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Topic (iv): Integration of statistical (survey) data with registers (administrative) data

**MANAGING STATISTICAL INFORMATION SYSTEMS WITH COMMINGLED SURVEY
AND ADMINISTRATIVE DATA: A U.S. CENSUS BUREAU EXAMPLE**

Submitted by U.S. Bureau of the Census ¹

INVITED PAPER

I. INTRODUCTION

1. The maturation of the information age has created new challenges. Governments are faced with rapidly changing economies and societies are forced to make far-reaching economic and social policy decisions. These decisions, however, are based on limited, static, and expensive survey data. At the same time, large administrative and survey data sets are available which are derived from data collected from households, business establishments and governmental entities. These data, which could describe the dynamic interactions of workers, businesses, government and society, are not effectively used in the United States, because key issues have not been fully addressed. American statistical agencies have the legal means and mandates to use such data to improve the scope and quality of statistical modeling. However,

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they have made far less scientific and policy use of restricted-access, linked data than many other national statistical agencies.

2. The integration of administrative records and survey and census data offers a solution for generating timely statistics at much lower costs while reducing respondent burden. Profound advances in computing technology and record linkage accuracy have significantly increased the feasibility of expanded uses of administrative records for statistical purposes that avoids repetitive and burdensome inquiries of the public. These advances coupled with spiraling costs of, and public resistance to, traditional data collection have increased the opportunity for significant benefits through using administrative records in data collection, estimation, and evaluation systems [P1996], [PL1999].

3. The existence of enormous amounts of personal information in electronic form and the Internet revolution both have added to heightened public awareness of and concern about information privacy and confidentiality. The management of activities that blend respondent information from multiple sources must weigh any, and all, privacy and confidentiality concerns against the potential benefits of such research. Statistical agencies that integrate administrative and survey data must also have a corporate approach to the development and application of policies ensuring that the privacy and confidentiality concerns of the public and their data providers are met.

II. CENSUS BUREAU MISSION AND MAJOR ACTIVITIES

4. The Census Bureau's mission is "To be the preeminent collector and provider of data about the people and economy of the United States [CEN1999]." Our core business is large-scale surveys and censuses. This involves the full range of activities required to produce data, including survey and instrument design, and, data collection processing and dissemination. Research and data analysis directly support our capabilities to conduct large-scale surveys and censuses. Under our current strategic plan there are three key strategies that include the use of administrative records. The first key strategy entitled "Responding to our customers" includes the production of an enterprise-wide, geographically-based information system that develops products for public use and research. These products will integrate summary data from population, housing, business survey, census, and, if appropriate, administrative record data. The goal here is to develop new, relevant data products without imposing new data collection costs. The second related key strategy entitled "Improving Public Cooperation" is focused on reducing individual and business response burden and assuring confidentiality of response data. The third related key strategy entitled "Innovating in our work" specifies the development of innovative and quality components in our programs. One of the several actions proposed for achieving this is to "increase the use of administrative records for data collection processing and evaluation to reduce respondent burden and cost and develop innovative, useful products."

5. The Census Bureau currently uses administrative records extensively in a wide variety of its economic and demographic programs. The economic census and survey programs rely on administrative records about businesses from the Internal Revenue Service (IRS), and, to a lesser degree, on information from the Social Security Administration (SSA) and the Bureau of Labor Statistics (BLS). The demographic programs use administrative records related to individuals and households primarily to produce estimates and to evaluate or enhance survey data.

II.1 Business Administrative Data

6. The Census Bureau's economic censuses and surveys use information from administrative records to (a) define the universe of business establishments, (b) identify proxy information for both non-responding firms and for those firms not being surveyed in an attempt to manage respondent burden, (c) improve the quality of survey responses through editing and questionnaire design improvements, and (d) reduce the need to conduct an expensive pre-census industry classification operation.

7. Of these uses, the first use is perhaps most critical, in that the administrative data are an integral part of the sampling frame--the Standard Statistical Establishment List (SSEL)--for all components of the economic census and surveys. The SSEL provides a complete, current, and consistent source of establishment-based information about U.S. businesses, and is essential to assuring full coverage and high quality in Federal economic statistics programs. In addition to administrative data, the current SSEL contains extensive amounts of information gathered during previous Census Bureau data collection activities. Therefore, it is much more than just a census or survey frame. The SSEL represents a longitudinal file of the business universe over time. It includes predecessor/successor links that enable the Census Bureau to track a company over time. Moreover, many of the Census Bureau's economic census and survey operations have been built into the SSEL processing, including mail-out, check-in, and disclosure protection. The SSEL provides a great deal of current and historical information about firms prior to actual data collection. Therefore the SSEL increases the efficiency of collection and processing, and the quality of the information ultimately received.

II.2 Person and Household Administrative Data

8. While many of the economic census and survey program activities rely extensively upon administrative records relating to businesses, only a few program activities rely upon administrative records for individuals. Perhaps because of the perceived sensitivity and associated higher privacy costs associated with administrative records relating to individuals, their routine use in major program activities has been somewhat restricted. However, the Census Bureau is currently exploring expanded use of administrative records in a number of research activities designed to produce results that, if fruitful, can be used to implement major program activities.

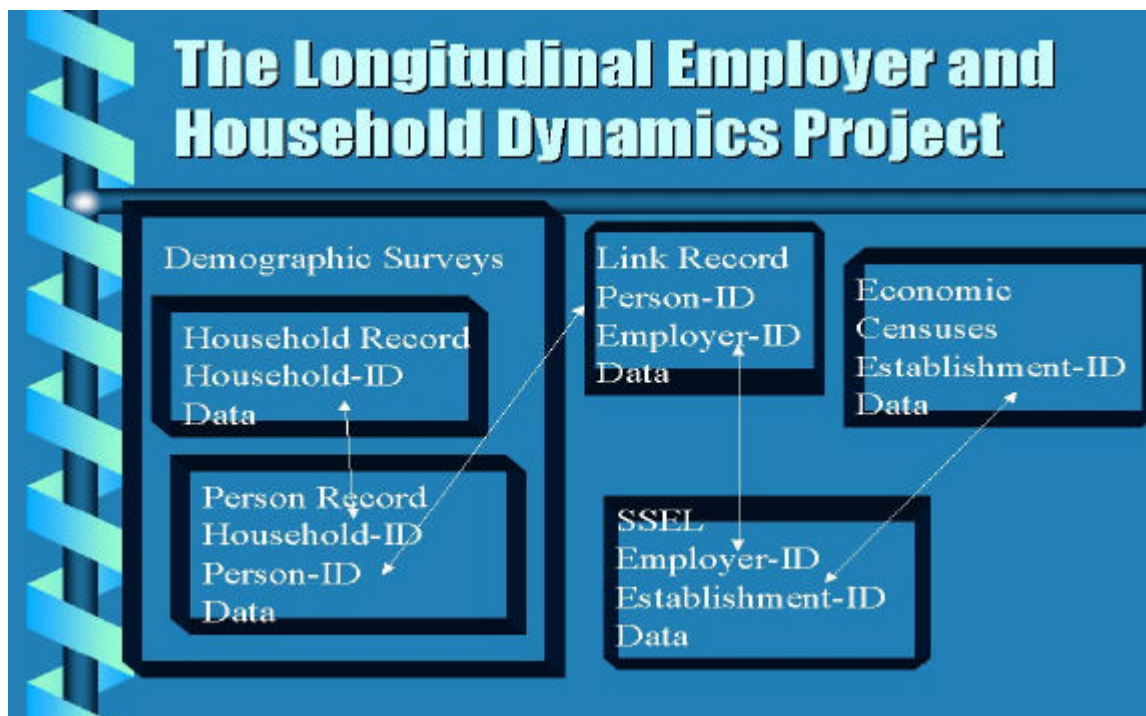
9. While administrative records about businesses have long been used to develop the frames for economic censuses and surveys, household addresses from administrative records are being used extensively for the first time in creation of the Master Address File (MAF) for Census 2000. The Census Bureau entered into an agreement with the U.S. Postal Service to use information contained in the Delivery Sequence File (DSF) as a critical component of the Census 2000 address list. The "Census Address Improvement Act of 1994 (PL 103-430)" required the Postal Service to provide the DSF to the Census Bureau for use in building its address list. The Census Bureau merged addresses from the DSF with the 1990 Address Control File (ACF) to create the first draft of the MAF. As part of our current research activities, we are examining the potential for addresses from other administrative records about individuals, to be used to 1) provide direct updates to supplement the DSF, 2) to target field activities that are necessary to check and enhance the address lists and 3) to confirm addresses from other sources to avoid costly field checks [L1999], [P1996], [PL1999].

III. MERGING BUSINESS AND PERSON DATA

10. The Longitudinal Employer-Household Dynamics Project (LEHD) is the Census Bureau's latest example of efforts to combine administrative and survey data. The mission of LEHD is to evaluate, and improve the quality and understanding of data collected by the Census Bureau's core demographic and economic censuses and surveys through longitudinal analysis. LEHD accomplishes this mission by combining federal and state administrative data on employers and employees with core Census Bureau censuses and surveys. The project conducts policy-relevant research on labor force and employment issues, suggests improvements to the design and processing of census and survey instruments and frames, and creates value-added data products.

11. The LEHD represents a substantial investment made by the Census Bureau to permit direct linking of its demographic surveys (household-based instruments) with its economic censuses and surveys (establishment and business unit-based surveys). The LEHD uses state and federal administrative records as the mechanism to identify the link between employers and employees. The main data products produced by this project are integrated versions of data protected by Title 13 of the United States Code, from the Current Population Surveys, Surveys of Income and Program Participation, Surveys of Program Dynamics, American Community Surveys, Standard Statistical Establishment Lists and Economic Censuses and Surveys. LEHD is employing this technique to prototype current quarterly estimates of employment and job dynamics for states.

12. The direct benefits to the Census Bureau, and the potential benefits to social science research are substantial. Generically, the structure of the LEHD data base consists of two types of links: (1) internal (not public use) versions of core Census demographic surveys that have been linked with information on the employer obtained from sources in the Bureau's economic censuses and surveys; and (2) variables created for the economic data bases from linked information on the workforce characteristics.



IV. RESEARCH OPPORTUNITIES

13. A fair amount of demographic analysis takes place internally at the Census Bureau, but analogous economic research more likely is conducted by outside experts. In our dynamic economy, the Census Bureau is increasingly unsure about what it should be measuring to capture the underlying activity in the economy. To determine this, and to determine whether existing data collection programs are adequate, this research is critical. The Public Use Micro Sample (PUMS) program on the demographic side has had a tremendous impact on the usefulness of Census Bureau data for internal and external research. The need to safeguard confidentiality with the release of these data into general use has created a core of technical expertise within the Census Bureau. It also has created a knowledgeable user base for these programs in the research community, providing a reservoir of skills and talent from which the Census Bureau can draw.

14. The skewed distribution of economic activity makes it infeasible to release data in a manner that simulates PUMS. Therefore, economic research files often contain identifiable data. These files may be used by outside researchers, but only after they have received Special Sworn Status (SSS) from the Census Bureau. Special Sworn Status means that individuals have agreed to maintain the confidentiality of the data they access in accordance with the appropriate legal provisions, and work on projects that directly benefit Census Bureau programs under the supervision of Census Bureau employees. Conferring Census SSS upon an individual includes (1) the individual taking an oath and signing an affidavit of nondisclosure, and, (2) the issuance of Census facility access upon requisite suitability/security clearance — either via a physical badge/pass or key code identification (as in the case of the Research Data Centers). The oath of nondisclosure has no time limits. Even when an individual's facility or information/computer access has expired or has been revoked, they are still expected to abide by the nondisclosure oath. Special Sworn Status researchers work in highly controlled, limited-access environments at the Center for Economic Studies (CES), LEHD, and several Research Data Centers (RDCs) throughout the country. Secure access to confidential micro data, data that inherently include administrative records, creates new products, and disseminates information not otherwise available to the public. This process provides a necessary link between the Bureau, as producers of data, and the users of the data.

15. LEHD's approach to doing business is to provide:

- ◆ A secure area where combined administrative and survey data on businesses and people can reside. LEHD has large, secure computer facilities; secure physical locations where research can be conducted with the limitation that its use is solely for statistical purposes; and assures the protections mandated by the laws governing both administrative and survey data sets. Commingled administrative data, and Census Bureau survey and census respondent data are subject to the confidentiality provisions of all sources.
- ◆ The opportunity to explore mutually beneficial research and new data products for the Census Bureau and its research partners. LEHD possesses: a specialized staff that is experienced in data exploration, standardization, editing, and matching techniques; the existence of a core data infrastructure; the capacity to append new administrative and survey data sets required by our staff and research partners; and the provision of controlled access as part of the Census Bureau's data dissemination efforts.

- ◆ A process to facilitate the research activities conducted at the Census Bureau. All analyses of the LEHD micro data will be conducted using the Title 13 secure facility that the Bureau has provided for LEHD. Only a handful of Census Bureau employees will have access to the data files that contain the personal identifiers required to do the most sensitive part of the data linking. Specially processed research versions of these files, which contain no personal identifiers, will be used on the LEHD computer system. Researchers working on approved projects will be provided with extracts from the LEHD data containing only the variables and cases required for their analyses.
- ◆ A process to facilitate the external research. A proposed example of this process would include the creation of synthetic micro-record databases that possess the qualities of real data but in no way identify individual entities. These databases could be used by researchers to develop programs to produce or simulate the statistics they require. Researchers would then submit their final programs to LEHD staff who would run production programs on the "real" data. LEHD would disclosure-proof the output and return the final product to the researcher.

V. MANAGERIAL CONTROLS ON RESEARCH

16. Research conducted on the LEHD data at the Census Bureau, by individuals with Special Sworn Status, takes place under a set of rules and limitations that are considerably more constraining than those prevailing in typical research environments:

- ◆ The solicitation of research proposals using the LEHD data is a public process.
- ◆ Proposals to use the LEHD data should be submitted to the National Science Foundation, the National Institute for Aging or another appropriate funding agency with strict peer-review procedures. (Permission to secure funding from an agency other than the two listed must be secured in advance from the Bureau of the Census.)
- ◆ Successful peer-reviewed proposals to carry out research using the LEHD data must then be approved by the Bureau of the Census, which will use an internal review panel consisting of subject matter, database and disclosure specialists. The Census Bureau review will confirm that it would benefit from the proposed research (a requirement for granting access to Title 13 protected data). The proposed research must also be feasible using the LEHD data; the variables and cases requested can be supplied, and appropriate resources exist to undertake the analysis. The internal review will follow the procedures developed by the Census Bureau's Administrative Record Steering Committee for the review of projects using household administrative data. These procedures use the Center for Economic Studies review process for access to internal micro data supplemented by the additional requirements imposed by the use of household administrative data.
- ◆ Researchers using the LEHD data are required to obtain Special Sworn Status from the Census Bureau. To obtain this status, researchers are required to undergo a security check, including fingerprinting.
- ◆ Researchers holding Special Sworn Status are subject to the same legal penalties as regular Census Bureau employees for disclosure of confidential information.
- ◆ All data analyses are performed at LEHD secure research facilities. Access is strictly limited to researchers and staff authorized by the Census Bureau. The computers and local area network connected to the LEHD secure facilities are not accessible from outside the Census Bureau's firewall.
- ◆ Researchers may not remove any Title 13 confidential data—whether recorded on any medium or merged with non-confidential data—from the LEHD facility. All research findings must be submitted to Census Bureau personnel for disclosure review prior to public release of any kind

VI. LEGAL CONTROLS

VI.1 Authority

17. The Census Bureau's general legal authority for using administrative records comes from two sources. First, Section 6 of Title 13, U.S.C. permits the Secretary "whenever he considers it advisable" to call on other agencies of the federal government for "information pertinent to the work provided for in [Title 13]." 13 U.S.C. Section 6(a). Subsection (c), added to the statute in 1976, makes this directive mandatory:

To the maximum extent possible and consistent with the kind, timeliness, quality and scope of the statistics required, the Secretary shall acquire and use information available from any source referred to in subsection (a) or (b) of this section instead of conducting direct inquiries.

18. Second, under the Privacy Act of 1974, agencies are permitted to disclose records "...to the Bureau of the Census for the purposes of planning or carrying out a census or survey or related activity pursuant to the provisions of title 13; ..." (Title 5, Section 552a(4)). Further, the Census Bureau is exempt from specific requirements under the Act, because, according to the Act, the Bureau's records are "...required by statute to be maintained and used solely as statistical records..." (Title 5, Section 552(k)(4)). Under these exemptions, the Bureau is not required to:

- ◆ permit an individual to determine what records pertaining to him are collected, maintained, used, or disseminated by such agencies;
- ◆ permit an individual to prevent records pertaining to him obtained by such agencies for a particular purpose from being used or made available for another purpose without his consent;
- ◆ permit an individual to gain access to information pertaining to him in Federal agency records, to have a copy made of all or any portion thereof, and to correct or amend such records.

19. The Congressional intent is clear: the Census Bureau must "to the maximum extent possible," consistent with good statistical practice, use administrative records from other federal agencies in lieu of conducting new censuses or surveys.

VI.2 Informed Consent

20. Participants in all surveys used by LEHD gave informed consent to use the data they provided in conjunction with data from other sources to improve the statistical analyses of the Census Bureau. Consider first the responsibility to maintain the respondent's privacy. Some Census Bureau data were acquired with the explicit promise that they would not be used for certain purposes. Such promises must always be respected—thus limiting the linkages that can be developed with those data. On the other hand, substantial amounts of Census Bureau data were, and are, collected with the explicit acknowledgement, notification, and informed respondent consent that they would be used in conjunction with other data for the purpose of improving the quality of statistical analyses of the economy. This informed consent permits the linking of these data under controlled, secure conditions without violating the privacy of the respondents.

VI.3 Confidentiality

21. The confidentiality of all respondent information is rigorously maintained (both non-public administrative records and individual census reports), as required by law. Section 9 of Title 13, U.S.C. is the most recent codification of a statutory confidentiality requirement that dates back almost a century and bars the disclosure of census information. The statute permits any Census Bureau employees to use information furnished for any of its programs only for a statistical purpose, and prohibits disclosure to anyone not a sworn employee. In fact, census information is immune from legal process. Section 214 provides for both fines and criminal penalties for wrongful disclosure of census information. The Sentencing Reform Act of 1984, 18 U.S.C. ' 3571(b)(3), increased the maximum amount of the fine for violation of this section to \$250,000. Administrative records in the possession of the Census Bureau are also maintained in accordance with other confidentiality provisions of its data providers.

22. Safeguarding this confidentiality means that only authorized persons may see the internal Census Bureau data and that any published results must adequately mask the identity of the respondents. It is vitally important to respect such promises while recognizing that there are a variety of legitimate ways to authorize tabulations and research using such data. One of LEHD's efforts to ensure this protection is the removal of all personal identifiers from its databases. These databases reside on a special-purpose machine, that is isolated within its own firewall, within the LEHD and Center for Economic Studies firewalls, within the Census Bureau's general firewall. Thus, an additional program of research into confidentiality and disclosure risk management must accompany any efforts to link data from multiple sources.

VII. ADMINISTRATIVE CONTROLS

7.1 Security

23. The conduct of legal, authorized research using linked confidential data requires the use of networked, large-scale computing systems. The Census Bureau takes the necessary precautions to ensure that unauthorized persons cannot gain access to these systems. Precautions that must be undertaken include:

- ◆ Security testing whenever there is a change to a computer system or its security-related features.
- ◆ A formal Computer Incident Handling Capability in accordance with the U.S. Office of Management and Budget (OMB) Circular A-130, Appendix III. This capability includes an automated reporting process for users as well as a number of reporting features. In addition, the Census Bureau is working with other federal agencies to facilitate incident identification and handling.
- ◆ Logs of all incoming cartridges, tapes, CDs that are maintained for five years. Log entries include the number of media received, assignment of serial/slot numbers, file name, date received, current and cumulative record count, source, contact person, data descriptions, and comments, and method of destruction.
- ◆ An audit trail (consistent with OMB requirements [IRS1999]) must be maintained for accesses to the system objects and data in order to comply with security requirements and effectively support the enforcement of individual accountability. The audit trail is a systematic record that is sufficient to enable reconstruction and/or review of activities related to operations, procedures, or events occurring in the system. Audit trails must be reviewed on a regular basis and in random inspections of systems processing or storing sensitive information.
- ◆ Independent reviews of the information technology security program in order to ensure that our

processing environment meets or exceeds requirements.

- ◆ Physical access to sensitive data is limited to locations where the following features exist: 1) roof to floor separation of offices or intrusion detection systems; 2) single points of entry to clusters of offices and strict key control of offices; cipher locks on doors that are entry points to offices. Locks are changed annually or upon termination, retirement or transfer of an employee knowing the combination of the room.
- ◆ Individuals access administrative data on a need-to-know basis. In addition to Title 13 Awareness Training, individuals provided access to administrative data receive a consistent core set of training materials that detail data access and use restrictions, secure data storage and disposal practices, and an overview of the civil and criminal penalties associated with unauthorized disclosures. Supervisors are required to certify that all employees working with administrative data have received the appropriate awareness training on an annual basis.

VII.2 Administrative Integration

24. The Census Bureau has experienced a significant expansion of administrative record data acquisitions over the last five years, and has augmented its policy and administrative functions with several additional efforts:

- ◆ We have centralized administrative data acquisitions. This action supports a unified approach for developing interagency relationships and integrated data acquisition strategies as well as the capability to centrally track file use and derivatives once received by the Census Bureau, as required by most data agreements. In the case of demographic files, it also supports additional privacy protections for sensitive personal information by elimination of Social Security Number and name on micro records prior to program uses.
- ◆ We have instituted an Administrative Records Steering Committee (ARSC), chaired by the Associate Director of Methodology and Standards and comprised of demographic, decennial, economic and research division chiefs as well as our Policy office. This committee was formed in 1997 to provide guidance on cross program uses of administrative records and policy matters related to those uses.
- ◆ We have developed and implemented important new policies: "A Policy for Access and Use of Administrative Records [GC1999]" and "A Policy for Review and Approval of Administrative Records Projects [S2000]." The latter policy is implemented through the Center for Economic Studies, complementing their broader role of reviewing individual external research proposals.
- ◆ Policy guidance on several other issues is currently under development: Record Linkage Procedures in Research Data Centers and Guidelines for Developing Data Sharing Agreements.
- ◆ The Census Bureau's Privacy Research Coordinating Committee, chaired by the Chief of the Policy Office, addresses issues of privacy more broadly and is currently developing a set of privacy principles applicable to all Bureau programs, including use of administrative records. In addition, the Census Bureau's Disclosure Review Board reviews products and provides protections against inappropriate disclosure, including products based, in whole or part, on administrative data.
- ◆ The Census Bureau has recently developed a prototype tracking and control database--the Administrative Records Tracking System (ARTS)--for administrative records data use agreements and associated projects, as well as people assigned to projects. This inventory will contain detailed project descriptions with the needs and uses for data that are employed to support legal agreements and annual data requests to administrative agencies. The ARTS will also track the Census Bureau's project approval process and the review and approval process of agencies providing administrative data. Finally, the ARTS will allow the Census Bureau to track the status of any Special Sworn Status

individual to a specific project and data agreement. The Census Bureau is developing a specific plan to fully populate the database by approximately January 2001.

- ◆ The Census Bureau is developing a Corporate Metadata Repository [HG1999] to support the documentation of its data products. LEHD has been employing this resource to register and track its databases, whether they are solely administrative data, survey data or commingled data. This resource is an invaluable tool to determine the location, use, or disposition of any sensitive data set.

VIII. CLOSING COMMENTS

25. The management of statistical information systems containing commingled survey and administrative data requires a multitude of control points. We must assure administrative data providers that we possess both the legal authority to acquire their data, and the administrative constructs and operations to assure the privacy and confidentiality of that data after receipt. These constructs are manifested in computer and physical security plans, practices, and reviews; employee oaths promising confidentiality; certification that employees understand the proper procedures for handling sensitive data; public notification for the needs and uses of information; completion of disclosure reviews for all releasable data products; and the maintenance of metadata libraries describing the contents and disposition of data files.

26. We must also assure data providers that we will use their data for appropriate activities. This assurance is manifested in a project review, approval and tracking process that requires the coordination of policies and operations throughout a statistical agency. We must be prepared at any time to generate reports on the disposition of data files, the status of privacy and confidentiality controls, and the status of projects that use administrative data. The project review process includes the following criteria for evaluation of administrative projects: scientific merit; benefit to the Census Bureau; disclosure risk; conflict of interest; resource requirements; feasibility of project; compliance with interagency data agreements; public perception; and compliance with security standards and policies. Finally, projects are not reviewed in a vacuum. In an agency the size of the Census Bureau, there are multitudes of projects at some stage of proposal or completion. Each new project possesses the potential to set new policy precedents. Therefore, project reviewers must be ever vigilant to maintain the agency's strategic plan, and work within a process that does not stifle new and important research ideas.

27. Linked data, if used wisely, can reduce respondent burden, increase data quality, and enhance the information available to the federal, state, and local agencies that rely on Census Bureau data for decision making. These data also provide a valuable tool to the research community. Indeed, other societies, notably in Europe, have made careful and wise use of such data and have demonstrated the enormous scientific gains from developing restricted-access files [SC99], [HK99]. European restricted-access linked data are inspiring new research programs. These new programs are focused on the interaction of employers and employees over time, the dynamics of social program participation, social organization, population demographics, and health care delivery, to name but a few. The Census Bureau needs the partnership of researchers in many disciplines from the scientific research community to improve linkage technology, to advance the understanding of the statistical properties of linked data, and to fully exploit the many different research opportunities in the social and behavioral sciences that are uncovered by access to such data.

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