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## Higher prevalence of hysterectomy among rural women than urban women: Implications for measures of disparities in uterine and cervical cancers

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### Abstract

**Purpose:** Differences in hysterectomy prevalence by rural or urban residence could distort comparisons of rural-urban cervical and uterine cancer incidence. Using data from a large population-based survey, we sought to understand whether hysterectomy prevalence varies by rural or urban residence and whether the relationship between hysterectomy prevalence and rurality varies by race or ethnicity.

**Methods:** Our analysis included 197,759 female respondents to the 2018 Behavioral Risk Factor Surveillance System, aged 20–79 years. We calculated population weighted proportions and 95% confidence intervals for hysterectomy prevalence, stratified by rural-urban residence and 5-year age groups. We also report estimates of hysterectomy prevalence by rural-urban residence for specific race and ethnic groups.

**Findings:** Hysterectomy prevalence increased with age and was more common among rural women than urban women. The largest absolute difference occurred among women aged 45–49 years; 28.6% of rural women (95% CI: 25.1–32.2) and 16.6% of urban women (95% CI: 15.3–17.8) reported a hysterectomy. For hysterectomy prevalence by race and ethnicity, rural estimates were higher than urban estimates for the following groups of women: non-Hispanic Asian, non-Hispanic other race, non-Hispanic Black, and non-Hispanic White. Among Hispanic women and non-Hispanic American Indian/Alaska Native women, rural-urban differences in hysterectomy prevalence were not statistically different at the 95% confidence level.

**Conclusions:** Our results suggest that variation in hysterectomy prevalence, if not adjusted in the analysis, could produce distorted comparisons in measures of the relationship between rurality and uterine and cervical cancer rates. The magnitude of this confounding bias may vary by race and ethnicity.

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#### DISCLOSURES

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. Our report presents data from the 2018 Behavioral Risk Factor Surveillance System, which is a collaborative project between all of the states in the United States and participating US territories and the Centers for Disease Control and Prevention.

## Keywords

cervical cancer; gynecologic cancer; hysterectomy; rural health; women's health

Hysterectomies reduce the population of women at risk for developing uterine and cervical cancer, but incidence rates for these cancers often are not adjusted for hysterectomy prevalence. Previous reports suggest that around 50% of Black women and around 45% of White women aged 70–74 years have had a hysterectomy.<sup>1</sup> Most hysterectomies are performed for benign indications, such as uterine fibroids, abnormal uterine bleeding, and endometriosis.<sup>2</sup> Analyses of uterine and cervical cancer incidence rates unadjusted for hysterectomy have been shown to underestimate cancer incidence rates for these sites, particularly at older ages.<sup>1,3,4</sup> Because hysterectomy prevalence varies by race, analyses unadjusted for race-specific hysterectomy prevalence can lead to distorted comparisons of race-specific rates for gynecologic cancer.<sup>1,3,4</sup>

Prior research suggests that women living in rural areas experience lower uterine cancer incidence<sup>5</sup> and higher cervical cancer incidence<sup>5–7</sup> compared to women living in urban areas. However, we do not know if variation in hysterectomy prevalence by rural-urban residence might bias these comparisons. Our analysis provides age-specific hysterectomy prevalence for both rural and urban women.

## MATERIALS AND METHODS

In 2019–2020, we analyzed public use data from the 2018 Behavioral Risk Factor Surveillance System (BRFSS), a cross-sectional, telephone survey which collected information from respondents living in the United States.<sup>8</sup> The BRFSS questionnaire included this measure of hysterectomy status: “Have you had a hysterectomy?” We treated rural-urban residence as a dichotomy, following the 2013 National Center for Health Statistics (NCHS) 6-category urban-rural classification scheme for counties. Specifically, our analysis used NCHS codes 1–4 to identify respondents who reside in metropolitan/urban counties and NCHS codes 5–6 to identify respondents who reside in nonmetropolitan/rural counties. The dichotomous NCHS rural-urban variable is publicly available in the 2018 BRFSS dataset. Its use results in around 15% of the US population classified as living in nonmetropolitan/rural counties.<sup>9</sup> The NCHS urban-rural classification scheme does not classify US territories,<sup>9</sup> so our analysis excluded BRFSS respondents from Puerto Rico and Guam. The dichotomous version of the NCHS rural-urban classification aligns with the classification typically used in rural-urban cancer incidence analyses.<sup>5–7</sup>

Our analysis included 197,759 female respondents aged 20–79 years (Table 1). The median BRFSS survey response rate in 2018 was 49.9% (range = 38.8%–67.2%).<sup>8</sup> We used SAS version 9.4 (SAS Institute Inc., Cary, NC) to calculate weighted proportions and 95% confidence intervals for hysterectomy prevalence, stratified by both rural-urban residence and 5-year age groups. We chose to stratify by 5-year age groups because previous reports demonstrated that hysterectomy status is associated with age among US women.<sup>1,3</sup> Many age-group specific estimates for rural women with an additional race/ethnicity stratification did not have the statistical stability needed to meet the National Center for Health Statistics'

data reporting criteria for proportions.<sup>10</sup> Race and ethnicity-specific estimates presented include all women aged 20–79 years without adjustment for age. SAS survey procedures incorporated cluster, stratum, and weight variables to ensure the weighted proportions and confidence intervals reflect the survey’s complex sampling design. The 2018 BRFSS public-use dataset top coded age at 79 years, which limited our ability to report estimates for 5-year age groups above age 79 years.

## RESULTS

Hysterectomy prevalence increased with age and was more common among rural women than urban women (Figure 1). The largest relative rural-urban differences occurred among women aged 25–39 years. Among women aged <40 years, rural women were more than twice as likely to report hysterectomy than urban women. The largest absolute difference occurred among women aged 45–49 years; 28.6% of rural women (95% CI: 25.1–32.2) and 16.6% of urban women (95% CI: 15.3–17.8) reported a hysterectomy. For hysterectomy prevalence by race and ethnicity, rural estimates were higher than urban estimates for the following groups of women: non-Hispanic Asian, non-Hispanic other race, non-Hispanic Black, and non-Hispanic White. The largest absolute rural-urban differences in hysterectomy prevalence occurred among women classified in the non-Hispanic other race group (rural prevalence: 26.0, 95% CI: 21.8–30.2; urban prevalence: 17.1, 95% CI: 15.0–19.2) (Figure 2). Rural-urban comparisons of hysterectomy prevalence for Hispanic women and non-Hispanic American Indian/Alaska Native women were not statistically different at the 95% confidence level (Figure 2).

## DISCUSSION AND CONCLUSIONS

To our knowledge, this is the first study to examine hysterectomy prevalence among US women by rural-urban residence. We found elevated hysterectomy prevalence among women living in rural areas compared to women living in urban areas. After adjustment for hysterectomy status, incidence rates for uterine cancer and cervical cancer may be higher in rural areas than previously reported. Therefore, the expected incidence for cervical and uterine cancer in rural areas based on rates unadjusted for age-specific hysterectomy status may be underestimated.

Study strengths include a large population-based sample and use of a self-reported measure of hysterectomy status that has been shown to have high validity.<sup>11</sup> Limitations include the inability to know which hysterectomies included removal of the cervix. Previous reports suggest that around 90% of hysterectomies include removal of the cervix.<sup>2,12</sup> In addition, we presented hysterectomy estimates by race/ethnicity and rural-urban residence unadjusted for age.

Accurate measures of cancer incidence are helpful for informing gynecologic cancer prevention and screening efforts. BRFSS data are drawn from a community-dwelling sample of US adults from all 50 states. The question on BRFSS did not ask whether the cervix had been resected, but an analysis of national data on inpatient procedures reported that supracervical hysterectomies represented less than 10% of all hysterectomies performed.<sup>2</sup>

Datasets on incident surgical procedures may have limited generalizability because of the characteristics of the population captured, missing data on race and ethnicity, or exclusion of outpatient procedures (the setting where most hysterectomies occur).<sup>13</sup>

The causes of hysterectomy are complex and can include the presence of benign gynecologic conditions, environmental and behavioral risk factors for developing gynecologic conditions, and limited health care access to hysterectomy alternatives.<sup>14</sup> Based on our results, future analyses could also explore how the underlying social, political, and historical causes of hysterectomy might explain variation in hysterectomy prevalence by rural-urban residence.<sup>15,16</sup>

Our results suggest that hysterectomy prevalence, if not adjusted in statistical analysis, could produce distorted comparisons in measures of the relationship between rurality and uterine and cervical cancer rates. The magnitude of this confounding bias may vary by race and ethnicity.

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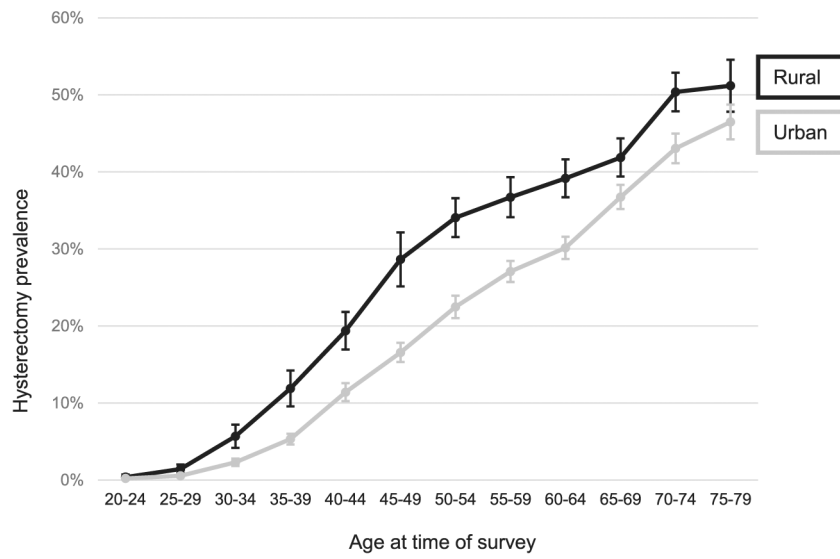
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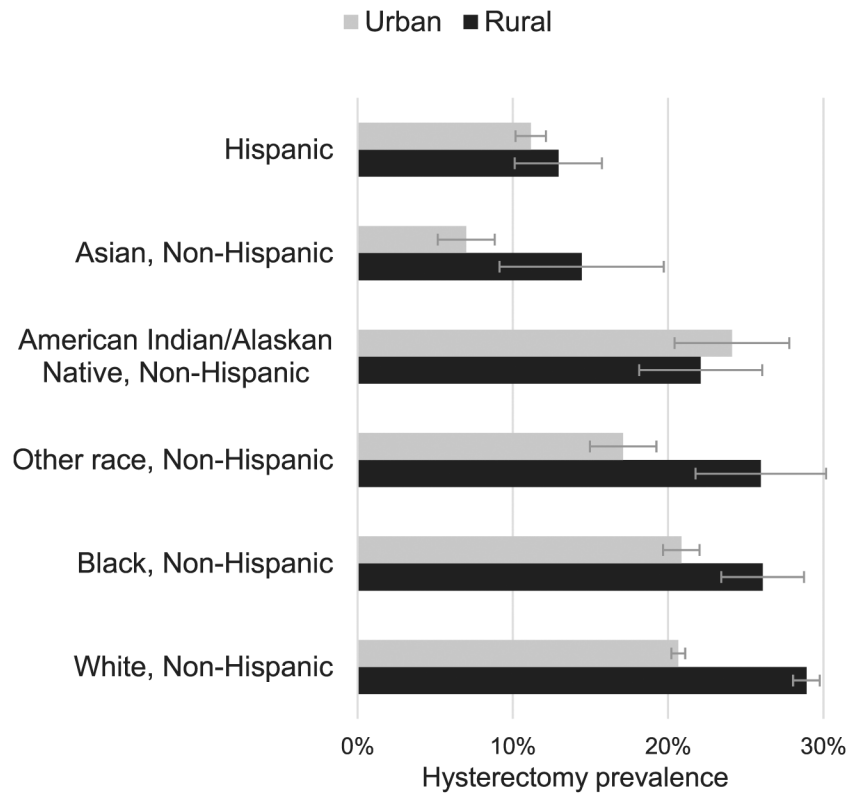
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**FIGURE 1.** Age-specific hysterectomy prevalence by rural and urban residence. Error bars represent 95% confidence intervals, BRFSS 2018



**FIGURE 2.** Hysterectomy prevalence by race, ethnicity, and rural-urban residence for US women aged 20–79 years. Error bars represent 95% confidence intervals, BRFSS 2018

**TABLE 1**

Age and race/ethnicity of female respondents by rural-urban residence, 2018 Behavioral Risk Factor Surveillance System

<b>Age group</b>	<b>Rural (n)</b>	<b>Urban (n)</b>
20–24 years	1,887	6,174
25–29 years	2,490	7,410
30–34 years	2,975	8,271
35–39 years	3,544	9,166
40–44 years	3,640	9,108
45–49 years	4,306	10,349
50–54 years	5,711	12,821
55–59 years	7,178	14,361
60–64 years	8,543	15,973
65–69 years	8,776	16,900
70–74 years	7,408	14,660
75–79 years	5,564	10,544
Race and ethnicity		
American Indian/Alaskan Native, non-Hispanic	2,202	1,745
Asian, non-Hispanic	536	3,446
Black, non-Hispanic	3,430	15,140
Hispanic	2,571	11,862
Other race, non-Hispanic	1,631	4,135
White, non-Hispanic	51,652	99,409

*Note:* The analysis identified rural/nonmetropolitan respondents with National Center for Health Statistics urban-rural codes 5–6 and urban/metropolitan respondents with codes 1–4.