

State-level Uterine Cancer Incidence Rates Corrected for Hysterectomy Prevalence, 2004-2008

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Background

- Women whose uterus has been surgically removed are not at risk for cancers of the uterus; however, routine reporting of cancer incidence rates for uterine corpus cancer (hereafter uterine cancer) does not take hysterectomy prevalence into account.
- Approximately 20 million U.S. women have had a hysterectomy and prevalence varies widely by region and race/ethnicity. Women in the South are twice as likely to have had a hysterectomy as those in the Northeast and prevalence among black women is three times that of whites.
- The interpretation of routinely reported uterine cancer incidence rates is hindered by the lack of exclusion from the population at risk of those women whose uterus has been surgically removed. The wide variation in hysterectomy prevalence by state and race/ethnicity exacerbates this issue.

Aims and Methods

- We estimated hysterectomy-corrected, age-standardized uterine cancer incidence rates, excluding uterine cervix, by state and race/ethnicity during 2004-2008 using:
 - incidence data from the Surveillance, Epidemiology, and End Results Program and the National Program of Cancer Registries, as provided by the North American Association of Central Cancer Registries;
 - population data from the U.S. Census Bureau; and
 - hysterectomy prevalence data from the Behavioral Risk Factor Surveillance System.
- We then compared race- and state-specific incidence patterns before and after correction and the correlation with obesity among non-Hispanic whites (NHWs).

Results

Demographic and geographic patterns in hysterectomy prevalence

- Hysterectomy prevalence was highest for blacks compared to whites and Hispanics except in the South, where it was highest for whites in 7 states (denoted in blue in Table).

Effect of hysterectomy correction on uterine cancer geographic patterns (NHW)

- Before hysterectomy correction, the geographic pattern of uterine cancer was sharply defined and consistent with hysterectomy rates; after correction there was no discernible geographic pattern (Figure).
- Uterine cancer incidence rates were not correlated with obesity before correction, but were significantly correlated after correction ($r=0.06$, $p=0.68$ vs. $r=0.37$, $p=0.009$).

Results (cont'd)

Effect of hysterectomy correction on state-level uterine cancer risk

- Correction increased incidence rates by $\geq 50\%$ in 36 states for whites, 26/28 states for blacks, and 8/18 states for Hispanics; rates increased by $\geq 75\%$ in 16 states for whites, 21/28 states for blacks, and 2/18 states for Hispanics ($\geq 75\%$ denoted in red in Table).
- Correction doubled incidence rates in 4 southern states for white women and 3 southern states for black women (Table).

Effect of hysterectomy correction on uterine cancer racial/ethnic patterns

- Correction eliminated the excess risk among whites compared to blacks in 12/28 states.
- Correction augmented the excess risk among whites compared to Hispanics in 2/18 states (Florida and Texas).

Table. Uterine cancer incidence rates before and after correction for hysterectomy prevalence, by state and race/ethnicity, 2004-2008

State	Non-Hispanic White			Black			Hispanic		
	Hysterectomy prevalence	Uncorrected rate	Corrected rate	Hysterectomy prevalence	Uncorrected rate	Corrected rate	Hysterectomy prevalence	Uncorrected rate	Corrected rate
Alabama	31.4	18.4	38.4	28.4	20.4	40.8			
Alaska	21.5	23.6	40.4						
Arizona	22.1	19.3	33.9				21.2	16.1	26.9
Arkansas	28.8	18.7	36.0	26.0	20.0	40.0			
California	16.6	24.3	37.6	21.1	20.3	36.5	15.7	18.4	26.5
Colorado	21.1	20.1	34.5				23.0	16.1	27.1
Connecticut	13.0	29.6	40.8	17.3	26.2	41.8	13.8	21.8	27.7
Delaware	16.0	29.0	42.4	18.8	28.0	41.3			
Washington DC*	10.1	17.2	22.4	17.4	26.4	40.7			
Florida	21.3	21.3	35.7	23.5	24.1	44.5	15.6	21.8	30.1
Georgia	24.8	18.6	34.3	24.5	19.3	38.3			
Hawaii	13.5	25.4	35.8						
Idaho	25.8	22.7	45.3						
Illinois	16.6	28.0	41.8	22.0	23.3	41.9	17.4	21.1	30.1
Indiana	22.3	26.3	43.6	22.7	20.5	38.3			
Iowa	18.0	28.6	43.3						
Kansas	24.4	23.3	40.9	25.4	22.2	42.5	22.2	23.3	39.5
Kentucky	25.6	24.4	43.8	22.7	20.3	35.5			
Louisiana	30.0	17.1	36.0	25.8	18.5	33.8			
Maine	18.1	31.2	46.9						
Maryland†	16.6			21.0					
Massachusetts	12.2	30.3	40.7	19.6	23.9	47.1	14.2	25.9	34.4
Michigan	18.6	28.1	42.9	21.9	24.0	41.7			
Minnesota	16.2	27.8	40.6						
Mississippi	31.1	18.7	39.7	25.3	23.4	41.7			
Missouri	20.8	24.8	39.8	25.3	20.7	37.7			
Montana	21.2	23.9	40.0						
Nebraska	20.7	26.7	44.2				20.7	20.9	37.5
Nevada‡	21.8	19.0	33.2				18.6	16.3	25.2
New Hampshire	15.4	29.9	43.0						
New Jersey	11.4	32.1	42.4	17.2	23.0	37.0	13.8	21.5	28.9
New Mexico	20.9	22.1	36.5				19.6	17.7	27.2
New York	13.2	31.0	42.3	15.1	27.0	38.2	15.5	24.0	34.6
North Carolina	22.5	22.1	37.8	24.9	22.0	41.2	15.1	12.4	16.8
North Dakota	19.7	26.8	41.7						
Ohio	19.8	28.2	44.1	25.5	20.5	39.5			
Oklahoma	27.5	19.9	40.5	26.0	18.1	36.1	23.5	21.8	41.7
Oregon	22.0	24.4	42.8						
Pennsylvania	17.3	31.7	47.4	19.8	22.3	37.1			
Rhode Island	15.4	30.6	43.2						
South Carolina	25.3	19.3	35.8	27.3	23.3	46.4			
South Dakota	19.1	24.3	38.0						
Tennessee	26.3	19.8	36.6	27.5	17.3	33.6	20.2	18.3	27.7
Texas	25.6	18.8	36.0	27.9	17.8	36.6			
Utah	25.0	22.4	43.1				19.1	15.9	22.7
Vermont	14.0	32.0	43.5						
Virginia	17.8	23.7	36.1	24.1	19.6	37.1			
Washington	20.0	24.7	41.0				17.4	15.3	22.5
West Virginia	23.1	29.1	48.0						
Wisconsin§	17.3	27.7	41.2	21.7	24.2	46.4			
Wyoming	25.3	20.9	38.2						
US¶	19.9	25.1	40.2	23.0	21.8	38.9	17.3	19.5	28.7

Blue indicates hysterectomy prevalence higher in non-Hispanic whites than blacks. Red indicates incidence rates that increased by $\geq 75\%$ as a result of hysterectomy correction. Incidence rates (all ages) and hysterectomy prevalence (ages 20+) were age-adjusted to the 2000 US standard population. States were excluded if case counts were < 20 or BRFSS sample size was < 500 .
 *Incidence data for 2008 were not high-quality based on NAACCR criteria. †Incidence data unavailable. ‡Incidence data for 2007 were not high-quality based on NAACCR criteria and for 2008 were unavailable. §Incidence rates for non-Hispanic white not exclusive of Hispanic origin. ¶Incidence rates exclude DC, MD, and NV; rates for non-Hispanic whites and Hispanics also exclude WI.

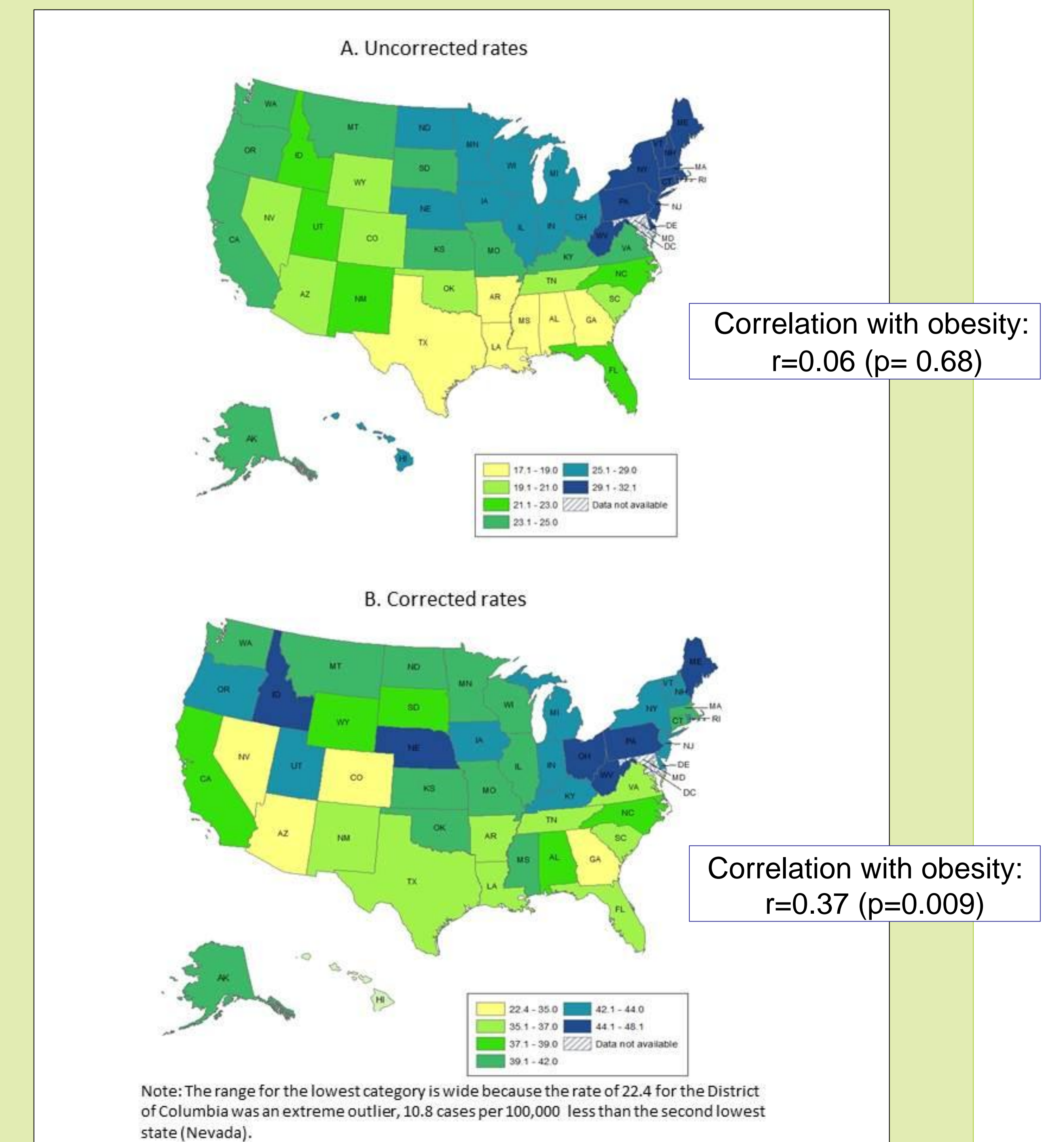


Figure. Geographic patterns in uterine cancer incidence rates among non-Hispanic white women before and after correction for hysterectomy prevalence, 2004-2008

Conclusions

Our study found that conventionally reported uterine cancer incidence rates that do not account for hysterectomy prevalence in the population at risk substantially underestimate disease burden, especially for states in the South, and distort true geographic and racial patterns. Accurate knowledge of the cancer burden at the state level is crucial for etiologic research and cancer control planning.