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Author manuscript

*J Food Prot.* Author manuscript; available in PMC 2015 November 09.

Published in final edited form as:

*J Food Prot.* 2014 September ; 77(9): 1571–1578. doi:10.4315/0362-028X.JFP-13-395.

## Knowledge, Attitudes, and Practices among Border Crossers during Temporary Enforcement of a Formal Entry Requirement for Mexican-Style Soft Cheeses, 2009<sup>†</sup>

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### Abstract

Mexican-style soft cheese known as queso fresco (QF), which is often unpasteurized, has been implicated in outbreaks of foodborne illness in the United States. The U.S. Food and Drug Administration (FDA) exercises discretion in enforcement of noncommercial importation of cheese. To test control measures aimed at decreasing unlawful QF importation, in 2009 the FDA temporarily enforced a requirement for formal commercial entry for all cheeses over 5 lb (2.3 kg) at the San Diego–Tijuana border. Enforcement was combined with educational outreach. Border crossers importing cheese and those not importing cheese were surveyed at the beginning and end of the temporary enforcement period. Data collected included participant demographic information, knowledge of QF-associated health risks, and attitudes and practices regarding QF consumption and importation. We surveyed 306 importers and 381 nonimporters. Compared with nonimporters, importers had a lower level of knowledge regarding QF-associated health risks ( $P < 0.0001$ ). Border crossers carrying cheese were more likely to have less education, be U.S. or dual residents, consume QF more frequently, and cross the border less often. Importation and consumption of unpasteurized QF remained prevalent among border crossers during the temporary enforcement period, and the level of knowledge regarding QF-associated risks remained low among these crossers. More vigorous, sustained messaging targeted at high-risk groups is needed

<sup>†</sup>The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention or the U.S. Food and Drug Administration.

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The authors have no financial relationships or conflicts of interest related to the content of this article.

to change behaviors. Definition and consistent enforcement of limits will likely be needed to reduce QF importation and the risk of QF-associated diseases along the U.S.–Mexico border; however, public health benefits will need to be balanced against the cost of enforcement.

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The Food Safety Modernization Act of 2011 requires people and businesses that provide food to the public to take steps necessary to identify and control hazards that could make food unsafe (28). However, such laws and regulations must be enforced to assure their effectiveness as public health interventions (17). Although many hazards at large food production facilities can potentially be eliminated by mandates and enforcement of better manufacturing practices, foodstuffs imported in small quantities for noncommercial use are much more difficult to regulate (28).

Mexican-style soft cheeses, typically referred to as queso fresco (QF), have been especially difficult to regulate. Often unpasteurized, QF is commonly made in small quantities by unregulated noncommercial processors, sold in small local markets in Mexico, and imported into the United States (14, 16, 18, 21). QF can be imported commercially into the United States if it is made from pasteurized milk, is otherwise in compliance with U.S. regulations, and makes formal entry with U.S. Customs and Border Protection (CBP) and the U.S. Food and Drug Administration (FDA). However, a significant proportion of the QF imported each year through border crossings between California and Mexico is transported by couriers or in personal baggage (16). FDA requirements for importation of food are based on chapter VIII of the Federal Food Drug and Cosmetic Act (21 US Code 381) (31). The Act makes no distinctions with regards to quantity, and the FDA exercises discretion in enforcement of noncommercial importation of cheese. Although upon entry to the United States QF is typically declared as being for personal use, experience in California suggests that much of this cheese is eventually sold commercially (20).

The health risks of cheeses made from unpasteurized milk are well documented (2, 4–9, 11, 19, 25). For several years before 2009, surveys and enhanced surveillance operations conducted by the FDA, the CBP, and state health agencies at noncommercial ports of entry (POE) along the United States–Mexico border have revealed high violation rates for raw milk cheeses and evidence of pathogens in imported QF, including *Salmonella*, *Escherichia coli* O157:H7, *Listeria* spp., and *Mycobacterium bovis* (14, 16, 18, 21, 29). QF-associated disease is more common in Hispanic populations, among whom pregnant women and the elderly appear to be at increased risk (24, 27). Outbreaks and sporadic cases of salmonellosis, listeriosis, brucellosis, and *M. bovis* infections have been frequently associated with consumption of QF in Hispanic communities in California and throughout the United States (4–9, 11, 19, 25, 29).

To test control measures aimed at decreasing unlawful importation of QF across the United States–Mexico border, the FDA and the CBP implemented a trial enforcement strategy requiring formal commercial entry for cheese imports in excess of 5 lb (2.3 kg) per border crosser. The requirement was fully enforced for 1 month starting 20 January 2009 with the assistance of the CBP who conducted systematic screening of border crossers at the two POE in San Diego, California (San Ysidro and Otay Mesa), and for another 2 months for QF detected during routine CBP inspections. The two POE were chosen because of the high

volume of QF imported from Mexico and previous links between QF and foodborne illnesses in California.

Outreach efforts were begun 30 days before the start of the enforcement period with educational materials containing information about the importation requirement and the risks of QF consumption. Posters were displayed at the two POE. Flyers and fact sheets were disseminated during routine vehicle inspections and in the pedestrian lane. Announcements were also provided through the U.S. media, including newspapers, television, and radio.

During the enforcement period, the U.S. Centers for Disease Control and Prevention (CDC) conducted a survey of individuals crossing the border from Mexico into the United States to monitor changes in awareness of and compliance with the requirement. We measured variation among border crossers in their knowledge regarding health risks associated with consumption of unpasteurized QF and their consumption and importation practices.

## MATERIALS AND METHODS

The CDC determined that this survey met the criteria for program evaluation and approved it as nonresearch. Verbal consent was obtained before each interview.

### Survey instrument design

A cross-sectional survey of knowledge, attitudes, and practices (KAP) was adapted from a 2005 California Department of Health KAP survey tailored to Hispanic women of reproductive age in Imperial County, California (13). The survey gathered self-reported information regarding (i) demographic characteristics of the border crosser (age, sex, country of residence, education, language, and frequency of border crossing); (ii) awareness of the FDA's requirement (weight limit of cheese allowed, how respondent learned of the policy, and comprehension); (iii) knowledge about health risks associated with consumption of unpasteurized QF (tuberculosis, salmonellosis, other illnesses, and risks to children or pregnant women); (iv) attitudes and practices regarding QF consumption and importation (reasons for and frequency of consumption, consumption during pregnancy, and average amount imported per crossing); and (v) information about the QF being imported (packaging, storage, source, weight, pasteurization status, and intended use). Simple definitions were provided for all technical concepts, e.g., pasteurization was defined as "milk that had been heated to kill organisms that can cause disease or spoilage."

Surveys were available in English and Spanish and were administered verbally by eight interviewers; all interviewers were public health professionals and bilingual. Participants were recruited daily for an 8-h period at peak border-crossing times, 8 a.m. to 6 p.m., at the beginning of FDA enforcement (phase 1: 21 to 26 January 2009) and shortly following the end of the enforcement period (phase 2: 20 to 28 April 2009). The survey instrument included 22 questions in phase 1 and 27 questions in phase 2 (to include questions about activities during the enforcement period), with a mix of open- and closed-ended questions. Survey completion took 5 to 10 min.

## Eligibility

Border crossers were eligible for inclusion if they were 18 years of age or older and spoke either Spanish or English. Those who were detained by the CBP for suspected violations other than QF importation were not recruited.

## Screening process during full enforcement period

All pedestrians were screened for QF importation by the CBP. Vehicles and their occupants were selected by the CBP for screening based on standard protocols. CBP officers referred individuals who reported carrying cheese for further inspection by FDA staff and CBP agriculture specialists, who weighed the cheese. When the weight was less than or equal to 5 lb, the traveler was allowed to proceed. Quantities greater than 5 lb were recorded, and the importer was given the option to make a formal commercial entry through a commercial POE, return the cheese to Mexico, or abandon the excess cheese to be discarded by the FDA.

## Participant sampling

A convenience sample of persons carrying QF (importers) and not carrying QF (nonimporters) was selected among pedestrians and occupants of vehicles. In the pedestrian line, where border crossers waited for their luggage to be screened by the CBP, approximately every 5th to 10th person was asked whether he or she was carrying QF. Those who stated they were not importing QF were recruited immediately. Recruitment of those carrying QF was deferred until after the CBP screening and subsequent FDA inspection; the majority of these importers were recruited. Drivers of vehicles, both importers and nonimporters, were recruited after screening by the CBP; approximately half of these drivers were approached to participate.

## Data analysis

Chi-square and *t* tests were used to compare demographic characteristics and KAP among importers and nonimporters. To identify demographic and KAP variables associated with cheese importation, we first applied bivariate logistic regression using whether the study participant was a cheese importer as the dependent variable. Variables with *P* values greater than 0.2 in the bivariate logistic regression were excluded from the multivariate logistic regression. Pairwise interactions of age, education, monthly consumption frequency, and monthly crossing frequency were also investigated in the multivariate analysis. To simplify the presentation of the results, we applied a stepwise backward elimination process to remove interactions that were not significant. We also applied multivariate logistic regression to explore the association between QF consumption and demographic characteristics and knowledge of the health risks associated with eating QF. Statistical significance in this analysis was defined as an alpha value of 0.05, and data were analyzed with SAS 9.2 (SAS Institute, Cary, NC).

## RESULTS

A total of 687 border crossers were surveyed: 376 (55%) during phase 1 and 311 (45%) during phase 2. Twenty additional border crossers started the survey but did not complete it.

Because of the complexity of the recruitment process, it was not possible to accurately track refusals, although based on a subjective judgment the refusal rate was low. Comparison of survey results for phases 1 and 2 revealed no significant differences in demographic characteristics and KAP, so we combined the results of the two phases for subsequent analysis. Table 1 includes the demographic characteristics of the participants. The mean age was 45 years (range, 18 to 81 years); 50.8% were male. More than one-third (38.5%) of respondents had only an elementary school education, and (36.1% reported residency in Mexico. The majority of respondents (85.1%) reported Spanish as their primary language. Travelers interviewed reported crossing the border an average of five times per month.

Among all participants, 306 (44.5%) were carrying cheese. Compared with nonimporters, importers were older, crossed the border less often, and were more likely to be crossing as pedestrians, have an elementary school education, reside in the United States, and report Spanish as their primary language ( $P < 0.0001$  for all comparisons; Table 1).

### **KAP among border crossers**

Table 2 provides results of the KAP portion of the survey. Overall, 24.2% of those surveyed were aware of the requirement limiting noncommercial importations to 5 lb or less; however, more than one-third (34.2%) of respondents did not know the reasons for the restriction. Awareness of the requirement was almost two times higher among nonimporters ( $P < 0.0001$ ). Border crossers surveyed learned of the requirement through electronic signs at the POE (33.2%), from CBP officers during inspection (17.9%), and from television announcements (13.2%). More nonimporters (50% versus 21% of importers) learned of the requirement through signage at the POE, whereas more importers (29% versus 3% of nonimporters) learned of it through the CBP.

Importers generally had a lower level of knowledge regarding health risks associated with QF consumption than did nonimporters ( $P < 0.001$ ; Table 2). Importers were more likely than nonimporters to report having consumed QF made with raw milk ( $P < 0.0001$ ) and to do so more often ( $P < 0.0001$ ). Approximately 60% of participants believed that QF was unsafe for pregnant women or children; this proportion was lower for importers ( $P < 0.001$ ). Eating QF while pregnant was reported by one-fifth of female participants and more than twice as often by importers.

Importers reported consuming QF on average twice as often as did nonimporters ( $P < 0.0001$ ; Table 2). Among all respondents, the most common reasons for consumption of unpasteurized QF were flavor (53.8%) and cultural tradition (15.2%); the reasons for consumption did not differ significantly between importers and nonimporters. When asked about the average amount of cheese they typically imported per crossing, importers (i.e., those carrying cheese at the time of the survey) reported greater amounts (9.7 lb [4.4 kg]) than did nonimporters (0.4 lb [0.2 kg]) ( $P < 0.0001$ ).

### **Variables associated with cheese importation and consumption (multivariate analysis)**

Border crossers carrying cheese were more likely to have had only an elementary education or less and be U.S. or dual residents (Table 3). The more frequently QF was consumed, the

more likely the border crosser was to be carrying QF. Significant interactions were found between education and crossing frequency in relation to importations. Individuals who crossed the border more often were less likely to import cheese. The association was more pronounced for participants with an elementary education (adjusted odds ratio [AOR] = 0.46) than for those with a high school (AOR = 0.78) or some college (AOR = 0.8) education ( $P < 0001$ , Table 3).

Consumption of unpasteurized QF was significantly associated with education and knowledge of health risks regarding safety for pregnant women and for children (Table 4). Participants with some high school and college education were less likely to report consumption of QF. Although the association between QF consumption and knowledge regarding risks of *Salmonella* and tuberculosis was not significant, participants who were aware of the health risks for pregnant women and for children were less likely to consume QF than were those who were not aware of these risks ( $P = 0.004$ , Table 4).

### Reported characteristics of cheeses carried by border crossers

Of the 306 importers, the majority (57%) stated that the QF was pasteurized, 16% reported that the cheese was unpasteurized, and 27% did not know whether the cheese had been pasteurized. QF was most commonly made at home (38%) or purchased from supermarkets (36%) or local neighborhood stores (26%). Half of the importers stated that the imported cheese was for personal consumption; the rest reported the cheese was intended for family or friends.

## DISCUSSION

The results of our survey, conducted during and shortly after a 3-month enforcement period instituted by the FDA that limited importation of QF to 5 lb per person, indicate that importation and consumption of unpasteurized QF remained prevalent among border crossers and knowledge and practices associated with consumption of unpasteurized QF remained relatively unchanged. These results should not be surprising, given the complexities of enforcement of importation regulations at land borders and the short duration of the enforcement period. However, the survey results did suggest potential target groups for additional behavior change efforts. Individuals carrying cheese across the border were often older, less educated (suggesting potentially lower literacy), and Spanish speakers who crossed the border infrequently and had less knowledge regarding health risks associated with consumption of unpasteurized cheese.

Almost half of border crossers carrying cheese reported that the cheese was unpasteurized or did not know whether it had been pasteurized, suggesting a general lack of awareness of the health risks associated with unpasteurized cheese. Many of the cheeses inspected were reported to be homemade. These findings are consistent with those of previous studies regarding food safety knowledge among consumers of unpasteurized cheese (16, 23) and suggest that educational materials regarding the health risks of QF should include recognition of unpasteurized cheese in addition to proper packaging and storage techniques. Because surveillance for QF-associated infections in Mexico is limited, enhanced surveillance in Mexico may be necessary to establish the burden of disease associated with

QF and to convince persons born in Mexico of the risks associated with QF consumption (15).

Half of border crossers surveyed learned about the temporary enforcement of the regulation at the POE, either through signage or from CBP officers, underscoring the value of education efforts at POE but suggesting that additional outreach is needed to reach border crossers before they travel. The FDA noted (32) that many travelers stated that they might have complied with the restriction if they had been aware of it. Travelers also commented that the formatting of the posters and handouts could have been improved through the use of larger fonts, color, and less text. This information could be used to guide future outreach efforts to higher risk populations, including the need for varied approaches to reach diverse at-risk audiences, e.g., news media, community outreach, and posters and electronic billboards at transit centers and POE, with messages in easily understood Spanish and English. More vigorous, sustained messaging aimed at high-risk border crossers probably will be needed to change importation behaviors.

Although our survey results suggest that enhanced communication is needed, based on experience with other laws, regulations, and public health recommendations, education alone is unlikely to be successful (1, 10, 12, 22, 26). Although the FDA has specific requirements for commercial importation of cheese into the United States, enforcement discretion is exercised in cases of noncommercial importations. Many of these importations, especially large quantities, likely result in distribution or illegal sale of cheese after entry into the United States, thus amplifying the disease risks from a single contaminated shipment.

The requirement for commercial licensing of imported QF in excess of 5 lb was relatively difficult and expensive to enforce, particularly with respect to personnel time. The FDA estimated the total cost of the 4-week full enforcement operation at \$112,000, of which \$5,000 was spent on disposal of unlicensed cheese lots (32). The FDA documented that during the full enforcement period, almost 6,000 border crossers were referred for cheese importation, and almost two-thirds were identified as attempting to import QF in excess of 5 lb into the United States. Over 65,000 lb (29,500 kg) of cheese imported in amounts exceeding 5 lb were processed by the FDA during the 4-week full enforcement period: 25,000 lb (11,350 kg) were permitted to enter the United States, 30,000 lb (13,620 kg) were disposed of by the FDA, and 11,000 lb (4,994 kg) were returned to Mexico (32). Almost all of the confiscated cheese was not labeled and was inadequately stored to prevent microbial growth. Many of the cheeses were not hygienically wrapped, and cheese found by the CBP was sometimes hidden in cars, including under seats and in gasoline tanks.

The enforcement period highlighted the challenges and underreporting associated with routine enforcement of U.S. importation regulations for noncommercial foods, many of which are associated with known or potential health risks. Similar operations conducted to identify illegal bushmeat importation at 6 POE during 2010 revealed a sevenfold increase in detection over baseline reporting (3). Resource limitations and the absence of specific guidance and regulations regarding noncommercial importations result in lack of systematic enforcement of federal importation regulations.

Our survey of the KAP of travelers regarding QF importation during this trial enforcement period had several limitations. The initial survey was administered after outreach efforts had begun, and no true baseline was obtained. We were not able to select a formal random sample of travelers crossing the border. Only travelers crossing at peak hours were recruited because of limited resources, and drivers of vehicles selected by the CBP using secondary screening protocols might not have been representative of all drivers crossing the border. The number of border crossers entering the United States from Mexico varies throughout the year (30), and the volume of cheese imported may also fluctuate seasonally. Bias may also have been introduced through recall or nonresponse. Only cheese lots weighing more than 5 lb were recorded, and many persons had smaller amounts.

The results of this survey, conducted during and shortly after a temporary enforcement period of a requirement for commercial licensing of imported QF in excess of 5 lb, revealed little change in KAP regarding QF consumption and importation. Lack of knowledge among border crossers regarding the health risks associated with QF consumption likely contributes to continued importation and consumption. In our analysis, greater crossing frequency was associated with a lower likelihood of QF importation. This finding supports the hypothesis of increased awareness of the policy due to signage and educational efforts at the POE. However, this finding may be more reflective of the greater access to QF among frequent border crossers and hence decreased need for importation during travel. Changing long-held cultural beliefs and practices regarding consumption and importation of unpasteurized QF and continued efforts to limit importations will probably need to include sustained and enhanced educational efforts and enforcement. Experience with other laws and regulations suggests that creating consistent and enforceable regulations to limit importation of potentially harmful QF will likely be necessary to effect long-term changes in importation behavior (1, 10, 12, 26, 27). The costs of such regulations and their enforcement would need to be balanced by the public health benefits of disease prevention.

## ACKNOWLEDGMENTS

The authors thank the late Harvey Lipman for his contributions to the design of the survey, Denise Borntrager for assisting with project coordination, and all CBP officers, FDA employees, and staff at the CDC San Diego Quarantine Station who participated in the survey.

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**TABLE 1**

Distribution of selected demographic characteristics among surveyed border crossers, Tijuana to San Diego, 2009

Characteristic	Total (n = 687)	Importers (n = 306, 44.5%)	Nonimporters (n = 381, 55.5%)	P value
Age (yr), mean $\pm$ SD (range)	44.98 $\pm$ 14.40 (18–81)	49.63 $\pm$ 13.91 (18–81)	41.25 $\pm$ 13.69 (18–77)	<0.0001
Male (%)	50.81	53.14	48.94	0.2766
Phase 1 (%)	54.73	56.86	53.02	0.3144
Crossing frequency (crossings/mo), mean $\pm$ SD (range)	4.93 $\pm$ 8.39 (0–30)	0.95 $\pm$ 3.12 (0–30)	8.11 $\pm$ 9.81 (0–30)	<0.0001
Mode of travel (%)				<0.0001
Pedestrians	63.02	88.41	42.51	
Vehicles	36.98	11.59	57.49	
Education (%)				<0.0001
Elementary or less	38.54	60.33	21.05	
Some high school	32.12	24.26	38.42	
Some college	29.34	15.41	40.53	
Residency (%)				<0.0001
Mexico	36.08	24.92	45.01	
United States	62.72	74.75	53.10	
Dual	1.20	0.34	1.89	
Primary language (%)				<0.0001
Spanish	85.07	89.80	81.27	
English	7.32	1.64	11.87	
Both	7.03	7.89	6.33	
Other	0.59	0.66	0.53	

TABLE 2

Knowledge, attitudes, and practices of surveyed border crossers regarding risks associated with importation and consumption of unpasteurized queso fresco (QF), Tijuana to San Diego, 2009

Question	Total (n = 687)	Importers (n = 306, 44.5%)	Nonimporters (n = 381, 55.5%)	P value
Do you think that eating QF can make you sick? (% yes) (n = 681)	58.00	47.87	66.22	<0.0001
Have you eaten QF while pregnant? (% yes) (female only, n = 421)	19.71	32.81	13.99	<0.0001
Do you think QF is unsafe for pregnant women? (% yes) (n = 668)	56.59	49.83	62.19	0.0008
Do you think QF is unsafe for children? (% yes) (n = 685)	60.00	49.02	68.87	<0.0001
Have you heard of <i>Salmonella</i> associated with QF? (% yes) (n = 679)	57.14	59.47	55.29	0.5070
Have you heard of TB associated with QF? (% yes) (n = 686)	37.46	41.97	33.86	0.0637
Are you aware of the new policy regarding QF? (% yes) (n = 677)	24.22	16.72	30.38	<0.0001
How did you learn of the policy? (%) (n = 325)				<0.0001
Signs at port of entry	33.23	21.16	50.00	
Customs and Border Protection	17.85	28.57	2.94	
Television	13.23	11.64	15.44	
Friends and relatives	6.77	5.82	8.09	
Newspaper	0.92	0.00	2.21	
Radio	0.00	0.00	0.00	
More than one way	4.31	1.59	8.09	
Other	23.69	31.22	13.24	
What do you think is the reason for the limit? (%) (n = 433)				0.0038
Health	45.50	40.83	54.86	
Commercial	10.62	12.11	7.64	
Both	8.31	6.57	11.81	
Other	1.39	1.73	0.69	
Don't know	34.18	38.75	25.00	
Mean self-reported weight of cheese typically carried per crossing (lb)	4.16	9.68	0.39	<0.0001
Do you eat QF? (% yes)	26.91	40.00	16.27	<0.0001
Consumption frequency (typical number of episodes per month)	9.33	12.74	6.56	<0.0001
Reasons for consumption (% , n = 171) <sup>a</sup>				0.9340
Tastes better	53.80	54.24	52.83	
Cultural	15.20	16.10	13.21	
More nutritious	4.09	3.39	5.66	
More accessible	4.09	4.24	3.77	
Cheaper	0.58	0.85	0.00	
Less harmful	0.58	0.85	0.00	
More than one reason	16.37	14.41	20.75	
Other	5.26	5.93	3.77	

<sup>a</sup>This question was asked when the respondent reported eating QF.

**TABLE 3**

Multivariate analysis of variables associated with queso fresco (QF) importations among surveyed border crossers, Tijuana to San Diego, 2009 (n = 620)

Variable	Unadjusted odds ratio			Adjusted odds ratio		
	Point estimate	95% confidence interval	P value	Point estimate	95% confidence interval	P value
Phase 1 (phase 2 <sup>a</sup> ) <sup>b</sup>	1.17	0.86–1.58	0.3145			
Age	1.04	1.03–1.06	<0.0001	1.01	1.00–1.03	0.1690
Female (male <sup>a</sup> ) <sup>c</sup>	0.85	0.62–1.14	0.2767			
Education <sup>d</sup>						
Elementary or less <sup>a</sup>						
Some high school	0.22	0.15–0.32	0.0048	0.34	0.19–0.61	<0.0001
Some college	0.13	0.09–0.20	<0.0001	0.23	0.12–0.44	<0.0001
Primary language						
Spanish <sup>a</sup>						
English, bilingual, other	0.47	0.30–0.75	0.0016	0.60	0.31–1.14	0.1172
U.S. residency (U.S. or dual vs Mexico residency)	2.47	1.77–3.44	<0.0001	2.44	1.50–3.97	0.0003
Monthly crossing frequency <sup>d</sup>	0.70	0.64–0.76	<0.0001			
Elementary or less education				0.46	0.35–0.60	<0.0001
Some high school education				0.78	0.68–0.89	<0.0001
Some college education				0.80	0.70–0.91	<0.0001
Awareness of health risks of eating QF (yes vs no) <sup>e</sup>	0.56	0.38–0.83	0.0041	0.69	0.38–1.28	0.2406
Monthly consumption frequency	1.05	1.04–1.07	<0.0001	1.06	1.03–1.08	<0.0001
Awareness of policy prior to survey (yes vs no)	0.46	0.32–0.67	<0.0001	0.76	0.44–1.31	0.3210

<sup>a</sup>Reference category.

<sup>b</sup>Phase 1 was the beginning of the FDA temporary enforcement period, 21 to 26 January 2009; phase 2 was shortly after the end of the temporary enforcement, 20 to 28 April 2009. Phase was not included in the multivariate logistic regression.

<sup>c</sup>Gender was not included in the multivariate logistic regression.

<sup>d</sup>Because of the significant interaction between education and monthly crossing frequency, statistics of education in the multivariate logistic regression were calculated for a median monthly crossing frequency of 1, and statistics of monthly crossing frequency were individually calculated for participants with different levels of education.

<sup>e</sup>Awareness of health risk was scored as “yes” when the respondent reported awareness of the association between consuming unpasteurized QF and *Salmonella* or tuberculosis or reported that eating QF was unsafe for pregnant women or children.

**TABLE 4**

Multivariate analysis of variables associated with consumption of unpasteurized queso fresco among surveyed border crossers, Tijuana to San Diego, 2009 (n = 620)

Variable	Adjusted odds ratio		
	Point estimate	95% confidence interval	P value
Age	1.00	0.98–1.02	0.999
Female (male <sup>a</sup> )	0.91	0.55–1.51	0.717
Education			
Elementary or less <sup>a</sup>			
Some high school	0.42	0.22–0.81	0.031
Some college	0.31	0.15–0.66	0.025
Primary language			
Spanish <sup>a</sup>			
English, bilingual, other	1.35	0.59–3.09	0.789
U.S. or dual residency (Mexico residency <sup>a</sup> )	1.19	0.68–2.08	0.539
Monthly crossing frequency	0.97	0.93–1.01	0.119
Aware of <i>Salmonella</i> risk (not aware <sup>a</sup> )	1.08	0.59–1.95	0.805
Aware of tuberculosis risk (not aware <sup>a</sup> )	0.79	0.45–1.37	0.399
Unsafe for a pregnant women to eat (not unsafe <sup>a</sup> )	0.35	0.17–0.71	0.004
Unsafe for a children to eat (not unsafe <sup>a</sup> )	0.44	0.21–0.92	0.029

<sup>a</sup>Reference category.