Measuring the Group Quarters Population in the American Community Survey: Interim Report

Kriztina Marton and Paul R. Voss, Editors; Panel on Statistical Methods for Measuring the Group Quarters Population in the American Community Survey; National Research Council

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Interim Report

Panel on Statistical Methods for Measuring the Group Quarters
Population in the American Community Survey

Krisztina Marton and Paul R. Voss, *Editors*

Committee on National Statistics

Division of Behavioral and Social Sciences and Education

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THE NATIONAL ACADEMIES PRESS
Washington, D.C.
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PANEL ON STATISTICAL METHODS FOR MEASURING THE GROUP QUARTERS POPULATION IN THE AMERICAN COMMUNITY SURVEY

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Acknowledgments

I am very pleased to see this interim report of The Panel on Statistical Methods for Measuring the Group Quarters Population in the American Community Survey (ACS) come together so extraordinarily well after just four meetings of a group of talented individuals, many of whom did not know one another just eight busy months ago. I wish to thank the many people who have assisted our work and contributed to the report.

The ACS staff of the U.S. Census Bureau, under the leadership of Daniel Weinberg (assistant director for decennial census and American Community Survey) and Susan Schechter (formerly chief of the ACS Office), have been generous in providing information to the panel and addressing our inquiries. The communication between the panel and the Census Bureau was greatly facilitated by lead technical liaison, Alfredo Navarro, who was a pleasure to work with; Philip Gbur served as contracting officer, and was always accessible. A number of Census Bureau staff made very informative presentations and provided useful materials to the panel, including Mark Asiala, Michael Beaghen, Scott Boggess, Edward Castro, Annetta Smith Clark, Sandy Clark, Steven Hefter, Todd Hughes, Sharon Stern, Amy Symens Smith, Victoria Velkoff, and David Whitford.

We also sought input on data collected about major segments of the group quarters population from experts in other agencies in the federal statistical system. In particular, William Sabol from the Bureau of Justice Statistics gave an overview of that agency's portfolio of data series on the correctional population. We also benefited from a discussion with Lauren Harris-Kojetin from the National Center for Health Statistics about health care facilities.

At our first meeting in March 2010, the panel formed two working groups to pursue specific tasks between meetings, and our work to date has been accomplished with few disagreements and with a keen sense of remaining within the boundaries of our charge from the Census Bureau and delivering the interim report on schedule. This could not have happened without the steady guidance and excellent writing talents of our study director, Krisztina Marton, and the strong support of other CNSTAT staff. We extend our sincere appreciation to Constance Citro, CNSTAT Director, for her always deeply knowledgeable guidance when questions of procedure arose or when advice was requested. We thank CNSTAT senior program officers Daniel Cork and Michael Cohen for taking time from their own busy schedules to attend the panel's meetings and provide occasional counsel. We also thank Christine McShane for the expert technical editing of the draft report, and Agnes Gaskin for handling a variety of logistical matters so capably.

This report has been reviewed in draft form by individuals chosen for their diverse perspectives and technical expertise, in accordance with procedures approved by the Report Review Committee of the National Research Council (NRC). The purpose of this independent review is to provide candid and critical comments that will assist the institution in making its published report as sound as possible and to ensure that the report meets institutional standards for objectivity, evidence, and responsiveness to the study charge. The review comments and draft manuscript remain confidential to protect the integrity of the deliberative process. We wish to thank the following individuals for

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their review of this report: Alicia L. Carriquiry, Department of Statistics, Iowa State University; John L. Czajka, Mathematica Policy Research, Inc., Washington, DC; David Hubble, Westat, Inc., Rockville, MD; Bruce D. Spencer, Department of Statistics, Northwestern University; and Preston Jay Waite, Consultant, Logan, UT.

Although the reviewers listed above have provided many constructive comments and suggestions, they were not asked to endorse the conclusions or recommendations nor did they see the final draft of the report before its release. The review of this report was overseen by Richard A. Kulka, Abt Associates, Inc., Durham, NC and Charles F. Manski, Department of Economics, Northwestern University. Appointed by the National Research Council, they were responsible for making certain that an independent examination of this report was carried out in accordance with institutional procedures and that all review comments were carefully considered. Responsibility for the final content of this report rests entirely with the authoring panel and the institution.

Finally, we recognize the many federal agencies that support the Committee on National Statistics directly and through a grant from the National Science Foundation. Without their support and their commitment to improving the national statistical system, the committee work that is the basis of this report would not have been possible.

Paul R. Voss, *Chair*
Panel on Statistical Methods for
Measuring the Group Quarters
Population in the American
Community Survey

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Executive Summary

Following several years of testing and evaluation, the American Community Survey (ACS) was launched in 2005 as a replacement for the census "long form," used to collect detailed social, economic, and housing data from a sample of the U.S. population as part of the decennial census. During the first year of the ACS implementation, the Census Bureau collected data only from households. In 2006 a sample of group quarters (GQs)—such as correctional facilities, nursing homes, and college dorms—was added to more closely mirror the design of the census long-form sample. With some exceptions, residents of group quarters are asked the same questions as household members. These include the questions about personal characteristics formerly included in the census long form—for example, disability, veteran status, and employment. Questions about housing characteristics are not asked, although the type of GQ facility is noted.

The design of the ACS relies on monthly samples that are cumulated to produce multiyear estimates based on 1, 3, and 5 years of data. The data published by the Census Bureau for a geographic area depend on the area's size. Estimates will be available based on data collected over a 1-year period only for the largest geographic areas (with a population over 65,000). For the smallest geographic areas (with a population under 20,000), the estimates are based on data cumulated over 5 years.

The multiyear averaging approach enables the Census Bureau to produce estimates that are intended to be robust enough to release for small areas, such as the smallest governmental units and census block groups. However, the sparseness of the GQ representation in the monthly samples affects the quality of the estimates in many small areas that have large GQ populations relative to the total population. For example, some counties have group quarters within their administrative boundaries but have no facilities represented in the sample. The Census Bureau, concerned about the adverse effects of group quarters on the 5-year estimates for small geographic areas, asked the National Research Council, through a panel of the Committee on National Statistics, to review and evaluate the statistical methods used for measuring the GQ population.

Below we summarize the panel's main recommendations addressing improvements in the sample design, sample allocation, weighting, and estimation procedures to assist the Census Bureau's work in the very near term, while further research is conducted to address the underlying question of the relative importance and costs of the GQ data collection in the context of the overall ACS design. The recommendations in this interim report are limited in their ability to address the fundamental issues related to the effects of the current ACS GQ data collection approach on small-area estimates. The recommendations herein are focused instead on identifying opportunities to evaluate the extent to which the GQ data could be improved, assuming that the goals related to this subset of the sample in the ACS remain the same or are only minimally modified. The panel's final report will consider the overall design of the current survey in light of data user needs.

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Sampling Frame Development and Maintenance

The sampling frame for the ACS is based on the Census Bureau's Master Address File (MAF), which is an inventory of addresses in the United States, including housing units and group quarters. However, the procedures developed to maintain and update the MAF are focused on housing units and are less adequate for group quarters, a situation that affects the representativeness of the sampling frame and increases data collection costs because of the additional work necessary to clean and improve the sample.

The Census Bureau should explore opportunities for developing and maintaining a better inventory of group quarters, and possibly reducing the amount of work that is invested in updating cases after they have been assigned to a field representative. For example, the ACS office could take advantage of the successful partnerships already in place between other Census Bureau divisions and state demographic offices and other local entities. These relationships could be expanded to better meet ACS sampling frame needs. Collaborations with other federal statistical agencies and organizations that also collect data about residents of various group quarters could be explored as a source of updates to the sampling frame.

Sample Allocation and Selection

The current ACS sample design is suitable for producing estimates of the characteristics of the household population for small-area geographies, but it is not optimized for substate estimates of the GQ population. Even though the Census Bureau does not intend to release detailed characteristics of GQ residents for small geographic areas, GQ data are included in the total population estimates. The Census Bureau should evaluate the current sample allocation rates at the state and substate levels, as well as the subsampling rates in large group quarters, to determine whether there are opportunities for a more efficient design.

Weighting and Estimation

Similar to problems with the sample design, the current group quarters weighting and estimation procedures for group quarters populations are not optimized for small-area estimates. The ACS substate samples are highly variable, particularly by GQ type, and some geographic entities with known GQ facilities have none represented in the sample. If the sample for a smaller area does not include group quarters, the state-level nonresponse adjustment factors and population controls will disproportionately increase the weights of group quarters in other areas. When the 5-year data are released for small-areas, in many cases the estimates will not reflect local reality. The Census Bureau should:

- Conduct an evaluation to better understand the quality of the estimates affected by group quarters and the effects of the population controls on these estimates.
- Evaluate alternative approaches for producing estimates for areas in which the quality of the direct estimates is in question.
- Clearly label data tables and other data products that may be affected by the presence of group quarters in a geographic area.

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Introduction

In the early 1990s, the Census Bureau proposed a program of continuous measurement as a possible alternative to the gathering of detailed social, economic, and housing data from a sample of the U.S. population as part of the decennial census. Pilot testing of the new survey began a few years later, and a major expansion of the survey's sample was undertaken as a formal experiment in the 2000 census. The replacement of the "long-form sample" with the new, ongoing survey—and the consequent casting of the 2010 decennial census as "short form only"—became a key part of the Census Bureau's strategy for the 2010 census. The full-fledged American Community Survey (ACS) became a reality in 2005 with full-scale, nationwide implementation at the household level.

The design of the ACS relies on monthly samples that cumulate to approximately 10 million completed interviews over each 5-year rolling interval. The data products are period—as opposed to "point"—estimates based on averaging 1, 3, or 5 years of data. Beginning in 2006, the Census Bureau has published annual 1-year estimates of characteristics of the U.S. population and housing units for all geographic entities with populations of at least 65,000. Since 2008, 3-year estimates for geographic entities with populations of at least 20,000 have been also been reported. The end of 2010 will mark a crucial milestone for the ACS. In December 2010, the first set of estimates based on 5 years of continuous data collection will be published for all statistical, legal, and administrative entities, including areas as small as census block groups.

PANEL CHARGE[1]

When the ACS entered full-scale production in 2005, it did so only for the household population. ACS coverage of what the census refers to as group quarters (GQ)—places such as college dormitories, nursing facilities, in-patient hospice facilities and military barracks—began one year later, in 2006, primarily to more closely replicate the design of the census long-form sample.

Box 1-1 provides the definition of group quarters used by the Census Bureau for purposes of the ACS and lists the major group quarter types included in the survey.

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[1] For the exact wording of the panel's charge, see Appendix A.

BOX 1-1
Group Quarters Definition and Major Types

Definition
A group quarters is a place where people live or stay, in a group living arrangement, that is owned or managed by an entity or organization providing housing and/or services for the residents. This is not a typical household-type living arrangement. These services may include custodial or medical care as well as other types of assistance, and residency is commonly restricted to those receiving these services. People living in group quarters are usually not related to each other. Group quarters include such places as college residence halls, residential treatment centers, skilled nursing facilities, group homes, military barracks, correctional facilities, and workers' dormitories.

Types
(1) Correctional facilities for adults;
(2) Juvenile facilities (including both correctional and noncorrectional facilities);
(3) Nursing facilities and skilled nursing facilities;
(4) Other health care facilities (including inpatient hospice facilities and psychiatric hospitals and units);
(5) College or university student housing (including dormitories and fraternity/sorority housing recognized by the university);
(6) Military group quarters (barracks, dormitories, and military ships); and
(7) Other noninstitutional facilities (including emergency and transitional shelters, group homes intended for adults, residential treatment centers for adults, religious group quarters, and workers' group living quarters).

SOURCE: U.S. Census Bureau (2008a).

In 2007, data products based on the ACS began to phase in sample-based estimates of the characteristics of the total (household and GQ) population. The 2010 release of 5-year period estimates will be based on one year of data (2005) that exclude a GQ sample and four years of data (2006-2009) that include GQ samples. Beginning in late 2011, all ACS data products will be based on samples of both households and group quarters.

The 5-year period estimates released in late 2010 from the ACS will furnish population characteristics for the same statistical, legal, and administrative entities as the 2000 census long-form sample. This includes entities as small as census block groups. Although ACS data products are expected to evolve based on data needs and feedback from researchers, the products that will be a part of this first 5-year release will be similar to existing ACS products. Selected data tables will report a breakdown of the total population into those living in households (often accompanied by additional characteristics) and those living in group quarters (with no additional detail).

In some small geographic areas, GQ residents represent a large proportion of the total population, whereas in other areas their number is relatively small or zero. The

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accurate counting of the GQ population in the decennial census has been an ongoing concern (National Research Council, 2004), and the measurement of this small (relative to the whole population) but diverse component of the population poses new challenges for the ACS.

In early 2010, the Census Bureau asked the Committee on National Statistics of the National Academies to convene a panel to examine and comment on the Bureau's statistical methods for measuring the GQ population in the ACS. The panel was asked to recommend alternatives that can make the data more useful for small-area data users, particularly users of ACS 5-year period estimates for small governmental entities, considering operational feasibility and compatibility with the treatment of the household population in the ACS.

This interim report makes recommendations addressing near-term improvements in the sample design, weighting, and estimation of the GQ population. At the end of the 24-month study, the panel will issue a final report with conclusions and recommendations for longer term improvements in light of data user needs.

BACKGROUND

The replacement of the census long-form sample with the ACS promises data users major benefits as well as new challenges. In terms of benefits, the critical advantage of the ongoing, continuous ACS is the timeliness of the estimates and the increased frequency of data releases. The continuous measurement also has some advantages in terms of data quality. Whereas the decennial census relies heavily on a vast temporary workforce that must be hired, trained, and deployed quickly, the continuous nature of the ACS can accommodate a staff of well-trained, permanent field representatives. This, in turn, may contribute to reducing various kinds of nonsampling error, including item nonresponse rates compared with data from the 2000 census long-form sample.

However, the ACS has some offsetting disadvantages, such as higher sampling errors associated with the estimates—a consequence of the smaller overall sample size (compared with the 2000 census long-form sample), even cumulating over 5 years, and the strategy of sampling for nonresponse in the follow-up stages of ACS data collection. In addition, the control totals used to reduce variation in the ACS estimates are based on postcensal population estimates, instead of the census itself, which means that the errors associated with the population estimates will also affect the ACS estimates.

The decision to include group quarters in the ACS presents some new challenges and data quality implications. One of these challenges stems directly from the survey design. Currently, a stratified sample of group quarters is selected for each state, without controlling for the allocation of GQ populations at substate levels of geography, such as counties, municipalities, tracts, and block groups (unlike the 2000 census long-form sample, which was generally controlled to census counts at subcounty levels of geography). Consequently, the measurement and estimation approaches developed for the GQ population are designed to be optimal only for estimates at the state level and higher levels of geography—yet the household sample is suitable for producing estimates of characteristics of people residing in households for substate geographies.

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Another challenge posed by the inclusion of group quarters in the ACS is "sampling zeroes"—counties and smaller geographic areas that have no group quarters represented in the sample, even after a 5-year period of data collection, despite the presence of GQ populations in those areas (including in the most recent decennial census counts for those areas). This adversely affects the estimates of characteristics for the total population, as well as the usefulness of the data about the GQ population itself, and it can elevate estimated standard errors for characteristics of the total population. The timing of the first 5-year data release for small areas—followed in a few months by the release of 2010 census counts—will make this especially awkward when the census counts reveal a nonzero GQ population for these same areas.

Other challenges include the complexities and costs associated with maintaining an accurate and up-to-date inventory of GQ facilities, independent of the inventory of household addresses. This is especially difficult in the case of smaller group quarters, which appear and disappear faster than larger facilities, and group quarters in structures that may have been recently converted from housing units. This affects the efficiency of the GQ sampling frame, as well as the GQ estimates produced by the Census Bureau's Population Estimates Program (PEP), which are used as controls in the ACS.

An important aspect of the panel's charge that is not fully explored in this report—but will be a major focus of the final report—is the importance of the ACS GQ estimates for the wide community of ACS data users. A key question is whether there is a demonstrated need for GQ data in the ACS and an evaluation of the benefits of such data relative to the costs of collecting them. At present, the principal justification for including a sample of the GQ population as part of the ACS appears to be based primarily on the original vision for the ACS to serve as a replacement for the census long-form sample. The long-form sample included both institutional and noninstitutional group quarters, and GQ facilities are currently included in the ACS, at least in part, to remain faithful to that goal.

The lack of clarity regarding the need for direct estimates of the GQ population in the ACS complicates a cost-benefit analysis of this data collection effort. At this stage in the evaluation, suffice it to say that due, in part, to the complex nature of the data collection procedures applicable to group quarters (see Box 1-2), the costs associated with the GQ data are higher than those of the household data. A cost of approximately $89 per interview among the GQ population contrasts with a per-person cost of roughly $13 among the household population (a factor of almost seven); overall the GQ data collection represents around 7 percent of the ACS budget request for fiscal year 2011.

As part of its work, the panel will assist the Census Bureau by assessing data user needs and ultimately will make recommendations regarding ACS methodology in light of these needs. Issues such as whether the ACS is a suitable vehicle for the measurement of the GQ population, the data collection costs, and the importance of the data to users will be examined in the panel's final report.

BOX 1-2
Group Quarters Data Collection Steps

Facility-Level Phase

The Census Bureau's National Processing Center (NPC) mails an advance letter and brochure about the ACS to each sampled GQ facility prior to the beginning of the field work. Field representatives (FRs) contact sampled group quarters by phone to schedule an appointment for visiting the facility, and the Regional Office assists the FRs, as needed, in gaining cooperation. During the visit to sampled facilities, FRs administer the computer-assisted Group Quarters Facility Questionnaire (GQFQ) to a contact. The facility type, population size, and the sample of individuals to be interviewed are determined during this process.

Person-Level Phase

Person-level interviews can be completed by:
- −In-person interview (Computer-Assisted Personal Interview) with the sample person (the method preferred by the Census Bureau)
- −In-person proxy interview with the GQ contact, relative, or guardian of the sample person
- −Telephone interview with the sample person
- −Leaving the questionnaire with the sample person (the FR must return to collect the completed questionnaire)
- −Leaving the questionnaire with the GQ contact, who agrees to give it to the sample person (the FR must return to collect the completed questionnaire)

If a GQ contact is involved in distributing the questionnaires or providing responses, he or she must take an oath of nondisclosure, under Title 13 of the United State Code.

Special Procedures

In remote Alaska, the GQ data collection is conducted twice a year, from January through mid-April and from September through mid-January.

Correctional and military facilities selected into the sample multiple times are visited only once, during a randomly selected month.

Data collection in federal prisons is completed during a 4-month period, from September through December. The Bureau of Prisons provides a list of inmates to the Census Bureau and conducts security clearances of FRs who will be visiting these facilities.

SOURCE: U.S. Census Bureau (2009).

OVERVIEW OF THE INTERIM REPORT

This report makes recommendations that address some immediate needs in light of the data release schedule, which calls for the publication of the first set of 5-year period estimates before the end of 2010, and publication of updated estimates every year thereafter. While the panel's initial deliberations and recommendations cannot affect the estimates in this first release of 5-year data, the intent is to use an evaluation of the initial release to potentially improve the ACS estimates planned for release in late 2011. Specifically, this report focuses on statistical methodology and proposes short-term revisions as well as research needed to inform longer term methodological decisions. Chapter 2 discusses the ACS sampling frame development and scope of coverage for the GQ component of the sample. Chapter 3 focuses on sample selection and allocation, and Chapter 4 discusses weighting and estimation procedures. The final chapter outlines the panel's plans for the remainder of the study and proposed areas of inquiry for the final report.

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Sampling Frame Development and Maintenance

The sampling frame for the American Community Survey (ACS) is based on the Master Address File (MAF), which is a database maintained by the Census Bureau and used to conduct the decennial census and supports some of its major survey programs. The MAF is an inventory of known housing units, group quarters, and selected nonresidential units in the United States. MAF records contain mailing address, location information, and additional attributes of each residence.

The Census Bureau developed the MAF in preparation for the 2000 census with the intent of keeping it updated as a continuous resource; previous censuses built their address lists anew each decade. During the past decade, the primary sources of MAF updates have been regular "refreshes" from the U.S. Postal Service Delivery Sequence File (DSF): which, as the name implies, is the Postal Service's inventory of mail delivery points. Some updates have also been generated by clerical operations, such as the Master Address File Geocoding Office Resolutions, and by field observations, whether through the Community Address Updating System in primarily rural areas or through feedback from ACS nonresponse follow-up attempts.

Most of the procedures developed to maintain the MAF are focused on keeping the inventory of housing units current. The strategy for updating the inventory of group quarters (GQ) facilities is less comprehensive, and the sources used for updates related to them are less adequate.

To develop a GQ sampling frame for the ACS, the ACS office begins with MAF extracts, including an inventory of group quarters from the most recent census and a list of group quarters closed on Census Day to be checked again during the ACS fieldwork. Information from these files is then supplemented with a list of federal prisons and detention centers obtained from the Federal Bureau of Prisons. The Census Bureau also uses its own Internet queries to update a variety of group quarters, such as state prisons and migrant worker camps. As feasible, the Census Bureau also relies on military liaisons to update the list of military GQ facilities.

Information about the group quarters selected into the sample is further updated with data obtained from field representatives, who complete a Group Quarters Facility Questionnaire during their initial visit to a facility. Problems encountered during field visits are researched by headquarters staff, and this research often provides new information about the status or location of a facility. The updates resulting from the fieldwork are used to update the ACS GQ universe for the following year's sample.

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OPPORTUNITIES FOR INCREASED COLLABORATION
TO IMPROVE THE GQ INVENTORY

Despite the efforts described, the various updating operations are not as efficient at maintaining the GQ sampling frame as are the procedures for maintaining the household frame. A major inefficiency in the Census Bureau's address update operations is that there is only limited collaboration among the divisions to integrate address updates and corrections resulting from work related to individual programs.

The Census Bureau has been working on securing a budget and establishing procedures that will allow for more thorough updating of the MAF and the closely associated Topologically Integrated Geographic Encoding and Referencing (TIGER) digital mapping system. This is also the right time to consider a more integrated, agency-wide approach toward the MAF as a complete inventory of living quarters, both "traditional" housing units and group quarters.

Some units in the Census Bureau have long-standing partnerships with states and localities and rely on these for local information. However, these partnerships are often established on the basis of the needs of a specific program, without maximizing coordination with other Census Bureau units that may have similar needs. For example, the Federal-State Cooperative for Population Estimates program involves states in assisting the Census Bureau's Population Estimates Program (PEP) to produce subnational population estimates. The State Data Center program is another partnership between the Census Bureau and the states, which facilitates the dissemination of data and other assistance to meet local needs. Many state partners supply information related to group quarters in a variety of nonuniform formats, and they could possibly be doing more to assist the ACS program needs if efforts were better coordinated across the different Census Bureau units.

> **Recommendation 2-1:** The Census Bureau should establish a mechanism for ensuring that information useful for the updating of living quarters, especially GQ living quarters, from existing state and local partnerships is more efficiently shared among different Census Bureau divisions and programs. This effort should begin with a review of possibilities for information sharing to improve the quality of the Master Address File, followed by the development of an operational plan for improved information flow and cross-unit sharing.

Working more closely with a large number of states and localities will present challenges. Establishing formal agreements with the approximately 39,000 functioning local governments, or even a subset of them, would be a major undertaking. Data availability varies greatly across local sources, and processing and standardizing these data may involve substantial resources. Perhaps a more practical alternative to consider would be heavier reliance on state demographic offices that maintain their own inventory of group quarters, some using them to generate their own estimates for state and local geographic areas. These offices could supply lists of facilities or estimates of the GQ populations as part of a formal program. These types of agreements may be particularly

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useful in large urban areas, where there are more GQ facilities with complex living arrangements (Goldenkoff, 2010).

> **Recommendation 2-2:** The various units in the Census Bureau should collaborate to undertake an investigation of opportunities that may exist to obtain more detailed records or state-generated estimates of group quarters from state demographic offices and other state and local partners.

Given that many group quarters operate as licensed establishments, the inventory of them could be improved by collaboration with the Census Bureau's economic statistics directorate and using the North American Industry Classification System, which classifies business establishments. The panel is aware that an effort to explore these opportunities is currently under way.

> **Recommendation 2-3:** The ACS office should continue to collaborate with the Census Bureau's economic programs to explore the possibility of using business registries for additional information regarding GQ facilities.

ACS efforts to collect detailed information from GQ populations are not unique in the federal statistical system. For example, the Current Population Survey includes residents of noninstitutional group quarters in the sample (even though uses different residence rules).Targeted surveys of specific GQ types exist as well. For example, the National Center for Health Statistics conducts a national survey of nursing home residents and is launching a new survey of residential care facilities. The Bureau of Justice Statistics regularly conducts administrative censuses of correctional facilities of various types and administers surveys to their occupants, and the Office of Juvenile Justice and Delinquency Prevention does the same for juvenile facilities. The National Center for Education Statistics collects data from students, including residents of college dorms.

The data collected by these agencies, and possibly others, may be useful to complement the Census Bureau's efforts to maintain and update the sampling frames for certain types of group quarters, especially given that the Census Bureau often serves as the data collection contractor for other agencies sponsoring studies of these populations. Closer collaboration with the Census Bureau would also be beneficial to other agencies that have to invest significant resources in maintaining the sampling frames for their surveys.

> **Recommendation 2-4:** The Census Bureau should continue to explore opportunities for partnering with other federal statistical agencies that collect data from GQ populations and identify opportunities that could lead to a more efficient updating of the GQ inventory.

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INTEGRATING UPDATES FROM FIELD REPRESENTATIVES

The processes currently in place for updating the GQ inventory are more likely to identify and remove out-of-business or out-of-scope records from the sampling frame than to locate and add new records, creating the impression that the GQ population is shrinking. Some of the additions are found to be ineligible after they are added to the sampling frame, and sometimes the reason is that the address is in fact a housing unit.

Anecdotal evidence suggests that it is not unusual for housing units to be converted to certain types of group quarters, such as group homes for adults, and then back to housing units over relatively short periods of time. Complex housing arrangements in some urban areas can include apartment buildings of conventional housing mixed with small group quarters—for example, for populations with special needs.

By the end of 2010, the ACS computer-assisted personal interview (CAPI) instrument used for interviewing households will have new functionality to allow field representatives who are assigned to interview housing units to also collect basic information (such as address, contact information, GQ type, and maximum occupancy) about group quarters that have been identified in the housing unit sample. This will greatly increase the efficiency of updating operations and should also reduce costs. Enabling field representatives to collect information about a housing unit that was included in the GQ sample has also been considered.

> **Recommendation 2-5:** The Census Bureau should identify ways to improve and expand procedures for integrating updates received from field representatives into the GQ frame. An operations plan needs to be constructed that permits the transfer of information from field workers in the regional offices to the geography division at headquarters, so that new GQ facilities can be added to the address list and changes in status of existing addresses can be reported—for example, by removing facilities that no longer exist and adding newly converted facilities. The Census Bureau should also continue to pursue the development of procedures that will allow for more efficient updating of the household sample with cases that have been converted from group quarters to housing units.

SCOPE OF COVERAGE

Due to difficulties described above associated with maintaining the sampling frame, the GQ sample contains a relatively high percentage of ineligible cases as identified during the facility-level data collection phase. This includes cases that are determined to be housing units instead of group quarters and group quarters that no longer exist—for example, because the facility has been closed.

The ACS also classifies some GQ types as permanently out of scope and excludes them from the sampling universe because of operational limitations, privacy concerns, and legal requirements, which are different for a continuous survey than for the census. The excluded GQ types are domestic violence shelters, soup kitchens, regularly scheduled mobile food vans, targeted nonsheltered outdoor locations, crews of commercial maritime vessels, and natural dangerous encampments.

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An additional challenge is introduced by a combination of the data collection methodology and the seasonal nature of some group quarters. Examples are college dormitories or military facilities, which may have no residents during some of the data collection months when they are included in the sample. As discussed later, sampled GQ facilities are randomly assigned an interview month throughout the course of the year, and the same facility may be in the sample during more than one month.

Table 2-1 summarizes the distribution of the main GQ-level outcome codes for those included in the 2008 ACS sample based on an internal evaluation of the sampling frame conducted by the Census Bureau (Williams, 2010). A facility case is considered completed at the GQ level if a field representative collects basic information and a resident roster from the facility. Once the names of the residents are collected, the actual respondents can be sampled and approached for an interview.

TABLE 2-1 Distribution of GQ-Level Outcomes for Facilities Sampled in 2008

GQ-Level Outcomes	Number in Sample	Percentage (unweighted)
Completed	13,610	76.4
Refusals, unable to locate, and other nonresponse	33	0.1
Eligible but unoccupied at the time of survey	1,694	9.5
Ineligible:	2,482	13.9
No longer exists	928	5.2
Converted to housing unit	1,049	5.9
Domestic violence shelter	17	0.1
Out of scope	488	2.7

SOURCE: Williams (2010).

While inability to locate a sampled facility or refusal to participate do not seem to represent serious problems for the ACS GQ sample, eligible facilities that are unoccupied at the time of the survey and ineligible cases make up close to one-quarter of the sample. Tables 2-2 and 2-3, also based on the Census Bureau's internal research, show that the rates of cases that fall into one of these two categories differ considerably by GQ type and size. The Census Bureau stratifies facilities by size: the "small" stratum includes group quarters with 15 or fewer residents, as shown on the frame, and the "large" stratum includes those with more than 15 residents.

Table 2-2 shows that the GQ types with the highest rates of noninterviews because the facility is unoccupied at the time of the survey are college housing, military facilities, "other health care facilities," homeless shelters, and "other noninstitutional facilities." In the case of college dorms, one out of four of the large dorms sampled is not interviewed because the facility is unoccupied at the time of the survey. Table 2-3 illustrates that the sample includes many ineligible cases as well, especially among small group quarters. For example, approximately half of the small military facilities, homeless shelters, and nursing homes are found to be ineligible.

The relatively high rates of ineligible and eligible but unoccupied cases raise concerns about overcoverage, in addition to the previously discussed undercoverage issues related to deficiencies in updating the GQ inventory. The ACS sample estimates

are controlled to population estimates obtained from the PEP program. However, as discussed in Chapter 4, these population estimates have their own limitations and are unlikely to be able to compensate for all of the problems discussed above.

The significant effort spent in the field pursuing GQ facilities that cannot lead to interviews warrants a closer look from a cost-benefit perspective. There may exist procedures that could be put into place to improve the frame before sampling, or at least before cases are assigned to field representatives. This should be evaluated in the context of the relative costs of the additional research that will have to be conducted in-house compared with the costs associated with closing out the cases in the field. It is also important to consider how the two methods compare in terms of the quality of the information available to make a determination about a facility's status—in other words, whether one method or the other is less prone to error.

In some cases there is a significant lag between the time when updates to the MAF are received and the time the sample is generated. To reduce the percentages of group quarters that no longer exist or have been converted to housing units in the sample, this lag time should be examined to identify possible opportunities for increased efficiency.

Another GQ facility type with relatively high rates of no residents is military facilities. When address updates are received by the Census Bureau, the challenge often becomes matching information from the different sources and identifying potential duplicates. More information about the quality of the updates received from such sources as the Department of Defense and the Defense Manpower Data Center (DMDC) is needed to assess whether replacing outdated lists of military facilities with updates from these sources, without spending additional resources on matching and reconciliation, may be justified.

TABLE 2-2 Distribution of Eligible But Unoccupied Rates by GQ Size for Facilities Sampled in 2008

GQ Type	Number in Sample	Percentage of Sample	Number of Sample Cases		Percentage of Cases Unoccupied But Eligible	
			Large (>15)	Small (≤15)	Large (>15)	Small (≤15)
Correctional facilities for adults	3,482	19.4	3,373	109	1.1	5.5
Juvenile facilities	330	1.8	241	89	7.5	6.7
Nursing facilities/skilled nursing facilities	4,256	23.8	4,075	181	0.5	1.7
Other institutional facilities	474	2.6	348	126	9.5	22.2
College/university student housing	4,872	27.2	4,672	200	25.2	17.0
Military group quarters	790	4.4	697	93	16.9	15.1
Emergency and transitional shelters	557	3.1	390	167	4.1	13.8
Group homes intended for adults	2,279	12.7	955	1,324	1.9	2.6
Other noninstitutional facilities	872	4.9	356	516	14.3	11.8
Total	17,912	100	15,107	2,805	9.8	7.5

SOURCE: Based on tabulations provided by the Census Bureau, August 11, 2010.

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TABLE 2-3 Distribution of Ineligible Rates by GQ Size for Facilities Sampled in 2008

GQ Type	Number in Sample	Percentage of Sample	Number of Sample Cases		Percentage of Cases Ineligible	
			Large (>15)	Small (≤15)	Large (>15)	Small (≤15)
Correctional facilities for adults	3,482	19.4	3,373	109	2.8	13.8
Juvenile facilities	330	1.8	241	89	14.5	22.5
Nursing facilities/skilled nursing facilities	4,256	23.8	4,075	181	10.3	48.6
Other institutional facilities	474	2.6	348	126	20.1	28.6
College/university student housing	4,872	27.2	4,672	200	5.1	30.5
Military group quarters	790	4.4	697	93	16.5	55.9
Emergency and transitional shelters	557	3.1	390	167	28.2	52.1
Group homes intended for adults	2,279	12.7	955	1,324	34.3	35.3
Other noninstitutional facilities	872	4.9	356	516	20.5	39.1
Total	17,912	100	15,107	2,805	8.3	36.6

SOURCE: Based on tabulations provided by the Census Bureau, August 11, 2010.

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SAMPLE REDESIGN OPTIONS

An overall question to consider is whether the sampling design—which relies on two separate samples, one for housing units and one for group quarters—is efficient in the case of every GQ type. In addition to the issue of duplication between the two frames, some of the living quarters move back and forth between them. For example, as mentioned earlier, some group quarters are converted to housing units, then back to group quarters, in the course of relatively short periods of time. Currently, if a group quarter is converted to a housing unit or if a housing unit turns out to be group quarter, the case is closed out and an interview is not completed. Greater field efficiencies might be derived with alternative procedures.

Small group quarters are disproportionately more likely to be converted to housing units by the time a field representative visits the premises than larger facilities, and some GQ types, such as homeless shelters and juvenile detention centers, are also more susceptible to this type of change (Williams, 2010). The Census Bureau should evaluate whether redesigning the sample based on either GQ size or type would improve the efficiency of the data collection. As discussed in Chapter 3, small and large group quarters are not sampled the same way, which raises the question of whether it would also be worthwhile to continue research on whether a cutpoint other than 15 or fewer for the expected number of residents would be more efficient for defining "small" facilities. A model relating an indicator of being in scope to the measure of size may be helpful in this regard.

Possibilities for redesigning the sample would include dropping small group quarters (or certain types of them) from the GQ sample or adjusting the data collection procedures to make it possible to interview residents of these facilities as part of the household data collection. In the latter case, for these living quarters, a determination about whether they are a household or a GQ facility would be made only during the interview rather than in advance. Naturally, this approach is more appropriate for the noninstitutional group quarters, and field representatives would not encounter some types at all while working a primarily household sample. For example, they would be unlikely to come across a large correctional facility. Integrating these two data collection efforts would be a substantial undertaking, and the subsampling procedures would have to be applied on the fly while the facility interviews are in progress. Nevertheless, there could be cost savings if the process involving these cases could be simplified. The Census Bureau could retain the goal of covering virtually the entire U.S. population without having to maintain a sampling frame for some of the difficult-to-cover sizes of group quarters. It is also possible that this approach would improve the household coverage rate.

An alternative option would be to drop certain types of group quarters (e.g., homeless shelters) from direct sampling instead of dropping group quarters of a certain size. Given that changes in GQ size are likely to be more frequent than type changes, this design may be more practical. GQ types that are especially likely to be found ineligible after a field visit or that may be characterized by seasonality—such as group homes intended for adults and other noninstitutional group quarters—may also turn out to be most likely to be picked up in the household sample if the procedures could accommodate these types of cross-sample interviews (U.S. Census Bureau, 2009).

In summary, the two redesign options discussed above are:

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1. Pick up some segments of the GQ universe only through the household sample. The segments could be defined by size or type. These segments would be represented in estimates of the total population, but the samples would probably be too small to produce reliable results for the group quarters population separately.
2. Completely exclude some GQ segments from the ACS universe.

Both of these options have the advantage of eliminating the need to maintain a sampling frame for certain segments of the universe. The first option would require that field representatives be able to conduct a household or GQ interview, depending on what is found in the field, or that a field representative refer a facility to the central office for interviewing at a later time.

These changes would have to be carefully considered in the context of data user needs, especially if the GQ estimates are important for calculating total population estimates. However, as discussed, a small number of GQ types are already excluded from the ACS data collection for a variety of reasons, and ACS estimates are controlled to be consistent with the PEP estimates for all group quarters (U.S. Census Bureau, 2009). Excluding more facilities would surely raise new concerns, but it is important to evaluate whether some are contributing disproportionately more to the cost of the data collection than the use of the data justifies. As discussed above, other sources that could provide population counts of the residents of certain types of group quarters should also be considered when evaluating this issue.

Recommendation 2-6: The Census Bureau should conduct a general evaluation of the reasons for the relatively high rates of ineligible and eligible but unoccupied group quarter facilities in the ACS sample and determine whether there are practical ways to reduce these rates for all or some group quarters.

Recommendation 2-7: The evaluation should take into consideration the costs associated with determining that a facility is ineligible or unoccupied and how these costs would change if some of the work were performed before a case is sent to the field.

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Sample Allocation and Selection

The goal of the American Community Survey (ACS) is to provide estimates of detailed characteristics of the total population of the United States at levels of geography as small as census block groups, replacing data that were previously obtained through the census long form. The current ACS sample design is optimized to produce substate-level estimates of characteristics of the household population. However, for the group quarters (GQ) population, the design accommodates only state-level estimates of the overall GQ population. The sample design is not adequate for substate GQ estimates, and this also affects the usability of the total population estimates for smaller geographic areas.

The GQ sample consists of two strata, small and large. As discussed in Chapter 2, the small stratum includes facilities with 15 or fewer residents, as shown on the frame, and ones for which the expected number of residents is unknown because the facility was closed on Census Day or because it was recently added to the sampling frame without information about the expected population count. The large stratum includes group quarters with expected populations of more than 15 residents.

The approach to sampling the small stratum is similar to the household sampling method (U.S. Census Bureau 2009). First, each small facility is randomly assigned to a subframe associated with one of five data collection years. The facilities in a state are then sorted by small versus closed on Census Day, GQ type, and geographical order (county, tract, block, street name, and GQ identifier), and a systematic sample is selected. In most states, the systematic sample selects 1 in 8 group quarters, resulting in an overall facility sampling rate of 1 in 40, or 2.5 percent in a given year. Some of the less populated states have higher target sampling rates to boost the precision of the estimates. For example, the target sampling rate is 7.11 percent for Wyoming and 4.95 percent for Vermont. All residents of the selected small facilities are eligible to be interviewed, except if the actual number of residents exceeds 15. In such instances, a subsample of 10 residents is selected when the field representative visits the facility (a process similar to that for the large facilities).

The sampling units for the large facilities are the GQ residents, who are selected in groups of 10. This means that a GQ facility is indirectly sampled with probability proportional to its number of anticipated groups of 10 residents. Larger facilities can have several groups of 10 represented in the sample. Specifically, large GQ groups are sorted by GQ type and geographical order and the groups are then systematically sampled at a 1 in 40 rate (again, with some exceptions). This means that only group quarters with 40 or more groups of 10 are guaranteed to have at least 1 group represented in a particular sample. As described above, the list of residents eligible to be interviewed is determined during the field representative's visit to the facility. During the visit, an algorithm with a random start is applied to the actual roster of residents. If

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multiple groups of 10 are selected, the groups are assigned to be interviewed during different months (with some exceptions, which are discussed in subsequent sections).

When the ACS sample design was first developed, the sampling rate was 3 percent of addresses annually, translating into 15 percent over 5 years. Due to budget constraints, the current annual sampling rate is around 2.2 percent, resulting in decreased reliability of the estimates. For fiscal year 2011, the Census Bureau has requested a budget increase that would allow for an increase in the sampling rate. However, because the primary concern is the reliability of the household estimates, a possibly increased budget is not expected to address challenges related to the reliability of the GQ estimates. This means that a careful look at the sample design is warranted to identify possible opportunities for increased efficiency.

STATE-LEVEL ALLOCATION

As discussed above, the sample of small group quarters in a state is proportional to the number of small group quarters on the frame for that state. The sample of large group quarters is proportional to the expected number of residents in large group quarters in the state.

Because the GQ sample is not currently controlled at substate geographies, substate estimates may be highly variable, a problem that is discussed in more detail in the next section. To address this, the sampling design could be modified to exercise more control over the allocation rates at the substate level and over time. For 3-year and 5-year estimates, the sample could be required to have a minimum number of group quarters in each county over the course of the 5-year period.

Another approach would be to individualize the sample further, depending on the characteristics of small jurisdictions. For example, the lack of control over the allocation rates for smaller geographies may have a large effect on the estimates produced for a community that has 1,000 households and a correctional facility with 100 residents. According to counts from the 2000 census, places that have 10 percent or more of their population residing in group quarters represent less than 5 percent of all places in the United States. These may be the cases that would need individualized attention.

Additional control over the allocation to substate areas may be facilitated by switching from a probability proportional to size (pps) design for large group quarters to one in which strata are created on the basis of size and substate area and an equal probability sample selected within strata. This would permit the allocation to substate areas to be better controlled over time. This type of design would also simplify variance estimation, which appears to be a problem with the current design (Keathley, Navarro, and Asiala, 2010). To determine whether any efficiency would be lost by such a design, the Census Bureau could undertake a study of the effectiveness of the current pps methods. The expected population numbers in the frame are often incorrect, which reduces the efficiency of pps sampling. Consequently, the loss in precision from moving from pps to stratified, equal probability sampling may not be serious.

> **Recommendation 3-1:** The Census Bureau should investigate the implications of controlling the ACS group quarters sample allocation at the substate level and over time to better understand how these changes would impact the precision of the estimates and the costs of the data collection at the state and substate levels.

Recommendation 3-2: The accuracy of the measures of size used in the probability proportional to size ACS group quarters sample design should be studied. If the measures of size are seriously out of date, methods should be considered for updating the frame, as suggested in Recommendations 2-1 through 2-4.

SUBSAMPLING WITHIN GQ FACILITIES

The residents of large group quarters are subsampled in groups of 10, and some group quarters can have multiple groups of 10 in the sample. Given that group quarters provide housing and services to people with similar needs and circumstances, the intraclass correlations within group quarters are naturally high for many variables. Thus, while cost-effective, subsampling a large number of residents in a facility may be statistically inefficient. Reducing the number of persons subsampled in a facility and increasing the number of sample group quarters could improve the reliability of the estimates. This would also mean increased field costs if the number of sampled group quarters has to be increased to achieve the same level of precision of estimates. However, it is also possible that the subsample sizes could be reduced without a substantial loss in precision. If so, there may be no need to increase the number of sampled group quarters. The balance between cost and variance would have to be evaluated to determine the optimal subsample size.

A recent Census Bureau project calculated the optimal subsample size to be around four after averaging the results of calculations based on two different sets of assumptions about travel costs (Sommers and Hefter, 2010). The question can be approached in a variety of ways, particularly in terms of calculating cost savings. This is one reason why pursuing this research further is important. Future research could also take into consideration possible differences among the intraclass correlations that characterize different GQ types, given that the correlations are presumably not equally high among all of them.

Recommendation 3-3: Research on the optimal cluster size for subsampling residents in large group quarters should continue, estimating intraclass correlations for different variables and factoring in facility-level and person-level costs using a variety of approaches. The analysis should address whether the same subsample size is efficient for each GQ type and whether the size of the subsample per facility should be reduced.

4

Weighting and Estimation

As is the case with the sample design, the current weighting and estimation procedures are not optimized for small-area estimates. Coverage adjustment for the group quarters (GQ) population is applied at the state level by GQ type categories. On the basis of the current estimation procedures, only the total population (households and group quarters) is controlled at the county level. While some small geographic areas with GQ populations do not have group quarters represented in the sample, the state-level adjustments disproportionately increase the weights of group quarters in other areas. For some small-area data users, the 5-year estimates may not reflect local reality.

While the 1-year and 3-year data from the American Community Survey (ACS) releases have been subject to dissemination restrictions based on the reliability of the estimates, the Census Bureau has decided not to restrict in this fashion the release of the 5-year estimates, primarily because such restrictions would preclude the use of census tract and block group data for the purpose of aggregation to larger user-defined geographic areas. Block group data will not be available through the American FactFinder interactive application on the Census Bureau's website, instead being accessible only through the download center targeted at more advanced users. As with all ACS data, the estimates will be accompanied by margins of error.

WEIGHTING PROCEDURES

To produce the GQ estimates, the data are weighted in three steps. The first step applies a trimmed base weight that reflects the initial sampling probability and the within-GQ subsampling probability. The second step is a noninterview adjustment across group quarters, defined within state, by county and by major GQ type group. If the sample is small or if the adjustment is large, the cells are collapsed to state by major GQ type group. The third step applies a coverage adjustment, controlling the GQ data at the state level by major GQ type group, using the GQ population estimates from the Population Estimates Program (PEP).

PEP CONTROLS AND ALTERNATIVES

To estimate subcounty GQ populations, the Census Bureau starts with GQ population counts by facility type for each subcounty area from the previous decennial census and updates them with a time series of individual GQ records from the group quarters report (GQR). The GQR is an annual count of group quarters populations prepared by Federal-State Cooperative for Population Estimates program units (Census Bureau, 2008b). A time series of the GQ population is derived in two steps. First, facility-level GQ populations from the GQR are summed to the

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subcounty level by facility type for each estimate date in the time series. Second, a year-to-year change is calculated by the aggregated GQR time series of population. For some GQ types, the population estimates may be out of date, since they are basically the decennial census counts kept constant.

As the decade progresses, the census counts become increasingly outdated, and the updates, such as the GQRs collected from the states, cannot always be counted on, which affects the quality of the population estimates. Following the release of counts from the decennial census, the Census Bureau typically conducts a formal evaluation of errors (bias and precision) in its population estimates for various levels of geography. These tests generally treat the census counts as the gold standard against which the population estimates are evaluated. The Census Bureau recently proposed a project to evaluate the 2010 round of population estimates against the 2010 census counts and awarded eight contracts to external researchers to evaluate alternative population estimation methodologies.

The purpose of this program will be to evaluate the current method by comparing the population estimates of the total resident population and the household population at the national, state, and county levels with the census counts. The plan is to examine the national, state, and county population estimates by selected characteristics (e.g., age, sex, race, Hispanic origin). At the subcounty level the plan will be to evaluate both the subcounty population totals and the housing unit estimates. Population estimates developed using the housing unit method at the national, state, county, and subcounty levels will also be evaluated. The population estimates produced using a housing unit method will be for the total resident population and the household population; they will not include any demographic characteristics data, nor will they provide information about the GQ population.

Despite uncertainty surrounding the quality of the GQ estimates prepared by the PEP, the proposed evaluation research, as planned, will focus only on estimated population (household and GQ populations combined), and household population compared with total 2010 census counts. The Census Bureau plans to consider the GQ estimates separately at a later time, but this could be a missed opportunity to better understand the challenges surrounding the GQ population estimates in relation to the total population estimates and to inform the deliberations about the role of the GQ populations in the ACS. The panel thinks that an evaluation of the GQ estimates should be conducted along with the evaluation of other aspects of the population estimates program.

> **Recommendation 4-1:** The Census Bureau should consider amending its current plan for evaluating the 2010 population estimates against the 2010 census counts to include an evaluation of the 2010 estimates of the GQ population at all levels of geography for which such estimates are prepared. This research should identify estimated bias and imprecision by GQ type. The evaluation of the 2010 population estimates should also be viewed as an opportunity to foster a closer collaboration between the Population Estimates Program and the ACS office to ensure that the estimates meet the needs of all users.

As discussed, currently the population controls for GQ estimates in the ACS products are applied at the state level, and this topic needs to be considered in the context of their effect on the mean square errors as well, given that inaccurate population controls will be more likely to introduce error than to reduce it. While there are arguments for considering county, or even

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subcounty controls, this may be unrealistic, because GQ types are often collapsed due to small sample size or large adjustments. Alternatives would be to control for demographics and drop controls for GQ type or to limit the use of controls to those GQ types for which the population controls are most reliable.

> **Recommendation 4-2:** Depending on the outcome of the evaluation discussed in Recommendation 4-1, the Census Bureau should also evaluate the relative advantages and disadvantages of developing control totals by demographic characteristics, possibly in addition to the control totals by GQ type.

It is likely that the population controls for some GQ types are inadequate, but alternatives exist and should be considered. If the updates received from outside sources about some GQ types are of adequate quality, it may be possible to use these population estimates instead. For example, the Defense Manpower Data Center or Bureau of Prisons records may supply better data than the current approach of updating the census counts for military and correctional facilities. Group quarters also maintain basic administrative records about their residents. If these facility level records include enough information to produce population counts by demographic cross-classification, they could also be used as controls.

> **Recommendation 4-3:** The Census Bureau should evaluate the possibility of using as controls population estimates from some of the outside sources that are currently used to provide updates for the sampling frame (also see Recommendations 2-1 and 2-2).

As discussed in Chapter 2, state and other local resources are underutilized as sources of data. Considering the limitations and costs of the current procedures, it may be worth exploring the possibility of obtaining state-generated estimates of GQ populations, as recommended in Chapter 2.

> **Recommendation 4-4:** Whenever possible, the Census Bureau should work with existing state-level partners to explore the use of state-generated estimates of GQ populations.

ESTIMATES OF THE GQ POPULATION IN SMALL AREAS

The decennial census, because of its role of providing complete counts of the population down to the census block level, mostly succeeds in completely enumerating the GQ population everywhere and is able to support counts by GQ type for all entities in the census geographic hierarchy. In contrast, the state-based sample design of the ACS is not an efficient vehicle for providing small-area estimates of the GQ population.

The ACS substate samples are highly variable, particularly by GQ type, and there are large fluctuations over time in the characteristics associated with residence in group quarters. In some cases, this variation results in counties with known GQ facilities within their administrative boundaries having no group quarters represented in the sample. At lower geographic levels this is a common occurrence, with approximately half of the census tracts that have group quarters according to the sampling frame ending up with none selected in the sample after four years (Asiala, 2010).

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For example, the ACS data for Elmore County, Alabama, seems to suggest that the poverty rate in the county dropped from 14 to 10.4 percent between 2006 and 2007. However, a closer examination of the role of the group quarters in the sample reveals that the apparent change is largely explained by the fact that in 2006 the ACS estimate of the GQ population for the county was 1,976, and 90 percent of the GQ residents were in poverty. In 2007 no group quarters were included in the sample, so the 10.4 percent poverty rate for that year is essentially the household poverty rate, which is not very different from the 11.8 percent household poverty rate in 2006 (Asiala, 2010).

Among the difficulties facing the Census Bureau in this regard is the goal of identifying and reporting, on the basis of a sample survey, a sparse and irregularly distributed GQ population for small geographic units. This is a fundamental tension arising from conflicting goals, and it leads to sample-based estimates that have, for the statistician, very large standard errors and, for the unsophisticated data user, numbers that simply make no sense. By definition, a survey sample will not include all households or all GQ facilities. When the only GQ facility in a small area is not selected for interviews, the sample-based estimate of the GQ population for that small area will be zero.

Acknowledging that the Census Bureau does not want to consider release restrictions for the 5-year estimates, the panel thinks that it is important to ensure that the data published resonates with reality from the perspective of small geographic areas. One statistical solution to consider is the use of some type of small-area estimate. There are a variety of estimators in this class, ranging from simple to complex. Which type would be both feasible and an improvement over the current method is a subject for study. The Census Bureau for many years has employed a variation of this approach as part of its Small Area Income and Poverty Estimates (SAIPE) program. It produces annual small-area income and poverty estimates for school districts, counties, and states using a model-based approach that relies on combining survey data with population estimates and administrative records (National Research Council, 2000). If a small area estimate were used for the total GQ population, for example for a county, an additional dilemma arises. A decision would have to be made about whether acceptable small area estimates could be made for the GQ totals in demographic groups in the small area. If this is not possible, it may be reasonable to simply report a small area estimate for the total GQ population without breakdown by characteristics. Breakdowns by characteristics for that area would refer only to the household population.

An option would be to use a composite of a small-area model estimate and direct estimate. If the geographic entity has group quarters but the sample has none, then the direct estimate would receive a weight of zero. Otherwise, a combination estimate could be used that accounts for the variance of each estimate.

Sources of GQ data that could be used in the model include, but are likely not to be limited to, counts of residents and group quarters for small areas as shown on the frame, the previous census counts of GQ population by small area, data provided by state or local agencies regarding GQ populations, or possibly the PEP subcounty estimates of the GQ population. Another option would be to investigate the use of administrative records maintained by GQ facilities for this purpose, even if these records are found not to be comprehensive enough to replace interviews with residents.

The best estimate to use may depend on how old the latest census counts are at any particular point. The census counts could be used in the years immediately following the

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decennial census, but a few years later the PEP numbers or information obtained from administrative records may be more reliable.

An additional issue to consider is how the unreliability of the GQ sampling frame may affect synthetic small-area estimates. A similar effort, the Local Area Unemployment Statistics (LAUS) program of the Bureau of Labor Statistics, uses state-level estimates from the Current Population Survey (CPS) as input to create model-based state-level estimates. It has found that the direct CPS estimates of unemployment for lower levels of geography are not reliable enough to publish (Pfeffermann and Tiller, 2006).

> **Recommendation 4-5:** The Census Bureau should evaluate methods for producing estimates for counties in which group quarters are known to exist based on the frame but are not included in the sample. The simplest method may be to use the county GQ count from the decennial census. A slightly more complex method would be to use a synthetic estimator, or another straightforward small-area estimator. The evaluation would ideally be completed and changes would be implemented before the 2011 ACS data products are released.

PUBLICATION OF DATA PRODUCTS

Given that small-area estimates based on the 5-year data are expected to be unreliable in some areas in which GQ residents represent a large proportion of the population, it will be important to flag data products that are affected by the presence of group quarters for a particular geography. This should be considered in addition to publishing the margins of error. One approach would be to flag tables applicable to areas in which there are group quarters in the administrative area but not in the sample.

> **Recommendation 4-6:** In addition to continuing to publish margins of error to accompany the estimates, the Census Bureau should also develop a system for flagging estimates that are adversely affected by the presence of group quarters in the area. This procedure should continue until alternative methodologies are developed to reduce the variance in GQ estimates.

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Future Work

This interim report makes recommendations and suggests further research focused on the statistical methods used to produce estimates from the American Community Survey (ACS) that include group quarters residents. During the course of the next year, the panel will continue to examine these topics in the broader context of data user needs and the role and mission of the ACS. The overall question to consider is whether the current and potential uses of the ACS data justify the costs associated with including group quarters (GQs) in the sample and whether data user needs could in fact be better met with alternative approaches to producing the estimates of interest.

The panel will consider the implications of dropping some types of group quarters from the sample, as well as alternatives to the current approach of producing estimates that may be necessary to users. The alternatives include a possible redesign of the data collection approach to combine the household and GQ data collection in a way that potentially increases efficiency and reduces some of the challenges related to maintaining two separate sampling frames. Better integration of the household and GQ address lists into one unified Master Address File may be an important aspect of this. Other possibilities involve the use of alternative sources for the GQ data and statistical techniques, such as small-area model-based estimates to replace unreliable direct estimates. The panel will also continue to examine the sampling approach, including the sample allocation and subsampling rates.

The discussion so far has focused on the problem of coverage error. Another area of interest is the quality and usability of the data obtained from group quarters when an interview is completed. The ACS survey instrument was developed with the household population in mind, and even though collecting some of the data on the questionnaire from GQ residents is necessary, many of the questions on the present questionnaire are not applicable to all GQ populations. Customizing the instrument by GQ type may not be cost-effective, but a short-form questionnaire that includes only the items that are absolutely necessary and applicable to group quarters could be considered. This is another topic of interest for the final report.

References

Asiala, M.E. (2010). *Weighting and Estimation: Challenges and Limitations.* Presentation prepared for the Panel on Measuring the Group Quarters Population in the American Community Survey. Washington, DC: U.S. Census Bureau.

Goldenkoff, R. (2010). *Operational Changes Made for 2010 Position the U.S. Census Bureau to More Accurately Classify and Identify Group Quarters.* Testimony before the Subcommittee on Information Policy, Census, and National Archives, Committee on Oversight and Government Reform, House of Representatives. U.S. Government Accountability Office, Washington, DC. Available: http://www.gao.gov/new.items/d10452t.pdf.

Keathley, D., A. Navarro, and M. Asiala. (2010). *An Analysis of Alternate Variance Estimation Methods for the American Community Survey Group Quarters Sample.* Paper prepared for the Joint Statistical Meetings, Vancouver. Washington, DC: U.S. Census Bureau.

National Research Council. (2000). *Small-Area Income and Poverty Estimates: Priorities for 2000 and Beyond.* Panel of Estimates of Poverty for Small Geographic Areas. C.F. Citro and G. Kalton, Eds. Committee on National Statistics. Division of Behavioral and Social Sciences and Education, Washington, DC: National Academy Press.

National Research Council. (2004). *The 2000 Census: Counting Under Adversity.* Panel to Review the 2000 Census. C.F. Citro, D.L. Cork and J.L. Norwood, Eds. Committee on National Statistics. Division of Behavioral and Social Sciences and Education, Washington, DC: National Academy Press.

National Research Council. (2007). *Using the American Community Survey: Benefits and Challenges.* Panel on the Functionality and Usability of Data From the American Community Survey. C.F. Citro and G. Kalton, Eds. Committee on National Statistics. Division of Behavioral and Social Sciences and Education, Washington, DC: National Academy Press.

Pfeffermann, D., and R.R. Tiller. (2006). Small-area estimation with state–space models subject to benchmark constraints. *Journal of the American Statistical Association*, 101, 1387-1397.

Sommers, D., and S.P. Hefter (2010). *Evaluation of the Effect on Cost and Variances of the Group Quarter Cluster Size.* Paper prepared for the Joint Statistical Meetings, Vancouver. Washington, DC: U.S. Census Bureau.

U.S. Census Bureau. (2008a). 2008 American Community Survey/Puerto Rico Community Survey Group Quarters Definitions. U.S. Department of Commerce, Washington, DC. Available: http://www.census.gov/acs/www/Downloads/2008_ACS_GQ_Definitions.pdf.

U.S. Census Bureau. (2008b). *Methodology for the Subcounty Total Resident Population Estimates (Vintage 2008): April 1, 2000 to July 1, 2008.* U.S. Department of Commerce,

Washington, DC. Available: http://www.census.gov/popest/topics/methodology/2008-st-co-meth.pdf.

U.S. Census Bureau. (2009). *Design and Methodology: American Community Survey.* Washington, DC: U.S. Department of Commerce.

Williams, A.L. (2010). Evaluation of the Quality of the 2006-2008 ACS Group Quarters Sampling Frame. Draft memorandum to S. Schechter from D. Whitford. U.S. Census Bureau, U.S. Department of Commerce, Washington, DC.

Appendix A

Panel Charge

An ad hoc panel will conduct an in-depth review of the statistical methodology for measuring the group quarters population in the continuous American Community Survey (ACS). The panel will consider user needs for ACS data on the various components of the group quarters population, including inmates of federal, state, and local correctional facilities, residents of nursing homes and other long-term health care facilities, college students living in campus housing, military personnel in barracks or on a ship in home port, and residents of noninstitutional group quarters, such as hospices, convents, monasteries, group homes, and migrant workers quarters. In light of user needs and considerations of operational feasibility and compatibility with the treatment of the household population in the ACS, the panel will recommend alternatives to the current sample design, weighting procedures, and other methodological features that can make the ACS group quarters data more useful for small-area data users, particularly users of ACS 5-year period estimates for small governmental jurisdictions, census tracts, and block groups. The panel will issue an interim report at the end of the first year of the study with recommendations for near-term improvements in the sample design and weighting of group quarters in the ACS and a final report at the conclusion of a 24-month study with findings and recommendations for longer term improvements to the measurement of the group quarters population.

Appendix B

Biographical Sketches of Panel Members and Staff

PAUL R. VOSS (*Chair*) is a fellow at the Carolina Population Center and senior spatial analyst at the Odum Institute for Research in Social Science at the University of North Carolina. He is also emeritus professor of rural sociology at the University of Wisconsin and was director of the University of Wisconsin Applied Population Laboratory. His research interests are in applied demography, including small-area demographic models of population estimation and projection, as well as human migration, environmental demography, and spatial statistics. He has written extensively on the use and applicability of census and American Community Survey data in small communities. He served on the U.S. Department of Commerce's Decennial Census Advisory Committee as representative of the Population Association of America as well as the Census Bureau's advisory committee of professional associations. At the National Research Council, he chaired the Committee on National Statistics Panel on Residence Rules in the Decennial Census and also served on the Panel on Estimates of Poverty for Small Geographic Areas. He has master's and Ph.D. degrees in sociology (demography) from the University of Michigan.

WILLIAM A.V. CLARK is professor of statistics and geography at the University of California, Los Angeles. His research is focused on demographic change and the nature of the spatial outcomes of population migration flows. He is currently investigating the interaction of class, race, and geography in metropolitan areas. He has published numerous research articles and books. He served on the editorial board of a number of journals, including *Population, Space and Place*, the *Journal of Urban Affairs*, *Population and Environment*, and *Urban Geography*. He is a member of the National Academy of Sciences and has served on a number of National Research Council (NRC) committees. He is currently on the Subcommittee for NRC Oversight, the Transportation Research Board Executive Committee, the Committee on Equity Implications of Alternative Transportation Finance Mechanisms, and the Geographical Sciences Committee; he also participated in Applications of Social Network Analysis for Building Community Disaster Resilience: A Workshop. He has a Ph.D. in geography from the University of Illinois.

SUSAN COPELLA is director of the Pennsylvania State Data Center at Pennsylvania State University. She is chair of the Federal State Cooperative Program for Population Projections, state representative to the Federal State Cooperative Program for Population Estimates, and member of its group quarters subcommittee. Her experience includes working with the Census Bureau to review population estimates, coordinate the Local Update of Census Addresses

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(LUCA), the Participants Statistical Areas Program, and the 2010 Count Review Program, including a review of housing units and group quarters. Prior to joining the State Data Center, she worked in a number of urban and regional planning agencies. She has a B.A. in urban studies and geography from the University of Pittsburgh.

DAVID DOLSON is director of the Social Survey Methods Division at Statistics Canada, where he is responsible for all statistical and survey methods in support of the Census of Population, including the program of postcensal surveys, the Geography Division, and the demographic statistics program. He also oversees the Statistical Consultation Group, the Questionnaire Design Resource Centre, and the Data Analysis Resource Centre. He directs the development, testing, evaluation, and implementation of statistical and survey methods, using a variety of data collection modes, including supplementing questionnaire data with information obtained from administrative records. He consulted with the U.S. Census Bureau staff on the Reverse Record Check methodology for census coverage measurement and participated in expert workshops on the U.S. census coverage measurement program and coverage improvement options for the 2020 U.S. census. He has a master of mathematics degree in statistics from the University of Waterloo.

RALPH FOLSOM is chief scientist at RTI, with expertise in complex sample design and analysis, small-area estimation, missing data imputation, and survey weight adjustment. Working on the National Survey on Drug Use and Health (NSDUH), which is based on a sample of individuals living in both households and group quarters, he initiated innovative weight adjustment methods based on his logistic response propensity and exponential poststratification models. He has also introduced model-based imputations for missing frequency of use and income data items, and he has been an influential collaborator in the development of the NSDUH current Predictive Mean Neighborhoods imputation methodology. He has recently led RTI's work in small-area estimation research, including the NSDUH team that developed small-area estimates for drug use, dependency, and treatment or treatment need for selected states and metropolitan areas. At the National Research Council, he served on the Panel to Evaluate the Survey of Income and Program Participation; he is a fellow of the American Statistical Association. He has an M.S. in statistics from Iowa State University and a Ph.D. in biostatistics from the University of North Carolina.

RACHEL HARTER is Senior Fellow at the National Opinion Research Center at the University of Chicago. She developed and evaluated alternative substate estimators using the Current Employment Statistics (CES) survey, which collects data each month on unemployment, hours, and earnings from a sample of nonfarm establishments. This included analyses of the similarities and differences between the CES program and related programs of the Bureau of Labor Statistics, investigated differences in program scope and coverage, empirically compared data series to determine the best auxiliary variable, conducted simulations of various estimators, supervised research on estimators for small domains, and supervised the development and enhancement of a small-domain estimation system for Illinois. Her current projects include work on the Survey of Doctorate Recipients for the National Science Foundation and the Residential Energy Consumption Survey for the Energy Information Agency. She is council of sections representative to the Survey Research Methods Section of the American Statistical Association

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and former program chair for the Survey Research Methods Section of the American Statistical Association. She has M.S. and Ph.D. degrees in statistics from Iowa State University.

STEVEN HEERINGA is a research scientist in the University of Michigan Survey Methodology Program, director of the Statistical and Research Design Group in the Survey Research Center (SRC), and director of the Summer Institute in Survey Research Techniques at the Institute for Social Research. He is on the faculty of the Michigan Program in Survey Methodology and the Joint Program in Survey Methodology and is an adjunct associate professor in the Department of Biostatistics at the University of Michigan. He has over 25 years of statistical sampling experience directing the development of the SRC national sample design, as well as sample designs for SRC's major longitudinal and cross-sectional survey programs. He has contributed as a consulting statistician to a number of international research projects and ongoing data collections and has published on sample design methods and procedures, such as weighting, variance estimation, and the imputation of missing data. He is a fellow of the American Statistical Association and has a master's in statistics and a Ph.D. in biostatistics from the University of Michigan.

KRISZTINA MARTON (*Study Director*) is senior program officer with the Committee on National Statistics. She is currently serving as study director for the Panel on Redesigning the Commercial Buildings and Residential Energy Consumption Surveys of the Energy Information Administration and the Workshop on the Future of Federal Household Surveys. Previously, she was a survey researcher at Mathematica Policy Research (MPR), where she conducted methodological research and oversaw data collections for the National Science Foundation, the Department of Health and Human Services, the Agency for Healthcare Research and Quality, the Robert Wood Johnson Foundation, and other clients. Prior to joining MPR, she was a survey director in the Ohio State University Center for Survey Research. She has a Ph.D. in communication with an interdisciplinary specialization in survey research from the Ohio State University.

JOSEPH SALVO is director in the Population Division of the New York City Department of City Planning. His background includes a year at the Census Bureau. He has broad experience in the application of small-area data for policies and programs and the use of census data. A past president of the Association of Public Data Users, he has experience with the Census Bureau's Master Address File and TIGER geographic database. At the National Research Council, he served on the Panel on the Functionality and Usability of Data from the American Community Survey and the Panel on the Research on Future Census Methods and chaired the Local Update of Census Addresses (LUCA) working group. He is a fellow of the American Statistical Association and an adjunct associate professor in the Urban Affairs and Planning Department at Hunter College of the City University of New York. He has M.A. and Ph.D. degrees in sociology from Fordham University.

RICHARD VALLIANT is research professor in the Joint Program in Survey Methodology at the University of Maryland and the University of Michigan. He was formerly an associate director at Westat and a mathematical statistician with the Bureau of Labor Statistics. His 30 years of applied experience includes survey sampling, estimation theory, and statistical computing for establishment and household surveys. At the National Research Council, he

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served on the Panel to Review Research and Development Statistics at the National Science Foundation. He is a fellow of the American Statistical Association, a member of the Census Advisory Council, and an elected member of the International Statistical Institute. He has served as associate editor of the *Journal of the American Statistical Association—Theory and Methods*, the *Journal of the American Statistical Association—Applications and Case Studies*, the *Journal of Official Statistics*, and *Survey Methodology*. He has an M.S. in statistics from Cornell University and a Ph.D. in biostatistics from Johns Hopkins University.

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