

2014

**MECKLENBURG COUNTY  
BEHAVIORAL RISK FACTOR  
SURVEILLANCE SYSTEM  
(BRFSS) 2014**

Methodology Report



**UNC CHARLOTTE**

Urban Institute

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## **About the UNC Charlotte Urban Institute**

The UNC Charlotte Urban Institute ("the Institute") was created in 1969 as a non-profit, non-partisan, applied research and consulting service outreach unit of the University of North Carolina at Charlotte. The Institute provides a wide range of services to the region and beyond in fulfillment of its mission to seek solutions to the economic, environmental, and social challenges facing our communities. For more information about the Institute, visit <http://ui.uncc.edu/>. For more information about the Institute's survey research services, contact Social Research Specialist Eric Caratao at [fcaratao@uncc.edu](mailto:fcaratao@uncc.edu) or by calling 704-687-1191.

# The Survey Process

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## **A. INTRODUCTION**

The Mecklenburg County Health Department contracted the University of North Carolina at Charlotte Urban Institute to administer a county-wide telephone survey modeled after the Behavioral Risk Factor Surveillance System (BRFSS). The BRFSS is a random telephone survey of Mecklenburg County residents aged 18 and older in households with landline telephones and/or cell phones. Through BRFSS, information is collected on a variety of health behaviors and preventive health practices related to the leading causes of death and disability such as cardiovascular disease, cancer, and diabetes. The survey interviews averaged 17.9 minutes to complete. Respondents were screened in order to interview the adult (18+) male/female in the household who had the most recent birthday. Additional screening was performed to ensure residence within Mecklenburg County.

## **B. OVERVIEW**

A total of 1,001 surveys were administered by CRI utilizing a questionnaire designed by staff at UNC Charlotte. Four-hundred ninety (490) surveys were conducted utilizing a Random Digit Dialing (RDD) sample of landline telephone numbers within Mecklenburg County with an additional 511 surveys utilizing an RDD sample of dedicated to wireless telephone numbers. Both telephone samples were appended with an activity code and only currently active telephone numbers were dialed. Both an English and Spanish language version of the questionnaire was made available. Spanish speaking households were called back by a bilingual interviewer in an attempt to complete the interview in Spanish. A total of 45 Spanish surveys were conducted. Additionally, in order to oversample Hispanic residents to achieve a sample proportionate to census demographic information, a sample of Hispanic surname households (landlines) was also utilized. Forty-seven (47) surveys were completed from this sample frame.

## **C. INTERVIEWING PROCESS**

The survey was interviewed by Customer Research International (CRI), an established survey research data collection provider. CRI fields all studies from its outbound call center in San Marcos, TX at 135 S Guadalupe Street. Within the respondent's time zone, interviewers dialed from 5:00 PM to 9:00 PM weeknights, 10:00 AM to 6:00 PM on Saturdays, and 1:00 PM to 9:00 PM on Sundays.

Interviews were conducted using computer-assisted telephone interviewing (CATI) software, which ensured all questions were asked correctly and all logic and skip

patterns were implemented properly. The telephone sample was also managed by the CATI system, allowing dialing rules and disposition management to be streamlined. To ensure the highest response rate, each telephone number was called up to eight times at various times of the day and week. Additionally, respondents were allowed to request a callback at a more convenient time and date. These appointments were called at the appointed time, and up to eight additional times if the respondent was not available at the initially requested time.

## D. SAMPLING

Telephone numbers were purchased by CRI through Marketing Systems Group, a reputable sample provider. A total of 10,806 unique landline telephone numbers and 7,244 unique dedicated to wireless telephone numbers were required to complete the study. The final calling results to each telephone number are indicated in the table below:

**Table 1.** Final calling results

	Count	Percent
No Answer	3370	18.67%
Phone busy	32	0.18%
Disconnected Phone	3818	21.15%
Business/Government	1881	10.42%
Respondent Not Available	284	1.57%
Refusal	1205	6.68%
Computer Tone	785	4.35%
Language Barrier	112	0.62%
Schedule Callback - Unqualified	91	0.50%
Schedule Callback - Qualified	34	0.19%
Mid-Interview Terminate	28	0.16%
Answering Machine	4155	23.02%
Terminate - No One in Household 18 or Older	102	0.57%
Terminate - Out of Area	1103	6.11%
Overquota - Race	49	0.27%
<b>Completes</b>	<b>1001</b>	<b>5.55%</b>
<b>Total Records Dialed</b>	<b>18050</b>	<b>100.00%</b>

Incidence of eligibility among contacted households (eligible/(eligibility + ineligible) = 45.9%

The following sample statistics have been calculated based upon AAPOR's Standard Definitions:

**Table 2. Sampling Statistics**

I=Complete Interviews	1001
P=Partial Interviews	0
R=Refusal and break off	28
NC=Non Contact	318
O=Other	0
Calculating e: e is the estimated proportion of cases of unknown eligibility that are eligible. This estimate is based on the proportion of eligible units among all units in the sample for which a definitive determination of status was obtained (a conservative estimate).	0.147
UH=Unknown Household	7557
UO=Unknown other	1317
Response Rate 1 $I / (I+P) + (R+NC+O) + (UH+UO)$	9.80%
Response Rate 2 $(I+P) / (I+P) + (R+NC+O) + (UH+UO)$	9.80%
Response Rate 3 $I / ((I+P) + (R+NC+O) + e(UH+UO) )$	37.8%
Response Rate 4 $(I+P) / ((I+P) + (R+NC+O) + e(UH+UO) )$	37.8%
Cooperation Rate 1 $I / (I+P)+R+O)$	97.3%
Cooperation Rate 2 $(I+P) / ((I+P)+R+O)$	97.3%
Cooperation Rate 3 $I / ((I+P)+R)$	97.3%
Cooperation Rate 4 $(I+P) / ((I+P)+R)$	97.3%
Refusal Rate 1 $R / ((I+P)+(R+NC+O) + UH + UO))$	0.30%
Refusal Rate 2 $R / ((I+P)+(R+NC+O) + e(UH + UO))$	1.06%
Refusal Rate 3 $R / ((I+P)+(R+NC+O))$	2.08%
Contact Rate 1 $(I+P)+R+O / (I+P)+R+O+NC+ (UH + UO)$	10.07%
Contact Rate 2 $(I+P)+R+O / (I+P)+R+O+NC + e(UH+UO)$	38.84%
Contact Rate 3 $(I+P)+R+O / (I+P)+R+O+NC$	76.39%

## E. WEIGHTING

### 1. Design Overview:

A survey of adults 18 and older residing in the Mecklenburg County, NC was of interest for various health related outcomes among its residence. The overall design utilized a dual frame random digit dialing sampling frame with separate design strata within each of the two frames: landline and cell. Within the landline frame, landline telephone exchanges were stratified into two specific strata: (1) listed telephone numbers with known Hispanic Surnames and (2) all other numbers in landline exchanges serving Mecklenburg County, NC. The cellular frame consisted of all cellular numbers in exchanges served by three rate centers which cover Mecklenburg County, NC. No additional stratification in the cellular frame was used for this study. A within household selection of one eligible adult from among all eligible adults within each landline household was also undertaken (as well as in cell households that reported that their phone number was in fact a landline).

In total, 1,001 responses were gathered from this sample – of these, 481 were completed on a landline phone and the remaining 520 on a cell phone. In total there were 13 respondents identified as porters – those who answered and completed the survey on a phone that was different from the frame they were selected. Consistent with overall BRFSS methodology, these porters were reassigned to the frame on which the survey was completed and were (re)assigned a corresponding base weight consistent with the completion mode.

### 2. Weighting:

The weighting approach for the Mecklenburg County Study (MCS) entails four main steps: (1) base weight calculation, (2) computation and application of a composite weight for dual users and (3) calibration of composite weights to population totals and (4) possible trimming of excessively large final weights. We describe each of these steps in this section.

#### 2.1 Base Weight Computation:

The sample for the Mecklenburg County study was selected independently from both a stratified landline frame with two strata as well as a cell phone frame during the Fall of 2014. The number of records selected as well as the specific stratum/frame universe size was recorded for each sampled record at the time of selection that occurred in

two distinct waves (with non-overlapping sampling frames). Sampling sizes were adjusted for porters prior to computation of the base weights to reflect samples that were selected and/or completed on a given mode: cellular or landline telephone. Porters frame assignment was also revised to indicate that the frame of selection was consistent with the mode of completion for base weight computation purposes. For each sampled number the base weight was then computed as the quotient of the frame and strata within frame (for landline) size divided by the sample size from that frame/strata as shown:

$$\text{Base Weight}_{ij} = \frac{[\text{Frame Size for Stratum } j \text{ of Frame } i]}{[\text{Sample Size (plus/minus porters)} \\ \text{for Stratum } j \text{ of Frame } i]}$$

i=landline of cell frame; j=Hispanic Targets of Remainder of Landline Frame;  
j=1 for cell phone frame (i.e. only one stratum for the cellular sampling frame).

### 2.1.2: Within Household Adjustments and Multiplicity Adjustments

Consistent with the sampling design, an adult selection adjustment was made to the base weights for those who completed the Mecklenburg County Study using a landline phone by multiplying the base weight by the number of eligible adults within the household (capped at 3). Additionally, the base weight was divided by the number of landline phone lines associated with the households of landline respondents to account for multiplicity of selection of a given household in the landline frame (capped at 2). There was no adult selection within the households contacted via the cell phone frame, so the adult selection factor was equal to one for all cell phone respondents. The cell phone base weights were however adjusted for multiple cell phone lines (capped at 2). We note that a small fraction of the landline and cell respondents did not have information on the number of phone lines associated with the household (13 of 1,001; 1.3%) and were randomly imputed based on the distribution of phone lines associated with landline and cell respondents, respectively. The design weights represent the base weight times the adult adjustment divided by the multiplicity adjustment. (represented by  $\text{Design\_Wt} = \text{AdultMultiplicityFactor} * \text{BaseWt} / \text{NumberOfPhoneLines}$ ).

### 2.1.3: Compositing the Dual Users

To account for the multiple probabilities of selection among those respondents who were dual users (i.e. owned both a landline and a cell phone) we applied a compositing factor to their raking weights after both the landline and cell phone respondent samples were calibrated to corresponding control totals displayed in Table 3. More specifically, the overall distribution of cell phone only and dual users from the cell respondents were calibrated to Cell Phone only and Dual User control totals listed in Table 3. These control totals were obtained using the most current information

available from the National Health Interview Survey (Blumberg et al., 2012) for the state of North Carolina. No county specific information for the three phone user levels was available below the state level for North Carolina. Similarly, landline respondents were calibrated to landline only and dual user control totals listed in Table 3. The calibration step made use of the new adjusted version of the base weights (Design\_Wt) and produced weights called New\_Wt2.

**Table 3.** Respondent and population counts by Phone User Status for compositing Dual Users

Phone Use	Respondents		Population	
Landline Only	109	10.9%	57,256	7.7%
Cell Only	573	57.2%	422,640	57.0%
Dual Users	319	31.9%	261,419	35.3%
<b>Total</b>	<b>1,001</b>	<b>100.0%</b>	<b>741,315</b>	<b>100.0%</b>

After calibration the composite factor was applied to each dual user respondent. The value of the compositing factor for landline respondents who were dual users was based on the effective sample size of the dual user landline respondents in relation to the effective sample size of dual user cell phone respondents as recommended by the AAPOR task force (2010), Brick et al. (2011) and Frankel et al. (2007). The effective sample sizes were based on the raw sample sizes of dual users from each response group (land/cell) and the unequal weighting effect of those users computed from the New\_Wt2 (i.e. phone user and adjusted base weights). We provide the details of this computation in Table 4.

**Table 4.** Computation of Compositing Factor for Dual Phone Users

Completed By	Number of Dual Users		UWE	Effective Sample Size	Compositing Factor, $\lambda$
Landline	37 2	64.92 %	1.2074	372/1.2074=308.1 0	$\lambda_{land} = 308.10 / (308.10 + 188.38)$ = .62
Cell	20 1	35.08 %	1.067	201/1.0670=188.3 8	$\lambda_{cell} = 188.38 / (308.10 + 188.38)$ = .38

The composited weights were computed as:

$$New\_Wt3 = \begin{cases} New\_Wt2 \text{ for Landline Only landline respondents} \\ New\_Wt2 * \lambda_{land} \text{ for Landline Respondent DUAL users} \\ New\_Wt2 * \lambda_{cell} \text{ for Cell Respondent DUAL users} \\ New\_Wt2 \text{ for Cell Only cell respondents} \end{cases}$$

**Table 6.** Respondent and population counts by Gender by Race for the 2<sup>nd</sup> demographic raking dimension

<b>Gender by Race</b>	<b>Respondents</b>		<b>Population</b>	
Male, Non-Hispanic White	278	27.8%	193,343	26.1%
Male, Non-Hispanic Black	95	9.5%	93,125	12.6%
Male, Non-Hispanic Other	43	4.3%	23,781	3.2%
Male, Hispanic	48	4.8%	41,466	5.6%
Female, Non-Hispanic White	277	27.7%	207,585	28.0%
Female, Non-Hispanic Black	156	15.6%	120,780	16.3%
Female, Non-Hispanic Other	36	3.6%	24,918	3.4%
Female, Hispanic	68	6.8%	36,317	4.9%
<b>Total</b>	<b>1,001</b>	<b>100.0%</b>	<b>741,315</b>	<b>100.0%</b>

**Table 7.** Respondent and population counts by Education for the 3<sup>rd</sup> demographic raking dimension

<b>Education</b>	<b>Respondents</b>		<b>Population</b>	
Some High School or less	77	7.7%	87,287	11.8%
High School Graduate	187	18.7%	153,131	20.7%
Vocational /Some College	235	23.5%	228,595	30.8%
Bachelors or Higher	502	50.1%	272,302	36.7%
<b>Total</b>	<b>1,001</b>	<b>100.0%</b>	<b>741,315</b>	<b>100.0%</b>

**Table 8.** Respondent and population counts by Age by Race for the 4<sup>th</sup> demographic raking dimension

<b>Age By Race</b>	<b>Respondents</b>		<b>Population</b>	
18-34, Non-Hispanic White	64	6.4%	121,381	16.4%
18-34, Non-Hispanic Black	52	5.2%	77,314	10.4%
18-34, Non-Hispanic Other	28	2.8%	23,033	3.1%
18-34, Hispanic	39	3.9%	40,040	5.4%
35-54, Non-Hispanic White	183	18.3%	155,282	20.9%
35-54, Non-Hispanic Black	82	8.2%	90,361	12.2%
35-54, Non-Hispanic Other	35	3.5%	17,888	2.4%
35-54, Hispanic	49	4.9%	30,616	4.1%
55+, Non-Hispanic White	308	30.8%	124,265	16.8%
55+, Non-Hispanic Black	117	11.7%	46,229	6.2%
55+, Non-Hispanic Other	16	1.6%	7,778	1.0%
55+, Hispanic	28	2.8%	7,128	1.0%
<b>Total</b>	<b>1,001</b>	<b>100.0%</b>	<b>741,315</b>	<b>100.0%</b>

**Table 9.** Respondent and population counts by Marital Status for the 5<sup>th</sup> demographic raking dimension

<b>Marital Status</b>	<b>Respondents</b>		<b>Population</b>	
Married (Currently)	619	61.8%	366,210	49.4%
Married (Formerly)	206	20.6%	134,919	18.2%
Never Married	176	17.6%	240,186	32.4%
Total	1,001	100.0%	741,315	100.0%

Population and sample distributions for the 6<sup>th</sup> dimension of the calibration variable – phone use status – are provided in Table 1.

#### 2.1.4: Weight Trimming and Recalibration

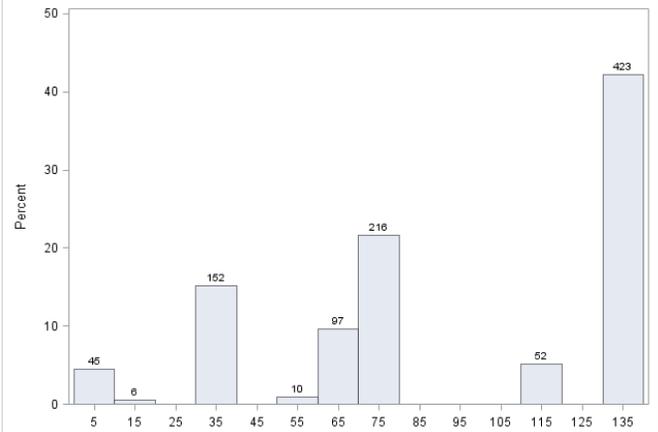
As a final step the calibrated weights (New\_Wt4) were trimmed at the 1<sup>st</sup> and 99<sup>th</sup> percentile of their distribution and the difference between the overall sum of the non-trimmed weights and the sum of the trimmed weights were redistributed to respondents whose calibrated weights were not trimmed. A final calibration step was performed on the trimmed version of the weights using the population control totals provided in Tables 3 through 7 above. The trimming process aimed at limiting the overall impact on few very large or small weights on estimates and resulting standard errors.

The final sampling weights are denoted by FinalWt and represent base weight computations, adjustments for multiplicity and within household selection (landline frame), calibration and compositing for dual users from the two frames, calibration to population control totals from 7 dimensions and weight trimming.

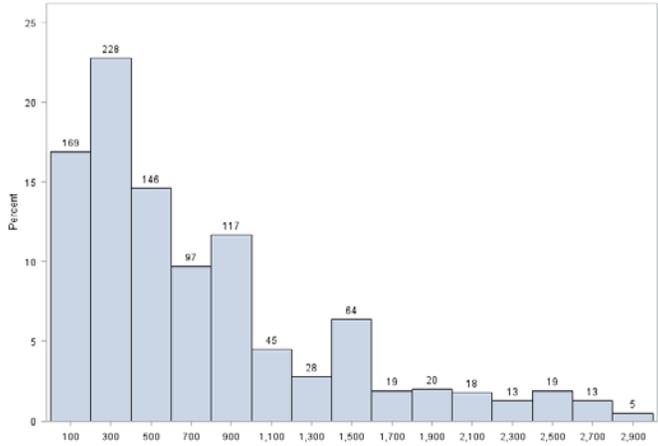
### 3. Summary Information for the Weighted Data and Implications for Analysis:

An overall histogram illustrating the design weights computed from the stratification base weights and adjustments within the household among landline respondents as well as the final, calibrated weights from the are shown in Figures 1 and 2, respectively. The unequal weighting effect (One plus the coefficient of variation of the weights, squared –  $1+CV^2$ ) based on the final weights is: 1.764. The UWE for the calibration version of the design weights (without calibration to population totals and before compositing – Design\_Wt) is 1.135. The increase in the UWE is expected as the calibration process potentially decreases coverage/nonresponse bias at the expense of increases in the variability of the sampling weights.

**Figure 1.** Distribution of the Base Weights (Design\_Wt) computed from the base weight-probability of selection as well as multiplicity for within household selection of one adult and adjustments for multiple phone lines for landline respondents.



**Figure 2.** Distribution of the final calibrated, trimmed sampling weights. These weights should be used in all analyses.



The variable FinalWt represents the final sampling weight that should be used for all MCS analyses.

## References:

Blumberg, SJ, Nadarajasundaram G., Luke, J.V., Gonzales, G. (2012)

Wireless Substitution: State-level Estimates from the National Health Interview Survey, 2012 accessed at <http://www.cdc.gov/nchs/data/nhsr/nhsr070.pdf>, Oct 9, 2014



Urban Institute  
UNC CHARLOTTE

9201 University City Boulevard, Charlotte, NC 28223-0001

Phone: 704-687-2307 | Fax: 704-687-3178

<http://ui.uncc.edu>