Louisiana Behavioral Risk Factor Surveillance System (BRFSS) 2011 Methodological Improvements: Incorporation of Cell Phones and Raking Weights

Jude Haney, Ph.D., MPH; Office of Public Health, Health Improvement Support Unit, Louisiana Department of Health and Hospitals

The Behavioral Risk Factor Surveillance System (BRFSS) is a state-wide health survey developed by the Centers for Disease Control and Prevention (CDC) and conducted by individual states and U.S. territories. Louisiana BRFSS data is used in most local and state programs to monitor lifestyle and behaviors related to chronic health conditions and leading causes of death across the Louisiana. In order to more accurately reflect the health of the state and reduce possible bias, BRFSS introduced a new methodology in analyzing the data. The two survey improvements are the addition of cell phone interviews and a weighting method called iterative proportional fitting (or raking).

Data from the National Center for Health Statistics indicate that a large number of US households using cell phones only are increasing. It is estimated that 26.8% of Louisiana adults currently live in cell-phone only households[1]. Traditionally, the BRFSS only administered surveys to households who had landline telephones. Due to the large increase in use of cellular phones, BRFSS must incorporate cell phone users to accurately represent Louisiana's population.

Including cell phone data requires a different type of weighting methodology to accurately represent and adjust the sampling method. A method called post-stratification was used by BRFSS before the survey added cellular phone to the data set. This statistical method weighted BRFSS data by simultaneously adjusting survey respondent data to known proportions of age, race and ethnicity, gender, geographic region or other known characteristics of the state's population. A new weighting method called raking was implemented in 2011 as the official BRFSS weighting methodology. Raking adjusts the sample based on eight socio-demographic factors that allows for both telephone sources (landline or cellular telephone), in the weighting methodology of the BRFSS. The addition of cell phone users and the modified weighting methodology (raking) will provide more representative estimates of Louisiana adult population. The BRFSS sample has been weighed based on the following factors:

Post-Stratification (prior to 2011)

- Age

- Gender

- Race/ethnicity

Raking (2011 and beyond)

- Educational level

- Marital status

- Home owner or rental status

- Telephone source

- Age by Gender

- Gender by Race/ethnicity

- Age by Race/ethnicity

- Detailed Race/ethnicity

Impact of the New Methodology in Louisiana

Some of the differences in the Louisiana BRFSS will vary by survey question and variations in demographic variables used for raking and the proportion of respondents who use cellular telephones. For the 2011 data only 8.7% of the population was surveyed via cell phone. The effect of adding cell phones accounts for the increasing number of households without a landline phone. Adding cell phone users to the sample and adjusting for more socio-demographic factors helps Louisiana better account for the under-representation of racial/ethnic minorities, males, adults with less formal education, lower income households and young adults. Because the raking process includes more socio-demographic factors to weight the data to represent Louisiana's population, policy makers, legislators, and key non-scientific audiences should expect prevalence estimates to be affected by those who are usually at risk for a particular indicator.

Preliminary analyses of Louisiana data indicate little significant change in estimates when comparing 2010 post-stratified estimates, 2010 raked estimates, and 2011 raked estimates. The largest changes between 2010 Post and 2010 Raked was current smokers and leisure time physical activity. For 2010 and 2011 raked estimates the largest change was among current smokers as well. (see Table 1) Significant differences are defined as non-overlapping confidence intervals. ***Interpretation of Prevalence Estimate Changes – What does a higher or lower estimate mean?***

The inclusion of data from cell phone respondents and implementation of the raking

methodology does not consistently impact all prevalence estimates the same way. Increased prevalence estimates can be misinterpreted by program and stakeholders. Adding cell phone data into the data set increases or decreases estimates according to how the cell phone population is impacted by that specific indicator. The cell-phone population tends to be younger, have less formal education, and identify themselves as racial/ethnic minorities. This is an example of how an increase in the prevalence of current smokers is expected due to the changes to BRFSS. It is difficult to determine long term trends by comparing an estimate from one year to the next. Comparing post-stratified estimates to raked estimate, the true differences in estimates over time are not discernible. This will be especially difficult to make when years 2010 and 2011 are compared. These changes to the BRFSS methodology will cause breaks in trends, but it will improve validity, accuracy, and representativeness of the Louisiana BRFSS.

Next Steps

The Health Improvement Support Unit of the Office of Public Health (OPH) Department of Health and Hospitals (DHH) in conjunction with the CDC will continue to monitor the impact of the addition of cell phone users and raking. The CDC has prepared an MMWR article published on June 8, 2012 to further describe the rationale and details of the changes in methodology.[2]   In addition, the Health Statistics Section is evaluating the effects introduced in 2011 and preparing supporting documents and information on expected changes in our state's prevalence estimates.

Table 1: Comparison of 2010 Post-stratified Estimates, 2010 Raked Estimates, 2011 Raked Estimates for Selected Health Indicators, Louisiana, BRFSS

	2010 Post-stratified Estimate (95% CI)	2010 Raked Estimate (95% CI)	2011 Raked Estimate (95% CI)
Uninsured Non-elderly Adults in Louisiana*	24.5 (22.6-26.5)	30.2 (27.9-32.5)	26.8 (25.1-28.4)
Diabetes	10.3 (9.5-11.1)	10.5 (9.6-11.5)	11.8 (11.0-12.7)
Current Asthma	6.6 (5.7-7.6)	8.1 (6.9-9.3)	6.4 (5.7-7.2)
General Health (Adults in Louisiana in Fair or Poor Health)	21.1 (19.9-22.4)	23.5 (21.9-25.1)	23.0 (21.8-24.2)
Leisure Time Physical Activity	69.9 (68.3-71.4)	66.7(64.8-68.6)	66.2 (64.8-67.7)
Current Smoking	22.1 (20.6-23.5)	28.2 (26.3-30.2)	25.7(24.3-27.1)
Overweight BMI**	34.7 (33.1-36.4)	34.7 (32.8-36.6)	34.1 (32.7-35.6)
Obese BMI**	31.7 (30.2-33.3)	33.18 (31.3-35.1)	33.4 (32.0-34.9)
Binge Drinking***	15.0 (13.7-16.4)	15.6 (14-17.3)	16.1 (14.8-17.3)
Heart Attack	5.1 (4.5-5.9)	5.6 (4.8-6.5)	5.0 (4.4-5.6)
Coronary	5.3 (4.7-6)	5.2 (4.6-6.0)	4.8 (4.3-5.4)
Stroke	3.4 (2.9-3.9)	3.5 (2.9-4.2)	3.6 (3.1-4.2)
Adults 65+ with flu shot	64.3 (61.9-66.6)	61.9(58.7-65)	70.2 (68.1-72.3)
HIV Never Tested	51.4 (49.5- 53.4)	47.7 (45.3-50.1)	54.3 (52.6-55.96)
Physically Unhealthy Days	13.4 (12.3-14.5)	15.3 (13.9-16.7)	14.6 (13.7-15.7)
Activity Limitation Days	9.3 (8.4 -10.3)	10.6 (9.4-11.9)	10.2 (9.4-11.2)
Mentally Unhealthy Days (Frequent Mental Distress)	12.6 (11.5-13.8)	15.8 (14.3-17.5)	14.6 (13.5-15.7)

* The proportion of Louisiana adults, ages 18-64, who reported having no health care coverage, including health insurance, prepaid plans such as HMOS, government plans, or Medicare.
**BMI = Body Mass Index
*** The proportion of Louisiana adults who reported consuming five or more drinks for men and four or more drinks for women per occasion at least once in the previous month.[i]

[i] 1. Blumberg SJ, Luke JV. Wireless substitution: Early release estimates from the National Health Interview Survey, January-June 2011. Available at http://www.cdc.gov/nchs/data/nhis/earlyrelease/wireless201112.pdf Accessed June 30, 2012.

2. Carol Pierannunzi, PhD, Machell Town, MS, William Garvin, Frederick E. Shaw, MD, JD, Lina Balluz, ScD, Div of Behavioral Surveillance, Office of Surveillance, Epidemiology and Laboratory Svcs, CDC. MMWR / June 8, 2012 / Vol. 61 / No. 22 http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6122a3.htm?s_cid=mm6122a3_w Accessed July 25, 2012