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The Prevalence of Smoking in Wisconsin: Variability at the County Level

The “prevalence of adult smoking” has been a key indicator by which to measure tobacco use in Wisconsin for several decades. In addition, it is used to monitor the utility of state and local tobacco prevention and control efforts. The primary source for this measure is the Behavioral Risk Factor Surveillance System (BRFSS).

Annually, the sample size of the BRFSS exceeds 4,000 respondents. This sample size is clearly adequate for establishing a state-based estimate of adult smoking prevalence. However, because the sampling frame is based on a probability sampling strategy, assessing tobacco use at the county level is less reliable, especially for smaller, less densely populated counties. Thus, local tobacco prevention and control advocates and professionals typically rely on the state-based estimate for program planning at the county and community levels. This approach assumes smoking prevalences at the county level are similar to the prevalence for the overall state.

In an effort to address this issue, the Wisconsin Division of Public Health, with support from the state’s Tobacco Prevention and Control Program and several state partners, increased surveillance efforts in Wisconsin’s smaller counties during 2006 through 2008. Over-sampling was conducted in order to establish more reliable estimates of various health related outcomes and behaviors at the county level. This surveillance brief presents information on the prevalence of smoking for all Wisconsin counties based on those data.

MAJOR FINDINGS:

- The average prevalence of adult smoking in Wisconsin during 2006-2008 was 19.5%.
- An estimated 852,617 Wisconsin adults were smokers in 2008.
- At the county level, the prevalence of adult smoking ranged from 13.3% to 34.0%.
- Ozaukee County had the lowest prevalence of adult smoking during 2006-2008 (13.3%).
- Menominee County had the highest prevalence of adult smoking during 2006-2008 (34.0%).

BACKGROUND

Tobacco prevention and control programs commonly use the prevalence of adult smoking as an indicator of progress in the reduction of tobacco use at the state and local levels. Data used to estimate the prevalence of smoking are accessed from systems of surveillance commonly conducted at the state and national levels. Sample sizes from these systems are large enough to create reliable (accurate) estimates of smoking prevalence at the state level. However, because the data are typically collected using a probability sampling strategy, sub-sampling of smaller geographic units (e.g., counties) may not result in reliable sample sizes. In particular, this approach results in extremely small sample sizes for sparsely populated counties. Thus, data pooling and calculating an average across several years, as well as merging data from multiple counties, has often been required to achieve reliable estimates for smaller geographic units. Many organizations simply rely on the state's [average] prevalence of smoking as a measure of smoking in their locality. This approach, however, has been of concern to some local tobacco control groups and county public health organizations that desire more precise estimates for use in program planning and policy development at the local level.

To respond to these needs, the Wisconsin Division of Public Health, along with support from the state's Tobacco Prevention and Control Program and other state and local partners sponsored expanded efforts to collect additional data. In 2006, Wisconsin began oversampling as a part of its annual Behavioral Risk Factor Surveillance System (BRFSS) survey to increase sample sizes for sparsely populated counties. These efforts were continued during 2007 and 2008, with the goal of establishing a minimum sample size of 100 for each of Wisconsin's 72 counties. Accordingly, more precise estimates of adult cigarette smoking could be established at the county level.

METHODS

The BRFSS is a national telephone-based survey of health conditions, health risk behaviors and the use of preventative services among non-institutionalized adults. Wisconsin has been participating in this surveillance system since its inception in 1984.

During 2006 through 2008, Wisconsin collected data from a *main sample*, based on the same probability sampling strategies employed each year. In addition, *over-sampling* was conducted in less densely populated counties as part of a three-year effort to produce county-specific estimates for all 72 counties. Data for this report came from both the main samples and over-samples of the 2006, 2007, and 2008 Wisconsin BRFSS surveys.

This report presents estimates of the adult smoking prevalence for the state of Wisconsin, and for each individual county. Data for the state estimate were weighted to create an estimate of smoking prevalence representative of the state population. Data for the county estimates were weighted to create estimates of smoking prevalence representative of each county's population. To further increase the sample sizes for county estimates, data for 2006 through 2008 were pooled. The resulting county samples ranged from 137 respondents to 3,193 respondents. The number of adult smokers in each county was estimated by applying the calculated smoking prevalence to 2008 Census Bureau population estimates of individuals 18 years of age or older.¹

The total number of smokers for Wisconsin was estimated by summing the number of smokers in all 72 counties. Analyses were conducted using SAS statistical software, version 9.1.

RESULTS

Table 1 presents estimates of the prevalence of adult smoking in Wisconsin for 2006, 2007, and 2008, and a pooled estimate. The prevalence of smoking varied minimally across the three years, ranging from 19.1% in 2006 to 19.9% in 2008. The average weighted prevalence for the three years was 19.5%.

Table 1. Prevalence of Adult Smoking, by Year, Wisconsin, 2006-2008

Sample Year	Sample Size	Smoking Prevalence
2006	8,517	19.1%
2007	7,413	19.6%
2008	7,066	19.9%
2006-2008	22,996	19.5%

Table 2 shows the prevalence of adult smoking during 2006-2008 for each county. Ozaukee County had the lowest estimated prevalence of adult smoking during 2006-2008 (13.3%). Menominee County had the highest estimated prevalence of adult smoking (34.0%). In addition, each county's rank is displayed, and the estimated number of adult smokers in each county (based on 2008 Census Bureau population data).

Table 2. Prevalence of Adult Smoking, Rank, and Number of Adult Smokers, by County, Wisconsin, 2006-2008

State/County	Prevalence of Adult Smokers (%)	Rank	Number of Adult Smokers
Wisconsin	19.5		852,617 *
Adams	24.2	61	4,076
Ashland	17.6	21	2,188
Barron	23.8	59	8,497
Bayfield	17.5	20	2,097

Table 2. Prevalence of Adult Smoking, Rank, and Number of Adult Smokers, by County, Wisconsin, 2006-2008

County	Prevalence of Adult Smokers (%)	Rank	Number of Adult Smokers
Brown	20.8	38	38,418
Buffalo	21.9	46	2,314
Burnett	18.6	26	2,401
Calumet	16.5	13	5,360
Chippewa	21.1	41	9,747
Clark	17.0	18	4,044
Columbia	16.9	16	7,175
Crawford	24.4	62	3,172
Dane	14.8	4	56,549
Dodge	19.1	30	13,138
Door	16.2	12	3,682
Douglas	21.1	42	7,344
Dunn	15.9	7	5,393
Eau Claire	17.0	19	13,255
Florence	23.4	55	893
Fond du Lac	23.2	54	17,903
Forest	25.3	68	1,932
Grant	21.0	40	8,126
Green	18.3	25	5,012
Green Lake	22.8	49	3,274
Iowa	19.8	33	3,539
Iron	20.9	39	1,085
Jackson	23.6	56	3,663
Jefferson	19.5	31	12,058
Juneau	23.0	50	4,790
Kenosha	24.6	64	30,053
Kewaunee	17.0	17	2,657
La Crosse	19.1	29	16,955
Lafayette	14.2	2	1,695
Langlade	20.2	36	3,213
Lincoln	25.7	69	5,883
Manitowoc	18.9	28	11,804
Marathon	19.5	32	19,345
Marinette	25.1	66	8,423
Marquette	28.9	71	3,427
Menominee	34.0	72	1,015
Milwaukee	22.3	47	158,841
Monroe	20.5	37	6,577
Oconto	18.7	27	5,432

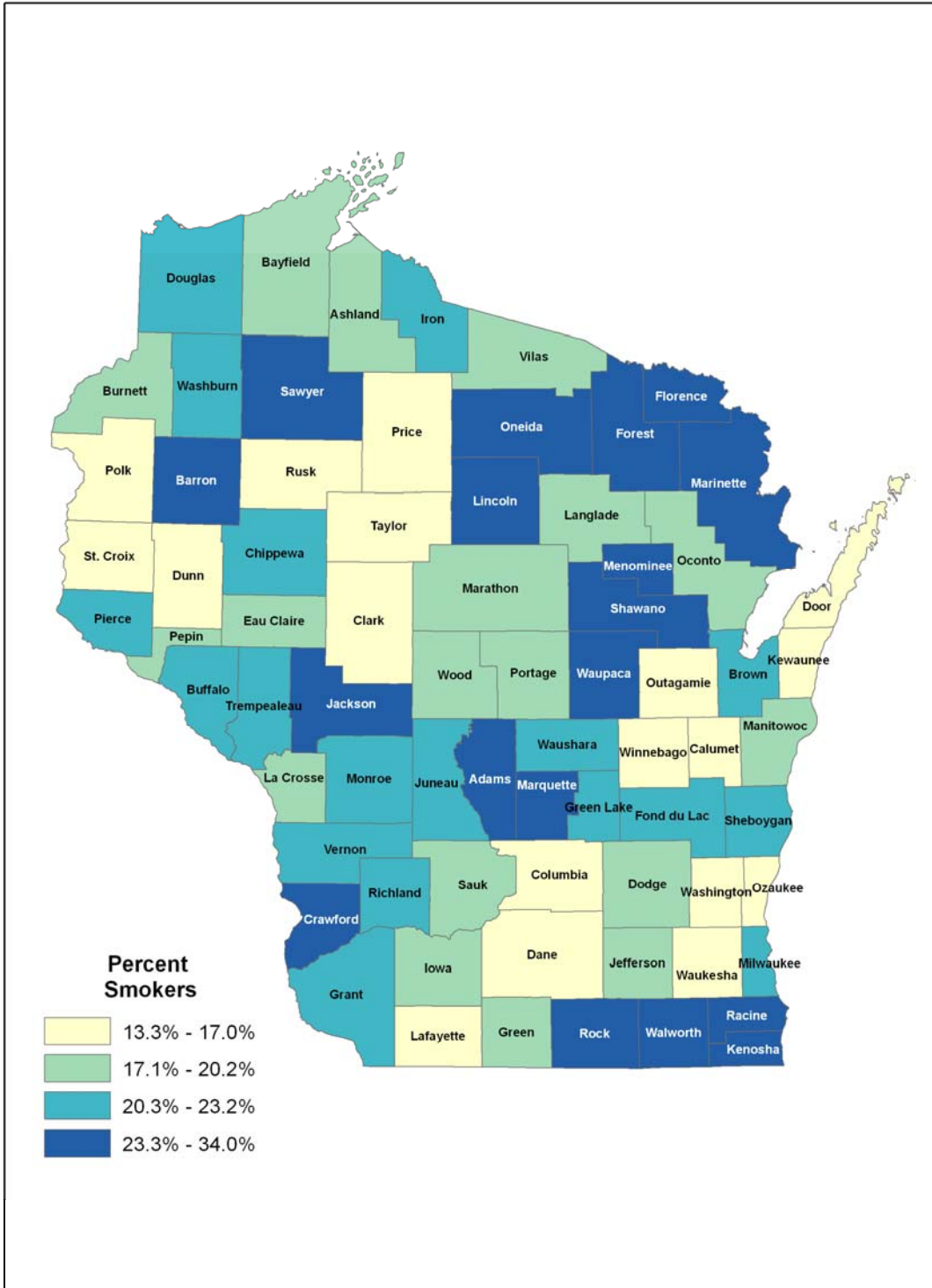
Table 2. Prevalence of Adult Smoking, Rank, and Number of Adult Smokers, by County, Wisconsin, 2006-2008

County	Prevalence of Adult Smokers (%)	Rank	Number of Adult Smokers
Oneida	23.9	60	7,045
Outagamie	15.9	9	20,997
Ozaukee	13.3	1	8,726
Pepin	20.2	34	1,141
Pierce	23.1	53	7,292
Polk	16.0	11	5,429
Portage	18.2	22	9,932
Price	15.9	8	1,834
Racine	25.0	65	37,493
Richland	21.2	43	2,954
Rock	27.1	70	32,594
Rusk	15.7	6	1,752
Saint Croix	15.4	5	9,383
Sauk	18.2	23	8,188
Sawyer	23.8	58	3,185
Shawano	23.8	57	7,497
Sheboygan	21.7	45	18,898
Taylor	16.8	15	2,479
Trempealeau	23.1	51	4,847
Vernon	23.1	52	4,974
Vilas	18.2	24	3,258
Walworth	24.5	63	18,984
Washburn	22.8	48	3,010
Washington	16.0	10	15,755
Waukesha	14.3	3	41,470
Waupaca	25.3	67	10,115
Waushara	21.4	44	4,231
Winnebago	16.6	14	21,163
Wood	20.2	35	11,544

* Number of smokers for Wisconsin was calculated by summing across the estimated number of smokers in all 72 counties.

Figure 1 displays the prevalence of adult smoking in Wisconsin counties, divided into quartiles. The largest range in prevalence occurs within the fourth quartile, where the percentages vary from 23.3% to 34.0% due to a few outliers at the highest prevalence of smoking (see Table 2).

Figure 1. Prevalence of Adult Smoking in Wisconsin Counties by Quartile, 2006-2008



In addition, more than half the counties (40 counties) have prevalence estimates that are above the state average. Finally, the map reveals a tendency for more rural counties to have higher prevalences of smoking than counties with larger urban areas (with some notable exceptions, such as of Kenosha, Racine, and Milwaukee counties).

LIMITATIONS

Estimates of the prevalence of smoking are limited by issues associated with the BRFSS. Data for the 2006, 2007, and 2008 BRFSS were collected via a landline telephone survey. Accordingly, low-income individuals without a phone may be missed as well as individuals who only use cell phones. In addition, the survey may be affected by biases inherent in self-reporting and recall.

Because estimated prevalences are based on a sampling methodology, they can rarely be “exact”. Margins of error will vary, with larger samples typically resulting in estimates closer to the actual prevalence.

CONCLUSIONS

Annual surveillance of tobacco use is crucial for assessing the progress of tobacco prevention and control efforts in Wisconsin. The state [average] prevalence of adult smoking is a useful measure for this assessment process. In addition, the state prevalence can serve as a proxy for monitoring county level efforts, as overall trends in tobacco use are likely to be similar across the state. However, as revealed in these analyses, the prevalence of smoking does vary considerably among Wisconsin’s 72 counties, ranging from 13.3% to 34.0%. Thus, it is useful to periodically increase surveillance efforts in order to give local tobacco prevention and control organizations, health professionals, and county officials a clearer picture of how their county is doing in reducing tobacco use and exposure among its population.

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