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Big Survey Meets Big Data: Implementing Administrative Records on the American Community Survey

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ABSTRACT

The U.S. Census Bureau has made significant progress exploring the use of administrative records in the American Community Survey (ACS) to continue to meet data needs in an era of limited budgets, rising costs and decreasing participation. Incorporating administrative records into our processes should positively impact respondent burden and data reliability, while saving costs by, for example, reducing the need for follow up visits. There is great potential for administrative record utilization in data collection and processing, but there are also great challenges. These include matching accuracy, geographic coverage, and a mismatch between administrative concepts and statistical requirements. This paper details the vision of how administrative data will be integrated into the ACS, including an evaluation of alternative administrative data sets, a case study on the use of administrative data to replace ACS housing items, and the use of administrative data for editing and imputation on the ACS.

INTRODUCTION

American society demands more data at a rapid pace to meet the needs of the changing landscape of America's communities. Declining response rates, as well as growing concerns about the privacy and confidentiality of data, challenge our ability to collect information using surveys. The Census Bureau has embraced this challenge and is turning to administrative data to strengthen survey programs by easing the burden on Americans asked to respond to federal surveys and deliver more rich, quality data to inform decisions made by policymakers, businesses, and many others.[1]

The American Community Survey (ACS) is the only source of comparable data for all of America's communities. Since 2005, the ACS has provided information on an annual basis that was previously collected only every 10 years on the decennial census. By collecting this information on an annual basis, the Census Bureau has greatly enhanced its ability to meet the needs of our various data users.

The Census Bureau continually researches ways to improve the quality of the ACS data, ensure the survey operates efficiently and is cost-effective, and to ensure the experience of ACS respondents is pleasant and they are asked only what is necessary. Administrative records show great promise for improving the quality of ACS data, enhancing the data products that are available, and asking less of our respondents. This document charts the course for the path forward to integrate administrative records into the ACS program.

THE VISION

The Census Bureau is considering several approaches to use administrative records to enhance the ACS program:

- Reduce the burden on our respondents by using information already available to the federal government instead of asking questions.
- Improve data quality by drawing upon administrative records for data editing and imputation, rather than statistical approaches to assigning values.
- Create blended data products, including merging administrative data on topics not currently asked about on the ACS to provide even more detailed information about each of America's communities and creating complimentary products for small geographies to improve the quality of community-level estimates such as median income.

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[1] Administrative records and third party data refer to micro data records contained in files collected and maintained by administrative (i.e., program) agencies and commercial entities. Government and commercial entities maintain these files for the purpose of administering programs and providing services. Administrative records are distinct from systems of information collected exclusively for statistical purposes, such as those the U.S. Census Bureau produces under the authority of Title 13 of the United States Code (U.S.C.). The Census Bureau uses, and seeks to use, administrative records developed by federal agencies, tribal, state, and local governments as well as data from commercial entities.

PAST EXPERIENCE

The Census Bureau has a long history of using administrative records to provide quality information about the U.S. population and economy. These data have been used for decades to produce population estimates and projections.[2] The Longitudinal Employer-Household Dynamics program has been integrating existing data from state-supplied administrative records on workers and employers with existing censuses, surveys, and other administrative records to create a longitudinal data system on U.S. employment since 2000.[3] The Small Area Income and Poverty Estimates (SAIPE) Program uses administrative records to provide annual estimates of income and poverty statistics for all school districts, counties, and states.[4] The Small Area Health Insurance Estimates (SAHIE) Program also uses administrative records to develop model-based estimates of health insurance coverage for counties and states.[5] The 2020 Census will use information that people have already provided to improve accuracy and reduce the need for census takers to knock on doors.

GUIDING PRINCIPLES

The Census Bureau has established a set of guiding principles to determine what administrative sources are appropriate for use on the ACS. These principles are used to evaluate each potential source to determine the suitability of using the administrative source either in place of asking a question on the survey or for editing and imputation of survey data.

Authorization	Do we have a formal agreement (e.g., contract or interagency agreement) to obtain and use an administrative data sources?
Availability	Are the data available for every year?
Conceptual Alignment	Do the administrative data correspond to the concept the ACS currently intends to measure?
Coverage	How comprehensive is the coverage of the administrative data with respect to geographies and population subgroups?
Data Source	Do the administrative data come from a trusted and respected source, above reproach and conflict free?

[2] For more information about the Census Bureau's population estimates, please visit: https://www.census.gov/programs-surveys/popest.html. For more information about the Census Bureau's population projections, please visit:
[3] For more information about the Longitudinal Employer-Household Dynamics program, please visit: https://lehd.ces.census.gov/.
[4] For more information about the Small Area Income and Poverty Estimates (SAIPE) Program, please visit: https://www.census.gov/programs-surveys/saipe.html.
[5] For more information about the Small Area Health Insurance Estimates (SAHIE) Program, please visit: https://www.census.gov/programs-surveys/sahie.html.

Disclosure Avoidance	Does use of the administrative data preclude the Census Bureau from ensuring disclosure avoidance of personally identifiable information?
Impacts on Estimates	To what extent does the administrative data source diverge from survey response (direct impact)? Do the differences carry over to other variables, for example, through editing and imputation (indirect impact)?
Intended Use	How will the administrative data be used (e.g., editing and imputation, substitution, blended data product)?
Population Universe	Are the administrative data intended for use to measure something for the total U.S. population or a population subgroup (e.g., condo owners)?
Quality	What is sufficient data quality for the published estimates? Do the administrative data meet these quality requirements?
Reliability	Are the administrative data available and consistent over time?
Temporal Alignment	Do the administrative data correspond to the time period referenced in the ACS?

EVALUATING ADMINISTRATIVE SOURCES

What sources are available?

The Census Bureau currently houses administrative records from federal, state, and third party sources relevant to 23 ACS content areas (see Table 1). Reliability, coverage, and quality of records vary by source.

Federal sources of administrative records used at the Census Bureau include the Internal Revenue Service (IRS), Social Security Administration (SSA), Department of Housing and Urban Development (HUD), U.S. Postal Service (USPS), Selective Service System (SSS), Indian Health System (IHS), and the Centers for Medicaid and Medicare Services. Each provides demographic, social, economic, and/or housing data on individuals, though none of these sources cover the entire U.S. population. Generally speaking, these federal administrative records are appropriate for usage in the ACS, as they meet several of our guiding principles. In particular, federal data are generally trusted and respected, authorized for use, reliable, of high-quality, and provide excellent coverage of the populations they reach.

The Census Bureau acquires data from states for some of the federally-funded benefits programs they administer, such as the Supplemental Nutrition Assistance Program (SNAP), Temporary Assistance for Needy Families (TANF) program, and the Women, Infants, and Children (WIC) program. State TANF records are relevant to several ACS demographic and income measures, while SNAP records are relevant to ACS Food Stamps questions. Relative to federal data sources, however, state-sourced administrative records may be less appropriate for ACS use. The Census Bureau currently has data from only a handful of states, and some states provide only samples of the individuals participating in their programs. Moreover, the quality of these state-provided administrative records, specifically the documentation and completeness, varies from state to state.

The Census Bureau also contracts with third party firms, which provide demographic characteristics for population subgroups and housing characteristics for select units. Third party data on individuals are obtained from sources like telephone books, change of address information for periodicals, and telephone, utility, voter registration, and property tax records. Third party data on households come from deeds, as well as foreclosure and property tax records. Relative to federally-sourced records, third party data may prove less appropriate for ACS use because of concerns about data reliability (e.g. consistency of measures), future availability, and coverage concerns.

Evaluating Administrative Records

The Census Bureau has evaluated the potential applications of these administrative records for the ACS by focusing on five of the guiding principles:

- Coverage
- Quality
- Conceptual Alignment
- Temporal Alignment
- Impacts on Estimates

<u>Demographic Measures</u>

Administrative records show particular promise for several demographic ACS items. As shown in Table 1 (provided at the end of the document), most administrative records contain at least some demographic information on the individuals they cover. Additionally, because of the relatively fixed nature of demographic characteristics like sex and date of birth, the conceptual and temporal alignment of AR and ACS measures is high. But, AR coverage of ACS respondents varies from source to source, and prior Census Bureau research shows that administrative records cover younger individuals less well than older individuals. Nevertheless, this research also shows that ARs may prove particularly useful in ACS production of age and sex items.

The potential applications of AR race and ethnicity data to ACS production are impacted by conceptual misalignment between ARs and ACS items, as well as inconsistent AR coverage of racial and ethnic groups. While the Census Bureau treats race and ethnicity in an additive fashion (such that an individual

could identify as both Black Alone and Hispanic, for example), it is common for AR sources to treat race and ethnicity as mutually exclusive (such that the same individual is either Black Alone or Hispanic, but not both). Prior research shows that White alone, Black alone, Asian alone, and non-Hispanic individuals are better covered and exhibit higher rates of AR-ACS response agreement than other racial and ethnic groups. One promising opportunity here is the pooling of multiple ARs to harmonize and catalog an individual's race and ethnicity responses across sources and over time, increasing potential utility for ACS use.

Social and Economic Measures

Relative to demographic items like sex and date of birth, a person's social and economic characteristics are more subject to change over time. This fact makes the temporal and conceptual alignment of AR and ACS social and economic measures particularly important.

Preliminary Census Bureau research on the use of IRS records for ACS income measures is promising. The utility of IRS records depends largely on the degree to which the IRS tax year coincides with an ACS respondent's period of reference in the survey. Despite temporal alignment issues, IRS ARs provide substantial coverage for the incidence of income from various sources (e.g. wages, self-employment income, dividend/interest income) included on the ACS, while wage and salary income amounts reported in IRS records show only small discrepancies with ACS responses.

IRS records may also be applicable to the ACS Residence One Year Ago (ROYA) question, which asks respondents whether or not they live in the same house they did one year ago. Prior Census Bureau research notes, however, that issues with respect to conceptual and temporal misalignment limit ACS applications to those respondents collecting some sort of income in the U.S. for two consecutive years, who respond to the ACS survey at approximately the same time they file taxes. Nevertheless, IRS records may be particularly useful for ACS ROYA responses that would have otherwise been edited or imputed.

Housing Measures

As shown in Table 1, third party administrative records contain information applicable to several ACS housing characteristic items, such as housing costs, home value, and tenure status. However, the future availability and reliability of third party records is less certain than that of federal and state records. Prior Census Bureau research finds that third party coverage of ACS households is low for measures of heating fuel, plumbing/kitchen facilities, and some mortgage measures. Additionally, preliminary research has found that some measures, such as tenure status, found in third party records do not provide the requisite level of quality for usage in ACS. While these factors limit the applicability of third party records for the direct replacement of ACS items (see the "Case Study" section of this report), research suggests that third party records may be useful in the editing and imputation of some housing measures.

Case Study: Replacing Housing Characteristics Data on the 2015 ACS

In support of the Census Bureau's goal to replace or supplement survey data to improve survey response and reduce respondent burden, we tested replacing 2015 ACS response data with administrative records for year structure built, acreage, property value, and real estate tax.[6]

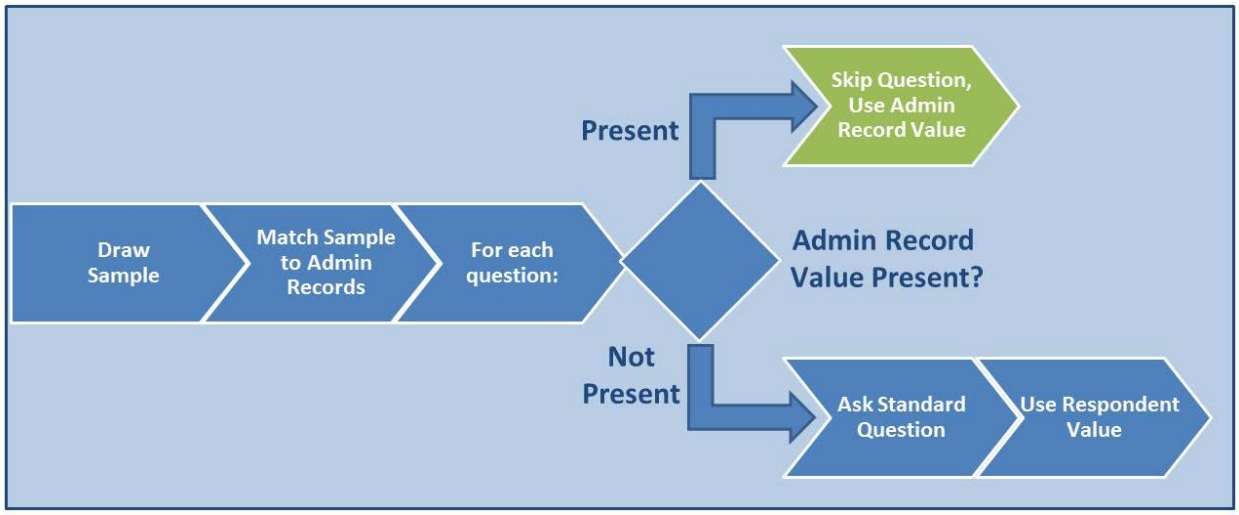
Administrative Data Source

This study uses administrative data from county and municipal tax records obtained from CoreLogic, a commercial vendor.

Adaptive Strategy for Integrating Administrative Data

The goal of a direct-replacement approach for integrating administrative data is to not ask a question if the administrative source provides the information needed. The adaptive design for incorporating administrative data is presented in the figure below. Once administrative data are matched to the survey sample, the records are reviewed to determine if there is an administrative record present. When the record is present, the survey instrument will skip the question (i.e., not ask the respondent) and use the administrative record value. If the record is not present for the sampled address, the survey instrument will ask the standard question and use the respondent value.

Figure 1. Adaptive Design for Integrating Administrative Records in ACS Data Collection



The ACS is collected by self-response via internet or paper questionnaire, and through a computer-assisted personal interview during our nonresponse follow up process. The internet and computer-

[6] Detailed results from this study will be published later this year at: https://www.census.gov/programs-surveys/acs/library/publications-and-working-papers/research-and-evaluation.html.

assisted interview modes use automated data collection instruments that can be programmed to skip questions, making them ideal for incorporating administrative data when available for a specified address. The number of items available in the administrative data for a housing unit varies, which would require multiple versions of the paper questionnaire. This would be difficult and costly to implement and manage. For this reason, the housing study only replaced responses values obtained by internet or computer-assisted interviewing. If the question was left blank on the paper questionnaire, the missing value was filled in using administrative data when available.

Research Findings

We assessed the impact of replacing survey responses with administrative data by:

- Comparing simulated estimates (using administrative records) with published estimates.
- Gauging the reduction in the number of cases that required allocation of values due to missing data.
- Evaluating the potential reduction in burden to respondents by estimating the number of respondents who would not have needed to be asked the question if administrative data were available.

How did the simulated estimates using administrative data differ from our published 2015 estimates?

- There were statistically significant differences for a large proportion of summary metrics for all four items across geographic levels (nation, states, counties, and places).
- At the national level, all but one of the 15 key measures studied were statistically different.
- Many of the simulated estimates had lower measures of property value and real estate taxes than the 2015 ACS estimates.
- The simulated estimates were generally lower than the published estimates for the acreage item.
- Compared to the published estimates, the simulated estimates appeared to have a larger number of housing units in the older year built categories and a smaller number of housing units in the more recently year built categories.

How did using administrative data effect assignment of values due to missing data?

- Using administrative data reduced allocation rates (i.e., assignment of values due to missing data) significantly, ranging from 2.3 percentage points lower to 12.4 percentage points lower.

What potential do administrative data show for reducing the burden on respondents to answer these survey questions?

- We were able to successfully replace responses to the four survey questions in this study for between 37.5 and 53.5 percent of ACS responding housing units.

Using administrative data clearly improves item allocation rates and reduces respondent burden. However, many of the simulated estimates were significantly different from the published estimates. In

addition, there were geographic disparities in coverage of the administrative data. Not having complete coverage of administrative data for all geographic areas and housing types means that data for some areas would contain mostly ACS response data, others mostly administrative data, and others with varying combinations of the two sources. Differential coverage and difference between the estimates derived from administrative data versus self-response data are of particular concern, as these issues may compromise the ability of the ACS to represent all areas and housing units as equally as possible.

The results from this study indicate that a direct-replacement method is not appropriate for the ACS, but other methods for incorporating administrative data in place of survey response such as modeling or data harmonization may prove more successful. Improvements in allocation rates suggest that administrative data should be considered for use in our editing and imputation procedures.

Lessons Learned

We learned a great deal from this research and will apply those lessons to our administrative records research moving forward.

1. **We have the ability to bring the administrative data into the production environment.** This simulation successfully demonstrated that we are able to incorporate the administrative data into our production systems, running all required programs and procedures to produce the tables published each year.
2. **Direct replacement alone is not appropriate for integrating administrative data on these selected housing items into the ACS.** This method does not meet several of the guiding principles. The data diverge from survey response and impact other survey items (Impacts on Estimates Principle). They do not offer complete coverage (Coverage Principle), and differ by concept and reference period (Conceptual and Temporal Alignment Principles). Modeling or data harmonization approaches should be considered to ensure estimates are comparable across geographies and better align with the guiding principles.
3. **Administrative data have the potential to improve our editing and imputation methods by using what we know about a housing unit to inform the assignment of a value.** This could benefit the ACS program and satisfies the guiding principle, Intended Use.
4. The data for this study come from an outside vendor. **There are risks associated with using an outside vendor**, such as another vendor being awarded the contract at a future date or the current vendor going out of business. In addition, we need to know if this vendor provides the most comprehensive administrative data or if there are other vendors that do a better job. There will be a need to keep up-to-date on this over time. The guiding principles must be carefully considered when choosing a vendor. It is crucial that the Data Source, Reliability, and Quality principles are fully met.
5. **There were some issues with matching the administrative data to the survey data.** This appears to be concentrated among certain types of housing units, such as multi-unit structures and trailer parks. We must continue work to improve our ability to link data sources and represent all areas of interest (Coverage and Population Universe Principles).

6. **Using administrative data impacts the entire survey life cycle, including the editing and imputation of other items** (e.g., the housing items used in this study are used for editing and imputing income). We must follow our standard practice of thoroughly testing any change to our production system to ensure the Census Bureau's high quality standards are met and that the Quality and Impacts on Estimates Principles are considered in the decision making process.

The Path Forward

Providing a positive experience, minimizing burden for survey respondents, and increasing data quality are clearly and demonstrably a central focus of the ACS program. There is no one-size-fits-all approach for accomplishing this, and the Census Bureau remains agile in researching new ways to create a positive respondent experience and improve data quality.

The field of survey research is shifting and we must do what we can to leverage other data sources to enhance, supplement, or in some cases replace what we gain from surveys. Leveraging existing data sources through linked approaches will be an important component of demographic research in the coming years.

Administrative sources show great promise and the Census Bureau is engaging the use of administrative records at all stages of the survey life cycle. We have established a robust research agenda, seeking to implement administrative data into ACS production as soon as possible, while continuing to adhere to our high quality standards and requirements to ensure we continue to meet the needs of our data users. To meet this goal, we have identified several next steps to build forward momentum:

- **Update and augment existing data sharing agreements** to facilitate the use of administrative records in ACS production.
- **Pursue additional data sharing agreements** to broaden the range of ACS items addressed in administrative records. For example, acquiring administrative records that cover ACS content areas such as disability, employment, school enrollment, and educational attainment may expand the scope of AR use in ACS production.
- **Cultivate and expand the acquisition of state administrative records** to increase coverage of ACS respondents, as well as AR-ACS agreement rates.
- Continue research to **improve linkage methods** and **assess the quality of administrative data**.
- Consider how administrative records from various sources could be used to **create harmonized measures of individual and household characteristics**. This may increase coverage of ACS respondents, as well as AR-ACS agreement rates.
- Implement administrative records in the ACS editing and imputation procedures.

Table 1. Availability and Evaluation of Administrative Records for American Community Survey Subjects

ACS Subject	AR Available?		AR Evaluation Results					
	Yes	No	Multiple ARs Available?	Available for Research?	Geographic Level	Observational Unit	ACS Match Rate	Response Agreement Rate
Demographics								
Age	X		Yes	Yes	National	Individual	0-95%	0-96%
Hispanic Origin	X		Yes	Yes	National	Individual	0-42%	69-97%
Race	X		Yes	Yes	National	Individual	0-72%	1-99%
Relationship	X		Yes	Yes	National	Individual	Unknown	Unknown
Sex	X		Yes	Yes	National	Individual	0-93%	95-100%
Social Characteristics								
Ancestry	X		Yes	Yes	National	Individual	Unknown	Unknown
Citizenship	X		No	Yes	National	Individual	Unknown	Unknown
Disability		X						
Educational Attainment		X						
Fertility	X		No	Yes	National	Individual	Unknown	Unknown
Grandparents		X						
Language		X						
Marital Status		X						
Migration	X		Yes	Yes	National	Individual, Household	78-98%	82-85%
School Enrollment		X						
Veterans	X		No	Yes	National	Individual	Unknown	Unknown
Economic Characteristics								
Class of Worker		X						
Commuting		X						
Employment Status	X		No	No	National	Individual	Unknown	Unknown
Food Stamps (SNAP)	X		Yes	Yes	State	Individual	Unknown	Unknown
Health Insurance	X		Yes	Yes	National	Individual	Unknown	Unknown
Hours/Week, Weeks/Year	X		No	No	National	Individual	Unknown	Unknown
Income	X		Yes	Yes	National	Individual, Household	88-98%	87%
Industry & Occupation	X		No	Yes	National	Individual, Household	Unknown	Unknown
Housing Characteristics								
Computer & Internet Usage		X						
Costs (Mortgage, Taxes, Insurance)	X		No	Yes	National	Housing Unit	4-77%	13-87%
Heating Fuel	X		No	Yes	National	Housing Unit	14%	81
Occupancy		X						
Plumbing/Kitchen Facilities	X		No	Yes	National	Housing Unit	14%	95%
Property Value	X		No	Yes	National	Housing Unit	99%	29%
Structure	X		Yes	Yes	National	Individual, Housing Unit	Unknown	Unknown
Tenure (Own/Rent)	X		No	Yes	National	Housing Unit	12%	62%
Utilities		X						
Vehicles		X						
Year Built/Year Moved In	X		Yes	Yes	National	Housing Unit	78%	76%

Note: Percentages pulled from "Synthesis report table_se.xlsx" and various ACS-AR Memos/research papers.