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## Profile of Raw Milk Consumers in California

### SYNOPSIS

**Objectives.** The authors sought to determine the prevalence of raw milk consumption in California—the largest producer of certified raw milk in the United States—and to describe the demographic and behavioral characteristics of raw milk consumers in that state.

**Methods.** The authors analyzed responses to questions on the 1994 California Behavioral Risk Factor Surveillance System Survey that asked respondents about whether they drank raw milk, the amount consumed, the reason for drinking raw milk, and where raw milk was most often obtained.

**Results.** Among 3999 survey respondents, 3.2% reported drinking raw milk in the previous year. Raw milk drinkers were more likely than nondrinkers to be younger than age 40, male, and Hispanic and to have less than a high school education.

**Conclusions.** Raw milk continues to be consumed by some residents of California despite the documented hazards associated with this dietary practice.

**R**aw milk—milk that has not been pasteurized—has served as the vehicle of transmission for several pathogens, including *Salmonella*, *Campylobacter*, and *E. coli* O157:H7.<sup>1,2</sup> *Salmonella* and *Campylobacter* are the leading causes of bacterial enteritis in the United States, and *E. coli* O157:H7 is an important cause of diarrheal disease and the hemolytic uremic syndrome. Although a ban on interstate sale of all types of raw milk was implemented in the United States in 1987, a 1995 Food and Drug Administration survey of state officials who regulate milk revealed that 28 states permitted the intrastate sale of raw milk.

We used data from the 1994 California Behavioral Risk Factor Surveillance System (BRFSS) to determine the prevalence of reported raw milk consumption in California. We chose California as a study site because the sale of raw milk is legal in the state, the largest producer of certified raw milk in the United States is located there, raw milk sale has been a controversial issue for many years in the state, and the hazards of raw milk ingestion have been well publicized there.<sup>3-7</sup> (Certified raw milk is produced according to standards established by the American Association of Medical Milk Commissions, a private trade organization of certified raw milk producers.)

Between 1977 and 1994, the California Department of Health Services

issued nearly 50 public health advisories, along with orders to stop the sale of raw milk, when routine bacteriologic samples revealed *Salmonella* contamination of raw milk supplies; in 1991, regulations were imposed requiring a warning label on all raw milk and products made from it.<sup>8</sup>

## Methods

BRFSS is an ongoing telephone survey of randomly selected adults, used to collect information on a wide variety of health-related behaviors. The survey is conducted by individual states in collaboration with the Centers for Disease Control and Prevention.<sup>9</sup>

The sample of respondents to the 1994 California BRFSS was obtained through telephone interviews using random digit dialing.<sup>10</sup> Questions about raw milk consumption were included in the survey. For the present study, we compared the demographic characteristics of raw milk drinkers and nondrinkers using chi-square tests.

Survey respondents were asked, "In the past year, did you ever drink any kind of raw milk?" For those who answered the question, the possible responses were "Yes," "No," or "Don't know." Respondents who answered the question affirmatively were asked the number of glasses of raw milk consumed in a month, where the raw milk was purchased, and to specify the "most important reason" for choosing to drink raw milk. In the analyses reported here, the 12 respondents (0.3%) who either answered "Don't know" or did not answer the question were considered as nondrinkers of raw milk.

The estimated volume of raw milk sold to the public in California in 1994 was obtained through written communication with the California Department of Health Services and the California State Department of Food and Agriculture. The proportion of the population of California in 1980 and 1990 who were Hispanic was obtained from Census data.<sup>11,12</sup>

## Results

Data from the California Department of Food and Agriculture indicated that the estimated volume of fluid raw milk sold to the public in California in 1994 was 1.5 million gallons, or approximately 0.2% of the total volume of fluid milk sold in the state.

Among the 3999 survey respondents, 128 (3.2%) answered that they had consumed raw milk in the previous year. Of the 1761 male respondents, 77 (4.4%) reported drinking raw milk, as did 51 (2.3%) of the 2238 female respondents. Of the 128 raw milk drinkers, 60.2% were male and 39.8% were female.

**Table 1. Patterns of raw milk consumption, California Behavioral Risk Factor Surveillance System Survey, 1994 (N=128)**

Variable	Number	Percent
Glasses of raw milk drunk per month		
Fewer than 4	75	59
4-8	15	12
More than 8	34	27
Don't know	4	2
Most important reason for drinking raw milk		
Taste	48	38
Health	22	17
Nutritional value	13	10
Only milk available in home	13	10
Experimented only	12	8
Convenience	8	6
Cost	4	3
Other	8	8
Places where raw milk obtained		
Retail stores	50	39
Farm or ranch	38	30
At home	22	17
Dairy	9	7
On travel outside the		
United States	7	5
Other	2	2

Fifty-nine percent of respondents who said that they drank raw milk reported having consumed fewer than four glasses per month during the previous year, whereas 27% reported drinking more than eight glasses per month (Table 1). Taste was the leading reason respondents offered for drinking raw milk.

Respondents who reported that they drank raw milk were more likely than those who did not drink raw milk to be male ( $P<0.01$ ), Hispanic ( $P=0.02$ ), younger than age 40 ( $P=0.03$ ), and to have less than a high school education ( $P=0.01$ ). (See Table 2 and Figure.)

According to Census data, the proportion of the California population who described themselves as Hispanic increased from 19% in 1980 to 27% in 1990.<sup>11,12</sup> Although Hispanics were somewhat underrepresented in our sample (23.2% [927/3999]), they made up 34.4% of the raw milk drinkers. Of the 927 Hispanic respondents, 44 (4.7%) reported drinking raw milk, as did 84 (2.7%) of the 3072 non-Hispanic respondents.

Although the role of raw milk as a vehicle in disease transmission has been well documented, information regarding the prevalence of raw milk consumption is sparse.

**Table 2. Demographic characteristics of raw milk drinkers and nondrinkers, California Behavioral Risk Factor Surveillance System Survey, 1994 (N=3999)**

Characteristic	Drinkers	Nondrinkers	P-value
	(n=128) Percent	(n=3871) Percent	
<b>Age (years)</b>			
< 40	57.0	47.4	0.03
≥ 40	43.0	52.6	
<b>Gender</b>			
Male	60.2	43.5	<0.01
Female	39.8	56.5	
<b>Hispanic ethnicity</b>			
Yes	34.4	22.8	0.02
No	65.6	77.2	
<b>Education</b>			
< High school	3.4	14.7	0.01
≥ High school	76.6	85.3	
<b>Annual income (dollars)</b>			
< 10,000	20.3	15.8	NS
10,000–19,999	13.8	17.4	
20,000–34,999	24.4	22.6	
35,000–49,999	21.1	15.5	
50,000–75,000	8.1	16.0	
> 75,000	12.2	12.6	

NS = Not statistically significant

A higher percentage of Hispanic raw milk drinkers (34%) than of non-Hispanic drinkers (17%) reported acquiring raw milk from farms or ranches ( $P = 0.03$ ). In an attempt to determine if a cluster of low-income people, perhaps farmworkers or others with access to farms, contributed to the relatively higher proportion of raw milk drinkers among the Hispanic respondents to the survey, we looked at respondents who fell into the lowest income and education groups. Among the 25 raw milk drinkers who reported an income of less than \$10,000 per year, 17 (68%) were Hispanic and 8 (32%) were non-Hispanic. Among the 14 raw milk drinkers who reported less than a high school education, 13 were Hispanic and one was non-Hispanic. Excluding those who made less than \$10,000 annually, we found that the difference between the percentage of Hispanic respondents who were raw milk drinkers (4.2%, [27/648]) and the percentage of non-Hispanic respondents who were

raw milk drinkers (2.8 %, [76/2739]) was no longer statistically significant.

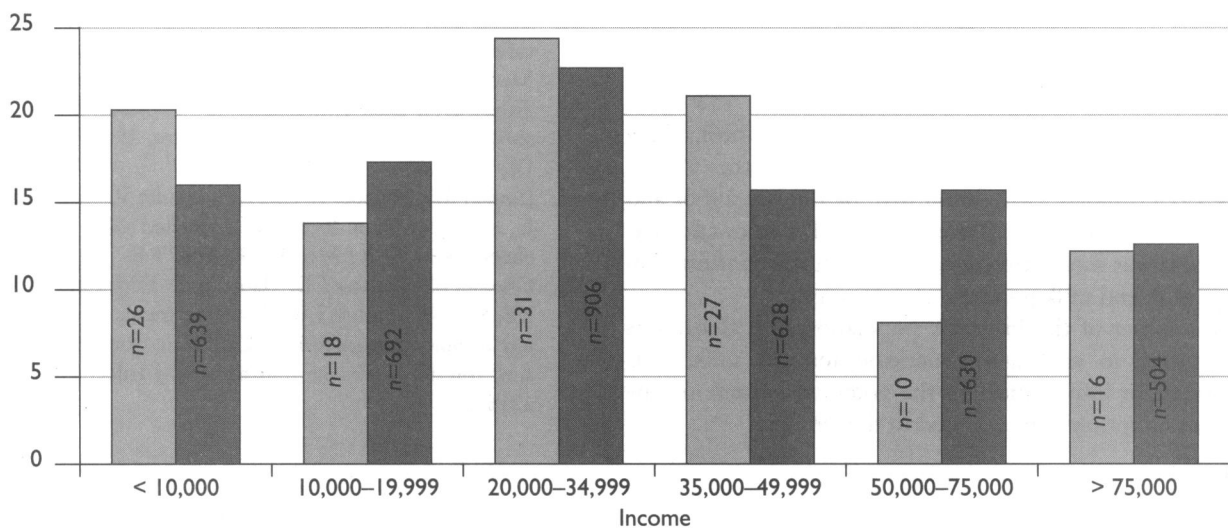
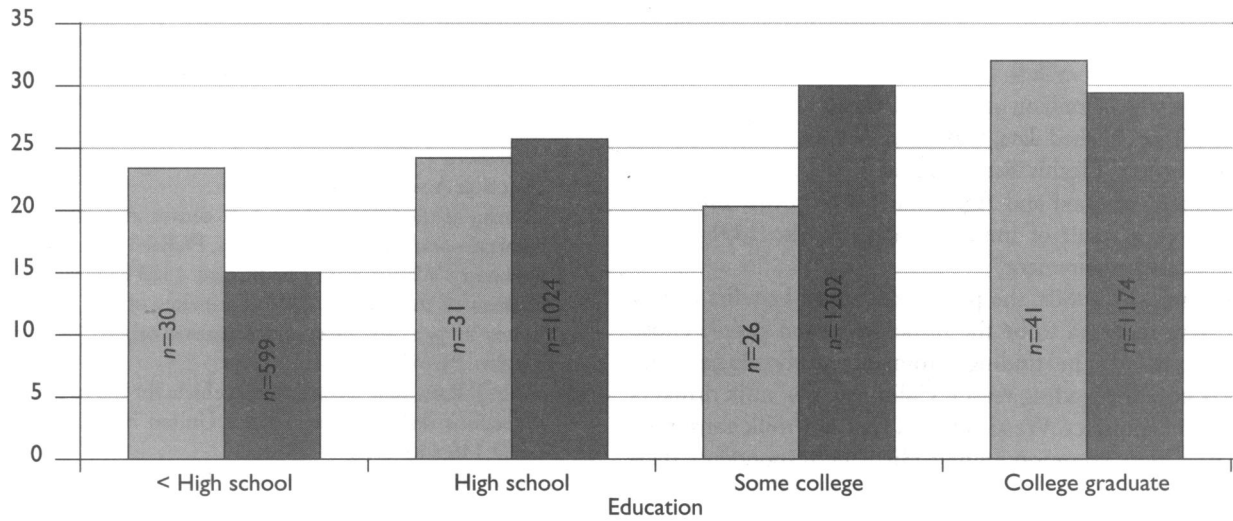
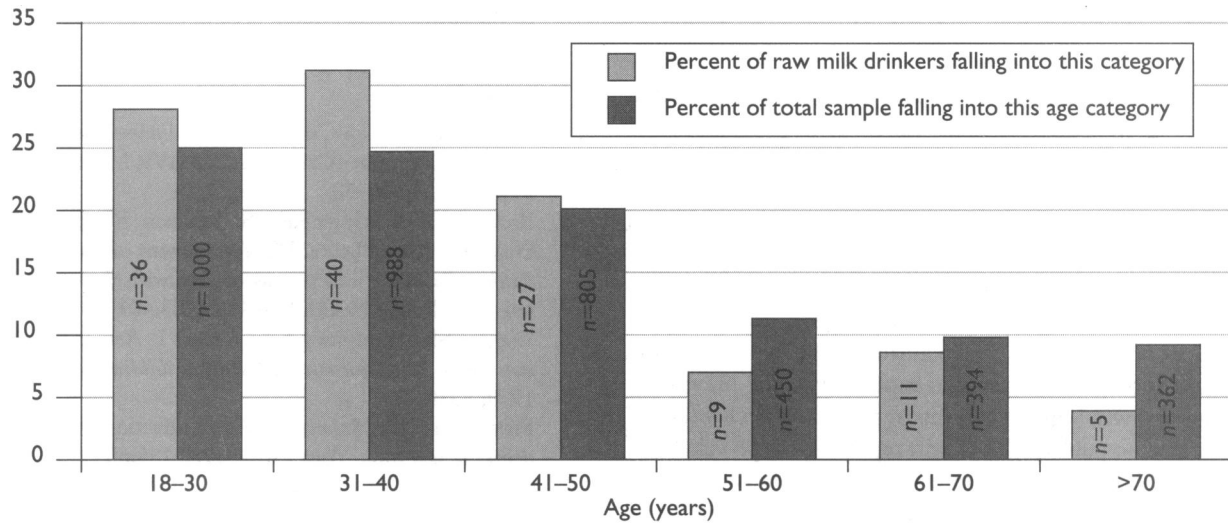
### Discussion

Although the role of raw milk as a vehicle in disease transmission has been well documented,<sup>3-7</sup> information regarding the prevalence of raw milk consumption is sparse. We are aware of two previously published studies that have estimated the prevalence of raw milk consumption among California residents.<sup>4,5</sup> Richwald and coworkers<sup>5</sup> assessed the prevalence of consumption indirectly using raw milk sales for the period 1980–1983 and an assumed serving size (one six-ounce portion per day), estimating that 0.3% to 1.3% of the

Between 1977 and 1994, the California Department of Health Services issued nearly 50 public health advisories when routine bacteriologic samples revealed *Salmonella* contamination of raw milk supplies.

population regularly used certified raw milk in California during the early 1980s. This estimate was lower than our finding of 3.2%.

**Figure. Distribution of raw milk drinkers compared to distribution of total sample, California Behavioral Risk Factor Surveillance System Survey, 1994 (N=3999)**



Several factors may have contributed to this difference. First, in their estimate of raw milk sales in California for the period 1980–1983, Richwald et al. used data for raw milk sales only from a certified raw milk producer in southern California that supplied more than 90% of the raw milk distributed for human consumption in the state at that time. Thus, raw milk sales for the state would have been underestimated somewhat by this method. It is also possible that the serving size used in their calculations (one six-ounce serving per day) may not have accurately reflected the true drinking habits of the population; assuming smaller portions or less frequent consumption would have resulted in a higher estimated prevalence of consumption.

On the other hand, we included as drinkers anyone who reported ever having had raw milk in the previous year, regardless of frequency; our inclusion of people who drank raw milk infrequently may also explain why the prevalence we observed was higher than that reported by Richwald.

Because no published data exist regarding the prevalence of raw milk consumption in California prior to the early 1980s, we do not know whether consumption levels were affected by the widespread dissemination in the medical literature of reports describing the health hazards of raw milk.<sup>3,6,13–16</sup> Estimated sales of raw milk in California decreased, however, from approximately 3.6 million gallons in 1991 to 1.5 million gallons in 1994 (Unpublished data, S. Benson Werner, MD, California Department of Health Services, and Lee Jensen, California Department of Food and Agriculture) a drop that may have occurred as a result of implementation in late 1991 of the warning label requirement.<sup>8</sup>

During the 1980s, the purported health benefits of raw milk were reported to be the principal reason people chose to drink it.<sup>7,14</sup> The findings from our study suggest that taste is now the leading reason California raw milk drinkers choose this product. We also found that raw milk consumption was more common among Hispanic respondents than non-Hispanic respondents. Although the differences were small, this finding suggests the need for additional research to further refine the profile of raw milk drinkers and determine their risk of adverse effects.

A 1985 outbreak of listeriosis in California that was linked to Mexican-style cheese made from raw milk affected Hispanics disproportionately.<sup>17</sup> Additionally, a study of reports of human brucellosis in California for the years 1973 through 1992 found that, by the late 1980s and early 1990s, brucellosis affected mostly Hispanics and that the illness was most often associated with the consumption of raw milk and milk products of goat origin.<sup>18</sup>

If a subset of the Hispanic population in California is contributing to an ongoing demand for raw milk, it is important for information on the potential hazards of raw milk consumption to be targeted to this group.

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