

Comparisons of Colorado Women's Cancer Screening Practices by Residence: Metropolitan, Non-metropolitan, and Farm

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ABSTRACT. *Combining farm residents and non-farm rural residents into a single category designated as rural may obscure differences in preventive care utilization, including cancer screening practices in each group, because of distinctive characteristics of farmers. This study compared three cancer screening practices (mammography, breast physical examination, and Pap smears) across three residence groups (metropolitan, non-metropolitan, and farms) of Colorado women and described demographic and socioeconomic characteristics of the groups. Females interviewed in the 1993 Colorado Behavioral Risk Factor Surveillance System (BRFSS) were divided into residence as metropolitan or non-metropolitan. Farm residents were female respondents interviewed as part of the Colorado Farm Family Health and Hazard Survey (CFFHHS) conducted in 1993-1997. Univariate and multivariate analyses were conducted to determine characteristics related to the screening practices. Farm women were more likely to be non-Hispanic white and older, to report their health as very good, and to have medical insurance and at least one source of primary care compared to non-metropolitan women. After controlling for related variables, residence was not associated with the screening practices, with the exception of breast physical examination; farm women were less likely to have a recent examination than metropolitan women (OR = 1.50, 95% CI = 1.07-2.10). When non-metropolitan and farm women were combined, there was no association between residence and having had a physical breast examination. There were important differences between non-metropolitan women and farm women in demographic and socioeconomic characteristics, which influenced screening practices. Further studies are needed to examine farm residents' cancer screening practices separately from other rural residents in order to fully understand the implications of these differences for health status in other geographic areas.*

Keywords . *Cancer screening, Farm, Rural residence, Women's health.*

Residence is among several factors associated with differences in breast and cervical cancer screening practices. Rural populations have been characterized as older, white, married, less educated with lower household incomes, and less likely to have medical insurance (Amonker and Madhavan, 2002; Coughlin et al., 2002; Zhang et al., 2000). Residents in rural areas were reported to be less likely to have recent cancer screening compared to urban residents (Amonker and Madhavan, 2002; Calle et al., 1993; Casey et al., 2001; Coughlin et al., 2002; Zhang et al., 2000), resulting in poorer outcomes due in part to higher incidence rates of invasive and advanced cancers at diagnosis relative to urban residents (Liff et al., 1991; Shootman and Fuortes, 1999).

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Although the differences found in cancer screening practices between people residing in urban areas and rural areas are substantively important in order to reduce disparities in access and use of preventive health care, it is necessary to recognize that residents in rural areas are not a homogenous group. In 1910, approximately 53% (49,348,883) of the U.S. population lived in rural areas, and 65% (32,077,313) of them lived on farms (Hart, 1995). However, by 1990, the population on farms had declined to 6.3% (3,871,583) of the total U.S. population (Hart, 1995) with the non-farm population moving into rural areas.

Separating farm residents from other rural residents and examining their characteristics and health needs has practical implications. In general, farmers have been considered to be healthier than other workers, characterized as being physically more active, less likely to smoke and drink excessively, having a healthier diet, being at lower risk for most diseases, particularly cardiovascular diseases and smoking-related cancers (Blair and Zahm, 1991; Cerhan et al., 1998; Stiernstrom et al., 1998). However, a study of mortality risks among white and non-white, male and female farmers revealed that farmers experienced excess mortality relative to other workers from selected cancers, illnesses, and injuries (Blair et al., 1993). For example, excess mortality from stomach cancer was observed among non-white female farmers, from diseases of the genitourinary system among white females, and from cervical cancer among non-white females living in the South region (Blair et al., 1993). As the authors discussed, environmental factors in agricultural work and/or chemicals used in farm work, which varied depending on the types of crops and animals the farms produce, might be possible causes, although reasons for the observed excess mortality rates have not been clarified. Based on the distinctive characteristics of farmers, health-related behaviors including cancer screening utilization by farm residents are an important target of occupational health; however, thus far, few studies have examined farm residents' cancer screening practices (Carr et al., 1996; Muldoon et al., 1996; Park et al., 2002; Rosenman et al., 1995), and only two of them compared farmers with non-farm rural residents (Muldoon et al., 1996) or with other workers (Park et al., 2002).

Secondly, to determine whether farm residents and non-farm rural residents have different demographic and socioeconomic characteristics related to health care service utilizations has important implications for prevention programs. In addition to the farmers' healthier lifestyles, studies have reported that farmers were likely to have medical insurance (Carr et al., 1996; Muldoon et al., 1996; Park et al., 2002; Rosenman et al., 1995), in contrast with the findings from rural-urban comparisons mentioned earlier. Simply combining farmers with other rural residents may obscure the health care needs and disadvantageous status of the latter group.

The purposes of this study are to address the associations between residence (urban, rural, and farm) and breast and cervical cancer screening practices among women in Colorado and to describe the demographic and socioeconomic profiles that may be related to cancer screening behaviors.

Methods

Study Populations

Two data sources were used. The first was the 1993 Colorado Behavioral Risk Factor Surveillance System (BRFSS), and the second was the Colorado Farm Family Health and Hazard Survey (CFFHHS). Both surveys included Colorado residents; however, the regions where the samples were drawn differed. The BRFSS sample was randomly

selected from all counties in Colorado, and the CFFHHS sample was collected from the farm population in an eight-county area in northeastern Colorado.

The BRFSS is a nationwide telephone survey of non-institutionalized adults 18 years of age and older, using a standardizing questionnaire that includes items on breast and cervical cancer screening utilization and optional questionnaires chosen to apply by states (CDC, 1996). In collaboration with CDC, each state's health department collects data from randomly selected participants by random-digit dialing techniques. The 1993 Colorado BRFSS used a two-stage Waksberg cluster design to generate the sample. A total of 1,802 people, including 1,049 females, responded to the survey, with an overall response rate of 71%. The age range of females in the sample was between 18 and 95.

The study sample of CFFHHS was selected using a multistage area probability sample in an eight-county area of northeastern Colorado, which included 47% of the total agriculturally employed population in the state (Stallones and Beseler, 2003). The eight counties were: Larimer, Logan, Morgan, Phillips, Sedgwick, Washington, Weld, and Yuma. From the randomly selected farms, farm operators and their spouses residing on site were recruited for the study (Stallones and Beseler, 2003). The recruitment procedure differed from the BRFSS interview, in which interviewees could be any person 18 years of age and older living in selected households (CDC, 1996). Personal on-farm interviews were conducted between 1993 and 1997 to collect information including demographics and socioeconomic status, farm characteristics, physical/mental health, safety knowledge and practices, and behavioral risk factors. The total sample was 763 (301 females) representing 479 farms. Response rates for each county ranged from 47% to 80%, with an overall response rate of 57% based on all eligible farms contacted (Stallones and Beseler, 2003). Females' age in the sample ranged from 24 to 82.

Study Variables

Mammography and breast physical examination were used to identify breast cancer screening practices, and Papanicolaou (Pap) smears were used for a cervical cancer screening practice based on 1991 American Cancer Society (ACS) guidelines (Metzlin and Dodd, 1991). The guideline recommended: mammography every 1-2 years for 40-49 years of age, mammography every year for 50 and older, breast physical examination every 3 years by a doctor or a medical assistant for 20-40, physical examination every year for 40 and older, and Pap smear every year for all women who are (or have been) sexually active. Based on the guidelines, the study dichotomized women into those who had had recent screenings (within 2 years for mammography, within the previous year for breast physical examination and Pap smear) and those who had not had recent screenings or who had never been screened. The study only examined recent screening behaviors because the percentages of females who had ever been screened was high across all groups: mammography was 84.1% (metropolitan), 79.0% (non-metropolitan), and 84.8% (farm); breast examination was 92.4%, 98.0%, and 96.0%; and Pap smear was 97.7%, 96.2%, and 99.6%, respectively.

Rural-urban continuum codes were used to classify the counties of respondents in the 1993 BRFSS into metropolitan or non-metropolitan areas. The codes were developed by the USDA Economic Research Service in 1974 and revised in 1983, 1993, and 2003 (USDA-ERS, 2003a). The advantage of using these codes is that all counties are classified by degree of urbanization and proximity to a metropolitan area so that accessibility to health care facilities can be inferred, assuming more health care facilities are located in metropolitan areas than non-metropolitan areas. The 1993 codes (USDA-ERS, 2003b) were used to categorize the BRFSS respondents into metropolitan and non-metropolitan. Of 63 counties in Colorado at that time, 10 counties classified as metropolitan and 53 as non-metropolitan. In 1993, the total Colorado population

consisted of 2,989,341 (83.1%) in the metropolitan counties and 608,053 (16.9%) in the non-metropolitan counties (USDA-ERS, 2003b). Colorado's farm population in 1990 was 45,118, constituting 1.4% of the total population at that time (U.S. Census Bureau, 1990a).

For comparability, the items for cancer screening practices in the CFFHHS questionnaire were developed using BRFSS questionnaires and other national health survey questionnaires that were used at that time. Other demographic and socioeconomic questions were comparable except items on income, which were not used in the analyses because the CFFHHS questionnaire used crop value as a measure of income, while the BRFSS asked annual household income from all sources.

Data Analysis

Female respondents whose age or county of residence were not available were excluded. The youngest age of respondents reported in the CFFHHS dataset was 24 years; therefore, those who were younger than 24 years of age in the BRFSS were excluded. The procedures yielded a final sample of 804 female residents in metropolitan counties (from the BRFSS sample), 152 residents in non-metropolitan counties (from the BRFSS sample), and 299 farm residents (the CFFHHS sample). The total sample size was 1,255. Analyses of the Pap smear practices excluded 308 women who reported they had a hysterectomy. Differences in the proportions of those who had the surgery across the three residence groups were not statistically significant (χ^2 [df = 2] = 3.6, $p = 0.16$).

Chi-squared tests were conducted to explore the univariate associations between the variables of interest, i.e., the residence (metropolitan, non-metropolitan, and farm) and the demographic and socioeconomic variables. Additionally, the associations between each of the screening practices and all the variables were examined by chi-squared tests.

Logistic regression was used to assess the associations of study variables with each of the cancer screening practices. The variables that were statistically significant (p -values were less than 0.05) in univariate chi-squared tests or those that were substantively important were included in the models: age in years, Hispanic origin, race/ethnicity, education, marital status, self-perceived general health, having medical insurance, having experienced financial barriers to seeing a doctor when needed, having a primary source of medical care, and residence. Two demographic variables, Hispanic origin and race/ethnicity, were combined into a variable with four levels (Hispanic or non-Hispanic, and white or non-white) because these were highly correlated ($r_s = 0.60$, $p < 0.0001$). Five categories of self-perceived general health were combined into two categories for the analyses (excellent/very good/good, and fair/poor) because a response of "poor" was uncommon in non-metropolitan and farm women. Marital status was dichotomized into "married" and "not married," which included divorced, widowed, separated, unmarried, and never having been married.

Reference groups in the models were chosen as the categories that were assumed to be the most protective, i.e., more likely to have cancer screening. The groups were: the age categories at which females should start regular frequent screening practices (mammography was 40-49, breast physical examination was 40-49, and Pap smear was the youngest category); non-Hispanic white; having completed four years or more of college; married; excellent or good health status; having medical insurance; having no financial barriers to obtaining medical care; having a regular source of primary care; and residence in a metropolitan area. SAS software version 8.02 (SAS Institute, Inc., Cary, N.C.) was used to perform all of the calculations.

Table 1. Characteristics of the study population.

Characteristics	Metro (<i>n</i> = 804), % (No.)	Non-metro (<i>n</i> = 152), % (No.)	Farm (<i>n</i> = 299), % (No.)
Age in years ^[a]			
24-29	12.94 (104)	13.16 (20)	4.35 (13)
30-39	29.73 (239)	21.05 (32)	19.73 (59)
40-49	21.27 (171)	23.03 (35)	27.09 (81)
50-59	12.44 (100)	17.76 (27)	22.41 (67)
60-69	12.81 (103)	8.55 (13)	19.40 (58)
70+	10.82 (87)	16.45 (25)	7.02 (21)
Race ^{[a],[b]}			
White	86.07 (692)	90.13 (137)	98.66 (295)
Black	5.10 (41)	0.00 (0)	0.33 (1)
Asian, Pacific Islander	1.24 (10)	0.00 (0)	0.00 (0)
American Indian	0.62 (5)	1.97 (3)	0.00 (0)
Other	6.84 (55)	7.89 (12)	1.00 (3)
Hispanic origin ^{[a],[c]}			
Non-Hispanic origin ^[d]	90.90 (729)	88.16 (134)	97.99 (293)
Race/ethnicity combined ^{[a],[c]}			
Non-Hispanic white	83.79 (672)	86.18 (131)	97.66 (292)
Hispanic white	2.49 (20)	3.95 (6)	1.00 (3)
Non-Hispanic non-white	7.11 (57)	1.97 (3)	0.33 (1)
Hispanic non-white	6.61 (53)	7.89 (12)	1.00 (3)
Education ^{[a],[c]}			
Some high school or less	9.20 (74)	15.23 (23)	6.04 (18)
High school graduate or GED	28.23 (227)	35.76 (54)	34.90 (104)
Some college or technical school	30.35 (244)	22.52 (34)	33.89 (101)
College, four years or more	32.21 (259)	26.49 (40)	25.17 (75)
Marital status ^{[a],[c]}			
Married	53.30 (428)	61.18 (93)	96.97 (288)
Divorced or separated	20.30 (163)	17.11 (26)	1.68 (5)
Widowed	11.83 (95)	14.47 (22)	1.35 (4)
Never married or unmarried	14.57 (117)	7.24 (11)	0.00 (0)
Self-perceived general health ^{[a],[c]}			
Excellent	27.36 (220)	24.34 (37)	23.08 (69)
Very good	34.08 (274)	30.26 (46)	43.81 (131)
Good	24.00 (193)	31.58 (48)	27.76 (83)
Fair	11.19 (90)	7.89 (12)	4.01 (12)
Poor	3.23 (26)	5.92 (9)	1.00 (3)
Have medical insurance ^{[a],[b]}			
Yes ^[d]	87.80 (705)	83.55 (127)	94.98 (284)
Experience of financial barrier ^[a]			
No ^[d]	86.69 (697)	78.29 (119)	97.66 (292)
Have primary care place ^{[a],[b]}			
Yes ^[d]	92.04 (740)	88.74 (134)	96.66 (289)

[a] Chi-squared test was significant at the $p = 0.01$ level.

[b] Missing = 1.

[c] Missing = 2.

[d] The percentage of the counterpart was not shown.

[e] Missing = 3.

Results

Characteristics of the Study Population

Table 1 displays the demographic characteristics, socioeconomic status, perceived health status, and health care access of the metropolitan, non-metropolitan, and farm female residents. Farm residents were older compared to metropolitan and non-metropolitan residents. Farm women were more likely to be non-Hispanic white than the other two groups. The proportion of farm residents who completed four years or more of college was lower than metropolitan residents, but farm and non-metropolitan residents were similar, 25.2% and 26.5%, respectively. More farm residents perceived their health as excellent, very good, or good compared with the other two groups. Only 5.0% of the farm residents answered that their health was fair or poor, compared to 14.4% of metropolitan and 13.8% of non-metropolitan residents. Ninety-five percent of the farm residents had medical insurance and had at least one source of primary care. Only 3% of the farm female residents did not see a doctor when they needed to due to cost. In contrast, non-metropolitan women were less likely to have medical insurance and a regular source of primary care, and were more likely to have experienced financial barriers compared with farm and metropolitan residents.

Cancer Screening Practices

As shown in table 2, the proportion of women who were 40 years of age and older and had mammography within the past two years were almost the same between metropolitan and farm residents, but were lower among non-metropolitan residents, although the difference was not statistically significant. However, when including women in ages 24-39, for whom the 1991 ACS guideline did not recommend the screening, the difference was significant. A significantly higher proportion of farm and metropolitan women aged 24-39 had received a mammogram compared with those non-metropolitan women. The metropolitan residents were more likely to have had a breast physical examination within the past year compared with the non-metropolitan and farm residents, but the difference was not statistically significant regardless of whether younger groups were included or not. The proportions of respondents who had a Pap smear test within the past year did not differ among the groups.

Table 2. Cancer screening practices of the study population.

Characteristics	Metro, % (No.)	Non-metro, % (No.)	Farm, % (No.)
Have mammogram within the past two years ^[a]			
Yes (40 years and older) ^[b]	73.85 (n = 455)	62.00 (n = 100)	73.66 (n = 224)
Yes (all age) ^{[b],[c]}	51.63 (n = 798)	44.74 (n = 152)	62.24 (n = 294)
Have physical exam within the past year ^[a]			
Yes (40 years and older) ^[b]	69.30 (n = 456)	66.00 (n = 100)	64.57 (n = 223)
Yes (all age) ^[b]	69.17 (n = 798)	64.24 (n = 151)	67.24 (n = 293)
Have Pap smear within the past year ^{[a],[d]}			
Yes (all age) ^[b]	67.05 (n = 604)	61.17 (n = 103)	63.23 (n = 223)

[a] The number of women who answered the question of “having had a recent screening” was among all women including “never had one” and “ever had one.”

[b] The percentage of the counterpart was not shown.

[c] Chi-squared test was significant at the p = 0.01 level.

[d] 308 were excluded because of having a hysterectomy.

Table 3. Percentages, odds ratios, and 95% confidence intervals for study characteristics associated with not having recent cancer screening practices.^[a]

	Not having mammogram		Not having physical exam		Not having Pap smear	
	within the past two years		within the past year		within the past year	
	%	OR (95% CI)	%	OR (95% CI)	%	OR (95% CI)
Age in years						
24-29	86.86	15.91 (8.74-28.97)	29.20	0.59 (0.36-0.96)	25.19	Reference
30-39	75.00	7.49 (5.11-10.97)	31.60	0.83 (0.57-1.19)	30.69	1.71 (1.02-2.86)
40-49	31.58	Reference	34.04	Reference	37.67	2.53 (1.47-4.35)
50-59	21.13	0.53 (0.34-0.85)	28.50	0.76 (0.50-1.16)	33.04	2.11 (1.13-3.97)
60-69	23.98	0.64 (0.40-1.01)	34.30	0.97 (0.63-1.49)	48.00	3.49 (1.87-6.51)
70+	34.11	1.08 (0.65-1.78)	32.56	0.88 (0.54-1.45)	43.08	2.85 (1.40-5.79)
Race/ethnicity combined						
Non-Hispanic white	45.62	Reference	31.42	Reference	34.65	Reference
Hispanic white	67.86	1.10 (0.40-3.02)	48.28	1.35 (0.59-3.08)	57.14	2.15 (0.81-5.69)
Non-Hispanic non-white	49.18	0.75 (0.38-1.46)	34.43	1.04 (0.58-1.87)	28.57	0.69 (0.33-1.45)
Hispanic non-white	54.41	0.63 (0.33-1.19)	29.41	0.66 (0.36-1.23)	28.07	0.63 (0.32-1.25)
Education						
Some high school or less	50.89	2.26 (1.27-4.03)	46.85	2.20 (1.31-3.70)	49.23	1.96 (1.02-3.79)
High school grad. or GED	47.64	1.94 (1.34-2.79)	30.63	1.23 (0.87-1.73)	34.21	1.40 (0.95-2.07)
Some college or tech school	47.34	1.66 (1.15-2.39)	33.96	1.40 (1.00-1.96)	40.99	1.89 (1.30-2.75)
College, four years or more	44.09	Reference	26.81	Reference	26.03	Reference
Marital status						
Married	44.14	Reference	28.96	Reference	31.79	Reference
Not married	51.48	1.12 (0.81-1.54)	37.21	1.38 (1.03-1.86)	39.63	1.36 (0.96-1.92)
Self-perceived general health						
Excellent, very good, good	47.80	Reference	30.98	Reference	33.29	Reference
Fair or poor	38.67	0.98 (0.62-1.53)	38.67	1.06 (0.71-1.60)	47.56	1.28 (0.76-2.17)
Have medical insurance						
Yes	42.53	Reference	28.99	Reference	31.78	Reference
No	80.43	2.74 (1.58-4.76)	55.47	1.81 (1.16-2.82)	54.95	1.86 (1.11-3.11)
Financial barrier						
Yes	72.11	1.48 (0.88-2.48)	52.74	1.77 (1.15-2.74)	50.00	1.49 (0.89-2.48)
No	43.30	Reference	29.11	Reference	32.31	Reference
Have primary care place						
Yes	43.75	Reference	28.67	Reference	31.23	Reference
No	83.52	4.97 (2.62-9.44)	72.22	5.27 (3.17-8.73)	72.00	5.28 (2.99-9.34)
Residence						
Metropolitan	48.37	Reference	30.83	Reference	32.95	Reference
Non-metropolitan	55.26	1.55 (1.00-2.39)	35.76	1.09 (0.73-1.63)	38.83	1.11 (0.69-1.78)
Farm	37.76	1.15 (0.80-1.66)	32.76	1.50 (1.07-2.10)	36.77	1.41 (0.96-2.08)

^[a] The percentages indicate the proportion of women who did not have the screenings among each subgroup of the categories. The odds ratios show the risks of not having the screenings compared to the reference groups.

Cancer Screening Practices and Demographic/Socioeconomic Characteristics

Table 3 contains odds ratios (ORs) and 95% confidence intervals (95% CI) for the relationships between recent cancer screening practices and residence and other selected characteristics. The ORs indicate the extent to which women in that group were less likely to have had the recent screening relative to the reference category after controlling for

other characteristics, and can be interpreted as the risk of failing to have the screening relative to the reference group. All regression models were statistically significant ($p < 0.0001$).

Factors associated with not having a recent mammogram were: being 24-39 years of age, all education categories less than completing college, having no medical insurance, and having no primary source of medical care. Women aged 50 and older were more likely to have a recent mammogram compared to those aged 40-49. Not having had a recent breast physical examination was associated with residing on farms, having no insurance and no primary source of medical care, having experienced a financial barrier to seeking medical care, not being married, and having lower educational attainment. Women aged 24-29 were more likely to have had a recent breast physical examination. The following characteristics were associated with not having had a Pap smear within a year: all age categories older than 30 years, lower educational attainment, having no medical insurance, and not having a primary source of medical care.

Discussion

Farm women were less likely to have had a recent breast physical examination compared to metropolitan women. Even though the farm women were more likely to have insurance and a source of primary care, they were less likely to have had one within the previous year. However, the significant relationship disappeared when combining the farm residents with non-metropolitan residents (OR for the combined group was 1.32 [CI = 0.99–1.75]), indicating the importance of separating farmers from other rural residents. This provides support for further investigation of associations between cancer screening practices and farm residence in other populations in the United States.

Non-metropolitan residence was not associated with a recent breast physical examination. Non-metropolitan or farm residence was not associated with recent mammography or with Pap smear screening. These findings differ from previous studies, which reported that residing in rural areas was negatively associated with cancer screening practices (Amonker and Madhavan, 2002; Calle et al., 1993; Casey et al., 2001; Coughlin et al., 2002; Zhang et al., 2000). Perhaps differences in accessibility to health care services between metropolitan-adjacent non-metropolitan counties and non-adjacent non-metropolitan counties contributed to the lack of differences observed in the current study, because 11 of the rural counties were adjacent to urban counties. These counties should have been assessed separately; however, only a small number of women in this study ($n = 27$) lived in the metropolitan-adjacent non-metropolitan area. Furthermore, the farm area of this study included two counties, Larimer and Weld, classified as metropolitan based on the 1993 rural-urban continuum codes. Therefore, some of the farm women might have the same accessibility to screening services as other metropolitan women did.

Besides the impact of residence, the study revealed that differences in demographic and socioeconomic characteristics between non-metropolitan and farm residents were large enough to suggest a need to take them into account in promoting cancer screening. Some of these, for example, lack of insurance and a primary care facility, had significant negative impacts on recent screening practices. These findings are consistent with previous literature (Amonker and Madhavan, 2002; Casey et al., 2001; Coughlin et al., 2002; Muldoon et al., 1996; Zapka et al., 1989; Zhang et al., 2000). Non-metropolitan women and farm women showed considerable differences in these factors. Farm women were about 10% more likely to have medical insurance coverage compared to non-metropolitan women, with a similar percentage difference in access to primary care.

Ignoring the differences and using “rural” as a category will underestimate the unfavorable socioeconomic profiles of the non-metropolitan non-farm population and overestimate the unfavorable circumstances among farm women. Separating non-farm rural residents from farm residents can benefit both groups, at least in Colorado. This could be accomplished if the BRFSS includes questions of occupational and industrial information of respondents, such as the work done as a pilot study in the 1999 Iowa BRFSS (Park et al., 2002).

The study has several limitations. First, the study did not separate screening practices from diagnostic tests. Given the knowledge about differences in prevalence rates or aggressiveness of the cancers at the time of diagnosis across demographic groups, e.g., racial/ethnic groups (Canto and Chu, 2000; CDPHE, 1999, 2000; Davis et al., 1995) and the different demographic profiles across the three residence groups, the reasons for having had the tests might have differed. Secondly, the BRFSS data were collected by telephone interview, while the CFFHHS used an in-person interview for data collection. Data quality, including accuracy and item nonresponse, has been reported to be better in face-to-face interviews (de Leeuw and van der Zouwen, 1988). Furthermore, BRFSS is a telephone survey that excluded households without telephones. This might have caused under-representation of some populations, specifically the Hispanic population in Colorado, which was 10.2% of the total householders at the time of the 1990 census (U.S. Census Bureau, 1990b) and who are less likely to have telephones. In 1998, 12.3% of Hispanic households in the U.S. did not have telephones, while only 4.3% of non-Hispanic white households did not (CDC, 2002). Approximately 3.5% of the households in Colorado, those who did not have telephones in 1990 (U.S. Census Bureau, 1996), were more likely to be Hispanic; therefore, the BRFSS population was likely to represent cancer screening practices among a selected population of the Hispanics. Lastly, it should be noted that it was possible that the BRFSS sample of this study contained farm residents because the questionnaire of 1993 BRFSS did not ask respondents about their work. However, the sample was designed to select a representative sample of households in Colorado; therefore, the probability of selecting a farm household was lower than an urban or even rural non-farm household, since less than 2% of households would have been a farm.

In summary, the study provided support for further research that investigates farm women’s cancer screening practices and the impact of rural/farm residence on these practices. Males living on farms and in rural areas should also be examined.

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