

Occupational Conditions and Well-Being of Indigenous Farmworkers

Stephanie Farquhar, PhD, Nargess Shadbeh, JD, Julie Samples, JD, Santiago Ventura, BS, and Nancy Goff, BS

Increasing numbers of indigenous farmworkers from Mexico and Guatemala have been arriving in the Pacific Northwest (indigenous people are not of Hispanic or Latino descent and migrate from regions with unique cultural and linguistic traditions). Multilingual project outreach workers administered surveys to 150 farmworkers in Oregon to assess health, occupational safety, and general living conditions. This study confirms the increasing presence of indigenous peoples in Oregon and characterizes differences between indigenous and Latino farmworkers' occupational and health needs. (*Am J Public Health*. 2008;98:1956–1959. doi:10.2105/AJPH.2007.124271)

There are an estimated 2.5 million farmworkers in the United States and, according to the National Agricultural Workers Survey, about 78% are immigrants.¹ Mirroring a national trend, increasing numbers of new migrants have been arriving in Oregon from indigenous communities in Mexico.^{2,3} Of the estimated 174 000 farmworkers in Oregon, indigenous farmworkers from Mexico and Guatemala, with cultural and linguistic traditions distinct from Latinos, now compose approximately 40% of the farmworkers in Oregon.^{3–5}

Farmworkers in the United States face economic and social challenges. Many endure substandard working and housing conditions. Approximately 20% of farmworkers live in employer-provided housing or in labor camps,¹ many of which lack basic amenities such as hot water and heat. Farms are commonly geographically isolated from health and social services, and studies show that few farmworkers receive federally mandated

occupational health and safety training, elevating their risk of occupational-related injuries and illnesses.^{6–8}

Although the occupational health of migrant farmworkers is becoming increasingly well studied, there is a dearth of research specifically related to indigenous farmworkers. For example, indigenous workers may experience discrimination by both the mainstream US population and other migrant workers. This type of “double discrimination” may push indigenous workers into the most labor-intensive jobs and poorest housing conditions.⁹ Few agencies and organizations serving indigenous farmworkers have acquired the language skills or cultural competence necessary to assist these communities. Linguistically relevant occupational safety materials are difficult to develop because of the multiplicity of languages. Many indigenous languages have no contemporary or standard written form, and literacy levels are generally low, which presents challenges when selecting modalities (i.e., written, oral) for training materials.

We present survey results of the Promoting the Occupational Health of Indigenous Farmworkers Project, a partnership with indigenous populations in Oregon to improve farmworkers' understanding of the hazards associated with agricultural work and to increase their access to economic, health, and social services. Funded by the National Institute of Environmental Health Sciences and the National Institute for Occupational Safety and Health, this 4-year project sought to better understand the unique occupational hazards of indigenous farmworkers and included representatives from the Oregon Law Center, Salud Medical Center, Pinos y Campesinos Unidos del Noroeste (Northwest Treeplanters and Farmworkers United), Portland State University School of Community Health, and Farmworker Justice.

METHODS

Closely following the principles of community-based participatory research,¹⁰ a baseline survey was developed with the input of all project partners. Survey questions were created based on items previously validated with farmworkers,^{2,4} and informed by the

results of focus groups conducted earlier in the project with indigenous farmworkers.¹¹ The survey included 107 items that assessed demographic variables, language skills and preferences, health status, occupational exposures, pesticides knowledge and training, experiences with discrimination, and attitudes about work and community.

Multilingual project outreach workers administered surveys to Spanish- and indigenous language-speaking respondents. Participants were given the option to complete the interview in Spanish or by listening to a prerecorded version in Mixteco Alto, Mixteco Bajo, or Triqui (Copala). Project partners prerecorded the survey in the indigenous languages to ensure that the questions were culturally and linguistically appropriate for some of the indigenous languages most commonly spoken in Oregon and to increase the consistency of the survey administration. Surveys were conducted primarily at labor camps, but also at farmworkers' homes and community centers, between April and October 2006. This timeframe allowed the project to access workers in a variety of agricultural sectors based on seasonal schedules.

All survey participants received information about their rights as a participant before the survey was administered and agreed to participate by providing verbal consent. Participants were given a \$10 gift certificate to compensate for their time and participation.

SPSS version 11.5 (SPSS Inc, Chicago, IL) was used to analyze the data, from which frequencies and descriptive statistics were computed for all survey items. Repeated-measures analysis of variance (ANOVA) and the Pearson χ^2 test were used to examine differences between indigenous and nonindigenous farmworkers' responses. Post hoc analyses (using the Bonferroni test) were computed for significant ANOVAs to locate differences between categories.

RESULTS

Demographics and Health Status

A total of 150 surveys were completed with 76 indigenous and 74 nonindigenous, Latino survey participants; 32% of respondents were female. Results suggest linguistic and cultural diversity among survey respondents. Participants reported that they came from 98

different pueblos (towns) in Mexico, with the majority of indigenous workers originating from the regions of Oaxaca and Guerrero, and Latino workers originating from various parts of Mexico (Table 1). Twelve native languages were represented in our sample; all Latino workers spoke Spanish, and indigenous workers spoke mostly Mixteco Bajo, Zapoteco, and Triqui (Copala and Itunyoso).

Survey participants varied along demographic variables. Compared with nonindigenous workers, indigenous workers were younger (36.0 vs 32.5 years; $P < .05$), had less formal education in Mexico (5.2 vs 4.1 years; $P < .05$), and had been in both the United States and Oregon for a shorter period of time (11.4 vs 7.6 years, and 9.1 vs 6.4 years, respectively; $P < .05$). Both indigenous and Latino workers reported that they received less than 1 year of formal education in the United States.

The majority of farmworkers in Oregon lived in apartments (39%) or labor camps (33%). Indigenous workers lived in significantly more crowded conditions, with an average of 6.4 people per household compared with 4.6 people in Latino households. On average, both indigenous and Latino workers reported that they had few children, either in the United States (1.5 children) or in Mexico (1.1 children), indicating that households mainly comprised adults.

The types of jobs that respondents currently held were different for indigenous and Latino workers. A total of 40% of the indigenous workers hand harvested agricultural products from trees and the ground (called “pickers”) compared with 19% of Latino workers. Latinos worked mostly in orchards (28%) and nurseries (24%), whereas fewer indigenous workers were employed in orchards (4%) and nurseries (19%). Although both indigenous and Latino workers said they were employed for an average of 8.6 months each year, indigenous people spent significantly less time during the year working in Oregon (6.1 vs 7.6 months; $P < .05$). Regardless of work type, only 22% of all respondents said the money they make is sufficient to support their families (including their families in Mexico), and most workers (77%) said it would be difficult or impossible to find work outside of agriculture. Workers were not asked about income because of the sensitive nature of income and legal status; however, the

TABLE 1—Demographic Characteristics of Participant Farmworkers: Promoting the Occupational Health of Indigenous Farmworkers Project, Oregon, April–October 2006

	Total Sample (N = 150), No. (%) or Mean	Nonindigenous Latino (n = 74), No. (%) or Mean	Indigenous (n = 76), No. (%) or Mean
Mexican state of origin*			
Oaxaca	88 (59)	25 (34)	63 (83)
Michoacan	21 (14)	20 (27)	1 (1)
Guerrero	16 (11)	5 (7)	11 (14)
Other	25 (17)	24 (32)	1 (1)
Age, y**	34.2	36.0	32.5
Years of education in Mexico**	4.6	5.2	4.1
Years of education in the United States	0.2	0.2	0.1
Years in the United States*	9.5	11.4	7.6
Years in Oregon**	7.7	9.1	6.4
Gender			
Men	102 (68)	53 (72)	49 (64)
Women	48 (32)	21 (28)	27 (36)
Type of residence			
Apartment	58 (39)	30 (41)	28 (37)
Labor camp	49 (33)	26 (36)	23 (30)
House	27 (18)	12 (16)	15 (20)
Trailer	10 (7)	1 (1)	9 (12)
Other	5 (3)	4 (6)	1 (1)
No. of people in home*	5.5	4.6	6.4
No. of children in United States	1.5	1.2	1.7
No. of children in Mexico**	1.1	0.8	1.4
Types of work*			
Orchard	24 (16)	21 (28)	3 (4)
Nursery	32 (21)	18 (24)	14 (19)
Cannery	21 (14)	13 (18)	8 (11)
Picker	44 (30)	14 (19)	30 (40)
Christmas tree farm	11 (7)	3 (4)	8 (11)
Other	17 (11)	5 (7)	12 (16)
Most hours worked weekly	48.3	48.9	47.7
Least hours worked weekly	29.8	28.6	31.0
Months worked in agriculture yearly	8.6	8.8	8.4
Months worked in Oregon agriculture yearly**	6.8	7.6	6.1
Worker thinks the money made is sufficient to support the family (including family in Mexico)	33 (22)	20 (27)	13 (17)
Visited a health clinic in Oregon*	75 (50)	45 (62)	30 (39)
Worker has health insurance option	19 (14)	11 (16)	8 (11)
Self-reported health			
Excellent	9 (6)	4 (5)	5 (7)
Good	43 (29)	25 (34)	18 (24)
Fair	89 (59)	39 (53)	50 (66)
Poor	9 (6)	6 (8)	3 (4)
How difficult would it be to find work outside of agriculture?			
Impossible	14 (10)	5 (7)	9 (12)
Very difficult	75 (52)	33 (47)	42 (58)
Moderately difficult	22 (15)	13 (18)	9 (12)
Somewhat easy	22 (15)	13 (18)	9 (12)
Very easy	11 (8)	7 (10)	4 (6)

Note. Percentages reported were calculated as a proportion of all respondents that answered the individual question.
*Differences are significant at $P < .01$.
**Differences are significant at $P < .05$.

TABLE 2—Pesticides and Occupational Health of Participant Farmworkers: Promoting the Occupational Health of Indigenous Farmworkers Project, Oregon, April–October 2006

	Total Sample (N = 150), No. (%)	Nonindigenous Latino (n = 74), No. (%)	Indigenous (n = 76), No. (%)
Reported currently working in pesticide-treated areas (n = 67)*	67 (48)	46 (65)	21 (31)
Received any pesticide training	38 (57)	25 (54)	13 (62)
Language of training video or presentation			
Spanish	28 (88)	18 (82)	10 (100)
English	1 (3)	1 (5)	0 (0)
Both	2 (6)	2 (9)	0 (0)
Language of written training materials			
Spanish	12 (63)	11 (79)	1 (20)
English	2 (11)	1 (7)	1 (20)
Both	4 (21)	2 (14)	2 (40)
Exposure to pesticides			
Touched plants outdoors	58 (39)	30 (42)	28 (37)
Breathed in the air	90 (61)	46 (63)	44 (59)
Accidentally sprayed	51 (34)	25 (34)	26 (34)
Touched nursery plants	46 (32)	25 (35)	21 (28)
Worker understands Spanish well enough to receive oral information*	130 (94)	71 (100)	59 (87)
Worker understands Spanish well enough to receive written information*	73 (53)	46 (66)	27 (40)
Experienced language discrimination*	30 (20)	6 (8)	24 (32)

Note. Percentages reported were calculated as a proportion of all respondents that answered the individual question.

*Differences are significant at $P < .01$.

national hourly wage for farmworkers is approximately \$7.25.¹

Additional results suggest that the farmworkers surveyed do not frequently use health services. Only 39% of indigenous workers and 62% of Latino workers had ever been to a health clinic in Oregon, and only 14% of all workers had the option of obtaining health insurance through their employer. Lack of health services utilization is a concern because about 65% of workers said their health was “fair” or “poor.” This is a lower rating than the general US Hispanic population, who on average, rate their health as “good.”¹²

Pesticides and Training

Pesticides pose a great risk to workers' health. Approximately half of the farmworkers interviewed (n = 67) reported currently working in areas that are treated with pesticides, although it is likely that pesticides are applied at all worksites (see Table 2). Latino workers may

have a greater awareness of pesticide use in their workplace, because they reported working around pesticides significantly more than did indigenous workers (65% vs 31%; $P < .01$). Respondents said that they have breathed pesticides in the air (61%), touched plants with visible residue (39%), and have been accidentally sprayed by a plane or tractor (34%). Yet only 57% of the farmworkers who reported working in treated areas said they received any type of pesticide safety training.

All pesticide training discussed by workers had been conducted in Spanish and English. No training was conducted in any indigenous language. When asked about receiving health and safety information, 87% of indigenous workers said that they understood Spanish well enough to understand information presented orally, and only 40% said that they could understand Spanish well enough to understand written information. Other studies and results from this project's focus groups suggest that

indigenous workers much prefer to receive materials and understand information more completely when presented in their indigenous languages.²

Indigenous workers reported higher levels of discrimination experienced on the job. A total of 32% of indigenous workers reported discrimination for speaking their native language in the workplace, whereas only 8% of Latino workers experienced this problem for speaking Spanish. The specific source of the discrimination was not evaluated in the survey questionnaire. However, previous reports indicate that discrimination against indigenous workers exists from American and Latino supervisors, employers, and coworkers.⁹

DISCUSSION

There were several limitations to this study. Principally, the data are based on 150 survey interviews with farmworkers in Oregon. This small number may reduce the study's statistical power and the generalizability of study findings to other farmworkers who live outside of Oregon. However, interviews were conducted from spring through early fall of 2006 in an effort to include farmworkers in a variety of agricultural settings. Additionally, we included seasonal farmworkers who live in Oregon year-round, as well as migrant farmworkers who move between states and are more transient, to understand farmworkers' experiences outside this region.

Primary findings suggest that the farmworkers who participated in the survey are exposed to health-threatening conditions, including exposure to pesticides and discrimination, yet receive inadequate training about ways to protect themselves. Previous studies have found similar low levels of pesticides training^{2,6} and evidence of discrimination against indigenous farmworkers⁹ in the workplace. Indigenous farmworkers are especially at risk, because the training that is provided is presented in a language that they may not fully comprehend. A recent study of indigenous farmworkers in California reported that only 62% of women and 57% of men understood the pesticide training information given to them in the workplace.¹³ During years 3 and 4 of the Promoting the Occupational Health of

Indigenous Farmworkers Project, partners will promote leadership among indigenous farmworkers by directly involving the farmworkers as *promotores/as* (health promoters) to develop educational materials and advocate for healthier occupational environments. The changing demographics of the agricultural workforce require development of suitable services and materials for indigenous farmworkers, as well as greater attention to this population's basic rights. ■

About the Authors

Stephanie Farquhar and Nancy Goff are with the School of Community Health, Portland State University, Portland, OR. Nargess Shadbeh, Julie Samples, and Santiago Ventura are with the Oregon Law Center, Woodburn.

Requests for reprints should be sent to Stephanie Farquhar, PhD, Portland State University, School of Community Health, PO Box 751, Portland, OR 97207 (e-mail: farquhar@pdx.edu).

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Contributors

S. Farquhar facilitated development and implementation of research instruments and protocol, data analyses and interpretation, and article preparation. N. Shadbeh conceptualized the study and supervised all aspects of implementation and evaluation. N. Shadbeh, J. Samples, and S. Ventura provided expertise on farmworker communities in Oregon, contributed to development of instruments, conducted focus groups, administered surveys, interpreted data, and edited the article. N. Goff managed, analyzed, and interpreted the data, and contributed to article preparation and editing.

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Human Participant Protection

Human participant approval for this research was obtained from the institutional review board at Portland State University.

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We used a retrospective, matching, birth cohort design to evaluate a comprehensive, coalition-led childhood immunization program of outreach, education, and reminders in a Latino, urban community. After we controlled for Latino ethnicity and Medicaid, we found that children enrolled in the program were 53% more likely to be up-to-date (adjusted odds ratio=1.53; 95% confidence interval=1.33, 1.75) and to receive timely immunizations than were children in the control group ($t=3.91$). The coalition-led, community-based immunization program was effective in improving on-time childhood immunization coverage. (*Am J Public Health*. 2008;98:1959–1962. doi:10.2105/AJPH.2007.121046)

The most effective strategies for improving community-wide childhood immunization rates combine reminders, tracking, and outreach.^{1,2} Most evidence about these strategies derives from provider-driven programs, with very little from community-driven programs.^{3–6} Our immunization program, Start Right, is community driven, but until recently, we have not had community-specific data for demonstrating its effectiveness, relying instead on comparisons to national data.^{7,8} In this study, we re-examined the program's effectiveness with a comparison cohort in our own community.

METHODS

Prior to the intervention, our Latino, low-income community in New York City had childhood immunization rates of 57%—well below city and national rates.⁷ To address this problem, Start Right, our 23-partner coalition, adapted national and citywide materials for its own package of bilingual and community-appropriate immunization-promotion materials; trained peer health educators; implemented personalized immunization outreach and promotion within social service and educational programs; provided outreach, education, and reminders to parents; and supported provider immunization delivery^{1,5,6,9–19}

Effectiveness of a Community Coalition for Improving Child Vaccination Rates in New York City

Sally E. Findley, PhD, Matilde Irigoyen, MD, Martha Sanchez, MA, Melissa S. Stockwell, MD, Miriam Mejia, BA, Letty Guzman, BA, Richard Ferreira, MSW, Oscar Pena, JD, Shaofu Chen, MD, PhD, and Raquel Andres-Martinez, PhD

(Table 1). Enrollment, tracking, and accountability were shared among partners.^{20,21} Participants were recruited through the Special Supplemental Nutrition Program for Women, Infants, and Children (27%), facilitated State Children’s Health Insurance Program enrollment program (20%), childcare and Head Start centers (20%), parenting assistance programs (19%), and housing and tenant associations (9%). The refusal rate was 2%.

Study Design

We used a quasi-experimental, retrospective, birth cohort design^{22,23} with 10857 children born between April 1999 and September 2003 at the primary community hospital (76% of community births) who resided in the community’s zip codes. Following National Immunization Survey methodology, we created 4 annual cohorts of children, aged 19 to 35 months as of April 1 of each year, 2002 to 2005 (n=2879, 2788, 2653, and 2577,

respectively). The annual cohorts were divided into intervention and control groups. The study was conducted retrospectively in 2006 to 2007.

The hospital database was used for demographics; the New York Citywide Immunization Registry (CIR) for immunization records. CIR is a population-based registry with mandated provider reporting. Most children (88%) had a record in CIR (n=9511; 93.9% of the Start Right group, 87.0% of the control group).

Outcome measures were up-to-date immunizations for the 4:3:1:3:3 series (4 diphtheria-tetanus-pertussis [DTaP]; 3 polio; 1 measles-mumps-rubella; 3 *Haemophilus influenzae* b; and 3 hepatitis B²⁴) and timeliness of the last DTaP dose, known as DTaP4, measured by elapsed days between the date a child became overdue and the immunization date for children with a DTaP4 dose (n=5059).²⁵ Significance of differences in coverage and timeliness were assessed with the χ^2 test and the unpaired

2-sample Student’s *t* test. Logistic regression was used to estimate adjusted odds ratios (AOR) for the intervention effect on immunization status, controlling for Latino ethnicity and Medicaid enrollment (n=10 231).²⁶ We used Stata 9.0 (StataCorp, College Station, TX) for statistical analysis.

RESULTS

Across all birth cohorts, 8.2% (n=895) enrolled in Start Right. Compared with control groups, children in Start Right were similar in age (mean=27.4 months) but were more likely to have Medicaid (85.1% vs 78%; $\chi^2=27.8$; *df*=2; *P*<.001) and be Latino (92% vs 85.1%; $\chi^2=39.1$; *df*=2; *P*<.001).

Children in Start Right achieved significantly higher (11.1%) immunization coverage than did control children ($\chi^2=44.6$; *P*<.001; Figure 1) and completed the immunization series earlier, by 11 days (*t*=3.91). After controlling for ethnicity and Medicaid, children in Start Right

TABLE 1—Community-Based Immunization-Promotion Program Components

Strategy	Implementation	Result
Membership	A total of 23 community organizations: social services, housing, faith-based, childcare providers, primary care providers, the city health department.	Broad-based constituency.
Leadership	Shared leadership, academic, 2 community organizations.	Enhanced coordination and community ownership.
Program design	Used community organization needs and experiences and provider perspectives to select evidence-based best practices and to develop bilingual and community-specific outreach and educational materials.	Blend of own experience and national evidence-based insights; enhanced community ownership and relevance of immunization materials.
Integration into existing services	Immunization promotion designed as an “add-on” to 5 basic community social service and education programs: parenting assistance, childcare, facilitated enrollment for SCHIP, housing assistance, and WIC. Implementation guide tailored the intervention to each type of program.	Immunization promotion not stand-alone, but incorporated into ongoing programs working with parents of young children.
Staff/peer training	Social service and educational staff or peers trained in immunization outreach, education, reminders and tracking with our own bilingual materials and curriculum, including Immunization 101, Card Reading, Tips on Educating Parents, and Methods for Reminding and Tracking Families.	A total of 998 community staff trained in 2000 to 2007, with 150 to 200 active at any given time; enhanced outreach and sustainability through the long-term presence of trained staff in the community.
Parental empowerment	Parents learn about immunizations, immunization cards, and the immunization schedule from peers or trusted staff through one-on-one and group sessions. Use of coalition-developed, bilingual, low-literacy materials.	A total of 10 251 parents participated, with 60% receiving one-on-one education, and 40% receiving both group and one-on-one education. Parents like the program and recommend it to friends.
Reminders and recall	Parents given calendar dates for when shots are due, reminder phone calls and cards before each immunization due date, and recall phone call, card, or visit if missed.	Average of 2.7 calls, reminders, or visits per child.
Tracking	Decentralized immunization tracking at each member organization, consolidating data from parents’ cards and electronic registries.	A total of 184 896 immunization records in the consolidated coalition database, including 24% recorded only on the child’s vaccination card.

Note. SCHIP=State Children’s Health Insurance Program; WIC=Special Supplemental Nutrition Program for Women, Infants, and Children.

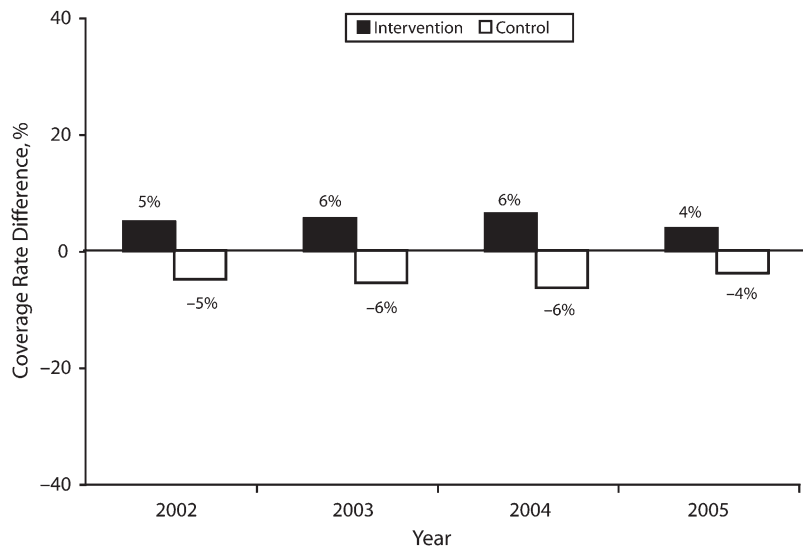


FIGURE 1—Differences in registry-reported immunization coverage rates from the community average: New York City, 2002–2005.

were 53% more likely to be up-to-date than were control children (AOR=1.53; 95% confidence interval [CI]=1.33, 1.75). Neither Latino ethnicity (AOR=1.07; 95% CI=0.93, 1.24) nor Medicaid (AOR=1.05; 95% CI=0.95, 1.16) significantly influenced immunization coverage.

DISCUSSION

Despite similarities at birth and control for ethnicity and Medicaid insurance, less than 3 years later, the children in the Start Right intervention had significantly higher immunization coverage rates than did the rest of their birth cohort. The community birth cohort control further validates our earlier findings regarding the effectiveness of our community-driven, comprehensive immunization-promotion intervention.^{7,8} The observed increased coverage is not the result of a higher community-wide immunization level, but of the immunization-promotion program year after year. This improvement in coverage is well within the range expected for reminder-recall interventions and other community-based programs.⁵

The major limitation to this study was incomplete data reporting to the CIR.^{27,28} In contrast to our previous reports, which included parent-held vaccination card data, we only included

registry data in this study. Incomplete provider reporting of immunizations to the CIR, estimated at 85%, may have downwardly biased immunization coverage.²⁹ As indicated in Table 1, including only immunizations reported to the CIR excluded 24% of immunizations recorded on the intervention children's vaccination cards.

We attribute the success of the program to a number of factors, including community ownership of the program, integration of immunization promotion into social service and educational programs, training of a large cadre of peer educators, intense parental education and empowerment, and culturally appropriate reminders arising out of the context of our intervention. We hope that this study helps others seeking ways to embed health care promotion into community programs. ■

About the Authors

Sally E. Findley, Martha Sanchez, and Raquel Andres-Martinez are with the Heilbrunn Department of Population and Family Health, Mailman School of Public Health, Columbia University, New York, NY. At the time of the study, Matilde Irigoyen, Melissa S. Stockwell, Oscar Pena, and Shaofu Chen were with the Department of Pediatrics, College of Physicians and Surgeons, Columbia University, New York. Miriam Mejia and Letty Guzman are with Alianza Dominicana, Inc, New York, NY. Richard Ferreira is with Harlem Congregations for Community Improvement, New York.

Reprint requests should be sent to Sally E. Findley, Heilbrunn Department of Population and Family Health, Mailman School of Public Health, Columbia University, 60 Haven Ave, B-2, New York, NY 10032 (e-mail: sef5@columbia.edu).

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Contributors

All authors except R. Andres-Martinez (who joined the team later) participated in the design of the study. M. Irigoyen and M.S. Stockwell obtained the control sample data, and S. Chen and R. Andres-Martinez assembled and analyzed the data. L. Guzman helped develop the Start Right database and, with O. Pena, assured high-quality data inputs from partners. The article was drafted by S.E. Findley, M. Irigoyen, M. Sanchez, and M.S. Stockwell, with assistance in developing the program summary in Table 1 from M. Mejia and R. Ferreira, who also reviewed the final draft of the article.

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Human Participant Protection

This study was approved by the Columbia University Medical Center institutional review board.

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