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Continued Development of the Medicaid Analytic Extract Enrollee Master (MAXEM) File

Final Report

May 27, 2011

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Shinu Verghese

MATHEMATICA
Policy Research, Inc.

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CONTENTS

TABLES

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EXECUTIVE SUMMARY

To provide health policy researchers with access to Medicaid administrative data in a form that is suitable for research, the Centers for Medicare & Medicaid Services (CMS) has funded and overseen the development of an annual Medicaid Analytic Extract (MAX). MAX includes enrollment and claims information for each person enrolled in Medicaid and a subset of those enrolled in the Children's Health Insurance Program (CHIP) through a separate child health program (S-CHIP). While the MAX data have supported extensive research on state Medicaid programs and enabled detailed cross-state comparisons, their application to national-level and longitudinal research has been limited by the fact that the files do not identify records belonging to the same individual over time or across states.

To address this limitation of the MAX data, CMS contracted with Mathematica Policy Research to design and implement a MAX Enrollee Master file (MAXEM) that would identify unique Medicaid enrollees both within and across states and provide a reliable means of linking the records of unique enrollees over time. In September 2010 Mathematica delivered the first MAXEM products, for calendar years 2005 and 2006. To continue the development of MAXEM, CMS contracted with Mathematica to create MAXEM research and cross-reference files for 2007. This report documents the results of that work.

Unduplication Methodology

The goal of unduplication in MAXEM is to determine which records in an annual MAX file and in MAX files from multiple years represent the same person. Once we have made this determination, by evaluating pairs of records to decide if they should be linked or not, we assign these records a common identifier—a MAXEM ID—that is unique to the person that these records represent.

MAXEM Linkage Algorithm. Several "linkage" variables are used to evaluate whether two records represent the same person. These are the Medicaid Statistical Information System (MSIS) ID, the MAX Social Security number (SSN), the Medicare Enrollment Database (EDB) SSN, the Health Insurance Claim number (HIC), and two demographic variables, date of birth (DOB) and sex. The algorithm links a pair of records if they agree on any one of the following:

- MSIS ID
- MAX SSN + sex + at least two of (DOB year, DOB month, DOB day)
- EDB-SSN + sex + at least two of (DOB year, DOB month, DOB day)
- EDB-HIC + sex + at least two of (DOB year, DOB month, DOB day)

The four criteria are applied sequentially. That is, all record-pairs are evaluated to determine which pairs satisfy the first criterion. Following that, the same record-pairs are evaluated to determine which pairs meet the second criterion, and so on. For record-pairs within the same state, 99 percent of the linkages are determined by the MSIS ID while for record-pairs from different states, 99 percent of the linkages are determined by the MAX SSN and the demographic variables, as the MSIS ID is state-specific and cannot be used to link records across states.

MAXEM 2005 and 2006. Before the first linkage pass, each record was assigned a preliminary MAXEM ID. For the initial implementation of MAXEM, this ID consisted of three components in the following order: (1) a scrambled state code, (2) a year code equal to the year less 2000, and (3) a record number from MAX. The sequence of components matters because each record is ultimately assigned the lowest of its preliminary MAXEM ID and all of the MAXEM IDs on the records to which it linked. Records were first linked within states, both within the same year and across years. At the conclusion of the within-state linkages the MAXEM IDs were reassigned, using the logic just described, and all records with the same MAXEM ID were edited to replace missing or inconsistent values for five of the linkage variables (all but the MSIS ID) and a race/ethnicity code. Records with the same MAXEM ID within a state and year were then consolidated (combined into a single record) so that any given MAXEM ID occurred no more than once within a state and year. After this, the unduplicated records were linked across states, both within and across years, but they were not edited and they were not consolidated. To produce unduplicated counts of Medicaid enrollees nationally, the number of states in which each MAXEM ID appeared was enumerated, and the inverse of this state count was used as a weight. When this weight was summed across all records, a MAXEM ID that appeared in two states would be counted twice with a weight of one-half each time, yielding a total count of one for that MAXEM ID.

MAXEM 2007. In developing MAXEM 2007, we made several adjustments to the procedures that were used to produce MAXEM 2005 and 2006 in addition to adding a third year of data. These included:

- Redefining the MAXEM ID to place the year component first
- Retaining records with no enrollment data through the unduplication process
- Assigning common MAXEM IDs at the conclusion of each major linkage step
- Applying a first round of editing to replace missing and inconsistent values immediately after the completion of linkages based on the MSIS ID rather than editing only at the conclusion of within-state linkages
- Editing MAXEM IDs to eliminate within-state duplicates created during cross-state linking

The last three revisions were designed to (1) reinforce the linkages that were based on the MSIS ID, which prior research had shown to be the most reliable of the four types of linkages allowed by our linkage algorithm, and (2) reduce the influence of incomplete or inconsistent linkage variables in determining what records are linked or not.

Implementation

The implementation of unduplication for MAXEM 2007 can be divided into unduplication within states and unduplication across states. These production activities were followed by an evaluation of the linkages before the final MAXEM data files were created.

Unduplication Within States

Eight states use SSNs as MSIS IDs. When new enrollees lack SSNs, temporary MSIS IDs are assigned, which the states later correct once the recipients have been issued SSNs. In many

cases the corrected MSIS IDs will not be identified until after the state has submitted the original records to CMS, so the state will compile and send corrections. For MAXEM 2007, we received corrections to 49,000 records from 2005 and 112,000 records from 2006. We applied these corrections and then ran our linkage program using just the MSIS ID within each of the states that submitted corrections. For the two years we identified 46,500 linked pairs.

Following these preliminary steps we performed the full cross-year linkages for all states, again using just the MSIS ID. We identified 50.3 million linked record-pairs between 2005 and 2006, another 50.3 million between 2006 and 2007, and 42.2 million between 2005 and 2007. In a change from MAXEM 2005 and 2006, we reassigned MAXEM IDs at this point and ran our edit routine in order to reduce inconsistencies among the remaining linkage variables. We then repeated the cross-year links using the three additional linkage criteria, which produced a total of 1.0 million new cross-year linkages. Reassigning MAXEM IDs at the end of this step produced a number of within-year linkages—about 421,000—between records that linked to common records in other years. We performed within-year linkages with these same three linkage criteria, obtaining 69,000 additional linkages. Overall, linkages by MSIS accounted for 99.3 percent of the cross-year linkages but only 8.7 percent of the within-year linkages.

To complete the within-state unduplication we reassigned MAXEM ID again, performed a second edit step, and then consolidated records within states. Consolidation removed 199,000 records from the 61.4 million MAX records in 2005; 179,999 records from 61.7 million MAX records in 2006; and 151,000 records from 61.7 million records in 2007.

Unduplication Across States

Records were linked across states, both within and then across years using the SSN and HIC criteria. Within year we identified a total of 4.1 million linked pairs over the three years, with 99.9 percent of them being based on the MAX SSN (with sex and DOB). Across years we identified more than twice that number for a total of 8.9 million over the three pairs of years. Here, too, 99.9 percent of the linked pairs were identified with the MAX SSN. MAXEM IDs were reassigned at the end of this process. Taking into account the duplicates across states, we identified 59.8 million unique individuals in the 2005 MAX data, 60.1 million in 2006, and 60.3 million in 2007.

Quality of Linkages Within States

We evaluated the quality of the linkages within states by comparing records linked by MSIS ID with respect to DOB and sex, which were not required to agree, and race/ethnicity and basis of eligibility (BOE). Only 58 percent of the records that were linked within state as a result of the state-supplied corrections had full agreement on DOB and sex while 90 percent had the same nonmissing MAX SSN. For record-pairs linked across years (for all states) by MSIS ID, 92 percent had the same, nonmissing MAX SSN, and 98.7 percent had the same DOB and sex. Agreement on race and BOE was lower. Depending on the pair of years, between 86 percent and 93 percent of record-pairs had the same race/ethnicity and BOE while another 7 to 8 percent agreed on one of the two variables with the other being missing.

Record-pairs that were linked by the other three linkage criteria could not be evaluated with respect to DOB and sex, as these were used as linkage variables. Agreement on race/ethnicity and BOE was 56.3 percent overall for cross-year linkages and 66 percent for within–year

linkages. Including cases that agreed on either race/ethnicity or BOE, with the other missing, raised the level of agreement to between 76 percent and 78 percent for cross-year links and 82 percent for within year links.

Quality of Linkages Across States

The record-pairs linked across states had somewhat higher levels of agreement on race/ethnicity and BOE than the record-pairs linked within states with the same variables (SSNs, HICs, and sex and DOB). For all within-year links, 73 percent agreed fully on race/ethnicity and BOE. For cross-year links, 72 percent agreed fully on these two variables. Adding cases that agreed on one of the two while the other was missing raised the levels of agreement to 84 percent and 85 percent, respectively.

About 10 percent of the records in 2005 and 2006 and 11 percent in 2007 were missing SSNs and therefore could not be linked to records in other states. Nearly two-thirds of the missing SSNs were from California, due in large part to a restricted benefits program in which immigrants could participate without providing SSNs. We estimated that 70,000 of the 6.1 million records with missing SSNs would have linked to records in other states if valid SSNs had been present.

Output Files

The files produced for this project include a MAXEM research file and a cross-reference file for each of the three years, 2005, 2006 and 2007. Each MAXEM research file contains one record for each unique person enrolled in Medicaid or S-CHIP (for states that submit S-CHIP data to MSIS) in each state in the indicated calendar year. The file includes the final MAXEM ID; the number of states in which that identifier was found on a Medicaid record and, separately, an S-CHIP only record; a subset of variables from the MAX PS files; and several variables created for MAXEM. The cross-reference file contains a record for every MAX PS record for the corresponding year. It includes the MSIS ID, state, and year (needed to link to the MAX PS file), the MAXEM ID, and an indicator identifying records with claims but no enrollment.

Medicaid Enrollment: Analyses with Unduplicated Data

Several analyses illustrate what can be learned about Medicaid enrollment patterns by reducing MAX data to unique enrollees.

Enrollees by Eligibility Group

Within the population of Medicaid enrollees there are differences in the impact of unduplication by eligibility group—that is, among the aged, disabled, child, and adult enrollees. In all three years, duplicate records among disabled and child enrollees occur at about twice the frequency as among aged enrollees and about 50 percent more often than among adult enrollees. In 2007, for example, duplicates within and across states accounted for 1.15 percent of aged enrollee records, 2.73 percent of disabled enrollee records, 2.61 percent of child enrollee records, and 1.56 percent of adult enrollee records.

Geographic Movement

The cross-state linkages performed as the final stage of the unduplication of Medicaid enrollment records provide detailed information on the movement of Medicaid enrollees between states. One way that such movement is reflected is in persons enrolled in more than one state in the same year. In 2005, 2.31 percent of the 59.8 million unique individuals in the MAX PS file had records in more than one state; in 2006, 2.23 percent of the 60.1 million unique enrollees had records in more than one state; and in 2007 1.98 percent of the 60.3 million unique enrollees had records in more than one state. Nevada and Wyoming led all states with six to seven percent enrolled in other states during the year. California was lowest with less than one percent enrolled in other states during any year while New York was next lowest with between 1.20 and 1.37 percent enrolled in other states. Four additional states—Hawaii, Massachusetts, Michigan, and Pennsylvania—had less than two percent of their enrollees enrolled in other states.

When we link records across states over time, we are able to separate the flows of enrollees from state A to state B from the flows of enrollees from state B to state A. Over the three years the largest movement was that of 66,000 individuals from Louisiana to Texas between 2005 and 2006, reflecting the impact of Hurricane Katrina. The second largest flow in that year was 45,000 persons in the reverse direction. Three other pairs of states had flows in excess of 30,000 in at least one pair of years. About 35,000 enrollees moved from California to Arizona between 2005 and 2007. Over that same period, nearly 33,000 moved from New York to Florida, and more than 30,000 moved from Florida to Georgia. All three pairs of states had smaller but still substantial flows of enrollees in the reverse direction over the same years. Most of the remaining large flows involved a fairly small set of states, and most of these shared borders.

We calculated migration rates out of and into each state for each pair of years. Nevada and Wyoming stand out with double-digit rates in both directions in all three pairs of years. Louisiana had an out-migration rate of 12 percent and an in-migration rate of nearly 10 percent between 2005 and 2006 but smaller rates in later years. California had the lowest migration rates in both directions in all three pairs of years, with out-migration of about 2 percent and in-migration hovering around 1.5 percent. New York also had comparatively low migration rates in both directions, as did Pennsylvania, Maine, Massachusetts, Vermont, Michigan and Hawaii.

States' outflows and inflows were generally comparable to each other, regardless of magnitude. Only three states and the District of Columbia had net in-migration rates (in-migration minus out-migration) in excess of two percent in either direction for any pair of years, and none of the four did so in more than one pair of years. Household survey data from the American Community Survey (ACS), which asks respondents where they lived one year ago, shows similar patterns among persons who were enrolled in Medicaid at the time of the survey. While the ACS captures a lower volume of migration (in part because in asking about location one year earlier it misses seasonal migration), it too shows flows of similar magnitude in both directions in a substantial majority of states as well as generally low net migration.

Turnover in Medicaid Enrollment

With Medicaid records that have been unduplicated at the state and national levels, it becomes possible to examine turnover in Medicaid enrollment more rigorously than with other Medicaid administrative data.

Comparisons of annual-ever enrollment and average monthly enrollment in 2005 show differing amounts of turnover by age. For all ages combined the ratio of the former to the latter is 1.26, implying that annual-ever enrollment was 26 percent higher than average monthly enrollment. For children, annual-ever enrollment is 23 percent higher than average monthly enrollment. For nonelderly adults, annual-ever enrollment is 32 percent higher than average monthly enrollment; for elderly adults, annual-ever enrollment is 15 percent higher. Removing enrollees who received institutional care has no discernible effect except among the elderly; annual-ever enrollment among the non-institutionalized is 14 percent higher than average monthly enrollment.

Using records that were unduplicated within each state, we estimated the combinations of years that unique enrollees were enrolled within the same state. Of those who were enrolled in 2005, 82.2 percent were still enrolled one year later, and 66.8 percent were still enrolled two years later (that is, enrolled in all three years). A very small fraction, 2.0 percent, were not enrolled in 2006 but resumed enrollment in 2007 while 15.8 percent were not enrolled in either 2006 or 2007. Among those who were enrolled in both 2005 and 2006, 81.2 percent remained enrolled for an additional year. That this is barely lower than the proportion of 2005 enrollees who were still enrolled a year later suggests that the rate of disenrollment from Medicaid may not increase appreciably with the duration of enrollment.

The possibility that former Medicaid enrollees whose coverage has ended may remain on the rolls in some states has been suggested as a possible explanation for why survey estimates of Medicaid coverage do not compare more closely with program administrative estimates. To evaluate this idea, we examined patterns of service use in 2007 by enrollment duration and the number of states in which an individual was enrolled. With respect to duration of enrollment, we found that in all but three states, service use was higher among enrollees with three or more consecutive years of coverage than among those enrolled for just a single year. This runs counter to the prediction, but this evident tendency for service use to increase with years of enrollment would obscure any reduction in service use due to persons remaining on the rolls past the end of their eligibility. With respect to the number of states in which an individual was enrolled, however, we do find that service use declined between those enrolled in only one state and those enrolled in three or more states. This may indicate simply that people enrolled in multiple states distribute their annual service use across the states, but further investigation with more extensive measures of service use and with the expenditure data available in the MAX files could shed further light on this finding.

Conclusion

We are highly satisfied with how our revised procedures performed for MAXEM 2007. If CMS elects to add a fourth year to MAXEM, we recommend that MAXEM 2008 be produced using the methods that we refined for MAXEM 2007 except that we would start by assigning each record from 2005 through 2007 its final MAXEM ID. In this way, only records that did not already share the same MAXEM ID could be linked to each other. If MAXEM continues beyond 2008, we recommend that serious consideration be given to the construction of a cumulative cross-reference file as the way to assign MAXEM IDs to future MAXEM files.

I. INTRODUCTION

To provide health policy researchers with access to Medicaid administrative data in a form that is suitable for research, the Centers for Medicare & Medicaid Services (CMS) has funded and overseen the development of an annual Medicaid Analytic Extract (MAX). MAX includes enrollment and claims information for each person enrolled in Medicaid and a subset of those enrolled in the Children's Health Insurance Program (CHIP) through a separate child health program (S-CHIP) during a calendar year.[1] To produce MAX, quarterly state Medicaid Statistical Information System (MSIS) submissions are aggregated into calendar year files and retroactive records, correction records, and adjustments are applied. Other corrections and enhancements are also made to improve the usefulness of the files for research. While the MAX data have supported extensive research on state Medicaid programs and enabled detailed cross-state comparisons, their application to national-level and longitudinal research has been limited by the fact that the files do not identify records belonging to the same individual over time or across states.

To address this limitation of the MAX data, CMS contracted with Mathematica Policy Research to design and implement a MAX Enrollee Master file (MAXEM) that would identify unique Medicaid enrollees both within and across states and provide a reliable means of linking the records of unique enrollees over time. In September 2010 Mathematica delivered the first MAXEM products, for calendar years 2005 and 2006. For each year, Mathematica produced two data files: (1) a MAXEM research file, consisting of one record for each unique person enrolled

[1] States can administer CHIP through a Medicaid expansion program (M-CHIP), which provides full Medicaid benefits, a separate state program designed by the state, or a combination of the two. States are required to submit enrollment and claims data for M-CHIP, but the submission of data for S-CHIP is optional, and many states with separate child health programs choose not to submit S-CHIP data.

in Medicaid or S-CHIP (the latter for just those states that submit S-CHIP data to MSIS) and (2) a MAXEM cross-reference file that maps the MAX Person Summary (PS) file for that year into the MAXEM research file by providing MAXEM's unique person-level identifier for each MAX PS record.

To continue the development of MAXEM, CMS contracted with Mathematica to create MAXEM research and cross-reference files for 2007. This report documents the results of that work. In this introductory chapter, Section A provides additional background on the initial implementation of MAXEM for 2005 and 2006. Section B outlines Mathematica's approach to extending MAXEM to 2007. Then, Section C reviews the organization of this report.

A. Background on MAXEM 2005 and 2006

Central to the development of MAXEM is the determination of which records in the MAX files refer to the same person. This requires variables that can reliably and uniquely identify each Medicaid enrollee. Accordingly, the first task in the development of MAXEM 2005 and 2006 was an evaluation of the strengths and limitations of state-reported identifiers contained in MAX. We concluded that five personal identifiers—the MSIS ID, Social Security number (SSN), health insurance claim number (HIC), date of birth (DOB), and sex—could be used to link MAX records within states, and that the last four of these could be used to link MAX records across states. The MSIS ID assigned by the state is designed to uniquely identify each enrollee within that jurisdiction, so it is highly effective in linking enrollee records within a state, but it is of no use in linking enrollee records across states. SSNs collected during Medicaid enrollment are available for most enrollees. SSNs are also obtained independently from Medicare Enrollment Database (EDB) records that have been merged with the Medicaid records for Medicare enrollees. The EDB is the most reliable source of the HIC.

After reviewing alternative algorithms that might be used to link records based on these five fields, we selected an algorithm that CMS has used to link Medicare records, but modified it to better suit the linking of Medicaid records. The final algorithm allows a pair of records to be linked if they agree on any one of the following:

- MSIS ID
- MAX SSN + sex + at least two of (DOB year, DOB month, DOB, day)
- EDB-SSN + sex + at least two of (DOB year, DOB month, DOB, day)
- EDB-HIC + sex + at least two of (DOB year, DOB month, DOB, day)

This algorithm was applied first to link records within states, both within and across years, and then to link records across states.

Over the two years we found comparatively few linked pairs within a state and year—only 327,000 out of 121 million records. MSIS IDs are not duplicated on MAX files within a state and year, but some duplicates were created in MAXEM processing when we applied corrections to temporary IDs supplied by the states. These duplicates accounted for 5.17 percent of the total pairs that were linked within state and year for the two years. Net additional links by MAX SSN accounted for 93.15 percent of the two-year total, with another 1.37 percent linked by EDB-SSN and the remaining 0.31 percent by EDB-HIC. In eight states, however, links by EDB-SSN and EDB-HIC accounted for more than half of the within-year total, implying that most of the within-year duplication in these states occurred among beneficiaries dually enrolled in Medicaid and Medicare.

While within-year links were comparatively rare, high rates of enrollee retention were responsible for a substantial number of linkages across years. We identified 50.2 million linked pairs between the two years, which means that 83 percent of the 60.5 million enrollee records in 2005 linked to records in the same state in 2006. Virtually all of these links—99.38 percent—were based on MSIS ID. The proportion of enrollee records in 2005 that linked to records in

2006 did not vary greatly among the states. All but a handful of states had rates between 79 and 87 percent, but there were outliers, with Louisiana the highest at 90 percent and Nevada the lowest at 68 percent. The narrow distribution of across-year linkage rates implies considerable similarity in caseload turnover across states.

After the within-state record linkage was complete, the process of unduplicating records identified as representing the same individual within each state involved three steps: (1) assignment of a common MAXEM ID to all records representing the same individual, (2) reconciliation of identifiers and demographic variables across records with the same MAXEM ID, and (3) consolidation of linked records within the same year into a single record per MAXEM ID. Step 2 involved the replacement of missing or inconsistent values with a single value for each of six fields: MAX SSN, EDB-SSN, EDB-HIC, sex, DOB, and race/ethnicity. This value was determined by an algorithm that selected the latest nonmissing value—that is, the value from the record with the latest month of enrollment among records with nonmissing values for the field in question. If at least one of the records sharing a common MAXEM ID was an EDB dual record, then the latest such record with a nonmissing value was selected over a later non-dual record. Because the algorithm favored later over earlier values, the replacement of inconsistent values was much less frequent in 2006 than in 2005.[2] This implies that the addition of 2007 data to MAXEM will yield substantially more corrections to the 2006 data.

Records were linked across states in order to produce an unduplicated count of enrollees in each year for the entire United States. These linkages could not use the MSIS ID, as it is assigned at the state level. That is, an individual who enrollees in Medicaid in two different states will be assigned two different MSIS IDs. For the nation as a whole and in virtually every

[2] *Missing* values were replaced, if possible, regardless of where they occurred, but if the value of the DOB differed between a 2005 and a 2006 record, the 2005 value would have been the one defined as inconsistent.

state, 99.9 percent of the across-state linkages were due to the MAX SSN (combined with DOB and sex).

On average, 4.2 percent of enrollee records in the two years linked to a record in another state in the same year, which means that about half that fraction of individual enrollees were enrolled in two or more states in the same year. An additional 0.4 percent of records in 2005 linked to a record in another state in 2006. For the across-year linkages we can identify an origin (2005) and a destination (2006) state. California and New York had pronounced net out-migration among enrollees, while Nevada, Oklahoma, Tennessee, and Wyoming had pronounced net in-migration.

Linkages of records across states are potentially more problematic than linkages within states because cross-state linkages have not been validated by the states through the assignment of common Medicaid identifiers. Because the linkages across states depend almost entirely on SSNs, missing or incorrect SSNs will depress linkage rates. After the reconciliation process described above, when missing SSNs were replaced with nonmissing SSNs from records linked within states, 9.2 percent of SSNs were still missing in 2005 and 9.8 percent were missing in 2006. About two-thirds of the missing SSNs were in California, where enrollees who qualify for limited benefits that are available only in that state are not required to provide SSNs. This subset of beneficiaries may be unlikely to qualify for Medicaid should they move to other states. If so, most of the missing SSNs from California will have little impact on linkage rates across states. Based on this assumption, we estimated that only 3 to 4 percent of the enrollees who were enrolled in multiple states could not be identified because of missing SSNs.

Our principal findings from this initial implementation of MAXEM can be expressed in terms of the impact of unduplication on the estimated number of unique individuals enrolled in

Medicaid in 2005 and 2006.[3] Eliminating duplicate records within each state and year had a very small impact on the total number of records retained in the MAXEM files. We removed 181,000 records or 0.30 percent of the initial total records in 2005, and 137,705 or 0.23 percent of the initial total records in 2006. Unduplication across states did not entail removing any records but, rather, counting each unique individual only once in a national total for a given year. Our unduplicated count of Medicaid enrollees nationally in 2005 was 2.34 percent lower than the total number of Medicaid enrollment records across the states after eliminating duplicate records within states. Our unduplicated count of Medicaid enrollees nationally in 2006 was 2.25 percent lower than the total number of Medicaid enrollment records after removing the within-state duplicates. The combined effect of unduplication within and across states was to reduce the estimated number of Medicaid enrollees nationally by 2.64 percentage points in 2005 and by 2.48 percentage points in 2006.

B. Extending MAXEM to 2007

In the course of producing MAXEM 2005 and 2006, we identified two aspects of our unduplication methodology that should be revisited at the next opportunity: the sequence of state and year codes in the MAXEM ID and how we dealt with inconsistencies among the linkage variables, which could result in asymmetric linkages where, for example, record A links to records B and C but record B does not link to record C (Czajka, Wenzlow and Sykes 2010). In our analysis plan for MAXEM 2007 we identified several additional aspects of the methodology that warranted review. These included the pair-wise linking approach, the sequence of linkages, whether to incorporate edits to the linkage variables into subsequent linkages, and whether links by MSIS ID should require agreement on sex and date of birth, which they did not require in the

[3] The estimates include persons enrolled only in S-CHIP in those states that report their S-CHIP enrollment in MSIS.

2005 and 2006 implementation (Czajka 2010). While the objective of the current task is to extend MAXEM to 2007, any change to our methodology would have implications for links created (or not created) in MAXEM 2005 and 2006. Even with no changes to the unduplication methodology, the information contained in the 2007 MAX file could change a previously nonlinked pair into a linked pair or change a linked pair into a nonlinked pair. At a minimum, such information could enable us to edit previously unedited data in the 2006 MAXEM file and possibly even the 2005 file as well.

In addition, each year a small number of states submit corrections to their MSIS IDs for the previous year, but these corrections lag the availability of MAX data by at least a year. For example, when we produced the MAXEM files for 2005 and 2006, we made use of corrections to the MSIS IDs in the 2005 MAX data from eight states, but we had not yet received corrections to the 2006 MAX data. By the time we began production of MAXEM 2007, we had received the states' corrections to the MSIS IDs in their 2006 MAX data, but we also discovered that the states had submitted additional corrections to their 2005 MAX data. At a minimum, then, there are potential changes to the 2005 and 2006 MAXEM data from the additional information that became available in the next year.

To take advantage of this additional information and because we decided to modify aspects of our unduplication methodology, in addition to extending MAXEM to 2007, we also recreated MAXEM files for both 2005 and 2006.

C. Organization of This Report

Chapter II discusses the overall methodology for unduplicating records in MAXEM 2007 and creating the final MAXEM products. Revisions to the methodology from the initial implementation of MAXEM for 2005 and 2006 are noted and explained. Chapter III describes the implementation of this methodology, with documentation of the process and results at each

step. Chapter IV presents findings from several analyses of Medicaid enrollment using the unduplicated data. Chapter V reviews the modifications to our procedures for this extension of MAXEM to 2007 and recommends an approach to MAXEM 2008 should CMS elect to continue the development of MAXEM through at least another year. Appendix A contains state-level tables that supplement the tables presented in Chapter III, and Appendix B includes additional state-level tables that accompany Chapter IV.

II. UNDUPLICATION METHODOLOGY

The goal of unduplication is to determine which records in an annual MAX file and which records in MAX files from multiple years represent the same person. Having made this determination, we assign these records a common identifier—a MAXEM ID—that is unique to the person that these records represent. How to get to this final result is the challenge that must be addressed in developing a methodology for unduplication of MAX data.

As we worked through the production of MAXEM 2005 and 2006, we made note of aspects of the unduplication methodology that we might want to reconsider when we extended MAXEM to 2007. Other issues emerged as we considered how the addition of a third year could best be accomplished and recognized that the addition of a third year had to include recreating the 2005 and 2006 MAXEM data. This chapter reviews how we addressed all of these issues in developing an unduplication methodology for MAXEM 2007. Section A discusses the issues that arose from our experience with MAXEM 2005 and 2006. Section B provides an overview of the unduplication methodology for MAXEM 2007.

A. Issues Arising from MAXEM 2005 and 2006

Before determining the final unduplication methodology for MAXEM 2007, we revisited several aspects of the methodology used in creating MAXEM 2005 and 2006. We focused on areas where issues emerged during or after the production of MAXEM 2005 and 2006. Below we discuss the issues that we considered in developing the final methodology for MAXEM 2007. Many of these issues are interrelated, so there is no best order for discussing them. We begin with the concept of pair-wise linking that is the foundation of our unduplication methodology and then discuss the construction of the MAXEM ID—specifically, the sequence of state and year codes. Next we consider the problem of inconsistent data, which underlies many of the subsequent issues. Following that we discuss the treatment of records that have only claims data.

From there we move to a consideration of the sequence of linkages and, following that, whether edits to the linkage variables should be used in subsequent linkages. After that we discuss whether agreement on demographic variables should be required of linkages based on the MSIS ID. We conclude with a discussion of duplicate MAXEM IDs within the same state and year, which are an unintended byproduct of linking records across states.

1. Pair-wise Linking

Our approach to unduplicating the 2005 and 2006 MAX files was built on the construction of linked pairs. In effect, we identified records belonging to the same individual by comparing records two at a time. Every record in a specified set (for example, records in the same state in the same year) was paired with every other record in the same set or a different set, depending on the stage of the linkage process, and specific linkage variables were compared to determine which pairs of records should be retained as linked pairs representing the same individual. Separate linkage steps were conducted to identify linked pairs among records in the same state and year; in the same state but different years; in different states in the same year; and in different states in different years. In the end, each linked pair of records was assigned a common MAXEM ID. If two records linked to a third record, all three received the same MAXEM ID. Likewise, if two records linked to three other records, then all five were assigned the same MAXEM ID.

The principal alternative to linking records two at a time is to construct a large index file that contains the universe of MAXEM IDs and, for each ID, a set of identifiers found in MAX data that uniquely describe the individual to whom that MAXEM ID is assigned. To unduplicate the records in a MAX file, one would first "look up" or find each MAX file record in the index file, based on the set of identifiers (presumably the same variables used in pair-wise linking) to

determine that record's MAXEM ID. All records that were assigned the same MAXEM ID would be linked, in effect, by their common ID.

Ideally, the index file would be constructed independently of the MAX data, and the identifying variables would be recorded with no error. Potential matches to the index file could be evaluated with respect to how closely they matched the "true" values in the index file. The Census Bureau uses this general approach to link data from its household surveys with administrative records from a variety of sources. The index file in this case is based on the Social Security Administration's Numident file, which contains data from applications for SSNs, but the Census Bureau has expanded the set of personal characteristics to include additional variables commonly collected in the Bureau's surveys. In addition, as a data security measure, the Census Bureau has created its own unique identifier that is not used anywhere outside of the Census Bureau, but once a record has been assigned this unique identifier (by being matched to the index file), it can be linked to records in other survey or administrative files that have been assigned the unique identifier as well.[4]

For years, CMS contractors have used an analogous approach to assign unique identifiers to MAX PS records when they are loaded into the Chronic Conditions Data Warehouse. The beneficiary ID created for this purpose is a CMS construct that is used solely for this purpose. The index file in this case is a cumulative, historical file of Medicaid and Medicare enrollee data.

The challenge in building an index file of this nature is securing suitable data with which to populate the index records. The best data to which CMS has ready access comes from the Medicare program, which is administered—by CMS—at the national level. Only a small portion

[4] Record linkage activities at the Census Bureau are tightly controlled and limited to purposes that serve the needs defined in the legislation that authorizes such activity.

of the Medicaid population is covered by Medicare, however, which limits the usefulness of the Medicare data in developing an index file for Medicaid enrollees. If we were to construct an index file as the basis for assigning the MAXEM ID, we would have to use the MAX data for this purpose. In reviewing potential design changes for MAXEM 2007, we concluded that the pair-wise linkage approach still provided the better mechanism for unduplicating MAX data, and based on our experience with MAXEM 2005 and 2006 we felt that we had a good grasp of its strengths and limitations. Its major limitations derive from incomplete and inconsistent data on the MAX records themselves, discussed below. These data issues would continue to present problems if we based our approach on an index file instead of pair-wise linking; they would just be manifested differently, which would require that we develop new strategies to address them. But see Chapter V for a discussion of potential future consideration of an index-based approach.

2. Construction of the MAXEM ID

The preliminary MAXEM ID that is assigned to every record consists of three parts: (1) a scrambled state code, (2) a year code equaling the year minus 2000, and (3) a record number from MAX. Because each record is ultimately assigned the lower of its initial MAXEM ID and the lowest MAXEM ID among the set of records to which it links, the sequence of the three components of the MAXEM ID affects which MAXEM IDs are assigned under different circumstances. For example, for linkages occurring within a state (the vast majority of linkages), the state portion of the ID is irrelevant because it is the same for every record; if records are linked across years, therefore, the earlier record's MAXEM ID will take precedence. For linkages *across* states, however, the final MAXEM ID assignments will favor the lower scrambled state code in every case, even if the records are from different years.

Moving the year code to the front of the MAXEM ID would affect which MAXEM IDs are assigned, ultimately, to records that link to records in other states. Thus, a 2007 record that

linked to a 2005 record would receive the earlier record's MAXEM ID regardless of whether the link was within or across states. This would be a minor change, as most records in MAXEM 2007 will link to records from 2005 within the same state and, therefore, would receive their final MAXEM IDs from 2005 records regardless. But implementing this change would ensure that if a fourth year were added to MAXEM, very few MAXEM IDs on records from the first three years would change. For this last reason we elected to move the year code to the front of the MAXEM ID.

3. Inconsistent Data

As described in Chapter I, the linkage algorithm used for MAXEM 2005 and 2006 allowed a pair of records to be linked if they agreed on any one of the following:

- MSIS ID
- MAX SSN + sex + at least two of (DOB year, DOB month, DOB day)
- EDB-SSN + sex + at least two of (DOB year, DOB month, DOB day)
- EDB-HIC + sex + at least two of (DOB year, DOB month, DOB day)

In applying this algorithm, we first identified all linked pairs based on the MSIS ID, then cycled back through the data to identify all linked pairs based on MAX SSN and the demographic variables, then made a third pass to identify all linked pairs based on the EDB-SSN and the demographic variables, and, finally, made a fourth pass to identify all linked pairs based on the EDB-HIC and the demographic variables. When we identified a linked pair, we wrote a record containing data from both records as well as the source of the link. If the same pair of records was linked on more than one variable or combination of variables, only the first linked record was retained.

Because of errors in the linkage variables on the MAX PS record, it is possible that a record, A, might link to a second record, B, on the MSIS ID, but the two records might have divergent values for one or more other linkage variables. Record A might then link to a third record, C, on

the MAX SSN, sex, and DOB but not on the MSIS ID. Record B, with a slightly different MAX SSN than record A, would not link to record C at all. For MAXEM 2005 and 2006 we did not develop a rule for resolving such inconsistencies. Instead, we allowed such cases to be resolved in the same way as all other linked pairs. If record A had the lowest MAXEM ID, all three records would be assigned record A's MAXEM ID because both B and C were linked to record A. If record B had the lowest MAXEM ID, records A and B would end up with record B's MAXEM ID while record C received the lower of its own MAXEM ID and that of record A, with which it linked. If record C had the lowest MAXEM ID, then records A and C would be assigned record C's MAXEM ID while record B was assigned the lower of its own MAXEM ID and that of record A.

Letting the outcome of an asymmetric set of linkages be determined by which record has the lowest MAXEM ID was not a particularly satisfying way of resolving the inconsistent linkage outcomes. We would have preferred to have had an evidence-based rule for selecting one link (or set of links) over the other alternatives. That is, we would have preferred to have had an empirical basis for determining which of the possible outcomes was most likely to be correct. In the absence of such evidence, choosing an outcome based on the lowest MAXEM ID would be acceptable if the assignment of the MAXEM ID were random. For linkages within the same state and year, the MAXEM ID *is* effectively random, but for linkages across years within the same state, a 2005 MAXEM ID will be lower than a 2006 MAXEM ID; and for linkages across states, the lower MAXEM ID will be determined by the scrambled state code and thus will vary with the states involved.

How often did inconsistent data values occur in developing MAXEM 2005 and 2006, and how many linked pairs were potentially affected? Table II.1 presents estimates of agreement on

Table II.1. Agreement on ID Variables among Record-Pairs Linked by MAXEM ID Within State, 2005

Agreement on Linkage Variables	Number	Percent of Linked Pairs
All Pairs Linked in 2005	180,478	
Pairs Linked by MSIS ID	16,905	
Both MAX SSNs are nonmissing and agree	16,898	99.96
Both MAX SSNs are nonmissing and disagree	1	0.01
One MAX SSN is missing, the other is not	6	0.04
Both MAX SSNs are missing	0	0.00
Both EDB-SSNs are nonmissing and agree	399	2.36
Both EDB-SSNs are nonmissing and disagree	18	0.11
One EDB-SSN is missing, the other is not	239	1.41
Both EDB-SSNs are missing	16,249	96.12
Both EDB-HICs are nonmissing and agree	427	2.53
Both EDB-HICs are nonmissing and disagree	45	0.27
One EDB-HIC is missing, the other is not	313	1.85
Both EDB-HICs are missing	16,120	95.36
All three IDs agree or are missing on both records	16,519	97.72
One of IDs does not agree (including one missing, one not)	151	0.89
Two of IDs do not agree	234	1.38
All three of IDs do not agree	1	0.01
Pairs That Differ on MSIS ID but Agree on MAX SSN	163,573	
EDB-SSNs and EDB-HICs agree or are missing	157,002	95.98
EDB-SSNs do not agree; EDB-HICs agree or both missing	161	0.10
EDB-HICs do not agree; EDB-SSNs agree or both missing	106	0.06
EDB-SSNs do not agree and EDB-HICs do not agree	6,304	3.85

the ID variables among record pairs that were linked by MAXEM ID within state in 2005. Out of 180,478 total record-pairs, 16,905 were linked by MSIS ID (all of these were the result of corrections to MSIS IDs submitted by a handful of states) and 163,573 were linked by MAX SSN instead. Of those that were linked by MSIS ID, 99.96 percent (all but seven records) also agreed on MAX SSN.[5] Disagreement on EDB-SSN or EDB-HIC when they were not missing was also rare—only 0.11 percent of the pairs had nonmissing EDB-SSNs that differed, and only 0.27 percent of the pairs had nonmissing EDB-HICs that differed. More commonly, an EDB-based ID was present on one record but missing on the other. This, too, could lead to different

[5] Edits may have increased the agreement on MAX SSN. All but one of the states that submitted corrections to MSIS IDs use the SSN as an MSIS ID. For these states we corrected SSNs along with MSIS IDs.

linkage outcomes based on these alternative IDs, but not as consistently as having different nonmissing values. For 1.41 percent of the pairs, an EDB-SSN was present on one record but missing on the other. This fraction was 1.85 percent for the EDB-HIC. Treating a combination of missing and nonmissing values as nonagreement, 0.89 percent of the pairs linked by MSIS ID did not agree on one of these IDs, and 1.38 percent differed on two. Altogether, 2.28 percent of the pairs that were linked by MSIS ID had a difference on one of the other ID fields that could potentially result in one but not both of the records in a pair being linked to a third record.

For pairs that were linked by MAX SSN instead of MSIS ID, disagreements on EDB-SSN or EDB-HIC were more common. In all, 4.02 percent of the record pairs had some form of disagreement on one or both of these ID fields.

Linkages within state but across years (between 2005 and 2006) were vastly more common than linkages within year: 50.195 million versus 0.180 million. Virtually all of these linkages (49.887 million) were based on MSIS ID (Table II.2). Disagreements on MAX SSN or EDB-SSN, including one value being missing while the other was not, were present in about half a percent of the linked pairs in each case. Disagreements on EDB-HIC were observed in just over 0.9 percent of the pairs. Overall, almost 1.5 percent of the 49.887 million pairs had disagreements on at least one of the ID fields. For pairs that linked on MAX SSN instead of the MSIS ID, just over 2.5 percent differed on EDB-SSN or EDB-HIC. Again, these differences represent a potential for one member of a pair to link to a third record to which the other member of the pair does not link.

While these results suggest potential magnitudes, section 6 below provides estimates of how often record-pairs that linked on one or more of the four conditions in our linkage algorithm ended up with different MAXEM IDs. These estimates suggest that data inconsistencies are a problem primarily for within-year linkages and only in 2006, where we know that there were few

edits to correct inconsistent values. For MAXEM 2007 we modified our unduplication procedures, as discussed in Section B, to reduce potential inconsistencies among records before conducting the next linkage step.

Table II.2. Agreement on ID Variables Among Record-Pairs Linked by MAXEM ID Within State Between 2005 and 2006

Agreement on Linkage Variables	Number	Percent of Linked Pairs
Pairs Linked Within State Between 2005 and 2006	50,194,517	
Pairs Linked by MSIS ID	49,887,151	
Both MAX SSNs are nonmissing and agree	46,090,047	92.39
Both MAX SSNs are nonmissing and disagree	32,788	0.07
One MAX SSN is missing, the other is not	215,247	0.43
Both MAX SSNs are missing	3,549,069	7.11
Both EDB-SSNs are nonmissing and agree	8,600,764	17.24
Both EDB-SSNs are nonmissing and disagree	447	0.00
One EDB-SSN is missing, the other is not	233,024	0.47
Both EDB-SSNs are missing	41,052,916	82.29
Both EDB-HICs are nonmissing and agree	8,736,212	17.51
Both EDB-HICs are nonmissing and disagree	17,656	0.04
One EDB-HIC is missing, the other is not	439,499	0.88
Both EDB-HICs are missing	40,693,784	81.57
All three IDs agree or are missing on both records	49,170,972	98.56
One of IDs does not agree (including one missing, one not)	495,354	0.99
Two of IDs do not agree	219,168	0.44
All three of IDs do not agree	1,657	0.00
Pairs That Differ on MSIS ID but Agree on MAX SSN	307,366	
EDB-SSNs and EDB-HICs agree or are missing	299,303	97.38
EDB-SSNs do not agree; EDB-HICs agree or both missing	252	0.08
EDB-HICs do not agree; EDB-SSNs agree or both missing	713	0.23
EDB-SSNs do not agree and EDB-HICs do not agree	7,098	2.31

4. Treatment of Records with Only Claims Data

The MAX PS files include a number of records that contain claims data but no enrollment information. In 2005 there were 914,000 such records, or about 1.5 percent of the universe of 61.4 million MAX PS records. These records frequently lack all of the linkage variables other than the MSIS ID, which they are required to have. Because enrollment variables account for a major portion of the variables on the MAXEM research files, claims-only records are excluded from the research files. For this reason, we removed the claims-only records before we initiated

the linkage operations for MAXEM 2005 and 2006. After the unduplication process was complete, we added the claims-only records to the MAXEM cross-reference file for each year. Each such record retained its unique MAXEM ID, which did not appear on any other record in 2005 or 2006.

While claims-only records have no enrollment data, they have MSIS IDs, which can be used to link them to other records in the same state in other years. Virtually none of these records have any additional linkage variables, however. In 2005, just 9,036 records that lacked enrollment data had MAX SSNs, DOB, and sex—less than 1 percent of the total. Thus, very few of the claims-only records have any possibility of being linked to records in other states, whether in the same year or other years. Nevertheless, if the claims-only records were included in the linkage process, their MAXEM IDs could be used by researchers to locate associated records in the same year or other years, and the MSIS IDs and state codes on the cross-reference file would provide access to their full MAX data. Our decision, then, was to include these records in the linkage process.

5. Sequence of Linkages

For MAXEM 2005 and 2006, we pooled records across the two years when we performed the within-state linkages. This eliminated a step that would have been necessary had we separated the within-year and cross-year linkage operations; in the absence of errors in the linkage variables, performing these operations jointly rather than separately would have had no impact on the final MAXEM ID assignments. But in light of the data inconsistencies documented above, it was important to ask whether separating the within-year and cross-year linkages—if combined with other revisions—might afford a better chance of minimizing the impact of errors.

A factor to consider in addressing this question is that linkages between consecutive years within a state are very common, while linkages within the same year within a state are exceedingly rare. One inference that might be drawn from these relative frequencies is that within-year linkages should be viewed more critically than cross-year linkages. This would suggest that inconsistencies be identified and evaluated rather than simply allowed to resolve themselves through the assignment of common MAXEM IDs. At the same time, however, we acknowledge that we lack concrete evidence that the within-year linkages that we produced for 2005 and 2006 were any less reliable than the much more numerous cross-year linkages.

Despite this uncertainty, we opted to modify the sequence of linkage steps, as described in Section B.

6. Incorporating Linkage Variable Edits into the Linkages

Following the within-state linkages, we edited missing and incorrect values of all of the linkage variables except the MSIS ID, but these edits were not allowed to affect the within-state linkage outcomes—at least not directly. That is, we did not rerun any of the within-state linkage programs after making the edits. The edited values were used in the subsequent cross-state linkages and may have altered some within-state linkages, but we did not monitor the impact of within-state edits on the cross-state linkages. Perhaps more commonly, the edits may have generated inconsistencies between linkage outcomes and agreement on the linkage variables measured after the linkages were complete.

Working with the final MAXEM research files for 2005 and 2006, we estimated the number of record-pairs that would link based on any of the four criteria, yet had different MAXEM IDs. These pairs reflect edits of the kind we have described, as well as inconsistencies that were unaffected by editing. Within state, we found only 17 such pairs in 2005 but 5,170 in 2006 (two-thirds of them in Wisconsin). We identified another 3,120 pairs that linked between 2005 and

2006. Across states there were substantially fewer: 31 in 2005, 34 in 2006, and just 8 between 2005 and 2006. While these numbers are dwarfed by the numbers of Medicaid records in each year, the within-state pairs in 2006 represent 3.6 percent of the 144,000 linked pairs in that year—hardly a negligible fraction. This suggested that it would be worthwhile to reconsider how we deal with inconsistent linkages in determining the final MAXEM ID assignments. Possible strategies besides changing the sequence of linkage operations include implementing edits to variables before we link on those variables, "locking in" particular types of linkages so that they are not undone by subsequent linkages, and conducting more extensive reviews of intermediate linkage outcomes. The changes that we implemented are detailed in Section B.

7. Should Links by MSIS ID Require Agreement on Sex and DOB?

Linkages based on the MAX SSN, EDB-SSN, or EDB-HIC require agreement on sex and at least two of the three parts of the DOB, but linkages by MSIS ID do not. Is the MSIS ID so reliable as a basis for linking records within states that any such restrictions are unnecessary, or could the within-state linkages be improved by requiring at least some level of agreement on these additional characteristics? Table II.3 breaks down all within-state linked pairs, prior to consolidation within state and year, by the source of their linkage and the extent of agreement on sex and DOB. For pairs that were linked by identifiers other than the MSIS ID, only the DOB could differ, and only on one part. For pairs that were linked by MSIS ID, however, any amount of disagreement on sex and DOB was allowable under the MAXEM linkage algorithm.

Table II.3. Linked Pairs Within State by Agreement on Linkage Variables

Description of Linkage	Number of Linked Pairs	Percent of Total Linked Pairs	Percent of Pairs Linked by MSIS ID
Total Linked Pairs	50,526,468	100.000	
Pairs linked by MSIS ID	49,904,056	98.768	100.000
Agree on sex and 3 parts DOB	49,671,972	98.309	99.535
Agree on sex and 2 parts DOB	86,596	0.171	0.174
DOB and/or sex different or missing	145,488	0.288	0.292
DOB and sex differ	38,861	0.077	0.078
DOB differs; sex agrees	19,351	0.038	0.039
Sex differs; 2 or 3 parts DOB agree	894	0.002	0.002
DOB missing	73,683	0.146	0.148
Sex missing; DOB differs	11,267	0.022	0.023
Sex missing; 2 or 3 parts DOB agree	1,432	0.003	0.003
Pairs linked by MAX SSN	611,813	1.211	
Agree on sex and 3 parts DOB	556,502	1.101	
Agree on sex and 2 parts DOB	55,311	0.109	
Pairs linked by EDB-SSN	8,903	0.018	
Agree on sex and 3 parts DOB	8,018	0.016	
Agree on sex and 2 parts DOB	885	0.002	
Pairs linked by EDB-HIC	1,687	0.003	
Agree on sex and 3 parts DOB	1,613	0.003	
Agree on sex and 2 parts DOB	74	0.000	

Of the pairs that were linked by MSIS ID, 99.535 percent agreed on sex and all three parts of the DOB, and another 0.174 percent differed on just one part of the DOB. All other possibilities, including missing values, accounted for only 0.292 percent of the pairs that were linked by MSIS ID. Linked pairs with different sex codes, exclusive of missing values, were 0.080 percent of the pairs linked by MSIS ID (and effectively the same fraction of all linked pairs). These numbered just under 40,000 pairs. Imposing a requirement that sex not differ among pairs linked by MSIS ID—as we require for pairs linked by SSN or EDB0HIC—would remove that many linkages from MAXEM. The issue here is whether we have more confidence in the MSIS ID or in the accuracy of the sex codes as a linkage variable. CMS has expressed concern about the potential fallout that might accompany a revelation that two Medicaid records linked under the agency's auspices were actually a man and a woman; for this reason we want to

call attention to the number of linked pairs that differ on sex. At the same time, while the consequences of linking two records that represent different individuals are potentially worse than the consequences of failing to link two records that represent the same individual, the exceedingly low incidence of uncertain pairs serves to diminish the potential consequences in either direction.

8. Duplicate MAXEM IDs Within a State and Year

When records are linked across states in the final step of the unduplication process, only linkages involving records from different states are identified. It is possible, however, that two records from the same state that were not linked previously may link to the same record from another state. Depending on which record has the lowest MAXEM ID, all three records could be assigned the same MAXEM ID, which would result in a duplicate pair of MAXEM IDs within the one state.

For MAXEM 2005 and 2006, if this occurred the duplicate MAXEM IDs were left unchanged. As a result, the MAXEM research file will include two records with the same MAXEM ID in the same state and year. For MAXEM 2005 there were 53 MAXEM IDs that appeared twice in the same state, and for MAXEM 2006 there were 191 MAXEM IDs that appeared twice in the same state (nearly two-thirds in Wisconsin). The MAXEM research file for a given year is intended to provide only one record per unique individual in each state (an individual can have records in more than one state). Multiple records for an individual in the same state are inconsistent with this objective.

We addressed this problem directly in MAXEM 2007 and added a step that will eliminate duplicate MAXEM IDs from the research file. The details are provided below.

B. Methodology for MAXEM 2007

We considered the issues raised in the preceding section and reviewed tabulations and a small number of record listings. Based on this review, we proposed to CMS a revised unduplication methodology for MAXEM 2007, and CMS agreed to the changes. In making these changes we sought to reduce the frequency of incorrect links and potentially increase the frequency of valid links. At the same time, however, we recognized that the data needed to confirm these outcomes are lacking.

1. Overview of Changes for 2007

The principal change for 2007 was to build on the fact that the MSIS ID is the only identifier that is assigned with the intention that it will serve as a unique identifier for Medicaid enrollees in the state that assigns it. In carrying out our within-state linkages, we first linked records within years by MSIS ID after applying corrections supplied by a handful of states. Then we linked records across years—again by MSIS ID—for each pairs of years. Upon completing these linkages we applied our demographic edits to assign missing values and replace inconsistent values with what we judged to be the most reliable values. Using the edited data, we cycled through the cross-year linkages using the three additional sets of linkage criteria and then performed within-year linkages using these same variables. In basing these additional within-state linkages on data that had been edited after the MSIS linkages, we hoped to minimize the identification of inconsistent linkages. A second round of editing was conducted after the within-state linkages were completed—and prior to the performance of cross-state linkages.

Another significant change was to retain the claims-only records through the entire unduplication process rather than excluding them at the very beginning. This enabled claims-only records to be linked by MSIS ID within state and across years, and it also permitted such records to be linked to records in other years *with* enrollment data.

Another change was to reorder the components of the MAXEM ID, moving the year code from second to first. Apart from changing the sequence of components in every MAXEM ID, this had a small impact on who got what MAXEM ID in cases involving record-pairs that linked across states over time. The net result is that fewer MAXEM IDs will be likely to change if a fourth year is added to MAXEM.

The final change of note was to add a step to review all cases where the implementation of the cross-state linkages produced additional within-state linkages in the same year—that is, cases where a MAXEM ID occurred twice within the same state and year. We reviewed and edited these linkages in order to eliminate this unintended duplication of MAXEM IDs.

2. Unduplication Methodology for MAXEM 2007

Key steps in the implementation of unduplication for MAXEM 2007 are listed below:

- Assignment of the initial MAXEM ID
- Identification of linked pairs
- Sequence of within-state links
- Application of edits
- Consolidation of records
- Sequence of cross-state links
- Assignment of "final" MAXEM IDs
- Review and editing of within-state duplicates

Each of these components is discussed below, with particular attention to changes from MAXEM 2005 and 2006.

a. Assignment of the Initial MAXEM ID

Every record was assigned a preliminary MAXEM ID, consisting of three components in the following order: (1) a year code equaling the year minus 2000, (2) a scrambled state code, and (3) a record number from MAX.

b. Identification of Linked Pairs

We identified linked pairs using the same four criteria that we used for MAXEM 2005 and 2006, as CMS did not recommend that we require agreement on sex when records are linked by MSIS ID—as we do with linkages by MAX SSN, EDB-SSN, or EDB-HIC. However, rather than cycling through all four linkage criteria, generating all links that satisfy any of these criteria, we revised the sequence of linkages and edits, as explained below. In addition, rather than excluding records without enrollment data from the linkage process, we retained these records through the entire unduplication process, as all of them contain MSIS IDs and some contain additional linkage variables. Any changes to their MAXEM IDs that resulted from this process were included in the final cross-reference files that constitute part of the MAXEM output.

c. Sequence of Within-State Links

Our experience in producing MAXEM 2005 and 2006 taught us that more than 80 percent of the records in a given year can be expected to link to records in the same state in the *next* year, but less than one-third of one percent of the records in a given year can be expected to link to records in the same state in the *same* year. Furthermore, our review of asymmetric links suggests that within-year links are more problematic than cross-year links. This stands to reason. Within-year links should not exist if states are assigning MSIS IDs as they were intended—that is, uniquely and with only one per person.[6]

[6] If a state were to change its MSIS system part way through the year, or at the end of a fiscal year, this would potentially create a large number of within-year duplicates. Prior to 2005, CMS did not always learn in advance that a state was converting to a new system. Subsequently, however, CMS does receive this information in advance, and the state submits a cross-reference file linking the new MSIS ID back to the original MSIS ID. This cross-reference file is applied during MAX processing, so within-year duplication of enrollee records is addressed at that stage and would not be observed in MAXEM processing. In this case, however, we would observe few cross-year links between the year in which the new system was implemented and any prior year.

In carrying out the within-state linkages, we first linked records by MSIS ID alone, doing this within-year and then over time. Specifically, we linked 2005 to 2006, then 2005 to 2007, and, finally, 2006 to 2007. After that, we assigned the new MAXEM IDs implied by the linkages and then applied edits from later records to earlier records in order to fill in missing values or replace inconsistent values (see below). By applying the edits at this point rather than later, we hoped to reduce the number of cross-year links by MSIS ID that were undone, in effect, by subsequent linkages.[7] Within a state, the MSIS ID is the most reliable linkage variable between consecutive years, because enrollees who remain enrolled simply retain their MSIS IDs. Linkages that put together records that the state regards as separate individuals are necessarily more subject to error.

After applying these edits we repeated the cross-year linkages using the remaining three criteria in the same order that we used for MAXEM 2005 and 2006. We then used these same criteria to link records within the same year. After completing all of the within-state linkages, we conducted a second round of edits for the relatively small number of additional linkages identified in this manner.

d. Application of Edits

As with MAXEM 2005 and 2006, we used the values on later records to fill in missing values and replace inconsistent values on earlier records. Our rule was that for each of the linkage fields except for the MSIS ID we determined the latest nonmissing value and made certain that all of the earlier values (and any later missing values) were consistent with this value. If they were not, we replaced them. If any of the linked records represented a dual-eligible with

[7] Of the 3,120 record-pairs that could be linked across years on one or more variables but did not receive the same final MAXEM ID, nearly two-thirds had been linked initially by MSIS ID.

EDB codes, we used the latest such record as the source for editing the other records, as the Medicare data are generally more reliable than the Medicaid data. This, too, was consistent with the application of editing in our creation of MAXEM 2005 and 2006.

At the completion of this reconciliation, we generated tabulations to document the impact of the editing. Our intention was that if the edits seemed excessive or in any way inconsistent with our expectations in 2005 and 2006, we would investigate the results before moving forward. The edits yielded no surprises, however.

e. Consolidation of Records

As with 2005 and 2006, pairs that linked within the same state and year were consolidated—that is, combined into a single record. For 2005 and 2006 we developed a set of specifications designed to minimize the loss of information when records were combined. We applied the same programs to consolidate records within 2005, 2006, and 2007.

f. Sequence of Cross-State Links

For the cross-state links, we combined the three years of data into a single file, which we then sorted by MAXEM ID, from lowest to highest. We then created a second copy of this file and applied our three sets of linkage criteria (all but MSIS ID) sequentially in order to identify all linked pairs between the two files that involved records from different states. To prevent duplication of linkages, we linked only pairs in which the record from the first file had a lower MAXEM ID than the record from the second file.

g. Assignment of Final MAXEM IDs

Each set of records that was determined to represent the same individual was assigned the lowest of the MAXEM IDs associated with that set of records. This was done at four points: (1) following the application of the cross-reference files to correct MSIS IDs within a small set of states, after which we performed a within-state, within-year linkage by MSIS ID; (2) following

the initial cross-year linkages by MSIS ID; (3) following the completion of the within-state linkages; and (4) following completion of the cross-state linkages.

h. Review and Editing of Duplicate MAXEM IDs Within State and Year

The cross-state linkage process produced a small number of instances in which two records within the same state and year were linked to the same record in another state and were thus assigned the same MAXEM ID. The MAXEM research file is supposed to have only one record per enrollee in each state and year—that is, only one record per MAXEM ID. To restore this property, we reviewed all cases where a MAXEM ID occurred twice in the same state and year and we defined edits to correct these occurrences.

III. IMPLEMENTATION

In the development of MAXEM, record linkage and other techniques are employed to achieve two objectives: (1) to enable the creation of annual MAXEM research files in which no individual has more than one record in the same calendar year and the same state and (2) to make certain that any records representing the same individual in two or more states in the same year or in different years are associated through a common MAXEM ID. If the first objective is achieved, the records contained in the MAXEM research file for a given year will provide an unduplicated count of Medicaid beneficiaries in each state during that year. In other words, within each state, every record in MAXEM will correspond to a unique individual. If the second objective is achieved as well, then researchers working with the MAXEM data will be able to generate an unduplicated count of Medicaid beneficiaries for the nation as a whole in a given calendar year by counting the number of unique MAXEM IDs on the research file for that year. In addition, by using the separate cross-reference file, which provides the MAXEM ID for every record on the MAX PS file for that year, researchers will be able to assign these same MAXEM IDs to records in previously released MAX data.

This chapter documents the implementation of MAXEM 2007. Section A describes the process of unduplicating MAX PS records within each state. Section B details the unduplication of records across states. Section C presents an assessment of the quality of the record linkage underlying the unduplication of MAX records. Finally, Section D describes the MAXEM outputs—specifically, the annual MAXEM research files and the annual cross-reference files.

A. Unduplication Within States

The unduplication of MAX records within states involves the application of five distinct processes: (1) use of state cross-reference files to correct MSIS IDs and MAX SSNs in selected states, (2) linkage of records within and across years, (3) assignment of a common MAXEM ID

to all records that the record linkage process has determined represent the same individual, (4) reconciliation of identifiers and demographic variables across records with the same MAXEM ID, and (5) consolidation of linked records within the same year. Some of these processes are applied more than once, but in general they are sequential. Below we describe how we implemented these processes and document key outcomes.

1. State Cross-Reference Files

In the eight states that use the SSN as an MSIS ID, an SSN may not be available when an individual is first enrolled in Medicaid. This is most commonly true of infants but it also occurs among adults and children in California, which offers restricted services to aliens, who frequently do not have SSNs. In cases where the SSN is not available, states assign a temporary MSIS ID, replacing it with the individual's SSN when the SSN is issued. These states typically submit a cross-reference file with a later MSIS submission that maps the permanent MSIS IDs (SSNs) into the temporary IDs that were assigned earlier. For example, seven of the eight states submitted updates to their 2005 MSIS records along with their 2006 MSIS files. As we show in the next section, when the updates are applied, the new MSIS IDs may duplicate the IDs found on other records within the same calendar year.[8]

Table III.1 summarizes the updates to MSIS IDs in the eight SSN states in 2005, based on cross-reference files supplied with the 2006 and 2007 MSIS files. The table also includes North Dakota; while it is not an SSN state, it submitted a cross-reference file to address problems that emerged in 2005. The table reports the number of updates received from these nine states for 2005 in relation to their total MAX PS records for the year. It is noteworthy that the updates

[8] Prior to the application of these updates, no two records within the same state and calendar year shared the same MSIS ID. This is true not just of the eight SSN states but of all other states and DC.

received with the 2007 MSIS files (49,270) were nearly two-thirds as numerous as the updates received with the 2006 MSIS files (77,449). This suggests that CMS will continue to receive updates affecting MAXEM files for at least two years after the initial MAXEM files are prepared.

Table III.1. Updates to 2005 MSIS IDs from 2006 and 2007 State Cross-Reference Files

State	Number of PS Records for 2005	Updates from 2006 Files	Additional Updates from 2007 Files	Total Number of Records Updated	Percent of Records Updated
California	10,924,768	31,725	33,941	65,666	0.60
Kentucky	894,282	18,939	1,254	20,193	2.26
Louisiana	1,244,886	1,159	1	1,160	0.09
Minnesota	792,366	2,431	1,588	4,019	0.51
Nevada	272,739	2,335	980	3,315	1.22
New Jersey	1,134,761	20,295	10,653	30,948	2.73
New Mexico	530,733	0	835	835	0.16
North Dakota	79,961	457	0	457	0.57
Vermont	165,860	108	18	126	0.08
Total	16,040,356	77,449	49,270	126,719	0.79

In two states, Kentucky and New Jersey, the updates to MSIS IDs affected more than two percent of the MAX PS records for 2005, and in Nevada the updates affected more than one percent of the MAX PS records. In three of the remaining states, updates were received for around half a percent of the 2005 MAX PS records. In the final three states, updates were received for only .08 to 0.16 percent of the MAX PS records.

The eight SSN states submitted substantially more updates to their 2006 MAX PS records than they did for their 2005 MAX PS records in the same period of time: 111,538 versus 77,449 (Table III.2). It remains to be seen whether they will submit as many additional updates with a two-year lag as they did for 2005. Updates exceeded one percent of the total MAX PS records for 2006 in New Jersey, Kentucky, and Nevada. Updates affected roughly half a percent of the records in three other states (California, Minnesota, and New Mexico) but much smaller fractions in the remaining two states.

Table III.2. Updates to 2006 MSIS IDs from 2007State Cross-Reference Files

State	Number of PS Records for 2006	Updates from 2007 Files	Percent of Records Updated
California	10,946,644	64,427	0.59
Kentucky	893,225	11,095	1.24
Louisiana	1,273,978	2,705	0.21
Minnesota	809,009	5,057	0.63
Nevada	256,955	2,861	1.11
New Jersey	1,190,176	22,880	1.92
New Mexico	521,785	2,441	0.47
Vermont	164,682	72	0.04
Total	16,056,454	111,538	0.69

When we updated the MSIS IDs in states that use the SSN as an identifier, we also updated the MAX SSNs, which were missing or filled with temporary values. We will show later that California leads the nation, by far, in both the number and proportion of its MAX records that lack SSNs. The fact that California was able to provide SSNs for no more than 0.60 percent of its MAX PS records a year or two later suggests that the vast majority of SSNs that are missing when California submits its initial MSIS files will remain missing.

2. Record Linkage

The within-state record linkage for the 2007 extension of MAXEM was performed in stages. First, records were linked by MSIS ID within 2005 and 2006 in the nine states that submitted updates to their MSIS IDs for these years. Second, records were linked by MSIS ID *across* all three years, and an editing step was performed among linked records to improve their consistency on the other linkage variables before the next linkage step was performed. Third, records were linked across years by MAX SSN, then EDB-SSN, and then EDB-HIC (in each case with sex and DOB as well). Finally, records were linked *within* year by MAX SSN, EDB-SSN, and EDB-HIC (along with DOB and sex) in succession.

Linkage results are summarized in Table III.3. Application of the state cross-reference files for nine states yielded 46,510 linked pairs within year—that is, duplicate MSIS IDs. About

26,900 were linked within 2005, and 19,600 were linked within 2006. Linkages by MSIS ID across years produced a total of 142.8 million linked pairs. Of these, 50.3 million were linked between 2005 and 2006, 50.3 million were linked between 2006 and 2007, and 42.2 million were linked between 2005 and 2007. Cross-year linkages by MAX SSN (with sex and DOB) yielded about one million additional linked pairs for all three pairs of years. Cross-year linkages by EDB-SSN added only another 13,734 linked pairs, while linkages by EDB-HIC added just 1,923 linked pairs.

Appendix Table A.1 reports the number of cross-year linked pairs between 2005 and 2006 and their distribution by source of the linkage for each of the 50 states and DC. In one state, Montana, the MSIS ID accounted for 100 percent of the cross-year linkages. In the eight SSN states (identified in the table), the MSIS ID accounted for nearly 100 percent of the linkages because the MAX SSN (which is identical to the MSIS ID in these states when it is not missing) produced no additional linkages, and the EDB-SSN and EDB-HIC produced exceedingly few additional linkages in any state. In six states, however, the MAX SSN accounted for at least one percent of the total linkages, including three to four percent in Illinois, New York, and South Dakota and 6.5 percent in North Dakota. Ohio and Wisconsin were the other two states in which linkages by MAX SSN were at least one percent of the total. Results by state were similar for record-pairs linked between 2006 and 2007 (see Table A.2) except that linkages by MAX SSN rose to 11.2 percent of the total in North Dakota.

Theoretically, record-pairs that we link by MAX SSN (or EDB-SSN or EDB-HIC) should have been assigned the same MSIS ID. Thus, states with comparatively high linkage rates by MAX SSN are being less successful in reassigning the same MSIS ID to enrollees who return after an absence than their counterparts with lower linkage rates. Consistent with this

Table III.3. Summary of Within-State Linkages for MAXEM 2007

Description of Linkage	Total	Within 2005	Within 2006	Within 2007	2005 to 2006	2006 to 2007	2005 to 2007
Within year, by MSIS ID	**46,510**	**26,926**	**19,584**	**0**			
Across years, by MSIS ID	**142,766,900**				**50,318,375**	**50,291,046**	**42,157,479**
Across years, by other IDs	**1,017,310**				**334,519**	**317,055**	**365,736**
MAX SSN, sex, and DOB	1,001,653				329,563	311,728	360,362
EDB SSN, sex, and DOB	13,734				4,309	4,699	4,726
HIC, sex, and DOB	1,923				647	628	648
Within year, from linkages across years, by other IDs[a]	**420,628**	**122,936**	**156,864**	**140,828**			
Within year, by other IDs	**68,770**	**51,381**	**4,663**	**12,726**			
MAX SSN, sex, and DOB	67,422	50,562	4,476	12,384			
EDB SSN, sex, and DOB	1,119	740	163	216			
HIC, sex, and DOB	229	79	24	126			
Subtotals							
Within year	535,908	201,243	181,111	153,554			
Across years	143,784,210						
Total Linked Pairs	**144,320,118**						

[a] These are same-year pairs that were assigned the same MAXEM ID as a result of the linkages across years.

interpretation, linkages by MAX SSN were more common, generally, for linkages between 2005 and 2007 than for linkages between consecutive years. Linkages by MAX SSN were more than one percent of the total in eight states, and they grew to more than four percent of the total in Illinois, New York, and South Dakota. With a two-year time span, enrollees who left the rolls and returned will constitute a larger share of linked pairs.

After completing the cross-year linkages, we reassigned MAXEM IDs (see the next section), and this had the effect of creating numerous within-year linkages as a byproduct.[9] For instance, if two 2006 records linked to the same 2005 record, all three records would have been assigned the same MAXEM ID, creating a within-year link between the two 2006 records. In this manner we created 123,000 linked pairs within 2005, 157,000 within 2006, and 141,000 within 2007, for a total of 421,000 linked pairs. Direct within-year linkages by MAX SSN (plus sex and DOB) added another 67,422 linked pairs; linkages by EDB-SSN added 1,035; and linkages by EDB-HIC added only 217.

Table III.4 compares the linkage results for MAXEM 2007 with the earlier linkage results for MAXEM 2005 and 2006. MAXEM 2007 has nearly three times as many linked pairs across years because of the two additional pairs of years that were linked, but the distribution of linked pairs by the linkage variables is very similar to MAXEM 2005 and 2006. Because of the additional volume of corrections supplied in the state cross-reference files, the within-year links for MAXEM 2007 include nearly three times as many pairs that were linked by MSIS ID, but the total number of within-year linked pairs did not increase in the same proportion, so the fraction

[9] For MAXEM 2005 and 2006, we did not reassign MAXEM IDs until all linkages had been performed. For MAXEM 2007 we reassigned MAXEM IDs at the end of the cross-year linkages by MSIS ID in order to perform the intermediate editing step that we added to eliminate inconsistent values of secondary linkage variables among records with common MSIS IDs and thereby reduce the number of errant linkages. We repeated the reassignment of MAXEM IDs at the conclusion of the cross-year linkages by these additional linkage variables.

of within-year links due to MSIS ID is higher for MAXEM 2007 than for MAXEM 2005 and 2006. The within-year linkages that were the indirect result of cross-year linkages by MAX SSN, EDB-SSN, and EDB-HIC have been allocated to those three sources in proportion to their relative shares of the cross-year links. The resulting distribution is reasonably similar to the distribution of within-year links in MAXEM 2005 and 2006.

Table III.4. Distribution of Within-State Cross-Year and Within-Year Linkages by Source: MAXEM 2005 and 2006 versus MAXEM 2007

	MAXEM 2005 and 2006	MAXEM 2007	MAXEM 2005 and 2006	MAXEM 2007
Description of Linkage	Number of Linked Pairs		Percent of All Linked Pairs	
Across years	50,199,639	143,784,210	100.000	100.000
By MSIS ID	49,887,151	142,766,900	99.378	99.292
By MAX SSN, sex, and DOB	307,366	1,001,653	0.612	0.697
By EDB SSN, sex, and DOB	4,438	13,734	0.009	0.010
By HIC, sex, and DOB	684	1,923	0.001	0.001
Within year	326,829	125,184	100.000	100.000
By MSIS ID	16,905	46,510	5.172	8.679
By MAX SSN, sex, and DOB	304,447	481,576	93.152	89.862
By EDB SSN, sex, and DOB	4,465	6,798	1.366	1.269
By HIC, sex, and DOB	1,012	1,024	0.310	0.191

Note: MAXEM 2007 includes all three years. Within-year linkages that were the indirect result of cross-year linkages after MSIS ID have been allocated to the three sources in the same proportion as the cross-year linkages.

3. Assignment of a Common MAXEM ID

At the end of each of the four linkage steps described above, we assigned each record the lowest of its own MAXEM ID and the MAXEM IDs of any records to which it had been linked. Thus, if a set of two or more records linked only to the other members of the set, each would receive the same MAXEM ID. If one of the members of the set linked to a record outside the set, then it was possible that the record that linked to a record outside the set could receive a different MAXEM ID than the other members of the set. Ultimately, only the MAXEM ID assigned at the end of the last linkage step is carried forward to the MAXEM data products, but as we explained above, we assigned new MAXEM IDs at the end of the cross-year MSIS ID

linkage step so that we could edit the remaining linkage variables—making them consistent among the members of each set—before we performed another linkage step. After these edits, all of the members of sets would link to the same additional records, if any, and thus all would receive the same final MAXEM ID.

The initial MAXEM ID assigned to each record included three components: (1) a two-digit year code (the year minus 2000), (2) a two-digit, scrambled, numeric state identifier, and (3) the observation number from the MAX PS file (up to nine digits). For two records linked within state and year, the record with the lower observation number will have the lower MAXEM ID. For two records linked within state but *across* year, the record from the earlier year will have the lower MAXEM ID. For two records linked across state but within the same year, the record with the lower scrambled state identifier will have the lower MAXEM ID. Lastly, for two records linked across state *and* year, the record with the earlier year will have the lower MAXEM ID. After the final MAXEM ID assignments have been made, MAXEM IDs from 2005 will be more common than MAXEM IDs from 2006, which, in turn, will be more common than MAXEM IDs from 2007. Among MAXEM IDs from any year, MAXEM IDs from larger states will be more common than MAXEM IDs from smaller states, generally, while MAXEM IDs from states with lower scrambled state codes will tend to grow in frequency with cross-state links while MAXEM IDs from states with higher scrambled state codes will tend to decline in frequency.

4. Reconciliation of Identifiers and Demographic Variables

Records assigned a common MAXEM ID may nevertheless differ with respect to SSNs, HICs, or demographic variables when these were not used to link the records. For example, an SSN, HIC, sex, DOB, or race/ethnicity may be missing on one or more records, or the values may be inconsistent across the records. Records were subject to reconciliation if their MAXEM IDs appeared on at least two records over the three-year period. The records could be in the

same year or different years, but they had to be from the same state, as MAXEM IDs did not recur outside of the same state prior to cross-state linkage.

For the vast majority of linked records, missing or inconsistent identifiers or demographic variables presented no problem. When missing or inconsistent values occurred, we applied an algorithm to assign the same MAX SSN, EDB-SSN, EDB-HIC, DOB, sex, and race/ethnicity to all the records associated with the same MAXEM ID. For each variable, we first determined whether any of the linked records had a missing value. If so, we replaced the missing value with the latest nonmissing value, where "latest" is defined as coming from the record with the most recent month of enrollment. We selected the record with the most recent month of enrollment because we assumed that errors are corrected over time. If, however, one of the records with nonmissing information for a given variable was an EDB dual record, we assigned the value from that record (or the latest such record), even if there was a later enrollment record. This is because data in the EDB are verified with data collected by SSA.[10]

The MSIS ID was not subject to replacement under any circumstances.[11] While MSIS IDs are never missing, two records with the same final MAXEM ID could have different MSIS IDs. This occurred when records were linked within state by identifiers other than the MSIS ID. As we saw in Table III.3, record-pairs linked by other IDs accounted for just over 1.5 million or about 1.04 percent of the 144 million record-pairs linked within the same state.

Nationally, the fraction of MAX PS records subject to reconciliation following the cross-year linkages by MSIS ID was 83.8 percent in 2005, 96.7 percent in 2006, and 83.4 percent in

[10] While data in the EDB are of very high quality, the EDB fields are not part of the Medicaid record submitted by the states. Rather, they are merged with the Medicaid record during MAX processing. The merge itself is based on fields that may be in error, which means that, in some cases, the EDB fields may refer to someone other than the enrollee. For this reason we must be careful not to overstate the reliability of the EDB fields.

[11] The MSIS ID is not included on the research files. This further reduced the need to resolve any discrepancies.

2007. This fraction was highest in the middle year, 2006, because MAXEM IDs were more likely to recur in adjacent years. While a high percentage of records were evaluated for reconciliation, the information recorded on linked records was highly consistent. Therefore, edits were made to only a small fraction of records.

Table III.5 reports the frequency of edits, by year, to each of the six variables as a result of the reconciliation performed after the cross-year linkages by MSIS ID. The most common edits involved the replacement of missing values for race/ethnicity, the MAX SSN, and the EDB-HIC.[12] The proportion of eligible records with missing values replaced was as high as 1.5 percent for race/ethnicity in 2006, 1.2 percent for the EDB-HIC in 2005, and 0.9 percent for the MAX SSN in 2006.[13] Rates of replacement of missing values declined sharply over the three years for the EDB-SSN and EDB-HIC but much less so for the other fields, where edit rates peaked in 2006. Because Medicaid enrollees are much more likely to gain than lose dual eligibility over time, situations where an EDB-SSN or EDB-HIC is missing in a later year but present in an earlier year are comparatively rare. For the other fields, however, missing values seem to occur without regard to whether data were available in an earlier year. We note, in particular, that the DOB, sex, and race/ethnicity had both absolutely and relatively higher replacement of missing values in 2007 than 2005.

[12] If an EDB-HIC was available in 2007 but missing in 2005 and 2006, we filled in the missing value on the earlier records without regard to whether the enrollee was a dual eligible in the earlier years, on the ground that the EDB-HIC could still be useful for linkage. This may be less true with our revised approach to linkage for MAXEM 2007 than with the approach used for MAXEM 2005 and 2006.

[13] The denominator for these percentages is the total number of records eligible for reconciliation, not just those with missing values.

Table III.5. Frequency of Edits by Variable and Year Following the Completion of Within-State Cross-Year Linkages by MSIS ID

Variable and Year	Number of Edits: Missing Value Replaced	Number of Edits: Nonmissing Value Replaced	Percent of Records with: No Change	Percent of Records with: Missing Value Replaced	Percent of Records with: Nonmissing Value Replaced
MAX SSN					
2005	434,471	63,045	99.034	0.844	0.122
2006	532,609	48,148	99.026	0.893	0.081
2007	258,338	140	99.498	0.502	0.000
EDB-SSN					
2005	375,700	625	99.269	0.730	0.001
2006	190,482	265	99.680	0.319	0.000
2007	26,366	0	99.949	0.051	0.000
EDB-HIC					
2005	616,001	30,229	98.745	1.196	0.059
2006	217,826	24,467	99.594	0.365	0.041
2007	26,704	239	99.948	0.052	0.000
DOB					
2005	186,510	205,892	99.238	0.362	0.400
2006	272,516	135,318	99.316	0.457	0.227
2007	193,783	2,070	99.619	0.377	0.004
Sex					
2005	145,875	66,776	99.587	0.283	0.130
2006	230,744	47,749	99.533	0.387	0.080
2007	193,857	3,356	99.617	0.377	0.007
Race/ethnicity					
2005	581,669	877,741	97.165	1.130	1.705
2006	907,117	487,701	97.660	1.522	0.818
2007	618,510	490	98.797	1.202	0.001

Note: Records were subject to reconciliation if their MAXEM IDs occurred at least twice in the three years. The number of such records at the time these edits were applied was 51.5 million in 2005, 59.6 million in 2006, and 51.5 million in 2007. These counts are the denominators of the percentages.

For all but the DOB and race/ethnicity, nonmissing values were replaced at a much lower rate than missing values. In 2005, for the MAX SSN, the replacement rate for nonmissing values was 0.122 percent compared to 0.844 percent for missing values. For the EDB-SSN the two rates were 0.001 percent and 0.730 percent, respectively; and for the EDB-HIC the two rates were 0.059 and 1.196 percent. For sex the two rates were 0.130 percent and 0.283 percent. For

DOB the replacement rate for nonmissing values was marginally higher than the rate for missing values in 2005, at 0.400 percent versus 0.362 percent. For race/ethnicity the difference was quite substantial: 1.705 percent for replacement of nonmissing values compared to 1.130 percent for missing values.

For all six variables, however, the replacement of nonmissing values declined sharply between 2005 and 2007. The highest replacement rate in 2007 was 0.007 percent for sex. The lowest was literally zero. We would like to think that these declining replacement rates are a reflection of improving data quality over time rather than an artifact of our replacement rule, but this is almost certainly not the case.

The second round of edits, performed at the conclusion of within-state linkage, yielded substantially fewer changes than the first round (Table III.6). Except for DOB and race/ethnicity for replacement of nonmissing values, none of the replacement rates rose appreciable above 0.01 percent. For the MAX SSN, DOB, and race ethnicity, in fact, the replacement of nonmissing values exceeded the replacement of missing values in every year. The low edit rates for the second round reflect the comparatively small number of additional linkages identified by the SSN and HIC variables within and across years (recall Table III.3).

Appendix Table A.4 reports, by year, the combined number and percent of MAX PS records that were subject to reconciliation at one or both stages in each state. In the middle year, 2006, with potential links on either side, a minimum of 93.3 percent and as many as 99.0 percent of the records in any one state were subject to reconciliation. Edit results for the three identifiers are reported by state for 2005, 2006, and 2007 in Table A.5, A.6, and A.7, respectively. Missing MAX SSNs were replaced most often in Arkansas in 2005 (on 8.4 percent of the records that were subject to reconciliation) and 2006 (7.5 percent), but the fraction of records with missing

Table III.6. Frequency of Additional Edits by Variable and Year Following the Completion of Within-State Linkages

Variable and Year	Number of Edits: Missing Value Replaced	Number of Edits: Nonmissing Value Replaced	Percent of Records with: No Change	Percent of Records with: Missing Value Replaced	Percent of Records with: Nonmissing Value Replaced
MAX SSN					
2005	1,264	2,741	99.992	0.002	0.005
2006	1,104	2,229	99.994	0.002	0.004
2007	1,139	1,866	99.994	0.002	0.004
EDB-SSN					
2005	6,751	5	99.987	0.013	0.000
2006	2,318	3	99.996	0.004	0.000
2007	1,977	3	99.996	0.004	0.000
EDB-HIC					
2005	7,220	309	99.985	0.014	0.001
2006	2,619	226	99.995	0.004	0.000
2007	1,912	238	99.996	0.004	0.000
DOB					
2005	0	30,434	99.941	0.000	0.059
2006	0	20,644	99.965	0.000	0.035
2007	0	11,372	99.978	0.000	0.022
Sex					
2005	0	0	100.000	0.000	0.000
2006	0	0	100.000	0.000	0.000
2007	0	0	100.000	0.000	0.000
Race/ethnicity					
2005	29,779	56,877	99.832	0.058	0.110
2006	32,734	36,766	99.883	0.055	0.062
2007	35,230	19,573	99.894	0.068	0.038

Note: Records were subject to reconciliation if their MAXEM IDs occurred at least twice in the three years. The number of such records at the completion of within-state linkages was 51.6 million in 2005, 59.6 million in 2006, and 51.5 million in 2007. These counts are the denominators of the percentages.

MAX SSNs replaced fell to less than one percent in 2007. Missing MAX SSNs were replaced on at least three percent of the records in Colorado, Delaware, South Carolina, and Washington in 2005, with somewhat smaller shares in 2006 and much smaller shares in 2007. Replacement rates for EDB-SSNs and EDB-HICs were generally very similar because the two were frequently replaced together. Notable exceptions were Kentucky in 2005, when missing EDB-HICs were replaced on 8.8 percent of the records, and Texas in 2005, when missing EDB-HICs were

replaced on 5.7 percent of the records. In both cases, the replacement rate for missing EDB-SSNs was well below one percent.

In nearly every state in every year, the fraction of records with nonmissing values replaced for any of the three identifiers rarely approached one percent, but in Montana nonmissing values of the MAX SSN were replaced for 2.5 percent of the records in 2005 and 1.2 percent of the records in 2006.

Rates of replacement for DOB, sex, and race/ethnicity are reported by state in Tables A.8, A.9, and A.10 for 2005, 2006, and 2007. Of the three variables, race/ethnicity was the most likely to be replaced. For individual states, the fraction of records with missing values replaced exceeded 11 percent in Massachusetts in 2005 and 2006 and in Washington in 2006. Nonmissing values of race/ethnicity were replaced for 26.5 percent of the records in Connecticut and 18.7 percent of the records in Nevada in 2005, implying values that were frequently inconsistent with those on linked records in later years. There was very little replacement of nonmissing values in any state in 2007 because later values were judged the most accurate, but missing values of race/ethnicity were replaced in 8.0 percent of records in Washington, 6.9 percent in Colorado, 5.0 percent in Illinois, and 3.8 percent in Oregon.

5. Consolidation of Linked Records within the Same Year

Following the reconciliation process, all records bearing the same MAXEM ID within the same state and year were combined into a single record. Because of reconciliation, the identifiers and demographic variables were identical across the records being combined, but each of the records had its own set of enrollment and service utilization data. This information had to be consolidated. We did this in a manner that would limit the loss of information, as explained below. First we review the impact of consolidation on the total number of records retained in the file at the end of this step.

a. Impact of Consolidation on the Record Count

Table III.7 documents the reduction in the total record count, by year, due to the consolidation of records within each state and year. The first column reports the total count of MAX PS records with which we started. The second column reports the number of records remaining after consolidation, and the third column reports the reduction in the record count due to consolidation (the difference between the first two columns). The fourth column reports the number of consolidated or combined records. If every instance of duplication within a state and year involved only two records, the numbers in the third and fourth columns would be identical—that is, there would be a reduction of one record for every combined record that we created. When three records in a state end up with the same MAXEM ID, however, there is a reduction of *two* records for each combined record created. Differences between the reduction in the record count and the number of combined records created are reported in the fifth column, and we see that in all three years the excess duplicates numbered between 2,200 and 2,300 nationally while the number of combined records started at 196,976 in 2005 and then declined to 176,651 in 2006 and 148,923 in 2007. The final column expresses the reduction in each state's record count as a percentage of the total records prior to unduplication (that is, the third column as a percentage of the first column). This fraction declines from about one-third of a percent (0.324) in 2005 to about one-quarter of a percent in 2007 (0.245).

Table III.7. Reduction in Record Count Due to Consolidation of Records Within State and Year: 2005, 2006, and 2007

Year	Total Number of MAX PS Records	Records Remaining After Consolidation	Reduction in Record Count	Number of Combined Records	Duplicate MAXEM IDs in Excess of Two	Reduction As Percent of Initial Records
2005	61,429,538	61,230,279	199,259	196,976	2,283	0.324
2006	61,661,641	61,482,777	178,864	176,651	2,213	0.290
2007	61,673,120	61,521,916	151,204	148,923	2,281	0.245

Appendix Table A.11 reports the results of consolidation by state for 2005 while Tables A.12 and A.13 provide the same for 2006 and 2007. In 2005 the fraction of MAX PS records removed from each state varies from a low of zero in Montana and less than 0.01 percent in six other states (Maine, Nebraska, New Hampshire, New Mexico, Pennsylvania, and Rhode Island) to more than one percent in five states, with Kentucky highest at 2.14 percent and North Dakota second at 2.05 percent (the next three states were South Dakota, Illinois, and New York). Montana had no records removed in 2006 and only one in 2007. Five other states had less than 0.01 percent removed in 2006 and this expanded to 12 other states including California in 2007. Six states had at least one percent of their records removed in 2006, but these dropped to four in 2007. North Dakota had the largest fraction removed in any year at 3.78 percent.

The obvious question raised by these results is the following. Did the number of Medicaid enrollees with multiple MAX records in the same state and year truly decline by about a quarter between 2005 and 2007, or are we simply identifying fewer of them? Some insight can be gained, perhaps, by asking if the additional year of data used in MAXEM 2007 had any impact on the number of duplicates identified in 2005 and 2006. For MAXEM 2005 and 2006 our estimates of duplicates did not include records with no enrollment data, so they are not directly comparable to the estimates in Table III.7. For Medicaid enrollees and persons enrolled only in S-CHIP, however, we do have comparable estimates, and these are presented in Table III.8. The estimates provide evidence suggesting that the additional year of data available for MAXEM 2007 did increase the number of duplicate enrollee records identified, at least in 2006. While MAXEM 2007 found 2,355 additional duplicate Medicaid enrollee records and 344 additional S-CHIP-only enrollment records in 2005 compared to MAXEM 2005 and 2006, the difference was much greater in 2006. In that year, MAXEM 2007 found 18,104 additional duplicate Medicaid enrollee records and 813 additional S-CHIP only enrollment records. Nevertheless it does

appear that duplicate Medicaid enrollee records are declining over the three-year period, even though we can infer from the comparison between the two MAXEM efforts that the estimated number of duplicates in 2007 is likely to rise if another year of data is added. In contrast to the Medicaid population, the estimated number of duplicate S-CHIP-only enrollee records actually rose by 11 percent between 2005 and 2007. Furthermore, MAXEM 2007 shows an increase between 2005 and 2006, whereas MAXEM 2005/2006 showed a decrease between the two years. The growth in the estimated number of duplicate S-CHIP only enrollee records could very well be a result of four additional states reporting S-CHIP enrollment in MAX 2007 compared to MAX 2005.[14]

Table III.8. Duplicate Medicaid and S-CHIP Only Enrollee Records by Year: MAXEM 2005/2006 and MAXEM 2007

	Duplicate Medicaid Enrollee Records			Duplicate S-CHIP Only Enrollee Records		
Year	MAXEM 2005/06	MAXEM 2007	Change	MAXEM 2005/06	MAXEM 2007	Change
2005	181,000	183,355	2,355	4,811	5,155	344
2006	137,705	155,809	18,104	4,521	5,334	813
2007	n/a	136,743	n/a	n/a	5,725	n/a

b. Consolidating Information on Combined Records

For each of the combined records we created the following consolidated codes:

- 34 type-of-service (TOS) indicators
- 12 monthly uniform eligibility group (UEG) codes
- One annual UEG code
- 12 monthly CHIP codes
- One annual S-CHIP-only code
- One annual restricted benefit flag (RBF) code
- One annual dual-eligibility code

[14] The four states are Arizona, Louisiana, Missouri, and Nevada.

Creation of the consolidated codes is described below.

TOS Indicators. The 34 TOS indicators on each MAX record indicate whether or not a particular type of service was used during the calendar year. To create the consolidated codes, we summed each of the 34 codes across the records being combined; any values in excess of 1 were then recoded to 1. The interpretation of the new codes is unchanged, but they reflect the service utilization reported on two or more records.

UEG Codes. The monthly UEG code on the MAX records indicates both eligibility basis and maintenance assistance status in a single, two-digit code. To consolidate codes across records, we established a precedence order.[15] If two or more distinct code values were reported for a given month on the records being combined, we selected the code with the highest precedence order and assigned that code to the combined record in that month. We also created an annual UEG code by assigning the latest nonzero value, working backwards from month 12.

CHIP Codes. The monthly CHIP code indicates whether an individual was enrolled in Medicaid, M-CHIP, S-CHIP, or not enrolled in a given month (a value indicating unknown enrollment is also reported). In consolidating the codes across records we created four new code values to indicate enrollment in the possible combinations of two or all three programs. Codes are 4, Medicaid and M-CHIP; 5, Medicaid and S-CHIP; 6, M-CHIP and S-CHIP; and 7, all three. We also created an annual S-CHIP-only code to indicate whether or not the individual was only enrolled in S-CHIP during the year. This code will allow analysts to easily exclude individuals with no Medicaid enrollment during the year.

RBF Code. The MAX records contain monthly codes that indicate the type of benefits for which an individual was eligible. We created a simplified, annual RBF code for each of the

[15] The precedence order, from highest to lowest, was 11, 21, 31, 41, 51, 12, 22, 32, 3A, 42, 52, 15, 17, 25, 35, 45, 55, 14, 16, 24, 34, 44, 48, and 54.

records before we combined them. This code had three values, indicating (1) restricted benefits in all months of eligibility, (2) restricted benefits in some months of eligibility, and (3) eligibility for a broader set of benefits in all months of eligibility. In consolidating these codes across records, we assigned a code of 2 if the component records had codes of 1 and 2, 1 and 3, or 2 and 3, as each of these combinations implied eligibility for restricted benefits in some months and broader benefits in other months.

Dual Code. The MAX records also contain monthly codes that indicate dual versus nondual eligibility in each month of eligibility. For each individual record we combined the monthly codes to create an annual code indicating dual eligibility in all months, some months, or no months of eligibility. When we combined records, we assigned the value of the annual code if the same code was present on all records. If one record indicated dual eligibility in all months and another record indicated dual eligibility in just some months, we assigned a combined code indicating dual eligibility in some months. If one record showed no dual eligibility during the year while the other record indicated dual eligibility in some or all months, we assigned the code value indicating dual eligibility in some months.

Loss of Information. Our method of consolidating the monthly TOS indicators and CHIP codes and the annual RBF and dual codes entails no loss of information; all statuses reported on the records that were consolidated are preserved in these codes. This is not true of the consolidated monthly UEG codes, as we explained above. To assess the loss of information, we tabulated how often each basis of eligibility or maintenance assistance status was ever reported on a component record over the 12 months but never reported on the combined record. Our findings are reported in Tables III.9, III.10, and III.11 for 2005, 2006, and 2007, respectively.

Because of the way the precedence order was defined, the consolidated monthly UEG codes lost no information identifying aged beneficiaries in any month in any year, but information

identifying child beneficiaries was lost from 2.296 percent of combined records in 2005, 2.578 percent in 2006, and 2.897 percent in 2007. Loss of information identifying disabled and adult beneficiaries was less common, with 0.564 percent of combined records failing to identify a disabled basis of eligibility in 2005, 0.596 percent in 2006, and 0.610 percent in 2007; 0.866 percent of combined records failed to identify an adult basis of eligibility in 2005, 0.930 percent in 2006, and 0.930 percent in 2007.

Table III.9. Information Loss for UEG Status Due to Unduplication Within State and Year, 2005

Measure of Information Loss	Number of Combined Records with Information Loss	Percent of All Combined Records	Percent of All Records After Un-duplication
Basis of Eligibility Reported on a Component Record But Not the Combined Record			
Aged	0	0.000	0.000
Disabled	1,110	0.564	0.002
Child	4,523	2.296	0.007
Adult	1,705	0.866	0.003
Maintenance Assistance Status Reported on a Component Record But Not the Combined Record			
Cash	187	0.095	0.000
Section 1931	1,916	0.973	0.003
Means Tested	4,874	2.474	0.008
Poverty	5,043	2.560	0.008
Other	3,444	1.748	0.006
Foster Child	11,164	5.668	0.018
Section 1115	10,769	5.467	0.018

Table III.10. Information Loss for UEG Status Due to Unduplication Within State and Year, 2006

Measure of Information Loss	Number of Combined Records with Information Loss	Percent of All Combined Records	Percent of All Records After Un-duplication
Basis of Eligibility Reported on a Component Record But Not the Combined Record			
Aged	0	0.000	0.000
Disabled	1,053	0.596	0.002
Child	4,554	2.578	0.007
Adult	1,642	0.930	0.003
Maintenance Assistance Status Reported on a Component Record But Not the Combined Record			
Cash	117	0.066	0.000
Section 1931	1,779	1.007	0.003
Means Tested	4,432	2.509	0.007
Poverty	4,700	2.661	0.008
Other	1,613	0.913	0.003
Foster Child	11,631	6.584	0.019
Section 1115	4,525	2.562	0.007

Table III.11. Information Loss for UEG Status Due to Unduplication Within State and Year, 2007

Measure of Information Loss	Number of Combined Records with Information Loss	Percent of All Combined Records	Percent of All Records After Un-duplication
Basis of Eligibility Reported on a Component Record But Not the Combined Record			
Aged	0	0.000	0.000
Disabled	908	0.610	0.001
Child	4,315	2.897	0.007
Adult	1,385	0.930	0.002
Maintenance Assistance Status Reported on a Component Record But Not the Combined Record			
Cash	89	0.060	0.000
Section 1931	1,356	0.911	0.002
Means Tested	3,815	2.562	0.006
Poverty	3,896	2.616	0.006
Other	1,112	0.747	0.002
Foster Child	12,256	8.230	0.020
Section 1115	3,044	2.044	0.005

Again, because of the precedence order in assigning the consolidated monthly UEG codes, only 0.095 percent of combined records in 2005, 0.066 percent in 2006, and 0.060 percent in 2007 failed to identify a cash beneficiary. For other maintenance assistance statuses, however, the loss of information ranged from 0.973 percent to 5.668 percent of combined records in 2005, from 0.913 percent to 6.584 percent in 2006, and from 0.747 to 8.230 percent in 2007. Foster child status was the most likely to be unidentified in all three years, with the difference between this and other statuses growing substantially between 2005 and 2007. Unidentification of Section 1115 status was comparable to that of foster child status in 2005, but foster child status was four times as likely to be unidentified in 2007.

While the level of information loss may seem high for some statuses, combined records are a very small fraction of the total. If we express the lost information as a percentage of all records after unduplication within state and year, the rates fall dramatically. The highest rate of information loss for any status is between 0.018 and 0.020 percent (for foster child status in all three years).

B. Unduplication Across States

The unduplication of MAXEM records across states involved four steps performed in sequence: (1) linkage of records across states, both within and across years; (2) assignment of a common MAXEM ID to records representing the same individual in more than one state; (3) editing of these assigned MAXEM IDs to undo any within-state duplicates created by the first two steps; and (4) calculation of counters indicating the number of states in which an individual appeared on each of three different types of records, for each year. Unlike the unduplication of records within states, there is no reconciliation process or consolidation of records across states. Below, we describe how we implemented each of these steps and document key outcomes.

1. Record Linkage

We have seen that linkages by MSIS ID account for 99.3 percent of the within-state, cross-year linkages, leaving only 0.7 percent for the three additional linkage paths (see Table III.4). When we link records across states, however, we cannot make use of the MSIS ID at all and must rely instead on the MAX SSN (combined with agreement on sex and at least two parts of the DOB), with minimal additional help from the EDB-SSN and EDB-HIC.

Cross-state record linkage was accomplished in a single step. Records for all three years, unduplicated within state, were combined into a single database, which was matched to itself in order to identify all pairs that satisfied any of the three sets of linkage criteria among record-pairs that met two requirements: (1) the state code for the first record did not equal the state code for the second record and (2) the MAXEM ID of the first record was less than the MAXEM ID of the second record. Once the linked pairs were identified, they were classified as within year (by year) or across year (by pair of years).

Altogether, we identified 13.08 million cross-state linked pairs (Table III.12). Of these, 4.19 million were linked within the same year, and 8.89 million were linked across years. Within-year links imply persons enrolled in (at least) two different states in the same year. That the within-year links are nearly half as numerous as the cross-year links suggests that nearly half of those who moved between states and re-enrolled in Medicaid in their new states did so within the same calendar year.[16] The within-year linkages declined from 1.48 million to 1.27 million between 2005 and 2007. This decline over time is consistent with our findings for within-state links, but less pronounced. It is not clear how much of the decline may be due to less complete

[16] A person who moved from state A to state B in 2005, was enrolled in Medicaid in both states in that year, and continued to be enrolled in state B in 2006 would be counted as two cross-state linked pairs in our tabulation.

Table III.12. Summary of Cross-State Linkages for MAXEM 2007

Description of Linkage	Percent Share	Total	Within 2005	Within 2006	Within 2007	2005 to 2006	2006 to 2007	2005 to 2007
Within year	**100.000**	**4,191,248**	**1,484,577**	**1,437,416**	**1,269,255**			
MAX SSN, sex, and DOB	99.928	4,188,220	1,483,724	1,436,297	1,268,199			
EDB SSN, sex, and DOB	0.071	2,968	835	1,102	1,031			
HIC, sex, and DOB	0.001	60	18	17	25			
Across years	**100.000**	**8,891,496**				**2,971,903**	**2,765,067**	**3,154,526**
MAX SSN, sex, and DOB	99.929	8,885,178				2,969,946	2,762,897	3,152,335
EDB SSN, sex, and DOB	0.070	6,192				1,922	2,127	2,143
HIC, sex, and DOB	0.001	126				35	43	48
Total Linked Pairs		**13,082,744**						

identification of linked pairs in more recent versus less recent data. Earlier, we suggested that the later data may be helpful in identifying links in the earlier data—primarily through edits that improve the quality of the linkage variables on earlier returns. We also find that the linkages between adjacent years diminish slightly—from 2.97 million to 2.77 million—between 2005 to 2006 and 2006 to 2007. However, there are somewhat more cross-state linkages between 2005 and 2007 (3.15 million) than between 2005 and 2006. A two-year gap allows more time for people to have moved between states, but our within-state linkages show markedly lower enrollment between 2005 and 2007 than between either adjacent pair of years.

2. Assignment of a Common MAXEM ID

The final MAXEM ID assignment was performed following completion of the cross-state record linkage process. For enrollees with records in multiple states, all records that were successfully linked were assigned a common MAXEM ID that incorporates a state code for one of these states. For enrollees with records in just a single state, this final MAXEM ID assignment did not change the MAXEM ID assigned at the conclusion of the within-state unduplication.

3. Editing of Within-State Duplicates

Through the cross-state linkage process it was possible that two records in the same state and year might link to a common record in another state and be assigned the same final MAXEM ID. The occurrence of such cases in MAXEM 2005/2006 was one of the factors motivating changes to the unduplication process for 2007. These changes reduced the incidence of duplicate MAXEM IDs in the same state and year but did not eliminate them entirely. There were seven such cases in 2005, eight in 2006, and 12 in 2007. These compared to 53 such cases in 2005 and 191 in 2006 in MAXEM 2005/2006. We reviewed all 27 cases from MAXEM 2007 and designated one member of each pair to retain its previous MAXEM ID. As a result, the final

MAXEM research files will contain only one record per unique MAXEM ID in each state and year.

4. Counting the Number of States per MAXEM ID

Because we are not consolidating records across states, we need a mechanism that will enable MAXEM users to generate an unduplicated count of persons enrolled in Medicaid across the United States. The number of states in which each MAXEM ID appears provides an intuitive way to achieve this. The inverse of this number can be used as a weight that when summed over all records will ensure that each unique enrollee will be counted only once.

To provide a capacity to produce unduplicated counts of different types of enrollee records, we split the records into three different types—specifically, ever Medicaid, S-CHIP-only, and claims-only (no enrollment). For each MAXEM ID we counted the number of states in which that MAXEM ID had an enrollment record of each type. NSTATE-M counts the number of states in which an enrollee had a Medicaid enrollment record (indicating that the individual was ever enrolled in Medicaid during the calendar year); NSTATE-S counts the number of states in which an enrollee had an S-CHIP-only enrollment record (indicating that the individual was enrolled only in S-CHIP during the year); and NSTATE-N counts the number of states in which an individual had only claims records—that is, records with no enrollment data.[17] We used the inverses of these three counters as weights to generate unduplicated counts of enrollees with each type of record for the validation tables that accompany this report. Furthermore, because a MAXEM ID can appear only once in a given state in a given calendar year (after the editing

[17] To generate an unduplicated count of persons with *any* S-CHIP enrollment, we would need separate counters for Medicaid only and Medicaid/S-CHIP enrollment. Given that many states still do not submit S-CHIP enrollment and claims data through MSIS, the ability to produce unduplicated estimates of S-CHIP enrollment was not a high priority.

described in the preceding section), a MAXEM ID is associated with only one type of record in any one state. Therefore, the counters can be summed to identify the total number of states in which a MAXEM ID appears during the year. We used the inverse of this sum, NSTATE, as a weight to provide an unduplicated national count of persons with MAX PS records in 2005, 2006, and 2007—also for the validation tables.

Table III.13 provides distributions of total enrollees and each of the three types of enrollment records by the number of states in which their MAXEM IDs appeared in 2005. Altogether, there were 59.8 million unique MAXEM IDs in that year, and 1.38 million or 2.31 percent of the total appeared in two or more states. Relatively few of these appeared in more than two states. Of the total, just 45,589 appeared in three states, 2,162 appeared in four states, and just over 200 appeared in five or more states. Two MAXEM IDs appeared in eight states, and one appeared in 10. Medicaid records had a very similar distribution, as the vast majority of MAXEM IDs appeared on Medicaid records. Furthermore, no MAXEM ID appeared with an S-CHIP only record more than twice, and only 438 had S-CHIP records in two states. Records with no enrollment data were slightly more numerous than records with S-CHIP only enrollment, but only nine MAXEM IDs had two such records, and none had more than two. Because a MAXEM ID could appear on two or all three types of records in different states, the sum of the totals in the last three columns exceeds the total number of unique MAXEM IDs—but by less than 28,000.

Table III.14 provides the same distributions for 2006, and Table III.15 provides the same for 2007. While the number of unique enrollees increases from 59.8 million to 60.1 million in 2006 and 60.3 million in 2007, the number appearing in two or more states declines—to 1.34 million or 2.23 percent of the total enrollees in 2006 and to 1.19 million or 1.98 percent of the total

enrollees in 2007. Distributions of the record types by number of states look very similar across the years. In particular, the long tails for all enrollees and Medicaid records persist.

Table III.13. Unique Enrollees by Type of Record and Number of States in Which They Had Records, 2005

Number of States	All Enrollees	Medicaid Records	S-CHIP Only Records	Records with No Enrollment Data
Total	59,799,302	58,038,716	885,570	902,915
1	58,418,914	56,685,638	885,132	902,906
2	1,332,430	1,306,098	438	9
3	45,589	44,667	0	0
4	2,162	2,108	0	0
5	170	168	0	0
6	24	24	0	0
7	10	10	0	0
8	2	2	0	0
9	0	0	0	0
10	1	1	0	0
2 or more	1,380,388	1,353,078	438	9
Percent of total	2.31	2.33	0.05	0.00

Table III.14. Unique Enrollees by Type of Record and Number of States in Which They Had Records, 2006

Number of States	All Enrollees	Medicaid Records	S-CHIP Only Records	Records with No Enrollment Data
Total	60,095,404	58,261,213	1,055,389	811,869
1	58,755,378	56,953,579	1,054,899	811,852
2	1,295,006	1,263,731	490	17
3	42,958	41,900	0	0
4	1,852	1,799	0	0
5	164	158	0	0
6	40	40	0	0
7	3	3	0	0
8	3	3	0	0
2 or more	1,340,026	1,307,634	490	17
Percent of total	2.23	2.24	0.05	0.00

Table III.15. Unique Enrollees by Type of Record and Number of States in Which They Had Records, 2007

Number of States	All Enrollees	Medicaid Records	S-CHIP Only Records	Records with No Enrollment Data
Total	60,292,635	58,306,487	1,158,313	859,494
1	59,101,232	57,146,287	1,157,801	859,482
2	1,155,314	1,125,062	512	12
3	34,489	33,566	0	0
4	1,461	1,434	0	0
5	108	107	0	0
6	18	18	0	0
7	8	8	0	0
8	4	4	0	0
9	1	1	0	0
10	1	1	0	0
2 or more	1,191,404	1,160,201	512	12
Percent of total	1.98	1.99	0.04	0.00

5. Results of Unduplication

Results of this final step in the unduplication process are reported in Table III.16, which reports the original record counts, duplicate records removed both within and across states, and the final unduplicated enrollee counts for all three years. Separate counts are provided for all MAX PS records, Medicaid enrollee records, S-CHIP only enrollee records, and records with no enrollment data. In 2005, duplicate records within states accounted for just 0.32 percent of the total enrollment records in the MAX PS file whereas duplicate records across states accounted for 2.33 percent of the total records. Unduplicated enrollees in the 2005 MAX PS file amounted to 97.35 percent of the total records in the file. Duplication was slightly less in the 2006 and 2007 files; unduplicated enrollees were 97.46 percent and 97.76 percent of the respective total records in the two years.

Table III.16. Unduplication of Enrollee Records in MAX PS Files, 2005 to 2007

	Number of Records			Percent of Total Records		
Enrollee Population	2005	2006	2007	2005	2006	2007
All MAX PS Records						
Total Records in MAX PS	61,429,538	61,661,641	61,673,120	100.00	100.00	100.00
Duplicate Records Within States	199,259	178,864	151,204	0.32	0.29	0.25
Duplicate Records Across States	1,430,977	1,387,373	1,229,281	2.33	2.25	1.99
Unduplicated Enrollees	59,799,302	60,095,404	60,292,635	97.35	97.46	97.76
Medicaid Enrollees						
Total Records in MAX PS	59,624,702	59,770,821	59,640,328	100.00	100.00	100.00
Duplicate Records Within States	183,355	155,809	136,743	0.31	0.26	0.23
Duplicate Records Across States	1,402,631	1,353,799	1,197,098	2.35	2.26	2.01
Unduplicated Enrollees	58,038,716	58,261,213	58,306,487	97.34	97.47	97.76
S-CHIP Only Enrollees						
Total Records in MAX PS	891,163	1,061,213	1,164,550	100.00	100.00	100.00
Duplicate Records Within States	5,155	5,334	5,725	0.58	0.50	0.49
Duplicate Records Across States	438	490	512	0.05	0.05	0.04
Unduplicated Enrollees	885,570	1,055,389	1,158,313	99.37	99.45	99.46
No Enrollment Data						
Total Records in MAX PS	913,673	829,607	868,242	100.00	100.00	100.00
Duplicate Records Within States	10,749	17,721	8,736	1.18	2.14	1.01
Duplicate Records Across States	9	17	12	0.00	0.00	0.00
Unduplicated Enrollees	902,915	811,869	859,494	98.82	97.86	98.99

Because Medicaid enrollee records were a very large fraction of the total records in the MAX PS file for each year, the impact of unduplication was about the same for Medicaid enrollee records and total MAX PS records. For S-CHIP only records, within-state duplicates were a somewhat larger share of the total than they were for Medicaid records (0.58 percent versus 0.31 percent in 2005), but duplication across states was negligible, amounting to only .05 percent of the initial total records. Over the three years, the number of cross-state duplicates ranged from only 438 to 512 or between 0.04 and 0.05 percent of all S-CHIP only records. Overall, the unduplicated numbers of S-CHIP only enrollees ranged from 99.37 percent to 99.46 percent of the total S-CHIP only records. For records with no enrollment data, duplicates within state were at least twice as common as they were among S-CHIP only records. In 2005, the within-state duplicates were 1.18 percent of the total records with no enrollment data. In 2006,

such duplicates were 2.14 percent of the total, but in 2007 they dropped back to 1.01 percent of the total. We have no ready explanation for the anomalous middle year. Duplication across states was almost non-existent, however, with only 9 duplicates in 2005, 17 in 2006, and 12 in 2007.[18] As a fraction of the total MAX PS records with no enrollment data the unduplicated counts were between 97.86 and 98.99 percent of the initial totals. This reflects more duplication than among S-CHIP only records but less duplication than among Medicaid enrollee records.

C. Linkage Quality

Ultimately, the effectiveness of any record-linkage endeavor depends upon the quality of the underlying data. Because of missing, incomplete, or even outright incorrect identifiers, records belonging to different individuals may be linked and records belonging to the same individual may go unlinked. Section 1 examines a variety of evidence regarding the quality of within-state linkages, while Section 2 assesses the cross-state linkages.

1. Quality of Linkages Within States

To fully evaluate the quality of any record linkages, we would need independent information suitable for verifying at least a random sample of the linkages. Lacking such information, we were left to conduct a more limited evaluation, asking how often our linked records agreed on characteristics that were not used in linking them but which ought to be identical whenever a linked pair of records represents the same individual. For records linked by MSIS ID—the vast majority of within-state linkages—we looked at agreement on the MAX SSN, sex, and DOB, as these variables were not used in linkages based on the MSIS ID. For records linked by MAX SSN, EDB-SSN, or EDB-HIC, which required agreement on sex and at least two parts of the

[18] This could reflect the frequently missing SSNs, sex, and DOB on such records, which limited our ability to link them across states.

DOB, we had to enlist other variables to evaluate the linkages. We used race/ethnicity and basis of eligibility (BOE), which identifies enrollees as aged, disabled, children, or adults. Both characteristics would be expected to show more agreement within than across years, as states implemented a new race/ethnicity classification between 2005 and 2006, and because enrollees can transition between BOE categories as they age.

a. Agreement on MAX SSN, Sex and DOB

Beginning with the small number of records that were linked by MSIS ID within the same year, we found that 90.69 percent of the linked pairs in 2005 but only 70.48 percent in 2006 had the same, nonmissing MAX SSN (Table III.17). In all but one case, however, the lack of agreement was due to a missing SSN on one of the two records. If we exclude the pairs with missing SSNs, then effectively 100 percent of the remaining linked pairs share the same MAX SSN.

Table III.17. Agreement on MAX SSN, DOB, and Sex Among Records Linked by MSIS ID Within State and Year: 2005 and 2006

	Number of Records		Percent of Total		Percent of Nonmissing	
Measure of Agreement	2005	2006	2005	2006	2005	2006
Total Linked Pairs	26,926	19,584				
Agreement on MAX SSN						
Same nonmissing MAX SSN	24,419	13,803	90.69	70.48	100.00	100.00
One MAX SSN present, the other missing	2,506	5,781	9.31	29.52	n/a	n/a
Different nonmissing MAX SSNs	1	0	0.00	0.00	0.00	0.00
Both MAX SSNs missing	0	0	0.00	0.00	0.00	0.00
Agreement on DOB and Sex						
Same DOB, same sex	15,679	11,427	58.23	58.35	84.52	84.73
Same two parts of DOB, same sex	602	391	2.24	2.00	3.25	2.90
Different DOB, same sex	913	675	3.39	3.45	4.92	5.01
Same DOB, different sex	445	241	1.65	1.23	2.40	1.79
Same two parts of DOB, different sex	179	148	0.66	0.76	0.96	1.10
Different DOB, different sex	733	604	2.72	3.08	3.95	4.48
DOB or sex is missing on one or both records	8,375	6,098	31.10	31.14	n/a	n/a

Agreement on DOB and sex is not nearly as high as agreement on the MAX SSN. In both years only 58 percent of the pairs had the same DOB and sex, and another 2 percent agreed on sex and two parts of the DOB. One or both variables were missing for 31 percent of the linked pairs, but that still leaves 8 or 9 percent of the records with discrepant values on sex or DOB. We would be more concerned about this were it not for the fact that all of the within-state linkages by MSIS ID are a direct result of corrected MSIS IDs supplied by nine states in their cross-reference files. Nevertheless, there are sizable differences across these states in the fraction of their records with discrepant sex or DOB. Ignoring the states that submitted fewer than 300 records, we found that in the one state in 2005 (New Jersey) and two of the five states in 2006 (California and New Jersey) the linked pairs had high rates (27-29%) of discrepant DOB or sex codes (Table III.18). Among the other three states in 2006, Louisiana had 99.0 percent agreement on DOB and sex, and Kentucky had 74.8 percent agreement. The low level of agreement in New Mexico (0.1 percent) was due almost entirely (97.5 percent) to missing values of DOB or sex.

Turning to the cross-year linkages, which involved all of the states and a substantial majority of the records in them, we found the following. Of the 142.8 million record-pairs that were linked by MSIS ID, 92.08 percent shared the same nonmissing MAX SSN (Table III.19). Just 0.10 percent, representing 141,503 record-pairs, had different nonmissing MAX SSNs. Most of the rest of the pairs—6.65 percent of the total—had no MAX SSN on either record, and 1.16 percent had a missing MAX SSN on one of the two records. Of the pairs with two missing MAX SSNs, 13,789, or .01 percent, of the total linked pairs had EDB-SSNs on both records. The two SSNs disagreed on just one pair of records; all others agreed. If we exclude the pairs with one or both MAX SSNs and one or both EDB-SSNs missing, then 99.88 percent have matching MAX SSNs and an additional 0.01 percent have matching EDB-SSNs.

Table III.18. Agreement on DOB and Sex Among Records Linked by MSIS ID Within State and Year: 2005 and 2006, by State

State	Total Records	Total Percent	Same DOB, Same Sex	Same Two Parts of DOB, Same Sex	Different DOB or Sex	Missing[a] DOB or Sex
Linkages Within 2005						
Minnesota	230	100.0	0.0	0.0	1.3	98.7
Nevada	195	100.0	22.1	0.5	2.6	74.9
New Jersey	5,854	100.0	42.4	6.4	28.6	22.7
New Mexico	29	100.0	0.0	13.8	51.7	34.5
North Dakota	297	100.0	97.0	1.0	0.7	1.3
Vermont	114	100.0	18.4	0.0	0.0	81.6
Linkages Within 2006[b]						
California	994	100.0	8.4	6.6	28.3	56.7
Kentucky	9,155	100.0	74.8	0.1	0.3	24.7
Louisiana	2,687	100.0	99.0	0.0	0.2	0.7
Minnesota	36	100.0	0.0	0.0	2.8	97.2
Nevada	214	100.0	13.6	0.5	1.9	84.1
New Jersey	4,955	100.0	36.1	6.1	26.6	31.2
New Mexico	1,474	100.0	0.1	0.5	2.0	97.5
Vermont	69	100.0	20.3	0.0	0.0	79.7

[a] One or both fields are missing on one or both linked records.
[b] North Dakota did not submit corrections for 2006.

Table III.19. Agreement on MAX SSN, DOB, and Sex Among Records Linked by MSIS ID Within State, Across Years

Measure of Agreement	Number of Records	Percent of Total	Percent of Nonmissing
Total Linked Pairs	142,766,900		
Agreement on MAX SSN			
Same nonmissing MAX SSN	131,464,821	92.08	99.88
One MAX SSN present, the other missing	1,652,404	1.16	n/a
Different nonmissing MAX SSNs	141,503	0.10	0.11
Both MAX SSNs missing but same EDB SSN	13,788	0.01	0.01
Both MAX SSNs missing and different EDB SSNs	1	0.00	0.00
Both MAX SSNs and one or both EDB SSNs Missing	9,494,383	6.65	n/a
Agreement on DOB and Sex			
Same DOB, same sex	140,848,152	98.66	99.59
Same two parts of DOB, same sex	356,374	0.25	0.25
Different DOB, same sex	71,822	0.05	0.05
Same DOB, different sex	143,321	0.10	0.10
Same two parts of DOB, different sex	3,671	0.00	0.00
Different DOB, different sex	6,607	0.00	0.00
DOB or sex is missing on one or both records	1,336,953	0.94	n/a

The missing SSNs are relevant to our cross-state linking. Given that the MSIS ID cannot be used to link records across states, we will depend on the MAX SSN, the EDB-SSN, and the EDB-HIC to establish cross-state links. The 7.81 percent of pairs with one or both SSNs of both types missing provides an indication of how often records will lack the linkage variables needed to establish links across states (the EDB-HIC is rarely present if the EDB-SSN is missing).

Overall agreement on DOB and sex among the pairs linked by MSIS ID is higher than agreement on the MAX SSN because DOB and sex are much less likely to be missing. Of the total record-pairs linked by MSIS ID, 98.66 percent agree on the full DOB and sex, and another 0.25 percent agree on two parts of the DOB and sex. As a point of comparison, when we link records across years by MAX SSN, EDB-SSN, and EDB-HIC, where we require agreement on at least two parts of the DOB, the ratio of linked-pairs with full agreement on DOB to those with agreement on two parts is 11 to 1—that is, 9 percent differ on one part of the DOB. For pairs linked by MSIS ID, the ratio is nearly 400 to 1. That is, of those that agree on at least two parts of the DOB, only one-quarter of a percent agree on fewer than all three parts.

In all, about 225,000 pairs linked by MSIS ID disagree on at least two parts of the DOB and/or sex. Of these, about two-thirds differ on sex, representing 0.10 percent of all linked pairs, and 0.05 percent differ on DOB. Only 6,607 pairs disagree on both DOB and sex. Another 0.94 percent of the linked pairs are missing either the DOB or sex on one or both records. If we exclude the pairs with missing DOB or sex, then 99.59 percent of the remainder agree on sex and the full DOB, and another 0.25 percent agree on sex and two parts of the DOB.

As we discussed in the last chapter, when we revisited the question of whether or not to require agreement on sex or any part of the DOB when linking records by MSIS ID, we and CMS were influenced by the recognition that the incidence of disagreement on either variable was so low that the observed disagreements could easily be due to errors in the recorded

variables. With disagreements as low as 0.10 percent for sex and 0.05 percent for DOB, we can easily maintain that view.

b. Agreement on Race/Ethnicity and BOE

Record-pairs that were linked by MAX SSN, EDB-SSN, and EDB-HIC were required to agree on sex and at least two parts of the DOB, so we assessed their agreement on race/ethnicity and BOE instead. Because these variables have just a handful of coded values each, agreement between matched records does not provide the same degree of validation as agreement on DOB. At the same time, BOE can change with age or other circumstances, and race/ethnicity is partly subjective, implying that it can be coded differently for the same individual.[19] Consequently, we can expect some level of disagreement on these two variables even when two records represent the same person. Furthermore, BOE is not coded for S-CHIP only records and will be absent as well on records with no enrollment data while race/ethnicity has even higher levels of missing data.

To provide some context for evaluating levels of agreement and disagreement on race/ethnicity and BOE, we measured agreement on these variables among records linked within state and over time by MSIS ID. We excluded records that disagreed on at least two parts of the DOB and sex because such records would not be allowed to link on MAX SSN, EDB-SSN, or EDB-HIC. Results are presented in Table III.20, which breaks down agreement on race/ethnicity (labeled "race" in this and subsequent tables) and BOE into nine categories to account for missing data.

[19] In addition, the set of race/ethnicity codes was expanded between 2005 and 2006, and the two sets of codes do not map completely into one another. Our coding of agreement takes account of the different sets of codes to the extent possible.

Over all three pairs of years, 88.20 percent of linked records had the same race and BOE while another 6.04 percent had the same BOE with a missing race/ethnicity and 1.94 percent had the same race/ethnicity with a missing BOE.[20] Combining these three categories, 96.18 percent had "only agreement" in that they agreed on at least one of the two and did not disagree on the other. We observed essentially the same level of agreement between record-pairs linked between 2005 and 2006 and between 2006 and 2007, but the incidence of only agreement was more than two percentage points lower for record-pairs linked between 2005 and 2007.

Table III.20. Agreement on Race and BOE Among Records Linked by MSIS ID Within State, Across Years: Records with Same Sex and Two or More Parts of DOB

Measure of Agreement	Total	2005 to 2006	2006 to 2007	2005 to 2007
Total Number	141,204,526	49,764,665	49,745,920	41,693,941
Same race, same BOE	124,536,568	44,477,097	44,025,769	36,033,702
Missing race, same BOE	8,533,273	2,957,010	3,140,310	2,435,953
Missing BOE, same race	2,745,054	873,937	1,001,092	870,025
Same BOE, different race	1,033,491	239,908	326,943	466,640
Same race, different BOE	3,613,819	1,020,147	1,005,977	1,587,695
Different race, different BOE	58,075	10,084	14,964	33,027
Missing race, different BOE	317,335	84,416	91,396	141,523
Missing BOE, different race	40,911	10,378	9,866	20,667
Missing race and BOE	326,000	91,688	129,603	104,709
Total Percent	100.00	100.00	100.00	100.00
Same race, same BOE	88.20	89.37	88.50	86.42
Missing race, same BOE	6.04	5.94	6.31	5.84
Missing BOE, same race	1.94	1.76	2.01	2.09
Same BOE, different race	0.73	0.48	0.66	1.12
Same race, different BOE	2.56	2.05	2.02	3.81
Different race, different BOE	0.04	0.02	0.03	0.08
Missing race, different BOE	0.22	0.17	0.18	0.34
Missing BOE, different race	0.03	0.02	0.02	0.05
Missing race and BOE	0.23	0.18	0.26	0.25
Only agreement	96.18	97.07	96.83	94.35
Mixed agreement/disagreement	3.29	2.53	2.68	4.93
Only disagreement	0.29	0.21	0.23	0.47
Percent with Same Race, BOE				
Same DOB	95.12	95.83	95.26	94.06
Same two parts DOB	89.63	88.77	91.18	88.97

[20] A variable is classified as missing if it was missing for at least one member of the pair.

An additional 3.29 percent over all three pairs of years had mixed agreement and disagreement, meaning that they agreed on one of the two variables and disagreed on the other. Most of these record-pairs disagreed on BOE (2.56 percent) rather than race (0.73 percent). Only 0.04 percent disagreed on both race/ethnicity and BOE while 0.22 percent differed on BOE with a missing race/ethnicity and 0.03 percent differed on race/ethnicity with a missing BOE. We classify these three combinations as having only disagreement, and together they account for just 0.29 percent of all pairs linked over time by MSIS ID. Both mixed agreement/disagreement and only disagreement were about twice as common among records linked between 2005 and 2007 as among records linked between consecutive years, but the combined difference was less than three percentage points.

Results by state show considerable variability in the level of agreement on race/ethnicity and BOE—due in part to differences in the frequency of missing data. Most states had the same race/ethnicity and BOE on over 90 percent of the record-pairs linked between 2005 and 2006, but in four states this fraction was less than 70 percent because at least 30 percent had agreement on only one of the two variables while the other was missing (see Appendix Table A.14). Five other states had less than 80 percent of linked records agreeing on both variables. Results were similar for record-pairs linked between 2006 and 2007 (Table A.15) and record-pairs linked between 2005 and 2007 (Table A.16).

We also compared the percent with the same race/ethnicity and BOE between record-pairs that agreed on the full DOB and record-pairs that agreed on only two of the three parts (among records that also agreed on sex). Depending on the pair of years, agreement was four to seven percentage points higher among record-pairs with identical DOBs. Across all linked pairs the difference was 5.5 percentage points. While agreement on DOB was not required for records to be linked by MSIS ID, this suggests that we could increase the probability that a linked record-

pair represented the same individual by requiring agreement on the full DOB (along with sex). We obtained similar findings with MAXEM 2005 and 2006 but decided not to restrict our MSIS linkages in this way on the grounds that this was a very small difference.

On the whole, then, while agreement on race/ethnicity and BOE among records linked over time by MSIS ID was not quite as high as agreement on DOB and sex, it was nevertheless very high, and this provides a standard against which to compare the level of agreement that we find among records linked by MAX SSN, EDB-SSN, and EDB-HIC.

Table III.21 reports the level of agreement on race/ethnicity and BOE among record-pairs linked by the SSN and HIC variables across pairs of years and also within year. For record-pairs linked across years, agreement on race/ethnicity and BOE is reported for each combination of years as well as for all combinations together (as was done for the linkages by MSIS ID). For record-pairs linked within year, agreement is not reported by year because there were fewer than 69,000 linked pairs over all three years compared to over a million record-pairs linked *across* years.[21]

Agreement on race/ethnicity and BOE among record pairs linked by MAX SSN, EDB-SSN, and EDB-HIC is well below what we observed for record-pairs linked by MSIS ID. For all record-pairs linked across years, 59.00 percent had the same race/ethnicity and BOE, 13.56 percent had the same BOE with a missing race/ethnicity, and 4.68 percent had the same race/ethnicity with a missing BOE, yielding a total of 77.25 percent with only agreement. This is 19 percentage points lower than we observed for pairs linked by MSIS ID. Record-pairs with mixed agreement/disagreement were 17.65 percent of the total (compared to 3.29 percent for

[21] For operational reasons, within-year record-pairs that were linked indirectly based on their receipt of a common MAXEM ID following the cross-year linkages (see Section A.3 above) are not included in this table.

pairs linked by MSIS ID), but we note that two-thirds of these agreed on BOE whereas very few of the pairs linked by MSIS ID with mixed agreement on race/ethnicity and BOE had the same BOE. Record-pairs with only disagreement were 4.50 percent of the total. Of these, 1.19 percent differed on both variables while 2.91 percent differed on BOE with a missing race/ethnicity, and only 0.41 percent differed on race with a missing BOE. Record-pairs that were missing both race/ethnicity and BOE were 0.60 percent of the total.

Table III.21. Agreement on Race and BOE Among Records Linked by MAX SSN, EDB-SSN, or EDB-HIC Within State, Across and Within Years

	Record-Pairs Linked Across Years				
Measure of Agreement	Total	2005 to 2006	2006 to 2007	2005 to 2007	Pairs Linked Within Year
Total Number	1,017,310	334,519	317,055	365,736	68,770
Same race, same BOE	600,257	201,504	178,610	220,143	45,353
Missing race, same BOE	137,961	43,976	47,920	46,065	8,239
Missing BOE, same race	47,657	13,611	21,427	12,619	2,509
Same BOE, different race	113,691	39,351	31,924	42,416	6,674
Same race, different BOE	65,856	20,066	18,923	26,867	3,261
Different race, different BOE	12,091	3,719	3,466	4,906	495
Missing race, different BOE	29,609	9,356	9,938	10,315	1,558
Missing BOE, different race	4,125	1,230	1,647	1,248	287
Missing race and BOE	6,063	1,706	3,200	1,157	394
Total Percent	100.00	100.00	100.00	100.00	100.00
Same race, same BOE	59.00	60.24	56.33	60.19	65.95
Missing race, same BOE	13.56	13.15	15.11	12.60	11.98
Missing BOE, same race	4.68	4.07	6.76	3.45	3.65
Same BOE, different race	11.18	11.76	10.07	11.60	9.70
Same race, different BOE	6.47	6.00	5.97	7.35	4.74
Different race, different BOE	1.19	1.11	1.09	1.34	0.72
Missing race, different BOE	2.91	2.80	3.13	2.82	2.27
Missing BOE, different race	0.41	0.37	0.52	0.34	0.42
Missing race and BOE	0.60	0.51	1.01	0.32	0.57
Only agreement	77.25	77.45	78.21	76.24	81.58
Mixed agreement and disagreement	17.65	17.76	16.04	18.94	14.45
Only disagreement	4.50	4.28	4.75	4.50	3.40
Percent with Same Race, BOE					
Same DOB	58.82	60.10	56.02	60.08	65.61
Same two parts DOB	61.05	61.67	59.96	61.38	69.24

Agreement on both race/ethnicity and BOE was lower for records linked between 2006 and 2007 (56.33 percent) than for records linked between 2005 and 2006 (60.24 percent) and between 2005 and 2007 (60.19 percent), but the proportion of record-pairs with only agreement was highest among those linked between 2006 and 2007 (78.21 percent compared to 77.45 percent for records linked between 2005 and 2006 and 76.24 percent for record linked between 2005 and 2007).

Results by state reflect the broadly lower level of agreement on race/ethnicity and BOE among records linked by SSNs or HICs compared to MSIS IDs. Only four states had as many as 80 percent of record-pairs linked between 2005 and 2006 sharing the same race/ethnicity and BOE while 11 states had disagreement on at least one of the two variables among at least 25 percent of its linked pairs (see Appendix Table A.17). Peculiar to records linked between 2005 and 2006, Rhode Island had missing values on both values among 93 percent of linked pairs. Disagreement was less common among record-pairs linked between 2006 and 2007; only six states differed on at least one of the two variables (Table A.18). Disagreement at this level was somewhat higher among records linked between 2005 and 2007, but 13 states had agreement on both variables among more than 80 percent of the record-pairs (Table A.19).

Record-pairs linked within year show higher agreement on race/ethnicity and BOE at nearly 66 percent, compared to 59 percent for record-pairs linked across years. Similarly, pairs with only agreement were 81.58 percent of the total compared to 77.25 percent for those linked across years. It makes sense that agreement should be higher within versus across years, as the measurement of race/ethnicity will be more consistent within the same year than in different years, and enrollees are less likely to change BOE over a shorter versus longer period of time. The incidence of disagreement on one or both variables was only slightly lower among record-pairs linked within versus across years (3.40 versus 4.50 percent), however, as the higher overall

agreement was mostly reflected in a lower level of mixed agreement and disagreement (14.45 percent for record-pairs linked within year versus 17.65 percent for record-pairs linked across years).

Results by state show the higher level of agreement among record-pairs linked within versus between years. In 18 states at least 80 percent of the linked pairs agreed on both variables while 25 percent or more of the linked pairs differed on at least one of the two variables in eight states (see Appendix Table A.20).

Finally, in a reversal from what we found with the record-pairs linked by MSIS ID, the percent of record-pairs agreeing on both race/ethnicity and BOE was actually a little higher among record-pairs that agreed on only two of the three parts of the DOB than among record-pairs that agreed on the full DOB. For all record-pairs linked across years, 61.05 percent of those with less than full agreement on the DOB had the same race/ethnicity and BOE compared to 58.82 percent of those with identical DOBs, a difference of 2.2 percentage points. The difference was a little larger—3.6 percentage points—among record-pairs linked within the same year. At a minimum, this finding should give us pause in moving toward requiring full agreement on the DOB when linking pairs of records.

Should we infer from these comparative findings that the quality of linkages among record-pairs linked within state by SSNs or HICs in combination with DOB and sex is markedly lower than that of record-pairs linked by MSIS ID? Taking this a step further, is it possible that as many as many as 19 percent of the record-pairs linked by SSN—this is the amount by which the agreement on race/ethnicity and BOE among these records falls short of the agreement found among records linked by MSIS ID—could be incorrect links? Before we accept that conclusion we need to weight the potential implications of the fact that the record-pairs linked by SSN and HIC were identified only after all of the record-pairs that could be linked by MSIS ID were

removed. As we showed earlier, most of the record-pairs linked by MSIS ID would be linked as well by MAX SSN, DOB, and sex as well. This suggests that when we link records within state, the records that can be linked by MSIS ID represent the highest quality linkages, and any additional linkages that can be established—which necessarily involve pairs that *disagree* on MSIS ID—may not be of the same quality. Now, it is also possible that race/ethnicity is measured less accurately on record-pairs that disagree on MSIS ID but agree on MAX SSN, DOB, and sex, and this would make some correct links appear questionable. It is difficult to make this same argument about BOE, however, as this variable reflects the enrollee's eligibility determination. Nevertheless, unless and until we can validate a sample of our linked pairs, we cannot be certain why the agreement on race/ethnicity and BOE is lower among the residual records linked by MAX SSN than among those linked by MSIS ID. The obvious explanation is that within-state linkages among record-pairs that disagree on MSIS ID are less reliable than linkages among pairs that agree on MSIS ID. But the lower agreement may be at least partly related to the way that states process records. A difference in MSIS ID indicates that the state did not connect the two enrollees, which means that the enrollee data on the two records were entered independently, creating the potential for errors or the application of different standards in recording race, in particular.

2. Quality of Linkages Across States

When we link records across states, we do not have the benefit of an MSIS ID and must rely on MAX SSN, EDB-SSN, EDB-HIC, DOB, and sex for all of our linkages. At the same time, however, the records that we link across states with these variables do not disagree on MSIS ID in the same sense as those that we linked within states. Rather, the MSIS ID is simply not relevant to linking records across states. In assessing the quality of linkages across states, we examine agreement on race/ethnicity and BOE just as we did in assessing the quality of linkages

within states. We also estimate the number of true record-pairs we may have failed to identify because of missing linkage variables—in particular, SSNs and HICs. Lastly, we consider whether finding people enrolled in multiple states in the same year is indicative of a problem that attends the use of SSNs for record linkage.

a. Agreement on Race/Ethnicity and BOE

Among all record-pairs that were linked across states within the same year, 73 percent agreed on race/ethnicity and BOE (Table III.22). The rate of agreement declined by three percentage points (from 74 percent to 71 percent) over the three years. For cross-year links, the rate of agreement—72 percent—was a percentage point lower than the average within-year agreement. There was a modest difference between pairs linked between 2005 and 2006 (73.48 percent) and those linked between 2006 and 2007 (71.99 percent) and between 2005 and 2007 (71.53 percent). Adding pairs that agreed on either race/ethnicity or BOE while the other was missing raises the estimated level of agreement to 85 percent for within-year record-pairs and 84 percent for cross-year record-pairs.

Only about half a percent differed on both race/ethnicity and BOE. Adding those that disagreed on one variable while the other was missing yields an estimate of 1.61 percent with only disagreement among the within-year links and 1.85 percent among the cross-year links. The fraction of records with mixed agreement and disagreement is a consistent 13 percent among record-pairs linked within year and between 13 and 14 percent among record-pairs linked across years. Pairs with both variables missing range from 0.28 percent to 0.46 percent across all types of links and years.

Compared to the within-state links reported earlier, the fraction of cross-year links with only agreement is seven percentage points higher than for the links we obtained with SSNs and HICs

Table III.22. Agreement on Race and BOE by Source of Linkage and Agreement on Sex and DOB: Cross-State Links

	Within-Year Links			Cross-Year Links				
	2005	2006	200	2005 to 2006	2006 to 2007	2005 to 2007	Within-Year Links	Cross- Year Links
Total Number	1,484,577	1,437,416	1,269,255	2,971,903	2,765,067	3,154,526	4,191,248	8,891,496
Same race, same BOE	1,102,566	1,057,400	904,231	2,183,621	1,990,579	2,256,389	3,064,197	6,430,589
Missing race, same BOE	136,270	143,110	149,558	279,208	293,358	311,447	428,938	884,013
Missing BOE, same race	22,461	25,856	24,073	49,890	51,606	57,503	72,390	158,999
Same BOE, different race	136,883	126,780	114,231	266,269	245,259	280,327	377,894	791,855
Same race, different BOE	59,538	55,843	49,495	132,483	122,949	172,819	164,876	428,251
Different race, different BOE	6,947	6,475	5,880	15,381	14,206	19,906	19,302	49,493
Missing race, different BOE	12,931	12,981	12,666	28,502	28,430	36,449	38,578	93,381
Missing BOE, different race	2,846	3,539	3,248	6,604	7,079	7,684	9,633	21,367
Missing race and BOE	4,135	5,432	5,873	9,945	11,601	12,002	15,440	33,548
Total Percent	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Same race, same BOE	74.27	73.56	71.24	73.48	71.99	71.53	73.11	72.32
Missing race, same BOE	9.18	9.96	11.78	9.39	10.61	9.87	10.23	9.94
Missing BOE, same race	1.51	1.80	1.90	1.68	1.87	1.82	1.73	1.79
Same BOE, different race	9.22	8.82	9.00	8.96	8.87	8.89	9.02	8.91
Same race, different BOE	4.01	3.88	3.90	4.46	4.45	5.48	3.93	4.82
Different race, different BOE	0.47	0.45	0.46	0.52	0.51	0.63	0.46	0.56
Missing race, different BOE	0.87	0.90	1.00	0.96	1.03	1.16	0.92	1.05
Missing BOE, different race	0.19	0.25	0.26	0.22	0.26	0.24	0.23	0.24
Missing race and BOE	0.28	0.38	0.46	0.33	0.42	0.38	0.37	0.38
Summary Excluding Both Missing								
Only agreement	84.96	85.32	84.92	84.55	84.47	83.22	85.07	84.05
Mixed agreement/disagreement	13.23	12.70	12.90	13.42	13.32	14.36	12.95	13.72
Only disagreement	1.53	1.60	1.72	1.70	1.80	2.03	1.61	1.85
Percent with Same Race, BOE								
Same DOB	74.40	73.69	71.36	73.60	72.11	71.63	73.23	72.43
Same two parts DOB	70.32	69.61	67.23	69.74	68.24	68.24	69.17	68.76

(compare Table III.21) but 12 percentage points lower than for the links that were based on MSIS IDs (compare Table III.20). For cross-state, within-year links the fraction with only agreement is 3.5 percentage points higher than for the within-state, within-year links we obtained with SSNs and HICs. These comparisons suggest that the cross-state linkages are more reliable than the residual within-state linkages performed using the same variables. The better performance here may derive from the fact that all of the cross-state linkages are based on MAX SSN, EDB-SSN, and EDB-HIC and not just those that were rejected as linkages using a stronger linkage variable. While the level of agreement on race/ethnicity and BOE does not match what we found for record-pairs linked within state by MSIS ID, it is quite plausible that discrepant values of these two variables are more common when records are linked across rather than within states. States may assign their race/ethnicity codes somewhat differently, depending on the racial and ethnic composition of their populations and other factors. Differences observed among record-pairs linked across states may also reflect differences in local office practice rather than systematic state-to-state differences. Enrollees whose records are linked within the same state, even across years, may be more likely to have consistent race/ethnicity codes because their codes were assigned by the same local office or, perhaps in most cases, simply never changed. We note that agreement on BOE alone is 92 percent among cross-state record-pairs linked within the same year and 91 percent among record-pairs linked across years. Given that BOE can change over time, the rate of agreement on BOE, while not as high as we might like, is nevertheless respectable.

As with the within-state linkages, we find that record-pairs that agree on all three parts of the DOB show somewhat higher agreement on race/ethnicity and BOE than do record-pairs that agree on only two parts of the DOB. The differential is four percentage points for both within-year and cross-year linkages.

b. Missing SSNs

Even with the editing that we were able to perform as part of the within-state linkage process, 10 percent of the unduplicated records in 2005 and 2006 and 11 percent in 2007 were without SSNs, which meant that they could not be linked to records in other states (Table III.23).[22] Missing SSNs are largely due to California. In 2005 and 2006, 66 percent of the missing SSNs were from that single state, which provides restricted benefits to individuals who either do not have or are not required to report SSNs. In California, 37 percent of the unduplicated enrollees in those two years had missing SSNs compared to 4 percent in the rest of the country. The rise in the incidence of missing SSNs between 2006 and 2007 was due to other states, however, as California had a very modest increase in the number of missing SSNs between the two years while the rest of the states added half a million records without SSNs, boosting the total from 4 percent to 5 percent of all records.

Table III.23. Records With and Without SSNs After Unduplication Within States, By Year

Description	2005	2006	2007
Total Records	61,230,279	61,482,777	61,521,916
Number with No SSNs	6,146,688	6,158,818	6,715,724
Percent with No SSNs	10.04	10.02	10.92
California			
Total records	10,923,391	10,945,409	10,987,628
Percent of national total	17.84	17.80	17.86
Number with no SSNs	4,032,219	4,092,519	4,161,025
Percent with no SSNs	36.91	37.39	37.87
Percent of national total	65.60	66.45	61.96
All Other States			
Total records	50,306,888	50,537,368	50,534,288
Percent of national total	82.16	82.20	82.14
Number with no SSNs	2,114,469	2,066,299	2,554,699
Percent with no SSNs	4.20	4.09	5.06
Percent of national total	34.40	33.55	38.04

[22] Because of the way that Medicare EDB data are linked to MAX records, the EDB-HIC is also missing when a record lacks an SSN.

Appendix Table A.21 reports the frequency of missing SSNs by state in 2005, and Tables A.22 and A.23 show the same for 2006 and 2007. In 2005 only two other states besides California—Arizona and Nevada—exceeded the national average with SSNs missing from more than 10 percent of their unduplicated records. Only Arizona and California did so in 2006 while Delaware joined these two in 2007. While California accounted for 66 percent of the missing SSNs nationally in 2005 and 2006, only four other states in each year accounted for more than two percent: Arizona, Georgia, New York, and Texas. In 2007, Florida and Michigan joined this group following increases of more than 50 percent in their numbers of records without SSNs.

Records with no enrollment data, which were added to the linkage process for MAXEM 2007, made a small contribution to the problem. They were 12.6 percent of the records with missing SSNs in 2005 and 10 percent in 2006 and 2007 (Table III.24).

There are sizable differences in medical service use between records with and without SSNs, which we attribute in large part to the restricted benefit eligibility that characterizes most of those who lack SSNs in California. Nationally, 58 percent of those who lacked SSNs in 2005 were eligible only for restricted benefits during the year. This compares to less than 5 percent among those who had SSNs. While 92 percent of those with SSNs qualified for broader benefits in all months that they were eligible for Medicaid, this was true of only 27 percent of those who lacked SSNs. We see differences in the use of most but not all major medical services between enrollees with and without SSNs. For example, 51 percent of enrollees with SSNs used physician services in each of the three years compared to between 30 and 34 percent of those without SSNs, and 54 to 58 percent of those with SSNs used prescription drug services compared to between 27 and 31 percent of those without SSNs. Similarly, 42 to 45 percent of those with SSNs participated in an HMO compared to 10 to 15 percent of those without SSNs. But

Table III.24. Medical Service Use Among Records With and Without SSNs

	2005		2006		2007	
	Records with SSN	Records without SSNs	Records with SSN	Records without SSNs	Records with SSN	Records without SSNs
No enrollment data	0.23	12.61	0.36	9.98	0.34	10.03
Restricted benefits indicator (annual)						
No eligibility	1.76	13.33	2.16	10.96	2.32	11.12
Restricted benefits in all months of eligibility	4.73	58.46	5.06	60.15	5.25	55.99
Restricted benefits in some months of eligibility	1.31	0.84	1.47	0.78	1.54	0.53
Eligible for broader benefits in all months	92.20	27.36	91.31	28.11	90.89	32.35
HMO/HIO premium payment	42.51	9.96	42.89	11.85	45.29	14.97
PHP and/or PCCM premium payment; no HMO	24.98	12.63	25.26	11.85	27.50	10.44
Receipt of FFS services						
Inpatient hospital	9.20	10.41	9.18	11.19	8.77	13.40
Nursing facility	2.79	0.07	2.72	0.06	2.72	0.19
Physician	51.00	30.49	50.57	31.40	51.42	33.64
Dental	22.10	3.22	22.66	3.28	23.26	3.21
Other practitioner	10.52	1.58	10.51	1.55	10.46	1.57
Outpatient	28.60	11.90	28.42	11.65	28.78	12.40
Clinic	16.64	23.47	17.22	24.87	17.82	24.95
Lab/X-ray	40.90	41.68	41.24	41.86	42.95	41.66
Prescription drug	58.14	27.26	54.45	30.25	54.41	30.90
Durable medical equipment	19.18	21.34	18.77	22.38	19.31	21.12
Psychiatric	11.71	4.34	11.81	4.43	12.22	4.64
No HMO premium or physician services	26.52	63.84	27.36	62.71	26.78	60.28
No managed care premium or FFS services	9.42	28.32	10.20	29.16	9.87	28.10

inpatient hospital use was slightly higher among those who lacked SSNs, as was the use of durable medical equipment while lab and x-ray use were comparable. Not surprisingly, though, clinic use was markedly higher among those without SSNs at 23 to 25 percent in each year compared to 17 to 18 percent among those who had SSNs. On the whole, though, indicators of low or no service use were higher among those without SSNs. Specifically, 60 to 64 percent of those without SSNs had neither an HMO premium payment nor a use of physician services during a given year compared to 27 percent of those with SSNs, and 28 to 29 percent of those without SSNs had no evidence of participation in managed care or receipt of FFS services compared to only 9 to 10 percent of those with SSNs.

Appendix Table A.24 reports the distribution of benefit eligibility, by state, for records with and without SSNs in 2005. In eight states, more than half of the records without SSNs have no reported Medicaid eligibility during the year (these tend to be records with only claims data), and in three more states more than half of the records without SSNs have only restricted benefit eligibility during the year. These latter are led by California, where 80 percent of the records without SSNs have restricted eligibility compared to only 2.3 percent of the records with SSNs. For most of the remaining states, however, well over half of the records with missing SSNs have eligibility for broader benefits. Tables A.25 and A.26 report similar findings for 2006 and 2007, respectively.

How many potential linkages across states did we miss because of records that lacked SSNs? We developed an estimate by applying our experience in linking records that had SSNs but shared certain key characteristics with those that lacked SSNs. Specifically, as shown in Table III.25, we classified enrollees with SSNs by whether they had no eligibility (restricted benefits flag equals 0), eligibility for only restricted benefits (flag equals 1), or eligibility broader

Table III.25. Estimation of the Number of Cross-State Links Missed Among Records without SSNs, 2006

Description	California	Balance of States	U.S. Total
Records with SSNs			
Restricted benefits flag = 0			
Number of records	17,059	1,175,479	1,192,538
Number of links	173	17,551	17,724
Linkage rate	1.01	1.49	1.49
Restricted benefits flag = 1			
Number of records	137,601	2,663,457	2,801,058
Number of links	456	41,452	41,908
Linkage rate	0.33	1.56	1.50
Restricted benefits flag = 2,3			
Number of records	6,698,230	44,632,133	51,330,363
Number of links	95,294	1,282,449	1,377,743
Linkage rate	1.42	2.87	2.68
Records without SSNs			
Restricted benefits flag = 0			
Number of records	316,998	358,229	675,227
Estimated number of links	3,215	5,349	8,564
Restricted benefits flag = 1			
Number of records	3,322,506	382,008	3,704,514
Estimated number of links	11,011	5,945	16,956
Restricted benefits flag = 2,3			
Number of records	453,015	1,326,062	1,779,077
Estimated number of links	6,445	38,103	44,548
All records			
Number of records	4,092,519	2,066,299	6,158,818
Estimated number of linked pairs	20,671	49,397	70,068

benefits in some or all months (flag equals 2 or 3). We did this separately for residents of California and the balance of states, and we calculated the cross-state linkage rate for each of these six categories in 2006. We then applied these linkage rates to persons with no SSNs, classified in the same way. Linkage rates were lower in California than the balance of states in each of the three benefit categories, and the linkage rate among California residents with restricted benefits was particularly low. When we applied these six linkage rates to the six subpopulations of persons without SSNs, we obtained estimated numbers of missed links for each of the six, which we summed to provide an estimate of the number of missed links among all persons with missing SSNs. This estimate, reported in the lower right corner of the table, is

70,068 or about five percent of the 1.4 million cross-state linked pairs that we identified in 2006 among records with SSNs. Since the records without SSNs in 2006 were 10 percent of the total, this implies that records without SSNs would be only about half as likely to link to records in other states as records *with* SSNs. For the more substantial cross-state, cross-year linkages, therefore, we estimate that we missed identifying between 140,000 and 160,000 true record-pairs across years, depending on the specific combination of years.

c. Enrollment in Multiple States in the Same Year

While finding people enrolled in the Medicaid programs of two different states in the same year is not too surprising, given the mobility of the population, earlier we documented that some individuals were enrolled in as many as 10 different states in the same year. Is this indicative of a linkage problem, where we lack the means to differentiate among records that carry the same SSN, sex, and DOB, perhaps erroneously? Here is where it would be especially valuable to be able to perform an independent validation of selected linked pairs, but we are unable to do so. Instead, we must rely on more indirect evidence to assess whether the assignment of the same MAXEM ID to individuals in multiple states in the same year is at all problematic.

While the biggest concern about using SSNs for record linkage in a deterministic procedure is that simple errors in the reporting or recording of SSNs will prevent true pairs from being linked, we also recognize concerns that some SSNs may be shared or otherwise used by multiple individuals, creating the potential for false linkages between pairs of records. This is much less of a problem within states than across states, as shared SSNs residing on the same computer system have a likelihood of being detected and ultimately corrected. If SSNs are being shared among individuals in different states, we ought to find more incidence of duplication among SSNs alone than among MAXEM IDs, which require agreement not only on SSN but on sex and

DOB in addition—that is, unless SSNs are being shared only among people recording the same sex and DOB.

In 2005, 1.436 million MAX SSNs appeared in two or more states, with one SSN being reported in 10 states and 2,458 being reported in at least four states (Table III.26). There was only a modest drop off with MAXEM IDs, as 1.380 million appeared in two or more states, with one showing up in 10 states as well and 2,369 in at least four states. Of those SSNs and MAXEM IDs that occurred in at least two states, approximately 3.5 percent of both appeared in three or more states, and only 0.17 percent appeared in four or more. While it is difficult to imagine that an individual could have enrolled in Medicaid in more than three states in a single year, the fraction of individuals who appear to have done so is exceedingly small. Clearly, the cross-state linkages are not being influenced to any significant degree by SSNs that are reported in more than three states. Furthermore, both the total number of SSNs and MAXEM IDs occurring in two or more states in the same year and the fraction occurring in at least three states declined somewhat over the years 2006 and 2007 (Tables III.27 and III.28).

Table III.26. MAX SSNs and MAXEM IDs Appearing in Multiple States, 2005

	Occurrences		Cumulative Occurrences		Cumulative Percent	
Number of States	MAX SSNs	MAXEM IDs	MAX SSNs	MAXEM IDs	MAX SSNs	MAXEM IDs
2	1,385,852	1,332,430	1,436,211	1,380,388	100.000	100.000
3	47,901	45,589	50,359	47,958	3.506	3.474
4	2,236	2,162	2,458	2,369	0.171	0.172
5	181	170	222	207	0.015	0.015
6	27	24	41	37	0.003	0.003
7	11	10	14	13	0.001	0.001
8	2	2	3	3	0.000	0.000
9	0	0	1	1	0.000	0.000
10	1	1	1	1	0.000	0.000
Total	1,436,211	1,380,388				

Table III.27. MAX SSNs and MAXEM IDs Appearing in Multiple States, 2006

	Occurrences		Cumulative Occurrences		Cumulative Percent	
Number of States	MAX SSNs	MAXEM IDs	MAX SSNs	MAXEM IDs	MAX SSNs	MAXEM IDs
2	1,346,643	1,295,006	1,393,810	1,340,026	100.000	100.000
3	45,018	42,958	47,167	45,020	3.384	3.360
4	1,933	1,852	2,149	2,062	0.154	0.154
5	167	164	216	210	0.015	0.016
6	41	40	49	46	0.004	0.003
7	5	3	8	6	0.001	0.000
8	3	3	3	3	0.000	0.000
9	0	0	0	0	0.000	0.000
10	0	0	0	0	0.000	0.000
Total	1,393,810	1,340,026				

Table III.28. MAX SSNs and MAXEM IDs Appearing in Multiple States, 2007

	Occurrences		Cumulative Occurrences		Cumulative Percent	
Number of States	MAX SSNs	MAXEM IDs	MAX SSNs	MAXEM IDs	MAX SSNs	MAXEM IDs
2	1,202,549	1,155,314	1,240,197	1,191,404	100.000	100.000
3	35,973	34,489	37,648	36,090	3.036	3.029
4	1,528	1,461	1,675	1,601	0.135	0.134
5	111	108	147	140	0.012	0.012
6	21	18	36	32	0.003	0.003
7	9	8	15	14	0.001	0.001
8	5	4	6	6	0.000	0.001
9	1	1	1	2	0.000	0.000
10	0	1	0	1	0.000	0.000
Total	1,240,197	1,191,404				

We also examined the joint occurrence of MAXEM IDs in multiple states in all three pairs of years. Table III.29 provides a cross-tabulation of the number of occurrences of unique MAXEM IDs in 2005 by 2006 among MAXEM IDs that occurred at least once in the two years (not necessarily in both years). There are scattered instances of MAXEM IDs appearing in large numbers of states in both years, but these are exceedingly small numbers relative to the 70 million total MAXEM IDs that are represented in the table. To what extent do MAXEM IDs that

Table III.29. Number of States in Which Each MAXEM ID Appeared: 2005 by 2006

Occurrences in 2005	Occurrences in 2006									
	0	1	2	3	4	5	6	7	8	Total
0	0	10,112,104	66,086	939	22	2	0	0	0	10,179,153
1	9,825,359	47,857,206	721,691	14,242	382	30	3	0	1	58,418,914
2	56,859	768,387	486,785	19,603	741	44	11	0	0	1,332,430
3	811	17,175	19,575	7,482	497	42	6	1	0	45,589
4	21	489	819	619	173	33	7	1	0	2,162
5	1	16	45	62	30	7	9	0	0	170
6	0	1	3	9	4	4	3	0	0	24
7	0	0	0	2	3	2	1	0	2	10
8	0	0	1	0	0	0	0	1	0	2
9	0	0	0	0	0	0	0	0	0	0
10	0	0	1	0	0	0	0	0	0	1
Total	9,883,051	58,755,378	1,295,006	42,958	1,852	164	40	3	3	69,978,455

Table III.30. Persistence of Medicaid Enrollment in Multiple States in the Same Year Across Pairs of Years

	2005 to 2006		2006 to 2007		2005 to 2007	
	Number	Percent	Number	Percent	Number	Percent
Enrolled in only one state in first year	58,418,914	100.00	58,755,378	100.00	58,418,914	100.00
Enrolled in second year	48,593,555	83.18	48,753,250	82.98	41,628,723	71.26
In only one state in second year	47,857,206	81.92	48,067,397	81.81	40,873,787	69.97
In two or more states in second year	736,349	1.26	685,853	1.17	754,936	1.29
Not enrolled in second year	9,825,359	16.82	10,002,128	17.02	16,790,191	28.74
Enrolled in two or more states in first year	1,380,388	100.00	1,340,025	100.00	1,380,388	100.00
Enrolled in second year	1,322,696	95.82	1,268,722	94.68	1,185,792	85.90
In only one state in second year	786,068	56.95	825,283	61.59	941,180	68.18
In two or more states in second year	536,628	38.88	443,439	33.09	244,612	17.72
Not enrolled in second year	57,692	4.18	71,303	5.32	194,596	14.10
Enrolled in three or more states in first year	47,958	100.00	45,019	100.00	47,958	100.00
Enrolled in second year	47,125	98.26	43,939	97.60	43,766	91.26
In only one state in second year	17,681	36.87	18,999	42.20	28,449	59.32
In only two states in second year	20,444	42.63	18,402	40.88	12,543	26.15
In three or more states in second year	9,000	18.77	6,538	14.52	2,774	5.78
Not enrolled in second year	833	1.74	1,080	2.40	4,192	8.74

appear in multiple states in one year continue to do so in the next year? To answer this question we used Table III.29 and tables like it for the years 2006 by 2007 and 2005 by 2007 to construct Table III.30, which shows the number of MAXEM IDs appearing in one state, two or more states, and three or more states in the first of each pair of years and breaks down these numbers by enrollment status in the second year. For example, of the 48,000 MAXEM IDs that appeared in three or more states in 2005, 98 percent were enrolled in 2006, but less than 19 percent were enrolled in three or more states in that year. Instead, 43 percent were enrolled in two states, and 37 percent were enrolled in only one state. Looking ahead two years, less than 6 percent were enrolled in three or more states in 2007 while 26 percent were enrolled in two states, and 59 percent were enrolled in just one. In addition, nearly 9 percent were not enrolled at all compared to less than 2 percent in 2006. For MAXEM IDs that appeared in three or more states in 2006, the distribution one year later was similar to what we observed for 2005 to 2006, but a somewhat smaller share remained enrolled in three or more states in 2007 while a larger share was enrolled in only one state.

For the much more substantial number—1.380 million—of MAXEM IDs appearing in two or more states in 2005, we find that 96 percent were enrolled the next year, and 39 percent or 537,000 were still enrolled in at least two states while 57 percent dropped down to one state. After two years, however, only 18 percent were enrolled in two or more states, 68 percent were enrolled in only one, and 14 percent were not enrolled at all.

Of the 58.4 million MAXEM IDs that appeared in only one state in 2005, 83 percent were enrolled the next year, and 82 percent were enrolled in only one state, with just a little over 1 percent enrolled in two or more states. The distribution a year later among MAXEM IDs enrolled in 2006 was very similar to that of MAXEM IDs enrolled in 2005. Between 2005 and 2007, however, the fraction enrolled in the second year dropped to 71 percent. The fraction

enrolled in two or more states remained a little above one percent, but the fraction enrolled in one state declined to 70 percent.

In sum, there is a marked fall-off between one year and the next in the number of MAXEM IDs appearing in multiple states, given that they did so in the first year. Yet while MAXEM IDs appearing in two or more state in consecutive years were less than one percent of the total caseload in either year, they still represented more than half a million individuals—enough to warrant further research to help untangle whether erroneous SSNs play a role in the record linkages that underlie these numbers.

D. MAXEM Output Files

The files that were produced for this project include three MAXEM research files for national and cross-state analyses—one each for 2005, 2006 and 2007—as well as three cross-reference files—one for each year as well—for cross-year and more in-depth national and cross-state studies. Each MAXEM research file contains one record for each unique person enrolled in Medicaid or S-CHIP (for states that submit S-CHIP data to MSIS) in each state. It includes a MAXEM person identifier and a subset of variables from the MAX PS files that can be used to produce basic counts of Medicaid enrollment by enrollee characteristic and service use. The associated cross-reference file contains only linkage variables designed to be used with MAX files for unduplicating records within a state and year and across years and states. This section describes the contents of the MAXEM research and cross-reference files, beginning with the latter.

1. MAXEM Cross-Reference File

Construction of the MAXEM research files required that we map each record in each state PS file for each year to a unique MAXEM ID. To do so, we created a cross-reference file for each of the three years that contains one record for each record found in the state PS files for that

year. For example, if a person had two records in MAX 2005 in Arizona, another record in MAX 2006 in Arizona, and a fourth record in MAX 2006 in California, we included two records in the MAXEM cross-reference file for 2005 and two records in the cross-reference file for 2006. Each of the four records has the same MAXEM ID. Table III.31 lists the fields included in the cross-reference file for each year.

Table III.31. Variable List for CMS MAXEM Cross-Reference File

Variable	Label
FNL_MAXEM_ID	MAXEM ID
STATE	State
YEAR	Year
MSIS ID	Original MSIS ID
FLAG_CLMNOELIG	Flag- Claims but no eligibility record

In addition to being a necessary part of the development of the MAXEM research file, the cross-reference file may also be useful to researchers who want to link and unduplicate records in MAX. While the MAXEM research files will be sufficient for researchers interested in basic demographic and enrollment characteristics of unique enrollees, other researchers will need to create their own analytic files to study measures not included in MAXEM—for example, expenditure patterns among enrollees in more than one state or more than one year. The MAXEM cross-reference file will enable researchers to merge records for the same individual within a MAX year and across years and states.

2. MAXEM Research File

We constructed three MAXEM research files—one for each year—representing unique persons with enrollment records in MAX in each state in that year.[23] Unlike the cross-reference file, which is intended for linking purposes only, each annual MAXEM file is a stand-alone

[23] Records containing claims but no enrollment data continue to be excluded from the MAXEM research files.

research file containing one record per unique individual enrolled in Medicaid or (in states that report such data) S-CHIP within each state in that year. A person enrolled in Medicaid or S-CHIP in more than one state will have one record for each state, but all of these records will have the same MAXEM ID.

The core variables included in the MAXEM files (see Table III.32) were specified by CMS and include basic identifiers (MAX SSN, EDB-SSN, EDB-HIC, state, and year), demographic characteristics (sex, DOB, and race/ethnicity), the final MAXEM ID, the total number of states in which the person was enrolled in Medicaid or only in S-CHIP in that year, eligibility characteristics (dual Medicare and Medicaid enrollment status, MAX annual and monthly CHIP and uniform eligibility group codes), and both service use and premium payment indicators (for capitation payments associated with managed care enrollment). The inverse of each NSTATE counter can be used as a weight to generate an unduplicated national count of persons enrolled in Medicaid or just in S-CHIP during the year. In addition, because we define enrollment in Medicaid and S-CHIP only as mutually exclusive, the two indicators can be summed to obtain a count of the number of states in which each individual was enrolled in *either* Medicaid or S-CHIP.[24] The inverse of this combined count can be used as a weight to produce an unduplicated national estimate of unique individuals who were enrolled in either Medicaid or S-CHIP during the year.

[24] To be identified as enrolled only in S-CHIP in a state and year, an individual could not be enrolled in Medicaid in any month. It is important to remember that as late as 2007 nearly half of the states with separate child health programs were not submitting S-CHIP enrollment and claims data through MSIS. Thus any count of S-CHIP enrollment obtained from the MAXEM data will understate actual enrollment by a wide margin.

Table III.32. Variable List for CMS MAXEM Research File

Variable	Label
MAXEM_ID	Final MAXEM ID
STATE	State
YEAR	Year
NSTATE_M	Total number of states person is enrolled in Medicaid in year
NSTATE_S	Total number of states person is enrolled only in S-CHIP in year
NEW_MAX_SSN	Updated SSN (from MAX)
NEW_EDB_SSN	Updated SSN (from EDB)
NEW_HIC	Updated Medicare HIC number
NEW_DOB	Updated date of birth
NEW_SEX	Updated sex
NEW_RACETHN	Updated race/ethnicity (from MAX)
NEW_CHIP_1	Updated SCHIP eligibility (Jan)
NEW_CHIP_2	Updated SCHIP eligibility (Feb)
NEW_CHIP_3	Updated SCHIP eligibility (Mar)
NEW_CHIP_4	Updated SCHIP eligibility (Apr)
NEW_CHIP_5	Updated SCHIP eligibility (May)
NEW_CHIP_6	Updated SCHIP eligibility (Jun)
NEW_CHIP_7	Updated SCHIP eligibility (Jul)
NEW_CHIP_8	Updated SCHIP eligibility (Aug)
NEW_CHIP_9	Updated SCHIP eligibility (Sep)
NEW_CHIP_10	Updated SCHIP eligibility (Oct)
NEW_CHIP_11	Updated SCHIP eligibility (Nov)
NEW_CHIP_12	Updated SCHIP eligibility (Dec)
NEW_SCHIP_ANN	Updated Annual SCHIP Only Flag
NEW_UEG_ANN	Updated uniform eligibility group (annual)
NEW_UEG_1	Updated MAX eligibility group (Jan)
NEW_UEG_2	Updated MAX eligibility group (Feb)
NEW_UEG_3	Updated MAX eligibility group (Mar)
NEW_UEG_4	Updated MAX eligibility group (Apr)
NEW_UEG_5	Updated MAX eligibility group (May)
NEW_UEG_6	Updated MAX eligibility group (Jun)
NEW_UEG_7	Updated MAX eligibility group (Jul)
NEW_UEG_8	Updated MAX eligibility group (Aug)
NEW_UEG_9	Updated MAX eligibility group (Sep)
NEW_UEG_10	Updated MAX eligibility group (Oct)
NEW_UEG_11	Updated MAX eligibility group (Nov)
NEW_UEG_12	Updated MAX eligibility group (Dec)
NEW_RBF_ANN	Updated restricted benefits flag (annual)
NEW_DUAL_ANN	Updated Medicare/Medicaid Dual (annual)
NEW_TOS_01	Updated type of service indicator (MAX TOS 01)
NEW_TOS_02	Updated type of service indicator (MAX TOS 02)
NEW_TOS_04	Updated type of service indicator (MAX TOS 04)
NEW_TOS_05	Updated type of service indicator (MAX TOS 05)
NEW_TOS_07	Updated type of service indicator (MAX TOS 07)
NEW_TOS_08	Updated type of service indicator (MAX TOS 08)
NEW_TOS_09	Updated type of service indicator (MAX TOS 09)
NEW_TOS_10	Updated type of service indicator (MAX TOS 10)
NEW_TOS_11	Updated type of service indicator (MAX TOS 11)

Variable	Label
NEW_TOS_12	Updated type of service indicator (MAX TOS 12)
NEW_TOS_13	Updated type of service indicator (MAX TOS 13)
NEW_TOS_15	Updated type of service indicator (MAX TOS 15)
NEW_TOS_16	Updated type of service indicator (MAX TOS 16)
NEW_TOS_19	Updated type of service indicator (MAX TOS 19)
NEW_TOS_20	Updated type of service indicator (MAX TOS 20)
NEW_TOS_21	Updated type of service indicator (MAX TOS 21)
NEW_TOS_22	Updated type of service indicator (MAX TOS 22)
NEW_TOS_24	Updated type of service indicator (MAX TOS 24)
NEW_TOS_25	Updated type of service indicator (MAX TOS 25)
NEW_TOS_26	Updated type of service indicator (MAX TOS 26)
NEW_TOS_30	Updated type of service indicator (MAX TOS 30)
NEW_TOS_31	Updated type of service indicator (MAX TOS 31)
NEW_TOS_33	Updated type of service indicator (MAX TOS 33)
NEW_TOS_34	Updated type of service indicator (MAX TOS 34)
NEW_TOS_35	Updated type of service indicator (MAX TOS 35)
NEW_TOS_36	Updated type of service indicator (MAX TOS 36)
NEW_TOS_37	Updated type of service indicator (MAX TOS 37)
NEW_TOS_38	Updated type of service indicator (MAX TOS 38)
NEW_TOS_39	Updated type of service indicator (MAX TOS 39)
NEW_TOS_51	Updated type of service indicator (MAX TOS 51)
NEW_TOS_52	Updated type of service indicator (MAX TOS 52)
NEW_TOS_53	Updated type of service indicator (MAX TOS 53)
NEW_TOS_54	Updated type of service indicator (MAX TOS 54)
NEW_TOS_99	Updated type of service indicator (MAX TOS 99)

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IV. MEDICAID ENROLLMENT: ANALYSES WITH UNDUPLICATED DATA

Moving beyond the process of unduplicating MAX records within and across states, this chapter presents selected findings that illustrate what can be learned about Medicaid enrollment patterns by reducing the MAX data to unique enrollees. Section A presents estimates of unduplicated Medicaid enrollees by eligibility group. Section B examines geographic movement among enrollees. Finally, Section C explores aspects of turnover in Medicaid enrollment.

A. Unduplicated Enrollees by Eligibility Group

The principal findings from our unduplication of MAX PS records are national estimates of the numbers of unique enrollees represented by these data in each of 2005, 2006, and 2007. In Chapter III we presented national estimates of Medicaid enrollees, S-CHIP enrollees, records with no enrollment data, and total MAX PS records after unduplication within states and then across states. Within the population of Medicaid enrollees there are differences in the impact of unduplication by eligibility group—that is, among aged, disabled, child, and adult enrollees. Here we show the numbers of duplicates removed both within and across states for each of these four subpopulations, and present final counts of unduplicated enrollees.

The incidence of duplication in Medicaid enrollment varies by eligibility group. In all three years, duplicate records among disabled and child enrollees occur at about twice the frequency as they do among aged enrollees and about 50 percent more often than they do among adult enrollees. In 2005, for example, the unduplicated count of aged beneficiaries was 98.41 percent of the total enrollment of this subpopulation, while the unduplicated count of disabled enrollees was 96.93 percent of the total disabled enrollee records, the unduplicated count of child enrollees was 96.86 percent of the total child enrollee records, and the unduplicated count of adult

enrollees was 98.12 percent of the total adult enrollee records (Table IV.1).[25] Thus, duplicate records were 1.59 percent of the total aged records, 3.07 percent of the total disabled records, 3.14 percent of the total child records, and 1.89 percent of the total adult records. In 2006, duplicate records were 1.32 percent of the aged enrollee records, 2.96 percent of the disabled records, 2.98 percent of the child records, and 1.80 percent of the adult records (Table IV.2). In 2007, duplicate records were 1.15 percent of the aged records, 2.73 percent of the disabled records, 2.61 percent of the child records, and 1.56 percent of the adult records (Table IV.3).

Table IV.1. Unduplication of National Annual Medicaid Enrollment by Basis of Eligibility, 2005

Enrollee Population	Aged	Disabled	Child	Adult
		Number of Enrollment Records		
Total Medicaid Records in MAX PS	5,484,215	9,016,615	29,690,217	15,433,655
Duplicate Records Within States	26,692	20,809	110,323	25,535
Duplicate Records Across States	60,313	256,074	820,975	265,269
Unduplicated Medicaid Enrollment	5,397,210	8,739,732	28,758,919	15,142,851
		Percent of Total Enrollment Records		
Total Medicaid Records in MAX PS	100.00	100.00	100.00	100.00
Duplicate Records Within States	0.49	0.23	0.37	0.17
Duplicate Records Across States	1.10	2.84	2.77	1.72
Unduplicated Medicaid Enrollment	98.41	96.93	96.86	98.12

Note: Estimates exclude S-CHIP only enrollment.

[25] To calculate an unduplicated national total, we weighted each record by the inverse of the number of states in which that individual was enrolled during the calendar year. For example, if the individual was enrolled in two states, the weight was 1/2. If the individual was classified as a child in one state and an adult in the other, the individual would be counted in both eligibility groups but as half an enrollee in each.

Table IV.2. Unduplication of National Annual Medicaid Enrollment by Basis of Eligibility, 2006

Enrollee Population	Aged	Disabled	Child	Adult
		Number of Enrollment Records		
Total Medicaid Records in MAX PS	5,324,879	9,160,962	29,828,370	15,456,610
Duplicate Records Within States	10,440	19,650	99,481	26,241
Duplicate Records Across States	59,833	252,284	789,312	252,370
Unduplicated Medicaid Enrollment	5,254,606	8,889,028	28,939,577	15,177,999
		Percent of Total Enrollment Records		
Total Medicaid Records in MAX PS	100.00	100.00	100.00	100.00
Duplicate Records Within States	0.20	0.21	0.33	0.17
Duplicate Records Across States	1.12	2.75	2.65	1.63
Unduplicated Medicaid Enrollment	98.68	97.03	97.02	98.20

Note: Estimates exclude S-CHIP only enrollment.

Table IV.3. Unduplication of National Annual Medicaid Enrollment by Basis of Eligibility, 2007

Enrollee Population	Aged	Disabled	Child	Adult
		Number of Enrollment Records		
Total Medicaid Records in MAX PS	5,343,251	9,365,217	29,709,758	15,222,102
Duplicate Records Within States	7,635	19,884	87,357	21,867
Duplicate Records Across States	54,007	236,081	690,731	216,279
Unduplicated Medicaid Enrollment	5,281,609	9,109,252	28,931,670	14,983,956
		Percent of Total Enrollment Records		
Total Medicaid Records in MAX PS	100.00	100.00	100.00	100.00
Duplicate Records Within States	0.14	0.21	0.29	0.14
Duplicate Records Across States	1.01	2.52	2.32	1.42
Unduplicated Medicaid Enrollment	98.85	97.27	97.38	98.44

Note: Estimates exclude S-CHIP only enrollment.

We are not surprised that aged beneficiaries should have the least amount of duplication, given that cross-state duplication dominates within-state duplication and the aged have lower rates of geographic mobility than younger persons. But for the same reason we expected to see greater duplication among adult enrollees than among either disabled or child enrollees, rather than the reverse. This unexpected finding invites further investigation, for which the MAXEM research files may be uniquely well suited.

B. Geographic Movement

Our linkage of records across states provided the final piece of our unduplication of Medicaid enrollment records. In addition to enabling us to produce unduplicated national counts of Medicaid enrollee records by type, the cross-state linkages offer detailed information on the movement of Medicaid enrollees between states. In reviewing our findings here, we begin with estimates of persons enrolled in multiple states in the same year and then proceed to estimates of persons enrolled in multiple states over time.

1. Enrollment in More than One State During the Same Year

In Chapter III we reported that 1.38 million, or 2.31 percent, of the 59.8 million unique individuals in the 2005 MAX PS file had records in more than one state. This phenomenon declined over the three years. In 2006, 1.34 million, or 2.23 percent, of the 60.1 million unique enrollees had records in more than one state; in 2007, 1.19 million, or 1.98 percent, of the 60.3 million unique enrollees had records in more than one state.

If an individual was enrolled in two different states in the same year, the most likely explanation is that the individual was enrolled initially in the first state then moved to the second state and enrolled in that state before the end of the year. If an individual was enrolled in more than two states during the same year, an alternative explanation that should be considered is that the enrollment records may belong to different persons of the same sex who were using the same SSN and sharing or at least reporting the same date of birth. As we explained in Chapter III, however, individuals enrolled in more than two states in the same year were just a small fraction of those enrolled in at least two states. For the most part, then, individuals enrolled in two or more states during the same year were likely to be persons who moved.

For each of the three years, Appendix Tables B.1 through B.3 present counts of record pairs linked between states by the two states in which the pairs were enrolled. While it would be

possible to determine from monthly enrollment codes which state came first (unless the months of enrollment overlapped completely), we have not done so in these tables—although in the next section, where we report cross-year links, the two states in each linked pair can be ordered by year. For the same-year counts, however, there is only one count for each pair of states; this single count combines individuals who moved from the first state to the second and individuals who moved from the second state to the first, as well as any individuals who were enrolled in the two states in the same months.

The most common state pairs are reported in Table IV.4, which shows all of the state pairs that occurred at least 4,000 times in any of the three years. Because the ordering of state names in each pair does not indicate the direction of movement, the two states are listed alphabetically. The most frequent pairing by far was Louisiana and Texas, which had nearly 25,000 joint enrollees in 2005 and close to 31,000 in 2006, but only 12,000 in 2007. We infer that the very high counts in 2005 and 2006 reflect the displacement created by Hurricane Katrina, which devastated New Orleans and inflicted widespread damage along the Gulf Coast in 2005. Three other pairs of states had joint enrollments in excess of 10,000 in all three years but none approached Louisiana and Texas in magnitude. Florida and New York had 14,000 joint enrollees in 2005, declining to 10,000 in 2007. Arizona and California had 12,000 joint enrollees in 2005, declining to under 11,000 in 2007. Florida and Georgia had 12,000 joint enrollees in 2005, 11,000 in 2006, and 10,000 in 2007.

Another 12 state-pairs had at least 5,000 joint enrollees in one or more of the three years, and another 18 had at least 4,000—but less than 5,000— joint enrollees in one or more of the years. More than half of the pairs involved neighboring states, but Florida was often linked with states in the northeast and Midwest, and links between California and Texas—with the largest and third-largest Medicaid enrollments, respectively—were fifth in frequency. Mere size was

not a critical determinant, however: New York, with the second largest enrollment, was not linked with either Texas or California with enough frequency to make the list.

Table IV.4. Pairs of States with at Least 4,000 of the Same Individuals Enrolled in the Same Year, by Year: 2005 to 2007

First State	Second State	2005	2006	2007
Louisiana	Texas	24,777	30,659	12,018
Florida	New York	14,058	12,329	10,222
Arizona	California	12,239	11,113	10,622
Florida	Georgia	12,109	11,615	10,098
California	Texas	8,778	8,978	8,391
California	Nevada	8,107	7,257	6,696
Illinois	Indiana	7,971	8,058	8,054
New York	Pennsylvania	8,056	8,043	7,689
California	Washington	7,481	7,227	7,192
Georgia	Louisiana	7,058	7,417	2,688
California	Oregon	6,142	5,516	5,097
Illinois	Wisconsin	5,958	6,092	5,820
New Jersey	New York	5,491	5,919	5,612
North Carolina	South Carolina	5,687	5,227	4,724
Oklahoma	Texas	5,330	4,956	4,895
New York	North Carolina	5,087	5,099	4,730
Florida	North Carolina	4,934	4,837	4,478
New Jersey	Pennsylvania	4,425	4,858	4,929
Oregon	Washington	4,921	4,657	4,181
Florida	Texas	4,917	4,484	4,111
Alabama	Georgia	4,764	4,358	3,541
Georgia	New York	4,759	4,435	3,739
Illinois	Missouri	4,625	4,272	4,348
Florida	Ohio	4,615	4,111	3,621
North Carolina	Virginia	4,426	4,529	4,258
Florida	Pennsylvania	4,452	4,054	3,683
Florida	Massachusetts	4,353	4,174	3,732
Florida	New Jersey	4,272	3,823	3,392
Arkansas	Texas	4,251	4,061	3,795
Georgia	Tennessee	4,239	4,144	3,600
Florida	Tennessee	4,218	4,183	3,771
Georgia	South Carolina	4,137	3,530	2,959
Kentucky	Ohio	4,132	4,133	3,836
Florida	Michigan	4,006	3,828	3,532

Table IV.5 reports for each of the three years the percentage of unique enrollees in each state who were enrolled in at least one other state during the year. Nevada and Wyoming stand out

Table IV.5. Frequency of Linkages to Records in Other States in the Same Year, by State and Year

State	Percent of Records Linking to Records in Other States		
	2005	2006	2007
Alabama	2.56	2.45	2.08
Alaska	2.82	2.67	2.53
Arizona	2.72	2.42	2.31
Arkansas	3.74	3.61	3.20
California	0.90	0.85	0.78
Colorado	3.59	3.40	3.13
Connecticut	2.30	2.17	1.98
Delaware	3.22	3.01	2.84
District of Columbia	3.82	3.70	3.65
Florida	3.32	3.06	2.75
Georgia	3.32	3.16	2.69
Hawaii	1.90	1.83	1.68
Idaho	4.38	4.00	3.57
Illinois	2.38	2.34	2.21
Indiana	3.14	3.07	2.84
Iowa	3.50	3.20	2.95
Kansas	4.33	3.97	3.64
Kentucky	2.77	2.70	2.52
Louisiana	5.03	5.36	2.78
Maine	1.94	1.83	1.60
Maryland	2.73	2.64	2.49
Massachusetts	1.80	1.77	1.62
Michigan	1.91	1.80	1.68
Minnesota	2.61	2.45	2.24
Mississippi	3.13	3.25	2.57
Missouri	2.93	2.87	2.74
Montana	4.35	3.95	3.55
Nebraska	3.79	3.55	3.34
Nevada	6.74	6.44	5.91
New Hampshire	3.36	3.22	3.00
New Jersey	2.26	2.23	2.05
New Mexico	2.98	2.75	2.66
New York	1.32	1.26	1.17
North Carolina	2.77	2.65	2.43
North Dakota	4.08	4.09	3.77
Ohio	2.00	1.90	1.79
Oklahoma	3.34	3.06	2.82
Oregon	3.54	3.31	3.03
Pennsylvania	1.90	1.85	1.74
Rhode Island	2.55	2.57	2.36
South Carolina	2.69	2.61	2.39
South Dakota	4.15	3.99	3.77
Tennessee	2.98	3.30	3.05
Texas	2.33	2.35	1.76
Utah	3.04	2.96	2.79
Vermont	1.94	1.94	1.71
Virginia	3.12	2.98	2.74
Washington	2.39	2.40	2.30
West Virginia	3.48	3.25	3.10
Wisconsin	2.21	2.14	1.99
Wyoming	5.96	5.67	5.50

with cross-state linkage rates as high as six to seven percent while California is lowest with linkage rates under one percent in all three years. California was the only state with linkage rates under one percent in *any* of the three years, and a contributing factor may be the one-third of enrollees who lacked SSNs and, therefore, could not be linked to enrollees in other states. But New York's linkage rates ranged from only 1.17 to 1.37 percent, and Hawaii, Massachusetts, Michigan, and Pennsylvania were under two percent in all three years. Most states had linkage rates between two and three percent. Besides Nevada and Wyoming, only Louisiana exceeded five percent in any of the three years, and it dropped below three percent in 2007. The only other states to top four percent in any year were Idaho, Kansas, Montana, and North and South Dakota, reflecting a clear geographic pattern to the highest cross-state linkage rates.

We observed earlier that the percentage of unique enrollees with records in more than one state declined from 2.31 percent in 2005 to 2.23 percent in 2006 and 1.98 percent in 2007. We see in Table IV.5 that a decline occurred in every state between 2006 and 2007 and in all but a handful of states between 2005 and 2006. The waning impact of Hurricane Katrina clearly accounts for part of the decline, given the marked reduction in the rate at which enrollees in Louisiana had records in other states. We calculated that the reduction in the number of cross-state record-pairs that included Louisiana accounted for 22 percent of the overall decline in cross-state pairs between 2006 and 2007. Reductions in other cross-state record-pairs could be related to Katrina as well, but we are at a loss to explain the rest.

2. Enrollment in More Than One State over Time

When we link records across states over *time*, we add directionality to the linked pairs. That is, we know in which of the two states an individual was enrolled at time one and in which state the individual was enrolled at time two, and this enables us to measure the separate flows of enrollees from state A to state B and from state B to state A. For example, using the 2.97 million

record-pairs that we linked across states between 2005 and 2006, we cross-tabulated each enrollee's state in 2005 by his or her state in 2006 to determine how many individuals were enrolled in each combination of a 2005 state and a 2006 state. The full cross-tabulation of record-pairs linked between 2005 and 2006 is presented in Appendix Table B.4. The separate cross-tabulation of record-pairs linked between 2006 and 2007 is presented in Table B.5, and the cross-tabulation of record-pairs linked between 2005 and 2007 is presented in Table B.6.

a. Largest Flows

Table IV.6 lists the ordered pairs of states for which 10,000 or more enrollees "moved" from the origin state to the destination state in at least one of the three pairs of years—that is, between 2005 and 2006, 2006 and 2007, or 2005 and 2007.[26] Counts of enrollees are reported for each pair of years. The largest movement occurred between Louisiana and Texas between 2005 and 2006 and involved 66,000 individuals. The magnitude of this flow reflects the impact of Hurricane Katrina. The second largest flow of enrollees in that year was in the reverse direction, involving about 45,000 individuals. Between 2006 and 2007, the flow from Louisiana to Texas dropped to under 40,000 and was actually exceeded by a flow of about 42,500 in the reverse direction. Over the two-year period from 2005 to 2007, however, the flow from Louisiana to Texas exceeded the reverse flow from Texas to Louisiana by a margin of nearly 11,000.

Three other pairs of states had flows in excess of 30,000 in at least one pair of years. Between 2005 and 2007, about 35,000 enrollees moved from California to Arizona. The flows were under 30,000 in the adjacent pairs of years. Also between 2005 and 2007, nearly 33,000

[26] Movement between 2005 and 2007 represents persons enrolled in one state in 2005 and the other state in 2007.

Table IV.6. Pairs of States with Medicaid Enrollee Migration of 10,000 or More Between Any Pair of Years, 2005 to 2007, Arrayed from Largest to Smallest

Origin	Destination	2005 and 2006	2006 and 2007	2005 and 2007
Louisiana	Texas	66,097	39,962	45,623
Texas	Louisiana	45,094	42,512	34,930
California	Arizona	29,911	26,284	35,173
New York	Florida	31,109	25,281	32,842
Florida	Georgia	27,068	26,114	30,388
California	Texas	22,048	21,979	27,038
New York	Pennsylvania	20,985	19,640	25,466
Florida	New York	22,948	21,287	23,426
Georgia	Florida	20,786	18,252	20,123
Illinois	Indiana	18,185	17,904	20,653
California	Nevada	18,545	16,212	20,625
California	Washington	17,205	16,889	20,594
Arizona	California	18,435	18,727	19,584
New York	New Jersey	14,434	14,507	17,876
New York	North Carolina	13,487	13,049	16,777
California	Oregon	14,135	12,672	16,141
Louisiana	Georgia	15,665	9,111	10,058
Indiana	Illinois	13,964	14,537	15,008
Illinois	Wisconsin	13,441	13,021	14,820
Texas	California	14,375	14,213	14,757
Nevada	California	13,175	12,891	14,354
Florida	North Carolina	11,851	11,959	14,191
Washington	California	12,570	12,445	13,450
New Jersey	Pennsylvania	10,987	11,423	13,445
South Carolina	North Carolina	11,967	11,017	13,391
Georgia	Louisiana	13,265	10,280	9,955
Texas	Oklahoma	11,523	10,599	13,042
Pennsylvania	New York	12,435	12,875	13,009
New York	Georgia	11,251	9,783	12,442
Florida	Texas	10,248	10,767	12,165
Florida	Tennessee	10,085	9,726	11,716
Oregon	Washington	10,084	9,524	11,592
Virginia	North Carolina	9,722	9,925	11,401
Wisconsin	Illinois	10,671	10,929	11,189
North Carolina	South Carolina	10,257	9,498	10,840
Missouri	Illinois	9,509	8,663	10,611
Oklahoma	Texas	9,534	9,702	10,479
Washington	Oregon	9,502	8,810	10,248
Florida	Ohio	9,023	8,658	10,191
Ohio	Kentucky	9,018	8,703	10,142
Oregon	California	9,441	9,092	10,094
New Jersey	Florida	9,357	8,080	10,052

enrollees moved from New York to Florida and more than 30,000 moved from Florida to Georgia. As with Louisiana and Texas, all three of these pairs had smaller but still substantial flows of enrollees in the reverse direction—that is, from Arizona to California, Florida to New York, and Georgia to Florida.

Most of the remaining large flows involved a fairly small set of states, and most of the pairs were neighbors. These include, for example, New York, New Jersey, and Pennsylvania; Indiana, Illinois, and Wisconsin; California, Nevada, Oregon, and Washington; and North and South Carolina. The exceptions include flows between pairs of more distant states with particularly large Medicaid populations (for example, Texas and California, Texas and Florida, New York and Georgia, Ohio and Florida).

b. Out-migration and In-migration

To summarize the Medicaid population movements represented in the detailed state-by-state tables, we summed the movements out of and into each state for each pair of years and divided them in each case by each state's unduplicated count of enrollees during the earlier of the two years. The results can be interpreted as out-migration and in-migration rates (although they have an upward bias because an individual enrolled in state A in 2005 might be enrolled in two other states in 2006 and in that case would be counted twice as an out-migrant). Table IV.7 presents out-migration and in-migration rates by state for each of the three pairs of years. Double-digit rates in both directions stand out in Nevada and Wyoming. In Nevada, 13 percent of the enrollees were enrolled in another state in the following year, and 14 percent were enrolled in another state two years later. The flows into the state were even larger, however, representing 14 to 16 percent of the first-year population. Similarly, 11 to 12 percent of Wyoming's enrollees were enrolled in another state in the next year or two, but these outflows were exceeded by

Table IV.7. Enrollee Out-migration and In-migration by State, 2005 to 2007

State	Out-migration Rate			In-migration Rate		
	2005 to 2006	2006 to 2007	2005 to 2007	2005 to 2006	2006 to 2007	2005 to 2007
Alabama	5.02	4.69	5.18	5.63	4.68	5.61
Alaska	6.00	5.72	7.03	5.86	5.46	6.61
Arizona	5.18	4.82	5.69	6.03	5.47	6.95
Arkansas	7.30	6.99	7.52	8.17	7.45	8.70
California	2.12	1.93	2.40	1.57	1.53	1.66
Colorado	7.05	6.90	7.55	7.66	6.97	8.01
Connecticut	4.83	4.39	5.28	4.68	4.43	5.26
Delaware	6.29	5.85	6.78	6.94	6.70	8.02
District of Columbia	8.61	8.43	9.90	7.42	7.32	7.82
Florida	6.86	6.55	7.53	6.53	5.55	6.48
Georgia	6.35	5.77	6.39	7.23	6.34	7.34
Hawaii	4.39	4.17	4.94	3.54	3.32	3.81
Idaho	8.24	7.48	8.73	9.37	8.71	10.57
Illinois	5.18	4.96	5.59	4.65	4.65	5.03
Indiana	6.26	6.07	6.78	6.87	6.52	7.58
Iowa	6.93	6.28	7.57	7.80	7.00	8.96
Kansas	8.55	7.98	9.29	8.97	8.12	9.52
Kentucky	5.43	5.16	5.74	6.12	5.92	6.87
Louisiana	12.11	7.77	8.98	9.71	8.18	7.92
Maine	3.81	3.54	4.09	4.28	3.95	4.86
Maryland	5.88	5.71	6.54	5.44	5.12	5.67
Massachusetts	3.92	3.63	4.16	3.67	3.55	3.95
Michigan	4.23	4.07	4.86	3.75	3.33	3.87
Minnesota	5.08	4.89	5.62	5.69	5.13	6.19
Mississippi	6.66	6.00	6.51	6.68	6.04	6.43
Missouri	5.96	5.75	6.41	5.73	5.91	6.25
Montana	8.58	7.84	9.18	8.81	8.09	9.53
Nebraska	7.80	7.18	8.55	7.76	7.45	8.62
Nevada	12.81	12.74	14.17	14.65	14.07	16.14
New Hampshire	7.06	6.60	8.04	7.19	6.84	8.18
New Jersey	5.20	4.90	5.92	4.55	4.31	5.02
New Mexico	6.10	5.60	6.61	6.10	6.11	7.08
New York	3.21	2.95	3.69	2.27	2.19	2.31
North Carolina	5.11	4.74	5.31	6.51	6.13	7.55
North Dakota	8.43	7.93	9.11	8.98	8.83	10.25
Ohio	4.18	3.91	4.57	4.10	3.92	4.54
Oklahoma	6.27	5.79	6.61	7.58	6.88	8.62
Oregon	6.68	6.40	7.38	7.68	7.06	8.45
Pennsylvania	3.83	3.71	4.26	4.26	3.97	4.88
Rhode Island	5.98	5.75	6.85	4.86	4.62	5.01
South Carolina	5.34	5.08	5.57	5.48	5.38	5.86
South Dakota	8.22	7.79	8.58	8.87	8.49	9.81
Tennessee	5.89	6.37	6.12	6.80	6.91	7.29
Texas	4.55	4.13	4.43	5.30	4.59	5.27
Utah	5.71	5.62	6.14	6.68	6.47	7.40
Vermont	4.11	3.87	4.52	4.11	3.91	4.49
Virginia	6.28	5.94	6.79	6.72	6.19	7.34
Washington	4.72	4.66	5.15	5.27	5.26	6.08
West Virginia	6.93	6.42	7.32	7.16	7.00	8.08
Wisconsin	4.44	4.26	4.81	4.74	4.43	5.19
Wyoming	11.57	10.89	12.03	12.65	11.98	13.90

inflows that added between 12 and 14 percent of the first-year population. By comparison, Louisiana had an out-migration rate of 12 percent between 2005 and 2006 but rates of 8 to 9 percent between 2006 and 2007 and between 2005 and 2007. Louisiana's in-migration rate was nearly 10 percent in 2005 but around 8 percent in each of the other pairs of years. Idaho and North Dakota had inflows in excess of 10 percent between 2005 and 2007 while the outflows in both states between those two years were around 9 percent.

The lowest migration rates in both directions were found in California, where about 2 percent of enrollees moved to other states over any pair of years and a number equaling about 1.5 percent of California's 2005 enrollment moved into the state over the same period. New York had inflows of around 2.2 percent over all pairs of years, which were coupled with outflows of 3.0 to 3.7 percent. Other states at the lower end of the distribution with respect to both outflows and inflows included Pennsylvania and the New England states of Maine, Massachusetts, and Vermont, while Michigan and Hawaii had inflows below 4 percent (but outflows somewhat higher).

It is striking that, for the most part, the states' outflows and inflows were comparable to each other, regardless of magnitude. This is reflected in net in-migration rates (the in-migration rate less the out-migration rate) that are mostly below one percent in either direction (Table IV.8). Only three states (Louisiana, North Carolina, and Oklahoma) and the District of Columbia have net in-migration rates in excess of two percent for any pair of years, and none of the four achieves this level in more than one pair of years.

A phenomenon contributing to this rough balance between outflows and inflows for any pair of years is persons enrolled in two or more states in both years. We reported in Chapter III (Table III.30) that more than half a million people were enrolled in two or more states in both

Table IV.8. Enrollee Net In-migration by State, 2005 to 2007

State	2005 to 2006	2006 to 2007	2005 to 2007
Alabama	0.61	-0.02	0.42
Alaska	-0.14	-0.27	-0.42
Arizona	0.85	0.65	1.26
Arkansas	0.87	0.46	1.18
California	-0.55	-0.40	-0.74
Colorado	0.61	0.07	0.46
Connecticut	-0.15	0.04	-0.01
Delaware	0.65	0.85	1.24
District of Columbia	-1.19	-1.10	-2.08
Florida	-0.33	-1.00	-1.05
Georgia	0.88	0.57	0.95
Hawaii	-0.85	-0.86	-1.13
Idaho	1.13	1.23	1.85
Illinois	-0.53	-0.31	-0.56
Indiana	0.61	0.45	0.81
Iowa	0.87	0.72	1.38
Kansas	0.43	0.14	0.22
Kentucky	0.69	0.76	1.13
Louisiana	-2.40	0.41	-1.05
Maine	0.47	0.41	0.77
Maryland	-0.45	-0.59	-0.87
Massachusetts	-0.25	-0.08	-0.20
Michigan	-0.48	-0.75	-0.98
Minnesota	0.60	0.24	0.56
Mississippi	0.03	0.04	-0.08
Missouri	-0.24	0.16	-0.16
Montana	0.23	0.24	0.35
Nebraska	-0.04	0.26	0.07
Nevada	1.84	1.33	1.96
New Hampshire	0.13	0.24	0.15
New Jersey	-0.65	-0.58	-0.90
New Mexico	-0.01	0.51	0.47
New York	-0.94	-0.76	-1.39
North Carolina	1.40	1.39	2.24
North Dakota	0.56	0.90	1.14
Ohio	-0.08	0.00	-0.03
Oklahoma	1.30	1.09	2.02
Oregon	1.00	0.66	1.07
Pennsylvania	0.42	0.27	0.61
Rhode Island	-1.12	-1.13	-1.84
South Carolina	0.14	0.30	0.29
South Dakota	0.65	0.70	1.24
Tennessee	0.90	0.54	1.17
Texas	0.75	0.46	0.84
Utah	0.98	0.86	1.26
Vermont	0.00	0.04	-0.03
Virginia	0.45	0.25	0.56
Washington	0.55	0.60	0.94
West Virginia	0.23	0.58	0.76
Wisconsin	0.30	0.18	0.38
Wyoming	1.09	1.08	1.87

2005 and 2006. We have not determined how often the same pair of states appears in both years, but when this occurs we measure flows in both directions. For example, if an individual was enrolled in both California and Oregon in 2005 and in both states again in 2006, we would count one move from California to Oregon between 2005 and 2006 and another move from Oregon to California between the same two years. Migrant workers and other seasonal migrants may account for many of these occurrences. Recall (from Table IV.4) that persons enrolled in both Florida and New York in the same year were second in number only to persons enrolled in both Louisiana and Texas. It is quite possible that many of the persons enrolled in three or more states in the same year are migrant workers, but we would have no way to confirm this with MAX data.

c. Corroboration from Household Survey Data

Household survey data provide independent support for the finding that the flows of Medicaid enrollees into and out of individual states tend to be similar in magnitude. The American Community Survey (ACS), an annual survey of two million households, collects data on where each sample member lived one year earlier,[27] and as of 2008 the ACS also collects data on Medicaid and other health insurance coverage. From the responses recorded on the ACS public use file we can determine whether a respondent who was reported to be covered by Medicaid at the time of the survey had moved during the past year and, if so, whether the respondent had been living in the same state or in any specific other state—or outside the United States—one year earlier.

[27] The ACS asks of each person, "Did this person live in this house or apartment one year ago?" If the answer is no, the ACS asks "Where did this person live one year ago?" and requests the full address (or, if another country, the name of the country).

To estimate migration rates in both directions, we first cross-tabulated Medicaid enrollees who had moved in the past year by their current state of residence and their residence one year earlier (when they may or may not have been enrolled in Medicaid). To use these results to estimate an out-migration rate for each state, we determined how many Medicaid enrollees were living in each state one year earlier and, of these, how many were living in a different state at the time of the survey. Dividing the latter by the former yielded an out-migration rate for each state. To estimate an in-migration rate for each state, we determined how many Medicaid enrollees had moved from another state in the past year and divided this result by the number of Medicaid enrollees living in that state at the time of the survey, less those who had moved from outside the country and those who were under one year of age (that is, too young to have lived elsewhere a year earlier).

The out-migration and in-migration rates that we calculated from the 2008 ACS are reported in Table IV.9 along with net in-migration rates that we calculated by subtracting the out-migration rate from the in-migration rate. While smaller than the out-migration and in-migration rates derived from the MAXEM data, the ACS rates also show strong similarities between the magnitudes of the out-migration and in-migration rates by state. For the MAXEM data, correlations between the out-migration and in-migration rates ranged from 0.924 (for migration between 2005 and 2007) to 0.965 (for migration between 2006 and 2007). For the ACS data the correlation between the two sets of rates was 0.664, which is smaller but still moderately high. We also compared the out-migration and in-migration rates from MAXEM with the corresponding rates from the ACS. Correlations between the MAXEM out-migration rates and the ACS out-migration rates ranged from 0.467 (for 2005 to 2006) to 0.553 (for 2005 to 2007) while correlations between the two sets of in-migration rates ranged from 0.476 (for 2005 to

Table IV.9. Medicaid Out-migration and In-migration, by State, 2007 to 2008, from the 2008 ACS

State	ACS Out-migration Rate	ACS In-migration Rate	ACS Net In-migration Rate
Alabama	1.90	2.22	0.32
Alaska	13.13	6.66	-6.47
Arizona	1.86	2.92	1.06
Arkansas	2.29	2.76	0.47
California	0.92	0.59	-0.33
Colorado	3.46	3.94	0.48
Connecticut	1.42	2.43	1.02
Delaware	4.56	3.54	-1.02
District of Columbia	4.54	2.48	-2.06
Florida	3.36	2.29	-1.06
Georgia	2.47	2.74	0.27
Hawaii	3.04	1.79	-1.25
Idaho	4.91	3.69	-1.22
Illinois	1.88	1.35	-0.53
Indiana	2.07	2.80	0.73
Iowa	2.05	2.13	0.08
Kansas	3.25	2.82	-0.42
Kentucky	1.12	2.02	0.90
Louisiana	2.12	1.62	-0.50
Maine	1.53	1.11	-0.41
Maryland	2.57	2.54	-0.03
Massachusetts	1.07	1.82	0.75
Michigan	1.42	1.12	-0.30
Minnesota	1.40	1.61	0.21
Mississippi	1.51	1.84	0.33
Missouri	1.53	2.42	0.89
Montana	3.92	3.30	-0.62
Nebraska	2.87	4.46	1.59
Nevada	6.00	3.83	-2.18
New Hampshire	4.77	4.46	-0.31
New Jersey	2.12	1.82	-0.30
New Mexico	1.83	3.29	1.46
New York	1.21	0.94	-0.27
North Carolina	1.70	2.42	0.72
North Dakota	3.53	7.01	3.48
Ohio	1.23	1.31	0.07
Oklahoma	1.69	2.75	1.06
Oregon	2.67	1.85	-0.82
Pennsylvania	1.38	1.36	-0.01
Rhode Island	3.34	1.98	-1.37
South Carolina	2.15	2.03	-0.13
South Dakota	2.69	2.49	-0.20
Tennessee	1.98	2.63	0.65
Texas	1.44	1.64	0.20
Utah	2.75	4.33	1.57
Vermont	3.11	2.72	-0.38
Virginia	2.57	2.62	0.06
Washington	1.63	2.70	1.07
West Virginia	3.44	2.96	-0.48
Wisconsin	1.89	1.44	-0.46
Wyoming	6.96	2.48	-4.48

2006) to 0.529 (for 2005 to 2007). These correlations are moderately strong, suggesting that states with high out-migration as measured with MAXEM tend to have high out-migration rates with the ACS as well (and likewise for states with low out-migration).

The similarities between the two sources diminish when we compare net in-migration rates (the difference between in-migration and out-migration). Correlations between the MAXEM net in-migration rates and those estimated from the ACS range from 0.136 (2005 to 2006) to 0.217 (2006 to 2007), which is markedly smaller than the correlations between the component rates. We also notice some striking differences in the net in-migration rates estimated for selected states—particularly Alaska and Wyoming, which have sizable negative net in-migration rates in the ACS but, for Alaska, only very small negative rates in MAXEM, and, for Wyoming, relatively large positive rates in MAXEM. Alaska and Wyoming are among the smallest states in both population and Medicaid enrollment, however, and even with the ACS's very large national sample the estimates of migration rates for these two states are imprecise—particularly the net in-migration rate, which for these two states is the difference between two imprecise numbers. Excluding these two states, we find that in both MAXEM and the ACS the estimates of net migration rates are quite low for the most part. This may be the more important finding from this comparison.

There are several caveats in comparing the MAXEM and ACS estimates of migration rates of Medicaid enrollees by state. First, as we have already noted, the ACS estimates are based on a sample that, while large nationally, may yield imprecise estimates of phenomena as rare as migration by Medicaid enrollees—particularly in small states. Second, which we have noted as well, the ACS estimates apply to people who were reported to be enrolled in Medicaid at the time of the survey but not necessarily enrolled the previous year, whereas the MAXEM estimates are based on people who were enrolled in both of the years over which their migration was

estimated. Third, as is true of other major household surveys that measure health insurance coverage, the ACS underestimates reported enrollment in Medicaid, although apparently by less than 10 percent (see the next section). Fourth, the ACS counts each reported enrollee only once and, therefore, only in one state at a time, whereas the MAXEM data from which the migration rates were estimated were unduplicated only within states. Fifth, the ACS captures at most one move in the past 12 months, and the moves that it does capture are probably underestimated. Furthermore, someone who moves back in forth between two locations on a regular basis might very well respond to the ACS question that he or she lived in the same house or apartment one year ago—or at least indicate that he or she lived in the same state. The first three factors imply that the estimates from the two sources can be different, whereas the last two factors may help to explain why MAXEM shows generally higher migration rates than the ACS.

C. Turnover in Medicaid Enrollment

With Medicaid records that have been unduplicated at the state and national levels, it becomes possible to examine turnover in Medicaid enrollment more rigorously than is possible when the data contain duplicate records. First, we use records unduplicated at the national level to estimate monthly enrollment, which we then compare to estimates of persons ever enrolled during the course of the calendar year. Second, we use records unduplicated at just the state level to examine the continuity of Medicaid enrollment within the same state over time. Third, we examine indicators of Medicaid service use to see if this provides any evidence that states maintain inactive cases in their files, which could contribute to observed patterns of enrollment in multiple states in the same year and to high rates of enrollment continuity over time.

1. Monthly Versus Annual-Ever Enrollment

Table IV.10 provides unduplicated national estimates of Medicaid enrollment, by broad age group, for each of the months of calendar year 2005. The table also provides estimates of

persons ever enrolled in Medicaid during the year, which is the traditional way that Medicaid enrollment is reported. The ratio of enrollment ever in the year to the average monthly enrollment is reported for each age group at the bottom of the table.

Table IV.10. Unduplicated National Monthly Versus Annual-Ever Enrollment in Medicaid, 2005

	Enrollment by Age on December 31, 2005				
Enrollment Period	All Ages	Unknown	Under 19	19 to 64	65+
January	45,810,637	28,686	23,073,118	17,454,699	5,254,134
February	45,820,915	28,563	23,157,432	17,398,369	5,236,551
March	45,987,735	28,574	23,306,165	17,405,339	5,247,656
April	46,116,935	28,458	23,452,530	17,393,512	5,242,435
May	46,148,392	28,531	23,532,431	17,352,710	5,234,719
June	46,185,885	28,470	23,622,363	17,299,763	5,235,288
July	46,262,980	28,336	23,745,113	17,249,408	5,240,123
August	46,448,911	28,337	23,935,383	17,247,462	5,237,730
September	46,415,139	28,254	24,052,046	17,109,839	5,225,000
October	46,602,003	28,052	24,199,826	17,159,883	5,214,243
November	46,531,590	27,710	24,230,351	17,070,217	5,203,313
December	46,350,890	27,521	24,180,749	16,951,754	5,190,865
Average Monthly	46,223,501	28,291	23,707,292	17,257,746	5,230,171
Ever in Year	58,038,716	55,033	29,207,926	22,754,649	6,021,109
Ratio: Ever to Average Monthly	1.26	1.95	1.23	1.32	1.15

Note: Estimates exclude persons with only S-CHIP enrollment during the year and records with no enrollment data.

For all ages combined, monthly enrollment increases gradually over most of the year, such that the average monthly enrollment of 46.2 million falls about midway between the June and July enrollment counts. Enrollment trends differ by age group, however. For children, enrollment increases with every successive month except December. Over the course of the year, child enrollment grows by 1.1 million. For nonelderly adults, enrollment declines by 0.5 million over the calendar year, while enrollment among the elderly is relatively stable, dropping by only 64,000 between a January maximum and a December minimum.

Estimates of enrollment ever in the year show differing amounts of turnover by age. For all ages combined, the ratio of annual-ever enrollment to average monthly enrollment is 1.26, implying that annual-ever enrollment was 26 percent higher than average monthly enrollment. For children, annual-ever enrollment is 23 percent higher than average monthly enrollment. For nonelderly adults, annual-ever enrollment is 32 percent higher than average monthly enrollment, while the corresponding figure for elderly adults is 15 percent. Clearly, turnover involves more than just the growth or decline in total enrollment over the course of the year, as the peak enrollment for children (in November) is only five percent higher than the minimum enrollment (in January), the peak enrollment for nonelderly adults (in January) is only three percent higher than the minimum enrollment (in December), and the peak enrollment for elderly adults (also in January) is just a little over one percent greater than the minimum enrollment (in December).

There is interest in comparing Medicaid monthly and annual-ever enrollment with survey estimates. In particular, both the Survey of Income and Program Participation and the Medical Expenditure Panel Survey collect data on health insurance coverage by month and can generate estimates of persons who were ever enrolled in Medicaid during a calendar year or other 12-month period. Both of these surveys exclude residents of institutions, so we prepared a second set of estimates of monthly and annual-ever enrollment in Medicaid in which we excluded enrollees who had FFS claims for nursing home and other institutional care services during the calendar year.

Removing enrollees who received institutional care has no discernible effect on the ratio of annual-ever enrollment to average monthly enrollment except among the elderly, where it reduces the ratio from 1.15 to 1.14 (Table IV.11). This effect is the opposite of what was expected; we had hypothesized that turnover would be lower among institutionalized enrollees. While this was in fact true among both children and nonelderly adults (1.09 versus 1.23 for the

former and 1.10 versus 1.32 for the latter), there were too few nonelderly enrollees in institutions to affect the overall ratios for these subpopulations (Table IV.12). Elderly enrollees who were institutionalized—about one-fifth of the total—had a somewhat higher ratio of annual-ever enrollment to average monthly enrollment (1.22) than those who were not institutionalized.[28]

Table IV.11. Unduplicated National Monthly Versus Annual-Ever Enrollment in Medicaid, Excluding Persons Receiving Services in Institutions, 2005

	Enrollment by Age on December 31, 2005				
Enrollment Period	All Ages	Unknown	Under 19	19 to 64	65+
January	44,299,939	28,682	22,997,662	17,101,256	4,172,339
February	44,309,629	28,559	23,081,244	17,043,358	4,156,469
March	44,482,961	28,569	23,229,264	17,049,021	4,176,107
April	44,623,060	28,454	23,374,896	17,036,154	4,183,555
May	44,663,318	28,526	23,454,342	16,995,119	4,185,331
June	44,711,131	28,465	23,544,041	16,942,650	4,195,976
July	44,793,622	28,332	23,666,576	16,891,867	4,206,846
August	44,988,001	28,333	23,856,619	16,890,563	4,212,486
September	44,965,925	28,250	23,973,348	16,754,354	4,209,973
October	45,164,635	28,047	24,121,212	16,804,782	4,210,594
November	45,111,871	27,705	24,151,934	16,717,484	4,214,748
December	44,953,022	27,517	24,102,838	16,602,211	4,220,456
Average Monthly	44,755,593	28,287	23,629,498	16,902,402	4,195,407
Ever in Year	56,305,328	55,026	29,123,406	22,363,518	4,763,378
Ratio: Ever to Average Monthly	1.26	1.95	1.23	1.32	1.14

Note: Estimates exclude persons with only S-CHIP enrollment during the year and records with no enrollment data.

[28] Mortality could have a sizable upward influence on estimates of turnover among the elderly and especially among the elderly institutionalized.

Table IV.12. Unduplicated National Monthly versus Annual-Ever Enrollment in Medicaid: Persons Receiving Services in Institutions, 2005

	Enrollment by Age on December 31, 2005				
Enrollment Period	All Ages	Unknown	Under 19	19 to 64	65+
January	1,510,698	4	75,456	353,443	1,081,795
February	1,511,286	4	76,188	355,011	1,080,082
March	1,504,773	5	76,901	356,318	1,071,549
April	1,493,875	4	77,634	357,358	1,058,879
May	1,485,073	5	78,089	357,592	1,049,388
June	1,474,754	5	78,323	357,113	1,039,313
July	1,469,359	4	78,537	357,541	1,033,277
August	1,460,910	4	78,764	356,899	1,025,244
September	1,449,214	4	78,698	355,485	1,015,027
October	1,437,368	5	78,614	355,101	1,003,649
November	1,419,719	5	78,417	352,732	988,565
December	1,397,868	4	77,911	349,543	970,410
Average Monthly	1,467,908	4	77,794	355,345	1,034,765
Ever in Year	1,733,388	7	84,520	391,130	1,257,731
Ratio: Ever to Average Monthly	1.18	1.75	1.09	1.10	1.22

Note: Estimates exclude persons with only S-CHIP enrollment during the year and records with no enrollment data.

2. Continuity of Enrollment over Time

In Chapter III we presented estimates of enrollment retention over time, based on record-pairs linked between pairs of years. For the analysis presented here we used enrollment records that were unduplicated within state and estimated the combinations of years that unique enrollees were enrolled within the same state. The patterns that we can observe differ depending on the base year (2005, 2006, or 2007), as shown in Table IV.13. Beginning with 2005, we find that 82.24 percent of those who were enrolled in the base year were still enrolled one year later, and 66.82 percent were still enrolled two years later—that is, they were enrolled all three years. A very small fraction, 2.01 percent, skipped a year; that is, they were not enrolled in 2006 but returned to enrollment in 2007. Finally, 15.75 percent were not enrolled in either of the subsequent years after 2005.

Table IV.13. Patterns of Medicaid Enrollment Within the Same State Over Time, 2005 to 2007: Enrollees Unduplicated Within State

Base Year and Years Enrolled	Number Enrolled	Percent of Base Year Enrollment	Percent of Subtotal Enrollment
2005			
Total enrolled in year	59,441,347	100.00	
Enrolled one year later	48,884,409	82.24	100.00
Enrolled both one and two years later	39,716,087	66.82	81.24
Enrolled one but not two years later	9,168,322	15.42	18.76
Enrolled two years later	40,909,082	68.82	100.00
Enrolled all three years	39,716,087	66.82	97.08
Enrolled 2005 and 2007 only	1,192,995	2.01	2.92
Not enrolled one or two years later	9,363,943	15.75	
2006			
Total enrolled in year	59,615,012	100.00	
Enrolled one year later	48,723,157	81.73	
Enrolled one year earlier	48,884,409	82.00	
Enrolled one year earlier and one year later	39,716,087	66.62	
Not enrolled one year earlier or later	1,723,533	2.89	
Enrolled one year earlier	48,884,409	82.00	100.00
Enrolled one year later	39,716,087	66.62	81.24
Not enrolled one year later	9,168,322	15.38	18.76
Not enrolled one year earlier	10,730,603	18.00	100.00
Enrolled one year later	9,007,070	15.11	83.94
Not enrolled one year later	1,723,533	2.89	16.06
2007			
Total enrolled in year	59,503,585	100.00	
Enrolled one year earlier	48,723,157	81.88	100.00
Enrolled both one and two years earlier	39,716,087	66.75	81.51
Enrolled one but not two years earlier	9,007,070	15.14	18.49
Enrolled two years earlier	40,909,082	68.75	100.00
Enrolled all three years	39,716,087	66.75	97.08
Enrolled 2005 and 2007 only	1,192,995	2.00	2.92
Not enrolled one or two years earlier	9,587,433	16.11	

In addition, we found that for persons who were still enrolled a year after the base year (that is, enrolled in both 2005 and 2006), 81.24 percent remained enrolled for an additional year. This is only slightly lower than the fraction that remained enrolled one year after the base year, which suggests that disenrollment from Medicaid does not increase appreciably with the duration of enrollment—at least not over the three-year span that we can observe. Lastly, among persons

who were enrolled two years after the base year, 97.08 percent were enrolled during the intervening year, implying that only 2.92 percent were not.

We can produce the same kinds of estimates for the 2007 base year, except that they are retrospective rather than prospective. Not surprisingly, they look very similar to the prospective rates of enrollment retention. Of the 59.5 million enrollees in 2007, 81.88 percent had been enrolled since at least one year earlier, 66.75 percent had been enrolled since at least two years earlier, and 2.00 percent had been enrolled two years earlier but not one year earlier. Only 16.11 percent had not been enrolled in at least one of the two prior years. Also, of those who had been enrolled one year earlier, 81.51 percent had been enrolled two years earlier as well. Of those who had been enrolled two years earlier, 97.08 percent had been enrolled one year earlier as well.

With the 2006 base year we can examine the continuity of enrollment in both the forward and reverse directions, but only for one year each way. Of the 59.6 million who were enrolled in Medicaid in 2006, 81.73 percent were still enrolled one year later, 82.00 percent were enrolled one year earlier, and 66.62 percent were enrolled both one year earlier and one year later. Of the 48.9 million who had been enrolled for at least two years, 81.24 percent were enrolled one year later. Of the 10.7 million who had not been enrolled for more than just the one year, 83.94 percent were enrolled the next year.

Comparing these results to those for 2005 and 2007, we find virtually identical estimates of year-to-year continuity in enrollment whether we look forward, backward, or in both directions. Likewise, the probability that a Medicaid enrollee will still be enrolled the next year does not seem to depend appreciably on whether that individual has already been enrolled for one or two years. This would seem to suggest that enrollees disenroll at a relatively steady rate over time.

Tabulations of multiyear enrollment patterns by state, from which these national estimates were derived, are included in Appendix B. Table B.7 presents enrollment patterns among persons enrolled in 2005; Table B.8 presents enrollment patterns among persons enrolled in 2006; and Table B.9 presents enrollment patterns among persons enrolled in 2007.

For persons enrolled in 2005, most states are within five percentage points of the national average rates of 82.24 percent enrolled one year later and 66.82 percent enrolled both one and two years later. On the high end, Louisiana is the lone outlier, with almost 90 percent enrolled one year later, but it is joined by a few other states with relatively high percentages enrolled both one and two years later. At the low end, Nevada is far below the mean, with only 68 percent enrolled one year later and 47 percent enrolled one and two years later. Utah is the only other state with less than 50 percent enrolled one and two years later, and its 72 percent enrolled one year later is second only to Nevada as well.

With respect to persons enrolled in 2006, DC and Tennessee top all other states with 76 percent enrolled in the two surrounding years—nine percentage points above the national average. Nevada and Utah are lowest at 50 percent and 51 percent, respectively. The only other states below 50 percent are Colorado and Wyoming; together these four states form a tight geographic cluster. Enrollment in 2007 shows a similar pattern, with Tennessee and DC topping all other states in the percentage enrolled one and two years earlier while Nevada and Utah are once again at the bottom, but Colorado and Wyoming are much closer to the pack. In fact, Wyoming's enrollment pattern closely resembles California's.

3. Service Use

The possibility that former Medicaid enrollees whose coverage has ended remain on the rolls in some states has been suggested as a possible explanation for why survey estimates of Medicaid coverage do not compare more closely with program administrative estimates. Using

the data on service use reported in MAXEM, we explore this possibility by examining the relationship between service use and (1) the duration of enrollment and (2) the number of states in which an individual was enrolled in the same year.

a. Duration of Enrollment

If cases are retained in state Medicaid files after Medicaid coverage has ended, we might expect to see a reduction in service use with the number of years that an individual has been enrolled. The presumption here is that cases retained after coverage has ended tend to grow in proportion to the total caseload as the length of enrollment increases and that service use does not increase with length of enrollment, which would tend to offset the first effect. To investigate the relationship between service use and length of enrollment, we defined service use as the receipt of any of a small number of services widely used by Medicaid enrollees, and we compared recorded service use (the percentage of enrollees using any of these services) in 2007 among persons enrolled in just 2007, in both 2006 and 2007, and in all three years, 2005 through 2007. In defining a set of services we included physician, x-ray/lab, prescription drug, and clinic services as well as the recording of an HMO premium payment. We conducted this analysis at the state level, as states differ in the extent to which Medicaid benefits are provided through managed care arrangements, and services provided through an HMO are not recorded in the MAX data. More importantly, any tendency to retain cases on the rolls past the end of their Medicaid eligibility is likely to vary by state.

Rather than finding a decline in services with increasing duration of enrollment, we find just the opposite in nearly every state. With the exception of three states where service use was essentially unchanged as duration of enrollment rose (Alabama and Mississippi) or declined

slightly (Tennessee), every other state had higher service use among enrollees with three or more consecutive years of coverage than among those enrolled for just a single year (Table IV.14).[29] In 10 states—all in the northeast or Midwest—the differential was 15 percentage points or greater, led by New York with a difference of 29 percentage points.

That service use rises with years of enrollment makes it difficult to discern any tendency in the opposite direction that might be induced by cases retained on the rolls after their eligibility has ended. Because of this, our findings are inconclusive with respect to whether cases are retained on the rolls in any significant number in any state after eligibility ends.

b. Number of States Enrolled in the Same Year

One possible explanation for individuals being enrolled in multiple states in the same year—especially in more than two—is that they remain enrolled for a time after they have moved out of a state. If there is any truth to this, then we ought to see a decline in the use of Medicaid services through FFS arrangements as the number of states in which an individual is enrolled during a given year rises beyond one. It is less clear that we would also see a decline in managed care premium payments, as such payments do not reflect actual service use as closely as FFS payments. Furthermore, Medicaid enrollees in managed care are frequently given guaranteed eligibility—and their premiums paid—for a specified period of time. We examined the relationship between service use and the number of states in which individuals were enrolled, by state, for the calendar year 2005. For this exercise we focused on physician use as a measure of FFS utilization, but we also included in our binary measure of service use whether an HMO premium had been paid.

[29] Maine is excluded from the analysis of service use because most of the categories of services are not included in the MAX data for Maine.

Table IV.14. Percent of Enrollees Receiving Any of Selected Services in 2007, by Duration of Enrollment

State	One Year	Two Years	Three of More Years
Alabama	76.9	75.0	76.5
Alaska	73.4	78.4	79.3
Arizona	79.5	76.9	82.1
Arkansas	72.4	77.8	78.8
California	79.7	60.7	83.1
Colorado	72.7	77.9	80.9
Connecticut	78.7	93.5	94.8
Delaware	84.1	88.8	88.9
District of Columbia	77.8	87.8	91.5
Florida	79.2	83.4	83.0
Georgia	85.4	92.8	91.3
Hawaii	88.2	96.0	96.7
Idaho	74.5	79.8	78.6
Illinois	64.2	77.8	80.9
Indiana	77.4	92.5	93.1
Iowa	70.2	69.5	83.2
Kansas	80.8	91.3	91.2
Kentucky	79.7	86.6	89.8
Louisiana	77.3	82.7	79.9
Maryland	78.4	89.8	89.4
Massachusetts	65.2	77.1	85.7
Michigan	71.0	81.9	90.2
Minnesota	69.6	88.2	94.0
Mississippi	75.9	77.1	77.1
Missouri	82.8	92.2	93.9
Montana	69.1	76.6	77.0
Nebraska	77.1	87.7	90.1
Nevada	75.7	87.8	86.8
New Hampshire	69.6	80.4	85.5
New Jersey	73.6	91.7	91.0
New Mexico	81.4	88.5	89.4
New York	61.4	81.3	90.3
North Carolina	77.6	82.5	85.3
North Dakota	68.0	76.6	81.5
Ohio	81.1	92.3	94.2
Oklahoma	75.8	76.1	81.0
Oregon	80.5	85.4	88.0
Pennsylvania	80.2	88.7	86.8
Rhode Island	85.8	91.4	91.3
South Carolina	78.9	81.1	83.7
South Dakota	75.4	80.7	83.3
Tennessee	79.1	82.0	75.8
Texas	78.0	87.2	83.6
Utah	73.8	77.6	78.7
Vermont	68.5	82.3	88.5
Virginia	79.6	89.6	89.8
Washington	81.5	83.1	90.6
West Virginia	77.9	80.9	93.2
Wisconsin	79.0	85.1	92.0
Wyoming	73.5	75.2	80.6

Note: Services include physician, x-ray/lab, clinic, prescription drug, or an HMO premium payment.

Table IV.15 reports, by state, the proportion of enrollees with indicators of either measure of service use by the number of states in which individuals in each state were enrolled. We are less interested in the absolute magnitudes of service use than in whether service use declines as the number of states increases. Across all states (except Maine, which is excluded because the only service use recorded in MAX is the receipt of prescription drugs), service use declines from 69.8 percent for persons enrolled in only one state to 62.1 percent for persons enrolled in two states and 54.1 percent for persons enrolled in three or more states. As a summary measure that can be applied across states with varying levels of service use, we employ the ratio of service use among persons enrolled in only one state to the service use among persons enrolled in three or more states. Across all states this ratio is 1.29.

In three states—Arizona, California, and Oregon—this ratio is at or below one, meaning that persons enrolled in only the one state were no more likely to have an HMO premium payment or FFS physician claims than persons enrolled in three or more states. In Arizona, service use rises from 72.9 percent among persons enrolled in one state to 92.9 percent among persons enrolled in three or more states, but Arizona is unique. In all other states besides California and Oregon the ratio is above one, and in three states it is above two: Louisiana (2.49), Mississippi (2.02), and Tennessee (2.01). These include the two states hit hardest by Hurricane Katrina in that same year and another state in close proximity. Other states with ratios above 1.5 run the gamut, however. They include Alabama, Colorado, Idaho, Illinois, New Hampshire, North Carolina, South Dakota, and Wyoming. The three mountain states and Wyoming neighbor South Dakota stand out, and we showed previously that they rank among the lowest states in the proportion of their enrollees who remain enrolled from one year to the next, but the other states are more diverse.

Table IV.15. Percent of Enrollees with an HMO Premium Payment or FFS Physician Services by State and Number of States in Which Individuals are Enrolled, 2005

State	All Enrollees	Number of States in Which Individuals Are Enrolled			Ratio of 1 to 3+
		1	2	3+	
Alabama	57.8	58.5	43.7	34.7	1.69
Alaska	62.8	63.5	51.6	47.2	1.35
Arizona	73.7	72.9	87.6	92.9	0.79
Arkansas	64.9	66.5	44.5	35.0	1.90
California	59.3	59.1	70.6	60.5	0.98
Colorado	34.7	35.3	26.0	23.1	1.53
Connecticut	86.2	86.4	82.1	73.2	1.18
Delaware	86.0	86.1	83.6	83.2	1.04
District of Columbia	78.7	79.6	68.1	58.4	1.36
Florida	73.4	73.9	66.3	59.5	1.24
Georgia	69.6	70.0	63.5	52.0	1.35
Hawaii	93.2	93.4	88.8	82.9	1.13
Idaho	64.0	65.4	48.1	43.4	1.51
Illinois	54.8	55.5	42.1	34.3	1.62
Indiana	83.1	83.3	80.4	77.9	1.07
Iowa	62.2	62.6	56.5	48.6	1.29
Kansas	75.3	76.2	65.8	57.5	1.32
Kentucky	73.9	74.5	62.1	55.7	1.34
Louisiana	63.4	66.9	33.4	26.9	2.49
Maryland	81.1	81.5	73.0	71.4	1.14
Massachusetts	67.9	68.1	61.9	52.1	1.31
Michigan	77.4	77.4	76.8	68.9	1.12
Minnesota	82.6	82.7	80.5	71.9	1.15
Mississippi	57.5	58.8	38.8	29.1	2.02
Missouri	72.6	73.4	60.8	58.6	1.25
Montana	56.3	57.0	47.2	40.6	1.41
Nebraska	77.3	78.1	66.8	64.5	1.21
Nevada	78.8	79.9	71.4	62.9	1.27
New Hampshire	60.4	61.2	49.5	40.8	1.50
New Jersey	74.8	75.0	71.2	64.5	1.16
New Mexico	89.3	89.6	84.3	82.1	1.09
New York	79.0	79.2	70.7	56.5	1.40
North Carolina	69.3	70.2	53.6	44.8	1.57
North Dakota	58.4	58.9	52.1	46.7	1.26
Ohio	86.6	87.1	75.5	68.1	1.28
Oklahoma	61.1	61.9	48.8	44.2	1.40
Oregon	75.0	74.9	76.3	77.1	0.97
Pennsylvania	80.0	80.1	78.2	74.8	1.07
Rhode Island	83.2	83.5	78.6	68.4	1.22
South Carolina	64.8	65.6	50.0	43.9	1.49
South Dakota	55.9	56.9	44.5	36.0	1.58
Tennessee	55.8	57.1	37.5	28.4	2.01
Texas	73.9	74.3	64.4	57.1	1.30
Utah	24.2	24.4	21.1	19.9	1.22
Vermont	66.1	66.3	60.4	56.0	1.18
Virginia	79.3	79.5	74.9	73.1	1.09
Washington	76.4	76.3	77.7	71.3	1.07
West Virginia	81.8	82.6	70.6	63.3	1.30
Wisconsin	61.6	61.6	64.0	54.9	1.12
Wyoming	65.4	67.4	50.0	41.9	1.61
U.S. without Maine	69.5	69.8	62.1	54.1	1.29

We conclude that there is something here that bears further investigation with more extensive measures of service use and with the expenditure data that are available in the MAX PS files but not in MAXEM. It may be simply that individuals who are enrolled in more than one state during a year distribute their service use among the states. By using a binary indicator of service use we sought to minimize the impact of differential quantities of service use per state, but we may be seeing the effects of such differences in service use nonetheless. Again, this is a possibility that can be explored in further research with the MAX data.

V. CONCLUSION: LOOKING BACK AND LOOKING FORWARD

In developing MAXEM 2007, we made several adjustments to the procedures that were used to produce MAXEM 2005 and 2006 in addition to adding a third year of data. These included:

- Redefining the MAXEM ID to place the year component first
- Retaining records with no enrollment data through the unduplication process
- Assigning common MAXEM IDs at the conclusion of each major linkage step
- Applying a first round of editing to replace missing and inconsistent values immediately after the completion of linkages based on the MSIS ID rather than editing only at the conclusion of within-state linkages
- Editing MAXEM IDs to eliminate within-state duplicates created during cross-state linking

The last three revisions were designed to reinforce the linkages that were based on the MSIS ID, which prior research had shown to be the most reliable of the four types of linkages allowed by our linkage algorithm. One indication of the effectiveness of these modifications is that the number of within-state duplicates that we had to remove in the last editing step was substantially smaller than the number created during cross-state linking under MAXEM 2005 and 2006.

Overall, we are highly satisfied with how our procedures worked for MAXEM 2007. If CMS elects to add a fourth year to MAXEM, we could fall back on these same procedures, except that we would start by assigning each record from 2005 through 2007 its final MAXEM ID. This would ensure that we do not re-identify links that have already been established. The way our linkage software is designed, only records that did not already share the same MAXEM ID could be linked to each other.

There is one area that deserves greater scrutiny in MAXEM 2008: the state-supplied corrections to earlier MSIS ID assignments. In the MSIS ID corrections submitted by one of the SSN states for 2005, 12 records with different dates of birth and split between men and women

were assigned the same new MSIS ID, which happened to be an invalid SSN (the digits one through nine). An additional correction reassigned a different MSIS ID to these 12—which eliminated the invalid SSN but still left 12 seemingly different individuals with the same MSIS ID. Ultimately, these 12 records were combined into a single record in the consolidation step of MAXEM processing; this would have been replicated in later years as well. Even though the impact was small, and there is reason to believe that many of these records would have been removed as duplicates if processed correctly, it is clear that we will need to review future state-supplied corrections for duplicate MSIS ID assignments before we apply them. If we find such cases, we will need to identify alternative MSIS IDs. In many instances this may not be possible, as the records in question will lack ID variables, leaving only DOB and sex with which to find matches among other records. Furthermore, our experience with the state-supplied corrections, documented in Chapter III, is that the duplicates created by new MSIS ID assignments may not appear in the same year. If we are relying on a limited set of fields to identify matches, this reduces the likelihood that we will find them (or feel sufficient confidence in those we do find). When we cannot assign a new MSIS ID, we will restore the original value. Most likely, this will prevent our linking these records to other records in the same or later years, but the number of such records appears to be exceedingly small.

Returning to the bigger picture, it is an empirical question whether the addition of 2008 data would result in changes to any of the MAXEM IDs in 2005 through 2007. One of our changes for 2007 was to redesign the MAXEM ID so that the first component is the year. When we assign each record a final MAXEM ID, we assign the lowest of the MAXEM IDs among the records to which it has linked. This will tend to preserve the MAXEM IDs on records from 2005 through 2007 when they link to records from 2008. Only if a 2008 record links to two earlier

records that were not linked previously is there any possibility that one of those records might acquire a new MAXEM ID, but it would not come from the 2008 record.

The other way that a MAXEM ID from a pre-2008 record can change, of course, is through the aforementioned corrections to MSIS IDs that the states submit. We were surprised by the number of corrections (nearly 50,000) that the states submitted two years later to records from 2005; we do not know if the 2008 corrections will also extend back to 2005. But if our 2007 experience is any indication, we can be assured that the 2008 corrections will affect more than 100,000 records for 2007 and perhaps another 50,000 for 2006.

Given that the development of MAXEM 2007 used three years of data, a natural question is whether we should include or exclude 2005 from the development of MAXEM 2008. We know from MAXEM 2007 that there were 1.2 million records from 2007 that linked back to 2005 but not 2006, and we can predict that there will be records from 2008 that link back to 2005 but not 2006 or 2007. To assign the correct MAXEM IDs to such records, we need to include the 2005 records in the process. The questions remain, how many such records are there, and is there another way to assign them the right MAXEM IDs without linking four years of data?

One approach that we have discussed in the past and which merits increased consideration as we expand MAXEM beyond three years is to construct a cumulative cross-reference file from the MAXEM records from all prior years and use this file as a massive look-up table to assign MAXEM IDs to the newest year of data. This is analogous to the approach that has been used for years to assign unique identifiers to MAX PS records when they are loaded into the Chronic Conditions Data Warehouse. Our tabulation of unique Medicaid enrollees over time revealed that there were fewer than 80 million unique enrollees represented among the 180 million Medicaid enrollee records after unduplication within state and year. A cumulative cross-reference file for 2005 through 2007 would need to include no more than 80 million Medicaid

records (plus another two to three million with only S-CHIP enrollment or no enrollment data), whereas a simple extension of the MAXEM 2007 process would require all 180 million Medicaid records plus another five million for the additional record types. Furthermore, if properly constructed, a cumulative cross-reference file could incorporate our best information on the identifiers, sex, DOBs, and possibly other characteristics associated with each MAXEM ID.

We believe that this is the way to go if MAXEM continues past 2008, but given that the construction of a cumulative cross-reference file would involve an entirely new effort, we recommend that MAXEM 2008 be produced using the methods that we refined for MAXEM 2007. Furthermore, by starting the process with the MAXEM IDs assigned from MAXEM 2007, we can acquire useful information on how, if at all, the addition of another year might affect the MAXEM IDs assigned to earlier years. A cumulative cross-reference file would not ordinarily allow this type of feedback loop and to build in such a loop we would need a better understanding of the full implications of adding a new year.

The fourth chapter of this report presented a number of findings that provide a taste of the unique contribution that MAXEM can make to Medicaid research. The third chapter highlighted how much we have learned in developing MAXEM to date and showcased the solid foundation on which MAXEM is built. We hope that the material presented in this report will help to maintain CMS's interest in MAXEM or a MAXEM-type resource well into the future.

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APPENDIX A: STATE TABLES FOR CHAPTER III

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Table A.1. Cross-Year Linkages by State and Source of Linkage, 2005 to 2006

State	Cross-year Linked Pairs	Distribution by Source of Linkage			
		MSIS-ID	MAX SSN	EDB-SSN	EDB-HIC
Alabama	845,593	99.714	0.283	0.003	0.000
Alaska	107,725	99.901	0.099	0.000	0.000
Arizona	1,195,708	99.716	0.275	0.009	0.000
Arkansas	663,797	99.062	0.774	0.109	0.054
California (SSN)	8,444,876	99.995	0.000	0.005	0.000
Colorado	518,689	99.880	0.118	0.002	0.000
Connecticut	452,492	99.703	0.295	0.002	0.000
Delaware	152,665	99.972	0.028	0.001	0.000
District of Columbia	147,554	99.880	0.103	0.015	0.002
Florida	2,417,326	99.966	0.029	0.004	0.000
Georgia	1,744,511	99.683	0.314	0.002	0.000
Hawaii	202,504	99.845	0.154	0.001	0.000
Idaho	187,761	99.971	0.029	0.001	0.000
Illinois	2,213,214	96.870	3.124	0.005	0.000
Indiana	878,082	99.962	0.038	0.000	0.000
Iowa	356,263	99.696	0.304	0.000	0.000
Kansas	286,114	99.982	0.018	0.000	0.000
Kentucky (SSN)	767,269	99.985	0.000	0.009	0.006
Louisiana (SSN)	1,091,047	99.997	0.000	0.003	0.000
Maine	285,087	99.952	0.044	0.005	0.000
Maryland	733,240	99.956	0.043	0.000	0.000
Massachusetts	1,097,957	99.837	0.162	0.001	0.000
Michigan	1,610,243	99.963	0.033	0.003	0.000
Minnesota (SSN)	644,883	99.973	0.000	0.027	0.001
Mississippi	667,878	99.355	0.641	0.004	0.000
Missouri	964,998	99.904	0.093	0.002	0.000
Montana	103,153	100.000	0.000	0.000	0.000
Nebraska	213,381	99.953	0.046	0.000	0.000
Nevada (SSN)	184,455	99.997	0.000	0.003	0.000
New Hampshire	121,471	99.984	0.016	0.000	0.000
New Jersey (SSN)	983,903	99.882	0.000	0.108	0.009
New Mexico (SSN)	439,198	99.996	0.000	0.004	0.000
New York	4,459,375	96.528	3.456	0.015	0.000
North Carolina	1,469,593	99.921	0.079	0.000	0.000
North Dakota	66,335	93.504	6.496	0.000	0.000
Ohio	1,845,682	98.595	1.400	0.005	0.000
Oklahoma	614,657	99.223	0.776	0.000	0.000
Oregon	447,713	99.660	0.340	0.000	0.000
Pennsylvania	1,770,306	99.981	0.011	0.008	0.000
Rhode Island	194,725	99.986	0.013	0.001	0.000
South Carolina	822,665	99.956	0.037	0.006	0.000
South Dakota	112,580	96.290	3.705	0.005	0.000
Tennessee	1,318,065	99.913	0.086	0.001	0.000
Texas	3,314,847	99.508	0.486	0.003	0.002
Utah	258,756	99.958	0.041	0.001	0.000
Vermont (SSN)	140,725	99.994	0.000	0.006	0.000
Virginia	795,944	99.808	0.192	0.000	0.000
Washington	1,028,135	99.954	0.045	0.000	0.000
West Virginia	325,178	99.890	0.074	0.035	0.001
Wisconsin	881,040	98.282	1.718	0.000	0.000
Wyoming	63,536	99.836	0.161	0.000	0.003
United States	50,652,894	99.340	0.651	0.009	0.001

Table A.2. Cross-Year Linkages by State and Source of Linkage, 2006 to 2007

State	Cross-year Linked Pairs	Distribution by Source of Linkage			
		MSIS-ID	MAX SSN	EDB-SSN	EDB-HIC
Alabama	783,269	99.853	0.143	0.005	0.000
Alaska	104,149	99.940	0.060	0.000	0.000
Arizona	1,243,866	99.926	0.073	0.001	0.000
Arkansas	668,558	99.020	0.829	0.108	0.043
California (SSN)	8,477,822	99.995	0.000	0.004	0.000
Colorado	513,384	99.872	0.127	0.002	0.000
Connecticut	454,995	99.724	0.273	0.002	0.000
Delaware	155,248	99.964	0.036	0.000	0.000
District of Columbia	147,373	99.875	0.108	0.014	0.003
Florida	2,334,106	99.963	0.033	0.005	0.000
Georgia	1,668,497	99.765	0.233	0.002	0.000
Hawaii	200,836	99.862	0.137	0.001	0.000
Idaho	192,775	99.982	0.018	0.000	0.000
Illinois	2,286,771	97.701	2.297	0.002	0.000
Indiana	892,365	99.931	0.068	0.001	0.000
Iowa	385,726	99.682	0.318	0.001	0.000
Kansas	280,594	99.989	0.011	0.000	0.000
Kentucky (SSN)	765,064	99.995	0.000	0.003	0.002
Louisiana (SSN)	999,152	99.997	0.000	0.002	0.000
Maine	301,012	99.982	0.016	0.002	0.000
Maryland	720,789	99.944	0.056	0.000	0.000
Massachusetts	1,151,249	99.827	0.171	0.001	0.000
Michigan	1,680,879	99.971	0.025	0.003	0.000
Minnesota (SSN)	653,671	99.987	0.000	0.013	0.000
Mississippi	637,246	99.065	0.931	0.004	0.000
Missouri	908,214	99.891	0.107	0.002	0.000
Montana	102,899	99.999	0.000	0.001	0.000
Nebraska	214,631	99.926	0.074	0.000	0.000
Nevada (SSN)	182,850	99.990	0.000	0.009	0.001
New Hampshire	123,446	99.977	0.023	0.000	0.000
New Jersey (SSN)	1,027,746	99.812	0.000	0.174	0.013
New Mexico (SSN)	443,844	99.996	0.000	0.004	0.000
New York	4,370,470	96.677	3.308	0.015	0.000
North Carolina	1,509,704	99.931	0.069	0.000	0.000
North Dakota	67,224	88.773	11.227	0.000	0.000
Ohio	1,863,029	98.588	1.407	0.005	0.000
Oklahoma	642,817	99.236	0.763	0.001	0.000
Oregon	439,031	99.650	0.349	0.001	0.000
Pennsylvania	1,799,762	99.972	0.021	0.007	0.000
Rhode Island	193,696	99.944	0.055	0.001	0.001
South Carolina	786,843	99.961	0.036	0.003	0.000
South Dakota	113,650	96.266	3.733	0.002	0.000
Tennessee	1,297,122	99.884	0.115	0.001	0.000
Texas	3,335,629	99.467	0.526	0.005	0.003
Utah	244,069	99.909	0.090	0.001	0.000
Vermont (SSN)	140,018	99.996	0.000	0.004	0.000
Virginia	799,334	99.873	0.127	0.000	0.000
Washington	1,013,490	99.962	0.037	0.000	0.000
West Virginia	331,837	99.854	0.092	0.053	0.001
Wisconsin	895,479	97.669	2.330	0.001	0.000
Wyoming	61,871	99.931	0.066	0.000	0.003
United States	50,608,101	99.374	0.616	0.009	0.001

Table A.3. Cross-Year Linkages by State and Source of Linkage, 2005 to 2007

State	Cross-year Linked Pairs	Distribution by Source of Linkage			
		MSIS-ID	MAX SSN	EDB-SSN	EDB-HIC
Alabama	676,726	99.741	0.254	0.004	0.000
Alaska	89,032	99.885	0.115	0.000	0.000
Arizona	1,006,437	99.624	0.369	0.007	0.000
Arkansas	580,725	98.709	1.086	0.147	0.057
California (SSN)	6,741,630	99.994	0.000	0.005	0.000
Colorado	419,406	99.838	0.161	0.001	0.000
Connecticut	390,994	99.557	0.441	0.002	0.000
Delaware	130,490	99.952	0.047	0.001	0.000
District of Columbia	130,786	99.849	0.130	0.016	0.005
Florida	1,916,340	99.957	0.037	0.006	0.000
Georgia	1,418,093	99.656	0.341	0.003	0.000
Hawaii	175,067	99.801	0.198	0.001	0.000
Idaho	160,163	99.963	0.036	0.001	0.000
Illinois	1,963,473	95.926	4.069	0.005	0.000
Indiana	749,491	99.931	0.068	0.001	0.000
Iowa	301,337	99.439	0.561	0.000	0.000
Kansas	226,795	99.981	0.019	0.000	0.000
Kentucky (SSN)	673,384	99.982	0.000	0.010	0.008
Louisiana (SSN)	877,312	99.997	0.000	0.003	0.000
Maine	258,562	99.932	0.062	0.005	0.000
Maryland	618,536	99.943	0.056	0.000	0.000
Massachusetts	974,992	99.855	0.144	0.001	0.000
Michigan	1,405,910	99.960	0.036	0.003	0.000
Minnesota (SSN)	548,184	99.974	0.000	0.026	0.000
Mississippi	543,139	99.108	0.887	0.005	0.000
Missouri	801,744	99.857	0.141	0.002	0.000
Montana	85,221	99.999	0.000	0.001	0.000
Nebraska	179,875	99.912	0.088	0.001	0.000
Nevada (SSN)	134,602	99.995	0.000	0.004	0.001
New Hampshire	102,855	99.975	0.025	0.000	0.000
New Jersey (SSN)	864,447	99.806	0.000	0.181	0.013
New Mexico (SSN)	384,776	99.996	0.000	0.004	0.000
New York	3,768,211	95.598	4.384	0.017	0.000
North Carolina	1,281,678	99.905	0.095	0.000	0.000
North Dakota	54,813	89.382	10.618	0.000	0.000
Ohio	1,613,818	98.323	1.670	0.007	0.000
Oklahoma	530,301	98.996	1.004	0.001	0.000
Oregon	363,470	99.561	0.437	0.001	0.001
Pennsylvania	1,536,787	99.965	0.027	0.008	0.000
Rhode Island	168,774	99.943	0.056	0.001	0.001
South Carolina	685,786	99.952	0.041	0.007	0.000
South Dakota	96,233	95.571	4.427	0.002	0.000
Tennessee	1,157,634	99.888	0.111	0.001	0.000
Texas	2,803,282	99.315	0.679	0.004	0.002
Utah	195,456	99.875	0.124	0.002	0.000
Vermont (SSN)	124,345	99.995	0.000	0.005	0.000
Virginia	674,868	99.797	0.203	0.000	0.000
Washington	850,899	99.947	0.052	0.001	0.000
West Virginia	282,008	99.863	0.104	0.032	0.001
Wisconsin	754,869	97.966	2.034	0.001	0.000
Wyoming	49,459	99.830	0.166	0.000	0.004
United States	42,523,215	99.140	0.847	0.011	0.002

Table A.4. Records Subject to Reconciliation of Identifying Variables, 2005 to 2007

State	Number of MAX PS Records Subject to Reconciliation			Percent of Records Subject to Reconciliation		
	2005	2006	2007	2005	2006	2007
Alabama	858,539	964,695	796,542	89.1	98.8	86.7
Alaska	111,239	126,320	107,664	83.2	96.0	84.9
Arizona	1,242,373	1,478,582	1,289,646	83.3	96.4	82.0
Arkansas	670,461	757,491	675,491	88.0	98.2	85.9
California	8,657,981	10,394,118	8,690,501	79.3	95.0	79.1
Colorado	533,437	627,310	528,161	82.6	97.6	82.5
Connecticut	459,636	523,475	462,196	86.5	97.9	85.7
Delaware	156,252	180,993	158,848	86.3	97.5	84.2
District of Columbia	149,253	165,801	149,068	88.9	97.6	87.0
Florida	2,488,410	2,905,790	2,404,970	81.3	95.5	81.9
Georgia	1,778,718	2,029,195	1,703,716	84.4	96.5	84.6
Hawaii	206,452	232,149	204,799	86.8	97.4	85.2
Idaho	192,160	224,769	197,176	82.2	97.4	83.5
Illinois	2,229,207	2,534,576	2,299,039	85.3	97.4	86.1
Indiana	899,383	1,042,094	913,696	84.8	97.7	84.2
Iowa	365,739	450,031	395,199	84.9	96.0	81.6
Kansas	294,832	348,618	289,332	81.6	96.4	81.1
Kentucky	779,986	873,518	773,362	87.2	97.8	85.8
Louisiana	1,103,900	1,225,741	1,010,475	88.7	96.2	87.0
Maine	290,607	333,046	306,532	88.7	98.7	84.8
Maryland	746,379	848,542	733,917	85.9	97.8	85.7
Massachusetts	1,114,359	1,289,976	1,167,399	88.8	98.1	85.6
Michigan	1,644,571	1,919,488	1,715,273	87.5	98.0	86.5
Minnesota	663,125	768,542	671,900	83.7	95.0	81.6
Mississippi	676,934	769,570	645,777	86.0	99.0	86.6
Missouri	990,587	1,096,800	933,936	81.2	98.4	86.6
Montana	106,242	123,920	105,988	82.3	95.9	82.3
Nebraska	218,067	252,803	219,306	83.3	96.3	83.7
Nevada	191,418	239,614	189,751	70.2	93.3	73.0
New Hampshire	124,085	144,666	126,063	85.1	97.2	83.5
New Jersey	991,327	1,153,527	1,035,622	87.4	96.9	84.4
New Mexico	450,871	510,020	454,460	85.0	97.7	85.3
New York	4,442,742	5,017,339	4,356,347	86.8	97.9	86.5
North Carolina	1,502,423	1,730,140	1,542,908	86.9	97.0	84.6
North Dakota	65,570	76,873	66,521	82.0	95.0	82.5
Ohio	1,864,211	2,108,668	1,881,631	87.6	97.7	86.6
Oklahoma	628,193	739,105	656,769	86.0	96.8	83.5
Oregon	459,099	534,252	450,508	81.2	96.3	82.5
Pennsylvania	1,799,431	2,062,322	1,828,892	88.3	97.7	85.7
Rhode Island	197,282	222,192	196,243	87.7	98.4	88.3
South Carolina	838,426	939,345	802,553	82.8	98.9	87.5
South Dakota	112,424	128,988	113,517	85.8	97.2	84.8
Tennessee	1,339,765	1,478,925	1,318,745	83.3	98.6	88.2
Texas	3,440,145	3,967,191	3,461,734	82.6	94.8	80.3
Utah	269,939	318,553	255,248	75.1	93.8	77.9
Vermont	144,111	159,781	143,344	86.9	97.0	87.2
Virginia	808,718	932,949	812,116	87.1	97.6	84.1
Washington	1,051,418	1,213,910	1,036,802	81.8	97.4	84.4
West Virginia	333,150	382,961	339,855	84.6	97.3	85.5
Wisconsin	890,427	1,021,311	905,103	86.1	97.1	85.9
Wyoming	65,113	77,512	63,456	79.8	95.9	81.0
United States	51,639,117	59,648,097	51,588,097	84.1	96.7	83.6

Note: Records were subject to reconciliation if their MAXEM IDs occurred at least twice in three years.

Table A.5. All Edits to Assign Consistent SSNs and HICs as a Percentage of All Records Subject to Reconciliation, 2005

	Percent of Records with Missing Value Replaced			Percent of Records with Nonmissing Value Replaced		
State	MAX SSN	EDB-SSN	EDB-HIC	MAX SSN	EDB-SSN	EDB-HIC
Alabama	0.649	0.773	0.748	1.029	0.003	0.084
Alaska	1.583	0.536	0.526	0.289	0.000	0.031
Arizona	1.612	0.775	0.757	0.016	0.001	0.039
Arkansas	8.409	1.125	1.537	0.529	0.003	0.166
California (SSN)	0.153	0.588	0.566	0.004	0.001	0.042
Colorado	5.144	0.710	0.707	0.868	0.000	0.055
Connecticut	1.901	0.760	0.759	0.307	0.003	0.068
Delaware	3.288	0.899	0.885	0.135	0.000	0.061
District of Columbia	0.159	0.858	0.710	0.042	0.003	0.088
Florida	0.372	0.627	0.619	0.038	0.002	0.058
Georgia	0.153	0.408	0.408	0.038	0.001	0.045
Hawaii	1.158	0.805	0.785	0.041	0.001	0.049
Idaho	0.709	0.476	0.474	0.024	0.000	0.050
Illinois	0.375	0.761	0.740	0.221	0.001	0.049
Indiana	0.308	0.847	0.843	0.028	0.001	0.048
Iowa	0.800	0.815	0.816	0.236	0.001	0.088
Kansas	0.480	0.769	0.767	0.028	0.001	0.059
Kentucky (SSN)	0.122	0.788	8.812	0.009	0.000	0.072
Louisiana (SSN)	0.012	0.474	0.473	0.002	0.001	0.066
Maine	0.223	1.208	1.205	0.041	0.001	0.082
Maryland	0.302	0.799	1.191	0.139	0.001	0.108
Massachusetts	2.288	1.153	1.021	0.091	0.002	0.073
Michigan	2.988	1.019	1.011	0.089	0.001	0.055
Minnesota (SSN)	0.150	0.753	0.740	0.028	0.002	0.060
Mississippi	0.548	0.654	0.614	0.188	0.001	0.074
Missouri	0.084	0.794	0.792	0.034	0.001	0.054
Montana	0.190	0.787	0.783	2.524	0.004	0.065
Nebraska	1.868	0.510	0.499	0.076	0.000	0.058
Nevada (SSN)	0.397	0.654	0.651	0.001	0.001	0.061
New Hampshire	0.122	0.736	0.735	0.131	0.000	0.057
New Jersey (SSN)	0.297	0.679	0.698	0.073	0.005	0.087
New Mexico (SSN)	0.034	0.497	0.489	0.003	0.001	0.031
New York	0.467	1.097	1.089	0.083	0.001	0.058
North Carolina	0.172	0.687	0.681	0.053	0.001	0.073
North Dakota	0.509	0.575	0.573	0.015	0.002	0.073
Ohio	0.097	0.764	0.760	0.095	0.001	0.047
Oklahoma	0.069	0.476	0.475	0.016	0.001	0.053
Oregon	0.382	0.760	0.760	0.093	0.001	0.063
Pennsylvania	0.279	0.952	0.947	0.047	0.001	0.067
Rhode Island	0.482	0.769	0.767	0.024	0.002	0.072
South Carolina	3.124	0.710	0.575	0.299	0.004	0.065
South Dakota	1.863	0.487	0.477	0.233	0.001	0.052
Tennessee	0.145	0.797	0.790	0.041	0.000	0.066
Texas	1.220	0.477	5.721	0.240	0.001	0.057
Utah	0.488	0.698	0.726	0.090	0.001	0.050
Vermont (SSN)	0.416	1.518	1.517	0.003	0.001	0.090
Virginia	1.772	0.654	0.567	0.632	0.002	0.070
Washington	3.899	0.979	0.924	0.368	0.001	0.063
West Virginia	0.452	0.937	0.936	0.020	0.003	0.066
Wisconsin	0.943	0.616	0.606	0.029	0.001	0.070
Wyoming	0.932	0.550	1.424	0.416	0.000	0.138
United States	0.844	0.741	1.207	0.127	0.001	0.059

Table A.6. All Edits to Assign Consistent SSNs and HICs as a Percentage of All Records Subject to Reconciliation, 2006

	Percent of Records with Missing Value Replaced			Percent of Records with Nonmissing Value Replaced		
State	MAX SSN	EDB-SSN	EDB-HIC	MAX SSN	EDB-SSN	EDB-HIC
Alabama	0.538	0.355	0.339	0.693	0.000	0.042
Alaska	1.727	0.248	0.246	0.182	0.000	0.015
Arizona	0.799	0.659	0.658	0.023	0.001	0.018
Arkansas	7.473	0.628	0.894	0.453	0.001	0.078
California (SSN)	0.169	0.233	0.221	0.003	0.000	0.017
Colorado	3.753	0.486	0.473	0.549	0.000	0.026
Connecticut	1.245	0.222	0.247	0.248	0.001	0.029
Delaware	2.708	0.353	0.348	0.077	0.000	0.028
District of Columbia	0.253	0.332	0.343	0.028	0.001	0.038
Florida	0.859	0.252	0.244	0.045	0.001	0.026
Georgia	0.988	0.150	0.149	0.009	0.000	0.021
Hawaii	1.769	0.357	0.352	0.043	0.000	0.020
Idaho	0.793	0.190	0.190	0.004	0.000	0.023
Illinois	0.225	0.299	0.250	0.112	0.001	0.020
Indiana	0.263	0.288	0.284	0.029	0.000	0.022
Iowa	0.643	0.315	0.322	0.102	0.000	0.038
Kansas	0.217	0.326	0.326	0.011	0.000	0.026
Kentucky (SSN)	0.262	0.290	0.870	0.003	0.000	0.170
Louisiana (SSN)	0.015	0.165	0.163	0.002	0.000	0.022
Maine	0.252	0.437	0.425	0.023	0.000	0.040
Maryland	0.411	0.330	0.652	0.125	0.000	0.044
Massachusetts	1.178	0.455	0.251	0.058	0.001	0.034
Michigan	2.245	0.438	0.447	0.049	0.001	0.025
Minnesota (SSN)	0.412	0.272	0.274	0.011	0.001	0.026
Mississippi	1.888	0.304	0.265	0.191	0.001	0.031
Missouri	0.434	0.349	0.346	0.043	0.000	0.025
Montana	0.859	1.075	1.075	1.230	0.001	0.028
Nebraska	1.065	0.198	0.193	0.045	0.000	0.030
Nevada (SSN)	0.402	0.364	0.360	0.004	0.000	0.023
New Hampshire	0.433	0.261	0.261	0.135	0.000	0.028
New Jersey (SSN)	0.296	0.305	0.326	0.053	0.004	0.040
New Mexico (SSN)	0.407	0.213	0.203	0.002	0.000	0.018
New York	0.908	0.444	0.428	0.090	0.000	0.027
North Carolina	0.458	0.279	0.276	0.057	0.000	0.033
North Dakota	0.857	0.252	0.246	0.036	0.000	0.034
Ohio	0.123	0.362	0.368	0.042	0.000	0.021
Oklahoma	0.263	0.259	0.259	0.012	0.001	0.022
Oregon	1.160	0.304	0.303	0.080	0.001	0.032
Pennsylvania	0.445	0.356	0.367	0.021	0.000	0.030
Rhode Island	0.405	0.307	0.306	0.019	0.000	0.037
South Carolina	2.433	0.267	0.217	0.130	0.000	0.033
South Dakota	1.516	0.188	0.188	0.118	0.001	0.020
Tennessee	0.859	0.555	0.557	0.032	0.000	0.032
Texas	1.251	0.176	0.795	0.108	0.000	0.220
Utah	0.293	0.217	0.178	0.021	0.000	0.027
Vermont (SSN)	0.407	0.766	0.764	0.003	0.000	0.046
Virginia	2.344	0.320	0.243	0.563	0.001	0.034
Washington	3.557	0.628	0.623	0.208	0.001	0.028
West Virginia	0.122	0.355	0.360	0.042	0.000	0.033
Wisconsin	1.364	0.259	0.249	0.017	0.000	0.034
Wyoming	0.601	0.231	1.262	0.209	0.000	0.048
United States	0.895	0.323	0.370	0.084	0.000	0.041

Table A.7. All Edits to Assign Consistent SSNs and HICs as a Percentage of All Records Subject to Reconciliation, 2007

	Percent of Records with Missing Value Replaced			Percent of Records with Nonmissing Value Replaced		
State	MAX SSN	EDB-SSN	EDB-HIC	MAX SSN	EDB-SSN	EDB-HIC
Alabama	1.107	0.045	0.038	0.004	0.000	0.000
Alaska	0.139	0.059	0.068	0.002	0.000	0.000
Arizona	0.233	0.144	0.138	0.001	0.000	0.000
Arkansas	0.985	0.194	0.223	0.012	0.000	0.002
California (SSN)	0.112	0.043	0.026	0.002	0.000	0.000
Colorado	1.664	0.206	0.203	0.005	0.000	0.002
Connecticut	0.080	0.010	0.003	0.001	0.000	0.001
Delaware	0.229	0.016	0.018	0.000	0.000	0.000
District of Columbia	0.185	0.014	0.087	0.008	0.000	0.000
Florida	1.289	0.069	0.064	0.003	0.000	0.000
Georgia	2.077	0.012	0.009	0.001	0.000	0.000
Hawaii	0.294	0.024	0.032	0.000	0.000	0.000
Idaho	0.217	0.032	0.031	0.000	0.000	0.000
Illinois	0.025	0.043	0.025	0.001	0.000	0.001
Indiana	0.045	0.013	0.011	0.001	0.000	0.000
Iowa	0.101	0.011	0.019	0.000	0.000	0.000
Kansas	0.229	0.045	0.045	0.000	0.000	0.000
Kentucky (SSN)	0.750	0.050	0.028	0.002	0.000	0.001
Louisiana (SSN)	0.026	0.004	0.002	0.000	0.000	0.000
Maine	0.098	0.007	0.009	0.001	0.000	0.000
Maryland	0.225	0.012	0.270	0.000	0.000	0.000
Massachusetts	1.822	0.037	0.016	0.003	0.000	0.001
Michigan	1.171	0.065	0.072	0.002	0.000	0.000
Minnesota (SSN)	0.042	0.012	0.012	0.007	0.000	0.000
Mississippi	0.022	0.056	0.036	0.003	0.000	0.002
Missouri	0.062	0.031	0.029	0.000	0.000	0.000
Montana	1.112	1.116	1.119	0.001	0.000	0.001
Nebraska	0.243	0.015	0.013	0.000	0.000	0.000
Nevada (SSN)	0.218	0.093	0.099	0.006	0.000	0.000
New Hampshire	0.074	0.009	0.009	0.000	0.000	0.000
New Jersey (SSN)	0.356	0.065	0.028	0.078	0.000	0.001
New Mexico (SSN)	0.103	0.045	0.034	0.002	0.000	0.000
New York	0.064	0.061	0.045	0.007	0.000	0.004
North Carolina	0.146	0.016	0.013	0.000	0.000	0.000
North Dakota	0.837	0.060	0.060	0.000	0.000	0.000
Ohio	0.135	0.073	0.074	0.001	0.000	0.002
Oklahoma	0.123	0.070	0.070	0.000	0.000	0.000
Oregon	0.333	0.070	0.076	0.001	0.000	0.000
Pennsylvania	1.357	0.012	0.028	0.003	0.000	0.000
Rhode Island	0.297	0.008	0.007	0.001	0.000	0.000
South Carolina	0.030	0.015	0.006	0.001	0.000	0.000
South Dakota	0.065	0.024	0.019	0.001	0.000	0.000
Tennessee	0.643	0.219	0.217	0.001	0.000	0.001
Texas	0.885	0.032	0.078	0.003	0.000	0.004
Utah	0.265	0.005	0.012	0.000	0.000	0.000
Vermont (SSN)	0.443	0.398	0.393	0.001	0.000	0.000
Virginia	0.086	0.015	0.009	0.001	0.000	0.000
Washington	1.209	0.107	0.122	0.000	0.000	0.000
West Virginia	0.025	0.022	0.026	0.012	0.000	0.001
Wisconsin	0.563	0.017	0.008	0.000	0.000	0.000
Wyoming	0.147	0.003	0.019	0.002	0.000	0.000
United States	0.503	0.055	0.055	0.004	0.000	0.001

Table A.8. All Edits to Assign Consistent Demographic Information as a Percentage of All Records Subject to Reconciliation, 2005

	Percent of Records with Missing Value Replaced			Percent of Records with Nonmissing Value Replaced		
State	DOB	Sex	Race	DOB	Sex	Race
Alabama	0.518	0.855	0.733	0.784	0.098	0.123
Alaska	0.262	0.262	0.814	0.303	0.058	0.857
Arizona	0.727	0.727	1.064	0.321	0.075	0.748
Arkansas	1.890	2.083	2.083	0.404	0.141	0.360
California (SSN)	0.178	0.178	1.646	0.694	0.201	2.338
Colorado	3.386	3.380	6.124	1.339	0.303	1.277
Connecticut	0.395	0.395	0.428	0.316	0.077	26.531
Delaware	0.590	0.590	0.593	0.310	0.030	0.648
District of Columbia	0.080	0.063	0.090	0.064	0.013	0.025
Florida	0.283	0.279	0.815	0.188	0.036	0.394
Georgia	0.026	0.026	0.119	0.073	0.018	0.124
Hawaii	0.850	0.850	0.990	0.230	0.027	0.914
Idaho	0.044	0.043	0.043	0.164	0.012	0.486
Illinois	0.022	0.019	0.561	0.739	0.532	7.697
Indiana	0.173	0.173	0.279	0.151	0.032	0.212
Iowa	0.253	0.253	2.903	0.267	0.062	0.908
Kansas	0.383	0.383	0.474	0.065	0.008	0.257
Kentucky (SSN)	0.809	0.809	1.099	0.694	0.379	0.435
Louisiana (SSN)	0.142	0.142	0.186	0.084	0.052	0.056
Maine	0.156	0.156	0.242	0.130	0.017	0.055
Maryland	0.020	0.018	0.193	0.173	0.069	0.135
Massachusetts	0.070	0.070	11.731	0.599	0.186	1.648
Michigan	0.557	0.549	1.048	0.282	0.051	1.018
Minnesota (SSN)	0.174	0.174	1.076	0.332	0.074	0.495
Mississippi	0.014	0.033	1.311	0.559	0.091	0.156
Missouri	0.013	0.012	0.098	0.133	0.003	0.054
Montana	0.173	0.173	0.200	0.075	0.011	0.095
Nebraska	3.764	0.929	0.125	0.282	0.078	0.203
Nevada (SSN)	0.751	0.902	0.692	0.648	0.143	18.681
New Hampshire	0.031	0.010	0.343	0.112	0.029	0.103
New Jersey (SSN)	0.315	0.315	1.457	1.186	0.555	4.377
New Mexico (SSN)	0.035	0.035	0.381	0.249	0.052	0.606
New York	0.977	0.108	1.218	0.744	0.097	3.406
North Carolina	0.009	0.008	0.134	0.120	0.024	0.050
North Dakota	0.473	0.473	0.471	0.108	0.084	0.561
Ohio	0.015	0.011	0.023	0.157	0.014	0.484
Oklahoma	0.005	0.004	0.004	0.185	0.016	0.456
Oregon	0.065	0.064	0.738	0.141	0.044	0.303
Pennsylvania	0.240	0.238	0.252	0.121	0.011	0.143
Rhode Island	0.460	0.460	2.348	0.120	0.054	0.305
South Carolina	0.014	0.016	0.604	1.025	0.136	0.180
South Dakota	0.019	0.019	0.019	0.400	0.116	4.014
Tennessee	0.080	0.080	0.256	0.217	0.013	0.075
Texas	0.186	0.187	0.558	0.499	0.179	1.140
Utah	0.024	0.024	0.132	0.386	0.079	3.267
Vermont (SSN)	0.481	0.481	4.883	0.184	0.154	0.103
Virginia	0.009	0.011	0.097	0.748	0.138	0.623
Washington	1.402	1.404	2.653	0.372	0.130	3.199
West Virginia	0.448	0.448	0.448	0.211	0.026	0.297
Wisconsin	0.164	0.156	1.799	0.263	0.032	0.495
Wyoming	2.379	2.454	0.740	0.749	0.084	0.531
United States	0.361	0.282	1.184	0.458	0.129	1.810

Table A.9. All Edits to Assign Consistent Demographic Information as a Percentage of All Records Subject to Reconciliation, 2006

State	Percent of Records with Missing Value Replaced			Percent of Records with Nonmissing Value Replaced		
	DOB	Sex	Race	DOB	Sex	Race
Alabama	0.528	0.834	0.642	0.548	0.054	0.060
Alaska	0.265	0.265	0.627	0.151	0.030	0.524
Arizona	0.660	0.660	1.043	0.190	0.059	0.438
Arkansas	1.383	1.432	1.545	0.204	0.068	0.087
California (SSN)	0.231	0.231	1.882	0.324	0.113	1.365
Colorado	1.759	1.759	6.087	0.893	0.207	0.727
Connecticut	0.058	0.058	0.060	0.201	0.054	1.079
Delaware	0.521	0.522	0.522	0.185	0.031	0.407
District of Columbia	0.204	0.198	0.224	0.027	0.010	0.012
Florida	0.488	0.494	0.705	0.159	0.038	0.305
Georgia	1.171	1.171	1.127	0.019	0.004	0.035
Hawaii	0.871	0.871	0.994	0.233	0.030	0.892
Idaho	0.291	0.290	0.290	0.076	0.010	0.151
Illinois	0.017	0.015	3.009	0.365	0.296	2.862
Indiana	0.021	0.021	0.128	0.133	0.032	0.195
Iowa	0.178	0.178	2.808	0.157	0.030	0.690
Kansas	0.193	0.193	0.226	0.028	0.003	0.095
Kentucky (SSN)	0.307	0.307	0.585	0.515	0.306	0.109
Louisiana (SSN)	0.041	0.041	0.069	0.045	0.030	0.035
Maine	0.209	0.207	0.350	0.081	0.019	0.027
Maryland	0.049	0.047	0.194	0.133	0.064	0.114
Massachusetts	0.126	0.126	11.412	0.205	0.070	0.897
Michigan	0.884	0.879	1.235	0.120	0.022	0.740
Minnesota (SSN)	0.450	0.450	1.006	0.095	0.022	0.163
Mississippi	0.051	0.064	1.374	0.494	0.088	0.151
Missouri	0.160	0.159	0.230	0.141	0.004	0.039
Montana	0.850	0.850	0.861	0.039	0.010	0.068
Nebraska	3.788	0.619	0.112	0.123	0.037	0.084
Nevada (SSN)	0.513	0.571	0.491	0.342	0.061	7.338
New Hampshire	0.044	0.044	0.325	0.123	0.036	0.099
New Jersey (SSN)	0.283	0.283	1.084	0.719	0.351	2.330
New Mexico (SSN)	0.411	0.411	0.547	0.072	0.020	0.127
New York	0.903	0.160	1.320	0.580	0.094	2.950
North Carolina	0.053	0.052	0.122	0.115	0.027	0.047
North Dakota	0.719	0.719	0.721	0.082	0.079	0.605
Ohio	0.018	0.015	0.026	0.081	0.008	0.270
Oklahoma	0.130	0.129	0.129	0.106	0.011	0.268
Oregon	0.239	0.238	1.766	0.123	0.040	0.185
Pennsylvania	0.411	0.407	0.409	0.047	0.005	0.044
Rhode Island	0.329	0.328	2.025	0.071	0.030	0.210
South Carolina	0.019	0.018	0.425	0.253	0.082	0.090
South Dakota	0.083	0.082	0.082	0.207	0.066	2.427
Tennessee	0.693	0.693	0.833	0.131	0.011	0.050
Texas	0.383	0.383	0.920	0.252	0.085	0.408
Utah	0.024	0.026	0.090	0.089	0.013	1.188
Vermont (SSN)	0.443	0.443	3.216	0.106	0.114	0.058
Virginia	0.131	0.132	0.236	0.577	0.110	0.615
Washington	2.274	2.276	11.399	0.210	0.077	0.218
West Virginia	0.160	0.160	0.263	0.159	0.020	0.213
Wisconsin	0.616	0.613	2.047	0.148	0.021	0.306
Wyoming	1.180	1.361	0.653	0.391	0.037	0.255
United States	0.457	0.387	1.576	0.261	0.080	0.879

Table A.10. All Edits to Assign Consistent Demographic Information as a Percentage of All Records Subject to Reconciliation, 2007

	Percent of Records with Missing Value Replaced			Percent of Records with Nonmissing Value Replaced		
State	DOB	Sex	Race	DOB	Sex	Race
Alabama	0.133	0.134	0.194	0.009	0.002	0.000
Alaska	0.141	0.141	0.255	0.007	0.000	0.000
Arizona	0.246	0.246	1.144	0.011	0.007	0.003
Arkansas	1.104	1.104	1.627	0.021	0.003	0.007
California (SSN)	0.163	0.163	1.569	0.004	0.017	0.002
Colorado	1.579	1.579	6.865	0.017	0.016	0.005
Connecticut	0.061	0.061	0.076	0.021	0.001	0.027
Delaware	0.250	0.250	0.250	0.004	0.000	0.006
District of Columbia	0.201	0.201	0.230	0.003	0.000	0.001
Florida	1.358	1.362	1.137	0.004	0.001	0.001
Georgia	0.535	0.535	0.578	0.004	0.000	0.010
Hawaii	0.300	0.300	0.304	0.006	0.000	0.021
Idaho	0.223	0.223	0.223	0.000	0.000	0.000
Illinois	0.022	0.021	4.975	0.058	0.020	0.142
Indiana	0.024	0.024	0.107	0.002	0.000	0.003
Iowa	0.104	0.104	2.289	0.002	0.000	0.007
Kansas	0.229	0.229	0.234	0.001	0.000	0.000
Kentucky (SSN)	0.088	0.088	0.649	0.011	0.014	0.001
Louisiana (SSN)	0.149	0.149	0.145	0.001	0.000	0.000
Maine	0.098	0.098	0.382	0.001	0.000	0.000
Maryland	0.050	0.049	0.166	0.016	0.001	0.007
Massachusetts	0.186	0.186	0.375	0.009	0.014	0.007
Michigan	1.207	1.207	1.306	0.005	0.001	0.001
Minnesota (SSN)	0.049	0.049	0.518	0.002	0.001	0.000
Mississippi	0.020	0.022	1.367	0.037	0.009	0.015
Missouri	0.053	0.053	0.110	0.003	0.000	0.006
Montana	1.119	1.119	1.119	0.001	0.001	0.000
Nebraska	0.035	0.036	0.082	0.002	0.000	0.001
Nevada (SSN)	0.256	0.248	0.256	0.005	0.000	0.001
New Hampshire	0.071	0.071	0.084	0.001	0.000	0.003
New Jersey (SSN)	0.269	0.268	0.694	0.021	0.015	0.007
New Mexico (SSN)	0.130	0.130	0.267	0.007	0.005	0.001
New York	0.078	0.078	0.661	0.147	0.005	0.285
North Carolina	0.118	0.118	0.124	0.004	0.001	0.003
North Dakota	0.786	0.788	0.786	0.002	0.000	0.428
Ohio	0.014	0.014	0.032	0.014	0.000	0.065
Oklahoma	0.127	0.127	0.127	0.033	0.000	0.048
Oregon	0.221	0.221	3.760	0.007	0.002	0.014
Pennsylvania	1.326	1.326	1.292	0.003	0.000	0.001
Rhode Island	0.210	0.210	0.896	0.001	0.001	0.000
South Carolina	0.015	0.015	0.434	0.010	0.003	0.001
South Dakota	0.060	0.060	0.060	0.033	0.002	0.319
Tennessee	0.668	0.668	0.898	0.006	0.002	0.002
Texas	0.574	0.574	1.165	0.072	0.008	0.022
Utah	0.017	0.017	0.067	0.002	0.001	0.015
Vermont (SSN)	0.450	0.450	0.338	0.001	0.008	0.000
Virginia	0.050	0.050	0.136	0.008	0.001	0.004
Washington	1.448	1.448	7.992	0.004	0.000	0.001
West Virginia	0.061	0.061	0.066	0.052	0.000	0.001
Wisconsin	0.471	0.471	1.548	0.009	0.003	0.007
Wyoming	0.123	0.123	0.359	0.000	0.000	0.002
United States	0.376	0.376	1.267	0.026	0.007	0.039

Table A.11. Reduction in Record Count Due to Consolidation of Records Within State and Year, by State: 2005

State	Total Number of MAX PS Records	Records Remaining After Consolidation	Reduction in Record Count	Number of Combined Records	Duplicate MAXEM IDs in Excess of Two	Reduction As Percent of Initial Records
Alabama	963,526	961,997	1,529	1,527	2	0.159
Alaska	133,699	133,619	80	80	0	0.060
Arizona	1,491,569	1,488,947	2,622	2,606	16	0.176
Arkansas	762,193	759,124	3,069	3,051	18	0.403
California	10,924,768	10,923,391	1,377	1,375	2	0.013
Colorado	645,965	645,674	291	290	1	0.045
Connecticut	531,515	530,860	655	651	4	0.123
Delaware	181,053	181,028	25	25	0	0.014
District of Columbia	167,845	167,765	80	80	0	0.048
Florida	3,059,524	3,059,019	505	505	0	0.017
Georgia	2,107,826	2,104,721	3,105	3,105	0	0.147
Hawaii	237,736	237,563	173	173	0	0.073
Idaho	233,765	233,735	30	30	0	0.013
Illinois	2,612,709	2,572,397	40,312	39,634	678	1.543
Indiana	1,060,392	1,060,238	154	154	0	0.015
Iowa	430,985	430,438	547	547	0	0.127
Kansas	361,325	361,292	33	33	0	0.009
Kentucky	894,282	875,149	19,133	19,086	47	2.139
Louisiana	1,244,886	1,244,849	37	37	0	0.003
Maine	327,491	327,399	92	92	0	0.028
Maryland	868,686	868,531	155	155	0	0.018
Massachusetts	1,255,313	1,254,584	729	728	1	0.058
Michigan	1,878,812	1,878,535	277	277	0	0.015
Minnesota	792,366	792,013	353	351	2	0.045
Mississippi	787,537	785,705	1,832	1,805	27	0.233
Missouri	1,219,756	1,219,308	448	447	1	0.037
Montana	129,052	129,052	0	0	0	0.000
Nebraska	261,841	261,826	15	15	0	0.006
Nevada	272,739	272,544	195	195	0	0.071
New Hampshire	145,834	145,823	11	11	0	0.008
New Jersey	1,134,761	1,128,374	6,387	6,322	65	0.563
New Mexico	530,733	530,695	38	38	0	0.007
New York	5,118,695	5,043,106	75,589	74,405	1,184	1.477
North Carolina	1,729,575	1,728,822	753	753	0	0.044
North Dakota	79,961	78,324	1,637	1,637	0	2.047
Ohio	2,127,176	2,113,909	13,267	13,159	108	0.624
Oklahoma	730,873	728,081	2,792	2,770	22	0.382
Oregon	565,361	564,463	898	897	1	0.159
Pennsylvania	2,038,176	2,037,987	189	187	2	0.009
Rhode Island	224,884	224,876	8	8	0	0.004
South Carolina	1,012,763	1,012,557	206	206	0	0.020
South Dakota	130,988	128,882	2,106	2,098	8	1.608
Tennessee	1,607,615	1,607,129	486	479	7	0.030
Texas	4,164,091	4,156,090	8,001	7,916	85	0.192
Utah	359,506	359,449	57	57	0	0.016
Vermont	165,860	165,742	118	118	0	0.071
Virginia	928,642	927,737	905	904	1	0.097
Washington	1,285,090	1,284,810	280	280	0	0.022
West Virginia	393,616	393,478	138	138	0	0.035
Wisconsin	1,034,583	1,027,116	7,467	7,466	1	0.722
Wyoming	81,599	81,526	73	73	0	0.089

Table A.12. Reduction in Record Count Due to Consolidation of Records Within State and Year, by State: 2006

State	Total Number of MAX PS Records	Records Remaining After Consolidation	Reduction in Record Count	Number of Combined Records	Duplicate MAXEM IDs in Excess of Two	Reduction As Percent of Initial Records
Alabama	976,361	975,295	1,066	1,066	0	0.109
Alaska	131,586	131,554	32	32	0	0.024
Arizona	1,533,874	1,533,485	389	389	0	0.025
Arkansas	771,587	768,550	3,037	3,013	24	0.394
California	10,946,644	10,945,409	1,235	1,232	3	0.011
Colorado	642,575	642,222	353	352	1	0.055
Connecticut	534,495	533,900	595	594	1	0.111
Delaware	185,602	185,586	16	16	0	0.009
District of Columbia	169,814	169,715	99	99	0	0.058
Florida	3,042,834	3,042,379	455	455	0	0.015
Georgia	2,101,713	2,099,367	2,346	2,346	0	0.112
Hawaii	238,226	238,087	139	139	0	0.058
Idaho	230,815	230,791	24	24	0	0.010
Illinois	2,602,268	2,575,094	27,174	26,468	706	1.044
Indiana	1,067,016	1,066,806	210	210	0	0.020
Iowa	468,572	468,064	508	507	1	0.108
Kansas	361,498	361,478	20	19	1	0.006
Kentucky	893,225	884,193	9,032	8,893	139	1.011
Louisiana	1,273,978	1,271,272	2,706	2,706	0	0.212
Maine	337,424	337,396	28	28	0	0.008
Maryland	867,649	867,450	199	199	0	0.023
Massachusetts	1,315,266	1,314,064	1,202	1,201	1	0.091
Michigan	1,958,996	1,958,693	303	303	0	0.015
Minnesota	809,009	808,911	98	98	0	0.012
Mississippi	777,471	774,770	2,701	2,663	38	0.347
Missouri	1,115,164	1,114,674	490	490	0	0.044
Montana	129,162	129,162	0	0	0	0.000
Nebraska	262,403	262,320	83	82	1	0.032
Nevada	256,955	256,735	220	220	0	0.086
New Hampshire	148,759	148,750	9	9	0	0.006
New Jersey	1,190,176	1,184,535	5,641	5,617	24	0.474
New Mexico	521,785	520,302	1,483	1,482	1	0.284
New York	5,123,013	5,050,578	72,435	71,489	946	1.414
North Carolina	1,782,760	1,782,274	486	486	0	0.027
North Dakota	80,920	78,238	2,682	2,682	0	3.314
Ohio	2,157,415	2,144,466	12,949	12,815	134	0.600
Oklahoma	763,254	760,783	2,471	2,449	22	0.324
Oregon	554,749	553,934	815	814	1	0.147
Pennsylvania	2,111,259	2,111,090	169	167	2	0.008
Rhode Island	225,873	225,853	20	20	0	0.009
South Carolina	949,921	949,737	184	184	0	0.019
South Dakota	132,647	130,499	2,148	2,137	11	1.619
Tennessee	1,499,759	1,499,056	703	695	8	0.047
Texas	4,184,402	4,175,178	9,224	9,080	144	0.220
Utah	339,648	339,586	62	62	0	0.018
Vermont	164,682	164,609	73	73	0	0.044
Virginia	956,145	955,472	673	672	1	0.070
Washington	1,245,992	1,245,775	217	217	0	0.017
West Virginia	393,607	393,310	297	297	0	0.075
Wisconsin	1,051,903	1,040,576	11,327	11,324	3	1.077
Wyoming	80,790	80,754	36	36	0	0.045

Table A.13. Reduction in Record Count Due to Consolidation of Records Within State and Year, by State: 2007

State	Total Number of MAX PS Records	Records Remaining After Consolidation	Reduction in Record Count	Number of Combined Records	Duplicate MAXEM IDs in Excess of Two	Reduction As Percent of Initial Records
Alabama	919,048	918,707	341	340	1	0.037
Alaska	126,886	126,850	36	36	0	0.028
Arizona	1,572,906	1,572,426	480	480	0	0.031
Arkansas	786,248	782,932	3,316	3,297	19	0.422
California	10,987,805	10,987,628	177	175	2	0.002
Colorado	640,071	639,774	297	297	0	0.046
Connecticut	539,182	538,563	619	618	1	0.115
Delaware	188,695	188,647	48	48	0	0.025
District of Columbia	171,417	171,333	84	83	1	0.049
Florida	2,935,675	2,935,235	440	440	0	0.015
Georgia	2,014,312	2,012,723	1,589	1,588	1	0.079
Hawaii	240,407	240,270	137	137	0	0.057
Idaho	236,261	236,250	11	11	0	0.005
Illinois	2,671,131	2,646,386	24,745	24,020	725	0.926
Indiana	1,085,057	1,084,631	426	426	0	0.039
Iowa	484,526	483,867	659	659	0	0.136
Kansas	356,752	356,732	20	19	1	0.006
Kentucky	901,094	901,066	28	28	0	0.003
Louisiana	1,161,542	1,161,538	4	4	0	0.000
Maine	361,555	361,537	18	18	0	0.005
Maryland	856,476	856,244	232	232	0	0.027
Massachusetts	1,363,950	1,363,114	836	836	0	0.061
Michigan	1,982,608	1,982,443	165	165	0	0.008
Minnesota	823,723	823,673	50	50	0	0.006
Mississippi	746,010	742,759	3,251	3,161	90	0.436
Missouri	1,078,266	1,077,679	587	587	0	0.054
Montana	128,821	128,820	1	1	0	0.001
Nebraska	262,022	261,947	75	75	0	0.029
Nevada	259,843	259,831	12	12	0	0.005
New Hampshire	151,043	151,029	14	14	0	0.009
New Jersey	1,227,083	1,225,717	1,366	1,349	17	0.111
New Mexico	532,636	532,628	8	8	0	0.002
New York	5,038,798	4,974,807	63,991	63,202	789	1.270
North Carolina	1,822,975	1,822,238	737	737	0	0.040
North Dakota	80,594	77,545	3,049	3,048	1	3.783
Ohio	2,173,685	2,160,090	13,595	13,120	475	0.625
Oklahoma	786,992	784,069	2,923	2,905	18	0.371
Oregon	545,787	544,917	870	868	2	0.159
Pennsylvania	2,134,737	2,134,400	337	336	1	0.016
Rhode Island	222,340	222,253	87	87	0	0.039
South Carolina	917,726	917,611	115	115	0	0.013
South Dakota	133,795	131,605	2,190	2,180	10	1.637
Tennessee	1,494,749	1,493,877	872	859	13	0.058
Texas	4,313,350	4,304,249	9,101	8,992	109	0.211
Utah	327,812	327,662	150	150	0	0.046
Vermont	164,339	164,337	2	2	0	0.001
Virginia	965,390	965,062	328	327	1	0.034
Washington	1,227,878	1,227,686	192	192	0	0.016
West Virginia	397,462	397,240	222	222	0	0.056
Wisconsin	1,053,300	1,040,945	12,355	12,351	4	1.173
Wyoming	78,360	78,344	16	16	0	0.020

Table A.14. Agreement on Race and BOE among Record-Pairs Linked Within State, Across Years, by MSIS ID: 2005 to 2006

State	Same Race, Same BOE	One Agrees, One Missing	One Agrees, One Differs	One Differs, One Missing	Both Differ	Both Missing
Alabama	95.81	2.66	1.49	0.03	0.01	0.00
Alaska	93.48	2.68	3.76	0.07	0.01	0.00
Arizona	92.44	4.36	2.85	0.23	0.01	0.10
Arkansas	94.41	3.10	2.17	0.30	0.02	0.00
California	90.89	5.99	2.91	0.16	0.05	0.00
Colorado	65.35	31.08	1.38	1.01	0.02	1.16
Connecticut	97.74	0.04	2.21	0.00	0.01	0.00
Delaware	96.65	0.00	3.32	0.00	0.03	0.00
District of Columbia	95.07	2.31	2.53	0.09	0.00	0.00
Florida	89.96	8.18	1.56	0.29	0.00	0.00
Georgia	78.29	19.13	1.03	0.18	0.00	1.38
Hawaii	96.54	0.24	3.22	0.00	0.00	0.00
Idaho	96.94	1.36	1.68	0.01	0.01	0.00
Illinois	83.97	10.66	4.57	0.30	0.04	0.47
Indiana	94.56	3.19	2.20	0.02	0.00	0.03
Iowa	74.24	23.10	1.86	0.79	0.00	0.00
Kansas	94.98	2.78	2.19	0.04	0.00	0.00
Kentucky	90.85	7.01	1.70	0.42	0.01	0.01
Louisiana	92.89	5.50	1.52	0.10	0.00	0.00
Maine	87.24	8.76	3.41	0.41	0.00	0.19
Maryland	92.15	4.90	2.81	0.09	0.00	0.05
Massachusetts	60.69	33.28	2.97	0.94	0.06	2.06
Michigan	95.80	1.35	2.81	0.02	0.02	0.00
Minnesota	89.27	8.15	2.30	0.07	0.01	0.19
Mississippi	90.75	7.55	1.57	0.13	0.00	0.00
Missouri	96.01	2.13	1.81	0.05	0.00	0.00
Montana	85.81	10.80	2.21	0.00	0.00	1.17
Nebraska	95.67	2.82	1.46	0.04	0.01	0.00
Nevada	95.96	0.00	3.99	0.00	0.05	0.00
New Hampshire	91.59	6.78	1.47	0.01	0.00	0.15
New Jersey	76.58	18.28	3.66	0.74	0.10	0.65
New Mexico	95.38	2.67	1.77	0.18	0.01	0.00
New York	90.94	6.20	2.81	0.03	0.00	0.00
North Carolina	83.31	13.88	2.19	0.11	0.00	0.52
North Dakota	93.11	4.88	1.92	0.09	0.00	0.00
Ohio	96.58	0.03	3.39	0.00	0.01	0.00
Oklahoma	97.38	0.01	2.60	0.00	0.00	0.00
Oregon	75.55	19.94	2.37	0.31	0.00	1.82
Pennsylvania	94.17	2.26	3.51	0.06	0.00	0.00
Rhode Island	67.17	31.38	1.15	0.31	0.00	0.00
South Carolina	93.14	4.78	1.84	0.23	0.01	0.00
South Dakota	95.58	1.92	2.46	0.02	0.02	0.00
Tennessee	92.76	4.06	3.00	0.17	0.00	0.00
Texas	95.54	2.03	2.24	0.15	0.04	0.00
Utah	82.91	14.95	2.03	0.08	0.01	0.02
Vermont	58.83	36.08	2.76	0.78	0.00	1.55
Virginia	92.47	5.86	1.54	0.02	0.00	0.11
Washington	75.61	21.92	2.15	0.31	0.01	0.00
West Virginia	97.99	0.00	2.00	0.00	0.01	0.00
Wisconsin	80.78	16.97	1.58	0.66	0.01	0.00
Wyoming	98.17	0.73	1.04	0.05	0.01	0.00

Table A.15. Agreement on Race and BOE among Record-Pairs Linked Within State, Across Years, by MSIS ID: 2006 to 2007

State	Same Race, Same BOE	One Agrees, One Missing	One Agrees, One Differs	One Differs, One Missing	Both Differ	Both Missing
Alabama	95.24	2.85	1.87	0.03	0.01	0.00
Alaska	93.28	2.50	4.14	0.06	0.02	0.00
Arizona	87.44	8.77	2.95	0.27	0.02	0.55
Arkansas	94.51	3.28	2.07	0.13	0.01	0.00
California	90.93	6.08	2.78	0.16	0.05	0.00
Colorado	57.15	37.80	1.64	1.66	0.04	1.72
Connecticut	97.91	0.02	2.07	0.00	0.01	0.00
Delaware	96.26	0.01	3.68	0.00	0.05	0.00
District of Columbia	93.97	2.09	3.65	0.28	0.00	0.00
Florida	89.81	8.07	1.81	0.29	0.02	0.00
Georgia	75.64	21.60	0.97	0.13	0.00	1.66
Hawaii	95.74	0.21	4.01	0.00	0.04	0.00
Idaho	96.06	2.45	1.47	0.01	0.01	0.00
Illinois	82.11	13.67	2.90	0.41	0.02	0.89
Indiana	94.45	3.15	2.35	0.02	0.01	0.03
Iowa	67.99	29.17	1.83	1.00	0.00	0.00
Kansas	95.03	2.71	2.22	0.04	0.00	0.00
Kentucky	90.23	7.82	1.62	0.31	0.00	0.01
Louisiana	92.33	5.51	2.05	0.10	0.00	0.00
Maine	85.03	11.44	2.93	0.41	0.00	0.18
Maryland	92.00	5.15	2.71	0.08	0.00	0.05
Massachusetts	62.14	31.38	2.99	0.81	0.06	2.61
Michigan	95.25	1.42	3.27	0.02	0.03	0.00
Minnesota	89.41	7.93	2.40	0.09	0.01	0.16
Mississippi	89.35	8.60	1.81	0.23	0.01	0.00
Missouri	95.94	2.07	1.94	0.05	0.00	0.00
Montana	84.17	12.33	2.18	0.02	0.00	1.31
Nebraska	95.45	3.15	1.35	0.04	0.01	0.00
Nevada	96.44	0.02	3.50	0.00	0.04	0.00
New Hampshire	91.63	6.52	1.71	0.02	0.00	0.11
New Jersey	76.43	18.89	3.14	0.49	0.10	0.94
New Mexico	95.94	2.52	1.40	0.13	0.01	0.00
New York	88.41	6.47	4.92	0.08	0.12	0.00
North Carolina	84.18	13.10	2.16	0.10	0.00	0.45
North Dakota	92.42	5.64	1.90	0.04	0.01	0.00
Ohio	96.25	0.03	3.71	0.00	0.01	0.00
Oklahoma	97.30	0.05	2.63	0.00	0.02	0.00
Oregon	69.95	24.16	2.23	0.46	0.01	3.19
Pennsylvania	93.87	2.38	3.68	0.07	0.00	0.00
Rhode Island	64.26	34.09	1.29	0.36	0.00	0.00
South Carolina	92.54	4.87	2.36	0.23	0.01	0.00
South Dakota	95.36	1.84	2.74	0.03	0.03	0.00
Tennessee	93.39	4.24	2.22	0.14	0.01	0.00
Texas	95.49	2.15	2.17	0.17	0.03	0.00
Utah	82.20	14.58	2.84	0.32	0.03	0.03
Vermont	60.23	34.57	2.91	0.73	0.00	1.55
Virginia	91.35	6.55	1.94	0.05	0.01	0.10
Washington	74.64	22.84	2.13	0.38	0.01	0.00
West Virginia	96.39	1.38	2.20	0.02	0.01	0.00
Wisconsin	79.28	18.40	1.65	0.66	0.01	0.00
Wyoming	97.56	0.79	1.59	0.05	0.01	0.00

Table A.16. Agreement on Race and BOE among Record-Pairs Linked Within State, Across Years, by MSIS ID: 2005 to 2007

State	Same Race, Same BOE	One Agrees, One Missing	One Agrees, One Differs	One Differs, One Missing	Both Differ	Both Missing
Alabama	94.03	2.94	2.95	0.07	0.02	0.00
Alaska	90.52	2.41	6.90	0.12	0.05	0.00
Arizona	87.21	6.44	5.50	0.49	0.05	0.30
Arkansas	93.22	3.22	3.08	0.45	0.03	0.00
California	88.62	6.04	4.87	0.33	0.14	0.00
Colorado	59.39	33.75	2.75	2.52	0.07	1.53
Connecticut	95.89	0.06	4.03	0.00	0.03	0.00
Delaware	93.13	0.00	6.76	0.00	0.10	0.00
District of Columbia	92.05	2.03	5.61	0.31	0.00	0.00
Florida	88.14	7.99	3.26	0.58	0.03	0.00
Georgia	73.26	22.51	2.12	0.35	0.00	1.76
Hawaii	92.99	0.24	6.69	0.00	0.08	0.00
Idaho	94.43	2.16	3.35	0.04	0.02	0.00
Illinois	79.07	12.53	6.71	0.74	0.12	0.83
Indiana	92.32	3.37	4.22	0.04	0.01	0.03
Iowa	72.76	22.06	3.61	1.56	0.01	0.00
Kansas	92.88	2.48	4.55	0.07	0.02	0.00
Kentucky	87.85	7.92	3.41	0.79	0.02	0.01
Louisiana	90.75	5.29	3.76	0.20	0.01	0.00
Maine	84.94	8.47	5.76	0.62	0.00	0.20
Maryland	90.71	4.25	4.86	0.15	0.01	0.03
Massachusetts	62.32	28.11	5.75	1.38	0.22	2.23
Michigan	92.68	1.29	5.92	0.04	0.07	0.00
Minnesota	86.92	8.12	4.58	0.16	0.02	0.20
Mississippi	88.45	7.47	3.53	0.52	0.01	0.00
Missouri	93.70	1.97	4.21	0.11	0.00	0.00
Montana	81.95	13.03	3.94	0.03	0.00	1.05
Nebraska	94.36	2.69	2.85	0.08	0.02	0.00
Nevada	92.19	0.01	7.62	0.00	0.17	0.00
New Hampshire	89.11	7.44	3.27	0.03	0.00	0.14
New Jersey	72.12	19.19	6.25	1.43	0.24	0.76
New Mexico	93.36	2.76	3.50	0.33	0.05	0.00
New York	85.73	6.23	7.70	0.12	0.22	0.00
North Carolina	80.18	15.15	3.82	0.20	0.00	0.64
North Dakota	92.38	3.95	3.56	0.11	0.01	0.00
Ohio	94.36	0.03	5.58	0.00	0.03	0.00
Oklahoma	95.19	0.05	4.71	0.00	0.05	0.00
Oregon	68.11	23.20	4.37	0.71	0.02	3.59
Pennsylvania	91.00	2.10	6.77	0.12	0.00	0.00
Rhode Island	66.11	30.61	2.57	0.70	0.01	0.00
South Carolina	90.14	5.09	4.26	0.50	0.02	0.00
South Dakota	92.65	2.12	5.09	0.07	0.07	0.00
Tennessee	90.10	4.40	5.16	0.33	0.02	0.00
Texas	92.95	2.16	4.48	0.30	0.11	0.00
Utah	77.82	16.55	5.07	0.47	0.05	0.04
Vermont	58.01	33.93	4.90	1.36	0.01	1.79
Virginia	89.23	7.01	3.54	0.09	0.02	0.11
Washington	75.06	18.26	6.01	0.56	0.11	0.00
West Virginia	95.71	0.00	4.28	0.00	0.02	0.00
Wisconsin	77.88	17.63	3.08	1.39	0.02	0.00
Wyoming	96.26	0.91	2.69	0.10	0.04	0.00

Table A.17. Agreement on Race and BOE among Record-Pairs Linked Within State, Across Years, by MAX SSN, EDB-SSN, or EDB_HIC: 2005 to 2006

State	Same Race, Same BOE	One Agrees, One Missing	One Agrees, One Differs	One Differs, One Missing	Both Differ	Both Missing
Alabama	83.23	8.67	5.58	2.07	0.04	0.41
Alaska	76.64	11.21	9.35	1.87	0.00	0.93
Arizona	64.36	16.70	16.67	0.91	0.76	0.59
Arkansas	74.33	6.09	11.47	6.06	0.31	1.75
California	58.33	31.14	7.24	1.97	0.66	0.66
Colorado	62.82	18.59	12.66	1.92	0.80	3.21
Connecticut	81.40	0.30	18.15	0.07	0.07	0.00
Delaware	58.14	6.98	30.23	2.33	2.33	0.00
District of Columbia	57.63	16.38	18.64	7.34	0.00	0.00
Florida	46.73	24.17	13.69	14.43	0.86	0.12
Georgia	24.91	56.22	4.47	6.90	0.02	7.48
Hawaii	72.84	1.60	24.28	0.64	0.64	0.00
Idaho	70.91	5.45	23.64	0.00	0.00	0.00
Illinois	70.10	8.17	19.53	0.97	0.71	0.52
Indiana	73.96	15.09	9.47	0.30	0.59	0.59
Iowa	21.77	70.02	4.15	2.77	0.18	1.11
Kansas	69.23	13.46	15.38	0.00	1.92	0.00
Kentucky	79.13	12.17	6.96	1.74	0.00	0.00
Louisiana	77.78	11.11	11.11	0.00	0.00	0.00
Maine	52.90	33.33	7.25	3.62	0.00	2.90
Maryland	52.17	20.81	18.63	4.35	1.24	2.80
Massachusetts	27.55	57.00	3.08	4.70	0.45	7.22
Michigan	78.21	2.03	18.75	0.34	0.68	0.00
Minnesota	61.58	35.59	0.00	0.56	0.00	2.26
Mississippi	27.76	33.15	19.95	17.58	1.28	0.28
Missouri	74.81	14.92	8.65	1.41	0.00	0.22
Montana	n/a	n/a	n/a	n/a	n/a	n/a
Nebraska	78.00	12.00	10.00	0.00	0.00	0.00
Nevada	60.00	0.00	40.00	0.00	0.00	0.00
New Hampshire	73.68	5.26	21.05	0.00	0.00	0.00
New Jersey	33.79	56.87	6.40	2.51	0.26	0.17
New Mexico	62.50	12.50	0.00	0.00	25.00	0.00
New York	51.35	21.57	20.88	4.51	1.68	0.01
North Carolina	45.38	35.36	6.34	3.25	0.26	9.42
North Dakota	22.09	71.87	0.51	5.52	0.00	0.00
Ohio	77.81	1.09	19.87	0.32	0.91	0.00
Oklahoma	77.65	1.15	19.59	0.08	1.53	0.00
Oregon	58.97	26.82	9.66	0.99	0.39	3.16
Pennsylvania	54.09	23.10	12.87	8.48	1.46	0.00
Rhode Island	0.00	0.00	0.00	0.00	7.14	92.86
South Carolina	54.29	17.45	12.19	15.51	0.28	0.28
South Dakota	77.90	1.15	19.56	0.12	1.27	0.00
Tennessee	60.71	26.57	9.23	1.83	0.17	1.48
Texas	81.51	3.98	12.63	1.36	0.41	0.12
Utah	60.19	8.33	30.56	0.00	0.93	0.00
Vermont	25.00	62.50	0.00	0.00	0.00	12.50
Virginia	60.41	20.29	14.99	2.88	0.79	0.65
Washington	33.69	37.74	11.94	11.73	1.49	3.41
West Virginia	53.50	35.57	3.64	3.36	0.28	3.64
Wisconsin	72.70	22.79	1.26	1.15	0.01	2.09
Wyoming	83.65	5.77	7.69	1.92	0.00	0.96

Table A.18. Agreement on Race and BOE among Record-Pairs Linked Within State, Across Years, by MAX SSN, EDB-SSN, or EDB_HIC: 2006 to 2007

State	Same Race, Same BOE	One Agrees, One Missing	One Agrees, One Differs	One Differs, One Missing	Both Differ	Both Missing
Alabama	77.58	14.89	4.59	1.39	0.09	1.47
Alaska	80.95	15.87	1.59	1.59	0.00	0.00
Arizona	36.82	48.69	6.86	4.25	0.76	2.61
Arkansas	63.45	16.16	8.93	9.55	0.23	1.68
California	48.85	39.69	6.87	1.78	1.02	1.78
Colorado	59.27	21.28	11.40	2.74	0.91	4.41
Connecticut	78.95	0.16	20.57	0.00	0.32	0.00
Delaware	71.43	7.14	12.50	0.00	8.93	0.00
District of Columbia	57.61	17.39	16.30	8.15	0.54	0.00
Florida	48.86	26.77	12.13	11.33	0.57	0.34
Georgia	2.58	73.97	0.71	9.52	0.00	13.22
Hawaii	73.02	1.08	25.18	0.00	0.72	0.00
Idaho	70.59	2.94	26.47	0.00	0.00	0.00
Illinois	67.33	12.94	16.33	1.60	0.78	1.03
Indiana	78.41	12.82	7.95	0.32	0.16	0.32
Iowa	20.54	71.31	3.99	3.67	0.33	0.16
Kansas	77.42	12.90	6.45	0.00	3.23	0.00
Kentucky	52.63	39.47	5.26	2.63	0.00	0.00
Louisiana	84.00	4.00	12.00	0.00	0.00	0.00
Maine	7.27	63.64	0.00	9.09	0.00	20.00
Maryland	44.58	25.12	22.17	3.69	0.99	3.45
Massachusetts	3.42	77.65	1.41	5.33	0.35	11.83
Michigan	75.42	2.92	21.04	0.21	0.42	0.00
Minnesota	67.86	30.95	1.19	0.00	0.00	0.00
Mississippi	29.70	40.70	14.97	13.69	0.47	0.47
Missouri	17.78	68.79	1.72	8.28	0.00	3.43
Montana	100.00	0.00	0.00	0.00	0.00	0.00
Nebraska	83.65	10.69	5.03	0.00	0.63	0.00
Nevada	84.21	0.00	15.79	0.00	0.00	0.00
New Hampshire	75.00	7.14	14.29	3.57	0.00	0.00
New Jersey	55.81	35.53	6.85	1.04	0.26	0.52
New Mexico	70.59	11.76	5.88	0.00	11.76	0.00
New York	49.97	23.45	19.96	4.94	1.66	0.02
North Carolina	43.17	30.56	8.69	4.78	0.00	12.80
North Dakota	30.33	63.55	0.60	5.53	0.00	0.00
Ohio	75.47	1.25	21.84	0.38	1.06	0.00
Oklahoma	77.01	3.28	17.76	0.20	1.75	0.00
Oregon	55.83	29.51	8.86	1.17	0.13	4.50
Pennsylvania	66.33	15.34	11.16	5.98	1.20	0.00
Rhode Island	0.93	79.63	0.00	0.00	0.93	18.52
South Carolina	56.86	18.95	12.09	11.76	0.00	0.33
South Dakota	78.42	1.34	18.97	0.09	1.18	0.00
Tennessee	44.69	43.44	6.03	1.92	0.20	3.71
Texas	77.82	6.96	12.75	1.82	0.54	0.12
Utah	66.52	0.90	31.67	0.45	0.45	0.00
Vermont	33.33	50.00	0.00	0.00	0.00	16.67
Virginia	61.39	20.83	14.54	2.46	0.59	0.20
Washington	32.38	46.74	7.05	8.09	0.78	4.96
West Virginia	45.68	45.88	4.53	3.29	0.21	0.41
Wisconsin	54.11	38.12	0.77	0.92	0.00	6.08
Wyoming	60.47	23.26	9.30	0.00	4.65	2.33

Table A.19. Agreement on Race and BOE among Record-Pairs Linked Within State, Across Years, by MAX SSN, EDB-SSN, or EDB_HIC: 2005 to 2007

State	Same Race, Same BOE	One Agrees, One Missing	One Agrees, One Differs	One Differs, One Missing	Both Differ	Both Missing
Alabama	84.98	6.40	6.91	1.43	0.17	0.11
Alaska	88.24	2.94	8.82	0.00	0.00	0.00
Arizona	63.96	15.93	17.68	1.22	0.82	0.40
Arkansas	66.68	12.42	10.39	9.30	0.36	0.85
California	71.61	16.11	9.97	1.28	0.77	0.26
Colorado	64.32	16.74	12.19	2.64	0.88	3.23
Connecticut	80.31	0.17	19.11	0.00	0.40	0.00
Delaware	74.19	3.23	14.52	1.61	6.45	0.00
District of Columbia	58.38	13.71	20.81	6.60	0.51	0.00
Florida	50.18	22.41	13.28	12.79	0.97	0.37
Georgia	25.51	54.25	5.01	7.82	0.10	7.31
Hawaii	71.55	1.72	25.29	0.29	1.15	0.00
Idaho	77.97	1.69	20.34	0.00	0.00	0.00
Illinois	69.17	8.11	20.36	1.08	0.81	0.48
Indiana	82.36	5.23	11.63	0.19	0.39	0.19
Iowa	20.39	71.87	4.26	3.25	0.12	0.12
Kansas	64.29	9.52	26.19	0.00	0.00	0.00
Kentucky	81.51	5.88	11.76	0.84	0.00	0.00
Louisiana	82.14	7.14	10.71	0.00	0.00	0.00
Maine	56.57	28.57	8.57	5.14	0.00	1.14
Maryland	52.00	20.57	20.00	3.71	1.14	2.57
Massachusetts	32.65	51.60	4.19	4.83	0.64	6.10
Michigan	76.84	1.80	21.01	0.18	0.18	0.00
Minnesota	70.34	28.28	0.69	0.69	0.00	0.00
Mississippi	29.04	36.97	18.80	14.14	0.80	0.25
Missouri	81.72	7.75	9.40	0.78	0.17	0.17
Montana	100.00	0.00	0.00	0.00	0.00	0.00
Nebraska	81.13	10.69	7.55	0.00	0.63	0.00
Nevada	100.00	0.00	0.00	0.00	0.00	0.00
New Hampshire	76.92	3.85	15.38	3.85	0.00	0.00
New Jersey	48.25	39.14	9.28	2.56	0.36	0.42
New Mexico	62.50	12.50	12.50	0.00	12.50	0.00
New York	50.99	20.27	22.13	4.48	2.11	0.02
North Carolina	58.09	25.74	9.72	3.43	0.16	2.86
North Dakota	26.34	67.61	1.03	5.02	0.00	0.00
Ohio	75.23	1.09	22.26	0.36	1.06	0.00
Oklahoma	75.37	0.88	21.72	0.06	1.97	0.00
Oregon	60.35	23.59	11.79	1.19	0.25	2.82
Pennsylvania	66.05	16.79	11.44	4.61	1.11	0.00
Rhode Island	1.04	88.54	0.00	1.04	1.04	8.33
South Carolina	57.32	19.82	13.11	9.15	0.30	0.30
South Dakota	77.59	0.92	20.11	0.12	1.27	0.00
Tennessee	64.38	19.85	11.31	1.69	0.31	2.46
Texas	80.67	2.84	14.60	1.26	0.58	0.05
Utah	68.16	2.45	28.98	0.00	0.41	0.00
Vermont	33.33	66.67	0.00	0.00	0.00	0.00
Virginia	59.94	19.59	16.53	2.33	0.95	0.66
Washington	38.44	38.67	14.67	6.44	0.89	0.89
West Virginia	82.12	4.92	8.81	1.55	0.00	2.59
Wisconsin	79.35	17.19	1.83	1.56	0.01	0.07
Wyoming	85.71	3.57	7.14	1.19	2.38	0.00

Table A.20. Agreement on Race and BOE among Record-Pairs Linked Within State and Year by MAX SSN, EDB-SSN, or EDB_HIC: All Years

State	Same Race, Same BOE	One Agrees, One Missing	One Agrees, One Differs	One Differs, One Missing	Both Differ	Both Missing
Alabama	88.11	8.77	2.26	0.87	0.00	0.00
Alaska	85.29	2.94	11.76	0.00	0.00	0.00
Arizona	78.54	4.97	15.75	0.25	0.30	0.20
Arkansas	61.96	12.27	13.57	11.25	0.75	0.20
California	73.96	20.83	4.17	1.04	0.00	0.00
Colorado	50.00	33.33	14.58	0.00	0.00	2.08
Connecticut	84.62	0.23	15.16	0.00	0.00	0.00
Delaware	77.78	0.00	22.22	0.00	0.00	0.00
District of Columbia	72.00	12.00	12.00	4.00	0.00	0.00
Florida	51.94	20.49	13.78	13.07	0.71	0.00
Georgia	41.09	44.41	4.83	6.04	0.00	3.63
Hawaii	72.29	2.41	24.10	0.00	1.20	0.00
Idaho	88.89	0.00	11.11	0.00	0.00	0.00
Illinois	67.63	15.31	13.27	1.63	0.54	1.61
Indiana	86.67	6.67	5.56	1.11	0.00	0.00
Iowa	20.22	73.65	3.79	1.99	0.18	0.18
Kansas	89.47	0.00	10.53	0.00	0.00	0.00
Kentucky	100.00	0.00	0.00	0.00	0.00	0.00
Louisiana	100.00	0.00	0.00	0.00	0.00	0.00
Maine	54.00	36.00	4.00	4.00	0.00	2.00
Maryland	62.26	18.87	16.98	1.89	0.00	0.00
Massachusetts	21.88	50.00	3.13	3.13	0.00	21.88
Michigan	83.82	2.94	13.24	0.00	0.00	0.00
Minnesota	64.65	34.34	0.00	0.00	0.00	1.01
Mississippi	36.23	26.81	22.46	13.77	0.72	0.00
Missouri	81.60	7.20	11.20	0.00	0.00	0.00
Montana	n/a	n/a	n/a	n/a	n/a	n/a
Nebraska	100.00	0.00	0.00	0.00	0.00	0.00
Nevada	0.00	0.00	100.00	0.00	0.00	0.00
New Hampshire	50.00	25.00	25.00	0.00	0.00	0.00
New Jersey	67.01	28.42	3.94	0.62	0.00	0.00
New Mexico	100.00	0.00	0.00	0.00	0.00	0.00
New York	55.85	17.46	20.74	4.57	1.35	0.02
North Carolina	57.14	33.43	6.08	3.34	0.00	0.00
North Dakota	7.86	83.83	0.00	8.31	0.00	0.00
Ohio	82.21	2.35	14.69	0.07	0.67	0.00
Oklahoma	85.30	0.00	13.29	0.00	1.41	0.00
Oregon	69.68	19.68	8.33	1.16	0.00	1.16
Pennsylvania	58.44	22.08	11.69	7.79	0.00	0.00
Rhode Island	0.00	100.00	0.00	0.00	0.00	0.00
South Carolina	51.52	34.85	10.61	3.03	0.00	0.00
South Dakota	84.59	0.90	14.16	0.36	0.00	0.00
Tennessee	85.91	6.04	6.71	0.67	0.00	0.67
Texas	85.71	2.13	10.92	0.97	0.26	0.02
Utah	88.00	0.00	12.00	0.00	0.00	0.00
Vermont	n/a	n/a	n/a	n/a	n/a	n/a
Virginia	65.20	14.04	17.54	1.75	1.17	0.29
Washington	43.88	29.50	14.39	10.79	0.00	1.44
West Virginia	41.56	55.84	0.00	2.60	0.00	0.00
Wisconsin	62.74	36.17	0.68	0.41	0.00	0.00
Wyoming	71.43	0.00	21.43	7.14	0.00	0.00

Table A.21. Frequency of Missing SSNs, by State: 2005

State	Unduplicated Records	Records with Missing SSNs	Percent of Unduplicated Records	Share of National Missing SSNs
Alabama	961,997	9,595	1.00	0.16
Alaska	133,619	2,856	2.14	0.05
Arizona	1,488,947	153,973	10.34	2.50
Arkansas	759,124	41,162	5.42	0.67
California	10,923,391	4,032,219	36.91	65.60
Colorado	645,674	52,210	8.09	0.85
Connecticut	530,860	13,531	2.55	0.22
Delaware	181,028	11,917	6.58	0.19
District of Columbia	167,765	5,530	3.30	0.09
Florida	3,059,019	97,706	3.19	1.59
Georgia	2,104,721	145,669	6.92	2.37
Hawaii	237,563	6,789	2.86	0.11
Idaho	233,735	5,571	2.38	0.09
Illinois	2,572,397	63,397	2.46	1.03
Indiana	1,060,238	42,031	3.96	0.68
Iowa	430,438	4,571	1.06	0.07
Kansas	361,292	8,547	2.37	0.14
Kentucky	875,149	10,341	1.18	0.17
Louisiana	1,244,849	106,852	8.58	1.74
Maine	327,399	2,077	0.63	0.03
Maryland	868,531	24,899	2.87	0.41
Massachusetts	1,254,584	107,679	8.58	1.75
Michigan	1,878,535	92,034	4.90	1.50
Minnesota	792,013	15,819	2.00	0.26
Mississippi	785,705	42,897	5.46	0.70
Missouri	1,219,308	17,447	1.43	0.28
Montana	129,052	1,774	1.37	0.03
Nebraska	261,826	5,186	1.98	0.08
Nevada	272,544	31,583	11.59	0.51
New Hampshire	145,823	1,125	0.77	0.02
New Jersey	1,128,374	48,924	4.34	0.80
New Mexico	530,695	10,421	1.96	0.17
New York	5,043,106	322,079	6.39	5.24
North Carolina	1,728,822	33,264	1.92	0.54
North Dakota	78,324	1,337	1.71	0.02
Ohio	2,113,909	28,014	1.33	0.46
Oklahoma	728,081	20,753	2.85	0.34
Oregon	564,463	37,521	6.65	0.61
Pennsylvania	2,037,987	18,182	0.89	0.30
Rhode Island	224,876	6,285	2.79	0.10
South Carolina	1,012,557	20,125	1.99	0.33
South Dakota	128,882	1,529	1.19	0.02
Tennessee	1,607,129	24,752	1.54	0.40
Texas	4,156,090	216,401	5.21	3.52
Utah	359,449	24,810	6.90	0.40
Vermont	165,742	2,526	1.52	0.04
Virginia	927,737	28,440	3.07	0.46
Washington	1,284,810	102,576	7.98	1.67
West Virginia	393,478	9,242	2.35	0.15
Wisconsin	1,027,116	29,962	2.92	0.49
Wyoming	81,526	2,558	3.14	0.04

Table A.22. Frequency of Missing SSNs, by State: 2006

State	Unduplicated Records	Records with Missing SSNs	Percent of Unduplicated Records	Share of National Missing SSNs
Alabama	961,997	11,418	1.19	0.19
Alaska	133,619	3,210	2.40	0.05
Arizona	1,488,947	158,404	10.64	2.57
Arkansas	759,124	35,577	4.69	0.58
California	10,923,391	4,092,519	37.47	66.45
Colorado	645,674	36,997	5.73	0.60
Connecticut	530,860	15,410	2.90	0.25
Delaware	181,028	14,326	7.91	0.23
District of Columbia	167,765	7,791	4.64	0.13
Florida	3,059,019	105,519	3.45	1.71
Georgia	2,104,721	151,199	7.18	2.46
Hawaii	237,563	7,950	3.35	0.13
Idaho	233,735	6,422	2.75	0.10
Illinois	2,572,397	69,462	2.70	1.13
Indiana	1,060,238	29,561	2.79	0.48
Iowa	430,438	4,514	1.05	0.07
Kansas	361,292	7,452	2.06	0.12
Kentucky	875,149	638	0.07	0.01
Louisiana	1,244,849	111,439	8.95	1.81
Maine	327,399	2,058	0.63	0.03
Maryland	868,531	26,781	3.08	0.43
Massachusetts	1,254,584	112,670	8.98	1.83
Michigan	1,878,535	98,726	5.26	1.60
Minnesota	792,013	20,649	2.61	0.34
Mississippi	785,705	29,905	3.81	0.49
Missouri	1,219,308	19,753	1.62	0.32
Montana	129,052	2,146	1.66	0.03
Nebraska	261,826	5,176	1.98	0.08
Nevada	272,544	21,520	7.90	0.35
New Hampshire	145,823	1,072	0.74	0.02
New Jersey	1,128,374	54,966	4.87	0.89
New Mexico	530,695	11,306	2.13	0.18
New York	5,043,106	343,433	6.81	5.58
North Carolina	1,728,822	36,031	2.08	0.59
North Dakota	78,324	831	1.06	0.01
Ohio	2,113,909	28,397	1.34	0.46
Oklahoma	728,081	24,614	3.38	0.40
Oregon	564,463	38,506	6.82	0.63
Pennsylvania	2,037,987	24,399	1.20	0.40
Rhode Island	224,876	6,457	2.87	0.10
South Carolina	1,012,557	24,836	2.45	0.40
South Dakota	128,882	1,552	1.20	0.03
Tennessee	1,607,129	23,758	1.48	0.39
Texas	4,156,090	195,277	4.70	3.17
Utah	359,449	11,014	3.06	0.18
Vermont	165,742	2,606	1.57	0.04
Virginia	927,737	33,110	3.57	0.54
Washington	1,284,810	55,429	4.31	0.90
West Virginia	393,478	392	0.10	0.01
Wisconsin	1,027,116	29,035	2.83	0.47
Wyoming	81,526	2,605	3.20	0.04

Table A.23. Frequency of Missing SSNs, by State: 2007

State	Unduplicated Records	Records with Missing SSNs	Percent of Unduplicated Records	Share of National Missing SSNs
Alabama	961,997	35,494	3.69	0.53
Alaska	133,619	4,459	3.34	0.07
Arizona	1,488,947	155,221	10.42	2.31
Arkansas	759,124	43,740	5.76	0.65
California	10,923,391	4,161,025	38.09	61.96
Colorado	645,674	47,379	7.34	0.71
Connecticut	530,860	17,044	3.21	0.25
Delaware	181,028	19,042	10.52	0.28
District of Columbia	167,765	8,870	5.29	0.13
Florida	3,059,019	173,233	5.66	2.58
Georgia	2,104,721	187,294	8.90	2.79
Hawaii	237,563	10,834	4.56	0.16
Idaho	233,735	11,304	4.84	0.17
Illinois	2,572,397	74,681	2.90	1.11
Indiana	1,060,238	30,108	2.84	0.45
Iowa	430,438	8,088	1.88	0.12
Kansas	361,292	9,336	2.58	0.14
Kentucky	875,149	9,444	1.08	0.14
Louisiana	1,244,849	47,383	3.81	0.71
Maine	327,399	2,882	0.88	0.04
Maryland	868,531	29,354	3.38	0.44
Massachusetts	1,254,584	118,233	9.42	1.76
Michigan	1,878,535	157,270	8.37	2.34
Minnesota	792,013	24,757	3.13	0.37
Mississippi	785,705	24,867	3.16	0.37
Missouri	1,219,308	31,054	2.55	0.46
Montana	129,052	2,114	1.64	0.03
Nebraska	261,826	9,135	3.49	0.14
Nevada	272,544	25,231	9.26	0.38
New Hampshire	145,823	1,550	1.06	0.02
New Jersey	1,128,374	71,326	6.32	1.06
New Mexico	530,695	14,865	2.80	0.22
New York	5,043,106	404,568	8.02	6.02
North Carolina	1,728,822	44,211	2.56	0.66
North Dakota	78,324	1,159	1.48	0.02
Ohio	2,113,909	33,670	1.59	0.50
Oklahoma	728,081	44,370	6.09	0.66
Oregon	564,463	45,972	8.14	0.68
Pennsylvania	2,037,987	37,994	1.86	0.57
Rhode Island	224,876	6,326	2.81	0.09
South Carolina	1,012,557	45,596	4.50	0.68
South Dakota	128,882	3,982	3.09	0.06
Tennessee	1,607,129	43,190	2.69	0.64
Texas	4,156,090	257,124	6.19	3.83
Utah	359,449	13,145	3.66	0.20
Vermont	165,742	2,508	1.51	0.04
Virginia	927,737	51,415	5.54	0.77
Washington	1,284,810	65,258	5.08	0.97
West Virginia	393,478	1,893	0.48	0.03
Wisconsin	1,027,116	43,364	4.22	0.65
Wyoming	81,526	3,362	4.12	0.05

Table A.24. Eligibility for Restricted Versus Broader Benefits: Records without SSNs and Records with SSNs, 2005

State	Records with No SSNs			Records with SSNs		
	No Eligibility	Restricted Benefits	Broader Benefits	No Eligibility	Restricted Benefits	Broader Benefits
Alabama	37.00	10.84	52.16	0.45	22.87	76.67
Alaska	19.75	0.04	80.22	0.22	0.15	99.64
Arizona	3.82	73.49	22.69	0.66	3.45	95.89
Arkansas	9.52	9.96	80.52	1.61	16.98	81.42
California	7.88	80.20	11.92	0.18	2.30	97.52
Colorado	47.76	19.03	33.22	10.80	2.44	86.76
Connecticut	5.48	0.00	94.52	0.32	3.26	96.42
Delaware	1.81	36.65	61.54	0.53	9.35	90.12
District of Columbia	22.46	15.86	61.68	0.05	0.70	99.25
Florida	33.36	11.62	55.02	0.23	4.06	95.71
Georgia	13.88	2.38	83.74	12.64	4.89	82.47
Hawaii	62.65	0.94	36.41	0.73	0.84	98.43
Idaho	6.59	0.00	93.41	0.93	2.94	96.13
Illinois	47.13	1.41	51.47	5.21	9.95	84.84
Indiana	32.88	48.14	18.98	1.76	2.82	95.42
Iowa	29.07	9.10	61.82	0.20	2.26	97.55
Kansas	40.51	21.53	37.97	0.32	2.17	97.51
Kentucky	10.78	0.00	89.22	1.48	5.88	92.64
Louisiana	73.52	0.51	25.97	0.02	5.42	94.56
Maine	28.02	3.03	68.95	1.36	3.20	95.44
Maryland	6.79	19.88	73.34	0.93	14.98	84.09
Massachusetts	11.47	0.83	87.70	1.81	1.53	96.66
Michigan	13.36	22.11	64.53	0.49	1.64	97.87
Minnesota	26.26	9.47	64.27	3.06	1.57	95.37
Mississippi	16.73	0.68	82.59	0.02	5.70	94.28
Missouri	8.74	0.06	91.20	0.02	1.21	98.77
Montana	49.77	0.00	50.23	10.13	1.10	88.77
Nebraska	2.62	0.00	97.38	0.13	0.93	98.94
Nevada	12.41	14.56	73.04	0.33	6.64	93.03
New Hampshire	12.89	0.00	87.11	4.18	2.38	93.44
New Jersey	13.68	21.71	64.61	8.26	3.24	88.50
New Mexico	27.57	17.76	54.67	0.03	8.92	91.05
New York	8.39	3.09	88.52	0.08	2.40	97.53
North Carolina	4.01	27.89	68.10	7.45	2.93	89.62
North Dakota	70.46	0.07	29.47	3.59	2.54	93.87
Ohio	1.30	0.04	98.66	0.01	1.16	98.83
Oklahoma	10.51	11.53	77.95	0.01	4.66	95.33
Oregon	5.36	61.30	33.34	4.69	5.34	89.97
Pennsylvania	22.26	0.05	77.69	0.21	2.10	97.69
Rhode Island	68.04	2.34	29.63	0.37	2.16	97.47
South Carolina	0.79	12.52	86.69	0.03	15.48	84.49
South Dakota	5.76	0.00	94.24	1.41	4.30	94.29
Tennessee	49.68	5.97	44.34	0.07	1.77	98.17
Texas	25.32	31.70	42.98	0.15	4.13	95.71
Utah	56.86	15.12	28.01	10.79	0.99	88.22
Vermont	83.37	0.00	16.63	1.84	7.13	91.03
Virginia	12.74	16.66	70.60	4.48	5.46	90.06
Washington	69.42	12.29	18.28	1.21	11.71	87.09
West Virginia	97.51	0.00	2.49	0.38	3.52	96.10
Wisconsin	36.81	10.99	52.21	0.03	15.84	84.13
Wyoming	2.85	23.06	74.08	0.41	3.87	95.72

Note: Broader benefits are for some or all months of eligibility.

Table A.25. Eligibility for Restricted Versus Broader Benefits: Records without SSNs and Records with SSNs, 2006

State	Records with No SSNs			Records with SSNs		
	No Eligibility	Restricted Benefits	Broader Benefits	No Eligibility	Restricted Benefits	Broader Benefits
Alabama	35.98	12.22	51.80	0.45	24.48	75.07
Alaska	16.14	0.06	83.80	0.25	0.18	99.58
Arizona	2.76	74.15	23.09	4.70	3.44	91.86
Arkansas	8.92	8.08	83.00	1.27	15.55	83.19
California	7.75	81.18	11.07	0.25	2.01	97.74
Colorado	16.53	32.94	50.53	10.69	2.62	86.69
Connecticut	4.02	0.01	95.97	0.06	3.54	96.40
Delaware	1.02	34.76	64.22	0.53	9.70	89.76
District of Columbia	30.18	15.74	54.09	0.18	1.50	98.33
Florida	29.55	11.41	59.04	0.47	7.49	92.04
Georgia	21.92	7.22	70.86	15.79	5.40	78.82
Hawaii	58.34	0.73	40.93	0.85	0.93	98.23
Idaho	6.07	0.00	93.93	1.88	3.45	94.67
Illinois	45.06	1.30	53.64	6.55	4.13	89.33
Indiana	0.80	71.31	27.88	1.64	3.85	94.51
Iowa	10.04	14.93	75.03	0.16	6.50	93.33
Kansas	27.89	26.72	45.40	0.19	3.49	96.33
Kentucky	100.00	0.00	0.00	2.08	6.67	91.25
Louisiana	54.48	0.82	44.70	0.01	6.19	93.79
Maine	30.76	1.65	67.59	1.30	4.91	93.79
Maryland	5.07	23.09	71.84	1.25	10.84	87.91
Massachusetts	20.52	3.74	75.73	2.84	1.48	95.68
Michigan	4.73	20.54	74.73	0.86	2.97	96.17
Minnesota	35.52	8.10	56.38	2.98	2.26	94.75
Mississippi	3.62	1.39	94.99	0.04	15.02	84.94
Missouri	9.75	0.09	90.16	0.13	1.80	98.07
Montana	55.45	0.00	44.55	11.97	1.34	86.69
Nebraska	1.89	0.00	98.11	0.11	1.11	98.77
Nevada	5.66	23.81	70.53	0.35	7.00	92.66
New Hampshire	9.51	0.00	90.49	4.36	3.10	92.55
New Jersey	12.87	20.05	67.07	8.80	2.87	88.33
New Mexico	25.12	17.97	56.91	0.13	8.70	91.17
New York	7.64	2.86	89.51	0.08	2.64	97.28
North Carolina	3.54	28.15	68.31	6.16	4.13	89.71
North Dakota	57.88	0.60	41.52	4.48	3.30	92.22
Ohio	0.33	0.04	99.63	0.01	2.94	97.05
Oklahoma	4.83	11.08	84.09	0.12	5.92	93.95
Oregon	3.50	58.46	38.04	5.66	5.65	88.69
Pennsylvania	36.51	0.09	63.40	0.40	2.19	97.41
Rhode Island	64.95	2.18	32.86	0.28	2.34	97.38
South Carolina	0.21	12.02	87.77	0.03	11.35	88.61
South Dakota	1.42	2.32	96.26	1.51	4.71	93.78
Tennessee	43.19	26.36	30.46	0.67	3.46	95.87
Texas	9.51	35.59	54.89	0.35	4.47	95.19
Utah	2.62	35.61	61.77	11.93	1.06	87.02
Vermont	82.89	0.00	17.11	1.85	6.91	91.24
Virginia	11.76	16.91	71.33	4.80	6.06	89.14
Washington	59.71	10.32	29.97	1.79	11.50	86.71
West Virginia	100.00	0.00	0.00	0.09	6.34	93.58
Wisconsin	23.74	7.98	68.27	0.09	16.68	83.23
Wyoming	1.73	23.15	75.12	0.44	4.17	95.39

Note: Broader benefits are for some or all months of eligibility.

Table A.26. Eligibility for Restricted Versus Broader Benefits: Records without SSNs and Records with SSNs, 2007

State	Records with No SSNs			Records with SSNs		
	No Eligibility	Restricted Benefits	Broader Benefits	No Eligibility	Restricted Benefits	Broader Benefits
Alabama	20.54	4.27	75.19	0.11	20.57	79.31
Alaska	12.11	0.02	87.87	0.12	0.23	99.65
Arizona	3.29	77.19	19.52	5.46	3.60	90.94
Arkansas	31.50	3.79	64.71	0.81	16.79	82.40
California	7.68	81.23	11.09	0.14	1.80	98.06
Colorado	17.34	24.02	58.64	11.97	2.60	85.43
Connecticut	2.82	0.01	97.17	0.06	4.02	95.93
Delaware	3.91	27.84	68.24	0.22	10.21	89.58
District of Columbia	17.25	15.23	67.52	0.17	1.97	97.87
Florida	41.16	4.20	54.63	1.11	8.30	90.59
Georgia	17.59	6.08	76.33	17.08	6.05	76.87
Hawaii	63.01	0.47	36.51	0.28	0.99	98.72
Idaho	6.48	0.00	93.52	2.69	3.74	93.57
Illinois	42.16	1.08	56.76	7.37	3.36	89.27
Indiana	1.59	68.58	29.83	1.49	4.08	94.43
Iowa	8.11	10.29	81.60	0.08	8.54	91.37
Kansas	35.68	21.14	43.18	0.19	3.87	95.94
Kentucky	28.49	7.09	64.41	2.14	6.94	90.92
Louisiana	11.32	0.93	87.75	0.08	8.02	91.89
Maine	17.56	4.55	77.90	1.15	9.46	89.39
Maryland	3.96	22.34	73.70	0.19	8.98	90.83
Massachusetts	17.63	4.98	77.39	3.36	1.25	95.39
Michigan	3.43	13.23	83.34	1.08	3.81	95.11
Minnesota	27.24	11.43	61.33	2.24	4.79	92.97
Mississippi	1.37	1.99	96.64	0.01	15.28	84.71
Missouri	4.30	0.07	95.64	0.17	2.32	97.50
Montana	45.27	0.00	54.73	13.74	1.47	84.79
Nebraska	3.17	0.01	96.81	0.06	1.28	98.65
Nevada	4.54	22.33	73.14	0.25	7.38	92.37
New Hampshire	5.29	0.00	94.71	4.41	3.64	91.94
New Jersey	14.17	16.84	68.99	9.48	2.59	87.93
New Mexico	25.17	14.61	60.22	0.09	7.70	92.21
New York	7.55	2.09	90.36	0.06	3.36	96.58
North Carolina	2.96	24.44	72.60	6.42	5.00	88.58
North Dakota	40.12	0.26	59.62	4.89	3.92	91.19
Ohio	0.67	0.03	99.30	0.01	3.35	96.64
Oklahoma	5.79	5.63	88.58	0.13	5.92	93.95
Oregon	4.13	48.67	47.20	6.98	6.21	86.81
Pennsylvania	50.92	0.12	48.95	1.15	2.36	96.48
Rhode Island	64.34	2.10	33.56	0.15	2.52	97.33
South Carolina	0.35	6.88	92.77	0.03	9.93	90.04
South Dakota	0.83	2.66	96.51	1.42	4.98	93.59
Tennessee	43.24	12.25	44.51	0.56	4.67	94.78
Texas	17.59	26.95	55.46	0.44	4.74	94.82
Utah	21.94	32.64	45.42	11.61	1.06	87.34
Vermont	83.25	0.00	16.75	1.88	6.76	91.36
Virginia	11.15	12.77	76.08	5.20	6.39	88.41
Washington	54.38	4.90	40.72	1.02	11.25	87.73
West Virginia	26.62	0.79	72.58	0.02	6.85	93.13
Wisconsin	21.73	4.75	73.52	0.04	16.11	83.86
Wyoming	14.93	19.21	65.85	0.10	4.39	95.51

Note: Broader benefits are for some or all months of eligibility.

APPENDIX B: STATE TABLES FOR CHAPTER IV

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Table B.1. Within-State Linked Pairs, 2005

States	AL	AK	AZ	AR	CA	CO	CT	DE	DC	FL	GA
AL	0	39	196	413	877	161	108	31	23	3,685	4,764
AK	0	0	167	48	540	92	10	4	1	139	73
AZ	0	0	0	459	12,239	1,652	140	57	14	1,024	552
AR	0	0	0	0	2,147	350	39	22	11	1,006	699
CA	0	0	0	0	0	3,337	292	112	112	3,482	3,015
CO	0	0	0	0	0	0	47	22	19	963	422
CT	0	0	0	0	0	0	0	66	15	2,064	570
DE	0	0	0	0	0	0	0	0	19	412	221
DC	0	0	0	0	0	0	0	0	0	158	172
FL	0	0	0	0	0	0	0	0	0	0	12,109
GA	0	0	0	0	0	0	0	0	0	0	0
HI	0	0	0	0	0	0	0	0	0	0	0
ID	0	0	0	0	0	0	0	0	0	0	0
IL	0	0	0	0	0	0	0	0	0	0	0
IN	0	0	0	0	0	0	0	0	0	0	0
IA	0	0	0	0	0	0	0	0	0	0	0
KS	0	0	0	0	0	0	0	0	0	0	0
KY	0	0	0	0	0	0	0	0	0	0	0
LA	0	0	0	0	0	0	0	0	0	0	0
ME	0	0	0	0	0	0	0	0	0	0	0
MD	0	0	0	0	0	0	0	0	0	0	0
MA	0	0	0	0	0	0	0	0	0	0	0
MI	0	0	0	0	0	0	0	0	0	0	0
MN	0	0	0	0	0	0	0	0	0	0	0
MS	0	0	0	0	0	0	0	0	0	0	0
MO	0	0	0	0	0	0	0	0	0	0	0
MT	0	0	0	0	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0	0	0	0	0
NV	0	0	0	0	0	0	0	0	0	0	0
NH	0	0	0	0	0	0	0	0	0	0	0
NJ	0	0	0	0	0	0	0	0	0	0	0
NM	0	0	0	0	0	0	0	0	0	0	0
NY	0	0	0	0	0	0	0	0	0	0	0
NC	0	0	0	0	0	0	0	0	0	0	0
ND	0	0	0	0	0	0	0	0	0	0	0
OH	0	0	0	0	0	0	0	0	0	0	0
OK	0	0	0	0	0	0	0	0	0	0	0
OR	0	0	0	0	0	0	0	0	0	0	0
PA	0	0	0	0	0	0	0	0	0	0	0
RI	0	0	0	0	0	0	0	0	0	0	0
SC	0	0	0	0	0	0	0	0	0	0	0
SD	0	0	0	0	0	0	0	0	0	0	0
TN	0	0	0	0	0	0	0	0	0	0	0
TX	0	0	0	0	0	0	0	0	0	0	0
UT	0	0	0	0	0	0	0	0	0	0	0
VT	0	0	0	0	0	0	0	0	0	0	0
VA	0	0	0	0	0	0	0	0	0	0	0
WA	0	0	0	0	0	0	0	0	0	0	0
WV	0	0	0	0	0	0	0	0	0	0	0
WI	0	0	0	0	0	0	0	0	0	0	0
WY	0	0	0	0	0	0	0	0	0	0	0

Continued

Table B.1. Within-State Linked Pairs, 2005 Continued

States	HI	ID	IL	IN	IA	KS	KY	LA	ME	MD
AL	26	36	875	468	107	109	431	1,698	66	188
AK	173	129	38	36	21	24	22	61	22	15
AZ	201	546	1,653	682	434	422	237	620	137	224
AR	25	81	1,511	483	346	562	326	2,755	45	93
CA	1,311	1,851	3,742	1,405	875	1,096	601	3,243	223	786
CO	83	276	755	267	312	785	150	656	64	127
CT	14	5	120	62	27	22	29	102	344	152
DE	5	9	51	40	16	6	29	65	21	1,385
DC	1	1	42	13	4	4	11	115	1	3,866
FL	188	169	3,571	2,261	459	425	1,952	2,989	673	1,665
GA	89	69	2,453	1,016	253	315	964	7,058	153	1,004
HI	0	37	69	26	13	31	22	42	16	30
ID	0	0	104	52	72	72	48	72	13	34
IL	0	0	0	7,971	3,209	478	1,425	1,339	72	278
IN	0	0	0	0	324	182	3,295	618	48	164
IA	0	0	0	0	0	254	113	281	38	53
KS	0	0	0	0	0	0	115	357	32	53
KY	0	0	0	0	0	0	0	558	51	134
LA	0	0	0	0	0	0	0	0	70	507
ME	0	0	0	0	0	0	0	0	0	78
MD	0	0	0	0	0	0	0	0	0	0
MA	0	0	0	0	0	0	0	0	0	0
MI	0	0	0	0	0	0	0	0	0	0
MN	0	0	0	0	0	0	0	0	0	0
MS	0	0	0	0	0	0	0	0	0	0
MO	0	0	0	0	0	0	0	0	0	0
MT	0	0	0	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0	0	0	0
NV	0	0	0	0	0	0	0	0	0	0
NH	0	0	0	0	0	0	0	0	0	0
NJ	0	0	0	0	0	0	0	0	0	0
NM	0	0	0	0	0	0	0	0	0	0
NY	0	0	0	0	0	0	0	0	0	0
NC	0	0	0	0	0	0	0	0	0	0
ND	0	0	0	0	0	0	0	0	0	0
OH	0	0	0	0	0	0	0	0	0	0
OK	0	0	0	0	0	0	0	0	0	0
OR	0	0	0	0	0	0	0	0	0	0
PA	0	0	0	0	0	0	0	0	0	0
RI	0	0	0	0	0	0	0	0	0	0
SC	0	0	0	0	0	0	0	0	0	0
SD	0	0	0	0	0	0	0	0	0	0
TN	0	0	0	0	0	0	0	0	0	0
TX	0	0	0	0	0	0	0	0	0	0
UT	0	0	0	0	0	0	0	0	0	0
VT	0	0	0	0	0	0	0	0	0	0
VA	0	0	0	0	0	0	0	0	0	0
WA	0	0	0	0	0	0	0	0	0	0
WV	0	0	0	0	0	0	0	0	0	0
WI	0	0	0	0	0	0	0	0	0	0
WY	0	0	0	0	0	0	0	0	0	0

Continued

Table B.1. Within-State Linked Pairs, 2005 Continued

States	MA	MI	MN	MS	MO	MT	NE	NV	NH	NJ
AL	152	1,009	122	1,656	410	23	70	80	28	181
AK	28	76	79	24	81	63	39	76	6	15
AZ	335	978	510	200	949	254	289	1,210	65	209
AR	78	843	288	946	3,364	70	164	171	11	55
CA	1,029	1,728	1,425	955	2,530	573	787	8,107	116	682
CO	126	393	324	203	739	228	742	488	30	95
CT	1,582	119	28	36	67	10	22	39	108	472
DE	64	49	17	21	31	3	6	12	10	479
DC	29	33	17	24	22	3	4	9	1	45
FL	4,353	4,006	627	1,546	1,473	137	256	527	464	4,272
GA	858	2,026	408	2,033	970	47	153	235	63	1,434
HI	46	55	36	11	84	17	8	305	5	31
ID	35	72	63	24	145	379	63	322	5	18
IL	297	2,590	2,960	1,979	4,625	72	354	585	40	310
IN	106	2,543	594	551	790	49	113	184	26	133
IA	49	272	907	222	1,260	51	1,649	98	7	33
KS	54	177	161	185	3,943	46	538	138	20	41
KY	77	994	113	289	528	16	59	64	30	91
LA	232	877	352	3,843	1,172	57	200	429	44	250
ME	1,260	66	90	30	88	11	19	25	689	85
MD	284	223	101	141	174	7	29	77	41	675
MA	0	176	101	75	155	22	26	78	1,524	608
MI	0	0	515	703	824	51	184	300	41	200
MN	0	0	0	278	617	117	337	159	20	99
MS	0	0	0	0	649	28	100	131	8	87
MO	0	0	0	0	0	120	505	251	44	105
MT	0	0	0	0	0	0	61	115	6	9
NE	0	0	0	0	0	0	0	100	11	37
NV	0	0	0	0	0	0	0	0	15	92
NH	0	0	0	0	0	0	0	0	0	41
NJ	0	0	0	0	0	0	0	0	0	0
NM	0	0	0	0	0	0	0	0	0	0
NY	0	0	0	0	0	0	0	0	0	0
NC	0	0	0	0	0	0	0	0	0	0
ND	0	0	0	0	0	0	0	0	0	0
OH	0	0	0	0	0	0	0	0	0	0
OK	0	0	0	0	0	0	0	0	0	0
OR	0	0	0	0	0	0	0	0	0	0
PA	0	0	0	0	0	0	0	0	0	0
RI	0	0	0	0	0	0	0	0	0	0
SC	0	0	0	0	0	0	0	0	0	0
SD	0	0	0	0	0	0	0	0	0	0
TN	0	0	0	0	0	0	0	0	0	0
TX	0	0	0	0	0	0	0	0	0	0
UT	0	0	0	0	0	0	0	0	0	0
VT	0	0	0	0	0	0	0	0	0	0
VA	0	0	0	0	0	0	0	0	0	0
WA	0	0	0	0	0	0	0	0	0	0
WV	0	0	0	0	0	0	0	0	0	0
WI	0	0	0	0	0	0	0	0	0	0
WY	0	0	0	0	0	0	0	0	0	0

Continued

Table B.1. Within-State Linked Pairs, 2005 Continued

States	NM	NY	NC	ND	OH	OK	OR	PA	RI	SC
AL	80	649	604	12	876	205	93	285	26	473
AK	44	66	66	11	45	69	300	50	10	43
AZ	2,970	998	441	74	917	669	1,065	600	54	208
AR	179	232	352	21	365	2,816	213	174	15	154
CA	1,887	2,472	1,963	129	1,652	2,430	6,142	1,203	167	650
CO	1,696	341	319	77	344	668	424	235	30	132
CT	19	2,758	649	5	194	55	20	564	364	382
DE	11	569	239	2	80	19	7	1,140	10	111
DC	7	223	417	2	69	12	3	148	6	181
FL	385	14,085	4,934	55	4,615	817	364	4,452	924	2,796
GA	144	4,759	3,594	27	2,320	546	173	1,508	181	4,137
HI	47	111	69	5	62	36	245	53	7	29
ID	123	49	61	22	84	124	1,139	73	9	37
IL	287	912	872	53	1,632	640	203	510	48	394
IN	113	453	546	15	2,526	291	111	325	26	259
IA	97	131	163	38	200	250	138	94	6	73
KS	287	124	177	36	162	1,727	133	126	9	86
KY	73	377	586	21	4,132	196	76	292	24	352
LA	211	633	1,195	30	867	944	184	437	56	619
ME	32	348	218	6	114	46	43	182	182	110
MD	59	1,921	1,803	9	440	92	38	2,138	60	717
MA	46	3,372	742	6	324	65	63	949	1,694	368
MI	170	942	936	40	2,900	351	183	564	41	457
MN	111	303	259	869	342	241	187	172	22	85
MS	73	277	467	10	475	290	95	239	33	293
MO	240	413	437	48	648	1,907	315	331	31	220
MT	112	35	42	221	45	87	395	56	3	26
NE	102	84	98	52	93	232	98	70	7	46
NV	303	318	156	17	277	181	512	184	15	65
NH	13	262	145	3	50	15	22	85	71	87
NJ	57	5,491	1,950	5	444	50	33	4,425	107	757
NM	0	146	126	27	164	524	167	88	14	73
NY	0	0	5,087	17	1,514	186	168	8,056	766	2,388
NC	0	0	0	26	1,512	317	108	1,900	188	5,687
ND	0	0	0	0	30	45	48	21	1	6
OH	0	0	0	0	0	349	151	2,426	68	800
OK	0	0	0	0	0	0	268	173	20	167
OR	0	0	0	0	0	0	0	107	6	71
PA	0	0	0	0	0	0	0	0	190	1,044
RI	0	0	0	0	0	0	0	0	0	116
SC	0	0	0	0	0	0	0	0	0	0
SD	0	0	0	0	0	0	0	0	0	0
TN	0	0	0	0	0	0	0	0	0	0
TX	0	0	0	0	0	0	0	0	0	0
UT	0	0	0	0	0	0	0	0	0	0
VT	0	0	0	0	0	0	0	0	0	0
VA	0	0	0	0	0	0	0	0	0	0
WA	0	0	0	0	0	0	0	0	0	0
WV	0	0	0	0	0	0	0	0	0	0
WI	0	0	0	0	0	0	0	0	0	0
WY	0	0	0	0	0	0	0	0	0	0

Continued

Table B.1. Within-State Linked Pairs, 2005 Continued

States	SD	TN	TX	UT	VT	VA	WA	WV	WI	WY
AL	21	2,131	1,123	38	19	325	184	112	215	25
AK	13	42	165	63	9	29	632	8	86	26
AZ	169	581	2,400	1,343	59	228	1,613	98	572	241
AR	57	1,952	4,251	83	12	152	356	74	489	82
CA	271	2,073	8,778	2,291	87	1,030	7,481	197	1,230	322
CO	279	346	2,664	631	29	181	677	76	253	720
CT	8	114	175	21	146	303	59	36	56	6
DE	4	85	126	9	7	262	20	44	17	3
DC	3	30	71	4	3	625	17	35	16	0
FL	104	4,218	4,917	285	322	2,052	765	899	1,044	111
GA	47	4,239	3,206	129	63	1,647	508	350	552	46
HI	7	48	168	154	15	55	525	9	37	8
ID	65	100	430	905	7	56	2,253	15	64	219
IL	124	2,931	3,914	183	24	444	588	169	5,958	80
IN	62	1,890	1,685	89	15	297	257	223	834	44
IA	359	300	909	99	10	87	205	30	621	63
KS	73	243	1,676	85	10	97	269	45	133	97
KY	28	3,694	705	58	20	454	173	916	191	33
LA	47	2,119	24,777	192	23	907	588	95	361	65
ME	10	136	168	24	187	111	84	33	38	14
MD	19	377	585	39	38	2,342	130	1,111	64	11
MA	16	309	441	58	469	344	153	55	106	13
MI	60	2,351	3,475	90	27	442	354	235	1,385	51
MN	755	450	2,571	92	10	121	448	32	2,825	71
MS	28	3,278	1,780	37	15	314	169	62	575	27
MO	128	1,315	2,425	196	20	279	580	117	559	118
MT	162	80	246	188	4	28	1,046	19	82	317
NE	680	199	885	96	6	54	172	26	109	261
NV	44	193	765	590	16	87	676	23	157	69
NH	4	81	76	15	494	75	30	19	19	6
NJ	4	287	533	33	37	1,019	113	112	75	10
NM	105	189	3,880	326	17	68	301	28	81	132
NY	42	914	1,542	137	477	2,885	398	262	324	22
NC	37	1,777	1,770	81	113	4,426	296	1,309	325	46
ND	531	26	289	29	2	10	158	8	80	51
OH	47	2,379	1,860	122	54	839	370	3,509	389	51
OK	72	552	5,330	159	18	172	420	62	208	121
OR	82	204	653	363	18	62	4,921	27	136	145
PA	56	633	842	93	83	1,284	212	922	226	55
RI	2	60	89	9	35	102	21	4	40	1
SC	24	848	759	55	72	982	191	423	149	23
SD	0	56	222	76	3	25	195	21	105	207
TN	0	0	2,181	105	72	1,769	366	484	823	60
TX	0	0	0	505	47	995	1,532	257	1,358	303
UT	0	0	0	0	11	90	579	22	77	376
VT	0	0	0	0	0	44	19	27	17	11
VA	0	0	0	0	0	0	193	1,450	117	24
WA	0	0	0	0	0	0	0	55	307	211
WV	0	0	0	0	0	0	0	0	47	13
WI	0	0	0	0	0	0	0	0	0	41
WY	0	0	0	0	0	0	0	0	0	0

Table B.2. Within-State Linked Pairs, 2006

States	AL	AK	AZ	AR	CA	CO	CT	DE	DC	FL	GA
AL	0	35	190	387	854	166	106	31	18	3,342	4,358
AK	0	0	134	50	507	89	16	2	1	119	75
AZ	0	0	0	455	11,113	1,593	91	34	21	904	510
AR	0	0	0	0	2,105	321	20	17	12	932	682
CA	0	0	0	0	0	3,132	275	110	126	2,997	2,878
CO	0	0	0	0	0	0	53	26	13	838	354
CT	0	0	0	0	0	0	0	67	8	1,774	514
DE	0	0	0	0	0	0	0	0	25	346	189
DC	0	0	0	0	0	0	0	0	0	143	140
FL	0	0	0	0	0	0	0	0	0	0	11,615
GA	0	0	0	0	0	0	0	0	0	0	0
HI	0	0	0	0	0	0	0	0	0	0	0
ID	0	0	0	0	0	0	0	0	0	0	0
IL	0	0	0	0	0	0	0	0	0	0	0
IN	0	0	0	0	0	0	0	0	0	0	0
IA	0	0	0	0	0	0	0	0	0	0	0
KS	0	0	0	0	0	0	0	0	0	0	0
KY	0	0	0	0	0	0	0	0	0	0	0
LA	0	0	0	0	0	0	0	0	0	0	0
ME	0	0	0	0	0	0	0	0	0	0	0
MD	0	0	0	0	0	0	0	0	0	0	0
MA	0	0	0	0	0	0	0	0	0	0	0
MI	0	0	0	0	0	0	0	0	0	0	0
MN	0	0	0	0	0	0	0	0	0	0	0
MS	0	0	0	0	0	0	0	0	0	0	0
MO	0	0	0	0	0	0	0	0	0	0	0
MT	0	0	0	0	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0	0	0	0	0
NV	0	0	0	0	0	0	0	0	0	0	0
NH	0	0	0	0	0	0	0	0	0	0	0
NJ	0	0	0	0	0	0	0	0	0	0	0
NM	0	0	0	0	0	0	0	0	0	0	0
NY	0	0	0	0	0	0	0	0	0	0	0
NC	0	0	0	0	0	0	0	0	0	0	0
ND	0	0	0	0	0	0	0	0	0	0	0
OH	0	0	0	0	0	0	0	0	0	0	0
OK	0	0	0	0	0	0	0	0	0	0	0
OR	0	0	0	0	0	0	0	0	0	0	0
PA	0	0	0	0	0	0	0	0	0	0	0
RI	0	0	0	0	0	0	0	0	0	0	0
SC	0	0	0	0	0	0	0	0	0	0	0
SD	0	0	0	0	0	0	0	0	0	0	0
TN	0	0	0	0	0	0	0	0	0	0	0
TX	0	0	0	0	0	0	0	0	0	0	0
UT	0	0	0	0	0	0	0	0	0	0	0
VT	0	0	0	0	0	0	0	0	0	0	0
VA	0	0	0	0	0	0	0	0	0	0	0
WA	0	0	0	0	0	0	0	0	0	0	0
WV	0	0	0	0	0	0	0	0	0	0	0
WI	0	0	0	0	0	0	0	0	0	0	0
WY	0	0	0	0	0	0	0	0	0	0	0

Continued

Table B.2. Within-State Linked Pairs, 2006 Continued

States	HI	ID	IL	IN	IA	KS	KY	LA	ME	MD
AL	24	23	919	474	91	106	396	1,899	70	154
AK	161	90	48	35	22	25	26	58	16	11
AZ	222	439	1,641	572	374	420	229	547	175	173
AR	29	71	1,478	452	326	512	314	2,781	25	90
CA	1,271	1,685	3,698	1,348	806	1,021	582	2,845	175	748
CO	97	259	718	257	310	738	151	702	57	121
CT	15	7	115	56	23	19	36	95	316	144
DE	4	5	60	46	9	10	32	51	23	1,319
DC	3	1	41	14	5	5	11	90	3	3,762
FL	159	143	3,231	2,065	410	359	1,782	2,936	607	1,507
GA	73	64	2,319	979	233	260	872	7,417	143	965
HI	0	44	58	46	20	27	25	28	16	29
ID	0	0	124	53	63	57	33	48	13	18
IL	0	0	0	8,058	3,475	455	1,372	1,115	94	257
IN	0	0	0	0	322	157	3,214	622	49	169
IA	0	0	0	0	0	261	127	247	27	49
KS	0	0	0	0	0	0	126	338	26	41
KY	0	0	0	0	0	0	0	511	49	139
LA	0	0	0	0	0	0	0	0	59	473
ME	0	0	0	0	0	0	0	0	0	64
MD	0	0	0	0	0	0	0	0	0	0
MA	0	0	0	0	0	0	0	0	0	0
MI	0	0	0	0	0	0	0	0	0	0
MN	0	0	0	0	0	0	0	0	0	0
MS	0	0	0	0	0	0	0	0	0	0
MO	0	0	0	0	0	0	0	0	0	0
MT	0	0	0	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0	0	0	0
NV	0	0	0	0	0	0	0	0	0	0
NH	0	0	0	0	0	0	0	0	0	0
NJ	0	0	0	0	0	0	0	0	0	0
NM	0	0	0	0	0	0	0	0	0	0
NY	0	0	0	0	0	0	0	0	0	0
NC	0	0	0	0	0	0	0	0	0	0
ND	0	0	0	0	0	0	0	0	0	0
OH	0	0	0	0	0	0	0	0	0	0
OK	0	0	0	0	0	0	0	0	0	0
OR	0	0	0	0	0	0	0	0	0	0
PA	0	0	0	0	0	0	0	0	0	0
RI	0	0	0	0	0	0	0	0	0	0
SC	0	0	0	0	0	0	0	0	0	0
SD	0	0	0	0	0	0	0	0	0	0
TN	0	0	0	0	0	0	0	0	0	0
TX	0	0	0	0	0	0	0	0	0	0
UT	0	0	0	0	0	0	0	0	0	0
VT	0	0	0	0	0	0	0	0	0	0
VA	0	0	0	0	0	0	0	0	0	0
WA	0	0	0	0	0	0	0	0	0	0
WV	0	0	0	0	0	0	0	0	0	0
WI	0	0	0	0	0	0	0	0	0	0
WY	0	0	0	0	0	0	0	0	0	0

Continued

Table B.2. Within-State Linked Pairs, 2006 Continued

States	MA	MI	MN	MS	MO	MT	NE	NV	NH	NJ
AL	160	977	119	1,708	346	19	47	83	16	180
AK	19	56	90	20	58	47	24	57	6	13
AZ	335	1,077	501	204	782	207	260	1,046	71	218
AR	84	787	285	966	3,059	74	160	139	16	67
CA	972	1,736	1,243	913	2,242	547	811	7,257	110	717
CO	131	359	314	197	652	231	666	414	21	99
CT	1,596	93	34	35	51	5	9	36	106	453
DE	60	45	10	18	22	1	9	17	13	466
DC	40	38	12	27	12	3	2	10	1	56
FL	4,174	3,828	544	1,545	1,176	105	245	475	403	3,823
GA	928	1,957	384	1,938	779	35	158	217	80	1,516
HI	49	54	45	8	76	19	10	282	3	29
ID	22	96	68	19	151	327	64	279	12	24
IL	317	2,516	2,827	1,845	4,272	67	357	509	39	316
IN	130	2,559	579	568	746	31	96	178	28	162
IA	48	253	904	231	1,178	56	1,626	72	10	39
KS	50	186	177	168	3,557	40	490	111	8	44
KY	87	962	130	296	526	34	54	62	25	107
LA	212	838	331	4,158	1,077	61	180	347	32	236
ME	1,254	75	57	32	67	11	12	26	664	88
MD	277	236	88	129	139	13	25	59	32	683
MA	0	191	108	81	115	21	21	88	1,552	694
MI	0	0	486	699	789	58	152	349	42	236
MN	0	0	0	303	592	121	282	136	14	88
MS	0	0	0	0	605	24	96	117	14	97
MO	0	0	0	0	0	69	493	222	27	107
MT	0	0	0	0	0	0	61	92	4	9
NE	0	0	0	0	0	0	0	86	12	35
NV	0	0	0	0	0	0	0	0	16	90
NH	0	0	0	0	0	0	0	0	0	45
NJ	0	0	0	0	0	0	0	0	0	0
NM	0	0	0	0	0	0	0	0	0	0
NY	0	0	0	0	0	0	0	0	0	0
NC	0	0	0	0	0	0	0	0	0	0
ND	0	0	0	0	0	0	0	0	0	0
OH	0	0	0	0	0	0	0	0	0	0
OK	0	0	0	0	0	0	0	0	0	0
OR	0	0	0	0	0	0	0	0	0	0
PA	0	0	0	0	0	0	0	0	0	0
RI	0	0	0	0	0	0	0	0	0	0
SC	0	0	0	0	0	0	0	0	0	0
SD	0	0	0	0	0	0	0	0	0	0
TN	0	0	0	0	0	0	0	0	0	0
TX	0	0	0	0	0	0	0	0	0	0
UT	0	0	0	0	0	0	0	0	0	0
VT	0	0	0	0	0	0	0	0	0	0
VA	0	0	0	0	0	0	0	0	0	0
WA	0	0	0	0	0	0	0	0	0	0
WV	0	0	0	0	0	0	0	0	0	0
WI	0	0	0	0	0	0	0	0	0	0
WY	0	0	0	0	0	0	0	0	0	0

Continued

Table B.2. Within-State Linked Pairs, 2006 Continued

States	NM	NY	NC	ND	OH	OK	OR	PA	RI	SC
AL	67	643	627	9	839	197	81	306	16	403
AK	55	64	73	12	44	61	272	44	2	32
AZ	2,685	878	400	66	851	651	983	509	52	184
AR	161	236	339	16	404	2,884	210	185	28	144
CA	1,773	2,407	1,942	118	1,561	2,301	5,516	1,153	137	595
CO	1,521	313	290	96	334	614	345	271	32	128
CT	26	2,676	642	3	189	35	19	639	390	344
DE	7	567	249	3	74	16	9	1,145	8	93
DC	6	221	426	1	56	13	3	133	6	180
FL	311	12,329	4,837	63	4,111	745	307	4,054	868	2,481
GA	142	4,435	3,336	36	2,101	455	171	1,489	164	3,530
HI	44	111	65	5	51	46	218	39	4	28
ID	104	52	70	24	88	90	987	67	5	25
IL	286	929	883	51	1,608	625	195	544	55	370
IN	116	449	519	24	2,452	300	121	355	28	247
IA	86	146	174	38	183	215	105	101	9	73
KS	242	111	155	15	164	1,589	94	100	12	74
KY	71	349	619	24	4,133	181	86	323	19	321
LA	194	550	1,187	16	758	999	161	407	53	485
ME	29	355	225	10	128	47	32	182	188	104
MD	48	1,826	1,782	7	416	97	37	2,247	64	681
MA	49	3,546	877	13	409	81	66	1,018	1,769	407
MI	186	824	907	44	2,957	353	141	551	29	454
MN	95	306	255	959	347	213	175	186	37	90
MS	51	267	472	5	483	318	77	228	26	248
MO	201	322	354	52	560	1,691	274	298	16	184
MT	104	43	47	226	44	77	361	45	3	29
NE	83	69	68	72	96	222	110	92	6	43
NV	248	288	145	22	261	172	463	152	15	68
NH	11	245	114	4	46	14	14	102	91	62
NJ	40	5,919	2,086	8	461	59	43	4,858	132	722
NM	0	133	111	17	170	468	187	107	14	66
NY	0	0	5,099	25	1,445	219	137	8,043	753	2,208
NC	0	0	0	28	1,516	286	110	2,033	214	5,227
ND	0	0	0	0	20	39	51	24	1	10
OH	0	0	0	0	0	330	162	2,434	58	746
OK	0	0	0	0	0	0	258	186	17	144
OR	0	0	0	0	0	0	0	96	9	86
PA	0	0	0	0	0	0	0	0	224	1,027
RI	0	0	0	0	0	0	0	0	0	114
SC	0	0	0	0	0	0	0	0	0	0
SD	0	0	0	0	0	0	0	0	0	0
TN	0	0	0	0	0	0	0	0	0	0
TX	0	0	0	0	0	0	0	0	0	0
UT	0	0	0	0	0	0	0	0	0	0
VT	0	0	0	0	0	0	0	0	0	0
VA	0	0	0	0	0	0	0	0	0	0
WA	0	0	0	0	0	0	0	0	0	0
WV	0	0	0	0	0	0	0	0	0	0
WI	0	0	0	0	0	0	0	0	0	0
WY	0	0	0	0	0	0	0	0	0	0

Continued

Table B.2. Within-State Linked Pairs, 2006 Continued

States	SD	TN	TX	UT	VT	VA	WA	WV	WI	WY
AL	16	2,164	1,122	59	20	324	183	122	193	21
AK	16	64	179	49	8	36	646	9	57	21
AZ	167	575	2,116	1,123	58	220	1,550	91	530	212
AR	48	2,039	4,061	89	15	173	335	65	488	72
CA	260	2,048	8,978	2,386	88	999	7,227	157	1,123	341
CO	272	380	2,501	580	29	181	643	61	274	700
CT	14	119	152	22	130	272	65	36	57	5
DE	2	91	108	12	7	245	28	47	16	2
DC	1	40	81	5	3	628	17	32	15	1
FL	138	4,183	4,484	258	292	1,912	683	840	973	79
GA	38	4,144	3,045	91	63	1,501	544	289	505	40
HI	7	50	179	111	8	57	531	6	28	10
ID	51	89	411	814	12	39	2,052	12	50	209
IL	106	3,115	3,643	167	23	471	611	137	6,092	87
IN	61	1,929	1,482	94	26	321	273	238	757	44
IA	384	308	896	91	8	89	240	28	659	61
KS	75	270	1,501	88	11	90	221	33	134	74
KY	29	3,797	666	65	25	450	167	875	196	23
LA	53	2,530	30,659	157	25	847	589	85	327	63
ME	12	142	123	29	184	128	85	44	42	12
MD	14	416	553	37	37	2,312	145	1,046	71	9
MA	21	360	361	52	477	400	172	66	105	13
MI	66	2,453	3,222	104	22	444	352	248	1,405	89
MN	705	452	2,424	80	14	131	446	19	2,631	73
MS	21	3,551	1,963	61	9	304	176	66	616	34
MO	121	1,251	2,083	187	20	264	546	88	528	123
MT	167	62	220	152	12	22	897	18	70	296
NE	649	188	774	73	7	64	185	16	91	202
NV	36	181	680	521	6	94	628	36	171	55
NH	5	83	61	17	558	62	18	20	20	9
NJ	8	298	486	38	41	1,057	119	121	85	11
NM	93	171	3,336	266	16	71	316	27	80	114
NY	35	924	1,255	121	489	2,650	390	229	276	31
NC	33	1,793	1,671	101	105	4,529	333	1,190	280	35
ND	503	29	242	27	1	9	129	6	61	55
OH	46	2,379	1,662	112	43	759	341	3,239	464	45
OK	104	549	4,956	142	13	183	444	70	208	137
OR	109	213	590	308	13	69	4,657	30	116	102
PA	35	663	932	88	66	1,273	258	901	226	43
RI	6	65	63	4	39	107	24	9	38	1
SC	13	823	620	44	56	895	202	360	149	21
SD	0	61	190	45	6	24	166	14	125	230
TN	0	0	2,152	121	63	1,955	408	461	933	61
TX	0	0	0	434	43	928	1,566	222	1,202	294
UT	0	0	0	0	9	76	520	14	54	304
VT	0	0	0	0	0	56	34	12	16	4
VA	0	0	0	0	0	0	199	1,378	137	23
WA	0	0	0	0	0	0	0	54	294	199
WV	0	0	0	0	0	0	0	0	46	9
WI	0	0	0	0	0	0	0	0	0	47
WY	0	0	0	0	0	0	0	0	0	0

Table B.3. Within-State Linked Pairs, 2007

States	AL	AK	AZ	AR	CA	CO	CT	DE	DC	FL	GA
AL	0	32	177	296	721	119	102	27	20	2,802	3,541
AK	0	0	132	51	454	70	6	4	0	108	75
AZ	0	0	0	448	10,622	1,536	94	43	25	752	447
AR	0	0	0	0	1,990	294	24	18	10	790	557
CA	0	0	0	0	0	2,938	243	107	114	2,681	2,405
CO	0	0	0	0	0	0	55	40	15	737	343
CT	0	0	0	0	0	0	0	37	17	1,586	452
DE	0	0	0	0	0	0	0	0	29	312	183
DC	0	0	0	0	0	0	0	0	0	121	164
FL	0	0	0	0	0	0	0	0	0	0	10,098
GA	0	0	0	0	0	0	0	0	0	0	0
HI	0	0	0	0	0	0	0	0	0	0	0
ID	0	0	0	0	0	0	0	0	0	0	0
IL	0	0	0	0	0	0	0	0	0	0	0
IN	0	0	0	0	0	0	0	0	0	0	0
IA	0	0	0	0	0	0	0	0	0	0	0
KS	0	0	0	0	0	0	0	0	0	0	0
KY	0	0	0	0	0	0	0	0	0	0	0
LA	0	0	0	0	0	0	0	0	0	0	0
ME	0	0	0	0	0	0	0	0	0	0	0
MD	0	0	0	0	0	0	0	0	0	0	0
MA	0	0	0	0	0	0	0	0	0	0	0
MI	0	0	0	0	0	0	0	0	0	0	0
MN	0	0	0	0	0	0	0	0	0	0	0
MS	0	0	0	0	0	0	0	0	0	0	0
MO	0	0	0	0	0	0	0	0	0	0	0
MT	0	0	0	0	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0	0	0	0	0
NV	0	0	0	0	0	0	0	0	0	0	0
NH	0	0	0	0	0	0	0	0	0	0	0
NJ	0	0	0	0	0	0	0	0	0	0	0
NM	0	0	0	0	0	0	0	0	0	0	0
NY	0	0	0	0	0	0	0	0	0	0	0
NC	0	0	0	0	0	0	0	0	0	0	0
ND	0	0	0	0	0	0	0	0	0	0	0
OH	0	0	0	0	0	0	0	0	0	0	0
OK	0	0	0	0	0	0	0	0	0	0	0
OR	0	0	0	0	0	0	0	0	0	0	0
PA	0	0	0	0	0	0	0	0	0	0	0
RI	0	0	0	0	0	0	0	0	0	0	0
SC	0	0	0	0	0	0	0	0	0	0	0
SD	0	0	0	0	0	0	0	0	0	0	0
TN	0	0	0	0	0	0	0	0	0	0	0
TX	0	0	0	0	0	0	0	0	0	0	0
UT	0	0	0	0	0	0	0	0	0	0	0
VT	0	0	0	0	0	0	0	0	0	0	0
VA	0	0	0	0	0	0	0	0	0	0	0
WA	0	0	0	0	0	0	0	0	0	0	0
WV	0	0	0	0	0	0	0	0	0	0	0
WI	0	0	0	0	0	0	0	0	0	0	0
WY	0	0	0	0	0	0	0	0	0	0	0

Continued

Table B.3. Within-State Linked Pairs, 2007 Continued

States	HI	ID	IL	IN	IA	KS	KY	LA	ME	MD
AL	17	23	822	396	62	92	360	846	55	118
AK	136	98	55	26	26	24	35	27	22	11
AZ	205	464	1,653	541	407	386	239	304	151	184
AR	30	74	1,442	402	261	476	301	1,740	27	101
CA	1,111	1,545	3,524	1,232	836	904	570	1,708	167	650
CO	86	223	665	250	285	625	145	434	53	113
CT	11	10	140	59	27	27	46	47	308	117
DE	4	4	34	35	7	13	25	32	25	1,165
DC	5	1	42	13	3	9	13	45	3	3,814
FL	120	116	2,958	1,726	353	318	1,566	1,512	528	1,264
GA	83	58	2,213	873	209	241	842	2,688	123	910
HI	0	37	61	33	21	23	26	20	15	37
ID	0	0	123	63	68	56	46	34	21	15
IL	0	0	0	8,054	3,521	370	1,398	684	85	225
IN	0	0	0	0	314	144	3,146	331	56	145
IA	0	0	0	0	0	224	113	124	40	46
KS	0	0	0	0	0	0	103	214	27	40
KY	0	0	0	0	0	0	0	284	61	131
LA	0	0	0	0	0	0	0	0	42	196
ME	0	0	0	0	0	0	0	0	0	50
MD	0	0	0	0	0	0	0	0	0	0
MA	0	0	0	0	0	0	0	0	0	0
MI	0	0	0	0	0	0	0	0	0	0
MN	0	0	0	0	0	0	0	0	0	0
MS	0	0	0	0	0	0	0	0	0	0
MO	0	0	0	0	0	0	0	0	0	0
MT	0	0	0	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0	0	0	0
NV	0	0	0	0	0	0	0	0	0	0
NH	0	0	0	0	0	0	0	0	0	0
NJ	0	0	0	0	0	0	0	0	0	0
NM	0	0	0	0	0	0	0	0	0	0
NY	0	0	0	0	0	0	0	0	0	0
NC	0	0	0	0	0	0	0	0	0	0
ND	0	0	0	0	0	0	0	0	0	0
OH	0	0	0	0	0	0	0	0	0	0
OK	0	0	0	0	0	0	0	0	0	0
OR	0	0	0	0	0	0	0	0	0	0
PA	0	0	0	0	0	0	0	0	0	0
RI	0	0	0	0	0	0	0	0	0	0
SC	0	0	0	0	0	0	0	0	0	0
SD	0	0	0	0	0	0	0	0	0	0
TN	0	0	0	0	0	0	0	0	0	0
TX	0	0	0	0	0	0	0	0	0	0
UT	0	0	0	0	0	0	0	0	0	0
VT	0	0	0	0	0	0	0	0	0	0
VA	0	0	0	0	0	0	0	0	0	0
WA	0	0	0	0	0	0	0	0	0	0
WV	0	0	0	0	0	0	0	0	0	0
WI	0	0	0	0	0	0	0	0	0	0
WY	0	0	0	0	0	0	0	0	0	0

Continued

Table B.3. Within-State Linked Pairs, 2007 Continued

States	MA	MI	MN	MS	MO	MT	NE	NV	NH	NJ
AL	143	832	78	1,275	322	24	54	79	18	153
AK	27	59	75	15	66	63	18	53	5	13
AZ	329	1,208	502	147	766	176	283	1,005	53	232
AR	104	776	269	803	2,915	61	162	144	12	52
CA	958	1,594	1,236	730	2,036	541	673	6,696	112	682
CO	110	376	297	130	553	189	571	371	28	108
CT	1,479	86	40	29	45	8	13	23	91	421
DE	63	51	24	17	19	4	6	14	9	491
DC	39	34	14	19	17	4	6	6	1	42
FL	3,732	3,532	437	972	1,071	86	216	397	375	3,392
GA	813	1,807	342	1,242	694	43	137	217	71	1,383
HI	54	52	35	10	69	18	8	280	9	32
ID	25	73	55	21	136	302	51	240	7	17
IL	304	2,308	2,743	1,569	4,348	75	329	527	34	332
IN	146	2,427	515	411	654	21	102	174	26	155
IA	54	236	872	158	1,045	55	1,584	90	7	28
KS	49	153	160	143	3,366	45	439	75	13	43
KY	103	925	98	252	475	26	54	54	30	116
LA	148	558	176	2,795	603	41	93	187	11	105
ME	1,234	64	61	21	81	7	24	24	633	79
MD	250	230	64	92	132	13	30	55	24	641
MA	0	202	122	64	149	19	19	86	1,539	674
MI	0	0	470	585	680	68	123	349	38	209
MN	0	0	0	238	489	97	312	126	16	84
MS	0	0	0	0	477	16	91	80	8	62
MO	0	0	0	0	0	77	431	207	31	107
MT	0	0	0	0	0	0	59	85	5	7
NE	0	0	0	0	0	0	0	77	7	29
NV	0	0	0	0	0	0	0	0	19	81
NH	0	0	0	0	0	0	0	0	0	35
NJ	0	0	0	0	0	0	0	0	0	0
NM	0	0	0	0	0	0	0	0	0	0
NY	0	0	0	0	0	0	0	0	0	0
NC	0	0	0	0	0	0	0	0	0	0
ND	0	0	0	0	0	0	0	0	0	0
OH	0	0	0	0	0	0	0	0	0	0
OK	0	0	0	0	0	0	0	0	0	0
OR	0	0	0	0	0	0	0	0	0	0
PA	0	0	0	0	0	0	0	0	0	0
RI	0	0	0	0	0	0	0	0	0	0
SC	0	0	0	0	0	0	0	0	0	0
SD	0	0	0	0	0	0	0	0	0	0
TN	0	0	0	0	0	0	0	0	0	0
TX	0	0	0	0	0	0	0	0	0	0
UT	0	0	0	0	0	0	0	0	0	0
VT	0	0	0	0	0	0	0	0	0	0
VA	0	0	0	0	0	0	0	0	0	0
WA	0	0	0	0	0	0	0	0	0	0
WV	0	0	0	0	0	0	0	0	0	0
WI	0	0	0	0	0	0	0	0	0	0
WY	0	0	0	0	0	0	0	0	0	0

Continued

Table B.3. Within-State Linked Pairs, 2007 Continued

States	NM	NY	NC	ND	OH	OK	OR	PA	RI	SC
AL	54	525	516	4	688	156	47	262	21	302
AK	36	59	58	9	42	50	208	42	1	39
AZ	2,734	895	409	54	879	644	863	511	40	161
AR	151	234	356	21	344	2,822	170	162	21	131
CA	1,652	2,299	1,885	100	1,400	2,184	5,097	1,090	138	559
CO	1,531	260	296	79	331	594	319	227	25	113
CT	16	2,551	609	2	164	29	23	558	352	278
DE	8	544	241	1	92	12	10	1,159	13	94
DC	4	191	420	0	45	11	3	145	5	136
FL	289	10,222	4,478	54	3,621	669	287	3,683	701	2,265
GA	136	3,739	2,979	34	2,014	400	157	1,399	177	2,959
HI	42	82	74	8	55	43	220	44	9	33
ID	107	46	67	24	62	72	854	48	3	33
IL	290	908	846	54	1,644	623	210	488	39	352
IN	107	450	506	25	2,403	269	100	349	23	246
IA	99	141	145	50	172	208	89	92	9	79
KS	240	105	156	28	157	1,485	93	92	11	61
KY	68	333	597	11	3,836	199	53	294	10	303
LA	125	335	594	11	389	644	103	209	19	266
ME	30	304	202	8	133	47	18	175	171	106
MD	51	1,712	1,713	8	404	80	39	2,121	52	560
MA	60	3,426	870	8	351	73	58	971	1,696	363
MI	174	790	969	24	2,797	371	134	500	32	412
MN	89	284	253	898	392	237	142	165	22	83
MS	56	205	327	6	423	223	65	158	12	173
MO	195	295	362	29	523	1,519	258	248	18	195
MT	75	35	37	180	41	76	266	35	6	20
NE	87	68	101	52	110	240	91	66	5	60
NV	259	299	140	19	248	175	381	159	29	59
NH	11	225	126	3	43	26	11	112	79	48
NJ	46	5,612	2,006	6	450	71	40	4,929	126	687
NM	0	113	113	29	144	506	181	105	9	53
NY	0	0	4,730	25	1,430	198	133	7,689	653	1,956
NC	0	0	0	16	1,514	293	129	1,921	189	4,724
ND	0	0	0	0	32	36	45	27	3	7
OH	0	0	0	0	0	319	164	2,390	67	658
OK	0	0	0	0	0	0	225	187	20	127
OR	0	0	0	0	0	0	0	86	14	75
PA	0	0	0	0	0	0	0	0	228	884
RI	0	0	0	0	0	0	0	0	0	83
SC	0	0	0	0	0	0	0	0	0	0
SD	0	0	0	0	0	0	0	0	0	0
TN	0	0	0	0	0	0	0	0	0	0
TX	0	0	0	0	0	0	0	0	0	0
UT	0	0	0	0	0	0	0	0	0	0
VT	0	0	0	0	0	0	0	0	0	0
VA	0	0	0	0	0	0	0	0	0	0
WA	0	0	0	0	0	0	0	0	0	0
WV	0	0	0	0	0	0	0	0	0	0
WI	0	0	0	0	0	0	0	0	0	0
WY	0	0	0	0	0	0	0	0	0	0

Continued

Table B.3. Within-State Linked Pairs, 2007 Continued

States	SD	TN	TX	UT	VT	VA	WA	WV	WI	WY
AL	20	1,818	951	35	13	284	179	89	178	18
AK	9	58	158	34	8	32	601	9	51	29
AZ	187	530	2,223	1,081	42	228	1,637	94	511	203
AR	55	1,923	3,795	79	15	153	309	56	419	58
CA	261	1,911	8,391	2,149	69	845	7,192	165	1,019	339
CO	249	380	2,257	523	23	191	625	63	249	586
CT	6	120	106	20	113	265	38	43	52	5
DE	2	71	112	9	4	228	19	59	25	2
DC	0	40	82	4	2	665	18	38	12	1
FL	99	3,771	4,111	200	230	1,749	653	722	797	88
GA	47	3,600	2,346	108	48	1,339	439	258	435	43
HI	7	44	159	117	10	48	496	10	24	6
ID	53	105	366	716	11	63	1,852	13	38	187
IL	108	3,055	3,601	189	27	462	660	145	5,820	84
IN	47	1,834	1,386	73	27	302	219	227	741	33
IA	360	305	838	112	14	87	203	35	594	58
KS	71	226	1,291	65	8	84	218	47	111	60
KY	30	3,672	665	41	27	467	148	875	223	29
LA	33	1,468	12,018	53	13	363	380	57	215	38
ME	8	143	114	24	147	108	77	31	33	13
MD	10	383	547	41	33	2,169	131	1,038	66	8
MA	22	326	321	49	433	377	197	74	110	13
MI	70	2,406	3,024	97	23	454	351	240	1,278	133
MN	702	465	2,026	68	14	110	408	27	2,536	64
MS	15	3,080	1,544	44	10	198	143	57	496	24
MO	103	1,208	1,944	196	26	246	456	90	424	100
MT	154	56	188	126	4	31	818	13	58	278
NE	635	185	690	67	7	51	184	12	103	216
NV	39	175	623	459	7	88	605	29	182	50
NH	4	85	38	4	472	80	31	9	9	9
NJ	9	311	486	38	34	990	122	136	79	9
NM	85	180	3,414	286	14	79	292	20	82	121
NY	36	861	1,053	134	436	2,413	390	227	250	20
NC	29	1,782	1,713	77	106	4,258	392	1,083	269	38
ND	459	36	240	29	3	10	109	5	69	38
OH	39	2,302	1,557	125	29	787	399	3,234	418	49
OK	101	574	4,895	102	16	186	407	74	204	113
OR	84	210	512	277	16	70	4,181	29	115	99
PA	37	654	867	109	87	1,276	253	838	209	47
RI	2	56	39	5	35	79	29	16	39	3
SC	14	770	608	28	43	813	150	318	140	16
SD	0	65	191	62	4	24	144	16	107	216
TN	0	0	2,075	112	71	1,909	387	448	770	54
TX	0	0	0	390	27	868	1,442	203	1,203	311
UT	0	0	0	0	10	76	466	22	61	258
VT	0	0	0	0	0	38	28	13	19	5
VA	0	0	0	0	0	0	173	1,299	145	21
WA	0	0	0	0	0	0	0	55	284	206
WV	0	0	0	0	0	0	0	0	65	12
WI	0	0	0	0	0	0	0	0	0	46
WY	0	0	0	0	0	0	0	0	0	0

Table B.4. Cross-state Linked Pairs, 2005 to 2006

States	AL	AK	AZ	AR	CA	CO	CT	DE	DC
AL	0	76	365	813	1,560	310	195	44	41
AK	79	0	358	107	1,016	199	34	9	2
AZ	450	315	0	1,035	18,435	3,496	215	79	37
AR	801	102	836	0	3,514	666	52	34	21
CA	1,996	1,154	29,911	5,232	0	7,580	615	225	248
CO	347	199	3,185	696	5,565	0	81	50	30
CT	254	23	267	72	555	115	0	112	29
DE	79	3	94	45	227	48	139	0	45
DC	43	3	35	16	223	34	17	39	0
FL	7,901	254	2,161	2,260	6,303	1,904	3,482	721	306
GA	9,547	156	1,108	1,466	4,919	802	899	372	267
HI	56	418	484	64	2,754	211	22	12	4
ID	61	189	961	147	2,632	542	7	15	4
IL	1,889	79	3,615	3,287	7,123	1,540	216	121	84
IN	952	70	1,343	1,005	2,286	541	108	98	24
IA	201	31	813	677	1,355	638	44	20	8
KS	220	49	866	1,154	1,712	1,524	31	16	7
KY	869	35	458	642	1,000	279	64	62	21
LA	4,076	117	1,178	6,080	6,252	1,477	188	110	183
ME	133	44	358	82	417	120	601	57	5
MD	377	32	469	197	1,480	284	279	2,873	7,321
MA	360	54	770	171	2,011	280	3,094	158	66
MI	2,164	120	2,490	1,822	3,447	793	214	114	67
MN	245	190	993	609	2,511	650	48	27	27
MS	3,770	45	383	1,987	1,818	435	74	38	59
MO	791	138	1,806	6,865	4,315	1,524	127	41	30
MT	49	89	417	138	980	455	17	3	4
NE	133	81	588	359	1,424	1,382	29	18	11
NV	175	145	2,488	330	13,175	968	75	13	22
NH	46	9	141	34	228	72	191	28	0
NJ	393	37	536	144	1,407	237	1,024	1,090	113
NM	178	107	5,989	403	3,127	3,498	41	18	16
NY	1,562	158	2,241	568	5,267	751	6,832	1,421	447
NC	1,196	135	826	644	3,126	628	1,038	474	701
ND	21	10	141	40	209	208	6	2	0
OH	1,853	82	2,005	812	3,071	734	342	142	137
OK	428	109	1,218	5,514	3,793	1,228	89	32	15
OR	182	606	2,030	458	9,441	781	23	14	8
PA	622	90	1,196	395	2,318	561	1,139	2,570	278
RI	48	19	139	56	368	79	880	18	11
SC	950	68	397	293	1,103	285	655	194	341
SD	38	23	347	111	495	515	18	6	4
TN	4,345	108	1,074	3,961	3,485	739	180	157	61
TX	2,323	380	4,728	8,534	14,375	5,331	346	236	139
UT	78	130	2,373	173	3,528	1,175	40	16	11
VT	41	14	132	42	196	53	264	14	4
VA	677	53	457	328	1,775	346	490	493	1,075
WA	393	1,254	3,226	733	12,570	1,343	120	49	34
WV	234	28	183	158	301	139	63	78	48
WI	450	154	1,083	1,114	2,164	518	93	30	32
WY	58	47	464	151	557	1,444	11	6	0
U.S.	54,134	7,832	89,726	62,024	171,913	49,462	24,852	12,569	12,448

Continued

Table B.4. Cross-state Linked Pairs, 2005 to 2006 Continued

States	FL	GA	HI	ID	IL	IN	IA	KS	KY
AL	6,378	9,060	49	56	1,744	966	195	228	818
AK	289	168	288	222	93	65	58	64	45
AZ	1,792	1,063	404	1,096	3,061	1,271	910	877	540
AR	1,614	1,340	43	166	2,750	883	660	1,006	641
CA	6,862	6,984	2,485	4,587	7,888	3,383	2,062	2,618	1,437
CO	1,648	780	161	533	1,423	526	615	1,573	319
CT	4,476	1,316	35	12	243	135	63	52	60
DE	794	435	9	14	100	67	30	18	58
DC	314	341	4	0	78	30	10	9	24
FL	0	27,068	342	354	7,054	4,806	988	875	4,235
GA	20,786	0	151	129	4,560	2,009	504	581	1,957
HI	358	191	0	97	139	77	35	65	46
ID	267	137	64	0	221	117	126	132	95
IL	6,585	5,080	126	221	0	18,185	7,613	970	3,058
IN	4,128	2,139	45	107	13,964	0	751	328	6,739
IA	770	512	36	157	5,806	625	0	496	267
KS	750	580	50	120	912	341	547	0	260
KY	3,284	1,746	43	66	2,532	6,546	236	218	0
LA	5,929	15,665	72	125	2,330	1,266	545	714	1,079
ME	1,242	264	44	24	147	93	61	79	88
MD	3,383	2,290	52	56	553	363	106	110	290
MA	9,197	2,132	98	46	645	287	112	123	184
MI	8,022	4,578	105	183	5,192	5,455	566	389	2,261
MN	1,173	779	52	147	4,859	1,020	1,853	314	229
MS	3,021	4,140	22	39	3,760	1,196	474	361	653
MO	2,518	1,832	133	356	9,509	1,495	2,607	7,918	1,132
MT	230	85	33	698	127	103	88	78	60
NE	485	306	19	114	697	239	3,447	1,051	102
NV	838	453	481	740	1,027	341	184	308	127
NH	861	129	14	25	83	68	18	27	58
NJ	9,357	3,581	68	44	649	349	99	96	231
NM	770	278	79	251	545	206	213	542	188
NY	31,109	11,251	235	134	2,014	1,082	317	286	900
NC	8,086	6,967	114	129	1,601	1,025	312	320	1,254
ND	97	40	8	50	92	33	81	42	46
OH	8,757	4,776	110	182	3,080	5,335	425	319	9,018
OK	1,372	973	76	189	1,163	586	434	3,304	399
OR	613	328	388	2,203	360	243	270	217	154
PA	8,771	3,341	122	141	1,042	745	237	286	678
RI	2,041	452	10	19	119	61	19	17	49
SC	4,864	7,857	65	65	793	504	166	172	723
SD	204	72	14	110	207	140	733	138	54
TN	6,965	7,997	95	182	5,749	3,747	638	490	7,570
TX	8,751	6,019	284	908	7,177	3,187	1,830	3,163	1,524
UT	502	205	217	1,722	349	209	174	155	154
VT	597	136	21	22	47	56	10	19	62
VA	3,841	3,335	78	81	885	639	179	194	934
WA	1,331	1,042	879	4,375	1,106	577	473	531	410
WV	1,577	636	15	29	298	467	69	73	1,829
WI	1,865	1,132	58	113	10,671	1,606	1,313	303	443
WY	173	63	14	453	188	80	107	171	44
U.S.	199,637	152,074	8,410	21,892	119,632	72,835	33,563	32,420	53,526

Continued

Table B.4. Cross-state Linked Pairs, 2005 to 2006 Continued

States	LA	ME	MD	MA	MI	MN	MS	MO	MT
AL	3,129	136	308	272	1,858	248	3,156	715	38
AK	123	40	27	41	138	149	43	148	146
AZ	1,172	306	355	599	1,790	1,140	479	1,758	538
AR	5,028	63	182	139	1,475	570	1,872	6,088	156
CA	5,979	404	1,600	1,986	3,565	2,964	1,997	5,411	1,284
CO	1,227	120	235	247	754	640	371	1,293	462
CT	200	743	332	3,235	199	77	75	126	18
DE	124	40	2,605	111	78	22	36	62	2
DC	224	5	8,383	72	72	30	47	40	7
FL	5,901	1,365	3,004	7,919	7,795	1,258	3,270	2,873	254
GA	13,265	329	1,685	1,437	3,497	850	3,900	1,702	73
HI	74	24	64	100	112	113	20	200	41
ID	102	23	39	63	175	131	59	267	691
IL	2,599	181	499	559	5,103	6,686	3,975	8,482	146
IN	1,221	103	315	191	5,004	1,356	1,086	1,565	64
IA	530	69	109	83	513	1,886	450	2,389	147
KS	668	34	90	91	371	357	360	7,403	105
KY	1,038	106	240	150	1,678	239	557	1,012	45
LA	0	141	986	470	1,669	698	8,924	2,368	117
ME	118	0	115	2,246	151	143	65	154	18
MD	971	160	0	577	455	203	311	355	26
MA	406	2,844	543	0	346	217	155	264	40
MI	1,812	137	474	405	0	1,153	1,465	1,735	119
MN	659	144	167	192	890	0	552	1,121	260
MS	7,132	60	248	149	1,392	663	0	1,221	58
MO	2,148	140	292	274	1,573	1,345	1,320	0	196
MT	124	27	15	46	107	246	46	191	0
NE	388	25	66	52	364	679	196	1,038	111
NV	811	46	123	144	542	306	253	538	226
NH	67	1,536	86	2,847	118	36	24	87	11
NJ	507	203	1,422	1,341	479	211	196	227	20
NM	417	68	111	119	362	218	133	469	236
NY	1,223	831	4,278	7,833	1,863	718	581	791	92
NC	2,245	447	2,996	1,289	1,585	525	921	839	86
ND	54	12	23	14	63	1,952	12	92	403
OH	1,679	288	740	681	5,571	785	1,011	1,124	109
OK	1,686	83	165	133	619	436	534	3,265	163
OR	329	86	85	119	297	387	165	613	732
PA	812	400	3,967	1,869	1,129	358	470	657	99
RI	123	438	125	3,614	91	90	62	45	9
SC	1,207	209	1,273	603	873	200	619	424	58
SD	94	22	28	33	98	1,450	54	221	285
TN	3,826	254	702	603	4,295	963	6,559	2,369	132
TX	45,094	305	1,093	802	6,304	5,169	3,680	4,397	461
UT	374	54	81	91	213	150	88	352	325
VT	44	407	69	874	54	28	27	50	13
VA	1,721	226	4,457	668	837	282	606	536	57
WA	1,137	163	261	303	684	856	334	1,166	1,975
WV	191	63	2,006	102	452	71	118	216	44
WI	706	79	125	213	2,667	5,653	1,197	1,115	138
WY	120	23	23	27	114	123	61	235	538
U.S.	120,829	14,012	47,217	46,028	70,434	45,030	52,492	69,809	11,374

Continued

Table B.4. Cross-state Linked Pairs, 2005 to 2006 Continued

States	NE	NV	NH	NJ	NM	NY	NC	ND	OH
AL	117	166	50	349	138	1,090	1,295	24	1,669
AK	48	134	11	24	107	109	157	36	97
AZ	581	2,301	131	356	5,928	1,642	913	152	1,660
AR	312	306	26	104	295	393	732	41	732
CA	1,818	18,545	253	1,455	4,441	4,687	4,882	328	3,448
CO	1,491	882	37	180	3,103	574	638	167	620
CT	30	89	272	893	53	4,355	1,631	9	454
DE	11	38	17	811	16	916	536	7	166
DC	2	20	3	92	10	444	1,007	2	122
FL	570	1,166	913	7,129	692	22,948	11,851	134	9,023
GA	318	492	178	2,430	299	7,579	7,125	98	4,147
HI	22	772	3	58	109	225	175	14	122
ID	145	521	19	49	219	86	151	44	147
IL	739	1,192	71	594	621	1,679	1,884	115	3,342
IN	191	409	40	237	249	758	1,122	40	4,835
IA	3,209	168	17	58	159	260	349	80	374
KS	1,026	233	29	67	547	192	351	47	357
KY	125	132	48	166	108	602	1,168	40	7,841
LA	371	739	78	456	409	1,136	2,502	36	1,567
ME	41	66	1,297	158	62	633	438	14	231
MD	54	143	59	1,344	118	3,329	4,325	10	1,002
MA	46	185	3,413	1,232	78	5,942	1,969	22	764
MI	344	793	61	409	366	1,737	2,161	105	6,379
MN	550	299	32	171	223	517	543	1,804	612
MS	214	252	29	170	123	537	959	16	948
MO	1,035	454	54	207	418	727	802	96	1,325
MT	124	212	9	12	197	78	100	479	77
NE	0	216	29	79	177	119	168	146	209
NV	191	0	34	158	545	550	295	47	510
NH	23	33	0	83	27	474	317	6	102
NJ	67	215	99	0	110	9,205	5,272	19	1,001
NM	225	576	26	84	0	284	280	54	336
NY	192	691	601	14,434	309	0	13,487	56	3,457
NC	159	304	209	2,958	217	7,479	0	49	2,765
ND	126	45	8	12	47	30	51	0	36
OH	195	580	94	836	348	2,605	3,402	68	0
OK	435	330	28	88	934	364	592	99	662
OR	196	841	38	68	353	248	222	96	295
PA	195	380	200	8,117	224	12,435	4,695	52	4,980
RI	21	39	203	246	32	1,410	577	4	159
SC	89	137	156	1,247	143	4,091	11,967	23	1,584
SD	1,251	70	13	12	203	61	73	1,049	94
TN	399	363	110	450	340	1,625	3,423	62	4,523
TX	1,765	1,406	153	892	7,493	2,574	3,489	564	3,458
UT	177	1,049	27	51	556	273	158	51	270
VT	9	31	1,073	78	42	972	281	5	99
VA	95	180	109	1,744	124	4,766	9,925	26	1,544
WA	323	1,200	43	191	603	690	704	302	660
WV	44	57	37	174	47	462	2,597	18	6,851
WI	172	356	40	127	170	552	653	179	816
WY	441	118	9	17	233	46	87	101	98
U.S.	20,324	39,926	10,489	51,357	32,365	114,490	112,481	7,036	86,570

Continued

Table B.4. Cross-state Linked Pairs, 2005 to 2006 Continued

States	OK	OR	PA	RI	SC	SD	TN	TX	UT
AL	405	176	573	42	840	35	4,322	2,299	116
AK	163	614	102	6	80	40	105	345	130
AZ	1,541	2,295	1,121	78	396	332	1,264	4,602	2,829
AR	5,963	406	314	29	310	107	4,036	8,249	184
CA	5,972	14,135	2,501	283	1,476	577	4,875	22,048	6,028
CO	1,418	755	492	45	249	595	730	5,234	1,273
CT	94	48	1,313	729	810	24	321	332	46
DE	45	13	2,090	17	231	4	195	240	20
DC	38	3	294	14	384	2	78	165	4
FL	1,799	754	8,656	1,615	5,820	269	10,085	10,248	592
GA	1,047	355	2,715	247	7,560	89	8,876	6,715	267
HI	102	550	73	13	52	14	104	406	310
ID	247	2,131	147	10	59	110	203	801	1,827
IL	1,387	467	1,060	96	747	267	6,415	8,078	358
IN	625	221	663	59	553	110	4,028	3,188	172
IA	521	237	161	10	145	762	583	1,846	198
KS	3,448	244	165	18	161	152	559	3,320	188
KY	391	168	582	29	662	50	7,458	1,299	83
LA	2,243	383	883	92	994	101	5,531	66,097	319
ME	111	78	316	313	237	19	282	269	43
MD	216	77	5,019	126	1,554	38	897	1,199	67
MA	162	140	2,039	3,360	977	42	751	766	113
MI	807	365	1,124	43	1,023	147	5,456	7,175	196
MN	527	352	361	34	159	1,523	861	4,892	178
MS	726	181	467	59	465	47	7,375	3,941	103
MO	4,047	577	609	47	396	272	2,824	4,708	435
MT	174	808	106	5	57	345	157	467	350
NE	508	231	120	8	100	1,398	374	1,627	181
NV	427	1,152	336	20	143	112	406	1,582	1,267
NH	24	40	184	133	169	8	211	125	33
NJ	129	84	10,987	232	1,780	12	757	1,187	95
NM	1,133	388	196	21	155	198	389	7,396	691
NY	452	358	20,985	1,661	5,304	92	2,112	3,130	264
NC	662	234	3,351	273	10,257	70	3,802	3,477	203
ND	82	110	48	2	15	1,055	54	522	60
OH	737	329	4,867	99	1,585	90	5,074	3,783	205
OK	0	543	311	23	296	170	1,078	9,534	310
OR	524	0	193	11	149	171	461	1,239	663
PA	431	220	0	329	2,190	117	1,424	1,891	171
RI	49	17	488	0	303	8	164	183	15
SC	366	161	2,050	163	0	41	1,824	1,407	93
SD	202	217	62	8	40	0	126	383	118
TN	1,133	394	1,220	91	1,585	96	0	4,070	204
TX	11,523	1,337	1,719	122	1,390	424	4,609	0	931
UT	322	730	190	11	105	114	237	991	0
VT	41	41	148	69	134	7	126	81	22
VA	368	146	2,484	154	1,840	50	3,816	1,938	165
WA	951	9,502	489	23	461	389	791	3,211	1,072
WV	152	63	1,833	6	740	39	975	490	37
WI	450	257	445	46	285	258	1,912	2,572	118
WY	268	258	79	0	45	434	144	530	682
U.S.	55,153	43,345	86,731	10,924	55,468	11,426	109,237	220,278	24,029

Continued

Table B.4. Cross-state Linked Pairs, 2005 to 2006 Continued

States	VT	VA	WA	WV	WI	WY	Total
AL	39	663	400	236	415	37	48,254
AK	21	82	1,462	14	122	60	8,020
AZ	110	507	3,318	209	1,173	458	77,110
AR	22	320	692	119	890	145	55,429
CA	196	2,342	17,205	416	2,582	797	231,747
CO	63	412	1,398	133	544	1,416	45,529
CT	302	680	128	77	129	14	25,657
DE	14	540	48	98	34	3	11,395
DC	5	1,499	33	89	27	1	14,438
FL	641	4,219	1,663	1,922	2,211	205	209,778
GA	112	3,051	1,131	654	1,032	110	133,578
HI	21	134	1,248	20	77	20	10,425
ID	14	91	4,399	25	127	416	19,255
IL	41	923	1,308	288	13,441	146	133,281
IN	25	630	518	484	1,621	98	66,409
IA	15	180	450	41	1,249	128	29,832
KS	23	175	466	75	249	164	30,874
KY	31	863	311	1,774	344	73	47,514
LA	51	1,800	1,208	172	676	133	150,736
ME	357	254	180	86	73	32	12,459
MD	78	5,009	301	2,391	147	20	51,096
MA	1,023	822	379	136	216	25	49,205
MI	39	974	787	529	3,016	172	79,490
MN	20	239	1,013	37	5,433	155	40,246
MS	24	636	371	135	1,246	67	52,289
MO	36	592	1,107	209	1,077	249	72,728
MT	20	47	1,923	30	159	682	11,074
NE	14	142	385	47	225	515	20,422
NV	24	174	1,514	62	329	150	34,907
NH	1,118	180	61	38	45	16	10,294
NJ	77	2,456	289	308	205	23	58,670
NM	23	161	699	58	180	260	32,395
NY	1,017	6,492	896	553	696	57	162,081
NC	187	8,338	620	2,505	592	80	88,300
ND	1	13	290	12	133	98	6,601
OH	80	1,671	759	6,785	869	96	88,325
OK	25	348	787	115	356	247	45,681
OR	22	141	10,084	60	256	241	37,704
PA	161	2,722	502	1,833	469	114	78,145
RI	78	260	74	20	91	1	13,444
SC	118	1,914	363	806	320	54	54,078
SD	10	51	339	28	208	462	10,594
TN	147	3,691	843	965	1,643	108	94,731
TX	98	1,975	3,074	478	2,511	636	189,161
UT	19	183	1,176	35	146	697	20,507
VT	0	109	55	37	43	19	6,818
VA	101	0	311	2,810	234	39	58,219
WA	68	461	0	111	641	447	60,658
WV	43	2,889	111	0	78	28	27,259
WI	30	274	617	94	0	101	45,559
WY	7	52	379	19	88	0	9,430
U.S.	6,811	62,381	67,675	28,178	48,668	10,315	2,971,831

Table B.5. Cross-state Linked Pairs, 2006 to 2007

States	AL	AK	AZ	AR	CA	CO	CT	DE	DC
AL	0	76	400	760	1,575	302	188	55	38
AK	57	0	353	131	910	174	27	6	1
AZ	380	241	0	1,007	18,727	3,344	147	71	39
AR	647	100	840	0	3,562	661	47	39	24
CA	1,679	1,067	26,284	4,859	0	6,734	550	189	263
CO	292	160	3,171	596	5,747	0	99	62	30
CT	246	18	233	49	507	120	0	94	24
DE	51	3	88	34	257	73	112	0	48
DC	38	1	60	20	240	29	29	60	0
FL	6,960	268	1,923	2,017	5,906	1,851	3,457	704	262
GA	8,216	131	1,067	1,275	4,841	730	879	363	261
HI	42	369	481	65	2,606	213	23	8	9
ID	52	191	806	180	2,446	463	13	13	4
IL	1,743	102	3,643	3,037	6,938	1,416	248	100	78
IN	886	71	1,167	913	2,358	519	80	85	26
IA	150	50	775	592	1,451	577	43	13	8
KS	189	53	793	1,056	1,685	1,371	32	29	9
KY	739	56	483	581	1,049	266	63	52	24
LA	2,689	94	789	4,684	4,239	1,173	125	74	120
ME	105	33	359	52	342	121	537	41	6
MD	290	20	435	195	1,439	246	262	2,788	7,270
MA	339	52	756	211	2,007	253	2,920	123	78
MI	1,974	132	3,004	1,699	3,662	853	187	96	66
MN	172	196	1,075	611	2,534	613	58	47	26
MS	2,939	41	396	1,996	1,620	321	71	34	38
MO	613	129	1,647	6,312	3,872	1,213	87	38	34
MT	44	100	353	123	1,030	438	14	1	6
NE	92	48	508	350	1,297	1,272	28	10	12
NV	166	121	2,318	317	12,891	827	58	20	22
NH	39	14	141	36	217	45	187	26	0
NJ	379	18	537	138	1,474	238	950	1,156	101
NM	140	105	5,377	329	2,907	2,991	36	9	12
NY	1,278	133	2,170	536	5,116	638	6,594	1,403	476
NC	1,066	132	774	702	3,172	596	961	459	707
ND	9	16	126	33	180	177	4	3	2
OH	1,549	98	2,060	807	2,855	701	292	168	98
OK	313	94	1,192	5,646	3,614	1,197	49	31	16
OR	125	466	1,837	397	9,092	662	26	17	7
PA	625	84	1,191	372	2,313	512	1,224	2,636	282
RI	36	4	113	49	317	64	847	36	12
SC	710	72	378	336	1,085	253	566	190	314
SD	20	29	358	99	499	476	14	6	1
TN	3,907	115	1,106	4,082	3,687	790	213	143	81
TX	2,016	337	4,407	7,522	14,213	4,607	267	213	147
UT	81	68	2,225	174	3,505	1,113	42	15	8
VT	33	18	107	30	158	57	262	13	5
VA	561	68	460	338	1,781	373	477	515	1,187
WA	345	1,191	3,334	673	12,445	1,203	104	47	37
WV	175	18	197	107	302	129	69	85	75
WI	381	124	1,094	1,024	2,120	527	98	38	34
WY	23	51	424	122	549	1,216	12	7	2
Total	45,601	7,178	83,815	57,274	167,339	44,738	23,678	12,431	12,430

Continued

Table B.5. Cross-state Linked Pairs, 2006 to 2007 Continued

States	FL	GA	HI	ID	IL	IN	IA	KS	KY
AL	5,676	8,201	40	46	1,797	920	157	228	838
AK	244	168	251	201	103	78	47	58	62
AZ	1,524	932	403	1,074	3,125	1,190	878	887	512
AR	1,464	1,226	57	146	2,855	846	621	957	670
CA	5,650	6,098	2,196	4,210	7,693	2,934	1,927	2,332	1,324
CO	1,386	710	179	487	1,353	534	629	1,436	303
CT	3,457	1,108	32	19	257	147	60	54	95
DE	623	417	7	5	100	84	11	24	70
DC	276	366	4	0	83	29	10	16	32
FL	0	26,114	294	291	6,718	4,388	931	794	4,107
GA	18,252	0	157	143	4,644	1,832	528	516	1,937
HI	299	184	0	87	139	90	49	51	67
ID	249	100	73	0	255	126	143	99	82
IL	5,789	4,511	109	233	0	17,904	7,828	802	2,915
IN	3,461	2,013	70	104	14,537	0	688	329	6,529
IA	673	398	42	136	6,343	660	0	484	277
KS	611	513	48	130	854	310	519	0	237
KY	2,740	1,587	37	74	2,683	6,318	226	208	0
LA	3,684	9,111	41	88	1,742	870	374	543	788
ME	1,036	247	32	43	175	102	77	52	129
MD	2,920	2,290	62	48	496	341	116	93	342
MA	8,064	1,891	97	57	589	310	124	111	210
MI	7,551	4,375	109	193	5,199	5,623	544	389	2,280
MN	830	678	65	125	5,121	1,087	1,915	359	219
MS	2,141	3,140	12	32	3,628	1,053	434	331	537
MO	1,973	1,532	133	297	8,663	1,408	2,247	7,094	1,113
MT	160	88	33	684	135	55	128	85	59
NE	401	260	18	118	682	179	3,336	919	123
NV	756	453	433	633	984	338	171	210	138
NH	805	146	11	22	65	62	24	30	94
NJ	8,080	3,642	64	47	690	345	79	98	286
NM	533	301	88	227	544	229	206	448	135
NY	25,281	9,783	184	107	2,002	1,050	347	277	797
NC	7,198	6,118	109	129	1,702	1,026	340	352	1,318
ND	96	48	11	52	73	40	88	41	44
OH	7,084	4,410	93	142	3,115	5,087	371	369	8,703
OK	1,109	803	82	157	1,143	526	451	2,962	403
OR	515	315	398	1,896	398	229	229	222	135
PA	7,852	3,268	95	126	1,101	776	228	217	702
RI	1,798	440	12	8	97	56	25	17	34
SC	4,150	6,718	64	58	728	496	174	145	701
SD	182	82	11	97	202	100	696	156	64
TN	6,635	7,589	86	196	6,067	3,664	654	504	7,715
TX	6,902	4,848	303	847	6,780	2,665	1,795	2,723	1,390
UT	390	203	197	1,669	332	193	178	135	122
VT	490	122	14	29	52	57	24	16	52
VA	3,497	3,054	88	115	935	623	188	181	978
WA	1,228	923	887	3,940	1,223	528	448	463	336
WV	1,322	501	12	29	296	443	74	84	1,790
WI	1,653	995	44	78	10,929	1,469	1,317	295	501
WY	147	96	14	419	190	86	127	142	61
Total	168,837	133,116	7,901	20,094	119,617	69,506	32,781	29,338	52,356

Continued

Table B.5. Cross-state Linked Pairs, 2006 to 2007 Continued

States	LA	ME	MD	MA	MI	MN	MS	MO	MT
AL	2,715	143	281	290	1,776	223	3,104	711	44
AK	85	47	21	50	101	146	37	146	124
AZ	834	311	310	615	1,754	1,057	354	1,553	454
AR	4,318	50	169	179	1,474	542	1,669	5,826	160
CA	4,703	358	1,406	1,853	3,099	2,570	1,741	4,878	1,203
CO	1,087	106	212	218	701	640	329	1,241	458
CT	149	744	281	3,239	187	80	62	106	12
DE	91	45	2,341	119	88	21	38	51	2
DC	123	4	8,392	70	78	28	53	28	6
FL	4,913	1,328	2,725	7,901	7,428	1,189	2,866	2,666	224
GA	10,280	288	1,614	1,597	3,363	830	3,261	1,512	79
HI	53	25	69	105	82	91	23	161	36
ID	72	31	20	41	156	122	40	291	621
IL	1,801	179	483	619	4,559	6,113	3,291	8,703	139
IN	1,021	111	297	245	4,632	1,217	981	1,448	70
IA	374	59	86	82	455	1,822	382	2,272	108
KS	520	53	73	79	334	309	307	7,199	98
KY	737	96	209	167	1,560	255	553	939	61
LA	0	102	571	354	1,195	511	7,554	1,635	113
ME	89	0	87	2,318	131	122	58	141	14
MD	684	156	0	552	431	173	232	308	29
MA	364	2,707	515	0	373	261	157	266	41
MI	1,603	153	521	418	0	1,079	1,409	1,691	163
MN	501	118	136	189	843	0	519	1,059	212
MS	6,665	46	202	143	1,203	614	0	1,153	33
MO	1,670	174	226	260	1,289	1,157	1,071	0	130
MT	98	17	33	43	106	224	56	157	0
NE	294	24	54	26	250	612	158	1,047	110
NV	493	54	96	163	545	256	205	528	203
NH	49	1,419	60	2,894	101	39	14	48	7
NJ	380	174	1,471	1,397	478	192	151	253	20
NM	330	60	91	108	356	202	107	431	201
NY	986	775	4,061	7,896	1,627	712	509	710	88
NC	1,819	420	2,790	1,378	1,547	558	795	766	71
ND	29	20	11	17	59	1,940	11	71	361
OH	1,194	266	755	693	5,450	841	894	1,103	101
OK	1,566	75	144	130	554	395	459	3,103	165
OR	242	50	75	123	214	354	144	614	667
PA	633	378	3,954	1,944	1,067	364	404	606	88
RI	92	405	131	3,737	82	86	45	45	9
SC	756	200	1,087	645	743	208	438	397	47
SD	80	17	21	33	110	1,347	20	240	273
TN	3,729	271	703	651	4,352	915	6,656	2,487	127
TX	42,512	290	1,037	672	5,490	4,298	3,450	3,892	417
UT	206	73	66	92	211	153	88	387	291
VT	40	346	81	872	43	30	18	48	15
VA	1,289	237	4,208	707	789	254	511	521	60
WA	960	152	259	345	626	818	292	1,086	1,807
WV	128	63	1,833	152	456	55	118	173	31
WI	569	80	131	190	2,507	5,336	1,078	978	128
WY	112	24	16	29	117	143	53	222	522
Total	104,038	13,324	44,415	46,640	65,172	41,504	46,765	65,897	10,443

Continued

Table B.5. Cross-state Linked Pairs, 2006 to 2007 Continued

States	NE	NV	NH	NJ	NM	NY	NC	ND	OH
AL	118	174	41	313	122	1,168	1,276	20	1,633
AK	48	115	11	35	78	113	147	25	93
AZ	603	2,106	118	372	5,846	1,557	905	151	1,533
AR	304	278	29	111	294	408	684	49	734
CA	1,723	16,212	227	1,339	4,170	4,449	4,657	264	3,222
CO	1,310	808	54	191	3,329	526	648	180	656
CT	18	73	221	845	44	4,274	1,614	4	395
DE	21	48	21	833	25	863	552	5	187
DC	4	16	1	99	9	377	1,010	0	114
FL	557	1,022	867	6,672	712	21,287	11,959	158	8,658
GA	373	455	158	2,353	239	7,068	6,847	96	4,062
HI	20	770	13	54	91	206	195	16	119
ID	129	472	11	28	195	111	140	46	175
IL	692	1,147	80	605	609	1,704	1,740	123	3,496
IN	221	377	39	267	229	790	1,063	50	4,798
IA	3,222	175	22	53	158	266	320	100	351
KS	995	190	17	71	561	158	318	50	270
KY	111	126	24	177	146	598	1,132	20	7,722
LA	269	546	40	302	323	774	1,654	21	1,096
ME	45	45	1,308	156	58	606	450	23	262
MD	56	140	60	1,241	100	3,227	4,399	16	951
MA	52	187	3,443	1,312	108	6,182	2,107	22	799
MI	313	929	63	440	373	1,709	2,327	88	6,394
MN	629	273	16	153	186	509	495	1,945	662
MS	241	198	29	170	120	447	813	11	963
MO	871	399	64	182	405	565	705	69	1,113
MT	98	170	10	20	146	67	102	493	73
NE	0	174	13	54	192	135	177	124	193
NV	161	0	36	140	588	518	323	41	546
NH	23	36	0	76	19	452	288	10	91
NJ	70	201	74	0	104	9,327	5,437	17	1,013
NM	160	492	28	75	0	203	277	54	331
NY	152	699	493	14,507	305	0	13,049	58	3,324
NC	172	289	221	2,927	198	7,303	0	55	2,797
ND	139	41	1	11	47	49	23	0	55
OH	210	594	75	835	297	2,550	3,425	45	0
OK	411	278	36	113	916	383	577	76	582
OR	219	844	25	78	367	261	256	107	294
PA	205	332	235	8,667	251	12,875	4,712	65	5,059
RI	17	50	199	288	27	1,418	549	2	149
SC	129	122	103	1,122	133	3,707	11,017	11	1,435
SD	1,297	60	7	20	175	58	45	1,033	88
TN	387	320	149	508	375	1,659	3,585	72	4,463
TX	1,443	1,280	144	843	7,270	2,199	3,431	500	2,989
UT	162	934	25	50	610	268	184	41	247
VT	21	16	1,076	74	33	906	249	5	80
VA	119	209	144	1,754	152	4,486	9,722	18	1,594
WA	374	1,188	38	222	599	733	717	269	699
WV	28	48	35	189	38	420	2,278	7	6,478
WI	205	359	20	146	204	479	589	149	859
WY	388	101	16	17	209	50	77	101	84
Total	19,535	36,118	10,180	51,110	31,785	110,448	109,246	6,905	83,981

Continued

Table B.5. Cross-state Linked Pairs, 2006 to 2007 Continued

States	OK	OR	PA	RI	SC	SD	TN	TX	UT
AL	423	115	548	51	730	50	4,256	2,257	105
AK	154	574	82	2	86	21	136	368	115
AZ	1,517	2,001	994	77	348	394	1,131	4,636	2,417
AR	5,943	383	324	47	251	99	3,881	8,491	173
CA	5,600	12,672	2,256	227	1,293	566	4,377	21,979	5,836
CO	1,335	728	495	54	227	533	756	5,230	1,140
CT	81	67	1,232	687	718	27	285	261	41
DE	28	19	2,142	18	206	4	179	221	22
DC	35	6	307	12	323	1	76	184	10
FL	1,792	708	8,127	1,400	5,634	269	9,726	10,767	559
GA	953	349	2,644	265	6,606	91	8,082	6,067	204
HI	98	524	73	10	60	15	96	413	282
ID	193	1,870	115	8	55	105	195	749	1,435
IL	1,389	442	1,007	85	708	221	6,319	7,853	371
IN	656	226	664	50	525	115	4,019	3,284	146
IA	437	186	182	13	129	780	584	1,789	237
KS	3,325	177	177	25	139	143	509	3,057	163
KY	382	150	519	29	565	55	7,245	1,347	90
LA	1,728	285	562	55	704	88	4,178	39,962	175
ME	105	49	351	304	266	27	304	196	45
MD	213	97	5,086	107	1,441	32	916	1,255	99
MA	184	130	2,018	3,258	907	55	719	683	101
MI	931	365	1,089	48	1,043	151	5,502	7,098	218
MN	553	322	364	36	163	1,510	910	4,674	166
MS	633	143	353	34	408	48	6,986	3,711	120
MO	3,494	525	498	30	378	237	2,504	4,375	406
MT	178	629	86	7	51	367	120	406	292
NE	513	202	126	7	91	1,291	356	1,649	130
NV	455	950	325	41	124	95	409	1,440	1,076
NH	47	29	196	142	143	8	184	68	25
NJ	152	101	11,423	234	1,811	17	716	1,152	85
NM	1,078	410	184	19	115	171	339	6,810	601
NY	471	289	19,640	1,491	4,884	92	1,985	2,507	273
NC	602	221	3,376	282	9,498	91	3,606	3,568	196
ND	69	105	42	2	27	940	67	470	77
OH	716	380	4,824	96	1,461	95	4,967	3,664	253
OK	0	460	358	30	265	194	1,079	9,702	249
OR	531	0	177	10	179	174	420	1,219	621
PA	442	197	0	407	2,114	68	1,405	2,035	220
RI	47	35	544	0	261	8	157	111	13
SC	280	143	1,782	154	0	30	1,699	1,391	62
SD	212	200	75	6	32	0	121	354	116
TN	1,165	430	1,265	110	1,552	132	0	4,404	251
TX	10,599	1,103	1,689	110	1,188	417	4,242	0	846
UT	266	584	198	10	82	128	232	892	0
VT	34	41	145	66	121	9	137	64	20
VA	427	159	2,477	148	1,737	50	3,921	1,970	147
WA	961	8,810	481	50	419	336	772	3,151	987
WV	154	67	1,742	27	644	41	871	412	43
WI	467	267	435	49	328	268	1,803	2,614	130
WY	261	177	91	7	31	420	115	563	593
Total	52,309	39,102	83,890	10,437	51,071	11,079	103,594	191,523	21,982

Continued

Table B.5. Cross-state Linked Pairs, 2006 to 2007 Continued

States	VT	VA	WA	WV	WI	WY	Total
AL	35	711	361	242	389	52	45,774
AK	10	64	1,448	22	103	52	7,530
AZ	95	465	3,315	181	1,003	392	73,880
AR	30	310	630	141	852	148	53,743
CA	160	2,022	16,889	361	2,244	852	211,397
CO	52	395	1,467	125	556	1,336	44,297
CT	253	609	111	83	131	8	23,462
DE	12	441	47	130	27	4	10,858
DC	4	1,514	38	67	20	0	14,302
FL	590	4,076	1,581	1,869	1,974	186	199,375
GA	117	2,789	1,115	654	914	90	121,187
HI	17	113	1,215	27	63	23	9,940
ID	14	89	3,971	19	99	348	17,261
IL	50	941	1,301	268	13,021	159	127,614
IN	45	648	503	508	1,584	68	64,733
IA	15	159	471	47	1,273	112	29,393
KS	21	169	471	80	221	125	28,843
KY	52	902	304	1,766	363	55	45,643
LA	35	1,024	992	154	502	105	98,837
ME	309	239	182	76	75	26	11,956
MD	54	4,981	299	2,387	138	15	49,528
MA	967	844	402	122	224	27	47,729
MI	56	1,041	798	546	2,944	331	79,770
MN	25	235	941	42	5,309	136	39,562
MS	15	459	361	123	1,210	51	46,470
MO	55	491	984	189	969	221	64,111
MT	13	45	1,720	39	111	618	10,131
NE	9	114	400	22	178	468	18,846
NV	10	158	1,350	75	360	87	32,707
NH	1,099	142	69	19	47	14	9,822
NJ	81	2,360	281	335	174	18	58,021
NM	22	154	649	57	151	263	29,146
NY	1,030	5,971	899	495	614	58	148,822
NC	194	8,161	772	2,381	522	70	84,507
ND	2	26	222	20	124	83	6,204
OH	66	1,591	818	6,644	925	100	83,930
OK	34	332	827	144	361	254	44,040
OR	21	141	9,524	65	233	221	35,436
PA	152	2,822	557	1,805	476	86	78,229
RI	82	228	70	26	108	2	12,988
SC	86	1,777	340	751	271	39	48,243
SD	7	43	316	23	182	459	10,162
TN	143	3,881	853	933	1,618	116	95,496
TX	75	1,674	3,055	426	2,312	638	172,513
UT	14	151	1,071	43	101	562	19,072
VT	0	99	68	32	32	13	6,373
VA	90	0	374	2,713	273	48	56,727
WA	45	399	0	120	575	410	58,055
WV	22	2,772	103	0	89	24	25,249
WI	42	304	627	127	0	98	44,287
WY	5	43	409	19	92	0	8,795
Total	6,432	59,119	65,571	27,543	46,137	9,671	2,764,996

Table B.6. Cross-state Linked Pairs, 2005 to 2007

States	AL	AK	AZ	AR	CA	CO	CT	DE	DC
AL	0	86	430	827	1,652	338	211	49	39
AK	71	0	482	147	1,104	226	35	8	1
AZ	477	348	0	1,169	19,584	3,756	211	91	38
AR	716	108	846	0	3,583	693	63	42	20
CA	2,100	1,318	35,173	6,087	0	8,265	653	225	244
CO	332	201	3,487	723	5,957	0	100	70	38
CT	308	26	309	80	601	139	0	104	41
DE	70	4	110	46	268	59	137	0	49
DC	44	2	58	16	241	37	26	59	0
FL	8,378	317	2,415	2,464	6,880	2,133	3,907	805	297
GA	9,841	166	1,302	1,501	5,014	827	969	413	271
HI	40	471	571	70	3,036	230	25	14	6
ID	69	230	1,026	187	2,648	534	5	21	7
IL	1,939	83	4,115	3,509	7,337	1,549	250	113	80
IN	979	90	1,479	1,084	2,417	579	105	95	31
IA	189	38	915	710	1,505	643	56	14	8
KS	219	60	960	1,207	1,746	1,553	32	21	10
KY	860	50	524	666	1,122	272	65	61	26
LA	3,029	100	901	5,286	4,949	1,275	131	86	129
ME	110	41	414	85	430	138	588	48	6
MD	366	35	546	209	1,595	284	296	3,274	7,814
MA	384	71	879	242	2,179	288	3,187	173	76
MI	2,318	167	3,484	2,012	4,110	938	235	130	63
MN	208	264	1,241	703	2,979	686	62	47	34
MS	3,523	43	425	2,152	1,813	372	81	33	41
MO	762	181	2,046	7,667	4,552	1,534	135	46	35
MT	58	115	447	143	1,081	460	22	6	6
NE	137	90	658	411	1,532	1,437	29	16	14
NV	188	162	2,899	393	14,354	1,060	70	10	27
NH	55	16	172	40	264	72	217	29	0
NJ	444	36	666	173	1,587	273	1,174	1,320	108
NM	182	118	6,529	416	3,224	3,636	40	14	17
NY	1,629	169	2,787	638	5,915	789	8,503	1,749	501
NC	1,192	165	906	695	3,319	644	1,042	488	690
ND	15	9	168	45	212	197	12	3	1
OH	1,893	112	2,483	877	3,248	804	333	180	137
OK	420	118	1,334	6,034	3,867	1,291	86	43	14
OR	155	642	2,194	481	10,094	794	27	16	12
PA	698	110	1,442	427	2,655	596	1,345	3,160	307
RI	41	18	165	55	433	89	1,034	34	11
SC	869	78	471	341	1,189	292	676	223	330
SD	24	23	415	132	569	486	11	7	3
TN	4,316	111	1,180	4,258	3,672	772	208	153	62
TX	2,369	416	5,352	8,765	14,757	5,384	354	243	139
UT	65	122	2,647	179	3,610	1,247	46	14	9
VT	38	20	131	40	196	57	308	14	4
VA	672	64	535	342	1,858	375	540	561	1,186
WA	401	1,366	3,794	795	13,450	1,423	114	51	36
WV	206	25	218	138	314	165	78	96	64
WI	476	173	1,279	1,212	2,371	561	98	39	35
WY	51	59	491	140	575	1,460	15	6	0
Total	53,926	8,837	103,501	66,019	181,648	51,712	27,947	14,517	13,117

Continued

Table B.6. Cross-state Linked Pairs, 2005 to 2007 Continued

States	FL	GA	HI	ID	IL	IN	IA	KS	KY
AL	6,378	9,253	43	62	1,872	1,046	173	255	957
AK	323	198	308	275	120	90	67	73	66
AZ	1,804	1,055	449	1,337	3,304	1,446	1,100	1,020	659
AR	1,476	1,297	54	177	2,961	947	668	1,034	713
CA	7,081	7,512	2,670	5,513	8,690	3,745	2,407	2,965	1,642
CO	1,499	761	175	570	1,497	593	682	1,601	344
CT	4,652	1,364	39	14	278	161	82	64	93
DE	797	500	11	10	109	81	29	24	60
DC	318	416	5	0	83	35	14	12	39
FL	0	30,388	362	406	7,792	5,315	1,138	979	4,856
GA	20,123	0	179	159	4,954	2,182	625	614	2,219
HI	371	228	0	98	167	90	56	67	62
ID	250	107	82	0	274	141	169	118	100
IL	6,406	5,143	139	232	0	20,653	9,105	941	3,439
IN	3,956	2,320	58	124	15,008	0	888	386	7,559
IA	750	508	44	163	6,616	760	0	544	271
KS	734	599	59	143	972	344	606	0	264
KY	3,058	1,692	36	75	2,830	7,179	243	271	0
LA	4,045	10,058	63	109	1,926	956	453	588	903
ME	1,258	292	42	44	170	111	96	63	133
MD	3,502	2,696	62	71	593	387	138	131	364
MA	9,203	2,169	99	62	635	341	109	126	231
MI	8,380	5,179	128	214	5,776	6,425	636	436	2,691
MN	1,034	806	70	159	5,262	1,178	2,215	377	243
MS	2,413	3,546	23	35	3,975	1,194	484	356	654
MO	2,455	1,870	151	382	10,611	1,599	2,755	8,647	1,270
MT	223	87	38	817	132	99	125	98	58
NE	502	317	19	123	745	245	3,997	1,076	127
NV	879	535	517	835	1,128	396	236	296	140
NH	1,002	163	15	33	82	86	27	35	91
NJ	10,052	4,235	82	52	750	404	104	104	315
NM	761	325	94	285	622	256	255	568	194
NY	32,842	12,442	216	143	2,272	1,290	395	318	1,030
NC	7,832	7,007	114	148	1,737	1,173	376	388	1,466
ND	100	33	8	53	97	37	111	45	55
OH	8,507	5,352	116	164	3,318	5,856	482	391	10,142
OK	1,231	939	81	190	1,222	615	510	3,323	443
OR	601	341	458	2,372	424	272	330	267	151
PA	9,428	3,770	136	154	1,175	906	293	295	814
RI	2,260	536	12	18	112	74	22	24	51
SC	4,633	7,978	69	74	836	564	201	176	812
SD	183	82	12	117	215	127	755	155	73
TN	6,691	7,981	95	196	6,122	3,836	686	494	8,212
TX	8,242	5,605	292	1,017	7,538	3,211	1,993	3,129	1,720
UT	493	245	219	1,945	358	231	210	148	156
VT	595	133	28	27	66	69	15	21	73
VA	4,009	3,536	85	106	959	662	215	215	1,117
WA	1,404	1,051	906	4,782	1,256	655	533	558	436
WV	1,473	631	13	36	345	481	76	86	1,953
WI	1,870	1,170	53	109	11,189	1,763	1,537	313	563
WY	181	80	16	481	203	91	139	166	72
Total	198,260	154,531	9,045	24,711	129,378	80,398	38,561	34,381	60,096

Continued

Table B.6. Cross-state Linked Pairs, 2005 to 2007 Continued

States	LA	ME	MD	MA	MI	MN	MS	MO	MT
AL	2,565	144	301	297	1,937	258	3,184	755	42
AK	108	62	33	57	153	157	46	179	170
AZ	955	352	385	630	1,853	1,314	434	1,954	600
AR	4,285	68	188	161	1,552	614	1,766	6,391	187
CA	5,276	443	1,599	2,065	3,685	3,319	2,017	6,038	1,422
CO	1,033	137	237	230	811	726	329	1,366	504
CT	169	900	357	3,520	211	92	66	135	16
DE	113	48	2,668	104	96	28	37	64	4
DC	156	6	9,800	73	76	38	46	41	7
FL	5,167	1,599	2,928	8,439	8,261	1,409	3,148	3,253	285
GA	9,955	375	1,625	1,444	3,660	953	3,493	1,831	83
HI	71	39	69	106	92	108	29	197	36
ID	79	28	30	51	172	158	60	316	740
IL	2,155	174	504	581	5,183	7,389	3,673	9,569	150
IN	1,042	129	299	206	5,281	1,473	1,019	1,680	70
IA	426	80	108	74	498	2,139	416	2,574	164
KS	535	41	98	82	389	365	342	8,441	121
KY	804	130	217	156	1,715	265	542	1,070	66
LA	0	124	646	421	1,271	595	8,449	1,938	115
ME	99	0	110	2,335	163	169	66	181	20
MD	733	189	0	605	472	216	262	397	30
MA	356	3,163	537	0	375	270	163	314	44
MI	1,818	167	547	436	0	1,289	1,618	1,961	176
MN	553	172	137	213	904	0	533	1,201	256
MS	6,703	48	208	157	1,392	667	0	1,286	52
MO	1,803	197	271	323	1,584	1,415	1,261	0	193
MT	100	26	30	52	119	291	57	200	0
NE	350	34	80	47	365	744	172	1,219	114
NV	652	63	121	147	572	290	237	645	266
NH	58	1,788	84	3,183	139	49	20	103	12
NJ	417	215	1,617	1,458	536	236	176	284	23
NM	374	71	117	144	398	218	139	524	240
NY	1,125	944	4,863	8,871	1,989	851	581	865	112
NC	1,849	490	2,838	1,233	1,666	629	811	963	79
ND	50	15	21	15	70	2,179	12	92	413
OH	1,393	327	796	703	6,128	973	997	1,224	128
OK	1,491	81	151	138	622	479	430	3,476	178
OR	292	93	78	128	287	425	165	738	814
PA	685	449	4,137	1,988	1,219	416	442	740	116
RI	114	493	146	4,215	105	101	56	68	14
SC	960	234	1,190	611	860	230	553	472	67
SD	84	21	22	33	114	1,488	34	249	261
TN	3,104	280	677	631	4,495	1,025	6,748	2,613	142
TX	34,930	372	1,132	812	5,968	4,874	3,583	4,579	475
UT	288	58	74	98	257	169	70	407	341
VT	40	446	78	915	61	35	28	61	14
VA	1,392	254	4,641	680	858	298	580	576	69
WA	1,033	179	249	333	754	972	335	1,318	2,120
WV	152	51	2,032	130	475	87	110	218	40
WI	631	89	126	232	2,813	6,400	1,129	1,202	159
WY	101	25	23	31	121	134	47	258	551
Total	98,624	15,913	49,225	49,594	72,777	49,019	50,511	76,226	12,301

Continued

Table B.6. Cross-state Linked Pairs, 2005 to 2007 Continued

States	NE	NV	NH	NJ	NM	NY	NC	ND	OH
AL	154	181	64	351	151	1,173	1,428	24	1,845
AK	66	128	13	31	98	130	178	39	120
AZ	686	2,550	140	379	6,955	1,683	1,105	195	1,862
AR	349	320	33	101	313	376	756	54	787
CA	2,045	20,625	273	1,521	5,315	4,900	5,826	362	3,847
CO	1,584	914	53	207	3,666	574	734	188	666
CT	35	94	279	974	53	4,505	2,044	9	520
DE	18	54	27	886	26	902	665	7	214
DC	4	19	3	104	12	418	1,205	2	130
FL	680	1,266	1,057	7,471	822	23,426	14,191	170	10,191
GA	398	565	192	2,400	287	7,330	8,015	121	4,635
HI	24	924	12	59	132	214	230	20	144
ID	155	535	16	38	222	106	194	50	175
IL	797	1,305	87	655	695	1,717	2,029	152	3,820
IN	241	469	34	248	276	806	1,222	46	5,466
IA	3,601	216	18	53	167	294	364	106	415
KS	1,140	233	33	73	660	176	391	55	366
KY	131	152	45	169	123	600	1,261	29	8,624
LA	312	631	51	343	364	849	1,869	32	1,191
ME	60	58	1,476	158	77	631	493	16	259
MD	69	161	60	1,432	118	3,354	5,289	16	1,148
MA	60	219	4,005	1,280	97	5,904	2,347	20	870
MI	401	1,037	70	458	429	1,931	2,749	126	7,438
MN	692	317	33	198	259	529	557	2,179	721
MS	264	210	31	164	145	497	871	17	1,007
MO	1,072	504	68	220	499	748	921	91	1,476
MT	135	207	10	19	185	75	128	536	88
NE	0	218	23	74	200	143	215	157	208
NV	207	0	40	152	708	616	342	53	610
NH	23	45	0	87	29	499	387	10	114
NJ	86	252	117	0	145	9,181	6,616	19	1,180
NM	216	557	32	94	0	272	346	70	387
NY	254	841	635	17,876	366	0	16,777	69	4,092
NC	189	351	239	2,898	243	7,253	0	60	3,020
ND	148	51	8	11	68	31	33	0	48
OH	208	702	85	865	344	2,780	3,972	54	0
OK	480	337	32	101	1,048	400	652	98	693
OR	213	917	41	70	404	286	297	124	342
PA	254	400	240	9,003	289	13,009	5,592	74	5,671
RI	24	57	236	303	31	1,500	707	2	198
SC	135	144	148	1,234	162	4,123	13,391	18	1,654
SD	1,340	68	14	17	208	77	62	1,156	107
TN	425	359	126	490	424	1,697	3,859	90	4,699
TX	1,775	1,492	172	913	8,666	2,608	3,955	541	3,409
UT	204	1,095	26	50	672	295	196	74	314
VT	17	28	1,255	79	35	1,078	332	6	112
VA	106	208	147	1,762	164	4,760	11,401	33	1,803
WA	400	1,385	59	237	706	785	857	325	788
WV	41	54	36	167	50	486	2,730	14	7,551
WI	213	412	29	153	234	555	735	214	871
WY	449	114	7	14	235	48	94	103	107
Total	22,580	43,981	11,930	56,642	37,577	116,330	130,610	8,026	96,003

Continued

Table B.6. Cross-state Linked Pairs, 2005 to 2007 Continued

States	OK	OR	PA	RI	SC	SD	TN	TX	UT
AL	458	142	591	54	831	49	4,597	2,527	105
AK	198	731	103	3	111	42	136	417	147
AZ	1,891	2,460	1,272	64	406	400	1,397	5,327	3,129
AR	6,586	419	311	32	309	109	4,047	9,109	181
CA	7,151	16,141	2,764	265	1,629	656	5,384	27,038	7,139
CO	1,594	824	497	46	264	646	770	5,749	1,339
CT	113	74	1,474	782	897	26	391	356	63
DE	42	15	2,337	22	267	3	216	239	17
DC	41	7	347	14	394	4	74	208	4
FL	2,176	865	9,758	1,521	6,538	281	11,716	12,165	663
GA	1,180	391	2,923	262	7,699	113	9,335	7,091	265
HI	118	611	93	15	55	21	95	464	365
ID	261	2,221	140	11	58	121	232	875	1,829
IL	1,567	524	1,103	84	739	256	6,811	8,815	387
IN	754	268	741	50	623	134	4,467	3,695	174
IA	586	240	195	12	146	852	635	1,955	248
KS	3,917	245	204	23	159	164	583	3,686	205
KY	437	165	578	33	653	51	7,790	1,509	88
LA	2,029	346	671	55	772	82	4,670	45,623	182
ME	119	79	371	318	291	28	347	242	60
MD	231	99	5,997	114	1,660	31	1,051	1,387	99
MA	183	159	2,199	3,482	1,040	53	798	771	121
MI	1,074	446	1,289	42	1,209	176	6,344	7,893	260
MN	692	392	396	39	161	1,741	894	5,130	227
MS	749	182	394	40	421	50	7,874	3,999	117
MO	4,437	676	615	40	428	303	3,022	5,250	493
MT	205	791	104	6	58	381	155	451	365
NE	596	235	139	6	102	1,537	403	1,855	193
NV	549	1,240	406	38	143	110	486	1,799	1,412
NH	42	46	226	137	196	8	243	90	33
NJ	181	115	13,445	254	2,141	13	878	1,427	97
NM	1,354	453	205	23	154	183	420	8,208	753
NY	546	385	25,466	1,823	5,963	115	2,389	3,316	321
NC	745	277	3,579	282	10,840	93	4,103	3,965	216
ND	99	119	44	1	25	1,097	62	539	71
OH	870	422	5,564	96	1,749	123	5,489	4,193	254
OK	0	561	344	31	308	203	1,176	10,479	286
OR	620	0	216	9	183	175	497	1,458	724
PA	502	262	0	397	2,417	108	1,624	2,196	229
RI	56	25	618	0	343	9	204	168	17
SC	394	154	2,073	160	0	46	1,953	1,613	81
SD	231	201	69	8	44	0	136	380	125
TN	1,263	464	1,325	99	1,618	120	0	4,510	243
TX	13,042	1,333	1,805	133	1,438	491	4,807	0	1,017
UT	327	771	225	17	118	144	247	1,075	0
VT	49	52	174	65	139	7	150	88	25
VA	468	181	2,835	164	2,009	56	4,150	2,181	181
WA	1,068	10,248	565	35	510	407	844	3,575	1,171
WV	178	64	1,975	14	713	46	986	478	54
WI	548	311	489	46	330	312	1,990	2,866	136
WY	265	248	98	0	39	473	152	554	676
Total	62,782	47,680	99,352	11,267	59,340	12,649	117,220	218,984	26,587

Continued

Table B.6. Cross-state Linked Pairs, 2005 to 2007 Continued

States	VT	VA	WA	WV	WI	WY	Total
AL	43	774	415	258	441	47	49,857
AK	15	79	1,822	23	135	73	9,397
AZ	124	572	3,892	229	1,244	468	84,755
AR	21	313	695	155	933	152	57,071
CA	204	2,510	20,594	481	2,842	996	262,662
CO	57	447	1,645	141	621	1,507	48,736
CT	312	791	132	90	154	17	28,006
DE	15	527	62	145	35	3	12,270
DC	5	1,811	33	94	21	1	16,603
FL	703	4,746	1,947	2,163	2,377	234	230,448
GA	113	3,066	1,278	773	1,114	115	134,439
HI	21	134	1,478	32	98	21	11,729
ID	14	104	4,839	23	140	435	20,396
IL	55	991	1,438	324	14,820	170	143,752
IN	45	700	580	541	1,826	90	71,853
IA	15	184	512	43	1,379	155	32,604
KS	24	202	552	101	276	158	33,569
KY	39	1,005	353	1,947	386	74	50,237
LA	45	1,153	1,091	175	560	114	111,756
ME	369	293	215	90	84	34	13,380
MD	66	5,812	335	2,820	161	20	56,797
MA	1,110	903	454	148	228	25	52,152
MI	62	1,160	970	603	3,389	330	91,220
MN	24	261	1,140	50	6,211	165	44,545
MS	20	508	376	137	1,315	57	51,121
MO	57	613	1,263	225	1,154	262	78,182
MT	15	50	2,091	38	144	724	11,851
NE	10	158	464	34	229	600	22,399
NV	21	185	1,760	82	404	150	38,631
NH	1,271	192	88	36	64	16	11,717
NJ	84	2,775	318	396	212	20	66,793
NM	23	198	789	64	210	314	35,086
NY	1,166	7,479	1,034	612	803	61	186,218
NC	203	9,004	840	2,775	647	89	91,851
ND	1	22	287	22	156	121	7,132
OH	81	1,837	988	7,681	992	123	96,536
OK	38	359	887	157	352	262	48,091
OR	26	157	11,592	68	308	265	41,643
PA	179	3,232	628	2,005	555	115	86,884
RI	87	289	93	26	118	2	15,414
SC	114	2,068	401	913	339	60	56,367
SD	4	50	350	23	210	482	11,057
TN	170	3,999	924	1,033	1,609	125	98,431
TX	94	2,029	3,399	495	2,629	713	184,207
UT	21	224	1,378	60	140	693	22,072
VT	0	109	70	46	45	19	7,493
VA	101	0	404	3,120	286	48	62,953
WA	58	495	0	129	684	475	66,110
WV	39	3,161	130	0	109	31	28,800
WI	52	323	707	140	0	104	49,362
WY	8	50	434	26	96	0	9,807
Total	7,444	68,104	78,167	31,792	53,285	11,335	3,154,442

Table B.7. Medicaid Enrollment within the Same State Over Time, by State, Among Persons Enrolled in 2005

State	Medicaid Enrollment in 2005	Percent Enrolled One Year Later	Percent Enrolled One and Two Years Later	Percent Enrolled Two Years But Not One Year Later	Percent Not Enrolled One or Two Years Later
Alabama	954,121	87.75	68.84	1.48	10.78
Alaska	132,770	80.74	64.07	2.62	16.65
Arizona	1,474,262	78.65	61.81	3.49	17.87
Arkansas	743,666	86.40	73.62	1.45	12.15
California	10,592,869	79.16	61.39	1.98	18.85
Colorado	556,631	79.94	59.32	2.35	17.71
Connecticut	528,466	84.99	71.97	1.47	13.53
Delaware	179,910	84.14	69.93	2.05	13.81
District of Columbia	166,435	87.84	76.74	1.01	11.15
Florida	3,019,598	79.08	59.93	2.24	18.68
Georgia	1,836,905	78.24	58.96	2.19	19.58
Hawaii	231,617	85.21	72.23	1.53	13.26
Idaho	231,240	79.75	65.67	1.88	18.37
Illinois	2,411,772	82.24	70.73	1.72	16.04
Indiana	1,028,484	83.43	68.86	2.16	14.41
Iowa	428,268	82.67	67.53	2.31	15.01
Kansas	356,705	79.60	60.62	2.30	18.10
Kentucky	861,247	84.38	71.94	1.97	13.65
Louisiana	1,166,118	89.87	73.82	1.19	8.94
Maine	322,403	86.78	76.75	1.81	11.41
Maryland	858,970	83.99	69.33	1.89	14.13
Massachusetts	1,221,498	85.85	74.42	1.69	12.46
Michigan	1,857,500	85.42	72.57	1.95	12.63
Minnesota	764,114	80.91	66.36	2.45	16.64
Mississippi	778,416	84.96	67.39	1.66	13.39
Missouri	1,217,489	79.01	63.50	2.16	18.83
Montana	115,281	77.43	59.63	2.58	19.99
Nebraska	261,357	81.47	66.87	1.82	16.71
Nevada	267,831	68.21	47.21	2.56	29.23
New Hampshire	139,636	82.06	66.74	2.10	15.84
New Jersey	1,032,545	85.12	72.46	1.28	13.60
New Mexico	527,675	82.89	70.52	2.26	14.84
New York	5,012,359	85.23	70.56	1.62	13.15
North Carolina	1,601,161	83.53	69.48	2.19	14.28
North Dakota	74,617	77.96	60.97	2.73	19.31
Ohio	2,113,359	85.78	73.21	1.77	12.45
Oklahoma	725,817	83.79	70.26	2.12	14.09
Oregon	537,738	77.34	58.78	2.39	20.27
Pennsylvania	2,029,705	86.74	72.95	1.46	11.80
Rhode Island	219,783	86.79	74.19	1.08	12.13
South Carolina	1,012,082	81.20	66.11	1.58	17.22
South Dakota	127,000	83.08	68.73	2.15	14.77
Tennessee	1,593,780	81.72	70.59	1.29	16.99
Texas	4,095,308	80.01	64.26	3.30	16.68
Utah	309,239	71.58	49.22	2.95	25.48
Vermont	160,626	84.17	71.77	2.25	13.57
Virginia	883,800	84.70	69.25	1.66	13.64
Washington	1,199,307	82.35	66.42	2.01	15.65
West Virginia	382,998	84.40	71.13	2.02	13.59
Wisconsin	1,015,739	85.10	71.62	1.73	13.17
Wyoming	81,130	77.72	58.54	2.00	20.28
United States	59,441,347	82.24	66.82	2.01	15.75

Table B.8. Medicaid Enrollment within the Same State Over Time, by State, Among Persons Enrolled in 2006

State	Medicaid Enrollment in 2006	Percent Enrolled One Year Later	Percent Enrolled One Year Earlier	Percent Enrolled One Year Earlier and Later	Percent Not Enrolled One Year Earlier or Later
Alabama	966,828	80.23	86.60	67.94	1.11
Alaska	130,720	79.31	82.00	65.07	3.76
Arizona	1,464,443	79.32	79.18	62.22	3.73
Arkansas	756,083	85.28	84.98	72.41	2.15
California	10,611,352	79.35	79.03	61.29	2.91
Colorado	571,384	76.72	77.88	57.79	3.20
Connecticut	532,975	85.00	84.28	71.36	2.09
Delaware	184,529	83.43	82.04	68.18	2.72
District of Columbia	167,079	87.34	87.50	76.44	1.60
Florida	2,997,355	76.33	79.67	60.38	4.38
Georgia	1,758,708	76.14	81.72	61.59	3.73
Hawaii	231,503	84.32	85.25	72.26	2.69
Idaho	226,186	82.87	81.53	67.14	2.75
Illinois	2,379,769	85.29	83.34	71.68	3.05
Indiana	1,049,586	83.30	81.75	67.48	2.42
Iowa	466,852	82.14	75.84	61.95	3.97
Kansas	358,731	77.65	79.15	60.28	3.48
Kentucky	865,182	85.15	84.00	71.61	2.46
Louisiana	1,210,391	82.04	86.59	71.12	2.50
Maine	332,404	88.98	84.17	74.45	1.29
Maryland	855,586	83.09	84.32	69.60	2.19
Massachusetts	1,256,833	86.82	83.43	72.33	2.07
Michigan	1,938,100	85.32	81.87	69.55	2.36
Minnesota	778,066	80.73	79.46	65.17	4.99
Mississippi	773,358	81.34	85.51	67.83	0.99
Missouri	1,111,363	81.41	86.56	69.56	1.59
Montana	112,766	77.15	79.16	60.96	4.66
Nebraska	261,933	81.77	81.29	66.72	3.67
Nevada	254,706	71.24	71.73	49.64	6.67
New Hampshire	142,216	81.90	80.57	65.53	3.06
New Jersey	1,078,076	84.69	81.52	69.40	3.19
New Mexico	516,817	85.35	84.64	72.00	2.01
New York	5,020,581	83.58	85.09	70.44	1.77
North Carolina	1,673,440	83.00	79.93	66.47	3.55
North Dakota	74,290	77.14	78.31	61.24	5.80
Ohio	2,144,100	85.34	84.55	72.16	2.28
Oklahoma	758,678	83.88	80.16	67.21	3.17
Oregon	523,432	76.70	79.46	60.38	4.23
Pennsylvania	2,093,878	84.29	84.08	70.71	2.34
Rhode Island	221,049	85.93	86.29	73.77	1.54
South Carolina	949,377	82.79	86.56	70.48	1.12
South Dakota	128,536	82.90	82.09	67.91	2.92
Tennessee	1,478,963	86.71	88.07	76.07	1.30
Texas	4,142,849	79.37	79.10	63.52	5.06
Utah	300,106	69.68	73.76	50.72	7.28
Vermont	159,453	84.36	84.79	72.30	3.15
Virginia	907,318	82.30	82.50	67.46	2.66
Washington	1,191,316	81.56	82.90	66.86	2.41
West Virginia	392,575	84.33	82.34	69.39	2.73
Wisconsin	1,032,822	84.41	83.70	70.44	2.33
Wyoming	80,369	76.42	78.46	59.09	4.22
United States	59,615,012	81.73	82.00	66.62	2.89

Table B.9. Medicaid Enrollment within the Same State Over Time, by State, Among Persons Enrolled in 2007

State	Medicaid Enrollment in 2007	Percent Enrolled One Year Earlier	Percent Enrolled One and Two Years Earlier	Percent Enrolled Two Years But Not One Year Earlier	Percent Not Enrolled One or Two Years Earlier
Alabama	910,411	85.20	72.15	1.55	13.25
Alaska	126,169	82.17	67.42	2.76	15.07
Arizona	1,489,899	77.96	61.16	3.45	18.59
Arkansas	763,181	84.48	71.73	1.41	14.10
California	10,658,416	79.00	61.02	1.97	19.03
Colorado	560,648	78.18	58.90	2.33	19.48
Connecticut	537,785	84.24	70.72	1.45	14.32
Delaware	187,532	82.10	67.09	1.97	15.94
District of Columbia	169,529	86.08	75.34	0.99	12.93
Florida	2,833,322	80.75	63.87	2.39	16.86
Georgia	1,668,026	80.28	64.93	2.41	17.32
Hawaii	232,797	83.85	71.86	1.52	14.63
Idaho	229,467	81.68	66.18	1.90	16.42
Illinois	2,425,380	83.68	70.34	1.71	14.61
Indiana	1,068,427	81.83	66.29	2.08	16.09
Iowa	482,826	79.42	59.90	2.05	18.53
Kansas	352,744	78.97	61.30	2.32	18.71
Kentucky	879,311	83.78	70.46	1.93	14.29
Louisiana	1,155,236	85.95	74.52	1.20	12.85
Maine	356,895	82.87	69.34	1.63	15.50
Maryland	853,536	83.29	69.77	1.90	14.81
Massachusetts	1,300,446	83.91	69.90	1.59	14.51
Michigan	1,957,334	84.48	68.87	1.85	13.67
Minnesota	799,036	78.61	63.46	2.34	19.05
Mississippi	742,354	84.73	70.67	1.74	13.53
Missouri	1,074,539	84.20	71.95	2.44	13.36
Montana	110,456	78.76	62.24	2.69	18.55
Nebraska	261,493	81.90	66.83	1.82	16.28
Nevada	258,108	70.30	48.99	2.66	27.04
New Hampshire	144,353	80.69	64.56	2.03	17.28
New Jersey	1,106,160	82.54	67.64	1.20	16.26
New Mexico	528,420	83.48	70.42	2.26	14.26
New York	4,941,648	84.92	71.57	1.64	13.44
North Carolina	1,706,705	81.38	65.18	2.05	16.57
North Dakota	73,345	78.13	62.03	2.78	19.09
Ohio	2,159,656	84.72	71.64	1.73	13.54
Oklahoma	780,524	81.54	65.33	1.98	16.49
Oregon	508,178	79.00	62.19	2.53	18.47
Pennsylvania	2,090,884	84.41	70.81	1.42	14.17
Rhode Island	217,863	87.19	74.84	1.09	11.72
South Carolina	917,162	85.70	72.95	1.74	12.56
South Dakota	129,757	82.12	67.27	2.10	15.78
Tennessee	1,467,120	87.41	76.69	1.40	11.20
Texas	4,241,284	77.53	62.05	3.19	19.28
Utah	288,269	72.54	52.80	3.16	24.30
Vermont	159,203	84.49	72.42	2.28	13.24
Virginia	911,814	81.89	67.13	1.61	16.50
Washington	1,180,341	82.32	67.49	2.04	15.64
West Virginia	396,660	83.46	68.68	1.95	14.59
Wisconsin	1,031,168	84.55	70.55	1.70	13.75
Wyoming	77,768	78.97	61.07	2.08	18.94
United States	59,503,585	81.88	66.75	2.00	16.11

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