

# Impact of Individual-, Environmental-, and Policy-Level Factors on Health Care Utilization Among US Farmworkers

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US farmworkers face significant disease burden<sup>1</sup> and excessive mortality rates for some diseases (e.g., certain cancers and tuberculosis) and injuries.<sup>2</sup> Disparities in health outcomes likely stem from occupational exposures and socioeconomic and political vulnerabilities. US farmworkers are typically Hispanic with limited education, income, and English proficiency.<sup>3</sup> Approximately half are unauthorized to work in the United States.<sup>3</sup> Despite marked disease burden, health care utilization appears to be low.<sup>1,4–9</sup> For example, only approximately half of California farmworkers received medical care in the previous year.<sup>6</sup> This rate parallels that of health care utilization for US Hispanics, of whom approximately half made an ambulatory care visit in the previous year, compared with 75.7% of non-Hispanic Whites.<sup>10</sup> Disparities in dental care have a comparable pattern.<sup>6,8,11,12</sup> However, utilization of preventive health services is lower for farmworkers<sup>5,7,13,14</sup> than it is for both US Hispanics and non-Hispanic Whites.<sup>15,16</sup>

Farmworkers face numerous barriers to health care<sup>1,4,17</sup>: lack of insurance and knowledge of how to use or obtain it,<sup>6,18</sup> cost,<sup>5,6,12,13,18–20</sup> lack of transportation,<sup>6,12,13,19–21</sup> not knowing how to access care,<sup>6,18,20,21</sup> few services in the area or limited hours,<sup>12,20,21</sup> difficulty leaving work,<sup>19</sup> lack of time,<sup>5,13,19</sup> language differences,<sup>6,8,18–20</sup> and fear of the medical system,<sup>13</sup> losing employment,<sup>6</sup> and immigration officials.<sup>21</sup> Few studies have examined correlates of health care use among farmworkers. Those that have are outdated or limited in representativeness.<sup>5,7,14,22,23</sup> Thus, we systematically examined correlates of US health care use in a nationally representative sample of farmworkers, using recently collected data. The sampling strategy and application of postsampling weights enhance generalizability. We selected correlates on the basis of previous literature and the behavioral model for vulnerable populations.<sup>24</sup> The behavioral model posits that predisposing, enabling, and need characteristics influence health care

**Objectives.** We examined individual-, environmental-, and policy-level correlates of US farmworker health care utilization, guided by the behavioral model for vulnerable populations and the ecological model.

**Methods.** The 2006 and 2007 administrations of the National Agricultural Workers Survey (n=2884) provided the primary data. Geographic information systems, the 2005 Uniform Data System, and rurality and border proximity indices provided environmental variables. To identify factors associated with health care use, we performed logistic regression using weighted hierarchical linear modeling.

**Results.** Approximately half (55.3%) of farmworkers utilized US health care in the previous 2 years. Several factors were independently associated with use at the individual level (gender, immigration and migrant status, English proficiency, transportation access, health status, and non-US health care utilization), the environmental level (proximity to US–Mexico border), and the policy level (insurance status and workplace payment structure). County Federally Qualified Health Center resources were not independently associated.

**Conclusions.** We identified farmworkers at greatest risk for poor access. We made recommendations for change to farmworker health care access at all 3 levels of influence, emphasizing Federally Qualified Health Center service delivery. (*Am J Public Health.* 2011;101:685–692. doi:10.2105/AJPH.2009.190892)

use.<sup>25</sup> The ecological model, which specifies several levels of influence on behavior (e.g., policy, environmental, intrapersonal),<sup>26</sup> provided the overall theoretical framework. To our knowledge, we are the first to extensively examine multilevel correlates of farmworker health care use. We sought to identify farmworkers at greatest risk for low health care use and to suggest areas for intervention at all 3 levels of influence so that farmworker service provision can be improved.

## METHODS

The National Agricultural Workers Survey (NAWS) sample, conducted annually in 39 US states,<sup>27</sup> provided the study's primary data. Because of fluctuations and regional differences in population, the NAWS uses multistage sampling and bases the sampling frame on crop labor estimates.<sup>27</sup> Employers are identified with simple random sampling and whether they agree to

recruitment; their farmworkers are randomly selected and asked to provide written informed consent; and then consenting, eligible farmworkers are interviewed.<sup>27</sup> Eligible farmworkers hold a variety of job titles (e.g., fieldworkers, supervisors), but some (e.g., poultry or livestock workers or workers with H-2A visas) are excluded from recruitment.<sup>27</sup> We used data from 2006 (n=1519) and 2007 (n=1511) fiscal year administrations. NAWS researchers contacted 5254 employers; 1456 were eligible, and 692 (47.53%) participated in recruitment. NAWS researchers contacted 3379 workers, of whom 3099 (91.71%) participated (3030 provided valid data). We imputed values for case participants with missing data on continuous variables (age and income) with expectation maximization. We used listwise deletion for categorical variables (all had <5% of case participants missing) and eliminated 4 outliers. Although vulnerable farmworkers (e.g., low income, low education) had significantly more missing data, descriptive

and bivariate findings were comparable before and after data cleaning. The final sample consisted of 2884 farmworkers.

### Measures

The NAWS is an approximately 60-minute interviewer-administered survey. Location and language are selected by the farmworker.

*Outcome and individual-level factors.* Response to the question, “In the past 2 years, in the United States, have you used any type of health care services from doctors, nurses, dentists, clinics, or hospitals?” was the dichotomous outcome variable. Categorical sociodemographic variables evaluated as potential correlates were gender, marital status, country of origin (US born vs non-US born), immigration status (citizen, green card or other authorization, and unauthorized status), English proficiency (speak and read well [proficient], speak and read at least a little or somewhat [moderate], and all others [limited]), and access to transportation (US car or truck ownership vs not). Because Latino or Hispanic ethnicity is known to be associated with health care use,<sup>10</sup> a variable reflecting race/ethnicity was included. Participants were asked to categorize themselves into racial/ethnic categories, which the NAWS research team had created. We then combined responses to create a dichotomous variable: Hispanic (Mexican, Mexican American, Chicano, Puerto Rican, or other Latino/Hispanic) versus not Hispanic.

Additional categorical variables were the following: migrant status (nonmigrant, follow-the-crop [FTC] migrant [2 farmwork locations > 75 miles apart], and shuttle migrant [international shuttle or US homebase > 75 miles away but not FTC]), difficulty obtaining health care ( $\geq 1$  barrier vs none), need (diagnosis of chronic disease [i.e., heart disease, diabetes, or asthma] vs none), and use of non-US health care in the past 2 years. Age, annual family income, and educational attainment (in years) were continuous.

*Environmental-level factors.* To characterize county rurality and US–Mexico border proximity, we used the US Department of Agriculture’s system (1 [urban]–9 [rural])<sup>28</sup> and the US–Mexico Border Health Commission’s definition (within 62 miles),<sup>29</sup> respectively. The 2005 Uniform Data System, an annual survey administered to Federally Qualified Health Center

(FQHC) grantees,<sup>30</sup> provided FQHC information. FQHC information included grantee or delivery site locations and Section 330 funds (i.e., federal dollars distributed to FQHC grantees), full-time equivalent (FTE) physicians, and total FTE staff. Using geographic information systems,<sup>31</sup> we mapped grantees, delivery sites, and NAWS growers.<sup>32</sup> To obtain grantees’ counties and total county FQHC delivery sites, we performed, respectively, county–grantee and county–delivery site geographic information systems spatial joins. We aggregated FQHC resources to the county level and incorporated farmworker population (per 1000 farmworkers who performed agricultural work in county; population estimates derived from the 2007 census of agriculture). We also used geographic information systems data to calculate distance (Euclidean, in meters) from employer to nearest FQHC delivery site.<sup>33</sup> For all variables except distance to nearest FQHC, we merged data with the county in which interviews were conducted.

*Policy-level factors.* Insurance status (insured vs not), pay structure (salary, hourly, and piece rate or combination piece and hourly), and workers compensation (provided vs not) were categorical variables.

### Statistical Analysis

We applied postsampling weights to account for probability of sample inclusion.<sup>34</sup> We used Stata version 9 (StataCorp LP, College Station, TX)<sup>35</sup> and SPSS version 13.0 (SPSS, Inc, Chicago, IL)<sup>36</sup> to calculate weighted individual or policy and nonweighted environmental descriptive statistics, respectively. We used Stata version 9 to assess weighted bivariate associations. We included variables significantly associated with health care use in bivariate tests ( $P < .05$ ) in a multivariate binary logistic regression analysis. Because of multicollinearity among health care resource and accessibility variables, we entered only 3 county-level variables: total FTE staff, rurality, and border proximity. To account for clustering among farmworkers (level 1), within workplaces (level 2), and within counties (level 3), we used HLM version 6 (Scientific Software International, Lincolnwood, IL).<sup>37</sup> We entered individual and policy, distance to nearest FQHC, and county variables on levels 1, 2, and 3, respectively. We entered continuous variables grand-mean centered. We performed dummy coding for variables

with 3 categories (we reran the model with new reference groups to obtain all comparisons).

## RESULTS

More than half (55.26%) of farmworkers reported having used US health care during the previous 2 years. Table 1 presents individual variable descriptive data. The majority of farmworkers were male, married, Hispanic, foreign born, and in their 30s, with low educational attainment and low annual family income. Approximately half were unauthorized or had limited English language proficiency. Most farmworkers were nonmigrant, and few had a chronic disease diagnosis. Fewer than half had experienced at least 1 barrier to care or did not own a vehicle in the United States. Less than one fifth had used non-US health care in the past 2 years. Table 2 presents environmental variable descriptive data. NAWS counties were more urban, and few were near the US–Mexico border. Employers were closest to 263 unique delivery sites (affiliated with 135 grantees). Nearly half (40.7%) of affiliated grantees were migrant health centers. Table 3 presents policy variable descriptive data. The majority reported uninsurance, workers compensation coverage, and hourly payment.

### Bivariate Associations With Health Care Use

Table 1 presents bivariate associations between categorical individual variables and health care use. Numerous characteristics were associated with increased use: female, married, non-Hispanic, US born, chronic disease diagnosed, owned a vehicle, and only used US health care. US citizens were more likely to have used health care than were those with a green card or other authorization, who in turn were more likely to have used health care than were unauthorized farmworkers. The highest rates of use were reported by English proficient, followed by moderately proficient farmworkers. Nonmigrant farmworkers used more health care (FTC migrants had the second highest rates). The relationship with barrier endorsement was nonsignificant. Regarding continuous variables, farmworkers who used health care were significantly older (mean = 36.47; SE = 0.59 vs mean = 32.40; SE = 0.57;  $F = 24.66$ ), with significantly higher

**TABLE 1—Individual-Level Characteristics and Their Bivariate Associations With US Health Care Use: National Agricultural Workers Survey Sample, United States, 2006–2007**

Variable	Proportion, % or Mean (SE)	Used Health Care During the Previous 2 Y, % (95% CI)	Design-Based Pearson F Test
Mean age, y	34.65 (0.42)		
Mean income, US \$	21 484.97 (344.02)		
Mean education, y	7.79 (0.12)		
Gender			43.26***
Female	19.76	77.87 (70.84, 83.60)	
Male	80.24	49.69 (46.33, 53.06)	
Marital status			4.52*
Married	58.38	58.10 (54.49, 61.63)	
Not married	41.62	51.27 (46.06, 56.44)	
Race/ethnicity			73.55***
Non-Hispanic	20.32	82.71 (76.60, 87.48)	
Hispanic	79.68	48.26 (45.04, 51.49)	
Country of origin			75.97***
US born	26.16	80.55 (74.50, 85.45)	
Foreign born	73.84	46.30 (43.11, 49.51)	
Immigration status			77.69***
Citizen	28.51	79.56 (73.91, 84.25)	
Green card or other authorization	20.57	65.49 (59.97, 70.63)	
Unauthorized status	50.92	37.51 (33.87, 41.30)	
English proficiency			74.46***
Proficient <sup>a</sup>	25.57	81.20 (74.99, 86.16)	
Moderately proficient <sup>b</sup>	24.81	64.53 (59.58, 69.19)	
Limited proficiency <sup>c</sup>	49.62	37.25 (33.62, 41.02)	
Migrant status			71.40***
Nonmigrant	70.87	66.39 (63.17, 69.48)	
Follow-the-crop <sup>d</sup>	4.35	36.82 (25.78, 49.44)	
Shuttle migrant <sup>e</sup>	24.78	26.65 (21.34, 32.73)	
Health status			40.57***
Lifetime chronic disease diagnosis	8.13	87.54 (78.89, 92.96)	
No chronic disease diagnosis	91.87	52.40 (49.25, 55.54)	
Barriers to care			3.14
Endorsed none	55.80	57.71 (53.82, 61.51)	
Endorsed ≥ 1	44.20	52.16 (47.36, 56.92)	
Access to transportation in United States			102.50***
Owns car	54.73	69.41 (65.90, 72.71)	
Does not own car	45.27	38.15 (33.54, 42.98)	
Health care use outside United States			50.93***
No	81.80	60.49 (57.24, 63.65)	
Yes	18.20	31.72 (25.40, 38.80)	

Note. CI = confidence interval.

<sup>a</sup>Defined as speaking and reading English well.

<sup>b</sup>Defined as speaking and reading English at least a little or somewhat.

<sup>c</sup>Defined as all others who are not proficient or moderately proficient.

<sup>d</sup>Defined as a person who has 2 farmwork locations > 75 miles apart.

<sup>e</sup>Defined as a person who does an international shuttle to work or has a US homebase > 75 miles away but is not a follow-the-crop worker.

\**P* < .05; \*\*\**P* < .001.

income (mean = 23 937.09; SE = 545.67 vs mean = 18 456.64; SE = 381.66; *F* = 67.74) and education (mean = 8.58; SE = 0.15 vs mean = 6.82; SE = 0.16; *F* = 61.00), *P* < .001.

Table 2 shows bivariate associations between continuous environmental variables and health care use. Farmworkers who used health care worked in counties with significantly higher mean density of FQHC delivery sites, Section 330 funds, FTE physicians, and total FTE staff. Counterintuitively, farmworkers who used health care had higher mean distances to the nearest FQHC and worked in more rural counties. The proportion of farmworkers who used US health care was significantly higher for nonborder counties (55.89%; 95% confidence interval [CI] = 52.81, 58.93 vs 33.74%; 95% CI = 21.96, 47.95; *F* = 9.27; *P* = .002). Table 3 presents bivariate associations between policy variables and health care use. Farmworkers with insurance and workers compensation were more likely to have used health care. Rates of use were highest among salaried farmworkers and lowest among those paid by piece or a combination of hourly and piece pay.

### Independent Multivariate Associations With Health Care Use

We used median odds ratios (MORs) to estimate clustering,<sup>38</sup> which was moderate. The range of level 2 MORs was 1.01 to 1.71. Clustering at level 3 was higher (MORs = 1.73–2.26). The addition of variables (especially at level 1) substantially reduced the MORs. Results from the multilevel population-average model are presented in Table 4. In multivariate tests, farmworkers who were women, were moderately proficient in English (vs limited), were nonmigrant (vs shuttle and FTC migrant), and had a green card or other authorization (vs unauthorized status) were more likely to have used US health care in the previous 2 years, as were those with a chronic disease diagnosis, with US vehicle ownership, and who had not sought non-US care in the past 2 years. Working in a nonborder county was associated with higher US health care use. Insured farmworkers and those paid by salary (vs hourly and piece or combination) had higher rates of use. Total FQHC full-time equivalent staff and distance to nearest FQHC were not independently associated.

**TABLE 2—Environmental-Level Characteristics and Their Bivariate Associations With US Health Care Use: National Agricultural Workers Survey Sample, United States, 2006–2007**

Variable	Proportion, % or Mean (SD)	Used Health Care During the Previous 2 Years, Mean (SE)	Did Not Use Health Care During the Previous 2 Years, Mean (SE)	Wald F Test
County FQHC sites <sup>a</sup>	2.72 (7.82)	4.12 (0.70)	1.64 (0.52)	8.08**
County FQHC Section 330 funds <sup>a</sup> , US \$	773 846.54 (1 922 217.15)	1 023 556.00 (157 393.10)	469 375.00 (126 586.70)	7.53**
County FQHC FTE physicians <sup>a</sup>	3.40 (8.77)	4.58 (0.59)	1.99 (0.30)	15.41***
County FQHC total FTE employees <sup>a</sup>	40.77 (106.42)	50.07 (5.87)	24.25 (3.82)	13.61***
Nearest FQHC, meters <sup>b</sup>	16 797.58 (16 483.77)	16 997.03 (843.81)	14 479.53 (705.21)	5.24*
Rurality <sup>c</sup>	3.58 (2.23)	2.99 (0.08)	2.73 (0.07)	6.19*
Proximity to US–Mexico border <sup>c</sup>				
≥ 62 miles	94.78			
< 62 miles	5.22			

Note. FQHC = Federally Qualified Health Center; FTE = full-time equivalent. All counties situated > 62 miles from the US–Mexico border were considered nonborder counties; all counties within 62 miles of the border were considered border counties.

<sup>a</sup>2005 FQHC resource (per 1000 farmworkers in county) figures aggregated for counties from which farmworkers were sampled (n = 134).

<sup>b</sup>Distance to nearest FQHC from employer using 2005 FQHC figures for employers from which farmworkers were sampled (n = 640).

<sup>c</sup>Rurality and border figures for counties from which farmworkers were sampled (n = 134).

\*P < .05; \*\*P < .01; \*\*\*P < .001.

## DISCUSSION

We characterized health care use in a representative sample of US farmworkers. Just over half had used US health care during the previous 2 years, similar to previous studies of farmworkers<sup>5–8</sup> and US Hispanics.<sup>10</sup> Rates appear to be lower than were those for non-Hispanic Whites.<sup>10</sup> However, time frame and methodological differences inhibit direct comparison. Given the disproportionate

disease burden for farmworkers, the low rate of use is of concern. We identified individual-, environmental-, and policy-level correlates and highlighted areas for intervention.

Consistent with previous studies of farmworkers<sup>5,7,8</sup> and Hispanics,<sup>39</sup> women used significantly more health care than did men. Another correlate was immigration status, with unauthorized immigrants reporting less use. The impact of immigration status on farmworkers' health care use has not been studied previously,

but similar findings have been reported for US Hispanics,<sup>40,41</sup> perhaps as the result of poorer labor protections<sup>42</sup> or fear of immigration consequences<sup>43</sup>; the latter is a barrier farmworkers cited previously.<sup>21</sup> Barriers to insurance for both legal and illegal immigrants also may explain the findings. Rates of having insurance for Hispanics are lowest for unauthorized workers, followed by those with a green card.<sup>41</sup> Regardless of immigration status, farmworkers who are working in the United States should have access to sound health care. Reducing immigrant barriers to public-<sup>44</sup> and employer-sponsored<sup>45</sup> coverage and improving immigration policy by providing more pathways to legal status would likely improve farmworker health care access. The public health care sector also should enhance outreach to vulnerable immigrant groups.

English proficiency was associated with health care use, as in another study of farmworkers.<sup>7</sup> Farmworkers have reported language as a barrier,<sup>6,8,18,19</sup> but it may not be the strongest impediment.<sup>46</sup> Poor proficiency may affect quality of care more than access. Improving services for those with limited English language proficiency would likely improve use as well as the quality of that care. This potential improvement may be especially true in rural areas, which often lack language-tailored services.<sup>47,48</sup> California now requires that health plans, including

**TABLE 3—Policy-Level Characteristics and Their Bivariate Associations With US Health Care Use: National Agricultural Workers Survey Sample, United States, 2006–2007**

Variable	Proportion, %	Used Health Care During the Previous 2 Years, % (95% CI)	Design-Based Pearson F Test
Insurance status			107.21***
Insured	28.19	80.29 (75.51, 84.33)	
Uninsured	71.81	45.43 (41.75, 49.16)	
Workers compensation			34.65***
Provided by employer	70.94	61.75 (58.50, 64.90)	
Not provided by employer	29.06	39.40 (33.06, 46.13)	
Payment structure			20.70***
Salary	5.31	85.67 (78.11, 90.93)	
Hourly	83.50	54.86 (51.47, 58.20)	
Piece or combination hourly piece	11.19	43.80 (36.04, 51.89)	

Note. CI = confidence interval.

\*\*\*P < .001.

**TABLE 4—Multivariate Logistic Regression: Factors Independently Associated With Health Care Use: National Agricultural Workers Survey Sample, United States, 2006–2007**

Variable	Coefficient	OR (95% CI)
<b>Individual-level factors</b>		
Age	-0.01	0.99 (0.98, 1.01)
Income	0.00	1.00 (1.00, 1.00)
Educational attainment	0.01	1.01 (0.96, 1.05)
Female	1.18***	3.24 (2.23, 4.73)
Married	0.22	1.24 (0.92, 1.69)
Non-Hispanic	0.41	1.51 (0.55, 4.16)
Born in United States	0.09	1.09 (0.39, 3.06)
Immigration status		
Citizen vs unauthorized status	0.15	1.16 (0.55, 2.47)
Green card or other vs unauthorized status	0.48*	1.62 (1.09, 2.42)
Citizen vs green card or other <sup>a</sup>	-0.33	0.72 (0.39, 1.32)
English language proficiency		
Proficient vs limited	0.70	2.01 (0.68, 5.91)
Moderately proficient vs limited	0.54**	1.71 (1.20, 2.44)
Proficient vs moderately proficient <sup>a</sup>	0.16	1.17 (0.64, 2.14)
Migrant status		
Nonmigrant vs shuttle	0.81***	2.26 (1.61, 3.16)
Follow-the-crop vs shuttle	0.06	1.06 (0.59, 1.91)
Nonmigrant vs follow-the-crop <sup>a</sup>	0.75**	2.13 (1.33, 3.40)
Lifetime chronic disease diagnosis	1.66***	5.25 (2.35, 11.71)
No barriers to care endorsed <sup>b</sup>		
Owns car in United States	0.41**	1.50 (1.16, 1.95)
No health care use outside United States	0.50*	1.64 (1.12, 2.41)
<b>Environmental-level factors</b>		
FQHC total FTE staff	0.00	1.00 (1.00, 1.00)
Proximity to nearest FQHC	-0.00	1.00 (1.00, 1.00)
Rurality	-0.05	0.96 (0.87, 1.05)
Nonborder county	1.08*	2.93 (1.25, 6.87)
<b>Policy-level factors</b>		
Insurance and workers compensation status		
Insured	0.84***	2.32 (1.65, 3.26)
Has workers compensation	0.05	1.05 (0.81, 1.36)
Payment structure		
Salary vs combination or piece	0.73*	2.08 (1.07, 4.08)
Hourly vs combination or piece	0.05	1.05 (0.69, 1.61)
Salary vs hourly <sup>a</sup>	0.68*	1.98 (1.16, 3.39)

Notes. CI = confidence interval; FQHC = Federally Qualified Health Center; FTE = full-time equivalent; OR = odds ratio. Participants were considered proficient in English if they spoke and read well, moderately proficient if they spoke and read at least a little or somewhat, and limited if they did not fall into the first 2 categories. Participants were considered follow-the-crop workers if they had 2 farmwork locations > 75 miles apart and shuttle workers if they performed an international shuttle between their home and workplace or a shuttle > 75 miles between their US homebase and their workplace (and were not considered follow-the-crop workers).

<sup>a</sup>Dummy code comparison run in second multivariate (model estimates without robust SE).

<sup>b</sup>Not significant in bivariate tests of association.

\* $P < .05$ ; \*\* $P < .01$ ; \*\*\* $P < .001$ .

Medicaid, provide compensation for translation services.<sup>49</sup> Although this legislation represents meaningful progress toward improving

patient–provider communication and quality of care, the benefit would be limited to privately or publicly insured individuals living in California.

Migrant farmworkers had lower rates of health care use than did nonmigrants, as found in another farmworker study.<sup>5</sup> Migrant farmworkers may not know where to go for care when new to a community (a barrier farmworkers cited previously).<sup>21</sup> Employment or residence instability may interfere with obtaining insurance. Migrant farmworkers would benefit from tailored outreach and services. Individual FQHCs have attempted to tailor services to meet the needs of migrant farmworkers. For example, a Yuma County, Arizona, FQHC partnered with other community-based organizations to promote diabetes management among migrant farmworkers, targeting migrant farmworker-specific barriers.<sup>50</sup> Similar programming should be disseminated across migrant farmworker-serving FQHCs.

Access to transportation can improve health care use, especially in nonurban settings,<sup>51</sup> and farmworkers have previously cited poor transportation as a barrier.<sup>6,13,19,21</sup> Indeed, we found that vehicle ownership was associated with health care use. Providing transportation to services or to public transportation and using more mobile clinics will likely improve health care use for the many farmworkers lacking transportation. Health status and use of non-US health care, factors that we controlled for, also were independently associated with the outcome.

To our knowledge, this was the first study to comprehensively test the effect of public health care resources on farmworker health care use. We included only 4 environmental variables in the multivariate model, 1 of which (i.e., working in a non-border county) was independently associated with use. Bivariate associations suggested a positive impact of FQHC resources, yet they had no independent effect. Moreover, distance to nearest FQHC was positively associated with use in bivariate tests. These findings are surprising given that the nearest FQHC was an average of approximately 10 miles from each grower and nearly half of the nearest FQHC delivery sites were affiliated with migrant health centers. These findings may suggest that some unmeasured county characteristics accounted for the strong bivariate effect. After all, FQHCs are disproportionately located in areas of medical and socioeconomic need (both of which affect utilization). Findings also may suggest that FQHCs are not adequately overcoming

farmworkers' personal barriers. Indeed, nearly half of farmworkers who sought health care had their last visit in a private setting (data not shown). FQHCs are equipped to serve poor, uninsured farmworkers; thus, to maximize their utility to this population, they should better tailor outreach and services to overcome personal barriers, such as language and immigration status.

Farmworkers working near the US–Mexico border had lower rates of US health care use, as was the case in a study of women farmworkers.<sup>23</sup> Those working or living near the border may seek care in Mexico,<sup>52</sup> as shown previously for border-dwelling Hispanics<sup>53</sup> and farmworkers.<sup>5,8,12</sup> In fact, use of non-US care was independently associated with decreased US health care use in our study. Binational coverage, in which entities (i.e., insurance, health care system) on both sides of the US–Mexico border share coverage and care, would capitalize on such findings, likely improving access for farmworkers. However, travel across the border is inhibited for unauthorized farmworkers. To explore this issue further, we reran the multivariate model, stratifying by immigration status group. Indeed, relationships between nonborder county status and health care use were significant and positive for citizens (odds ratio [OR]=9.05;  $P<.01$ ) and those with green cards or other authorization (OR=2.52;  $P<.01$ ); the relationship was nonsignificant for unauthorized farmworkers. Thus, although binational coverage holds promise as a solution for some border-dwelling farmworkers, its utility is limited to certain subpopulations.

Uninsurance has been cited as a barrier to health care for farmworkers.<sup>6,18</sup> It was associated with use in our study, consistent with studies of women farmworkers<sup>14</sup> and other populations.<sup>54,55</sup> Only approximately one third of the sample reported being insured, consistent with rates for California farmworkers.<sup>8</sup> Rates of health care use among salaried farmworkers were higher than were rates for those paid an hourly or piece or combination wage. These findings are likely related to health care cost, which has been cited as a barrier in several farmworker studies.<sup>5,6,13,18,19</sup> Payment structure also likely relates to other barriers farmworkers previously reported: fear of job loss,<sup>6</sup> lack of time,<sup>5,13,19</sup> and need to stay at work to make money.<sup>19</sup>

Improving treatment of farmworkers not paid with salary and insurance policies will

likely result in improved access to health care. Mandating employer-sponsored coverage would likely prove challenging, as would a vast expansion of public benefits. Binational coverage provides a promising alternative. Insurance reform must be augmented with programs targeting unauthorized immigrants, who would likely be excluded from policy changes. The FQHC system is well suited for this task, assuming the suggested enhancements are made.

### Limitations

Our use of cross-sectional data limits our interpretation. Only working farmworkers were recruited, so those not at work because of illness or injury were excluded, yielding a sample with unique characteristics relevant to health care use. Similarly, participating employers were likely unique on relevant labor practices. Because the NAWS was not designed to measure all aspects of health care access and use (e.g., regular source, perceived need), this study's characterization is incomplete. We examined only acculturation proxies (e.g., English proficiency, which has significant limitations)<sup>56</sup> and did not assess cultural determinants because these factors were not assessed in the NAWS, thereby limiting our understanding of critical determinants.<sup>56,57</sup> Cultural barriers and facilitators of US farmworker health care use, from perspectives of consumers and the workforce,<sup>58</sup> should be studied further so that services can be better tailored to population need. Because the outcome's 2-year time frame is lengthy, farmworkers may not remember whether they used health care. Still, study findings suggest validity (e.g., need strongly associated with use).

We used Euclidean distance to nearest FQHC to estimate geographic accessibility. Future studies would benefit from examining other proximity measures (e.g., to account for geographic features).<sup>33</sup> FQHC resources were aggregated to the grantee's county because of the Uniform Data System structure. However, affiliated delivery sites may not be in the same county. The measurement of FQHC impact would be enhanced if distribution to delivery sites was reported in the Uniform Data System. In addition, we did not study resources from other health care types (e.g., private physician offices, hospitals, voucher programs). Future research should explore their impact. The denominator

for health care resources was also imperfect; FQHCs provide care to several non-farmworker groups. A denominator derived from populations living in poverty may have provided a superior estimate. Finally, we did not account for the endogeneity inherent in the relationship between insurance and utilization.<sup>54</sup> It was outside the scope of our study to assess public policy's impact on health care use; studying its impact would have implications for large-scale interventions to improve access.

### Conclusions

More research on farmworker health care use is needed. Our understanding would be enhanced with study of the usual source of care, purpose, and volume of visits; additional health care resources; and local, state, and federal policy. We identified farmworker subpopulations at risk for poor access as well as numerous areas for intervention. To improve access, outreach efforts should target farmworkers at greatest risk for unmet need (i.e., those who are men, non-US citizens, migrant, or who have limited English proficiency or transportation). A plan for affordable health care is needed. FQHCs provide low-cost services regardless of immigration status. However, differential community resources had no independent impact on utilization. Thus, although increasing resources for the public health care sector is needed, improvement in how those resources are spent (e.g., enhanced efforts to educate farmworkers about services, providing tailored services, using more mobile clinics) is needed as well.

Reform to the public health care system alone will not resolve disparities in health care utilization. Affordable health insurance is needed, and the plan must address barriers to insurance for farmworkers (e.g., immigration status, inconsistent residence, income, and employment). Binational coverage may assist with these issues, especially for documented farmworkers living near the US–Mexico border.

The farmworker population is large, with approximately 3 million persons in the United States occupying this position.<sup>59</sup> Failing to provide them with sound health care will result in continued disease burden, with implications for both farmworkers and the US general population.<sup>60</sup> For example, tuberculosis burden is

significant for farmworkers<sup>2</sup>; providing primary, secondary, and tertiary preventive care will not only promote farmworker health but also protect the general population from transmission. Additionally, farmworkers are a critical labor force that assists with the production and distribution of the US food supply. Protecting and promoting farmworker health is, therefore, of great economic and public health importance.

Farmworkers, FQHC providers and administrators, researchers, policymakers, advocacy groups, and agricultural employers on both sides of the US–Mexico border should continue their efforts to move such changes forward. These endeavors will likely improve farmworkers' health care use and in turn reduce the observed disparities in disease burden and mortality for this vulnerable population. ■

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### Contributors

K.D.H. conceptualized, designed, and carried out all aspects of the study and drafted the article. J.A.M. assisted with conceptualization, design, analysis, and revision of writing and supervised the work as doctoral dissertation chair. S.G. provided assistance with conceptualization, design, analysis, and revision of writing. R.G.K. provided assistance with conceptualization, design, and revision of writing. S.C.R. provided statistical consultation and assistance with design and revision of writing. V.L.M. assisted with conceptualization, design, and revision of writing. M.L.Z. assisted with conceptualization, design, and revision of writing.

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The institutional review boards of San Diego State University and the University of California, San Diego approved this study.

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