

RESEARCH PAPER



The importance of confidence, complacency, and convenience for influenza vaccination among key risk groups in large urban areas of Peru

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ABSTRACT

Influenza vaccination has been available under Peru's national immunization program since 2008, but vaccination coverage has decreased lately. Surveys and focus groups were conducted among four risk groups (pregnant women, mothers of children aged <6 years, adults with risk factors, and adults aged ≥65 years) to identify factors affecting influenza vaccine hesitancy in Peru. The 3Cs model (Confidence, Complacency, and Convenience) was used as a conceptual framework for the study.

Most pregnant women and mothers of young children (70.0%), but less than half (46.3%) of older adults and adults with risk factors were vaccinated against influenza. Vaccine confidence and complacency were positively associated with educational level. Complacency was the most deficient of the 3Cs. Pregnant women and mothers were the most informed and least complacent among risk groups.

Focus groups revealed the misconceptions behind the high level of complacency observed, including the perception of influenza risk and the role assigned to vaccination in preventing the disease. Interviews with officials identified that most strategies are directed to vaccination availability and hence to convenience, with opportunities for strategies to improve vaccination uptake and community engagement.

The results highlight the importance of implementing in Peru communication strategies to increase perceptions of vaccine safety and effectiveness thus improving confidence and reducing complacency. The establishment of explicit incentives should also be considered to increase vaccination uptake, particularly to health personnel.

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Introduction

Influenza is a respiratory viral disease that is responsible for high mortality and morbidity rates worldwide.^{1,2} The disease can be particularly severe in children younger than 5 years, pregnant women, older adults, and adults with risk factors.³

Influenza causes estimated 1 billion cases worldwide, of which 3 to 5 million are severe cases, and leads to 290,000–650,000 respiratory deaths.¹ During the influenza A(H1N1) pandemic in 2009, at least 214 countries reported confirmed cases of this variant; a total of 18,449 deaths were registered, although the actual figure could be as high as 284,000 deaths, according to the Center for Disease Control.⁴ Most of these deaths occurred in people under 65 years, unlike seasonal influenza. In Peru, H1N1 influenza spread out to its 24 departments, which reported more than 10,000 confirmed cases and 312 deaths.⁵

In Peru, the influenza vaccine belongs to the *Esquema Nacional de Vacunación* (National Immunization Program) since 2008. Vaccination is mandatory for children aged under 2 years, people aged 3 – 59 years with chronic comorbidity, adults aged over 60 years, pregnant women within 20 weeks of gestation, or women in the postpartum period.⁶ Vaccination is supported by the right to health in Peru and is part of its overall

development goals through *Agenda 2030*, the *Acuerdo de Gobernabilidad 2016–2021*, and the prioritized interventions of the *Programa Presupuestal Articulado Nutricional* since 2008.^{7–9}

Despite the actions, Peru has taken to guarantee vaccination against influenza, vaccination coverage has decreased in recent years. In 2016, its coverage was below 80% in the at-risk groups and as low as 23% in pregnant women.¹⁰ This situation requires an analysis of the barriers and drivers of influenza vaccine supply and demand, and particularly of the social factors affecting the acceptance of influenza vaccination.¹¹

The decision-making process followed by the population to get vaccinated is immersed in a specific social context of beliefs and perceptions as well as considerations of the availability of the vaccine and its costs.¹² The World Health Organization's Strategic Advisory Group of Experts proposed the concept of vaccine hesitancy with the objective of analyzing the social factors that lead either to a delay in the acceptance or to the rejection of vaccines despite the availability of vaccination services.¹³

Vaccine hesitancy is the result of a complex interrelation of behavioral and societal factors whose intervention requires an integral approach. Different conceptual models have been

proposed to address the complexity, applicability, and potential usefulness of vaccine hesitancy indicators, as well as for the design of surveys and interventions that can be applied locally and globally. The “3Cs” model is considered as one of the most useful models, given that it is intuitive and the easiest to understand and apply; it incorporates three categories for analysis: *confidence, complacency, and convenience*.¹⁴

Confidence is the degree of trust in the effectiveness and safety of the vaccine, in the system that delivers the vaccines, and in the motivations of those who make the decisions to achieve effective access to the vaccines.¹³ Lack of confidence is caused by strong negative attitudes toward vaccination, which can be influenced by misinformation about vaccination risks, by affiliation to anti-vaccine groups, or through legitimate concerns regarding vaccine safety and efficacy.

Complacency occurs when the risk of diseases preventable by vaccination is perceived as low, and vaccination is not considered a necessary preventive measure.

Convenience refers to the influence of certain factors on the decision to get vaccinated, such as availability, affordability, willingness to pay for the vaccine, geographical accessibility, level of understanding of health messages, and the degree of satisfaction with vaccination services.^{14,15} Low convenience means that even if a person considers vaccination important, certain barriers, such as difficulty in accessing the vaccine will prevent the person from getting vaccinated.¹⁵

The objective of this study was to identify the social factors affecting the uptake of influenza vaccination in Peru and the role played by the vaccination program to address them, as well as to offer general recommendations to strengthen the implementation of the National Coverage Program (*Programa de Cobertura Nacional*) for influenza vaccine.

Methods

A simultaneous-supplementary mixed-method study was designed to identify the broad social factors affecting influenza immunization through a point-of-service exit survey as well as the meaning and significance of social factors through risk-based focus groups. Interviews with program officers were undertaken to identify efforts to improve access to influenza vaccine and the role played by strategies targeting vaccine uptake. The “3Cs” model was used to integrate and analyze the social factors affecting the uptake of influenza vaccination. Exit surveys were carried out in health establishments and focus groups in the four risk groups: pregnant women, mothers of children aged <6 years, adults with risk factors, and adults aged 65 years and over. Older adults were persons 65 years and older who presented no impairment for participation. Adults with risk factors included participants 18 years and over who reported at least one underlying health condition, and which included at least one of the following: hypertension, gastritis, diabetes, cancer, chronic pulmonary diseases, or depression. In focus groups, older adults with risk factors were given the opportunity of choosing in which group they wanted to participate. For the survey, older adults with and without risk factors were included. Research was undertaken in the cities of Lima and Arequipa, from October to December 2018. For the analysis of the supply-side of the vaccination, the

immunization program documentation was reviewed, and officials involved in the national immunization program at the national decision-making level (strategic), as well as intermediate operators at the regional/local level (tactical), were interviewed.

The protocol was approved by the research ethics committees of the *Comité de Ética de Investigación de Prisma Investigación y Desarrollo*, a government-accredited research ethics organization in Peru.

Exit survey

A sample of persons from each of the four risk groups was surveyed. The selection criteria included being users of health services, living in large urban areas, and being residents in localities of medium to medium-low socioeconomic level. A questionnaire was designed for each risk group and was structured in approximately 50 questions. The questionnaire was applied by an interviewer in a face-to-face situation through opportunistic sampling in two public and two private ambulatory health-care units in each city, for a total of eight units.

The sample size was not calculated based on statistical error and confidence criteria because the selection process was not probabilistic and, therefore, was not intended to obtain estimates with associated levels of precision (error and confidence). The number of interviews was established based on optimization criteria seeking an adequate balance between the availability of resources and the robustness of the results.

In total, 640 participants were surveyed in Lima and Arequipa, that is, 160 individuals for each risk group. After a process of data quality assurance, a descriptive statistical analysis was conducted. The analysis categories for the identification of variables followed the 3Cs model. Aggregated indices were created to measure each of the dimensions of the 3Cs by averaging their component variables.

The 3C indicators were constructed based on specific survey responses as shown in [Table 1](#). The convenience indicator was constructed adding values for five dichotomous responses related to vaccine recommendation and access with up to five points. Vaccine confidence was constructed with three indicators of efficacy, safety, and effectiveness, each constructed with a Likert scale of up to 12 points. The complacency indicator was constructed with three sub-indicators for vaccine prejudice, knowledge on influenza, and risks associated with influenza and with the vaccine. The component was based on nine questions for a total of up to 41 points among dichotomous and Likert scale responses as well as a list of up to 15 influenza symptoms. One point was considered for each correct symptom mentioned. The vaccine convenience indicator was constructed adding values for five dichotomous responses related to vaccine recommendation and access with up to five points each, for a total of 5 points. Values within each of the 3Cs and in the case of Complacency within each sub-indicator were standardized in a scale of 0 to 100 for each individual. In the case of Complacency, a score of 100 means less complacency.

One-way ANOVA pairwise multiple comparison tests were applied to analyze the significance of differences in means across risk groups and for the aggregate T3 C indicator, the separate

Table 1. Construction of the 3Cs concepts from survey responses.

Indicator	Description	Questionnaire items *	Construction	Measurement scale (and points)
Confidence in the vaccine	Level of perception of the efficacy and safety of the vaccine	24.1: "Vaccine efficacy level". 24.2: "Vaccine safety level". 25.1: "The vaccine is very effective"	Points added gradually according to ordinal answers obtained in questions. Resulting sum is rescaled to the interval (0,1) and expressed as %.	From low confidence (0 Pnts.) to high confidence (12 Pnts.). The more confidence, the less hesitation to vaccinate
Complacency A. Influenza risk	Level of perception of the risk of contracting influenza and its severity	24.3: "Level of risk of contracting influenza." 24.4: "Flu severity level".	Idem.	From low risk (0 Pnts.) to high risk (8 Pnts.) The greater the risk, the less hesitation to be vaccinated
Complacency B. Knowledge of influenza and the vaccine	Level of knowledge of influenza and its vaccine	11: "You know what influenza is." 12: "Main symptoms of influenza." 13: "You know the vaccine exists" 25.5: "It is advisable to vaccinate against influenza every year." 25.6: "Only minors and the elderly should be vaccinated." (Calculated in an inverted sense to be consistent with the direction of the indicator)	Points added for positive answers in each of the questions. Resulting sum is rescaled to the interval (0,1) and expressed as %.	From low knowledge (0 Pnts.) to high knowledge (25 Pnts.) The more knowledge, the less hesitation to vaccinate
Complacency C. Vaccine prejudices	Level of prejudices expressed about influenza vaccine	25.2: "The vaccine has side effects." 25.4: "The vaccine causes reactions."	Points added gradually according to ordinal answers obtained in questions. Resulting sum is rescaled to the interval (0,1) and expressed as %. (The percentage complement is used to be consistent with the direction of the indicator)	From low prejudice (0 Pnts.) to high prejudice (8 Pnts.) A lower value, less prejudice and less hesitation to get vaccinated
Convenience	Level of convenience perceived in accessing the vaccine	19. Who recommended you get vaccinated? 20. Do you know where to go to get a flu shot? 22. Is the vaccine available at the health facility where you go regularly? 23. How long does it take to get from your home to the health facility you go to regularly? 25.3 Is the flu vaccine difficult to obtain?	Categorization and point addition in each question. Sum is rescaled to the interval (0,1) and is expressed as %.	From low convenience (0 Pnts.) to high convenience (5 Pnts.) The more convenience, the less hesitation to vaccinate

* Reference is made to the questionnaire for Adults with Risk factors. Questionnaires for other risk groups specified question 25.6. Questionnaire is available as supplementary material.

3C components and subcomponents of complacency as well as of vaccination status (at least once in the life-course and in the last year). Analysis of variance was applied to assess the significance of the association between the 3C components and socio-demographic variables by risk group. Binary logistic multivariate regression analysis was applied to assess the association within each risk group and for the sample as a whole between vaccine confidence, convenience, and complacency and vaccination status. Independent variables used for the analysis were age, sex (for adults with risk factors and older adults), and education, as reported in the exit survey. Age was selected considering its association with vulnerability while education as a proxy of health literacy. The processing and analysis of the information were carried out using the IBM-SPSS V.24 package.

Focus groups

Four focus groups were undertaken, one for each risk group and two per city. Six to seven people participated in each focus group. To homogenize the group of mothers of children, they

were restricted to women having only one child. The group of older adults included persons 65 years or older that presented no health or physical impediment for their participation. The group of adults with risk factors included participants above 18 years of age with at least one underlying health condition such as hypertension, gastritis, diabetes, cancer, chronic pulmonary diseases, and depression. Participants 65 years and older were given the choice of participating in either group. Participants were recruited at the end of their visit in three public and one private health facilities. They were informed about the purposes and procedures of the focus group, including a brief explanation of the project and the identification of the characteristics needed to participate in each focus group.

The guide developed for the focus groups was divided into categories of knowledge, attitudes, and practices. Within each of these categories, questions were included to recognize dimensions of the confidence, complacency, and convenience model. The focus was on obtaining information about the participants' knowledge of influenza disease and influenza vaccine, understanding their disposition and positioning

against influenza and vaccination, and the actions they take to prevent and treat influenza. Each focus group was led by a moderator, and staff were available to record the audio and to take notes. Audio recordings were transcribed and qualitative analysis was carried out following the categories of analysis of the 3Cs model. The information was coded and processed with the support of Atlas.Ti Version 7 (Atlas.Ti Qualitative Data Analysis, Berlin, Germany).

Document review and interviews with officials

The document review and interviews with officials focused on assessing the situation of the supply side of the vaccination program. Responsible officials were identified based on participation profiles throughout the program's management chain. Interviews were undertaken face-to-face by a trained interviewer. The selection of informants was for convenience, based on the premise of being a health personnel involved in decision-making for influenza vaccination management in the Ministry of Health (strategic), or regional governments in the cities of Arequipa and Lima (tactical). Two strategic level and five tactical level officials participated, distributed between Lima and Arequipa.

Strategies to guarantee the supply of the vaccine and to promote its demand were analyzed through the observation of influenza vaccine policy, planning, and programming and of operational effectiveness. Vaccine policy and general strategies and objectives were observed in official documentation and specified through interviews. Variables observed were objectives, strategies, and goals; strategic planning; provider participation and vaccine availability; regulatory process, purchasing, and distribution; provider network participation and lapses in coverage, program communications, demand and acceptance, and human resource training. The information was integrated into the categories of strategic planning, programming, implementation, and evaluation of the influenza vaccination program.

Results

Exit surveys

The survey had a response rate of 85%. In the groups of older adults and adults with risk factors, women constituted between 60 – 61% of the respondents (Table 2). The mean age in the group of elder adults was 73.3 years, while in adults with risk factors it was 58 years. The mean age in the group of pregnant women was 27 years, and the mean age in mothers of minor children was 31.9 years. The primary education levels were at 39.4% in the older adults, 23.1% in adults with risk factors, 3.8% in pregnant women, and 6.9% in mothers of minor children; 38.8% of women in the group with minor children had achieved technical education. Among adults with risk factors, the most prevalent diseases declared by respondents were hypertension (25.6%), diabetes (22.5%), and gastritis or gastric ulcer (22.5%).

Table 3 summarizes the results of the aggregated indices for the 3Cs. Of the three indices, convenience of the vaccine is the most favorable, with an overall value of 68.5%. Confidence in

Table 2. Sociodemographic characteristics of survey participants by risk group.

	Older adults (n = 160)	Adults with risk factors (n = 160)	Pregnant women (n = 160)	Mothers of chil- dren <6 (n = 160)
	%	%	%	%
Sex				
Male	38.8	39.4	0	0
Female	61.3	60.6	100	100
Total	100	100	100	100
Age (years)				
Minimum	65	23	15	16
Maximum	95	96	41	50
Average	73.3	58	27	31.9
Education level				
Up to primary	39.4	23.1	3.8	6.9
Secondary	39.4	38.1	46.3	36.3
Technical	10	21.3	27.5	38.8
Higher education	11.3	17.5	22.5	18.1
Total	100	100	100	100

Table 3. Comparison across risk groups between means of confidence, complacency, and convenience (and its subcomponents), the average of the three and vaccination status. One-way analysis of variance.

Indicator	Risk group				Total
	Older adults (n = 160)	Adults with risk factors (n = 160)	Pregnant women (n = 160)	Mothers (n = 160)	(n = 640)
	%	%	%	%	%
Confidence	63.3 (a)	64 (a)	65.9 (a)	65.2 (a)	64.6
Complacency*	45.8 (a)	48.1 (a)	48.4 (b)	49.5 (b)	47.9
Less prejudiced about the vaccine**	51.8 (a)	53.4 (a)	51.9 (a)	52.4 (a)	52.4
Knowledge of influenza and vaccine	31.2 (a)	37.2 (b)	41.8 (c)	42.2 (c)	38.1
Perception of risk of influenza	54.3 (a)	53.6 (a)	51.6 (a)	53.8 (a)	53.3
Convenience	64.4 (a)	64.8 (a)	70.8 (b)	73.9 (b)	68.5
Average of the 3Cs	57.8 (a)	59 (a)	61.7 (b)	62.8 (b)	60.3
Vaccinated at least once in life course	46.3 (a)	46.9 (a)	70.6 (b)	70.0 (b)	58.4
Vaccinated in the last year	31.9 (a)	29.4 (a)	54.4 (b)	54.4 (b)	42.5

*The greater the value, the less complacency. ** The greater the value, the less prejudices. In parenthesis, the same letter is assigned to means without statistically significant difference across risk groups or countries.

the vaccine is second with 64.6% and complacency is third with 47.9%. There are no significant differences across risk groups for confidence. Two sets of risk groups show mostly small but significant differences between them with respect to complacency and convenience, in the average of the 3Cs and in vaccination status: these are older adults and adults with risk factors, on the one hand, with lower values, and pregnant women and mothers, on the other, with higher values. In the case of vaccination status, differences are considerable. The three subcomponents of complacency show important differences across them, with prejudices (side effects and reactions) and perception of risk of influenza ranking at about the same values, with between 52.4% and 53.3% for all risk groups, while knowledge of influenza and of the vaccine ranking lower, at

38.1%. No significant differences are observed across risk groups except for knowledge, with older adults scoring 31.2%, adults with risk factors 37.2%, and without significant differences between them, pregnant women and mothers scoring the highest, with 41.8% and 42.2%, respectively.

The association of age, education, and sex with each of the 3Cs is sparse (not shown in tables). Sex was not significantly associated with any of the 3Cs, while age was inversely associated only in relation to convenience for the sample as a whole ($p < .01$). Education was directly associated with complacency only in the case of pregnant women ($p < .05$) and for the sample as a whole ($p < .01$) and in relation to confidence for the sample as a whole ($p < .05$).

The three indexes were found to be significant in their relationship with the decision to be vaccinated in the last year in the total sample ($p < .01$) (Table 4). The confidence index was significant in only for older adults ($p < .01$) and pregnant women ($p < .05$). The index of complacency was significant only for adults with risk factors ($p < .01$), while convenience was significant for pregnant women ($p < .01$) and mothers ($p < .05$). The odds ratios that represent the ratio-change in the odds of the event of interest (vaccinated) for a one-unit change in the indicator in each of the 3C are significant, ranging from 1.024 to 1.027 across indicators for the sample as a whole. This means that a 10-percentage point increase in either indicator would result in expected increases in vaccination status of 10.4% to 11.7%. Odds ratios are highest for older adults in relation to confidence, being of 1.06, and for adults with risk factors in relation to complacency, 1.061. Odds ratios are lowest for older adults in the case of convenience, with 1.016.

Focus groups

In the group of older adults, there were six women and a man, between 65 and 86 years of age, with a relatively high level of education (University or Technical). The group of adults with risk factors had four women and two men aged between 21 and 71 years with a heterogeneous level of education. The group of pregnant women included six participants between the ages 21 and 30 years with a higher educational level; three participants were pregnant for the first time and the other three were in their second pregnancy. The group of mothers with children aged <6 years had six participants between the ages 20 and 45 years, and only three had higher educational levels.

The risk groups expressed their perception of *confidence* in the influenza vaccine by giving their views on vaccine effectiveness and safety (Table 5). Relevant differences were observed between groups, for example, adults with risk factors

had more – and more specific – doubts regarding vaccine safety.

Complacency with the vaccine was addressed by asking about the perceived risks of influenza and the need for vaccination to prevent disease. Of the four groups, older adults showed a clear inclination toward vaccination, with greater awareness of the risks involved in belonging to that group, unlike the other groups, who did not identify themselves as a risk group (Table 6).

Convenience of the vaccine was explored through questions about the feasibility of the influenza vaccine application, its availability, proximity to the health services, the costs, the ability to decide if they want to be vaccinated, the information available, and the quality of treatment received, among others (Table 7). All four groups expressed a high level of convenience for getting vaccinated, especially because of vaccine availability.

Survey data summarized in Table 3 suggest low levels of knowledge about influenza and the vaccine across all risk groups. The beliefs associated with such low levels of knowledge are, however, diverse across risk groups (Table 8). Older adults recognize more than any other group the severity of the disease as well as its mode of transmission, although with other groups – except pregnant women – tend to associate good habits with the prevention of influenza. Adult group with risk factors is the group that more clearly recognizes the importance of the vaccine as well as its symptoms and have a greater level of detail regarding the disease in general. However, it was among this group that the most questionable beliefs were also identified, such as the association of the application of the vaccine to the disease itself or to the complication of respiratory conditions. Mothers of children believed more than any other group on the importance of hygiene for the prevention of the disease, to the extent that good hygiene could substitute for vaccination.

Documentary review and interviews with staff members

The main barriers and opportunities identified by the personnel interviewed are related to strategic planning, coordination, implementation, and evaluation of the vaccination program. Few efforts addressed the uptake of influenza vaccination.

Within strategic planning, the documentary procedure for the vaccine acquisition process is found as a barrier. In the coordination and implementation phases, the barriers are related to the vaccine programming processes, the lack of updating of the *Padrón Nominal* (electronic tool that allows online registration of children <6 years of age), delays in vaccine distribution, and problems in budget management. In the evaluation component, the main barrier is the absence of an

Table 4. Odds ratio of influenza vaccination in the last year and vaccine confidence, convenience, complacency, by risk group. Binary logistic multivariate regression analyses (enter method to select variables).

Risk group	Confidence			Complacency			Convenience		
	OR	CI	P value	OR	CI	P value	OR	CI	P value
Older adults	1.060	1.024–1.096	<0.01	0.995	0.953–1.040	NS	1.016	0.994–1.039	NS
Adults with risk factors	1.011	0.984–1.040	NS	1.061	1.019–1.105	<0.01	1.019	0.998–1.041	NS
Pregnant women	1.033	1.007–1.060	<0.05	1.033	0.997–1.070	NS	1.034	1.015–1.053	<0.01
Mothers of children	1.012	0.987–1.038	NS	1.009	0.977–1.041	NS	1.018	1.0003–1.036	<0.05
All	1.024	1.011–1.038	<0.01	1.024	1.006–1.042	<0.01	1.027	1.017–1.036	<0.01

OR: Odds ratio; CI: confidence interval (95%).

Table 5. Confidence analysis by risk groups.

	Older adults	Adults with risk factors	Pregnant women	Mothers of children <6 years
Overall confidence	(a) Confidence in making an influenza vaccination decision (b) The vaccine is reliable, especially if it is administered in health facilities	(a) The vaccine is not reliable (b) They doubt the effectiveness of the vaccine (c) Vaccination can cause influenza	(a) Experience of not having severe side effects (b) Confidence in health services (c) Only mild side effects occur	There are two subgroups: (a) The vaccine is effective in preventing influenza (b) The vaccine is unreliable
Knowledge	(a) Information about side effects is important (b) Information is required in mass media (c) Misinformation can create false perceptions of vaccine safety	(a) This vaccine, like others, is only partially effective (b) Great influence of beliefs and perception of unwanted side effects on the decision to be vaccinated (c) Demand more information on side effects	(a) The information they receive is adequate (b) Health personnel in prenatal checkups is the main source of information	(a) Need for more and better vaccine information and reasons for vaccination (b) Lack of information in vaccination campaigns (c) Some mothers prefer not to vaccinate their children
Efficacy, safety and side effects	(a) The vaccine is effective and safe (b) Unwanted effects may only occur in some cases (c) None presented negative experiences or identified known cases	(a) Doubts about vaccine efficacy and safety (b) The influenza vaccine has unwanted side effects (c) The conditions of the vaccine could produce undesirable effects (d) Side effects are allergic dermal reactions and idiosyncratic reactions that can be severe (e) The effects are related to vaccination during a respiratory episode	(a) Vaccination is an effective method of prevention (b) Adequate and timely information gives security and favors vaccination, even when there are side effects. (c) Mild adverse events may occur (d) Serious adverse events are infrequent	(a) Non-serious idiosyncratic side effects
Role of the vaccine in prevention	(a) Few identify the vaccine as a method of prevention (b) Principal methods of prevention known and practiced are associated with hygienic and dietary measures	(a) Annual vaccination can prevent influenza (b) Identify useful healthy habits, complementary to vaccination	(a) Identify hygienic and dietary prevention measures	(a) Eating healthy foods prevents influenza (b) It is not necessary to vaccinate if certain hygienic-dietetic measures are practiced (c) The vaccine is complementary to healthy eating

Source: Focus groups.

evaluation of the national vaccination scheme. It was noticeable that the only barrier referred to on the demand-side was geographical accessibility of the vaccine, mainly in rural areas.

Within strategic planning, areas of opportunity identified by participants included consolidating the cooperation agreements between regional governments and public and private institutions and strengthening the health service network. With respect to the processes of coordination and implementation, the main areas of opportunity identified were updating of the *Padrón Nominal* to enable better program planning and community engagement in preparing communication and diffusion plans. In the evaluation component, the main area of opportunity is the periodic implementation of evaluation processes to identify critical areas of the program and to define actions for improvement. Only two areas were identified as opportunities from the perspective of demand: strengthening community participation in communication and diffusion activities and consolidating cooperation agreements between regional governments and public and private institutions.

Discussion

Confidence and convenience in the influenza vaccine were measured at about equal levels and higher than complacency. Confidence and complacency were found to be directly associated with education for the sample as a whole, while the three indicators were observed with about equal impact on being vaccinated in the last year.

Vaccination status is particularly sensitive to confidence among older adults, and to complacency among adults with risk factors. These findings suggest the importance of promoting influenza vaccine confidence among the older population as well among the less educated. Convenience is a component particularly affecting vaccination of pregnant women and children. Knowledge of the vaccine and influenza is particularly weak in general, and the principal factor affecting complacency. While the importance of education has been widely discussed as a social determinant of health status,¹⁶ its role in the determination of each of the 3C components warrants further research.

The information obtained from the exit surveys and from the focus groups was complementary in terms of the similarities and differences observed between the risk groups. It must be noted, however, that focus group participants had a somewhat higher level of education than for the survey sample. The four risk groups showed similar characteristics in their perception of the 3C model, with the important exception regarding the beliefs sustained and the opportunities to improve knowledge and attitudes leading to greater confidence and hence vaccination.

Mothers of minor children and pregnant women showed interest and concern for the welfare of their children or their future child. They attended health services on a regular basis during pregnancy and childcare, and they easily accepted and integrated the influenza vaccine as part of their routine care; however, a lack of clarity was observed in the role assigned to the influenza vaccine as a preventative measure vis-à-vis other

Table 6. Complacency analysis by risk groups.

	Older adults	Adults with risk factors	Pregnant women	Mothers of children <6 years
Risk	(a) The risk of the disease is determined by experience (b) Importance of knowing cases of diseases and how to prevent them	(a) They receive information in health facilities about the importance of vaccination (b) Group well informed by continued medical attention	(a) They do not identify the risk of pregnant women as a particular group (b) They perceive the disease as very likely to be contracted in the general population (c) The disease is treatable (d) Influenza is the result of the complication of respiratory diseases	(a) Everyone is exposed to influenza (b) Children are not identified as a risk group
Severity	(a) The gravity of the disease is known by the experiences of people who have already suffered the disease	(a) Information is provided regarding the severity of the disease in health units (b) Some knowledge about influenza, identifying it as a dangerous disease, which can cause death (c) Knowledge and perception of severity due to symptoms (d) Influenza is a complication of a previous respiratory process	(a) The disease and the symptoms are little known (b) Influenza is a complication of a previous respiratory process (c) Perceive the severity of the disease	(a) Disease considered to be serious (b) Disease is known through the media and because some family member suffered it (c) Influenza is considered a "strong cold" (d) Influenza is a complication of a previous respiratory process
Feasibility of prevention, infection and cure	(a) Influenza can be treated at the health services (b) The doctor is important in the care of the disease (c) Contagion in environments with sick or overcrowded people	(a) The doctor is important in the care of the disease (b) Importance of prevention rather than treatment (c) Vaccination is the basis of prevention	(a) Influenza is preventable (b) Need information from health personnel on the prevention of disease (c) Influenza can be treated and cured by medical personnel	(a) Medical staff has the ability to cure influenza
Prevention and vaccination practices	(a) Knowledge of the existence of the vaccine and its utility in prevention (b) The vaccine is administered late (c) There are multiple methods of prevention	(a) The vaccine is the best way to prevent influenza (b) There are multiple methods of prevention	(a) Existence of the vaccine is known (b) Vaccine is useful to prevent the disease, along with other measures (c) Important to have information about influenza to protect families (d) Need more information about the disease and the vaccine	(a) Influenza is preventable (b) Different forms of dietary hygiene prevention are prioritized (c) Vaccines do not prevent the disease (one case) (d) Need to receive more information

Source: Focus groups.

preventative practices such as a healthy diet. Further research is warranted between how these two sets of practices are related, and if they could lead to influenza vaccine complacency.

In general, pregnant women and mothers of children aged <6 years knew most about influenza and recognized the existence of the vaccine against influenza. Both groups recognized the importance of influenza vaccination as a method of preventing the disease, but prioritized medical consultation, protection from cold weather, food choices, and herbalism over vaccination. Despite this, 70.3% of pregnant women and young children were vaccinated against influenza, unlike 46.6% of older adults or adults with risk factors. This could be related to the fact that in the focus groups older adults and adults with risk factors expressed more doubts about the vaccine than the other two risk groups, and also consistently obtained the least confidence in the exit survey.

Older adults and adults with risk factors had a more detailed perception of influenza risks and influenza vaccine than other risk groups due to familiarity with curative care and health service access, although such perceptions are not necessarily more precise. For them, influenza is a palpable risk; they considered prevention more important compared with the other two risk groups. However, they had a lower

level of understanding of the vaccine characteristics and the risks influenza poses, deepening complacency. These were the groups with greater vulnerability given their low educational level and, in general, showed complacency in regard to knowledge and attitudes toward influenza risks and prevention measures. To increase influenza vaccination coverage in this group, it is imperative to improve the regular access to health services and to provide more and better information. It would be recommendable to expand communication strategies taking advantage of the experience of other countries and regions, such as the social mobilization strategies implemented in Cameroon that were widely accepted by the population.¹⁷

In this context, complacency was the 3Cs model component that posed more issues in terms of the value of the index *viz-a-viz* confidence and convenience; the results show an important room for improvement in the understanding of influenza disease and vaccine. However, confidence, as noted, is the most critical indicator with respect to predicting vaccination.

The results of this study coincide closely with studies by Reinders and collaborators as well as those undertaken by the World Health Organization. Reinders and colleagues explored knowledge, perceptions, and practices about influenza illness

Table 7. Analysis of convenience by risk groups.

	Older adults	Adults with risk factors	Pregnant women	Mothers of children <6 years
Availability	(a) Can be vaccinated in health facilities and during campaign	(a) Ease of access to health services (b) Ease of being vaccinated in campaigns as vaccine not always available in health facilities	(a) Vaccine not always available in health facilities (b) Vaccine availability in workplaces	(a) Establishments and educational institutions identified for vaccination
Closeness	(a) Health facilities are nearby (b) Vaccination is easy and fast	(a) Identify nearby health facilities	(a) Closeness of health facilities (b) Important that health unit is close by or assigned	(a) Easy access to vaccination
Cost	(a) Free public services (b) Vaccines expensive in private services	<i>No comments</i>	<i>No comments</i>	(a) Unaware of free vaccine
Decision	(a) Vaccination decision taken at home by older adults	(a) Individual decisions made (b) Family members participate in health decision-making (c) Decision by heads of family and older members	(a) Pregnant woman decides on her health and the health of her family (b) Decision to be vaccinated assumed by each of the participants (c) Mothers decide (d) Older people have greater capacity of decisions	(a) Individual decision-making
Information	(a) Campaigns are not known (b) Vaccination information comes from health facilities	(a) Vaccination campaigns are important	<i>No comments</i>	(a) Insufficient information (b) Lack of information about campaigns
Treatment	(a) Good interpersonal quality in services and campaigns	<i>No comments</i>	<i>No comments</i>	(a) Barriers to adequate treatment at health services (b) Need for training of health personnel (c) Cultural barriers (d) Poor quality of care in health units
Practices	(a) Vaccination more frequent in vaccination campaigns	(a) Vaccinated only during vaccination campaigns	(a) Pregnant women are vaccinated due to having a sick person at home or from being workers	(a) Do not participate in vaccination campaigns

Source: Focus groups.

and vaccination through a randomized household survey in contrasting urban areas near large hospitals in Peru in 2016. They found low levels of self-perception of pregnant women and older adults as high-risk groups for influenza, with confidence as the most prevalent reason for not being vaccinated, specifically “being afraid of vaccination and its effects.” They also found greater vaccination rates among persons who perceived the severity of influenza.¹¹ The WHO study consisted of a world-wide systematic review of influenza vaccination intention and behavior between 2005 and 2016 and identified important barriers to vaccination against influenza in all risk groups. The most frequent reasons for influenza vaccine hesitancy were due to low-perceived risk of the disease, lack of confidence in the authorities, and low-perceived safety of the vaccine. For seasonal influenza vaccination, lack of confidence due to misconceptions and a negative attitude toward the vaccine was the most reported reasons. For both types of influenza, and in all risk groups, lack of confidence was frequently reported due to low-perceived effectiveness of the vaccine.¹⁸

Regarding the strategic planning of the influenza vaccination program, a focus on the supply-side of the vaccine was identified, with a poor appraisal of the social factors affecting the demand-side. Similarly, at the operational level, the main concern was vaccine availability, with little attention to strategies to improve demand, a problem that was recognized by the staff interviewed. Besides that, no specific information was found on the evaluation of the influenza vaccination program,

paying attention to the vaccination programs in general and especially to the children’s program.

Strategic planning and operational management of the vaccination program are focused mostly on improving access, which is reflected in the high level of convenience observed among the urban population studied. However, greater efforts can be made on the supply side to reduce complacency and increase convenience. Even though vaccine convenience is high, opportunities were identified to strengthen the budgetary and political prioritization, stakeholder coordination, consolidation of the nominal register, and assistance to health personnel in operational planning.

A key aspect noted in the literature is the sensitization of health personnel toward the importance of the vaccine.¹⁹ In Peru, these actions, together with the strengthening of communication and dissemination strategies with an emphasis on risk groups and with an intercultural approach, would influence complacency and especially confidence. However, communication strategies must be precise to avoid counterproductive results which could lead to reinforcing hesitation to vaccination.²⁰

A review of the psychological and social factors affecting vaccination uptake has highlighted three groups of actions to consider for policy and program development: changing what people think and feel about confidence in vaccine effectiveness and concerns about safety; improving normative messaging to bolster altruism in specific social contexts; and leveraging positive attitudes toward vaccination through incentives, sanctions, and requirements.²¹ Our results suggest that the relative success

Table 8. Beliefs regarding influenza and the influenza vaccine by risk group and alignment with the best evidence.

Risk group	Beliefs aligned with scientific knowledge	Questionable beliefs
Older adults	<ul style="list-style-type: none"> Influenza is a serious disease vaccination can have undesirable effects The disease can be transmitted where there is an influx of patients, especially in overcrowded conditions The infection begins in the respiratory system The transmission route is aerial 	<ul style="list-style-type: none"> Influenza can be prevented by eating fruits and vegetables, citrus fruits, vitamin C, sheltering, avoiding getting cold and not drinking ice water
Adults with risk factors	<ul style="list-style-type: none"> Vaccination is the right method to prevent influenza The vaccine is partially effective Influenza can be prevented curtailing the spread of the virus The vaccine has unwanted effects The vaccine may not be effective if out of date Side effects depend on each person Symptoms of the disease are well recognized 	<ul style="list-style-type: none"> If you get vaccinated you can get influenza The vaccine produces adverse reactions when there is a previous respiratory illness No vaccine is reliable Healthy habits prevent influenza The vaccine produces dermal allergic reactions
Pregnant women	<ul style="list-style-type: none"> The vaccine is an effective method to prevent influenza Vaccines are safe and effective Adverse events may occur after administration of the vaccine Serious adverse events are rare Each body receives the vaccine differently 	
Mothers of children under 6 years old	<ul style="list-style-type: none"> The vaccine is useful to prevent disease Adverse reactions depend on each person's body 	<ul style="list-style-type: none"> The vaccine is a complementary measure to the consumption of a healthy diet It is not necessary to receive vaccination if you have adequate hygienic and dietary measures

in Peru with improving the convenience in influenza vaccine access has to be now followed-up with policies to address complacency and especially confidence through appropriate information on safety and effectiveness, through targeted messaging and particularly through performance incentives targeted to health personal and the population at large.

The major strengths of this investigation were analyzed for the first time in Peru influenza vaccine hesitancy from a multi-methods perspective enabling the analysis of complementary supply and demand perspectives. The study is also the first to our knowledge that has published internationally on the situation of the influenza program in Peru and more specifically, on efforts to address vaccine hesitancy.

The most important limitations of the study lie in the sampling of populations living in two large urban areas of the country and no sampling in rural areas nor in small cities, and within large urban areas. The sample size for the exit survey was established based on optimization criteria seeking an adequate balance between the availability of resources and the robustness of the

results. Survey results must therefore be interpreted with caution. However, the age and insurance protection in the surveyed population is close to those observed in other more representative sources of information.¹¹ Another limitation of the study was its focus on the general population high-risk groups, excluding the observation of hesitancy among health workers. This group warrants to be the object of research given the importance of their protection as front-line workers, and the role they play in promoting vaccination among the general population.

Conclusions and recommendations

The analyses carried out on the demand and supply sides of influenza vaccination in urban areas of Peru lead to the identification of opportunities particularly to strengthen confidence and reducing complacency associated with influenza and influenza vaccination. Evident success can be demonstrated on the demand-side with the convenience of accessing the vaccine, although opportunities were identified to improve this indicator. Strategic planning should focus on acquisition and logistics of vaccination, and more importantly, on the incidence of social factors affecting confidence and complacency that emerge as the main determinants of effective vaccination in the urban environments analyzed in Peru.

It is recommended to investigate the factors that affect the different risk groups to increase confidence and reduce complacency, particularly by improving information in relation to the disease, and the benefits and safety of the vaccine. Apart from that, information and communication campaigns, normative messaging, and performance incentives can be strengthened to focus on those aspects that affect confidence and complacency, which were identified in the study with a high level of congruence among its three components. Likewise, it will be important to reduce missed opportunities for vaccination among elders and adults with risk factors. Finally, the application of the ThreeCs model is urged to investigate indecision in vaccine uptake among populations with greater barriers to the access of health services, as well as for lower socioeconomic groups, especially in rural areas of Peru.

Author contributions

Miguel Ángel González-Block, Blanca Estela Pelcastre-Villafuerte, Emilio Gutiérrez-Calderón, Sandra Patricia Díaz-Portillo, Juan Arroyo-Laguna, and Berenice Rodríguez-Zea contributed to project design, methods development, acquisition of data, and data interpretation. Elsa Sarti and Esteban Puentes-Rosas contributed to the design of the study and data interpretation. All authors helped to draft or revise the manuscript, and all authors reviewed and approved the final version.

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