

Analysis of the Sources of Group Quarters Enumeration Data in the 2010 Census¹

Asaph Young Chun, Census Bureau

Jessica Gan, JPSM Junior Fellow with Census Bureau²

Room 4K273, Washington DC 20233

Abstract: Group Quarters (GQ) enumeration in the U.S. Census involves collecting demographic data from such places as correctional facilities, skilled nursing facilities, college residence halls and military barracks. They include harder-to-access populations who live or stay in a group setting but are not usually related to each other. We analyzed the results of the 2010 Census to investigate the extent to which in-facility administrative records were possibly used for enumeration by major types of GQ. We discuss findings relative to merits and limitations of using administrative records for GQ enumeration in the Census.

Key Words: Administrative data, census, enumeration, group quarters

Group Quarters (GQ) enumeration in the U.S. Census involves collecting data from places where people who are not usually related to each other stay together in a living arrangement that is owned or managed by an entity providing housing and/or services for the residents (Williams, De Vos, Russell, and Barrett, 2013). These GQs include facilities, such as college and university residence halls, correctional institutions, military barracks, and nursing and skilled nursing facilities. The GQ facilities also include service-based locations, such as emergency and transitional shelters, soup kitchens, and regularly scheduled mobile food vans. In the 2010 Census, over 8 million people were enumerated in 166,827 GQs through the Group Quarters Enumeration (GQE). There were as many as 28 GQ types in seven major GQ categories. As Table 1 illustrates, GQ types with the largest share of population counts in the 2010 GQE were college/university student housing (31 percent) followed by correctional facilities for adults (28 percent) and nursing and skilled nursing facilities (19 percent). In the 2010 Census, these GQ types also contributed the top three population counts: college and university student housing (26 percent), correctional facilities for adults (26 percent), and nursing and skilled nursing facilities (22 percent).

¹ The views expressed are those of the authors and not necessarily those of the U.S. Census Bureau.

² Jessica Gan was a Junior Fellow of the Joint Program in Survey Methodology with the University of Maryland and who worked for the Decennial Statistical Studies Division at the Census Bureau during summer 2013. She attended Rice University.

Table 1: Population of Group Quarters Types with Most People

Type of GQ	Population Count	Percentage of GQ Population
College/University Student Housing	2,523,971	31.45
Correctional Facilities for Adults	2,276,581	28.37
Nursing and Skilled Nursing Facilities	1,508,081	18.79
All others	1,716,645	21.39
Total	8,025,278	100.00

Source: 2010 Census Group Quarters Enumeration Assessment Report (Williams, De Vos, Russell, and Barrett, 2013)

The purpose of this paper is to assess the extent to which administrative records (AR) available at GQ facilities were possibly used for the 2010 Census GQ enumeration, identify the benefits and challenges of using AR as a supplement to enumeration, and appraise the resulting data quality. We compare findings where desirable with Census 2000. Our attention to analysis of potential use of administrative records maintained by GQ facilities is motivated by the Census Bureau's aim for producing high quality GQ data in the most cost-effective way. We perform some initial analysis on the potential benefits of the use of AR to improve GQ operations, which must also account for the limitations of their use, such as reporting error, unit/item nonresponse error, coverage error, and/or linking error. (See a contrasting perspective of total survey error in Groves, Fowler, Couper et. al, 2009). We begin the paper in Sections 1 and 2 by presenting fundamental issues of administrative records and data quality to frame our analysis of GQE data sources in proper context. In Section 3, we present and discuss key findings of analysis relative to /source of data collected for GQ facilities, including administrative records. We conclude the paper in Section 4 proposing data quality indicators we consider critical in the future use of administrative records in GQ enumeration or surveys in a similar context.

1. Administrative Records

Administrative records are generally data collected by non-statistical agencies for administrative purposes. Examples include administrative data collected by Internal Revenue Service, Social Security Administration, and Selective Service System. The utility of AR has been widely discussed for decades to supplement large-scale surveys and censuses across the Atlantic (Chun and Scheuren, 2011). The National Research Council of the National Academies (2011) urges the Census to explore the effective use of AR in varying contexts, including Group Quarters.

Using AR as a partial supplement to surveys or census enumeration may result in various advantages, including cost reduction. If the data quality of AR is acceptable and fit to the intended purpose, it could be effective to resort to using AR after a certain number of Nonresponse Followup (NRFU) attempts (National Research Council, 2011). European studies

demonstrate that AR may also be a viable frame to determine or improve the survey sample and validate population counts (Wallgren and Wallgren, 2007).

Nevertheless, the potential use of AR raises various critical issues. There are laws and regulations that protect an individual's right to privacy. The idea that a federal statistical agency may obtain and use AR maintained at GQ facilities primarily for GQ unit's own administrative use might raise concerns about data confidentiality. In the case of GQ, data confidentiality is about both individual- and facility-level confidentiality of data to protect against both data breaches and inadvertent identification of personal and organizational information at GQ level. Administrative records useful to GQ enumeration are two types: 1) local administrative data maintained at the GQ facility for their own administrative use, and 2) state and national administrative data, such as the school census data regularly collected by the US Department of Education and the military data archived by the Department of Defense for their own military accounts.

2. Data Quality of Administrative Records

There are lessons to draw from best practices of assessing data quality of AR though each context varies from one another. Many countries conduct register-based censuses or surveys based on data from administrative sources (Laitila, Wallgren, Wallgren, 2011). As Laitila, Wallgren, and Wallgren (2011) noted, "The quality of a register is established with relation to a specific intended use...the quality requirements on an administrative register therefore depend on the overall role of the register in survey design within the production system of the statistical agency." It is essential to ask of the potential and intended use of AR before considering the associated data quality. What is the purpose of including the suggested AR in the enumeration? What are the requirements to assess data quality of AR? These are prerequisite questions to ask before developing any measures of data quality.

In determining the quality of specific AR, the linking variables are essential to determine. How data in each register may be linked to data in other surveys, censuses and registers is an important indicator of the data quality. The quality of one survey is likely to affect the quality of the rest of the register-based surveys when they are linked. A checklist developed by Daas, Ossen, Vis-Visschers, and Arends-Tóth (2009) is useful. They assess data quality of administrative records from three different categories, or hyper-dimensions:

- Source refers to where the data came from and how
- Metadata focuses on the metadata related topics
- Data focuses on the actual data

Table 2 shows an overview of quality indicators for each hyper-dimension. Most indicators are self-explanatory except a few. The Data Treatment indicator in the Metadata hyper-dimension column focuses on whether the data source keeper "performs any checks on and/or modifies the data in the sources" (Daas, Ossen, Tennekes, and Nordholt, 2013). Unique Keys refers to the presence of useful combinations of variables. Sensitivity in the Data hyper-dimension column refers to missing values, selectivity, and effect on totals.

Table 2: Quality Indicators of Each Hyper-dimension

Source	Metadata	Data
Supplier Relevance Privacy & Security Delivery Procedures	Clarity Comparability Unique Keys Data Treatment	Over-coverage Under-coverage Linkability Unit Nonresponse Item Nonresponse Measurement Processing Precision Sensitivity

Source: Checklist for the Quality evaluation of Administrative Data Sources (Daas, Ossen, Vis-Visschers, Arends-Tóth, 2009)

Several European countries have conducted a register-based Census by relying primarily on AR for enumeration. While their direct application to the US is not feasible, their efforts to conceptualize AR data quality are notable. A case in point is the Dutch practice of the Virtual Census that utilized the checklist created by Daas, Ossen, Vis-Visschers, and Arends-Tóth (2009). The registers used in the Virtual Census were evaluated based on the respective input quality. These registers included the Education Register, the Unemployment Benefit Register, the Social Security Register, the Housing Register, and the Population Register. These registers were chosen because each one provided adequate information on at least one important variable. The registers were evaluated based on Source hyperdimension, Metadata hyperdimension, and Data hyperdimension; each hyperdimension was evaluated based on the quality indicators listed in Table 2.

3. Findings and Discussion: Use of Administrative Records in Group Quarters Enumeration

We remind the reader that the National Research Council suggested using AR to supplement GQ Enumeration. Using AR as an auxiliary tool to improve GQ enumeration has been considered best practice based on the prior Census 2000. For example, Jonas (2003) demonstrated GQ enumeration would notably benefit from using AR maintained at GQ facilities. We begin this section by presenting the overall findings relative to use of AR in GQ enumeration in 2010. We then compare key findings with the Census 2000 by delving into major GQ types. In the next section, we turn to discussing the issue of data quality of AR in GQ enumeration and proposing a set of data quality indicators of AR tailored to GQ enumeration.

3.1 Use of Administrative Records in Group Quarters Enumeration 2010

Enumerators in the 2010 Census GQ operation used a paper questionnaire to conduct interviews at the GQ facility. For GQ enumeration in Census 2010, the enumerator was instructed to indicate how the Individual Census Report form was filled out by marking the appropriate box to the “Answered by” question on the back of the form (See Figure 1). The enumerator was to check either the “Respondent” box or the “Other” box. If the enumerator checked the “Respondent” box, it indicated that the respondent filled out the questionnaire or the questionnaire was filled out by the enumerator interviewing the respondent. On the other hand, if the enumerator checked the

“Other” box, it indicated the form was completed by other means, that is, with administrative records or personal knowledge of the GQ contact person.

For those questionnaires filled out by “Other” means, it could not be determined from the data provided how many questionnaires were filled out using AR alone.

Figure 1: “Answered By” Question on the Individual Census Report Form

The image shows a form titled "FOR OFFICIAL USE ONLY" with a "GQ Control Number" field. Below this are three checkboxes labeled "A. PN", "B. JIC1", and "C. JIC2". At the bottom, there is a section "D. Answered By:" with two checkboxes: "Respondent" and "Other".

As Table 3 shows, there were a total of 7,183,702 Individual Census Reports (ICR) indicating the enumerator response to the “Answered by” question. Most of the forms (64 percent) were completed by using administrative data or the GQ contact person’s own knowledge, as indicated by the “Other” checkbox. While there was unfortunately no valid method of determining what fraction of “Other” was actually filled out by AR, it has been observed in various field reports and ethnographic studies that AR does indeed play a critical role of enumeration in select GQs. Tables 5 and 6 both show a detailed breakdown of how GQs were completed during the 2010 Census GQ enumeration. We reiterate that AR used in GQ enumeration are those maintained at the GQ facilities, not those national or state-level administrative records.

Table 3: How GQ Questionnaires were Filled Out: 2010

Method	Count	Percent of Total
Administrative Data/Personal Knowledge	4,857,410	63.99
Respondent (Self)	2,326,292	30.64
Blank/Invalid Response	407,433	5.37
Total	7,591,135	100.00

Source: 2010 Census Group Quarters Enumeration Assessment Report (Williams, De Vos, Russell, and Barrett, 2013)

Table 4 shows the distribution of how GQ questionnaires (i.e., Individual Census Reports) were filled out by major GQ type in order of high to low prevalence of possible use of AR by the GQ facility respondent. Below are key findings.

The use of administrative data or personal knowledge of the GQ contact person to complete the GQ questionnaires was prevalent at most GQ types. Below are the four GQ types that we suspect most likely used administrative data to complete the questionnaires. For the most part,

administrative records if available at these facilities were used when a respondent was absent, incapacitated, or refused to be interviewed. Ethnographic studies provided evidence these facilities were where administrative records tend to be properly archived and the informant at the GQ was capable of providing the required GQ information.

- Hospital and In Patient Hospices (90 percent)
- Nursing and Skilled Nursing Facilities (89 percent)
- Residential Schools for People with Disabilities (89 percent)
- Juvenile facilities and Correctional Facilities for Adults (81 percent)

We observe that large GQs such as correctional facilities for adults and nursing and skilled nursing facilities were more likely to use administrative records to fill out questionnaires. These two GQ types together accounted for over 63 percent of GQ population counts possibly attributed to AR archived at facilities (i.e., 3.1 million out of 4.9 million counts). College/university student housing is another GQ type where AR was potentially frequently used for enumeration though only one third of ICRs were reportedly filled out with assistance of AR or the informant at GQ facilities (See further details in Table 9 in Williams, De Vos, Russell, and Barrett, 2013).

Table 4: How GQ Questionnaire Were Filled Out by “Other” Source of Data, including Administrative Records: 2010

Group Quarters Category	Other*	
	Count	Percent of Total
Hospital and In Patient Hospices	63,435	89.99
Nursing and Skilled Nursing Facilities	1,312,772	89.12
Residential Schools for People with Disabilities	15,190	88.78
Juvenile Facilities	118,368	80.92
Correctional Facilities for Adults	1,803,812	80.77
Group Homes Intended for Adults	237,859	78.67
Residential Treatment Centers for Adults	93,525	65.34
Unknown GQ Type	18,482	64.69
Workers’ Group Living Quarters and Job Corp Centers	98,032	60.89
Living Quarters for Victims of Natural Disasters	14	53.85
Religious GQs and Domestic Violence Shelters	47,782	47.54
Shelters and Service-based locations	178,187	44.69
College/University Student Housing	869,700	34.59
Military Group Quarters	252	13.68
Total	4,857,410	63.99

Source: 2010 Census Group Quarters Enumeration Assessment Report (Williams, De Vos, Russell, and Barrett, 2013). **NOTE:** Administrative data are included in the “Other” Answer category, which includes the GQ contact person’s knowledge as well as AR use in ICRs. Percentages of using administrative data by GQ type should be interpreted with caution. They are estimates of the upper limit of potential use of administrative data by each GQ type. Data for Military GQ was the result of inadvertently including ICRs with Military Census Report packets.

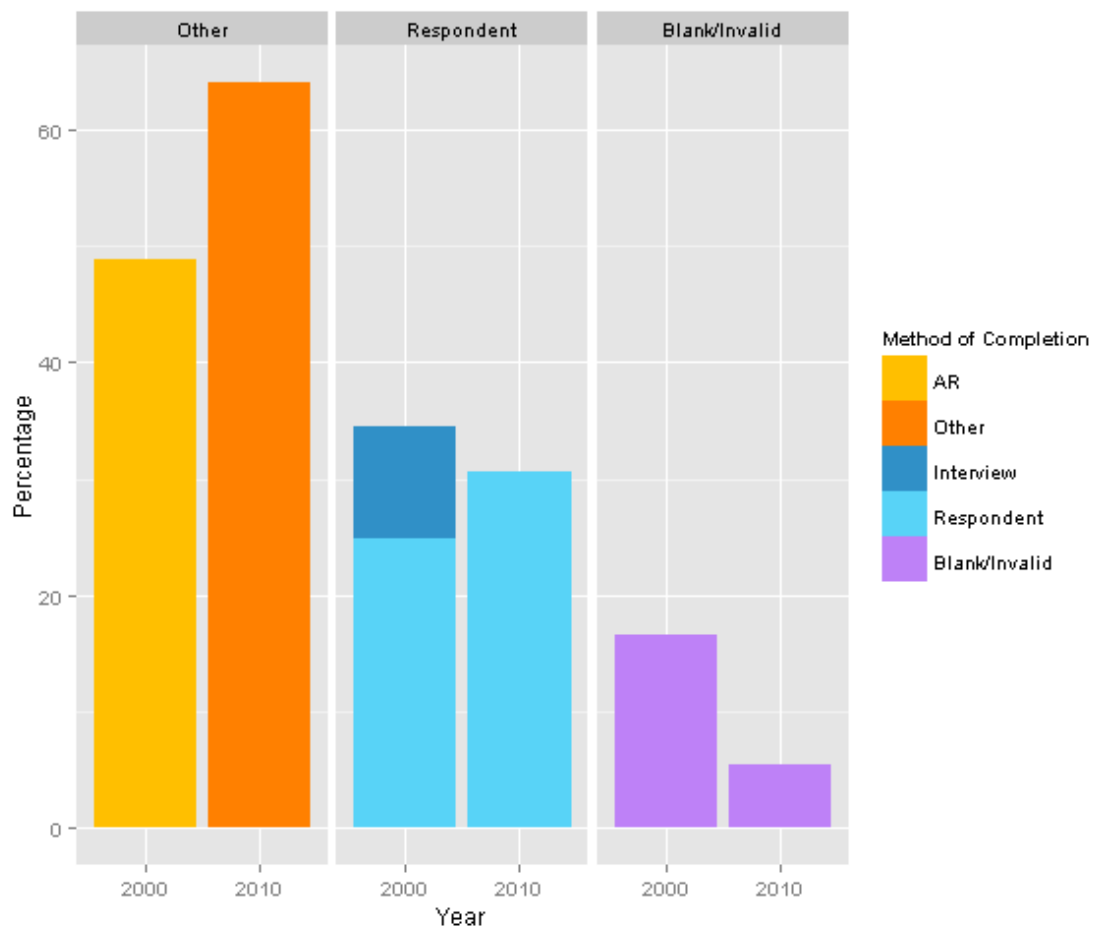
3.2 Potential Use of Administrative Records in GQ Enumeration between 2000 and 2010

Figure 2 provides data comparing how GQ questionnaires were filled out in both Census 2000 and Census 2010. In Census 2000, the enumerator was offered the three answer boxes to indicate sources of data used, such as Administrative records (Yellow), Respondent (Sky Blue), and Interview (Dark blue). In contrast, the enumerator conducting Census 2010 for GQ was offered the two answer boxes: Respondent, which is inclusive of self-response by the respondent or administered by enumerator; and Other (orange), which is inclusive of the use of administrative data or personal knowledge of the GQ contact person. For comparison across a decade, we used the two answer categories of Census 2010 as a benchmark. Thus in the first column of Figure 2, we compared the Census 2000 data of administrative data usage alone with the 2010 Census data of “Other” which is inclusive of AR and the GQ contact person’s personal knowledge. In the second column of Figure 2, we combined the Census 2000 data of self-response and interviewer-

administered response and compared this summary data to the 2010 Census data tied to “Respondent” which is inclusive of self-response by the respondent and enumerator-administered interview. Key findings are:

- Overall, the rate of self-response and enumerator-administered interview combined together has declined by about 3 percentage points.
- We observe that potential use of AR in 2010 seems to be increased over that of 2000 by about 15 percentage points to 64 percent. We offer a caution that we cannot say a definite size of increase of the use of AR in 10 years because the “Other” category in 2010 was inclusive of both AR use and personal knowledge of the GQ contact person.

Figure 2: How Group Quarters Questionnaires were Filled Out: 2000 and 2010



Source: Williams et. al, (2013) for 2010 data and Jonas (2003) for 2000 data. **Note:** Data analysis was based on 2010 Census Edited File for 2010 data and the 100% Census Unedited File for 2000 data.

We continue the comparison between censuses by observing what happened among major GQ types. As Figure 3 shows, overall, the potential use of AR between 2000 and 2010 has risen, particularly in Correctional Institutions, Juvenile Institutions, Hospitals, Nursing homes and

Group Homes. In contrast, self-response/enumerator-administered response has declined between these censuses in all GQ types except Shelters and Service-Based Locations.

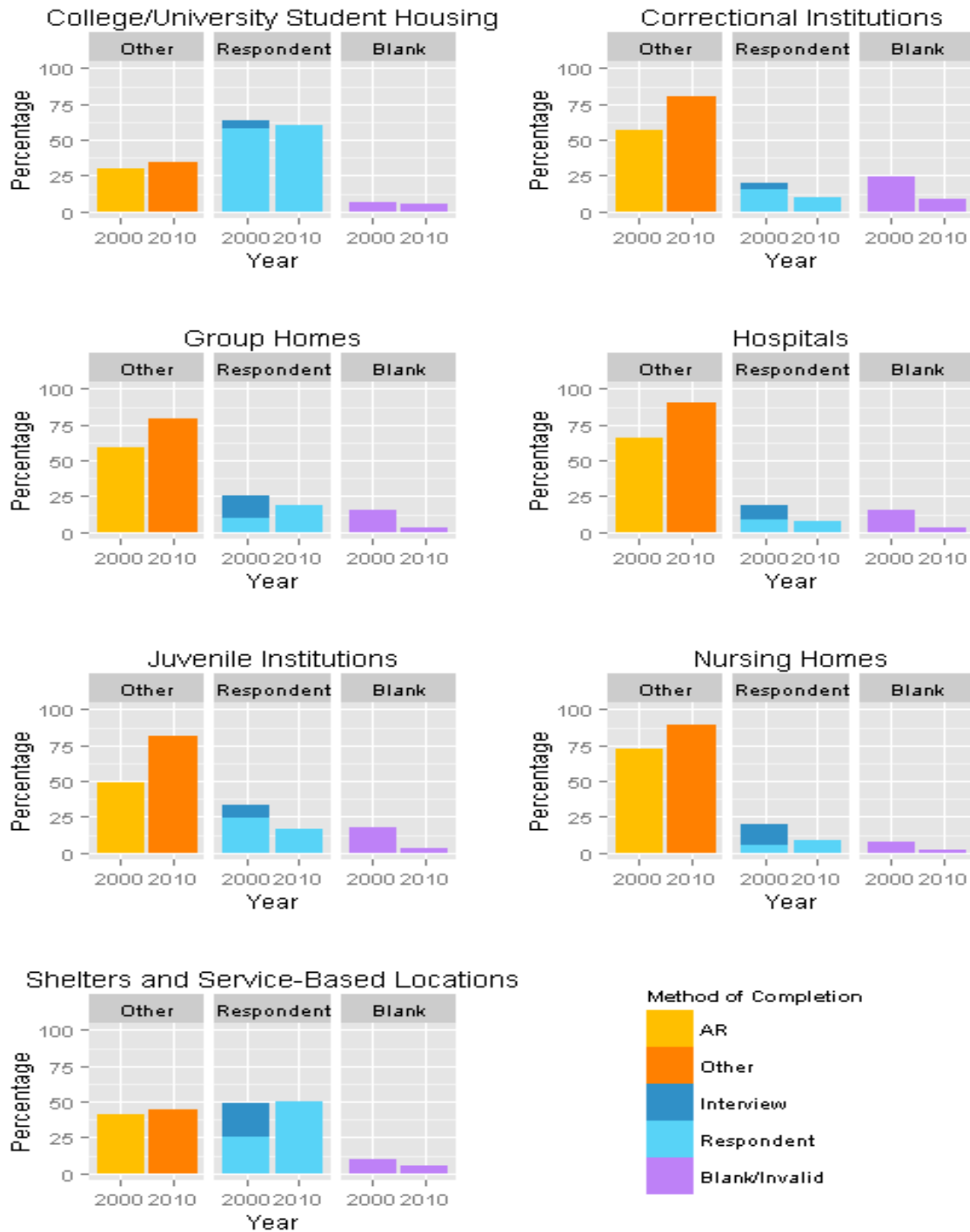
As shown in Figure 3 for correctional facilities for adults and juveniles, the potential use of administrative records appeared to have notably risen between 2000 and 2010. As shown in Table 1, the 2010 population counts in correctional facilities for adults accounted for 28 percent of the total population in GQs. Figure 3 seems to show up to 81 percent of this particular GQ population might be better accounted for by using administrative records. We find it is often unfeasible to distribute individual paper questionnaires in correctional facilities, where there is a lack of personnel to administer such surveys, and security issues may override other decisions. In these situations, using AR is the most pragmatic approach to an adequate enumeration of the incarcerated population. In the next section, we will discuss that we should also be mindful of data quality of race and ethnicity collected from correctional facilities.

As shown in Figure 3, nursing and skilled nursing facilities are the other GQ type where the potential use of administrative records has shown a substantive increase of over 10 percentage points in a decade. Given about 20 percent of the GQ population in 2010 came from nursing facilities and the increasing potential use of administrative records in this group, we recommend further investigation in this category.

In case of college and university student housing, self-response, which includes enumerator-administered interview, remains the most prevalent method of completing GQ questionnaires. This is the group where self-response facilitated by internet is likely to generate high quality data faster and cheaper. Given a large contribution of this group to GQ population counts (i.e., about 29 percent in 2010) and a considerable amount of administrative records use, at 35 percent, we suggest that we must find a more effective use of administrative records, for example, in collaboration with the US Department of Education. Federal education agencies might help get access to national data of college and university student housing facilities and associated administrative data.

While it is very likely that Prisons, Nursing Facilities, Colleges, and Universities intensely and regularly used AR, the same may not necessarily be true for Shelters and Service-Based Enumeration locations. Forty five percent of Service-Based Enumeration locations were completed by “Other” method, which includes administrative records or GQ contact person’s personal observation/ knowledge or by enumerator observation. There is certainly a lower likelihood of the existence of AR in mobile organizations such as soup kitchens, targeted non-sheltered outdoor locations, and regularly scheduled mobile food vans. Thus, it is more probable that observation, rather than AR, was used to enumerate these mobile GQ types. On the other hand, for locations such as shelters, the existence of AR is likely to be higher and therefore could be advantageous for enumeration (Russell and Barrett, 2010).

Figure 3: How Group Quarters Questionnaires were Filled Out in Select Group Quarter Types: 2000 and 2010



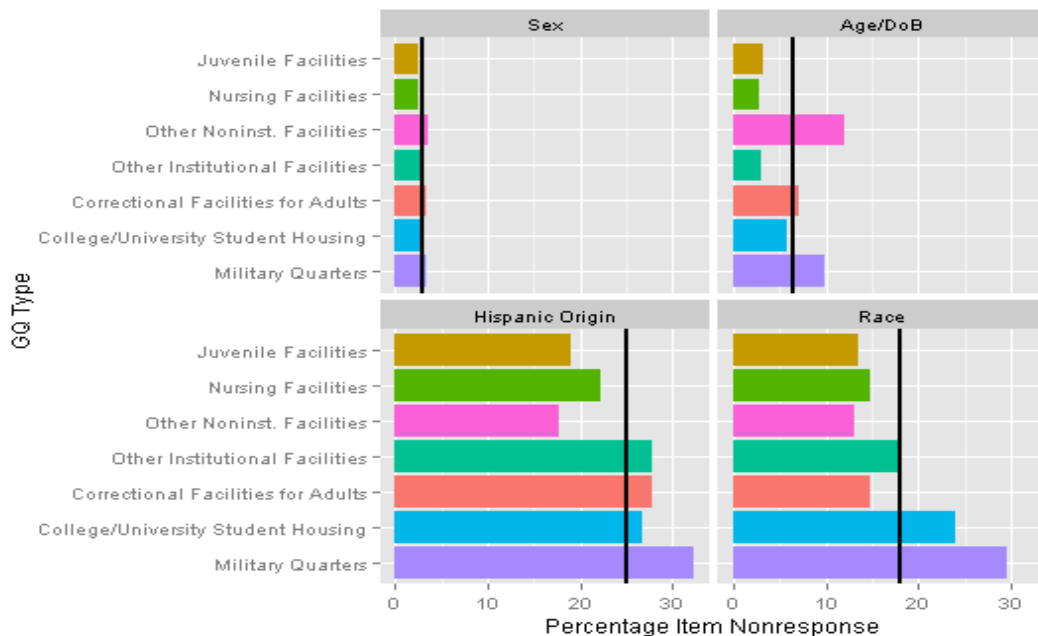
Source: Jonas (2003) for 2000 data and Williams et. al. (2013) for 2010 data. **Note:** GQ types were selected based on available data from 2000 and 2010 Group Quarters Enumeration.

3.3 A Glimpse of Data Quality of Administrative Records in GQ Enumeration

Ethnographers (e.g., Chan, 2012) have investigated quality of AR used for select GQ types. Ethnographers were sent to select GQs either on or the day after Census Day, 2010 to take an “alternative enumeration,” taking a literal head count of the institution and comparing it with the counts maintained within a GQ facility’s own AR system. In general, all the select facilities examined had relevant data that met the purpose of the data collection. Some facilities provided data meeting Census requirements, but others did not, particularly Juvenile Facilities and Military Quarters. Most GQs needed more research on item nonresponse and reliability, and many GQs had possible coverage errors (Chan, 2012).

Figure 4 shows item nonresponse rates for key background variables by select GQ types. Overall, Sex (mean of 3.0 percent) and Age/Date of Birth (mean of 6.5 percent) showed relatively lower item nonresponse rates. In contrast, Race (mean of 18.1 percent) and Hispanic Origin (mean of 25.0 percent) item nonresponse rates stood out across most GQ types. The reason for the higher item nonresponse rates for “Race” and Hispanic Origin” might be due to a variety of factors, including difficulty of contacting respondents, lack of knowledge by GQ point person providing information, and limited information available from GQ facility management (Rothhaas, Lestina, Hill, 2012). We would add potential adverse contribution by AR to item nonresponse rate. Race and Hispanic Origin data in AR tend to be of low quality (e.g., Schwede and Terry, 2013). In the case of GQ, a relatively high item nonresponse rate of race and ethnicity across most GQ types seems to be the norm. It is alarming to see high item nonresponse rates of Hispanic origin particularly among correctional facilities for adults and college/university student housing where we have reported a prevalent use of AR or a notable contribution of AR-based enumeration in previous sections.

Figure 4: Item Nonresponse for Select Group Quarters in 2010



Source: Rothhaas, Lestina, Hill (2012) for 2010 data.

Note: Vertical black line signifies the mean item nonresponse by GQ type. Data analysis was based on 2010 Census Unedited File.

3.4 Proposed Data Quality Indicators of Administrative Records in GQ Enumeration

The issue of item nonresponse we presented above with AR in GQ enumeration is a glimpse of how extensive research is required of assessing data quality of AR in GQ operations. In principle, high quality data is defined as “fit for use” in its intended environment. The seven basic properties of data quality generally include relevance, accuracy, timeliness, accessibility, comparability, coherence, and completeness (Herzog, Scheuren, and Winkler, 2007). In order for GQ to advance its effective use of AR, we propose to focus on the six GQ-specific data quality indicators of AR, such as Relevance, Clarity, Accuracy, Completeness, Timeliness and Coherence.

Relevance refers to how the data will be used, for what purpose it will be integrated. Relevance is a measure of how well the data meets the demands of the user, specifically, for our purposes, the Census Bureau. It also indicates how well the variables fit into the design of the survey, how useful they are in drawing conclusions (“Fit for Use”). Additionally, relevance measures how usable the data is in terms of statistical units, and whether or not the objects can be transformed into such. Wallgren and Wallgren (2007) assert that relevance is the most important aspect of quality for register-based surveys. If the survey does not meet the demands of the user, there is no need to continue the quality evaluation.

Clarity describes how well the variables and elements are defined, how clear the data is on what it is actually saying. It involves having an adequate understanding of what each variable is measuring, the units of measurement used, and the method of data collection for that specific variable. The definitions and explanations should be clear enough so that there is minimal confusion. This is especially important for AR maintained in GQ facilities because the Census Bureau has no control over how administrative data is collected, processed or coded.

Accuracy refers to how close variable values maintained on AR in GQ facilities are to their true values. It is a measurement of the authenticity of AR, with minimal errors and deviations in the data, as well as the correctness of each element. This may be measured by misreporting and processing errors such as coding and duplication errors. Accuracy-related errors may be examined in GQs by ethnographic follow up tests (e.g., the alternative enumeration practiced by Chan, 2012) to verify if the count from the actual Census is the real number of people living in that institution. However, for verification tests, it is important to keep in mind the high turnover rate in many GQs (Chan, 2012). Accuracy also includes coverage issues such as overcoverage and undercoverage rates to assess the quality of AR in terms of valid representation of the GQ facility.

Completeness refers to the degree to which records are missing and records have missing data elements. These quantities are known as unit nonresponse or item nonresponse in sample surveys, and the level to which they exist is termed incompleteness. Missing records or missing data elements may have serious consequences if they are associated with a particular segment of the nonresponse population, influencing the degree of matching between the archived AR and the target population to enumerate.

Timeliness refers to how current AR is to make it useful to the AR user. This is usually affected by “reference time period” by which AR are collected and available to the AR user.

Coherence refers to how comparable AR in one source are to other AR sources. This tends to be affected by the extent to which measurement constructs and administrative question wordings are

consistent across AR sources and over time. An AR that scores high in coherence should be consistent across multiple AR sources as well as consistent over time. The AR sources should have the potential to be linked at least by one variable.

4. Conclusions

The Census Bureau aims to obtain the most accurate count possible of people who live or stay in GQs and do it in the most cost-effective way. Given the Census Bureau's efforts to optimize the use of AR for GQ enumeration via automated data collection, we find it is essential to learn the merits and drawbacks of AR particularly in a GQ context. We reiterate AR for GQ operations are mostly facility-based except for certain GQ types where national AR may be available and useful.

We have shown the increasing potential use of AR in select GQ types, such as correctional facilities for adults, nursing and skilled nursing facilities and college/university student housing. We offer a cautionary measure against using AR where its use is not prevalent from perspectives of the tradeoff of cost and benefit analysis. Where the use of AR is prevalent, we have shown data quality is not equal at item level. Data quality indicators we propose for the use of AR in GQ enumeration are subject to further refinement, feasible measurement and pretests before their implementation in GQ operations.

Assuming we have time and other resource constraints, we recommend devoting pretests on priority GQ types such as nursing and skilled nursing facilities, correctional facilities for adults, and other GQs types where we conjecture a high prevalence of administrative records usage. College and university student housing could be another potential target GQ type, despite a relatively low propensity of the use of administrative records at the time of enumeration. Given a large population coming from this GQ type, it has been recommended to work with the National Center for Education Statistics of the Department of Education to obtain a comprehensive source of administrative records of student housing.

References

- Chan, A. (2012). *Investigation of methods to evaluate the coverage of group quarters populations report*. 2010 Census Program for Evaluations and Experiments, Center for Survey Measurement.
- Chun, Y, and Scheuren, F. (2011). Pandata Systems to Enhance Survey and Census Systems: Employing Administrative Data to Better Inform Public Policy. Invited paper presented in the 2011 Joint Statistical Meetings.
- Daas, P. J. H., Ossen, S. J. L., Tennekes, M., and Nordholt, E. S. (2013). Evaluation of the quality of administrative data used in the Dutch Virtual Census. Invited paper presented in the 2013 Joint Statistical Meetings.
- Daas, P. J. H., Ossen, S. J. L., Vis-Visschers, R. J. W. M., and Arends-Toth, J. (2009) Checklist for the Quality evaluation of Administrative Data Sources. Discussion paper 09042, Statistics Netherlands.
- Groves, R. M., Fowler, Jr., F. J., Couper, M. P., Lepkowski, J. M., Singer, E., & Tourangeau, R. (2009). *Survey methodology*. (Second ed.). Hoboken, New Jersey: John Wiley & Sons.
- Herzog, T. N., Scheuren, F. J., and Winkler, W. E. (2007). *Data quality and record linkage techniques*. New York, NY: Springer Science Business Media.
- Jonas, K. (2003). Group quarters enumeration. *Census 2000 Evaluation E.5, Revision I*. Extracted from <https://www.census.gov/pred/www/rpts/E.5%20R.pdf>
- Laitila, T., Wallgren, A., and Wallgren, B. (2011). Quality assessment of administrative data. *Research and Development - Methodology reports from Statistics Sweden, 2*.
- National Research Council of the National Academies. (2011). *Change and the 2020 census: Not whether but how*. Washington, DC.
- Rothhaas, C., Lestina, F., and Hill, J. M. (2012). *The 2010 decennial census: Item nonresponse and imputation assessment report*. United States Census Bureau, Decennial Statistical Studies Division. Extracted from http://www.census.gov/2010census/pdf/2010_Census_INR_Imputation_Assessment.pdf
- Russell, D., and Barrett, D. F. (2012) *The 2010 Census service-based enumeration operation assessment report*. United States Census Bureau.
- Schwede, L, and Terry, R. (2013). *Comparative ethnographic studies of enumeration methods and coverage across race and ethnic groups*. United States Census Bureau
- Wallgren, A., and Wallgren, B. (2007). *Register-based statistics: Administrative data for statistical purposes*. John Wiley & Sons, Ltd.
- Williams, J., De Vos, B., Russell, D., Williams, A., and Barrett, D. (2013). *2010 Census group quarters enumeration assessment report*. United States Census Bureau, Extracted from <http://www.census.gov/2010census/pdf/2010%20Census%20Group%20Quarters%20Enumeration%20Assessment%20Report.pdf>