



MICHIGAN BRFSS SURVEILLANCE BRIEF

A NEWSLETTER FROM THE CHRONIC DISEASE EPIDEMIOLOGY UNIT, MDCH

Methodology Changes within the Michigan BRFSS

Background. Data collected through public health surveillance systems, including the Behavioral Risk Factor Surveillance System (BRFSS), are put through statistical weighting procedures so that the estimates generated from these data are representative of the targeted populations of interest. Since the 1980s, the Centers for Disease Control and Prevention (CDC) has used a statistical procedure known as post stratification to weight state-level BRFSS data from landline telephone respondents so that they are representative of the current adult population (18+ years of age) based on age, gender, and race/ethnicity.¹

Over the past decade, the proportion of U.S. adults who live in cell phone-only households has increased dramatically. In a recent report based on data from the National Health Interview Survey, it was estimated that 29.2% of Michigan adults currently live within cell phone-only households.² As a result of this increase in cell phone-only households, it has become necessary to add cell phones to telephone survey samples, including the BRFSS. Adding cell phones to the BRFSS sample is important because research shows that adults from cell phone-only households are different from adults who live within landline only households. Cell phone-only adults tend to be younger, unmarried, have lower household incomes, and are more frequently Hispanic or African American. Adults from cell phone-only households also tend to have different health-related attitudes and behaviors, so in previous survey years, the BRFSS landline only telephone survey was not able to obtain a truly representative sample of the Michigan adult population.¹

To further increase the representativeness of BRFSS estimates, the CDC adjusted their statistical weighting procedures. In 2011, the CDC implemented iterative proportional fitting, also known as raking, as the official BRFSS weighting methodology. The BRFSS raking weighting methodology adjusts the data based on the eight demographic factors included within Figure 1. In contrast with post stratification, raking makes adjustments for each demographic factor individually through a series of data iterations. As each variable enters into the weighting process, the weights are adjusted until the sample weights are representative of the Michigan adult population. Figure 2 shows the advantages of raking over the previously used post stratification weighting methodology.³ As a result of these methodological changes, BRFSS results prior to 2011 cannot be compared to BRFSS results from 2011 and beyond. Essentially, 2011 will be the new BRFSS baseline.

Figure 1. 2011 BRFSS Raking Weighting Adjustment Factors

• Telephone Source (Landline vs. Cell Phone)	• Age by Gender
• Detailed Race/Ethnicity	• Gender by Race/Ethnicity
• Education Level	• Age by Race/Ethnicity
• Marital Status	• Renter/Owner Status

Methods. Michigan BRFSS data from 2010 and 2011 were used to assess the impact of the newly implemented BRFSS raking weighting methodology on selected health indicators. The CDC provided Michigan with a developmental BRFSS dataset for 2010 that contained the following weighting variables: 1) a landline telephone only weight based on the old post stratification weighting methodology, 2) a landline telephone only weight based on the new raking weighting methodology, and 3) a landline and cell phone combined weight based on the new raking weighting methodology. In 2011, the landline and cell phone combined raking weight was the only analysis weight included within the dataset.

The impact of the new raking weighting method was assessed by comparing the prevalence estimates for selected indicators based on each of the three weighting variables included within the 2010 developmental Michigan BRFSS dataset. Furthermore, the combined landline and cell phone raked estimates from 2010 and 2011 were compared in order to further assess the impact of the new BRFSS raking weighting methodology.

Figure 2. Survey Weighting - Raking vs. Post Stratification

• Raking allows for the introduction of more demographic variables into the weighting process, thus reducing the potential for bias and increasing the representativeness of the estimates.
• Raking incorporates each demographic adjustment variable one at a time in an iterative process, rather than creating weights for combined demographic subgroups
• Raking allows for the incorporation of data from both landline and cell phone respondents, which also helps to reduce bias and increased representativeness of the estimates.

MiBRFSS News

- The 2011 Michigan BRFS Annual Tables, which are based on the new raking weighting methodology that includes data from both landline and cell phone respondents, were released on the MiBRFSS website (www.michigan.gov/brfs) in August 2012.
- The 2011 Michigan BRFS Annual Report will be released by the end of this year.
- Did you miss an issue of *Michigan BRFSS Surveillance Brief*? Back issues are also available on our website.

Results. Table 1 includes the 2010 and 2011 Michigan BRFS prevalence estimates for selected health indicators by telephone source and weighting method. In 2010, the prevalence of current smoking among Michigan adults was 18.9% when based on landline data only and using the old BRFS post stratification weighting methodology. When switching to the new raking weighting methodology, the landline only prevalence of current smoking increased by four percentage points to 22.9%. Using the combined landline and cell phone raked dataset, the prevalence of current smoking increased by an additional nine-tenths of a percentage point to 23.8%. The prevalence estimates for health insurance coverage among adults 18-64 years of age were impacted in a similar manner to that of the current smoking indicator (Table 1).

The impact of telephone source and weighting method on the 2010 Michigan BRFS prevalence estimates for obesity and diabetes were very different from what was observed for current smoking and health insurance. The prevalence of obesity and ever told diabetes among Michigan adults were 31.7% and 10.1%, respectively, when based on landline data only and using the old BRFS post stratification weighting. The 2010 landline only raked prevalence estimates for obesity and diabetes were 33.4% (1.7 percentage point increase) and 10.5% (0.4 percentage point increase), respectively. Using the 2010 the combined landline and cell phone raked dataset, the prevalence estimates of obesity and diabetes dropped below the original landline only post stratified estimates (Table 1). Table 1 also provides the combined landline and cell phone raked prevalence estimates from 2010 and 2011 for each indicator.

Table 1. Selected Prevalence Estimates by Telephone Source and Weighting Method, 2010 and 2011 Michigan BRFS

	2010 Landline Only (Poststratification)	2010 Landline Only (Raking)	2010 Landline and Cell Phone (Raking)	2011 Landline and Cell Phone (Raking)
Current Smoking	18.9%	22.9%	23.8%	23.3%
Health Insurance (18-64 years)	16.6%	18.7%	19.9%	18.3%
Obesity (BMI ≥ 30.0)	31.7%	33.4%	31.5%	31.3%
Ever Told Diabetes	10.1%	10.5%	9.8%	10.0%

Conclusions. Implementation of the new BRFS raking weighting methodology and the inclusion of data from cell phone respondents does not impact BRFS prevalence estimates in a consistent manner. The results from Table 1 indicate that when comparing landline only prevalence estimates using post stratification and raking, the new BRFS raking weighting methodology seems to always increase the prevalence estimates, but to varying magnitudes. The adding of cell phone data into the raked dataset, increases or decreases estimates according to how the cell phone population is impacted by that particular indicator. The cell phone population is primarily younger and have lower household incomes than that of the non-cell phone population. Younger, lower income adults are also more likely to be current smokers. Through the inclusion of this previously underrepresented group, we are now able to provide a more accurate picture of the current smoking status among the Michigan adult population. This also explains the impact of raking on obesity and diabetes estimates. The prevalence of obesity and diabetes is very low in the younger age groups. By including more adults from the cell phone population, the BRFS estimates decrease to a level more representative of the true Michigan adult population. The implementation of the new raking weighting methodology and the inclusion of cell phone data will change the majority of BRFS prevalence estimates. These methodological changes will cause breaks in BRFS trends, but will greatly improve the accuracy, coverage, validity, and representativeness of the Michigan BRFS.

References

- ¹ Centers for Disease Control and Prevention. Behavioral Risk Factor Surveillance System - Improving Survey Methodology. 2011.
- ² Blumberg SJ, Luke JV, Ganesh N, et al. Wireless Substitution: State-level Estimates from the National Health Interview Survey, January 2007- June 2010. National Health Statistics Reports; No 39. Hyattsville, MD: National Center for Health Statistics. 2011.
- ³ Centers for Disease Control and Prevention. Methodological Changes in the Behavioral Risk Factor Surveillance System and Potential Effects on Prevalence Estimates. Morbidity and Mortality Weekly Report. 2011; 61(22):410-3.

The Michigan Behavioral Risk Factor Surveillance System (MiBRFS)

The MiBRFS comprises annual, statewide telephone surveys of Michigan adults aged 18 years and older and is part of the national BRFS coordinated by the CDC. The annual Michigan Behavioral Risk Factor Surveys (MiBRFS) follow the CDC BRFS protocol and use the standardized English core questionnaire that focuses on various health behaviors, medical conditions, and preventive health care practices related to the leading causes of mortality, morbidity, and disability. Landline and cell phone interviews are conducted across each calendar year. Data are weighted to adjust for the probabilities of selection and a raking weighting factor that adjusts for the distribution of the Michigan adult population based on eight demographic variables. All analyses are performed using SAS-callable SUDAAN[®] to account for the complex sampling design.

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