

The 2014 Supporting Statement B for OMB 0596-NEW Environmental Justice and the Urban Forest in Atlanta, GA

B. Collections of Information Employing Statistical Methods

- 1. Describe (including a numerical estimate) the potential respondent universe and any sampling or other respondent selection method to be used. Data on the number of entities (e.g., establishments, State and local government units, households, or persons) in the universe covered by the collection and in the corresponding sample are to be provided in tabular form for the universe as a whole and for each of the strata in the proposed sample. Indicate expected response rates for the collection as a whole. If the collection had been conducted previously, include the actual response rate achieved during the last collection.**

The setting for the study is the city of Atlanta, GA. Atlanta is the capital of Georgia and encompasses an area of 132.4 square miles in north Georgia. In 2010, the city had a population of 420,003 residents (U.S. Census, 2012). Atlanta is considered by many to be the premier southern city in terms of economic strength and cultural distinctiveness. Blending traditional southern traditions with an internationalism, Atlanta has emerged as a destination city for people from around the country and the world. According to the 2010 U.S. census, 54.0% of the city was comprised of African Americans, 38.4% white, 3.1% Asian, and 0.2% Native Americans. Latinos made up 5.2% of the city's population.

Most of the city's land area is contained within Fulton County (94.8). Approximately 5.2% of Atlanta's land area is in neighboring DeKalb County. Parcels from both counties that contain acreage belonging to the city of Atlanta are included in the universe. The universe consists of year 2012 taxed, residential improved parcels for the City of Atlanta, GA and 2008 residential improved parcels. Improved parcels are those with residential structures.

Households will be selected based on a stratified, random sample of the universe of improved parcels. **A random sample of improved parcels was generated by SAS software using proportional allocation techniques.** Potential respondents include homeowners residing in single family dwellings, condominiums, and rental units. Data for the survey will be collected face-to-face at the residential or parcel unit. The strata are based on neighborhoods, represented by the city's 25 Neighborhood Planning Units (NPU). In 1974, the city of Atlanta was divided into 25 NPUs which serve as citizen advisory councils providing advice and recommendations to city administrators (mayor and city council) on matters related to zoning, land use planning, and other planning issues. The NPUs also serve as community focal points for receiving information from various city departments such as law enforcement, zoning, and education. NPUs are designated by alphabetical letters A to Z, except U.

The following table shows the total number of residential parcels contained in each NPU, total number of housing units or residential improved units in each

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NPU and NPU acreage. The data for all NPUs except “O” are from the Fulton County Department of Information Technology, for 2012. NPU “O” is totally inside DeKalb County, so those data were not available from Fulton County. We were able to obtain parcel data for NPU “O” from the City of Atlanta’s Planning and Community Development Department, for the year 2008. The 2012 tax data had not been updated by the City of Atlanta as of writing. Also, NPUs “F,” “N,” and “W” lie partially inside DeKalb County. The residential improved parcels from NPUs F, N, and W located in DeKalb County were added to the universe. Again, these are 2008 data which the City of Atlanta compiled. NPU “F” has 610 improved parcels added; 2,196 were added to “N;” and 2,201. For NPU “O,” 4,633 were added. Roughly 7.6% of the data are from 2008.

NPU	Residential Parcels	Residential Improved	NPU Acreage	Sample size by stratum (rounded)
A	4449	4173	7323.234902	27
B	17631	17273	6521.178486	112
C	6473	6302	3876.646595	41
D	4390	3861	4153.421402	25
E	12649	12430	3783.310862	80
F	6660	7110	3021.259038	46
G	2529	1843	3600.547094	12
H	4276	3886	4061.026097	25
I	6892	6327	6090.137271	41
J	5091	4452	2842.420483	29
K	3580	3070	1529.524466	20
L	1989	1450	846.8855491	9
M	6123	5879	2423.930549	38
N	3873	5849	2201.213745	38
O	5086	4633	2218.209362	30
P	5685	4894	5905.728463	32
Q	798	773	659.6025255	5
R	3407	2971	3450.453456	19
S	4314	3956	2488.002644	26
T	3797	3469	1752.286783	22
V	4521	3784	2028.841569	24
W	6152	7889	3395.295477	51
X	4049	3747	2791.442673	24
Y	2759	2391	2108.225989	15

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Z	5741	4889	6709.866384	32
Total	127828	127301	85782.69186	824
* Fulton County Department of Information Technology and City of Atlanta’s Planning and Community Development Department, 2012 and 2008, respectively.				

2. Describe the procedures for the collection of information including:

- **Statistical methodology for stratification and sample selection**

The survey will be administered to a stratified, random sample of the population of Atlanta, GA living in non-institutionalized, residential households. This includes persons in both single and multiple-family owned dwellings and those in rental units. Again, the universe consists of 2012 tax parcels (96% of sample) and 2008 tax parcels (4% of sample) containing residential units. As Table 5 shows, NPUs vary in terms of geographical size and number of parcels (<http://www.atlantaga.gov/index.aspx?page=818>). As well, changing demographics and migration patterns to and out of the City of Atlanta over the past forty years has resulted in a great amount of racial/ethnic variation across NPUs. Some NPUs in North Atlanta have maintained high proportions of whites compared to other racial/ethnic groups since their establishment nearly forty years ago, while those elsewhere in the city have overwhelmingly African American populations. But there are others where the racial/ethnic mix is more even, particularly NPUs in in-town neighborhoods that have received substantial increases in white populations over the past twenty years.

We have found no information describing the basis or reasoning for NPU demarcations other than that Atlanta’s first black mayor in 1974, Maynard Jackson, established the NPUs as a way of helping the various communities contribute to city planning. The mayor recognized the uneven influence and participation in civic affairs across the city and sought to rectify this by sanctioning NPUs. As stated, however, neighborhood demographics in some NPUs have changed considerably since the early 1970s, such that the social capital contained in any given NPU is not static. In some cases, NPUs contain a high degree of homogeneity of race, education, and income but in other cases not so. Our reasoning for selecting NPUs as the strata is based on the understanding that in Atlanta, community identity and concerns for community integrity are as important as socio-demographics, if not more, in determining community participation.

The sample size within each NPU or stratum is 0.6% of the total number of residential improved parcels in each stratum. The 0.6% is derived by

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dividing the total sample size (824) by the total number of residential improved parcels for the city (824/127,301). For instance, the sample size for stratum A is 27, which is .6% of the residential improved parcels in NPU "A" (4,173).

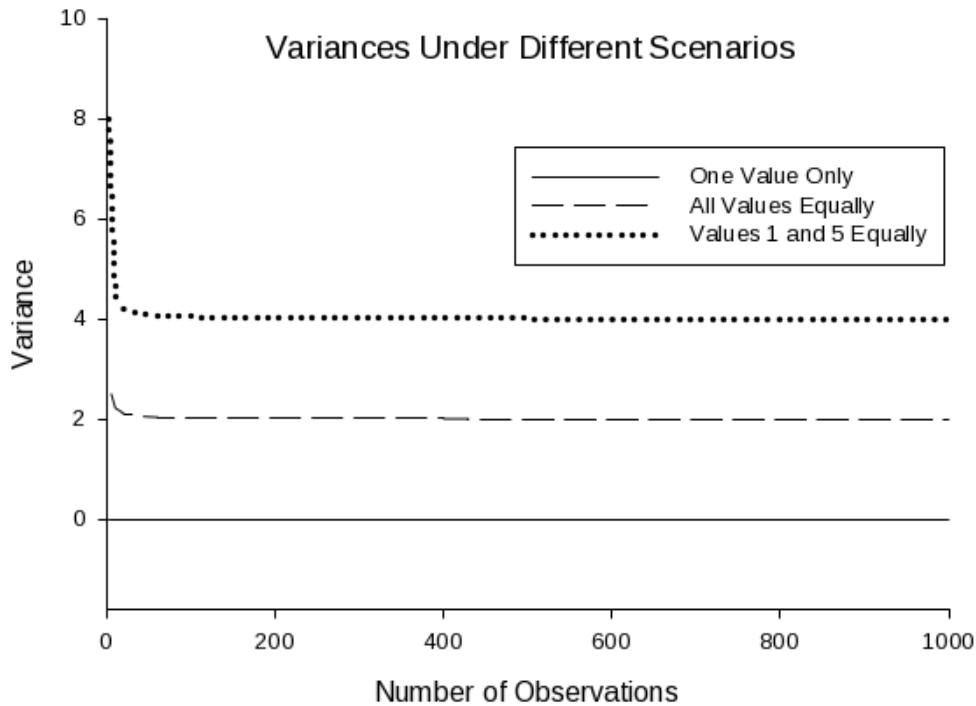
We expect a response rate of 85% or greater. Given this expected response rate, the total number of samples pulled will be 824 (700/0.85) to achieve a sample of 700.

- **Estimation procedure and degree of accuracy needed for the purpose described in the justification:**

The data collection instrument consists of 38 questions containing both dichotomous choice (yes, no) and ordered response, Likert-type options (1, 2, 3, 4, 5). We wish to estimate the mean for each question with a certain degree of precision. To determine the sample size required for such a multi-objective survey that is stratified is problematic, especially when no prior estimate of variability is available for any of the pertinent questions.

To simplify the situation and make sample size determination tractable, we will assume a simple random sample and approximate the variance with the upper bound of a Likert scale variable. Assuming a simple random sample will in all likelihood overestimate the required sample size for the required precision. Using a stratified sample with such a sample size should result in even greater precision; so we are being very conservative. In order to get an estimate of the variability, the variance of a 5-point Likert scale variable was computed under three different scenarios: (1) minimum variance where all responses to a question are the same, (2) when responses are distributed equally across the range from 1 to 5, and (3) under maximum variance when all responses are equally distributed in only the tails of the distribution at 1 and 5. The following figure displays these variances.

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Although the three scenarios above are all unrealistic, they do give an idea of the magnitude of variance for our situation. The “one value only” scenario is highly unlikely while the other two scenarios are probably reasonable bounds for the anticipated variance. To be conservative, again we will use the “1 and 5 equally” scenarios which is an upper bound on the variance for a Likert scale variable. Note from the graph that as long as the sample size is at least 10, an upper bound for the variance is basically four.

To estimate sample size, we will use the following formula:

$$E = \frac{Z * \text{Sigma}}{\sqrt{n}}$$

where,

E=the half width of the 95% confidence interval,

Z = the upper alpha/2 percentage point of the normal distribution (that is, 1.96),

Sigma=standard deviation (that is, square root of the variance), and

n=sample size.

Solving for *n* we get

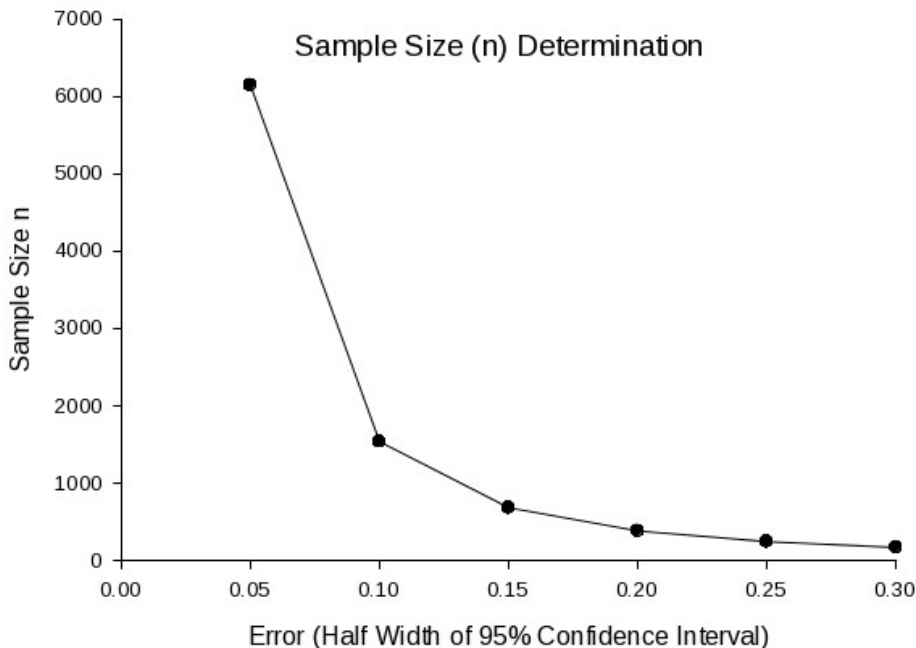
$$n = \left(\frac{Z * \text{Sigma}}{E} \right)^2$$

and using the variance=4 and *Z*=1.96 values, we get

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$$n = \left(\frac{1.96 * \sqrt{4}}{E} \right)^2 = \frac{15.3664}{E^2}$$

The above formula was solved for n over a range of E from 0.05 to 0.30 and is shown in the following graph.



The graph shows the approximate sample size needed to achieve an estimate of the mean with a given level of precision, E for a simple random sample. For instance, if the estimate is desired to be within 0.10 of the mean with 95% confidence, then 1,537 samples must be taken. We chose a precision of .15 around the mean of any given Likert question. With this precision level, the sample size for a simple random sample is 683—700 rounded. When applied to a stratified random sample as in this study, the sample size should be smaller, although the exact size is unknown, so we will use the sample size estimation for a simple random sample (700). Assuming a response rate of 0.85, we will draw a sample of 824 and expect 700 responses; and again, in any given NPU, the sample will be drawn 0.6% of the number of residential improved parcels.

Unusual problems requiring specialized sampling procedures

Because we will perform exploratory factor analysis, we are also aware of the sample size requirements for factor analysis. Factor analysis differs from other

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statistical procedures such as regression because with the former there are no inferential statistical tests and no method to determine the probability of making an inference error (Osborne and Costello, 2004). Some researchers recommend an absolute sample size such as 150; while others suggest a ratio such as the number of observations to scale items (questions) be used as guide to determining sample size (Hatcher, 1994; p.73).

Osborne and Costello (2004) stress that factor analyses require large sample sizes. Their analysis of a robust data set suggested that a ratio of subjects (number of observations) to questions is a valid way of determining sample size for factor analysis; however, results did not indicate what the optimal ratio should be. Hatcher (1994, p.73) recommends 5:1, and others recommend a 10:1 ratio. Again, however, Osborne and Costello (2004) caution that even with ratios of 20:1 or a sample in excess of 1,000, factor analysis can have error rates of up to 30 percent. They conclude that larger samples, in addition to considerations of ratios, represent the best solution to sample size calculations for factor analysis.

The number of questions on the protective capacity scale is twenty. Our sample size of 700 (calculated above) allows for a much larger sample size than does a ratio of 5:1 or even 10:1; so we are confident that our sample size is sufficient for exploratory factor analysis.

Any use of periodic (less frequent than annual) data collection cycles to reduce Burden.

This is a one-time survey. There is no use of periodic data collection to reduce the burden.

3. Describe methods to maximize response rates and to deal with issues of non-response. The accuracy and reliability of information collected must be shown to be adequate for intended uses. For collections based on sampling, a special justification must be provided for any collection that will not yield "reliable" data that can be generalized to the universe studied.

A letter explaining the survey's purpose and solicitation for response to a face-to-face interview at the home will be mailed on Morehouse College stationary to potential respondents one week prior to data collection. The letter will specify dates on which the interviewer will canvas a given NPU.

The survey will be administered door-to-door by four Morehouse undergraduate students. Each student will be assigned 6.25 NPUs to canvas. Interviews will be collected on all seven days of the week to avoid bias associated with particular

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days. If a householder 18 or older is unavailable at the initial visit, the interviewer will make two more attempts to attempt to contact the appropriate respondent. The 25 NPUs will be divided into four sections, and the letters will be mailed potential respondents in four phases. We employ this methodology for better ease of data collection. By mailing and canvassing one one-quarter of the city at a time, we will have better coordination and control of responses and non-responses. Also, this will make data collection more efficient by concentrating interviewers' locations.

To minimize respondent burden and encourage full involvement in the survey, each potential respondent will be asked, "Is this a good time to answer a few questions?" With the advance letter and repeated visits to the home, we expect a response rate of at least 85%. We believe this response rate can be achieved because of the direct method of door-to-door data collection and the familiarity of the Atlanta population with Morehouse College. Face-to-face interviewing offers numerous advantages in terms of increased response rates and minimization of non-response bias. The presence of the interviewer helps to increase response rates. The interviewer can quickly clarify questions the respondent might have about any of the survey questions, and the respondent is more likely to complete a survey administered by a human being. Importantly, face-to-face data collection is also better suited for reaching lower income and education and minority populations. Relatively high percentages of Atlanta's population fall into one or more of these categories (Dillman, 1978, p.40).

Interviewer training is central to achieving maximum response rates. All interviewers will receive intensive and detailed training in door-to-door data collection procedures. This training will enable them to conduct professionally accurate and efficient face-to-face surveys. Each interviewer will be monitored regularly for quality control purposes and additional training is provided as needed.

Refusal conversion

A second letter will be sent to the household of those who were not reached with the initial round of household visits (two attempts). The letters will restate the importance of the survey and again request household participation in the survey. Four days after the letters are sent, these homes will be visited again. If no one responds after three attempts, the interviewer will attempt to survey someone on the alternative stratified random sample list from a given NPU (n=824). The same procedures outlined above will be used to contact and survey residents on the alternative list. We expect roughly 25% of our interviews to come from the alternative list of random addresses. Total time allotted for data collection is three months.

We will characterize non-respondents whom we make contact (i.e., those who are appropriate respondents but refuse to participate) based on approximate age, gender, race, and NPU categorization. These data will be used in statistical models to compute multiple imputations for key questions, such as those comprising the protective capacity scale.

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- 4. Describe any tests of procedures or methods to be undertaken. Testing is encouraged as an effective means of refining collections of information to minimize burden and improve utility. Tests must be approved if they call for answers to identical questions from 10 or more respondents. A proposed test or set of tests may be submitted for approval separately or in combination with the main collection of information.**

The survey will be pre-tested as a part of classroom instruction at Morehouse College. No more than nine respondents will be asked questions.

- 5. Provide the name and telephone number of individuals consulted on statistical aspects of the design and the name of the agency unit, contractor(s), grantee(s), or other person(s) who will actually collect and/or analyze the information for the agency.**

Dr. Dr. Stanley Zarnoch, USDA Forest Service, Southern Research Station, was consulted on sampling design and statistical methods (864) 576.8188.

Statisticians with the National Agricultural Statistical Service also provided peer review and input. Their primary concerns are copied below. Each has been addressed in the appropriate section of the Supporting Statement.

Comments on justification:

The primary importance of the collecting the information is to more accurately reflect environmental justness. The goal is clearly stated at the beginning of the document and re-iterated in the section of the consequences of not collecting the data. In the section 16, how the data will be integrated to assess environmental justness is not well addressed. Section 14 also does not address the expenditure of time to integrate the information to assess environmental justness. In section 2, a number of uses of the data are listed, but these are not clearly addressed in time estimates in section 14 and in section 16 of what will be done with the data. You may also want to include what would be transferred.

In section 2, the data are to be collected by personal interview of the household resident who last had a birthday over a two month period. It may be better to ask the resident **currently** in the household who last had a birthday and is over 18 years of age. It is better to avoid return visits and risk larger non-response.

In section 4, duplication of information is addressed. It is stated that there are three principal means of identifying duplicate information, but only two are stated: a review of the OMB website and contacting Research Stations.

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Comments on Collections of Information Employing Statistical Methods:

The sample size needs to be calculated assuming that there will be inaccessible households. Inaccessible households may be more prevalent in some NPUs than in others and the total sample size needs to account for that. The goal for the response rate is 80%, so you will want to employ tactics of collecting your data to ensure the 80% goal is reached, but it is not realistic to assume that samples may be substituted when contact cannot be made. Substituting samples may bias your results. Some ways of improving response rates are requesting that the person currently in the house with the most recent birthday respond to the survey, so you do not risk non-response from the household. You may need to attempt to contact the household a larger number of times and ensure that you are making attempts at different times of the day or days of the week.

The sample size was determined based on a desired precision around the mean of a single 5 point Likert scale question over all 25 NPUs. There are 12 [actually 20] such Likert scale questions, and they will need to be evaluated in the context of a factor analysis to produce an index or potentially more than one index. Since the civic engagement survey is a novel idea, I would look at the factor analysis samples size calculation in the manner of exploratory factor analysis. The idea has great potential, but we need to learn from the first survey of its kind what the structure of the variance is. I would be more inclined to focus my sample size calculation on standards for principal component analysis/exploratory factor analysis. There is a good discussion on sample sizes for exploratory factor analysis and principal component analysis at <http://pareonline.net/getvn.asp?v=9&n=11> in an online journal.

I would keep in mind is that in most cases for model fitting there is a need to have a development (training) and validation dataset. I would plan to have an adequate number of respondents to provide the comparability between these.

It was outside the scope of this proposal to address how the index, including environmental risks, environmental amenities, and civic engagement, would be developed. However, I would caution that each index is being developed with error and combining the error may negate any opportunity to look at statistical differences between NPUs in Atlanta. I would look at the final index as primarily displayable graphically.

You will want to address item (or question) non-response for the 23 questions. If a question or group of questions is consistently not answered, this may diminish the number of complete responses available for analysis. Since you cannot require that each question is answered, you may want to address this in the sample size calculation. For example, we will need 700 complete responses, assuming X% is partial responses.

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References:

- Abel T. D. 2008. Skewed risksapes and environmental justice: a case study of metropolitan St. Louis *Environmental Management* **42** 232-248.
- Callahan, M.A., and K. Sexton. 2007. If cumulative risk assessment is the answer, what is the question? *Environmental Health Perspectives*. **5** 799-806.
- Dillman, D. A. 1978. *Mail and Telephone Surveys: The Tailored Design Method*, 2nd ed. New York: Wiley.
- Escobedo, F. Kroeger, T., Wagner J. 2011. Urban forests and pollution mitigation: analyzing ecosystem services and disservices *Environmental Pollution* **159** 2078-2087.
- Ernstson, H. 2013. The social production of ecosystem services: a framework for studying environmental justice and ecological complexity in urbanized landscapes. *Landscape and Urban Planning*, 109, 1, 7-17.
- Hatcher, Larry. 1994. *A Step-by-Step Approach to Using the SAS System for Factor Analysis and Structural Equation Modeling*. Cary, NC: SAS Institute.
- Heynen, N., Perkins H. A., Roy, P. 2006. The political ecology of uneven urban green space: the impact of political economy on race and ethnicity in producing environmental inequality in Milwaukee *Urban Affairs Review* **42**(1) 3-25.
- Kuo, F. E., Bacaicoa, M., & Sullivan, W. C. 1998. Transforming inner-city neighborhoods:
Trees, sense of safety, and preference. *Environment and Behavior* **30** 28-59.
- Kuo, F. E., Sullivan, W. C., Coley, R. L., Brunson, L. 1998. Fertile ground for community: Inner-city neighborhood common spaces. *American Journal of Community Psychology* **26** 823-851.
- The National Academy of Sciences. 2009. Implementing cumulative risk assessment. In: *Science and Decisions: Advancing Risk Assessment*. The National Academies Press: Atlanta, GA, pp.213-239.
- Osborne, J. W. and Costello, A.B. 2004. Sample size and subject to item ratio in principal components analysis. *Practical Assessment, Research & Evaluation*, 9(11).
- Pastor, M., Sadd J., Hipp J., 2001. Which came first? Toxic facilities, minority move-in, and environmental justice *Journal of Urban Affairs* **23**(2) 1-21
- Sadd, J. L., Pastor, M., Morello-Frosch, R., Scoggins J., and Jesdale, B. 2011. Playing it safe: assessing cumulative impact and social vulnerability through an environmental justice screening method in the South Coast Air Basin, California *International Journal of Research on Public Health* **8** 1441-1459.
- Sister, C. Wilson, J., Wolch J., 2008. The green visions plan for 21st century Southern California: 17. Access to parks and park facilities in the green visions plan region. PDF available from author, Forestry Sciences Lab, 320 Green St., Athens, GA USA.
- U.S. Bureau of Census, 2012. State and County Quick Facts (Atlanta, Georgia) <http://quickfacts.census.gov/qfd/states/13/13139.html>.
- U.S. Census Bureau: State and County QuickFacts. 2013. Data derived from

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Population Estimates, American Community Survey, Census of Population and Housing, County Business Patterns, Economic Census, Survey of Business Owners, Building Permits, Census of Governments.