Project VIVA: A Multilevel Community-Based Intervention to Increase Influenza Vaccination Rates Among Hard-to-Reach Populations in New York City

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Objectives. We sought to determine whether the work of a community-based participatory research partnership increased interest in influenza vaccination among hard-to-reach individuals in urban settings.

Methods. A partnership of researchers and community members carried out interventions for increasing acceptance of influenza vaccination in disadvantaged urban neighborhoods, focusing on hard-to-reach populations (e.g., substance abusers, immigrants, elderly, sex workers, and homeless persons) in East Harlem and the Bronx in New York City. Activities targeted the individual, community organization, and neighborhood levels and included dissemination of information, presentations at meetings, and provision of street-based and door-to-door vaccination during 2 influenza vaccine seasons. Participants were recruited via multiple modalities. Multivariable analyses were performed to compare interest in receiving vaccination pre- and postintervention.

Results. There was increased interest in receiving the influenza vaccine postintervention ($P<.01$). Being a member of a hard-to-reach population ($P=.03$), having ever received an influenza vaccine ($P<.01$), and being in a priority group for vaccination ($P<.01$) were also associated with greater interest in receiving the vaccine.

Conclusions. Targeting underserved neighborhoods through a multilevel community-based participatory research intervention significantly increased interest in influenza vaccination, particularly among hard-to-reach populations. Such interventions hold promise for increasing vaccination rates annually and in pandemic situations. (*Am J Public Health.* 2008;98:1314–1321. doi:10.2105/AJPH.2007.115986)

National guidelines recommend annual influenza vaccination for high-risk groups—specifically, persons 50 years and older and persons of any age with chronic medical conditions and their household contacts.[1] Despite these guidelines and the patent benefits of influenza vaccination—including reductions in influenza-related morbidity and mortality, attendant health care costs, and productivity losses[2]—vaccination rates among adults in the United States remain lower than recommended levels, especially among elderly with high-risk conditions and racial/ethnic minorities.[1,3–5]

Although data are sparse, influenza vaccination rates are particularly low among marginalized hard-to-reach urban populations such as substance abusers, undocumented immigrants, and homebound elderly.[6] During the 2004–2005 influenza vaccine shortage, the vaccination rate was 21% among hard-to-reach populations in designated priority groups for vaccination, compared with estimates of 42% among designated priority groups in the general population during this same period.[7] Members of these hard-to-reach groups are less likely to access routine health care or have a health care provider.[8–10] Low vaccination rates combined with risk factors and barriers to accessing health care place hard-to-reach populations at particularly high risk for influenza and attendant morbidity.

Additionally, the need for improvements in annual influenza coverage is coupled with recent concern for the potential of a human influenza pandemic.[11,12] Unvaccinated persons within the larger population may propagate disease, particularly in the event of a pandemic.[2,13] Consequently, public health officials face mounting pressure to vaccinate persons in all risk groups and to do so in a brief period of time.[14–16] Members of disadvantaged, urban, multiethnic communities may face additional challenges during a pandemic, including increased vulnerability and transmissibility from overcrowded living conditions, reliance on mass transportation, and limited access to health care.[17]

Although there have been some previous efforts to vaccinate high-risk populations, few were community-based.[18] Community-based programs that contributed to increased vaccination coverage have included vaccination at syringe exchange sites,[19] an immunization "blitz" in a neighborhood with widespread injection drug use,[20] interventions in religion-based neighborhood health centers, and public service announcements and mailings targeted to racial/ethnic minority Medicaid populations.[21,22] Interventions in medical settings have included components such as standing orders,[23,24] mailings,[25–27] education,[28–30] targeted advertising,[31] and visiting nurse programs.[32] Unfortunately, these efforts may have had little impact on hard-to-reach populations, because members of these groups are less likely to access routine health care.

In December 2003, members of the Harlem Community and Academic Partnership,[33] comprised of representatives from community and academic organizations committed to implementing interventions by using a community-based participatory research (CBPR) approach, formed an intervention working group to address challenges in vaccinating local hard-to-reach populations. Community-based participatory research is a collaborative process among researchers and community members that emphasizes building trust, equitable power sharing, capacity building, and long-term commitment from all involved in the research process.[34–36] The intervention working group, which was

comprised of members representing community residents, community-based organizations (CBOs), academic institutions, and the local health department, met regularly throughout the project to develop the research agenda and study design and to guide project implementation and evaluation. Guided by the Harlem Community and Academic Partnership principles of collaboration, the working group adopted a participatory approach to decisionmaking processes. A multilevel study design was chosen to address individual, social, and contextual factors related to access to, and acceptance of, the influenza vaccine among hard-to-reach populations.[37,38] The working group developed methods to target intervention activities to 3 levels: neighborhood, CBO, and individual.

The overall goal of the Project VIVA (Venue-Intensive Vaccines for Adults) intervention was to develop, implement, and assess a rapid-vaccination protocol for hard-to-reach populations that would increase interest in vaccination, provide free vaccination during 2 influenza seasons, and establish a model for the rapid vaccination of individuals that could be generalizable to other urban areas. We report the results of Project VIVA, including pre–post surveys in the 8 target areas within East Harlem and the Bronx, New York City, that evaluated whether interest in receiving influenza vaccination changed after intervention.

METHODS

Study Population

Intervention activities were conducted in 8 racially and ethnically diverse and economically disadvantaged locations in East Harlem and the Bronx. These 3 neighborhood areas in East Harlem and 5 in the Bronx were 6 to 8 blocks in size and were chosen through a participatory decisionmaking process with members of the intervention working group. The neighborhoods were also chosen on the basis of existing partnerships with CBOs in the area and because the neighborhoods included areas in which hard-to-reach populations were known to congregate.[6,39]

Although there is no uniform definition of hard-to-reach populations,[40–43] populations of interest included substance abusers, possible undocumented immigrants, homeless persons, commercial sex workers, and persons 65 years or older, including the homebound elderly.

Study Design

The intervention project was structured in 5 sequential phases: enumeration, vaccine shortage, pilot vaccination, rapid vaccination, and results dissemination (referred to as phases 1 through 5). In phase 1 (February–October 2004) staff conducted outreach to community members, organizations, and leaders; estimated the size of hard-to-reach populations in the target neighborhoods; and completed surveys to examine barriers to vaccination.[6] Results from these surveys helped guide the intervention strategy. The size of hard-to-reach populations was estimated through several methods, including venue-based and door-to-door sampling. Venue-based sampling resulted in the highest estimates of homeless persons, sex workers, and substance abusers; door-to-door sampling yielded the highest estimates of elderly and immigrants.

The flu vaccine shortage of 2004–2005 caused a delay in project activities, postponing the pilot vaccination phase until more vaccine was procured. From October to December 2004 (phase 2), outreach workers surveyed community members to assess awareness of the shortage and access to the vaccine.[7] Beginning in January 2005, phases 3 and 4 were implemented with a crossover design: 4 neighborhoods chosen at random received the pilot vaccination intervention to assess acceptance of vaccination (January–March 2005), whereas the remaining 4 neighborhoods received the rapid vaccination intervention later that year (September–October 2005). The rapid vaccination effort was used to develop a protocol for vaccinating hard-to-reach populations in the event of an influenza pandemic or other emergency situation.[44]

During phase 3, a team of 4 outreach workers and 1 clinician offered vaccination door-to-door in apartment buildings over 8 weeks. Phase 4 was designed to scale up, by aiming to vaccinate 1500 individuals in the remaining 4 neighborhood areas simultaneously during 10 working days.[44] Following 6 weeks of outreach efforts, 4 teams of 2 nurses and 4 outreach workers offered vaccination door-to-door, at street-based venues, and at CBOs.

Phase 5 focused on generalization and dissemination of the most promising elements of the intervention. We developed a project Web site (http://www.projectviva.org) and sponsored an experts meeting to generate strategies to improve immunization rates among hard-to-reach populations.[45] Project staff also presented findings at community meetings, CBOs, and scientific conferences.

Data Collection

Community residents were sampled through street-based intercepts in 16 venues selected as areas of high traffic in each of the 8 neighborhood areas (2 venues per neighborhood),[6,39] and door-to-door assessments of a random sample of residences in each of the 8 areas. Persons were eligible to participate if they were 18 years or older, spoke English or Spanish, and provided informed consent. In street-based intercepts, participants were first approached and asked if they would be willing to complete a survey. In door-to-door interviews, teams of interviewers approached persons at the doorway of their home and invited them to participate. After participants provided verbal informed consent, outreach workers administered a brief, anonymous survey. The survey assessed self-reported sociodemographic characteristics, social marginalization indicators including substance abuse and commercial sex work, access to health care and general health, vaccination history, and trust of government and social agencies. The outcome measure, interest in vaccination, was assessed in the survey through the question, "Are you interested in taking a vaccine against flu?"

Participants were eligible to receive the vaccine following survey administration if they provided written informed consent, reported no previous adverse reactions to a vaccine, reported no allergy to eggs, had not been previously diagnosed with Guillain-Barré syndrome, were older than 19 years, had not already received the vaccine for that flu vaccine season, and were not pregnant. Participants 19 years and older were eligible for vaccination because state reporting requirements mandated that younger persons report vaccinations, rendering the process

confidential but not anonymous. Additionally, although pregnancy is not a contraindication for influenza vaccination, working group members decided that vaccination of pregnant women would not be well received in our target communities.

Intervention Activities

Intervention activities were tailored to the neighborhood, community organization, and individual level within the 8 neighborhood areas from February 2004 through January 2007.

At the neighborhood level, outreach workers distributed project informational flyers, a comic strip outlining common vaccination myths, and locations of free vaccine clinics to community residents via door-to-door and street-based venues. Materials were disseminated over the course of the project to raise awareness and visibility and to increase interest in vaccination. A project phone number was included on all materials and calls were answered during business hours.

At the community organization level, staff members presented information about the project at local community board meetings and CBOs. Presentations informed community members about future activities and gathered feedback on project methods and results.

At the individual level, nurses and physicians provided vaccination to eligible participants during the vaccination phases (phases 3 and 4).

Data Analysis

Intervention activities were tabulated by intervention level and phase. Additionally, to compare characteristics and behaviors that were associated with interest in receiving influenza vaccination at the time of survey, frequency and proportions were calculated for each variable of interest. Variables were selected on the basis of a priori knowledge and included being a member of a hard-to-reach population, prior receipt of an influenza vaccine, being medically contraindicated for vaccination, date surveyed, and being medically indicated for vaccination, or in a CDC-designated priority group for vaccination. Persons designated as priority groups for vaccination were persons 65 years or older, and adults who had heart disease, kidney disease, diabetes, HIV/AIDS, asthma, and other chronic conditions. Differences at the bivariable level were tested with the Pearson χ^2 test except for when low sample sizes made the use of Fisher exact test more appropriate.

Three multivariate logistic regression models were developed to assess possible correlates of interest in receiving influenza vaccination. Groups modeled included the preintervention sample (phases 1–2), the postintervention sample (phases 3–4), and the combined pre- and postintervention samples (phases 1–4). Additionally, interest in vaccination was also modeled by neighborhood and hard-to-reach population groups. In the preintervention period, outreach efforts raised awareness and increased visibility of the vaccination effort. The postintervention period, in addition to the pilot and rapid vaccination efforts, also included a significant outreach component. Generalized estimating equations were used to account for intraneighborhood correlations. From the final models, odds ratios (ORs) and corresponding 95% confidence intervals (CIs) and *P* values were derived. All analyses were performed with SAS software, version 8 (SAS Institute Inc, Cary, North Carolina).

RESULTS

Among 6826 participants surveyed from February to October 2005 (n=3744 preintervention and n=3082 postintervention) the mean age was 41 years, 60% were women, 72% were Hispanic, and 68% reported an annual income of $9600 or less. Interest in vaccination significantly increased following intervention (80% preintervention to 94% postintervention; $P<.01$).

Overall, 37% of participants were members of 1 or more hard-to-reach populations, including substance users (18%), sex workers (2%), persons 65 years or older (7%), undocumented immigrants (16%), and homeless persons (6%). Demographic characteristics differed by study phase. Participants surveyed before the intervention were more likely to be younger, female, and Black, whereas participants surveyed after the intervention were more likely to be Hispanic (all $P<.01$). Participants were more likely to be sampled door-to-door if they were older, Hispanic/Latino, and a member of a hard-to-reach population, and more likely to be sampled from street-based settings if they were women (all $P<.01$). The number of missing values ranged from 24 to 282 (<1%–4%) for all variables.

Intervention Activities

Table 1 presents activities implemented at each intervention level and within each project phase. At the neighborhood level, 28 323 items, including flyers, comic strips, and informational pamphlets, were distributed to passersby and neighborhood residents in phase 1. Almost 20 000 items were disseminated in phase 2, and during phases 3 and 4, 41 490 items were handed out. During the final phase of the project, staff disseminated 24 000 flyers that noted locations of free vaccine clinics. At the community organization level, 19 presentations were given to local community boards and organizations during phase 1, and 16 presentations were conducted during the remainder of the project. Finally, 566 and 1648 participants were vaccinated in phases 3 and 4, respectively.

TABLE 1—Influenza Vaccination Intervention Outreach Activities in 8 Neighborhood Areas, by Level: Project VIVA, East Harlem and the Bronx, New York City, 2004–2007

Phase	Neighborhood Level (Materials Disseminated[a])	Community Organization Level (Meetings, Presentations)	Individual Level (Vaccination)
Enumeration (Feb–Oct 2004)	28 323	19	. . .
Vaccine shortage (Oct–Dec 2004)	19 748	3	. . .
Pilot vaccination (Jan–Mar 2005)	8 489	0	566
Rapid vaccination (Aug–Oct 2005)	33 001	5	1 648
Results dissemination (Jan 2006–Jan 2007)	24 000	8	. . .

Note. VIVA = Venue-Intensive Vaccines for Adults. Ellipses indicate that the influenza vaccine was not provided during the time period.
[a]Project promotional flyers, vaccination myths cartoons, vaccine and influenza information.

TABLE 2—Correlates of Interest in Influenza Vaccination Among Residents of 8 Neighborhood Areas: Project VIVA, East Harlem and the Bronx, New York City, 2004–2005

	Preintervention					Postintervention				
	Total Sample (n = 3744), %	Interest in Vaccination (n = 3011), %	*P*	AOR (95% CI)	*P*	Total Sample (n = 3082), %	Interest in Vaccination (n = 2882), %	*P*	AOR (95% CI)	*P*
Member of any hard-to-reach population			.05					.38		
No (Ref)	63.4	79.4		1.00		63.6	93.2		1.00	
Yes	36.6	82.1		1.28 (1.04, 1.56)	.02	36.4	94.0		1.14 (0.84, 1.54)	.41
Ever had an influenza vaccine			<.01					<.01		
No (Ref)	33.3	72.8		1.00		39.3	91.4		1.00	
Yes	66.7	84.2		2.23 (1.80, 2.75)	<.01	60.7	94.9		2.37 (2.10, 2.68)	<.01
Medical contraindication for vaccine			<.01					<.01		
None (Ref)	92.0	82.4		1.00		97.5	93.9		1.00	
Some contraindication	8.0	57.5		0.25 (0.21, 0.29)	<.01	2.5	79.2		0.32 (0.20, 0.51)	<.01
Medically indicated for vaccination			.07					.92		
No (Ref)	60.8	79.5		1.00		61.2	93.5		1.00	
Yes	39.2	81.9		1.21 (1.07, 1.36)	<.01	38.8	93.6		0.99 (0.84, 1.17)	.90
Date surveyed			.16					<.01		
Jan–Mar	17.8	82.5		1.26 (0.94, 1.67)	.12	16.8	99.4		0.96 (0.70, 1.31)	.77
Apr–Jun	20.6	77.8		0.97 (0.74, 1.27)	.84	. . .	. . .		. . .	. . .
Jul–Sept	50.4	80.7		1.07 (0.70, 1.63)	.76	12.2	78.8		0.21 (0.12, 0.36)	<.01
Oct–Dec (Ref)	11.2	80.6		1.00		70.9	94.6		1.00	

Note. VIVA = Venue-Intensive Vaccines for Adults; AOR = adjusted odds ratio; CI = confidence intervals. Surveys were not completed from April through June during the postintervention period.

Phases 1 and 2

Results of bivariable and multivariable correlates of interest in vaccination among the 3744 study participants sampled in East Harlem and the Bronx during the preintervention period are presented in Table 2. Overall, 37% of participants were members of a hard-to-reach population and 67% reported having received a prior influenza vaccine. In bivariable analysis, being a member of a hard-to-reach population, ever having received an influenza vaccine, and being medically indicated for vaccination were associated with greater likelihood of being interested in receiving the vaccine. Persons who reported a medical contraindication for immunization were significantly less likely to be interested in the vaccine. In multivariable analysis, persons interested in receiving a vaccine were more likely to be a member of a hard-to-reach population (adjusted OR [AOR]=1.28), report prior receipt of a flu shot ever (AOR=2.23), and be medically indicated for vaccination (AOR=1.21) compared with persons uninterested in the vaccine. Persons who had already received that year's influenza vaccine were counted among those who were interested in receiving vaccination but not actually vaccinated. Participants medically contraindicated for vaccination were less likely to be interested in the vaccine (AOR=0.25).

During phase two, 272 participants were surveyed to assess attitudes and other barriers to vaccination in the target areas during the 2004–2005 influenza vaccine shortage. The findings, described in a previous report, indicated that vaccination rates were substantially lower than the national estimates.[7] However, a higher proportion of those who received vaccination were members of a priority group for vaccine. There was widespread awareness of the shortage (90%), and most attributed it to vaccine production problems.[7] Finally, many of those surveyed said they would be more likely to seek vaccination in current and subsequent influenza seasons because of the shortage.

Phases 3 and 4

During phase three, 566 vaccines were administered door-to-door in 4 neighborhood areas. Vaccines were not distributed in CBOs or street-based settings, because the vaccine shortage limited the vaccine supply. Almost half (45%) of doors that were approached were opened; of those, 27% received the vaccine. Half (52%) of those vaccinated were members of a hard-to-reach population. During the 10-day phase 4, a total of 1648 vaccines were administered in the remaining 4 neighborhoods door-to-door, on the street, and at CBOs. Almost half (45%) of doors approached were opened and 46% of those who opened their door received the vaccine. Members of hard-to-reach populations composed 47% of those who received the vaccine. In phases 3 and 4, the most common reasons for not wanting a vaccine were safety concerns (26%), fear of needles (22%), not being in a designated priority group for vaccination (18%), and being medically contraindicated for vaccination (6%).

Table 2 shows bivariable and multivariable correlates of interest in vaccination among the 3082 participants sampled postintervention (phases 3–4). In bivariable analysis, only 1 covariate, prior receipt of an influenza vaccine, was associated with a greater likelihood of being interested in receiving vaccination. Covariates associated with a lower likelihood of being interested in vaccination were having a medical contraindication to the vaccine and the date the participant was surveyed. After adjustment, the odds of being interested in vaccination were more than twice as great for participants reporting prior receipt of an influenza vaccine (AOR=2.37), whereas participants medically contraindicated for vaccination (AOR=0.32) and persons surveyed from July to September (AOR=0.21) were less likely to be interested in vaccination.

Bivariable and multivariable correlates of interest in receiving the influenza vaccine among the 6826 participants sampled during the pre- and postintervention periods are shown in Table 3. Variables associated with an increased likelihood of being interested in receiving the vaccine were being surveyed postintervention, being a member of a hard-to-reach population, prior receipt of an influenza vaccine, and date surveyed. Persons surveyed from October to December, when most of the vaccine was distributed, were more likely to be interested in vaccination (92%), compared with persons surveyed during the rest of the year ($P<.01$). Table 3 shows, after multivariable adjustment, positive associations between being interested in the vaccine and being surveyed postintervention (AOR=2.69), being a member of a hard-to-reach population (AOR=1.14), prior receipt of influenza vaccination (AOR=2.20), and being medically indicated for vaccination (AOR=1.26). Variables negatively associated with interest in receiving the vaccine were having a medical contraindication to the influenza vaccine (AOR=0.25) and being surveyed from April to June in 2004 and 2005 (AOR=0.63), or from July to September in 2004 and 2005 (AOR=0.60).

Interest in vaccination among participants sampled in the pre- and postintervention periods was also modeled by neighborhood area and hard-to-reach population. Interest in vaccination increased following intervention in 2 areas in East Harlem and 2 in the Bronx ($P<.01$ for all). Hard-to-reach populations were more likely to be interested in receiving the vaccine in 2 of the Bronx areas ($P=.04$ and $P<.01$, respectively), and ever having received a flu vaccination was significantly associated with interest in vaccination in all but 1 of the neighborhoods ($P<.01$ for all). Participants medically indicated for vaccination were more likely to be interested in vaccination in 1 area ($P=.03$). Among hard-to-reach populations, undocumented immigrants, sex workers, and substance users were significantly more likely to be interested in vaccination postintervention ($P<.01$ for all). Prior vaccination was significantly associated with an increased interest in receiving vaccination among participants 65 years and older, homeless persons, and substance abusers ($P<.01$ for all).

TABLE 3—Correlates of Interest in Influenza Vaccination Among Residents of 8 Neighborhood Areas During Pre- and Postintervention Sampling: Project VIVA, East Harlem and the Bronx, New York City, 2004–2005

	Total Sample (n = 6826), %	Interested in Vaccination (n = 5893), %	P	AOR (95% CI)	P
Surveyed pre- or postintervention			<.01		
Preintervention (Ref)	54.9	80.4		1.00	
Postintervention	45.1	93.5		2.69 (2.17, 3.33)	<.01
Member of a hard-to-reach population			.04		
No (Ref)	63.5	85.7		1.00	
Yes	36.5	87.5		1.14 (1.02, 1.27)	.03
Ever had an influenza vaccine			<.01		
No (Ref)	36.0	82.0		1.00	
Yes	64.0	88.8		2.20 (1.85, 2.60)	<.01
Medical contraindication for vaccination			<.01		
No (Ref)	94.5	87.8		1.00	
Yes	5.5	62.0		0.25 (0.21, 0.30)	<.01
Medically indicated for vaccination			.12		
No (Ref)	60.9	85.8		1.00	
Yes	39.1	87.1		1.26 (1.09, 1.46)	<.01
Date surveyed			<.01		
Jan–Mar	17.4	89.9		1.02 (0.60, 1.76)	.93
Apr–Jun	11.3	77.8		0.63 (0.36, 1.09)	.10
Jul–Sep	33.2	80.4		0.60 (0.35, 1.03)	.06
Oct–Dec (Ref)	38.2	92.4		1.00	

Note. VIVA = Venue-Intensive Vaccines for Adults; AOR = adjusted odds ratio; CI = confidence interval.

DISCUSSION

Following Project VIVA—a multilevel community-based intervention aimed at increasing interest in vaccination among hard-to-reach populations through outreach efforts and vaccine distribution—persons living in intervention neighborhoods were more interested in receiving influenza vaccine compared with before the intervention. Specifically, members of hard-to-reach populations, persons reporting any prior influenza vaccine, and persons medically indicated for vaccination were significantly more likely to be interested in receiving the vaccine.

The CBPR approach has been shown to be an effective means to address components of health promotion in population-level intervention studies.[46] The CBPR methods used here, including the intervention working group–led intervention planning and implementation, helped ensure incorporation of community

priorities, and contributed to our ability to overcome issues of distrust and to gain access to members of hard-to-reach populations to deliver immunization. Specific factors related to using a CBPR approach to research, including outreach activities, and the selection of staff with personal knowledge of project neighborhoods, ultimately contributed to the success of the intervention.[44] These factors allowed us to gain access to populations unlikely to report to a private or government-sponsored health clinic to receive immunization. Without the expertise and guidance of the intervention working group it is unlikely that we would have seen the high rates of interest in vaccination among study participants. Our findings demonstrate the feasibility of offering vaccination to members of hard-to-reach populations in nontraditional urban settings through the use of a CBPR framework.

Vaccination of Hard-to-Reach Populations

There is a paucity of data related to vaccination rates among hard-to-reach populations, but reports that do exist show that members of hard-to-reach populations, when they are asked, are interested in receiving vaccination.[19,20] In our overall analysis, hard-to-reach populations were significantly more likely to be interested in vaccination than were others. However, hard-to-reach populations were not significantly more likely than others to be interested in vaccination after the intervention. This is probably because of intervention activities increasing interest in vaccination among the entire sample, not just among the hard-to-reach populations. Although Project VIVA offered vaccination, the impact of the vaccine provision was limited in duration and scope. We suggest that the demonstrated increased interest in receiving vaccination among hard-to-reach populations was more sustainable and could potentially affect future health-seeking behaviors. Further research will need to assess the sustainability of this increased interest after the termination of this project.

During the door-to-door vaccine distribution, less than half of those who opened their door were subsequently vaccinated. However, on the street, only those interested in receiving vaccine were surveyed when approached by project staff. Although different population groups were reached via door-to-door sampling compared with street-based sampling, prioritizing street-based vaccination may maximize the number of vaccines distributed, especially in an era of vaccine shortages or when project resources are limited.

We found that those who had been vaccinated in the past were more likely to be interested in receiving vaccine. This finding is consistent with other studies[47–49] and highlights the importance of promoting access to primary health care and routine vaccination. Other studies have also found that increased access to and use of health care was correlated with higher rates of vaccination.[50] Partnering with CBOs to deliver health care services may hold promise for vaccinating persons without a regular health care provider or persons unlikely to report to a government-sponsored health clinic.

The finding that members of high-risk groups medically indicated for vaccination were more likely to be interested in receiving vaccination is consistent with national estimates of influenza vaccination coverage levels indicating that 26% of persons aged 18 to 49 years with high-risk conditions were vaccinated, compared with 17% of persons without high-risk conditions.[1] Our outreach efforts, including the dissemination of national vaccine guidelines, may have contributed to the higher rates of interest in receiving vaccination among persons in priority groups.

In pandemic situations, gaining access to hard-to-reach populations for immunization could be particularly challenging.[44] Unvaccinated populations may serve as undetected reservoirs of infection and key bridge populations, thereby limiting the effectiveness of populationwide vaccination efforts. The planning process for an influenza pandemic should include the extension of immunization strategies beyond traditional providers to involve immunization in nontraditional settings, including CBOs.[45]

Limitations

There were several limitations to this study. First, the reliance on self-report of interest in vaccination may not necessarily translate into future seeking out of vaccination. Second, this intervention took place in 8 small underserved areas in New York City; it is difficult to know the extent to which these findings are generalizable to other populations in other areas. Third, our definition of hard-to-reach populations included all persons 65 years and older, including homebound and nonhomebound persons. This definition may have overestimated the number of persons who were truly hard to reach. The Intervention Working Group made the decision to target recruitment efforts to the elderly to maximize the amount of vaccine distributed to those at highest risk. Fourth, the decision not to vaccinate pregnant women may be considered a limitation resulting from the decisionmaking process of the working group. Although pregnancy is not a contraindication for influenza vaccination, we respected the concerns raised by working group members that vaccination of pregnant women would potentially not be well-received in our target communities. Fifth, respondents may have visited a venue more than once and, thus, may have been surveyed more than once. Sixth, we estimate that the majority of participants surveyed in venue-based settings were community residents; however, residence was not assessed.

Conclusions

Project VIVA attempted to create an environment that was receptive to influenza vaccination in nontraditional settings within our neighborhood areas. Bypassing the traditional modes of health care delivery and instead offering vaccination in door-to-door and street-based settings is a feasible means of accessing hard-to-reach populations and increasing interest in vaccination. Community-based participatory research interventions such as these may hold promise in increasing vaccination rates among hard-to-reach populations, especially in an era of vaccine shortages and threats of an influenza pandemic. ■

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Contributors

M.H. Coady implemented the study, synthesized the analyses, and led the writing. S. Galea supervised all aspects of study implementation, originated the analyses, and contributed to the writing. S. Blaney completed the analyses. D.C. Ompad assisted with the study. S. Sisco implemented the initial phases of the study. D. Vlahov originated the study and provided project oversight. All authors helped to conceptualize ideas, interpret findings, and review drafts of the article.

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Human Participant Protection

The institutional review board of the New York Academy of Medicine approved the study.

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