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BRIEF REPORT

US hysterectomy prevalence by age, race and ethnicity from BRFSS and NHIS: implications for analyses of cervical and uterine cancer rates

Emily E. Adam[1,2] · **Mary C. White**[1] · **Mona Saraiya**[1]

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Abstract

Purpose Previous reports of gynecologic cancer rates have adjusted for hysterectomy prevalence with data from the Behavioral Risk Factor Surveillance System (BRFSS) or the National Health Interview Survey (NHIS). We sought to determine if BRFSS and NHIS produce similar estimates of hysterectomy prevalence.

Methods Using data from BRFSS and NHIS, we calculated hysterectomy prevalence for women aged 20–79 years, stratified by 10-year age groups, survey year (2010, 2018), and race/ethnicity (Hispanic, non-Hispanic American Indian or Alaskan Native, non-Hispanic Asian, non-Hispanic Black, non-Hispanic White, non-Hispanic all other race groups).

Results BRFSS and NHIS produced similar increasing trends in hysterectomy prevalence by age and directional differences by race and ethnicity. Fewer than 2% of women aged 20–29 years and more than 4 out of 10 women aged 70–79 years reported having had a hysterectomy.

Conclusion Our analyses suggest adjustment for hysterectomy prevalence with data from either survey would likely reduce distortion in cervical and uterine cancer rates. BRFSS, a survey which has a larger sample size than NHIS, may better support analyses of hysterectomy estimates for smaller subpopulations.

Keywords Behavioral Risk Factor Surveillance System · Cervical cancer · Hysterectomy · National Health Interview Survey · Uterine cancer · Women's health

Introduction

Hysterectomy is the second most common operating room procedure among U.S. women [1]. The prevalence of hysterectomy varies by race [2–6], ethnicity [6], age [2, 4–7], geographic region [3, 4], and rural–urban residence [8]. Women who have had their cervix and uterus removed through hysterectomy are at lower risk for developing cervical and uterine cancer. Reports of gynecologic cancer rates sometimes have adjusted for population hysterectomy prevalence using either Behavioral Risk Factor Surveillance System (BRFSS) or National Health Interview Survey (NHIS) data [2–7, 9–11]. We sought to determine if BRFSS and NHIS produce similar estimates of hysterectomy prevalence.

We compared age group and race and ethnicity-specific hysterectomy prevalence estimates from the 2010 and 2018 BRFSS and NHIS, the two most recent years when both surveys fielded a hysterectomy item.

Methods

Data sources

Both BRFSS and NHIS are cross-sectional, interview surveys of non-institutionalized, U.S. adults who speak English or Spanish. Additional information about these surveys can be found online [12–14]. In 2010, all BRFSS interviews were conducted via landline telephone. In 2018, BRFSS interviews were conducted via landline telephone and mobile telephone. In contrast, most 2010 and 2018 NHIS interviews occurred in-person at the home of the respondent. Similarities, differences, and response rates for BRFSS

✉ Emily E. Adam
plv6@cdc.gov

[1] Epidemiology and Applied Research Branch, Division of Cancer Prevention and Control, CDC, 4770 Buford Hwy, MS S107-4, Atlanta, GA 30341, USA

[2] Oak Ridge Institute for Science and Education, Oak Ridge, TN, USA

and NHIS are outlined in Table 1. During 2010 and 2018 data collection years, respondents from both surveys were asked about their, age, hysterectomy status, race, and ethnicity. BRFSS asked about hysterectomy status for female respondents who were not currently pregnant. We recoded pregnant BRFSS respondents as not having had a hysterectomy. NHIS asked about hysterectomy status for all female respondents. Our analysis included female respondents aged 20–79 years with a reported hysterectomy status from the 2010 BRFSS ($n = 241{,}904$), 2018 BRFSS ($n = 201{,}311$), 2010 NHIS ($n = 12{,}697$), and 2018 NHIS ($n = 12{,}171$).

Statistical analysis

For each survey, we calculated population-weighted proportions and 95% confidence intervals of hysterectomy prevalence, stratified by 10-year age categories, survey year (2010, 2018), and race and ethnicity (overall, Hispanic, non-Hispanic American Indian or Alaskan Native, non-Hispanic Asian, non-Hispanic Black, non-Hispanic White, non-Hispanic all other race groups). We used SAS version 9.4 survey procedures (SAS Institute, Cary, NC) to account for the appropriate weight, cluster, and stratification variables to produce population-weighted proportions and confidence intervals. We do not show estimates for age groups > 79 years because the 2018 BRFSS and NHIS public use datasets top code age at 80 years and 85 years, respectively. NHIS hysterectomy estimates that did not meet presentation guidelines based on the National Center for Health Statistics' Data Presentation Standards for Proportions were omitted [15].

Results

The proportion of female respondents aged 20–79 years with a missing hysterectomy status varied slightly between surveys and survey years (Table 1). For each survey and data year, the most common reason for having a missing hysterectomy status was that the respondent was not asked the hysterectomy item, i.e., the respondent quit the survey after reaching the cutoff point for inclusion but before reaching the hysterectomy item.

Across most groups examined, BRFSS hysterectomy prevalence estimates were slightly higher than estimates from NHIS (Table 2). However, at the 95% confidence level, most BRFSS estimates were not statistically different from the NHIS estimates. In both surveys, hysterectomy prevalence estimates increased sharply with age. Among women aged 20–29 years, fewer than 2% reported having had a hysterectomy. In contrast, more than 4 out of 10 of women aged 70–79 years reported having had a hysterectomy.

Due in part to a smaller sample size, and in accordance with data presentation guidelines, most NHIS age-specific estimates were suppressed for women who identified as non-Hispanic American Indian or Alaskan Native, non-Hispanic Asian, or who were grouped in the dataset as non-Hispanic all other race groups. Among estimates which met presentation guidelines, BRFSS and NHIS yielded similar patterns by race and ethnicity.

Among estimates which met presentation guidelines, the largest absolute difference in hysterectomy prevalence by survey was observed for Hispanic women aged 70–79 years; the BRFSS hysterectomy prevalence estimate was 12% points higher than the NHIS prevalence estimate in 2018 and 7% points higher than the NHIS estimate in 2010. In general, differences between BRFSS and NHIS hysterectomy prevalence estimates were larger for Hispanic women than for non-Hispanic White and non-Hispanic Black women.

Discussion

This analysis used recent data to present concurrent hysterectomy estimates from BRFSS and NHIS. Although BRFSS prevalence estimates were slightly higher than NHIS estimates, most estimates which compared similar populations by race, ethnicity, and age group had overlapping 95% confidence intervals. Results from both surveys showed high hysterectomy prevalence at older ages and similar group differences by age, race, and ethnicity.

The choice of data source may depend on the goals of the analysis. NHIS offers a primarily in-person data collection and the public use dataset can support national-level analyses. NHIS also includes items about personal histories of cervical and uterine cancer. The public use BRFSS dataset can support analyses at the national level as well as the state and territory level [9, 16]. Survey methods for BRFSS and NHIS have changed over time, and these changes may compromise the ability to compare hysterectomy prevalence trends across years. Due to the larger sample size, BRFSS may produce estimates for smaller subpopulations including non-Hispanic Asian women and non-Hispanic American Indian or Alaskan Native women. BRFSS data can be used to assess hysterectomy prevalence among gender minorities residing in select states which field the Sexual Orientation and Gender Identity optional module [17].

Previous studies demonstrated that cervical and uterine cancer rates unadjusted for hysterectomy prevalence can underestimate cancer risk for women who have not had a hysterectomy and distort comparisons by race or age, and this bias was larger for Black women [2, 3, 5, 7] and American Indian and Alaskan Native women [4] than it was for White women. Our analyses demonstrated that most hysterectomy estimates by age and race and ethnicity were similar

Table 1 Comparison of 2010 and 2018 National Health Interview Survey (NHIS) and Behavioral Risk Factor Surveillance System (BRFSS) characteristics

	NHIS 2010	NHIS 2018	BRFSS 2010	BRFSS 2018
Jurisdictions included	All 50 states and District of Columbia	All 50 states and District of Columbia	All 50 states, District of Columbia, Puerto Rico, Guam, Virgin Islands	All 50 states, District of Columbia, Puerto Rico, Guam
Interview format	Primarily face-to-face in respondents' homes[a]	Primarily face-to-face in respondents' homes[a]	Telephone (landline only)	Telephone (landline or cell phone)
Missing hysterectomy status among females aged 20–79 years	7.9%	2.9%	2.7%	5.9%
Reason for missing hysterectomy status	Don't know: 26 Refused: 73 Not asked: 985	Don't know: $n=23$ Refused: $n=34$ Not asked: $n=308$	Don't know: $n=240$ Refused: $n=1,195$ Not asked: 5,373	Don't know: $n=397$ Refused: $n=615$ Not asked: $n=11,652$
Weighting system	Post-stratification	Post-stratification	Post-stratification	Iterative proportional fitting (raking)
Level of survey administration	National l	National l	State or territory	State or territory
Response rate	60.8%	53.1%[b]	54.6%[c]	Cell phone: 43.4%[d] Landline: 53.3%[c]
Hysterectomy item	"Have you had a hysterectomy?"	"Have you had a hysterectomy?"	"Have you had a hysterectomy?"	"Have you had a hysterectomy?"
Read if necessary	Not applicable	Not applicable	"A hysterectomy is an operation to remove the uterus (womb)."	"A hysterectomy is an operation to remove the uterus (womb)."
Date of hysterectomy	"When was your hysterectomy?"	Not assessed	Not assessed	Not assessed
Type of hysterectomy	Not assessed	Not assessed	Not assessed	Not assessed
Cancer diagnosis status	Site of cancer diagnosis	Site of cancer diagnosis	Site of cancer diagnosis obtained for respondents from 9 states and 1 territory	Site of cancer diagnosis obtained for respondents from 6 states

Additional information can be found at (https://www.cdc.gov/brfss/index.html) and (https://www.cdc.gov/nchs/nhis/index.htm)

[a]Most NHIS interviews were initiated through in-person visits, and a subset of respondents completed part of the interview through telephone

[b]Response rate reported as a mean

[c]Response rate reported as a median for all participating states

[d]Response rate reported as a median for all participating states and territories

Table 2 Age-specific hysterectomy prevalence from the 2010 and 2018 Behavioral Risk Factor Surveillance System (BRFSS) and National Health Interview Survey (NHIS) by race and ethnicity

Race and ethnicity	Age group (years)	NHIS 2010	BRFSS 2010	NHIS 2018	BRFSS 2018
		Population-weighted prevalence (95% confidence interval)			
Overall	20–29	0.7 (0.3, 1.1)	1.1 (0.8, 1.4)	0.5 (0.0, 1.1)	0.4 (0.3, 0.5)
	30–39	4.2 (3.3, 5.1)	5.3 (4.9, 5.7)	3.0 (2.2, 3.8)	4.3 (3.9, 4.7)
	40–49	14.7 (12.9, 16.5)	15.7 (15.1, 16.3)	13.2 (11.3, 15.2)	15.2 (14.4, 16.0)
	50–59	26.6 (24.5, 28.8)	29.4 (28.7, 30.0)	23.1 (21.0, 25.2)	26.4 (25.5, 27.2)
	60–69	36.1 (33.6, 38.6)	40.3 (39.6, 41.0)	28.9 (26.7, 31.1)	34.3 (33.4, 35.3)
	70–79	45.6 (42.3, 48.9)	48.8 (48.0, 49.6)	44.1 (41.3, 47.0)	45.5 (44.2, 46.7)
Hispanic	20–29	[a]	1.5 (0.6, 2.4)	0.3 (0.0, 0.9)	0.4 (0.2, 0.7)
	30–39	3.0 (1.2, 4.8)	4.6 (3.6, 5.7)	2.9 (1.3, 4.6)	2.9 (2.2, 3.7)
	40–49	14.7 (10.3, 19.1)	13.7 (12.0, 15.5)	5.5 (2.9, 8.2)	10.9 (9.1, 12.7)
	50–59	26.8 (20.9, 32.6)	28.9 (26.1, 31.6)	17.2 (11.8, 22.6)	21.1 (18.3, 23.9)
	60–69	30.5 (23.4, 37.6)	36.8 (33.7, 39.9)	24.4 (18.1, 30.8)	29.5 (25.5, 33.4)
	70–79	39.1 (28.8, 49.4)	45.8 (41.9, 49.6)	31.0 (21.9, 40.1)	43.0 (37.2, 48.9)
Non-Hispanic American Indian or Alaskan Native	20–29	[a]	0.7 (0.0, 1.8)	[b]	0.5 (0.0, 1.2)
	30–39	[b]	5.2 (1.9, 8.6)	[b]	7.4 (4.0, 10.8)
	40–49	[b]	23.9 (15.2, 32.6)	[a]	19.7 (13.5, 25.9)
	50–59	[b]	35.9 (28.7, 43.1)	[b]	28.9 (22.2, 35.7)
	60–69	[b]	52.7 (44.5, 60.9)	[b]	43.3 (36.9, 49.7)
	70–79	[b]	53.5 (42.5, 64.6)	[b]	55.7 (46.7, 64.6)
Non-Hispanic Asian	20–29	[a]	0.6 (0.0, 1.7)	[a]	0.4 (0.0, 0.8)
	30–39	0.9 (0.0, 2.8)	2.2 (0.6, 3.8)	0.9 (0.0, 2.7)	0.6 (0.2, 1.0)
	40–49	[b]	7.0 (3.9, 10.1)	[b]	7.8 (3.8, 11.8)
	50–59	[b]	15.6 (11.5, 19.8)	[b]	11.2 (6.7, 15.7)
	60–69	24.9 (11.5, 38.3)	22.0 (16.9, 27.1)	[b]	14.9 (6.3, 23.5)
	70–79	[b]	34.6 (24.6, 44.6)	[b]	27.6 (15.1, 40.1)
Non-Hispanic Black	20–29	0.5 (0.0, 1.3)	0.8 (0.2, 1.3)	0.3 (0.0, 0.9)	0.3 (0.0, 0.6)
	30–39	4.8 (2.5, 7.1)	4.7 (3.6, 5.8)	2.3 (0.5, 4.0)	3.8 (2.8, 4.7)
	40–49	19.4 (14.5, 24.3)	20.4 (18.1, 22.7)	12.5 (7.7, 17.2)	18.5 (16.0, 21.1)
	50–59	36.9 (31.0, 42.8)	37.2 (35.0, 39.4)	31.7 (25.1, 38.3)	33.7 (30.8, 36.5)
	60–69	46.1 (39.1, 53.1)	50.1 (47.6, 52.6)	34.9 (27.8, 42.0)	44.1 (40.9, 47.3)
	70–79	46.8 (38.7, 55.0)	53.4 (50.2, 56.7)	51.9 (43.4, 60.4)	52.1 (47.4, 56.8)
Non-Hispanic White	20–29	1.0 (0.4, 1.6)	1.1 (0.8, 1.4)	0.2 (0.0, 0.5)	0.5 (0.3, 0.6)
	30–39	4.5 (3.3, 5.7)	5.8 (5.3, 6.4)	3.5 (2.3, 4.7)	5.4 (4.8, 6.0)
	40–49	14.5 (12.3, 16.7)	15.5 (14.9, 16.2)	17.6 (14.7, 20.5)	16.6 (15.6, 17.5)
	50–59	25.4 (22.8, 28.1)	28.6 (28.0, 29.3)	24.0 (21.5, 26.4)	26.8 (25.8, 27.8)
	60–69	36.2 (33.2, 39.2)	39.7 (39.0, 40.4)	29.5 (27.0, 32.0)	34.1 (33.2, 35.0)
	70–79	47.2 (43.4, 51.1)	48.7 (47.9, 49.6)	46.1 (42.8, 49.3)	45.6 (44.4, 46.9)
Non-Hispanic all other race groups	20–29	[a]	0.7 (0.0, 1.5)	[b]	0.7 (0.1, 1.4)
	30–39	[a]	5.1 (2.3, 8.0)	1.3 (0.0, 4.0)	5.9 (3.8, 8.0)
	40–49	[b]	20.9 (16.3, 25.6)	[b]	16.4 (11.8, 21.0)
	50–59	20.4 (7.4, 33.3)	32.1 (27.7, 36.6)	[b]	29.6 (23.0, 36.2)
	60–69	[b]	45.1 (40.0, 50.1)	[b]	41.5 (35.2, 47.8)
	70–79	[b]	52.3 (46.3, 58.3)	[b]	46.2 (36.7, 55.7)

[a]Zero respondents reported a hysterectomy

[b]Cell data did not meet statistical presentation criteria

across the two surveys and suggest that hysterectomy-adjustment using data from either survey to cancer rates would likely reduce bias.

Results from both surveys rely on respondents' self-reported hysterectomy status, a measure which has been shown to be highly accurate [18]. Neither BRFSS nor NHIS attempt to measure if respondents' hysterectomies included removal of the cervix. The proportion of hysterectomies which included removal of the cervix may have changed over time [10]. Recent data suggest around 90% of hysterectomies include removal of the cervix [19, 20].

The observed differences in hysterectomy estimates by survey for older Hispanic women may reflect differences in the BRFSS and NHIS samples; BRFSS includes respondents from Puerto Rico but NHIS does not, and response bias may differ by survey. Across age groups, our finding of relatively lower hysterectomy prevalence among Hispanic women and non-Hispanic Asian women suggests that a relatively higher proportion of older Hispanic women and non-Hispanic Asian women remain at risk for developing cervical cancer and uterine cancer. Among women eligible for cervical cancer screening, however, Hispanic women are less likely to be screened for cervical cancer than non-Hispanic women [21, 22].

Although subject to error, we conclude that adjustment for hysterectomy prevalence based on data from either survey may reduce bias in analyses of rates for cervical and uterine cancer, especially among older women.

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Declarations

Conflict of interest The authors did not report any conflicts of interest.

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