेणे**		
9 Self-prescribed homeopathic medicines **स्वतःहून होमिओपॅथी औषधे घेणे**		
10 Self-prescribed allopathic drugs **स्वतःहून ॲलोपॅथी औषधे घेणे**		
11 Prayers, *pooja, bhajan* **प्रार्थना,पूजा,भजन करणे**		
98 Other, **इतर** specify:_____ / _____		
99 Cannot say **सांगता येत नाही**		

Narrative: _____

_____

5.5 *"What kind of help outside, if any, did you or your family get for the person(s) with Swine flu in either outbreak?"* **तुम्ही किंवा तुमच्या कुटुंबातील सदस्यांनी या स्वाईन फ्लूच्या कोणत्याही साथी दरम्यान औषधोपचारासाठी घराबाहेरील कोणाकोणाची व काय मदत घेतली याबद्दल आम्हाला सांगाल काय?**

Based on the respondent's account tick home-based treatment categories in the appropriate *column indicating a* spontaneous *response to the open-ended question above. Tick all that apply,* ***OR*** *tick only "Nothing,"* ***OR*** *tick only "Cannot Say."* ***Do not probe further****.*

Outside help- seeking	**2009-2010 Pandemic**	**2012 Outbreak**
1 No outside help **बाहेरून कुठलीही मदत न घेणे**		
2 Private health facility / doctor **खाजगी दवाखाना, हॉस्पिटल, डॉक्टर**		
3 Government health facility / doctor **सरकारी दवाखाना, हॉस्पिटल, डॉक्टर**		
4 Local health-worker **स्थानिक आरोग्य कर्मचारी**		
5 Informal help from a friend, neighbour or relative **मित्र,शेजारी किंवा नातेवाईकांकडून मदत मागणे/घेणे**		
6 Consult with a Chemist / Pharmacist **केमिस्टचा/ औषध विक्रेत्याचा सल्ला घेणे**		
7 Traditional healers (*vaidu, jhadi-booti wala*) **पारंपारिक वैदू, हकीम, जडी-बुटीवाला**		
8 Faith healers (*devrishi, bhagat*) **देवऋषी, भगत**		
98 Other, **इतर** specify:_____ / _____		
99 Cannot say सांगता येत नाही		

Narrative: _____

_____

_____

5.6 *"Have you ever taken a vaccine to prevent Swine flu?"* **स्वाईन फ्लू होऊ नये म्हणून तुम्ही कधी लस घेतली आहे का?**

Tick one only:

3 Yes	*2 Possibly*	*1 Uncertain*	*0 No*

Narrative:_____

_____

_____

5.7 "Has anyone else in your household ever taken a vaccine to prevent Swine flu?" **तुमच्या घरातील इतर कोणी स्वाईन फ्लू प्रतिबंधक लस घेतली आहे का?**

Tick one only:

3 Yes	*2 Possibly*	*1 Uncertain*	*0 No*

{If "yes" or "possibly," fill in all details about vaccine recipient(s) in table below}

	Sex	**Age**	**Sex**	**Age**	**Sex**	**Age**
1 Spouse						
2 Child						
3 Parent						
4 Other_____						

Narrative:_____

_____

_____

5.8 "For you or anyone in your household who did not take the vaccine for Swine flu, were there any particular reasons not to take it? Can you explain why some (or all) did not take it?" **तुम्ही किवा घरातील कोणी स्वाईन फ्लू प्रतिबंधक लस न घेण्याचे काही विशेष कारण आहे का*?* लस न घेण्याचे कारण तुम्ही सांगू शकाल का?**

***Narrative**:_____

_____

_____

*Tick all that apply **OR** tick only "Cannot say.":*

Reasons for not taking influenza vaccine	**Tick**
1 General dislike of injections **इंजेक्शनची भीती/ नावड**	
2 Concern about nasal spray as new mode of administration **नाकावाटे लस देण्याची पद्धत नवीन असल्याने त्याबाबत भीती**	
3 General avoidance of medications **शक्यतो औषधे घेणे टाळण्याची वृत्ती**	
4 Sufficient precautionary measures already taken **प्रतिबंध करण्यासाठी पुरेशी काळजी घेतली**	
5 Low risk attributed to Influenza/ Lack of perception of own risk **स्वतःला फ्लू होण्याची शक्यता कमी वाटणे**	
6 Fear of adverse reactions **रिअॅक्शन येण्याची भीती**	
7 Doubts about vaccine effectiveness **लसीच्या परिणामकारकतेबद्दल शंका**	
8 Costs of vaccine **लसीची किंमत**	
9 Health care provider did not recommend, or discouraged it **डॉक्टरांनी लसीबद्दल न सांगितल्यामुळे/ परावृत्त केल्यामुळे**	
10 Doesn't know about the vaccine **लसीबद्दल माहिती नसणे**	
11 Doesn't know how or where to get the vaccine **लस कोठे मिळते आणि कशी घ्यायची याबाबत माहिती नसणे**	
12 No time to take the vaccine **लस घ्यायला वेळ नसणे**	
13 Vaccine shortage due to high demand **जास्त मागणीमुळे लसीचा तुटवडा**	
98 Other, **इतर** specify:_____	
99 Cannot say **सांगता येत नाही**	

5.9 "Has your health care provider ever recommended your taking a vaccine to protect against Swine flu?" **तुमच्या डॉक्टरांनी तुम्हाला स्वाईन फ्लूपासून बचाव करण्यासाठी कधी लस घेण्याचा सल्ला दिला आहे का?**

Tick one only:

3 Yes	*2* Possibly	*1* Uncertain	*0* No

***Narrative**: _____

_____

_____

5.10 "Are there any particular problems that affect people who take the Swine Flu vaccine, either the nasal spray or injection?" **स्वाईन फ्लूच्या, नाकावाटे दिल्या जाणाऱ्या किंवा इंजेक्शनद्वारा दिल्या जाणाऱ्या लसीमुळे, लस घेणाऱ्याला काही विशेष त्रास होतील का? / होऊ शकतील का?**

*Tick all that apply **OR** tick only "No problem" **OR** tick only "Cannot say." **Do not probe.***

Problems caused by vaccines	**Nasal spray**	**Injection**
1 No problem		
2 Stuffy nose, runny nose or sneezing **नाक चोंदणे, नाकातून पाणी येणे, शिंका येणे**		
3 Pain, swelling or discomfort at injection site or in the nose **इंजेक्शन दिलेल्या जागी अथवा नाकात दुखणे, सूज, अस्वस्थ वाटणे (कसेतरी होणे)**		
4 Muscle pain or joint pain **स्नायू अथवा सांधे दुखी**		
5 Fever **ताप**		
6 Infection/abscess **संसर्ग /गाठ**		
7 Scar **वण**		
8 Paralysis or Guillain-Barre syndrome (GB Syndrome) **अर्धांगवायू**		
9 Not speaking (autism) **स्वमग्नता**		
10 Sterility **नपुंसकत्व**		
11 Miscarriage **गर्भ पडणे/ गर्भपात**		
12 Death **मृत्यू**		
98 Other, **इतर** specify:_____ / _____		
99 Cannot say		

Narrative:_____

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_____

5.11 "Which one of these vaccines (nasal spray or injection) do you think would be safer for you? … Why?" **नाकावाटे अथवा इंजेक्शनद्वारा दिल्या जाणारया स्वाईन फ्लूच्या लसी पेकी कुठली लस तुम्हाला तुमच्यासाठी सुरक्षित वाटते *?* ....का?**

Tick one only:

3 Nasal spray safer	*2 Injection safer*	*1 Both equally safe*	*0 Neither is safe*	*99 Cannot say*

Narrative:_____

_____

_____

5.12 *"We have now asked you many questions about [P] who had the Swine flu. Please recall the problems of [K], who I asked about before that. As it turned out, [K] was found to have had the regular flu, which affects many people every year, but not the Swine flu. Do you think a vaccine might have prevented [K]'s illness?"* **आता पर्यंत आम्ही तुम्हाला [पी] बद्दल बरेच प्रश्न विचारले ज्याला स्वाईन फ्लू झाला होता. त्या आधी आपण [के] च्या त्रासांबद्दल बोललो होतो, त्याबद्दल परत बोलूयात. त्याच असं झालं की, [के] ला साधा फ्लू झाल्याचे दिसून आले की जो दर वर्षी बऱ्याच लोकांना होतो, तो स्वाईन फ्लू नव्हता . तुम्हाला असं वाटते का की लस घेतल्यामुळे [के] चा ह्या साध्या फ्लूपासून बचाव झाला असता?**

Tick one only:

3 Yes	*2* Possibly	*1* Uncertain	*0* No

***Narrative**: _____

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_____

5.13 "Have you ever taken a vaccine to prevent the regular flu, like the problem that [K] had?"
[के] ला जसा साधा फ्लू झाला होता तशा साध्या फ्लू साठी तुम्ही कधीही लस घेतली आहे का?

Tick one only:

3 Yes	*2* Possibly	*1* Uncertain	*0* No

{If 'yes' or 'possibly', enquire further, otherwise skip to section 6}

5.14 "If so, how many times and when?" **<u>जर हो तर,</u> किती वेळा आणि केव्हा याबद्दल सांगाल का?**

Number of times : _____ times

Date 1 (mm-yyyy) - Date 3 (mm-yyyy) -

Date 2 (mm-yyyy) - Date 4 (mm-yyyy) -

Narrative: _____

_____

_____

6 Other Vaccine Experience

"So far we have been talking about Swine flu and seasonal flu vaccines. The following few questions will be about vaccines for other illnesses." **आतापर्यंत आपण स्वाईन फ्लू व साध्या फ्लूच्या लसींबद्दल बोलत होतो, यापुढील प्रश्न इतर आजारांवरील लसींबद्दल असतील.**

6.1 "Have you or anyone else in your household ever taken any vaccine for any illness **तुम्ही किंवा तुमच्या घरातील इतर कोणी कुठल्याही आजारांसाठी कुठली लस घेतली आहे का?**

Tick one only:

3 Yes	*2 Possibly*	*1 Uncertain*	*0 No*

Narrative: _____

_____

_____

6.2 "Based on your experience, do you think (any) vaccines are generally helpful?" **तुमच्या अनुभवावरून तुम्हाला वाटते का की साधारणतः कुठलीही लस उपयुक्त असते?**

Tick one only:

3 Yes	*2 Possibly*	*1 Uncertain*	*0 No*

Narrative:_____

_____

_____

6.3 " Has your health care provider ever urged you personally to take a vaccine for protection against any illness?" **तुमच्या डॉक्टरांनी आजारांपासून बचाव करण्यासाठी कधीही कोणतीही लस घेण्याचा आग्रह केला आहे का?**

Tick one only:

3 Yes	*2* Possibly	*1* Uncertain	*0* No

***Narrative**:_____

_____

_____

6.4 "Even if vaccines are effective, do you think that they are also likely to cause problems or side-effects?" **जरी लसी परिणामकारक असल्या तरी त्यांचे काही त्रास/ दुष्परिणाम असतात असे तुम्हाला वाटते का?**

Tick one only:

3 Yes	*2 Possibly*	*1 Uncertain*	*0 No*

Narrative:_____

_____

_____

{If "yes" or "possibly," enquire further, otherwise skip to section 7}

6.5 *"If so, what might these problems be?" (***जर हो) तर काय त्रास/ दुष्परिणाम होत असतील ?**

Tick all that apply or tick only "Cannot say."

Problems caused by vaccines	**Tick**
1 Pain, swelling or discomfort at injection site or in the nose **इंजेक्शन दिलेल्या जागी अथवा नाकात दुखणे, सूज, अस्वस्थ वाटणे (कसेतरी होणे)**	
2 Fever **ताप**	
3 Infection/abscess **संसर्ग, गाठ**	
4 Scar **व्रण**	
5 Paralysis or Guillain-Barre syndrome (GB Syndrome) **अर्धांगवायूचा झटका**	
6 Not speaking (autism) **स्वमग्नता**	
7 Sterility **नपुंसकत्व**	
8 Miscarriage **गर्भ पडणे/ गर्भपात**	
9 Death **मृत्यु**	
98 Other, **इतर** specify:_____	
99 Cannot say **सांगता येत नाही**	

Narrative:_____

_____

_____

7 Concluding advice from respondent

7.1 "Is there anything else you can tell me about the health problems we have discussed or about your experience with vaccinations? Any further comments, advice or suggestions will be appreciated." **आपण आत्तापर्यंत चर्चा केलेल्या आरोग्य समस्यांबद्दल (साधा फ्लू/ स्वाईन फ्लूबद्दल) तुम्हाला अजून काही सांगायचे आहे का? याबाबत तुमच्या काही सूचना किंवा सल्ला आहे का?**

***Narrative**: _____

_____

_____

_____

_____

Interview end time (hh:mm)			
I: Consent form signed? *(tick)*	*1* Signature	*2* Thumb print	*3* Neither
I: Team *(circle appropriate)*	A B C D		
I: Audio recording taped? *(tick)*	*1* Yes	*2* No	*3* Partial
Interviewer (name)			
Narrative recorder (name)			
N: File name on recorder			
Interviewer copy checked by (date/initials)			
Narrative copy checked by (date/initials)			
Narratives translated & typed (date)			
1st Data entry (date/initials)			
2nd Data entry (date/initials)			

Additional comments from the interview team

Notes concerning the participant's interest and the quality of the interview, and other noteworthy features and details of this interview:

_____

_____

_____

_____

_____

_____

_____

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_____

_____

Respiratory Illness Prevention Study: Vignettes

MALE, YOUNG

Prakash was a young man 25 years-of-age who lived in a place very similar to yours. In January 2010 he fell sick with a sore throat, runny nose and bad pains throughout his body. He also had a bad cough and a constant high fever that wouldn't go away. He was very tired, and he was unable to continue with his work. A few other people in his community also seemed to have the same illness, and there were reports about many cases like that on TV and in the local newspapers. The neighbours urged Prakash to go to a big government hospital for tests to find out what his problem was.

तरुण मुलगा

प्रकाश हा एक २५ वर्षाचा तरुण तुम्ही राहता अशाच जागी राहतो. २०१० सालच्या जानेवारी महिन्यात तो आजारी पडला. त्याचा घसा दुखायला लागला, नाक वाहू लागले आणि त्याचे सर्व अंग दुखून त्याला खूप वेदना होत होत्या. त्याला खोकलाही झाला होता आणि त्याला सतत असणारा ताप काही जात नव्हता. त्याला खूप थकवा आल्याने तो रोजची कामे करू शकत नव्हता. त्याच्या परिसरातील आणखी काही लोकांना त्याच्यासारखाच आजार झाला होता आणि टिव्ही वर आणि स्थानिक पेपर मधून अशा आजाराच्या खूप केसेस असल्याच्या बातम्या येत होत्या. त्याच्या शेजाऱ्यांनी त्याला मोठ्या सरकारी दवाखान्यात जाऊन, त्यास काय त्रास/ आजार झाला आहे हे समजण्यासाठी तपासणी करून घे असा सल्ला दिला.

MALE, OLD

Prabhakar was a middle-aged man 55 years-of-age who lived in a place very similar to yours. In January 2010 he fell sick with a sore throat, runny nose and bad pains throughout his body. He also had a bad cough and a constant high fever that wouldn't go away. He was very tired, and he was unable to continue with his work. A few other people in his community also seemed to have the same illness, and there were reports about many cases like that on TV and in the local newspapers. The neighbours urged Prabhakar to go to a big government hospital for tests to find out what his problem was.

मध्यमवयीन गृहस्थ

प्रभाकर हे एक ५५ वर्षाचे मध्यमवयीन गृहस्थ तुम्ही राहता अशाच जागी राहतात. २०१० सालच्या जानेवारी महिन्यात ते आजारी पडले. त्यांचा घसा दुखायला लागला, नाक वाहू लागले आणि त्यांचे सर्व अंग दुखून त्यांना खूप वेदना होत होत्या. त्यांना खोकलाही झाला होता आणि त्यांना सतत असणारा ताप काही जात नव्हता. त्यांना खूप थकवा आल्याने ते रोजची कामे करू शकत नव्हते. त्यांच्या परिसरातील आणखी काही लोकांना त्यांच्यासारखाच आजार झाला होता आणि टिव्ही वर आणि स्थानिक पेपर मधून अशा आजाराच्या खूप केसेस असल्याच्या बातम्या येत होत्या. त्यांच्या शेजाऱ्यांनी त्यांना मोठ्या सरकारी दवाखान्यात जाऊन, त्यांना काय त्रास/ आजार झाला आहे हे समजण्यासाठी तपासणी करून घ्या असा सल्ला दिला.

FEMALE, YOUNG

Pradnya was a young woman 25 years-of-age who lived in a place very similar to yours. In January 2010 she fell sick with a sore throat, runny nose and bad pains throughout her body. She also had a bad cough and a constant high fever that wouldn't go away. She was very tired, and she was unable to continue with her work. A few other people in her community also seemed to have the same illness, and there were reports about many cases like that on TV and in the local newspapers. The neighbours urged Pradnya to go to a big government hospital for tests to find out what her problem was.

तरुण मुलगी

प्रज्ञा ही एक २५ वर्षांची तरुण मुलगी तुम्ही राहता अशाच भागात राहते. २०१० सालच्या जानेवारी महिन्यात ती आजारी पडली. तिचा घसा दुखायला लागला, नाक वाहू लागले आणि तिचे सर्व अंग दुखून तिला खूप वेदना होत होत्या. तिला खोकलाही झाला होता आणि तिला सतत असणारा ताप काही जात नव्हता. तिला खूप थकवा आल्याने ती रोजची कामे करू शकत नव्हती. तिच्या परिसरातील आणखी काही लोकांना तिच्यासारखाच आजार झाला होता आणि टिव्ही वर आणि स्थानिक पेपर मधून अशा आजाराच्या खूप केसेस असल्याच्या बातम्या येत होत्या. तिच्या शेजाऱ्यांनी तिला मोठ्या सरकारी दवाखान्यात जाऊन, तिला काय त्रास/ आजार झाला आहे हे समजण्यासाठी तपासणी करून घे असा सल्ला दिला.

FEMALE, OLD

Pratibha was an middle-aged woman 55 years-of-age who lived in a place very similar to yours. In January 2010 she fell sick with a sore throat, runny nose and bad pains throughout her body. She also had a bad cough and a constant high fever that wouldn't go away. She was very tired, and she was unable to continue with her work. A few other people in her community also seemed to have the same illness, and there were reports about many cases like that on TV and in the local newspapers. The neighbours urged Pratibha to go to a big government hospital for tests to find out what her problem was.

मध्यमवयीन महिला

प्रतिभा या एक ५५ वर्षाच्या मध्यमवयीन बाई तुम्ही राहता अशाच भागात राहतात. २०१० सालच्या जानेवारी महिन्यात त्या आजारी पडल्या. त्यांचा घसा दुखायला लागला, नाक वाहू लागले आणि त्यांचे सर्व अंग दुखून त्यांना खूप वेदना होत होत्या. त्यांना खोकलाही झाला होता आणि त्यांना सतत असणारा ताप काही जात नव्हता. त्यांना खूप थकवा आल्याने त्या रोजची कामे करू शकत नव्हत्या, त्यांच्या समाजातील आणखी काही लोकांना त्यांच्यासारखाच आजार झाला होता आणि टिव्ही वर आणि स्थानिक पेपर मधून अशा आजाराच्या खूप केसेस असल्याच्या बातम्या येत होत्या. त्यांच्या शेजाऱ्यांनी त्यांना मोठ्या सरकारी दवाखान्यात जाऊन, त्यांना काय त्रास/ आजार झाला आहे हे समजण्यासाठी तपासणी करून घ्या असा सल्ला दिला.

8.7 Curriculum vitae

Name	Neisha Sundaram
Nationality	Indian

EDUCATION

Feb'13-Present *Switzerland*	PhD student (Epidemiology, Health Social Sciences) • Swiss Tropical and Public Health Institute (Swiss TPH)
Sep'09–Feb'11 *Switzerland*	M.Sc, Infection Biology and Epidemiology • Swiss TPH and University of Basel
Aug'04-Dec'08 *Singapore*	B.Sc (Hons.), Life Sciences; National University of Singapore (NUS) (Dean's List) • Awarded SIA-NOL scholarship for studies at NUS • Completed University Scholars Program and Special Program in Science
Jul'06–Jul'07 *U.S.A*	Minor in Technopreneurship, University of Pennsylvania • NUS Overseas Colleges Program; 20 applicants accepted from NUS
Jan'02–Jan'04 *Singapore*	Anderson Junior College, Singapore – GCE A levels • Received SIA youth scholarship

WORK EXPERIENCE

Aug'13-Present *Singapore*	National University of Singapore, Singapore • Research associate at the Saw Swee Hock School of Public Health
Apr'11-Jan'13 *Switzerland and India*	Swiss Tropical and Public Health Institute, Basel, Switzerland • Research assistant with the Society, Gender and Health Unit, Department of Epidemiology and Public Health
Apr'09-Aug'09 *India*	Robhatah Robotic Solutions, Singapore and India • Business analyst, involved in creating marketing strategy for educational robotics division in India
Jan'09-Mar'09 *India*	Volunteer work, Bangalore, India • Taught at Nivedita Vidya Peetha- a school for underprivileged children, tutored at an orphanage
Nov'06–Jul'07 *U.S.A*	Neuro Diagnostic Devices (NDD), Philadelphia, USA • Developed marketing and branding strategy for NDD's flagship medical device. • Responsible for project management, clinical monitoring and selection of sites for clinical trials
Jul'06–Nov'06 *U.S.A*	Science Center (SC), Philadelphia, USA • Conducted due diligence, evaluation processes for start-ups, wrote business plans and grants

RESEARCH EXPERIENCE

Aug'13-Present *Singapore*	Influenza vaccine uptake among health care professionals in Singapore • Project manager for study; data collection and analysis
Oct'13-Present *Singapore*	Health economic evaluations • Cost-effectiveness evaluation of pneumococcal vaccines for Ministry of Health, Mongolia • Broader economic impact of vaccination
Aug'14-Present *India*	Women, WASH and Health in rural Pune district: identifying stress and unmet needs • Project design, analysis and writing
Aug'12-Present *India and Switzerland*	Influenza vaccine uptake in urban and rural Pune district, India • Designed study along with collaborators- Maharashtra Association for Anthropological Sciences, Pune and World Health Organization (WHO), Project management of field work and interviews
Jan'10-Feb'11 *Kenya*	Socio-cultural features of cholera and anticipated acceptance of an oral cholera vaccine in Kenya • Interviewed residents at an urban slum and rural villages in Kisumu, Western Kenya

Dec'07-Nov'08 *Singapore* Jul'07–Dec'07 *Singapore*	The effect of Bisphenol A on mouse and human cells (Department of Physiology, NUS) • Honours research studying its effects on cell viability, chromosomal integrity and gene expression • The effect of low dose ionizing radiation on human peripheral blood lymphocytes (Undergraduate Research Opportunities Program in Science, NUS) • Telomere dynamics in senescence: an evolutionary perspective (Independent Study, NUS)

PUBLICATIONS

Sundaram N, Purohit V, Schaetti C, Kudale A, Joseph S, Weiss MG. Community awareness, use and preference for pandemic influenza vaccines in Pune, India. ***Human Vaccines & Immunotherapeutics*** **2015**; Advance online publication. doi:10.1080/21645515.2015.1062956

Sundaram N, Schaetti C, Purohit V, Kudale A, Weiss MG. Cultural epidemiology of pandemic influenza in urban and rural Pune, India: a cross-sectional, mixed-methods study. ***BMJ Open*** **2014**; 4(12): e006350

Sundaram N, Schaetti C, Chaignat C, et al. Socio-cultural determinants of anticipated acceptance of an oral cholera vaccine in Western Kenya. ***Epidemiology and Infection*** **2013**; 141(3): 639-650.

Nyambedha E, **Sundaram N**, Schaetti C, et al. Distinguishing social and cultural features of cholera in urban and rural areas of Western Kenya: implications for public health. ***Global Public Health*** **2013**; 8(5): 534-551.

Schaetti C, **Sundaram N**, Merten S, et al. Comparing sociocultural features of cholera in three endemic African settings. ***BMC Medicine*** **2013;** 11:206. doi: 10.1186/1741-7015-11-206.

Hirve S, Lele P, **Sundaram N**, Chavan U, Weiss M, Steinmann P, Juvekar S. Psychosocial stress associated with sanitation practices: experiences of women in a rural community in India. ***Journal of Water, Sanitation and Hygiene for Development*** **2015**; 5(1): 115–126. doi:10.2166/washdev.2014.110

Jit M, Hutubessy R, Png M, **Sundaram N**, Audimulam J, Salim S, Yoong J. The broader economic impact of vaccination: reviewing and appraising the strength of evidence. ***BMC Medicine*** **2015**; Accepted for publication (forthcoming)

Steinmann P, Bratschi MW, Lele P, Chavan U, **Sundaram N**, Weiss M, Juvekar S, Hirve S (in press). Availability and satisfactoriness of latrines and hand washing stations in health facilities, and role in health seeking behavior of women: evidence from rural Pune district, India. ***Journal of Water, Sanitation and Hygiene for Development*** **2015**; doi: 10.2166/washdev.2015.101

Kudale A, Purohit P, **Sundaram N**, et al. Socioeconomic, cultural and behavioural features of prior and anticipated influenza vaccine uptake in urban and rural Pune district, India:a mixed-methods case study.***BMJ Open*** **2013**; 3(2): e002573

Giduthuri JG, Maire N, Joseph S, Kudale A, Schaetti C, **Sundaram N**, Schindler C, Weiss MG. Developing and validating a tablet version of an illness explanatory model interview for a public health survey in Pune, India. ***PLoS One.*** **2014**; 9(9):e107374. doi: 10.1371/journal.pone.0107374. eCollection 2014.

TEACHING EXPERIENCE

Nov'14 *Singapore*	Vaccinology for clinical and public health practice, NUS, Singapore • Lecturer
Oct'14 *Switzerland*	Cultural epidemiology: principles and practice, Swiss TPH, Basel • Teaching assistant
Oct'13 *Switzerland*	Cultural epidemiology: principles and practice, Swiss TPH, Basel • Teaching assistant

CONSULTANCIES

Nov'13 *Mongolia*	Temporary advisor to the WHO for study on cost-effectiveness of pneumococcal vaccine introduction in Mongolia. November 2013, Ulaanbaatar, Mongolia
Mar'12 *Zanzibar*	Temporary advisor to the WHO at the 'Oral cholera vaccine meeting' in Zanzibar, 28 February- 1 March, 2012; presented work from Kenya to plan for cholera elimination in Zanzibar

PEER REVIEWER FOR

BMC Public Health, September 2013; Human Vaccines & Immunotherapeutics, June 2014