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Report to the Chairman, Information, Justice, Transportation and Agriculture Subcommittee, Committee on Government Operations, House of Representatives

August 1993

ILLEGAL ALIENS

Despite Data Limitations, Current Methods Provide Better Population Estimates

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Program Evaluation and
Methodology Division

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The Honorable Gary A. Condit
Chairman, Information, Justice,
Transportation and Agriculture Subcommittee
Committee on Government Operations
House of Representatives

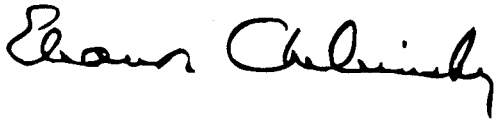
Dear Mr. Chairman:

At your request, we examined methods for estimating the size and flow of the illegal alien population in the United States. These methods have been improved since our previous report in 1982, providing a narrower range of estimates of the size of the illegal alien population. A number of limitations on the available data remain, however, which hinders more precise estimation.

We are pleased to send you our report. As we agreed with your office, unless you publicly announce its contents earlier, we plan no further distribution of this report until 30 days after its issue date. At that time, we will send copies of the report to other interested congressional committees, the Attorney General, the Secretary of Commerce, and the Secretary of Health and Human Services. We will also make copies available to others upon request.

If you have any questions or would like additional information, please call me at (202) 512-2900 or Robert L. York, Director of Program Evaluation in Human Services Areas, at (202) 512-5885. Other major contributors to this report are listed in appendix VI.

Sincerely yours,



Eleanor Chelimsky
Assistant Comptroller General

Executive Summary

Purpose

The presence of illegal aliens in the United States affects a wide range of social issues such as education, health care, urban planning, population estimates, and law enforcement. The Immigration and Naturalization Service (INS) has no separate data system for routinely counting the size of the U.S. illegal alien population or its total annual flow. Consequently, researchers use multiple data sources to estimate this hidden population and can measure only part of the total flow in any period.

The Chairman of the Information, Justice, Transportation and Agriculture Subcommittee of the House Committee on Government Operations asked GAO to address this measurement issue. To do so, GAO (1) identified the main methods for estimating the illegal alien population, (2) evaluated these methods, (3) combined estimates with other data to narrow the range of estimates, and (4) identified how the illegal alien population can be measured more accurately.

Background

The large volume and complexity of the movement of persons to and from the United States makes administering the nation's immigration laws a formidable task. INS inspected an estimated 455 million entries of persons legally moving across the nation's borders through its ports of entry in fiscal year 1991, and the U.S. Border Patrol made over 1.1 million apprehensions of deportable aliens (including those apprehended more than once).

The Immigration Reform and Control Act of 1986 (IRCA) reduced the size of the illegal alien population through a series of legalization programs. Also, to deter the future inflow of illegal aliens, IRCA authorized INS to penalize employers knowingly hiring illegal aliens and to strengthen enforcement along the borders. Assessing how well this and related legislation are working requires methods and data adequate for providing reasonably accurate estimates of the size and flow of the illegal alien population. To address these issues, GAO surveyed the relevant literature, consulted with an expert panel, and obtained and analyzed existing data from federal agencies and private researchers.

Results in Brief

During the 1980s, the methods used to measure the size and flow of the illegal alien population were refined so that they now produce a narrower range of estimates than was the case in GAO's 1982 evaluation.[1] A method

[1]See Problems and Options in Estimating the Size of the Illegal Alien Population (GAO/IPE-82-9, Sept. 24, 1982).

developed by the Census Bureau, for example, has narrowed the range of estimates of the total number of illegal aliens from the 1 million to 12 million speculated to be the total in the late 1970s to a range of 1.7 million to 5.5 million in 1990. By combining this estimate with data from the 1990 Mexican census, GAO further narrowed the likely estimate of the size of the illegal alien population to a maximum of 3.4 million.

Estimates of the gross annual inflow of illegal aliens are less certain. For example, based on two separate INS data sources, the total inflow in 1988 was estimated to be 2.3 million. However, owing to high potential error in estimation, GAO believes the actual inflow could have ranged from 1.3 million to 3.9 million. The main reason that this inflow of illegal aliens does not produce a larger illegal alien population is that much of it represents short-term visits to the United States.

Principal Findings

GAO identified five national-level illegal alien estimation methods: three for estimating the size of the population and two for the flow.

Problems in Estimating the Number of Illegal Aliens

GAO found that the methods in use have improved since its evaluation in 1982. Indeed, GAO's earlier work found that the range of estimates of the illegal alien population—1 million to 12 million—was too broad for policy purposes. Now, however, GAO can report that more recently published estimates are in a much narrower range and that a likely maximum is about 3.4 million. Further confidence could come through improving the quality of information used to make estimates. Currently, data limitations include lack of information on: (1) the legal status of members of the foreign-born population, (2) the geographic distribution of illegal aliens, (3) the size of the illegal alien population uncounted by the Census Bureau, (4) the birth and death rates of the foreign-born population, (5) whether the special agricultural worker applicants under IRCA are being counted by the Census Bureau, (6) the exact emigration of legally resident aliens, and (7) the inconsistencies between the decennial census and the Current Population Survey.

The Census Bureau has had no way to estimate separately the geographic distribution of either the legal or illegal alien population since 1980. Recent data from INS on permanent residents and those legalizing under IRCA, combined with data on the foreign-born from the 1990 census, could help point out where large numbers of foreign-born persons (including

illegal aliens) are settling. This information could be important, for example, to directing federal resources to particular localities.

Vital statistics on the foreign-born persons in the United States show some potential for measuring changes in the total foreign-born population. However, the estimates are sensitive to the assumed birth and death rates that apply, and currently, data on these rates are only sporadically available for foreign-born groups. The currently used estimate of foreign-born emigration is based on INS legal resident data collected before 1981 and research from the 1960 and 1970 censuses and needs to be updated. Also, the extent to which the special agricultural worker population has settled in the United States is unknown.

Problems in Estimating the Flow of Illegal Aliens

The problems hindering estimates of the flow of illegal aliens relate to (1) data problems with the Nonimmigrant Information System, which is used to record aliens arriving in the United States legally for temporary periods; (2) the volume and length of stay of nonimmigrant aliens who remain here beyond their legal periods of admission; and (3) the inflow volume, time between entry attempts, length of stay, and the probability of INS apprehension of those attempting illegal entry along the southern border.

INS' Nonimmigrant Information System processes data on nearly 20 million arrivals annually and suffers from lost records in 1990 and large errors through the noncollection of departure records. The magnitude of this error has been estimated but is not known precisely. Because of data processing problems, INS was unable to make a 1990 flow estimate based on nonimmigrant arrival data.

GAO found that using INS apprehensions data as a proxy for the inflow of illegal aliens is problematic. A drop in the number recorded may result from fewer entry attempts because aliens are remaining here for longer periods, fewer persons are actually attempting entry, or the U.S. Border Patrol is less productive or has fewer resources with which to operate. Survey data suggest that there is a mobile part of the labor force that lives only temporarily in the United States. The exact proportion of this population counted by the Census Bureau is unknown, which inhibits accurate estimation of this hidden population. Overall, measurements of the inflow of illegal aliens are less certain than those of the size of this population.

Recommendations

To meet the requirements of the Immigration and Nationality Act to provide information useful in evaluating the social, economic, environmental, and demographic impacts of immigration laws and in estimating the geographic distribution of illegal aliens, GAO recommends that the Commissioner ensure that INS: (1) further explore ways in which Census Bureau data can be used to improve information on the foreign-born population, including illegal aliens and special agricultural workers; (2) work with the Census Bureau to improve coverage of the foreign-born in the Current Population Survey, including more questions on emigration; (3) work with the Secretary of Health and Human Services to examine the potential for researching the birth and death rates of the foreign-born population by major source countries; (4) improve departure form collection and quality control of the Nonimmigrant Information System data base; (5) regularly determine the volume of long-term overstaying by illegal aliens through repeated tabulations with appropriate adjustments; and (6) provide timely statistical tabulations from the Software Assisted Screening System on illegal aliens attempting entry, to the extent that this system, which is used to identify criminal aliens, is implemented in INS Border Patrol sectors.

Agency Comments

Officials in the Departments of Justice, Commerce, and Health and Human Services reviewed a draft of this report. In principle, they concurred with GAO's recommendations. Justice and Commerce, however, disagreed with directing all of the action recommendations to INS rather than the agencies charged with collecting specific data. But, since INS has specific statutory responsibility for providing information on immigration, and since mechanisms exist for cooperation with the other agencies in collecting data needed to meet this responsibility, GAO believes that its recommendations are properly targeted. Justice and Commerce also made numerous detailed comments on GAO's work, especially the analyses in chapter 4. These have been addressed throughout the report, as appropriate. Chapter 5 contains a discussion of agency comments and our evaluation of them.

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Abbreviations

CPS	Current Population Survey
HHS	Department of Health and Human Services
INA	Immigration and Nationality Act
INS	Immigration and Naturalization Service
IRCA	Immigration Reform and Control Act
NCHS	National Center for Health Statistics
NIIS	Nonimmigrant Information System
SAW	Special agricultural worker

Introduction

Illegal aliens are of concern to law enforcement officials, urban planners, and policymakers, first, because they are lawbreakers, but also because their presence affects a wide range of issues at the local, state, and federal levels. These issues include the employment of U.S. workers, the maintenance of border control, changes in the country's ethnic composition, and the potential exploitation of the illegal aliens themselves. Illegal aliens also can represent an unpredictable demand for additional housing, employment, health care, schooling, access to public services, and so forth.

Yet, illegal aliens who seek political freedom or a way to better themselves economically often receive much sympathy and support from political leaders and the American people. One basic reason is that the image of the United States as a country where a lone, penniless immigrant can become successful through hard work is, for many, a universal symbol of the merits of self-reliance, and the opportunity for immigrants to begin life anew remains real and viable, as well as a cherished concept. Another reason is that most people in the United States today are descended from immigrants, and this creates continued sympathy for those who remind us of our forebears' struggles.

The popular image of an illegal alien as a young Mexican male crossing the U.S.-Mexico border illegally to find a job harvesting crops is unrealistically narrow.[1] Mexicans do make up the majority, but the illegal alien population, in fact, is extremely diverse. In November 1989, the Census Bureau estimated that of 2.1 million illegal aliens in the country, 1.1 million (53.7 percent) were females and 406,000 (19.8 percent) were born in countries other than Mexico (Woodrow, 1991b, 1992). This illegal alien population, in fact, is constantly changing because there are many ways to violate the nation's immigration laws and there is a tremendous movement of aliens (legal permanent residents and illegal aliens) in and out of the United States.[2]

Background

Each year from 1985 to 1990, the State Department issued between 5.8 million and 8.7 million nonimmigrant (temporary) visas resulting in

[1]Mexican nationals constituted 69.8 percent of the 1.8 million applicants for legal status under the general provisions and 81.6 percent of the 1.3 million applicants under the agricultural provisions of the Immigration Reform and Control Act (IRCA).

[2]It is inaccurate to think of legal status as static, because there can be considerable movement between statuses. For example, an alien can legally enter the United States under a student visa (as a temporary nonimmigrant) and later drop out of school but remain here (as an illegal alien). Such an alien could later acquire legal immigrant status by marrying a U.S. citizen.

between 9 million and 18 million legal admissions to the United States through its ports of entry. In 1991, there were also 455 million entries mainly of alien and U.S. citizen "commuters" living in Mexico or Canada and working in the United States. These persons travel legally across the borders, often on a daily basis. Compared to nonimmigrants, there were relatively few permanent resident aliens.[3] They generally have numbered between 600,000 and 800,000 annually in recent years.[4]

To ensure that aliens are legally admissible, the law requires INS to inspect the documentation of potential entrants before granting them entry to the United States. It is only within the legal context of this enforcement process that the term "illegal alien" is meaningful.

Definition of an Illegal Alien

An "illegal alien" is any person not a citizen or a national of the United States who is here in violation of U.S. immigration laws.[5] Such an alien may have entered (1) illegally, without INS inspection (undocumented) or using fraudulent documentation; (2) legally, under a nonimmigrant visa or other condition (such as asylum), but having subsequently violated the visa's terms (visa abuser) or other terms of entry; or (3) as a legal permanent resident. The third case may involve someone who commits a crime after entry and is found guilty after due process of law and becomes subject to an order of deportation or voluntary departure, but fails to depart.[6] The number of illegal aliens in the United States at any given time is known only to the extent to which they can be identified by various methods used to measure or estimate their unauthorized presence or activities. At this time, INS is the primary federal agency responsible for determining an alien's legal status.

Estimating the Illegal Alien Population

The size and distribution of the illegal alien population has always been difficult to measure. Ordinarily reliable methods cannot be used for a variety of reasons. Among them are: (1) a sampling frame from which to draw a statistically representative sample has not been developed; (2) a

[3]An "immigrant" is "an alien admitted for legal permanent residence in the United States," according to the Immigration and Naturalization Service (INS) definition under current law, but we recognize that others may use this term to refer to all aliens regardless of legal status. In this report, we use the term "legal permanent resident" to refer to those with the right to reside permanently in the United States.

[4]These figures do not include those acquiring permanent resident status under the provisions of IRCA.

[5]The term "national of the United States" means a U.S. citizen or a person who, though not a U.S. citizen, owes permanent allegiance to the United States.

[6]Many terms have been used to describe illegal aliens, such as "illegal immigrants," "illegal migrants," "undocumented aliens," and "undocumented immigrants." For consistency, we only use the term "illegal aliens" in this report.

direct question on legal status, except under the strictest assurances of confidentiality, is not likely to produce valid data; and (3) illegal aliens are a hidden population with powerful incentives to remain undetected (although there also are reasons for them to respond, including documenting their presence in anticipation of a legalization program and not wanting to draw attention to their nonresponse).

Consequently, researchers primarily use indirect analytic techniques to measure or estimate the number of illegal aliens. These techniques have led to varying estimates. For example, in 1975, INS estimated that the illegal alien population numbered from 4 million to 12 million. In 1979, the U.S. Select Commission on Immigration and Refugee Policy put the number at between 2 million and 12 million, although a paper prepared for the Commission provided an empirical estimate of 3 million to 6 million (Levine, Hill, and Warren 1985; Siegel, Passel, and Robinson, 1980).[7] These estimates were so wide-ranging as to be less than useful to support immigration policy. Methods developed more recently may allow for more precise measurement of this population, but they need to be evaluated to determine whether they can be reliably used to estimate the size and flow of the illegal alien population, overall or by major types. The present study was designed to conduct such an evaluation.

When considering measures of the illegal alien population, researchers must keep in mind how the information is going to be used by policymakers, public officials, and others. If the data are to be used primarily to improve overall population estimates, then national-level information may be adequate. However, if the information is needed to gauge the impact of illegal alien flows and settlement within communities, then data on the aliens' geographic area of settlement, occupation, age, sex, income, and service use may be needed. As discussed in chapter 2, this latter type of data is potentially more valuable yet much more difficult to obtain.

In 1982, we conducted an evaluation of then-available estimates of the illegal alien population and assessed the potential of methodologies used to estimate other hidden populations for their applicability to illegal aliens (GAO/IPE-82-9, Sept. 1982). At that time, we concluded that making precise estimates of the illegal alien population with these methods required better information. Also, estimates of the size and growth of the illegal alien population were then unsatisfactory for policy-making. The present evaluation, therefore, was also designed to report any improvements made

[7]Other estimates at this time had low-end ranges down to 1 million.

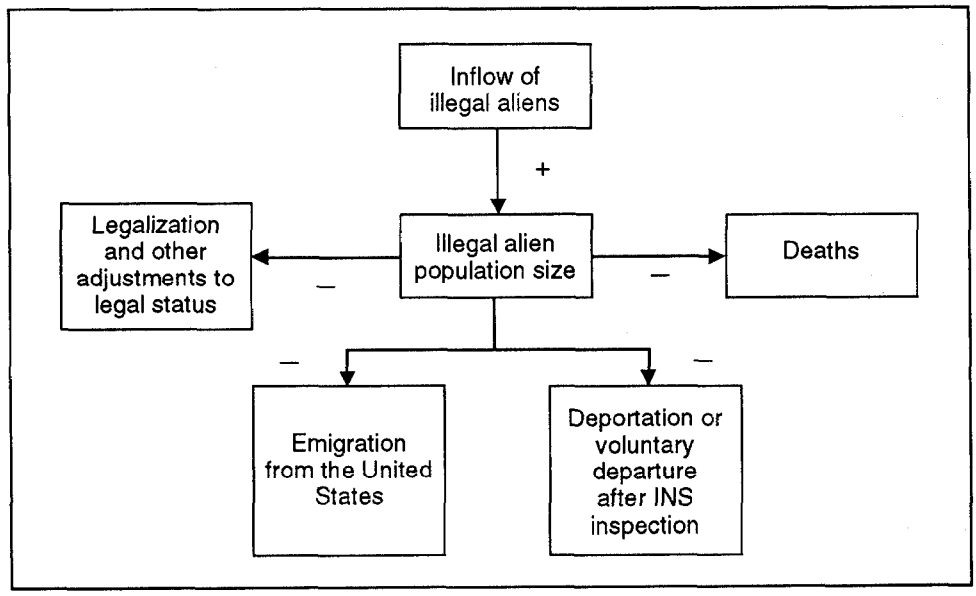
since that time and to examine the components of the illegal alien estimation methodologies themselves more closely.

Defining Size and Flow

The size of the illegal alien population is defined as the total number of illegal aliens residing in the United States at any given time. The flow, however, refers to the movement of illegal aliens into and out of the country. More precisely, the gross inflow is the total number of entries into the United States by illegal aliens in a given time period (usually a year) without regard to later return migration, multiple entries, adjustment to legal permanent residence, or other change from illegal status. By contrast, the net inflow reflects the number of persons entering the United States illegally (taking into account multiple entries).

Figure 1.1 indicates the relationship between the size and flow of the illegal alien population. The population grows when the inflow exceeds the loss through legalization or other adjustment of status, death, return migration, and deportation or voluntary departure after apprehension by the INS. Note that the population cannot grow through births, since under current law, all those born in the United States, regardless of the legal status of their parents, are U.S. citizens at birth.

Figure 1.1: Relation Between the Size and Flow of the Illegal Alien Population



Objectives, Scope, and Methodology

The four specific questions addressed in this report are:

- What methods have been used to measure or estimate the illegal alien population?
- How valid and reliable are the data used by these methods, and how sound and appropriate are the analytic techniques and the assumptions of each technique used in producing each estimate?
- What are the current size and flow of the illegal alien population?
- What data collection or methodological changes, if any, can contribute most to improving the measures or estimates of the size and flow of the illegal alien population?

We answered these questions by (1) identifying relevant methods used to make estimates of the national-level size and flow of the illegal alien population; (2) evaluating the methods, with the assistance of experts, including those who developed or used one or more of the methods; and (3) conducting an evaluation of recent estimates to quantify what is known about the size and flow of the illegal alien population now. The data we used came from published and unpublished estimates of the illegal alien population, public-use tapes on the applicants for legalization under the Immigration Control and Reform Act, ethnographic studies funded by the Census Bureau, and selected information from a survey sponsored by INS and conducted by Westat, Inc., of the population seeking legalization under IRCA (see Department of Justice, 1990). We also used data on the vital statistics of the foreign-born residing in the United States from 1983 to 1989 from the National Center for Health Statistics (NCHS), INS apprehensions data, calculations from the INS Nonimmigrant Information System (NIIS), and the 1990 Mexican census.

Strengths and Limitations of Our Approach

The main strength of our approach is that an analysis and comparison of the five main methods of estimating the illegal alien population helps point out which parts of this population can be counted and which are more difficult to measure. Our expert panel of researchers provided a thorough examination of the relevant issues and data problems involved. In our evaluation of the methods, we developed ranges around the estimates and specified their measurement precision.

The major problem we encountered is the inherent lack of certainty in the measurement and estimation of any hidden population; accurate data will be difficult to obtain as long as a population has the desire to remain hidden. However, using multiple methods can help to reduce the

uncertainty of the estimates, at least to some degree, especially if there is consistency across methods, and it should also help clarify the uncertainties that remain.

Our work was performed between September 1991 and December 1992 in accordance with generally accepted government auditing standards.

Organization of This Report

In chapter 2, we present information on the methods used to estimate the size of the illegal alien population, answering the first two evaluation questions involving data validity and reliability and assumptions and analytic techniques. Chapter 3 answers these first two evaluation questions as they relate to the flow estimation methods. Chapter 4 summarizes the latest available estimates on both the size and flow of the illegal alien population (question 3) and adjusts them to possible maximums. We answer the final evaluation question in chapter 5 by presenting information on what changes could be made to improve estimates in the future. Also in chapter 5, we provide our recommendations and discuss agency comments on our report and our evaluation of them.

Quality of the Data and Methods Used to Estimate the Size of the Illegal Alien Population

In this chapter and the next, we answer our first two evaluation questions: (1) What methods have been used to measure or estimate the illegal alien population? (2) How valid and reliable are the data used by these methods, and how sound and appropriate are the analytic techniques and the assumptions of each technique used in producing each estimate?

We have divided this discussion into two chapters so that we can focus separately on methods designed to address two quite different sets of problems. The methods reviewed in this chapter have been developed to estimate the size of the illegal alien population; that is, the number of illegal aliens in the United States at a given time. The methods discussed in chapter 3 have been designed to estimate the flow of illegal aliens; that is, the number of illegal aliens entering the United States over a given period of time, usually a year. Treating size and flow estimation methods separately allows us to provide a clearer exposition of the measurement and analysis issues involved than would be the case otherwise.

We address these evaluation questions based on our literature review, discussions with an expert panel, and separate examination of each technique and by comparing the estimates and the assumptions upon which they are based with each other and with independent data. We present the three main size estimation methods used: the residual method, the death registration method, and the sex ratio method. For each, we discuss the logic underlying the method and assess the data and analysis limitations. Table 2.1 summarizes the populations covered and the assumptions made in each method.

Table 2.1: Methods for Estimating the National-Level Size of the Illegal Alien Population

	Method		
Method characteristic	**Residual[a]**	**Death registration[b]**	**Sex ratio[c]**
Population covered[d]	Illegal aliens counted in the decennial census or Current Population Survey	Total foreign-born population (legal and illegal)	All emigrants from Mexico (legal and illegal)
Key assumptions	The difference between the counted foreign-born population and the estimated legally resident population is the counted illegal alien population. Those not reporting country of birth are allocated according to the known country of birth distribution. Emigration of the foreign-born is 133,000 annually. Assumptions about the number of special agricultural workers counted vary.	U.S. mortality rates apply for the foreign-born. Registered deaths are a consistent measure of the foreign-born population. All those foreign-born persons dying are residents of the United States.	Most Mexicans not accounted for in the Mexican census or its estimate of undercount are in the United States. Total migrant stream is 60-65 percent male and 60-65 percent aged 15-39. There is a 2- to 4-percent higher undercount for males in the Mexican census.

[a]See Woodrow and Passel (1990).

[b]See Borjas, Freeman, and Lang (1991).

[c]See Bean, King, and Passel (1983).

[d]Population intended to be measured.

Key Terms Used in This Report

Validity and Reliability

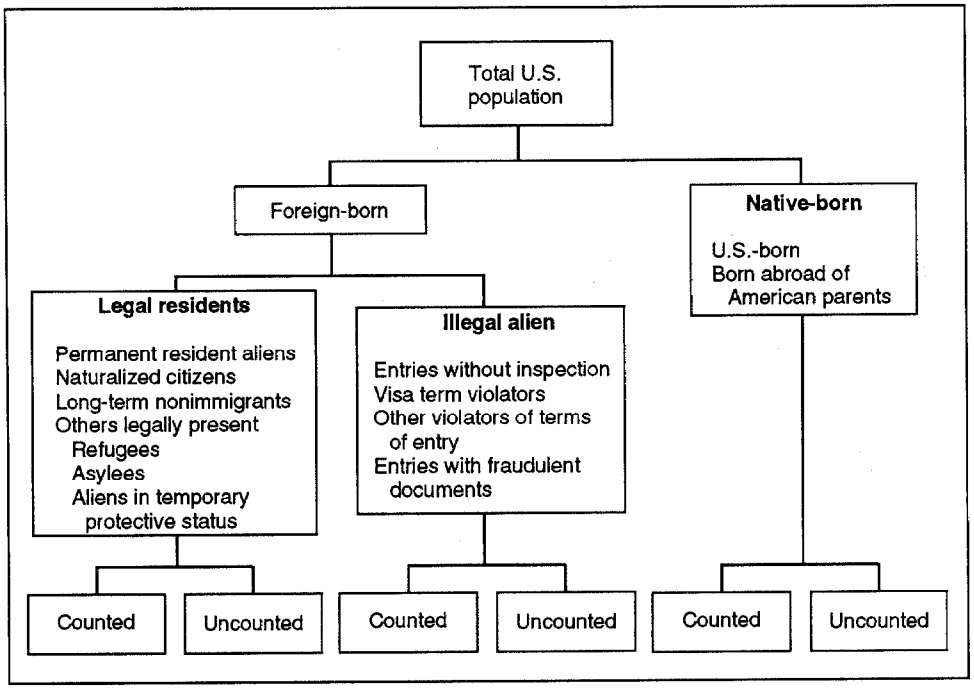
In this report, we refer to validity as face validity; that is, a judgment by experts about whether the measurement instrument measures what it purports to measure. Face validity is improved through reducing systematic error or bias in the measurement instrument. Where possible, we check for predictive validity; that is, whether the measurement instrument predicts what actually occurs when compared to a criterion set of data. By reliability, we refer to the consistency of a measure or the ability of the measurement instrument to detect the same entity consistently over time. Reliability is affected by the presence of random measurement error and the measurement precision of the instrument.

Counted and Uncounted

Throughout the report we also refer to "counted" and "uncounted" populations. The former refers to those about whom the Census Bureau actually records information in the decennial census or in a survey. The latter refers to those missed (not counted) in such data collection. This is an important distinction in any study that attempts to measure a population that seeks to remain hidden, because information on those not counted must be estimated.

Figure 2.1 helps to explain these terms. The figure provides a schematic of the components of the U.S. population by nativity (whether U.S.- or foreign-born) and legal resident status. For our purposes, all native-born persons are assumed to be legally resident, so that illegal aliens constitute a subset of the foreign-born component of the population: those entering without INS inspection, those violating the terms of their immigrant or nonimmigrant visas or other terms of entry after legal admission, and those entering with fraudulent documents.

Figure 2.1: U.S. Population by Nativity, Legal Resident Status, and Whether Counted by the Census Bureau



The figure clearly identifies that there are counted and uncounted portions of each component. As already explained, these terms denote whether an

individual was counted as part of the decennial census or the Current Population Survey (CPS), each of which is conducted by the Census Bureau. But the distinction is not simple. First, both census and CPS data apply to housing units enumerated by the Census Bureau—persons in missed units are not counted. Second, within enumerated housing units, some persons may be missed; illegal aliens in particular may not wish to be reported to a federal government agency. The 1990 Post-Enumeration Survey, conducted following the census, determined that about 1.3 percent of the U.S. population were missed through missing the entire housing unit, and about 2 percent were missed in enumerated housing units.[1]

Third, data on nativity from both the census and CPS are based on samples. The CPS, conducted monthly, uses a sample of approximately 70,000 units, of which about 56,000 are occupied households.[2] For the census, all enumerated housing units are surveyed, but the question on nativity is included only on the long form administered to a sample averaging 1 in 6 households nationally in 1990, though the proportion was higher in some areas. The census data on the foreign-born, therefore, include sampling error. But because the CPS is based on a much smaller sample size, it has a much higher sampling error and less detailed geographic coverage than the census. Throughout this report, then, when we refer to the "counted" illegal alien population, we will be referring to an estimate of the number of illegal aliens in housing units enumerated by the Census Bureau.

The Residual Method

The residual method uses Census Bureau and INS data to arrive at an estimate of the number of illegal aliens who have established residence in the United States. It estimates only those counted as residents in the decennial census or CPS and, hence, underestimates the total illegal alien population. (However, by making assumptions about the likely undercount in the census, an estimate for the uncounted can be derived to permit estimation of the total illegal alien population. We discuss this in detail in chapter 4.) The residual method is especially important because estimates derived using it are incorporated into both the death registration and the sex ratio estimates.

The residual estimates of the size of the illegal alien population are presented in table 2.2. Here, the number of illegal aliens is estimated to

[1]These rates refer to gross omissions but do not account for erroneous enumerations (see Hogan, undated).

[2]The remaining approximately 14,000 units consist primarily of empty housing units and other structures not permanently occupied.

equal the total counted foreign-born population, less the estimated number of foreign-born legal residents. Note the substantial drop of 1.2 million from nearly 3.2 million in 1986 to under 2 million in 1988, reflecting in part the change in status of over 1.7 million applicants for legalization under the pre-1982 provisions of IRCA. The fact that the number of persons legalized is larger than the decline in the estimated illegal alien population may reflect in part the difficulty of accounting for those who applied for legal status under the special agricultural worker (SAW) provisions of IRCA.[3] The Census estimates in table 2.2 assume these persons are not resident in the United States, given their high rates of mobility and reliance on seasonal employment. But as discussed below, the actual coverage of SAWs in the census and CPS is unknown.

Table 2.2: Residual Estimates of the Counted Illegal Alien Population[a]

	Type of foreign-born population		
Estimate date	Estimated legal residents[b]	Estimated counted illegal aliens (residual)	Total counted residents[b]
1979	7,036	1,724	8,760
1980	7,173	2,057	9,230
1983	7,855[c]	2,093[c]	9,949[c]
1986	9,911	3,158	13,069
1988	12,393	1,986	14,379
1989	13,104	2,050	15,154

[a]From 1979-89 for years when data were available; estimates in thousands.

[b]All foreign-born persons entering the country since 1960 and Mexican-born persons entering before 1960.

[c]All foreign-born persons aged 14 and over entering since 1960 and Mexican-born persons aged 14 and over entering before 1960.

Source: Woodrow (1990, 1992), Woodrow and Passel (1990), Passel and Woodrow (1987) and Warren and Passel (1987).

Logic of the Method

The residual method estimates the number of illegal aliens by subtracting an estimate of the legally resident foreign-born population from the total foreign-born population estimated in the decennial census or the CPS. The result is a "residual" that represents an estimate of the counted illegal alien population.

[3]These provisions allowed illegal aliens who met certain requirements based on having worked in U.S. agriculture for specified periods of time to apply for permanent resident status.

The residual method is illustrated using the following equation: I = F - L, where I is the estimated counted illegal alien population, F is the counted foreign-born population, and L is an independent estimate of the total legally resident foreign-born population. L is constructed based on 1980 INS data (the latest available) obtained from the Alien Registration Program, adding estimated legal immigration from INS permanent resident files and subtracting estimated emigration of foreign-born persons.

Once the legal resident alien population is calculated for the appropriate time period, it is subtracted from the decennial census or the CPS total foreign-born estimate as modified for misreporting of nativity and for unknown country of birth. Only to the extent to which the counted foreign-born population exceeds that expected based on the INS Alien Registration data base and immigrant arrivals will illegal aliens be measured by this method. The excess foreign-born is a "residual" that combines both an estimate of the illegal alien population counted by the Census Bureau and the total error in estimation.

This method is applied separately for major foreign countries to produce aggregate totals by country of birth, age, and year of entry, but it cannot be used to examine other characteristics of the illegal alien population, such as occupation, income, or the use of government services. As for the geographic distribution of the illegal alien population, this was estimated for 1980, when data on the residence of legal aliens were last available from INS (Passel and Woodrow, 1984). Since that time, the emigration and internal movement of legal resident aliens in the United States has been unrecorded, and hence, their distribution in the years after 1980 is not known. The residences of the counted illegal alien population in the census can be determined accurately only to the extent to which the reported residences of those in the legal resident alien data base are accurate. (See appendix I for an assessment of the predictive validity of the residual method in terms of age and geographic distribution.)

Data and Analysis Limitations

The Census Bureau attempts to collect data from all housing units sampled, and their question on country of birth measures the population of which illegal aliens are a subset. These data, when used in the residual method, should provide reasonably sound empirical estimates of the counted illegal alien population. However, the exclusion of persons uncounted and the inability to determine directly the legal status of the foreign-born population weaken these estimates. Complicating the estimates is the uncertainty of the resident status of those applying under

the SAW provisions of IRCA. These individuals may have adopted year-round residence in the United States and moved out of seasonal agricultural work into other types of employment. To the extent they have done so, the illegal alien population will be overestimated because the legally resident foreign-born will be underestimated.

Uncounted Illegal Aliens

The undercount problems of the Census Bureau could be especially severe where illegal aliens are concerned. These errors occur because aliens in violation of the law—the entity measured—have incentives to avoid contact with government authorities. We discuss this problem more thoroughly in chapter 4.

Legal Status of the Foreign-Born

The Census Bureau does not ask in either the decennial census or the CPS a direct question on the legal status of foreign-born persons. Such a question may be considered intrusive and would be expected to both lower response rates and weaken the data for other purposes.

The 1980 INS Alien Registration data constitute the base from which all subsequent legally resident foreign-born estimates have been derived. This data system has two problems: first, it was not designed to make population estimates, and second, it involves self-reporting by aliens using a form mailed to INS. Errors are likely even though the system was carefully adjusted for underreporting. Moreover, the data are out of date.

Currently, INS maintains information on aliens in its Central Index computerized data base. This system records and identifies individual immigrants when they obtain permanent resident status, become naturalized citizens, are apprehended, or have other contact with the agency. There is no removal of records following death or emigration; hence, it differs in this respect from the Alien Registration data base.[4]

Emigration From the United States

Error in estimating the level of emigration since 1980 would directly affect the illegal alien estimates. The residual method uses estimates of the total foreign-born and the legally resident foreign-born populations to derive estimates of the illegal alien population; thus, researchers need to know how many of those granted legal resident status actually were in the United States at the time the estimate was made. If the number of such emigrants was larger than assumed, the number of illegal aliens would be underestimated.

[4]Currently the Central Index System contains 33 million records including all those aliens on whom INS has created files since automating its recordkeeping system.

The current estimate of foreign-born emigrants leaving the United States annually is based on research measuring the annual change in the Alien Registration files last collected in 1980 and on estimates derived from changes between the 1960 and 1970 decennial censuses. Based on these sources, the Census Bureau estimates that 133,000 of the foreign-born emigrate annually. In July 1987, June 1988, and November 1989, CPS asked supplemental questions on the emigration of relatives of persons residing in the United States to evaluate this currently used level of emigration. They provided estimates during the 1980s of from 1 million up to 2.5 million emigrants (U.S.- and foreign-born), depending on sampling coverage and response errors (Woodrow, 1991a). This range suggests a need for better information on emigration.

SAW Population

Those adjusting their status under the SAW provisions of IRCA can reside permanently as legal residents. However, the extent to which they actually reside in the United States is unknown because the census does not identify legal status. The Bureau makes estimates based on various assumptions about the number of SAWs included in the CPS, and the point estimate of 3.3 million illegal aliens in 1990 assumes SAWs are not counted, largely because of their suspected high rates of residential mobility and possible return to Mexico.[5] However, if in fact they are being counted, then the estimates of the legally resident foreign-born are too low. As a result, part of the foreign-born counted by the Census Bureau and assumed to be illegal aliens actually would be legal residents, resulting in an overestimate of the illegal alien population. We do not know to what extent this is the case. In addition, there are numerous categories of aliens, such as foreign students, asylees, and parolees; those under temporary protected status; and persons residing under color of law, who are in the United States legally. However, the length of stay of these aliens is uncertain and complicates estimating the foreign-born legally resident population.

Total Errors

When estimates of all quantifiable errors (including sampling error) are taken into account, the maximum possible uncertainty surrounding the residual estimates of the size of the illegal alien population is substantial. One study based on the 1980 decennial census found that taking account of all sources of error resulted in an extreme range of 0.7 million to 3.4 million illegal aliens counted in that year. This range assumed the maximum likely error for each source in either direction; more reasonable assumptions resulted in a smaller range of 1.6 million to 2.6 million counted illegal aliens (Passel, 1991).

[5]Mexican nationals constituted 82 percent of the 1.3 million applicants under the agricultural provisions of IRCA.

The Death Registration Method

The death registration method is the only identified procedure to estimate nationally representative numbers of all foreign-born persons in the United States (including illegal aliens). It uses registered death data for this purpose. This method, used in combination with the residual method, could overcome a limitation of the latter; that is, its failure to provide an estimate of uncounted illegal aliens. Those foreign-born persons not represented in the decennial census and CPS may more likely be illegal aliens than legal residents.[6] However, researchers must also have an independent estimate of the number of foreign-born residents from the decennial census or CPS in an equivalent time period to determine the vital statistics rates before the estimate can be made.

The regular collection of data on country of birth and age by the National Center for Health Statistics (NCHS) since 1984 has allowed the development of this method. Published estimates using this method exist only for the Mexican-born population; however, in principle, it can be used to estimate those from the other countries as well.[7]

Using this method with mortality data for 1984, researchers estimated that there were 3 million total Mexican-born persons in the United States in 1980, 1.8 million of them illegal aliens. However, this time period difference has likely inflated the estimate since 4 years of growth is measured by the mortality data beyond the 1980 census. In contrast, the residual method estimated that 2.3 million Mexican-born were counted in the 1980 census, including 1.1 million illegal aliens (Borjas, Freeman, and Lang, 1991). The authors also have used an analogous procedure, based on births in 1983 rather than deaths, to estimate the number of Mexican women of child-bearing age illegally in the United States (see appendix II).

Logic of the Method

Recorded deaths of foreign-born persons indicate their presence in the United States and can be used to reconstruct or estimate the size of the total foreign-born population, by age and sex. The method calculates the population size needed to produce the observed deaths using mortality data and age-specific death rates. For example, over one million Mexican-born individuals in the 15- to 24-year-old age group would have

[6]The assumptions of higher undercount rates among illegal aliens than among legally resident persons is sound considering the likely avoidance of authorities and high mobility status of the former.

[7]Data on the foreign-born are available for those born in Mexico, Cuba, Canada, all other foreign countries combined, and in U.S. possessions.

been needed to produce the 1,030 deaths recorded for this group in the United States in 1985.[8]

While these calculations are straightforward, they require complete mortality records, and in the absence of specific mortality rates on the foreign-born, researchers have used the total U.S. mortality rate as a proxy.[9] However, if the actual unmeasured mortality rates for the U.S. foreign-born were higher or lower than the measured U.S. total rate, the estimated foreign-born population would be proportionally too low or too high, respectively. Since this information is currently unknown, the method may produce numbers that are inaccurate.

Data and Analysis Limitations

Overall, the vital statistics data on the number of deaths among the foreign-born are nearly complete, but there is little direct information on the rates at which this vital event occurs among the foreign-born.[10] Moreover, comparing the 1984 death data with 1980 population figures could upwardly bias the estimates.

Registered Deaths

NCHS considers its records of U.S. vital statistics to be 99-percent complete. The Census Bureau assumes death registration to be essentially 100-percent complete. This is a very high rate of collection and is by any measure highly valid and reliable demographic information. However, there is no separate information on the accuracy of the reporting for only foreign-born persons. In recent years, the proportion of cases with unknown country of birth has been less than one percent; however, there is no information on misreporting of nativity by relatives on death

[8]Calculating the population required to produce a given number of deaths involves solving the following equation:

$$p^r = (D^r/R^r)Y$$

where p^r represents the population in a given age range; D^r, the number of deaths for that group; R^r, the age-specific death rate; and Y, the number of years in the age range. Thus, to estimate the size of the Mexican-born U.S. population aged 15-24 needed to produce the 1,030 deaths reported for this group in 1985, using the total U.S. death rate for this age group of 9.45 per 1,000 persons, the calculation would be:

$$p^{15\text{-}24} = (D^{15\text{-}24}/R^{15\text{-}24})Y = (1030/0.00945)10 = 1{,}089{,}947.$$

[9]Researchers have calculated birth rates for the Mexican-born based on the CPS, although this information is not published by NCHS.

[10]Data on birth rates for the foreign-born have been calculated only occasionally, based on the CPS. The total foreign-born population has a high proportion of uncounted persons, preventing its accurate size estimation, especially in the intercensal periods. Hence, vital statistics rates cannot be directly calculated with accuracy.

certificates.[11] Also, delays in availability of vital statistics data prevent their timely and current use to make uncounted foreign-born population estimates. In mid-1992, mortality data were available only up to 1988.

Mortality Rates

The main source of error in using this method to estimate the number of foreign-born persons is in using total U.S. mortality rates. This is important because the estimates derived from this method are sensitive to assumptions about these rates. For example, overall U.S. mortality rates for those aged 20 to 25 have varied from 5.5 per 1,000 in 1984 to 5.8 per 1,000 in 1988. However, a change of 1 death in 1,000 persons results in an 18-percent change in the size of the population estimated using this method. Error can also be introduced through assuming that all foreign-born persons dying in the United States also resided here and that all uncounted foreign-born persons are illegal aliens.

The Sex Ratio Method

Researchers used the sex ratio method with the Mexican census and data on the age and sex composition of the Mexican migration stream to estimate the total Mexican-born population in the United States (Bean, King, and Passel, 1983). We examined this method because it focuses on Mexicans, the largest component of the illegal alien population by nationality, and it can provide a maximum upper bound on the number of these aliens in the United States. When used in comparison to the residual estimates, this method can check their plausibility and provide estimates of the number of Mexican-born uncounted by the decennial census or CPS.

The 1980 sex ratio estimates of the size of the illegal alien population range from 2.1 million to 2.7 million, depending on the assumptions used. These estimates compare to 1.8 million Mexican-born illegal aliens estimated with the death registration method and 1.1 million with the residual method in the 1980 decennial census.

Logic of the Method

The difference between the Mexican census population and an estimate of this population were it closed to migration (represented by age-specific sex ratios adjusted for births and deaths) can be used to estimate the total number of Mexicans outside Mexico. This method takes advantage of the fact that most persons born in Mexico reside in that country or in the United States, so any discrepancies between the Mexican census

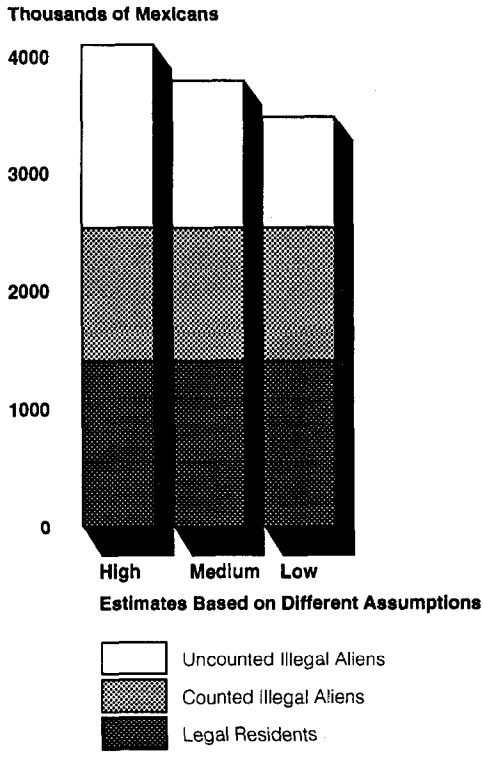
[11]Logically, relatives should report country of birth correctly if funeral arrangements are made in the native country.

population and that estimated by the sex ratio method can be assumed to represent an estimate of the number of Mexicans in the United States.

The number of Mexican emigrants to the United States is estimated by first making assumptions about the male-female ratio at birth in Mexico, the proportion of the emigrant stream that is male and female, and the age distribution of emigrants and by using the proportion of males and females actually counted in the Mexican census. This allows for a calculation of the number of persons who appear to be "missing" from Mexico. Those not accounted for by INS data on legal status and Census Bureau data on the foreign-born may be assumed to be illegal aliens.

Figure 2.2 shows the estimates for 1980 under various assumptions about the sex ratio at birth, the sex and age of Mexican emigrants, and sex differences in census coverage. The assumptions determine the variation in the estimates. One assumption, for example, is that males are less likely than females to be counted in the Mexican census. Thus, some of the apparently "missing" males in the Mexican census are actually in Mexico rather than the United States. The larger this difference in coverage is assumed to be, the smaller the number of Mexican-born males in the United States needed to account for this "missing" population. However, any estimate of Mexican aliens assumed to be in the United States will contain all errors in estimation.

Figure 2.2 - Sex Ratio Estimates of the Total U.S. Mexican-Born Population in 1980 by Legal Status



Legend

High—Assumes Mexican emigrants are 65 percent male and 60 percent aged 15-39 and that females are counted 2 percent more completely in the 1980 Mexican census than males and assumes a sex ratio at birth of 105:100, male to female.

Medium—Assumes Mexican emigrants are 60 percent male and 60 percent aged 15-39 and that females are counted 3 percent more completely in the 1980 Mexican census than males and assumes a sex ratio at birth of 104:100, male to female.

Low—Assumes Mexican emigrants are 60 percent male and 65 percent aged 15-39 and that females are counted 4 percent more completely in the 1980 Mexican census than males and assumes a sex ratio at birth of 105:100, male to female.

Source: Bean, King, and Passel (1983); revisions obtained from the authors.

Data and Analysis Limitations

To the extent that the quantities identified above are unknown from the Mexican census data, the method is vulnerable to errors in assumed values for these variables. However, there is some relevant information on the legal migration stream that can shed light on these issues. For example, in 1987-88, the legal Mexican stream to the United States, excluding any IRCA

adjustments, was known to vary between 56 and 57 percent male and from 51 to 60 percent aged 15-39. Of all Mexican aliens counted in the 1980 U.S. census, 52 percent were male and 60 percent were aged 15-39. At the same time, apprehended Mexicans are overwhelmingly young males. These facts suggest that the proportion of the total migration stream that is male and young is disproportionately high. Recognizing this, researchers using this method have assumed that a range of 60-65 percent are male and are aged 15 to 39 years.

The 1980 census showed evidence that some Mexican aliens misreport themselves as native-born or as naturalized citizens. Of a revised estimate of 2.1 million Mexican aliens, 375,000 (18 percent) were estimated to have misreported themselves as naturalized citizens (Warren and Passel, 1987). Hence, relying on unmodified census results may underrepresent the proportion of the actual Mexican population who are aliens.

Through extensive analysis, Mexican government researchers estimated the 1980 Mexican census undercount at 4 percent (Gomez and Partida, 1986). Based on other research, they concluded that 75 percent of the uncounted were males and that 94 percent of males and 98 percent of females were counted, or that females were counted approximately 4 percent more completely than males. This is within the range of the 2- to 4-percent differential assumed by researchers using the sex ratio method. The method is most sensitive to the proportion of the migration stream assumed to be male and least sensitive to the proportion assumed to be aged 15-39.

Evaluation of the Population Size Estimation Methods

In this section, we provide a summary evaluation of the methods discussed above. This evaluation is based on our assessment of the validity and reliability of the data used, the soundness of the assumptions, and the sensitivity of the estimates to those assumptions. Table 2.3 provides a summary of our evaluation of the methods.

We answer evaluation questions 1 and 2 by using judgments of highest, medium, and lowest to rate the size estimation methods against our evaluation criteria. "Highest" is the most desirable ranking, and "lowest," the least desirable for all criteria except sensitivity to the assumptions, for which the opposite applies. We assigned values to each of these judgments by comparing the methods with each other.

Table 2.3: Summary of the Methods to Estimate the Size of the Illegal Alien Population

	Method		
Evaluation criterion	**Residual**	**Death registration**	**Sex ratio**
Estimates the uncounted	No[a]	Yes[b]	Yes[b]
Measures illegal status directly	No	No	No
Validity of the data	Highest[c]	Medium[d]	Lowest
Reliability of the data	Highest[c]	Medium[d]	Lowest
Soundness and appropriateness of the assumptions	Highest	Medium	Lowest
Sensitivity to assumptions	Lowest	Medium[e]	Highest

[a]The residual method does not explicitly incorporate an estimate of uncounted illegal aliens; however, the 1990 point estimate of 3.3 million discussed in chapter 4 implicitly includes them through its treatment of census and CPS coverage.

[b]Only obtained in comparison to a residual estimate of those counted.

[c]The INS Alien Registration data apparently were valid and fairly reliable when they were collected; however, the fact that they have not been directly collected since 1980 weakens their utility for current use. In addition, both the census and CPS data are subject to sampling error. Nevertheless, overall data validity and reliability remain highest for the residual method.

[d]Data on the numbers of deaths are high in completeness, but the exact mortality rates applying to the foreign-born are unknown, and variations affect the estimates.

[e]The death registration estimates are more sensitive to assumptions about mortality rates than are the residual estimates to assumptions about the nativity of those whose country of birth is unknown.

The residual method has both the highest validity and reliability rating. It uses reliably collected decennial census and CPS data on the foreign-born, including illegal aliens, residing in households. The Census Bureau has applied it six times since 1979, providing multiple estimates of the counted growth in this population, allowing for intercensal monitoring of the illegal alien population. However, even in this most highly rated method for reliability, the data currently used to estimate legally resident aliens have errors of unknown magnitude. The Census Bureau has made careful statistical adjustments to keep the legal permanent resident estimate up to date; however, errors can be caused by a fixed estimate of emigration and possible counting of the several categories of aliens with the legal right to remain here for extended temporary periods, such as asylees and those in temporary protected status. Moreover, the decennial census and, to a greater extent, CPS data are subject to sampling error, which reduces reliability. We also rank this method highest in validity because of the nativity question asked of the entire resident population. However, the extent to which non-Mexican aliens misreport as naturalized or

native-born citizens will reduce validity since there is no adjustment for this possibility.

The death registration method relies on a vital statistics system that apparently produces valid numbers of deaths of the entire population; there are few unreported deaths in the United States. But the extent of misrecording as native among the foreign-born or vice versa and the death rates applicable to the foreign-born are unknown. In comparison to the residual method, these problems give it a lower ranking on reliability. Moreover, to deal with this problem, the method includes a key assumption that overall U.S. mortality rates apply to the foreign-born, which is less sound than those of the residual method. The death registration method is rated medium on sensitivity to the mortality rate assumption since varying the rates within a plausible range moderately affects the estimates.

Use of the death registration method results in estimates of the number of illegal alien "person years" in the United States, rather than the actual number of illegal aliens, since, for example, four persons in the United States for 3 months each will have the same exposure to death as one person for 12 months. Thus, because the estimates do not represent actual counts with identifiable characteristics as do those from the residual method, this method receives a lower validity rating.

The sex ratio method receives the lowest validity rating according to our evaluation criteria. The Mexican census largely undercounts Mexico's population—a problem thought to be larger among males than females. However, there remains uncertainty over whether the absence of males in proportion to females in Mexico is because of an undercount in the Mexican census or because of the predominantly male illegal migration to the United States. The method is useful in its ability to establish upper bounds on the size of the total (counted and uncounted) Mexican illegal alien population; however, since the Mexican census is only available decennially, there is no ability to detect intercensal growth, reducing the reliability rating for this method. It proves highly sensitive to assumptions, including the levels of relative undercount and sex composition of the emigrant stream, resulting in the highest sensitivity rating to its assumptions.

By applying confining but reasonable ranges to the assumptions, researchers can use this method to produce upper bound estimates of all Mexicans in the United States. More complete birth data and census

coverage data in Mexico can improve the estimates. Improving the data on the precise sex and age composition of all Mexicans here is a problem similar to that with the death registration method. If these data were precisely known, estimates would not need to be made.

All the methods for estimating the size of the illegal alien population use available data to reduce the unknowns as much as possible, but lack of information constrains every method at some point. The use of existing information from multiple sources to reduce the unknown quantities has been the main improvement in the methods for estimating the illegal alien population size since our evaluation in 1982. The uncounted illegal alien population remains the most difficult segment of the population to estimate.

Quality of the Data and Methods Used to Estimate the Flow of the Illegal Alien Population

In this chapter, we answer our first two evaluation questions as they relate to two methods used to estimate the annual flow of illegal aliens into the United States: nonimmigrant overstays and repeated trials.[1] To assess the validity and reliability of these flow estimates, we analyzed the assumptions and techniques employed and compared them with independent data. The data come from published studies, the INS Nonimmigrant Information System (NIIS), the legalized population survey conducted by Westat, Inc., and a study conducted by the U.S. Border Patrol identifying individuals apprehended while entering the United States illegally.

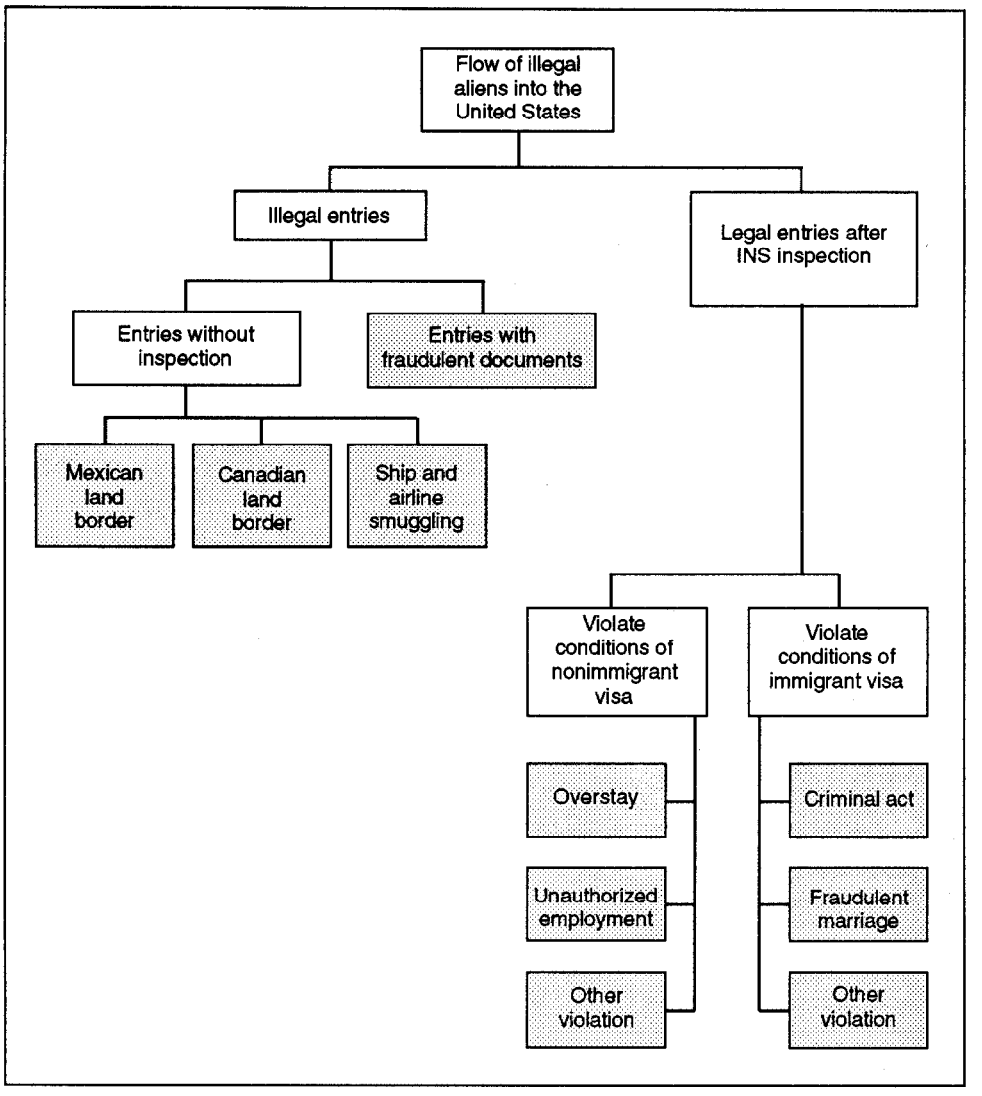
In contrast to the population size methods, the two flow methods we examined measure two distinctly different illegal alien populations. The nonimmigrant overstay method measures those who, after inspection and legal admission, violate the terms of their visas by remaining longer than authorized by INS. The repeated trials method measures those who enter illegally without inspection through the border with Mexico.[2] Figure 3.1 highlights the 10 segments to the illegal alien flow. Together these two methods measure only two of these segments, but those two include the bulk of the total illegal alien flow.[3]

[1]The residual method, evaluated in chapter 2, also has been used to estimate the net growth of the illegal alien population. This is discussed in appendix III.

[2]The method could be used to measure flow from the Canadian border, but has not been.

[3]Of 6.8 million deportable aliens located from fiscal years 1987-92, INS reported about 96 percent as having entered without inspection from Mexico and 2 percent as having entered legally as nonimmigrants, regardless of type of violation. This information cannot be interpreted as the composition of the actual flow, however, because many of those entering without inspection are known to be apprehended several times.

Figure 3.1: Illegal Alien Inflows by Manner of Entry



Regarding the other segments of the flow, INS does collect some data on those who have become illegal aliens through marriage fraud.[4] However, we identified no flow estimation methods to measure fraudulent document entries, those violating the terms of their immigrant or nonimmigrant visas through obtaining unauthorized employment, deportable criminal

[4]In fiscal years 1989-91, INS reported that 27,227 aliens became deportable through failure to successfully complete an interview examining the validity of each marriage 2 years after entry as spouses of U.S. citizens or permanent resident aliens. However, these represent a small portion of all deportable aliens.

immigrants, those gaining entry through ship and airline smuggling, or other violators. Table 3.1 presents information on the populations covered and the assumptions used for the two flow estimation methods.

Table 3.1: Summary of the Main Methods for Estimating the Flow of the Illegal Alien Population

Method characteristic	Method	
	Nonimmigrant overstay	Repeated trials
Population covered[a]	Legal nonimmigrants (except students) from all countries remaining beyond their legal periods of admission	Those successfully entering illegally through the border between the United States and Mexico
Key assumptions	Certain countries have no actual persons overstaying; "apparent overstays" represent error in measurement only	All those attempting entry succeed within 1 month

[a]Population intended to be measured.

The Nonimmigrant Overstay Method

The nonimmigrant overstay method estimates the number of aliens, except students, who after being legally admitted have remained in the United States longer than they have been authorized to stay (Warren, 1990). These individuals have been inspected by INS at authorized ports of entry, and a record of their arrival is known to the government. INS has made nonimmigrant overstay estimates for every fiscal year from 1985 to 1989.

Logic of the Method

The nonimmigrant overstay method uses matched records from arrival forms, collected by INS, and departure forms, collected primarily by airlines. Both admission and departure records are given to contractors who convert the information on the forms into machine-readable data and enter it into the NIIS.[5]

There are two major components of error in the NIIS: (1) flawed or missing data resulting from problems in the collection of the departure forms, and (2) keying and data entry errors.[6] INS estimates the magnitude of the missing data from noncollected departure forms and other system errors by assuming that apparent overstays for certain "criterion" countries which are believed to have virtually no overstays, such as Sweden and Belgium, do not represent actual overstays but data collection and

[5]Nonimmigrants, other than students, are covered by this system. Border crossers from Canada and Mexico or crewmen who enter legally through inspection are not included.

[6]The actual system error rate is caused by a number of factors: loss of the departure form by the alien, failure of the airline to collect the form, loss after collection, incorrect keypunching, and so forth.

processing errors. The error rate for the overstay data is calculated as the average of these countries' apparent overstay rates.[7] INS estimates that aliens from other countries are overstaying their lawful periods of entry only to the extent that the "apparent overstay" rates for these countries (including error) exceed those for the criterion countries (error only).

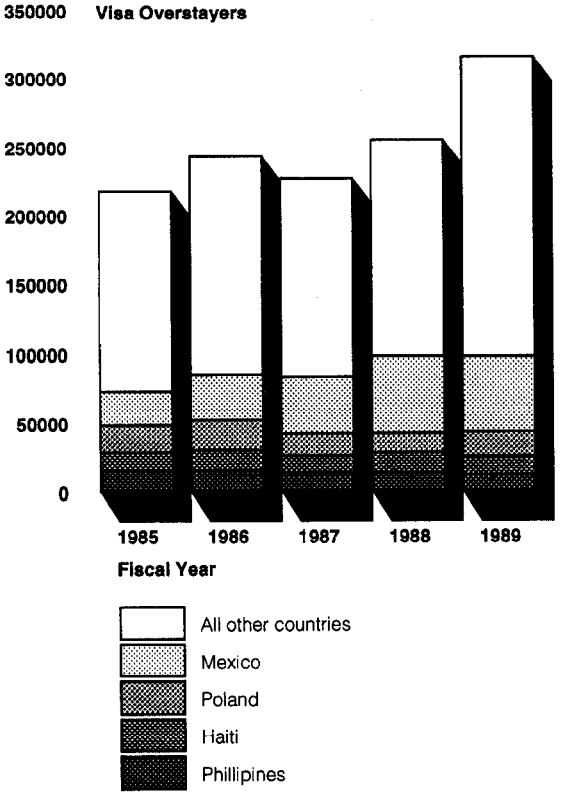
For example, in fiscal year 1988, there were 14.3 million arrivals and 13.7 million departures expected by the analysis date.[8] However, only 12.3 million departures were recorded, leaving 1.4 million apparent overstays. Based on the "apparent overstay" rates for criterion countries, INS estimated that 1.1 million of these represented system error. Taking this into account, 255,000 persons were estimated to be actual visa overstayers. The measured apparent overstay rate for all countries together was 10 percent, composed of an estimated actual overstay rate of 1.9 percent and an estimated system error rate of 8.1 percent. However, without adjustments for those who subsequently departed or adjusted to legal permanent residence, we cannot make the assumption that these illegal aliens represent permanent additions to the U.S. population.

Figure 3.2 presents available estimates on the gross number of nonimmigrant overstays by fiscal year and the main countries of citizenship. The figure shows that the estimated number of overstays grew from 217,000 in 1985 to 315,000 in 1989. However, since the number of those expected to depart during these years grew from 9.1 million to 15 million, the calculated overstay rate, after accounting for error, actually fell from 2.4 percent to 2.1 percent.

[7]The 11 separate error rates by class of admission and mode of arrival are calculated for each country as its average plus one standard deviation (see Warren, 1990, pp. 81-85).

[8]An error in data processing of the NIIS data base resulted in lost records and has prevented calculation of a 1990 estimate of nonimmigrant overstays.

Figure 3.2: Estimated Gross Nonimmigrant Overstays by Country of Citizenship



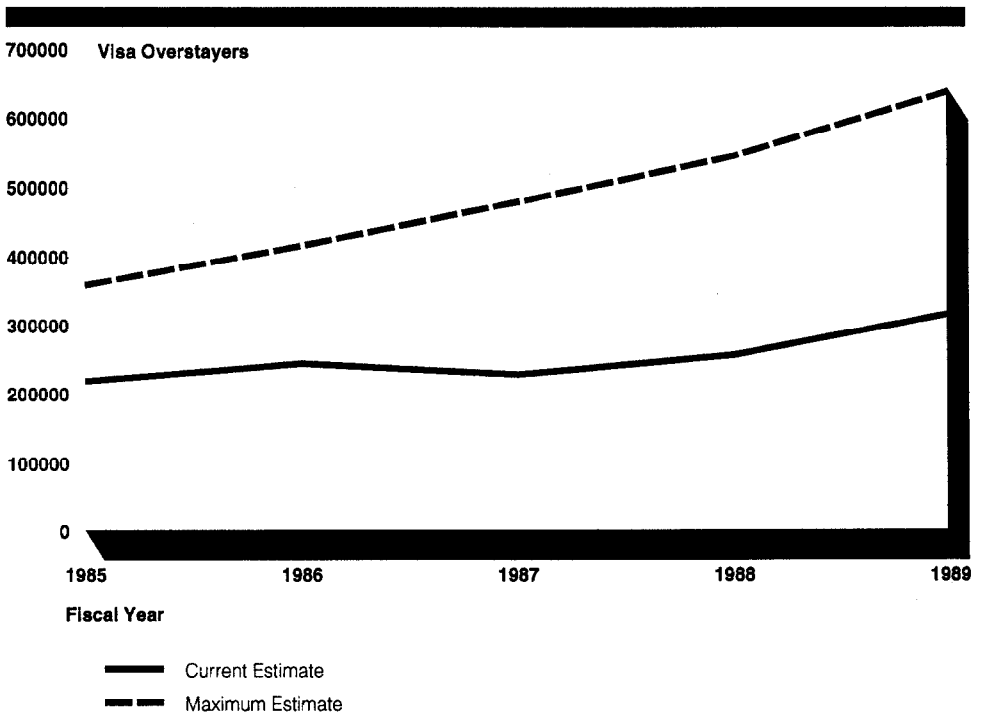
Data and Analysis Limitations

The total NIIS system error representative for all countries of citizenship cannot be determined precisely because the range of the apparent overstay rates of the criterion countries used to measure error varies considerably. Throughout the 1985-89 period, the 12-country highest and lowest range varied from 2.7 to 4.3 percentage points.[9] Under the assumption that each of the 12 criterion country rates is an independent observation of the actual system error rate, the system error could possibly be 1.4 to 2.1 percentage points higher or lower than the calculated average. Because of the large size of the NIIS data base, small variations such as these result in large variations in the number of possible overstayers.

[9]Apparent overstay rates are calculated by sea, air, and land mode of arrival and tourist, business, and other classes of admission. Hence, each criterion country rate is a weight of 11 different calculated rates. We collected criterion country rates only on the air tourist arrivals, who represent approximately 75 percent of all nonimmigrant arrivals and hence receive the highest weighting of all the calculated rates.

By assuming that the actual system error rate is the lowest criterion country rate, we illustrate the maximum possible overstayers in figure 3.3. However, this implies that there are some overstayers from the 11 other criterion countries whose error rates are larger. The actual number of overstayers is virtually certain to be less than this estimated maximum, since this information is in contrast to the criterion measures for these countries (see below).

Figure 3.3: Ranges of Total Estimated Nonimmigrant Overstays[a]



[a]The smallest rate by 6-month period is used to minimize the system error for the entire fiscal year in which it is contained. The maximum number of overstayers is estimated by assuming that the smallest criterion country error rate for tourists arriving by air represents the total error in the Nonimmigrant Information System.

The logic of using certain countries thought to have little or no overstays as a criterion against which to measure error is sound, as discussed below, but the variation in error among these countries is large in comparison to the measured estimates. The actual system error is unknown (and possibly unknowable), and its estimate remains up to four times larger than the number of estimated overstays.

The 12 criterion countries have been chosen on the basis of five measurable conditions:[10]

- low numbers of apprehensions by INS,
- low numbers of illegal aliens counted in the 1980 decennial census,
- low numbers of legalization applicants,
- low legal immigrant visa waiting list backlogs, and
- low rates of apparent overstay.

These criteria appear to be suitable indicators of little illegal immigration to the United States because, empirically, they show little demand for and evidence of illegal migration.

The nonimmigrant overstay method assumes country of citizenship to be the best determinant of error. Alternatively, one could assume that the airline or shipping company, which is responsible for collecting the forms, is the major determinant of error. However, we found that there is more variability of apparent overstay rates among persons from different countries using the same airline than there is among different airlines carrying persons from the same country.[11] For example, between October 1990 and March 1991, the apparent overstay rate for Poles (a high-overstay group) departing on American Airlines was 25.5 percentage points higher than that for Australians (a low-overstay group); on British Airways, the difference was 28.2 percentage points. By contrast, the ranges of apparent overstay rates within individual countries by airline were smaller. Among Poles, the difference between Lufthansa and Lot-Polish Airlines in apparent overstays was 22.3 percentage points; for the Australians, the difference between Lufthansa and US Air/Allegheny was 14.9 percentage points. Thus, using country as the criterion is more sound than using airline.

The overstay method assumes, however, that the class- and mode of travel-specific rates for each of the 12 criterion countries measure system error for other countries. If another variable, such as age, were significantly associated with system error, then this error could be misestimated.

[10]The criterion countries assumed to have little to no actual overstays are Belgium, Netherlands Antilles, Norway, Sweden, Kuwait, Saudi Arabia, Switzerland, Australia, New Zealand, Suriname, Singapore, and Finland.

[11]The airlines examined were American Airlines, Japan Airlines, Aero Mexico, Mexican Airlines, Lot-Polish Airlines, Lufthansa, and British Airways. The countries examined were Poland, the Philippines, Mexico (high numbers of overstays); Japan, Sweden, and Australia (countries assumed to have no actual overstays, although Japan is not a criterion country).

The Repeated Trials Method

The repeated trials method uses data on total Border Patrol apprehensions of those caught attempting entry and estimates by the Border Patrol of those attempting repeated entry to estimate the actual gross inflow (with no accounting for return migration or adjustment to legal status) of illegal aliens through the southern border of the United States (Espenshade, 1990).[12]

Logic of the Method

Researchers long have used data on apprehensions to estimate the inflow of illegal aliens across the southern border of the United States. However, these data suffer from several weaknesses that limit their utility as proxies for measures of actual illegal entries. Most importantly, the data refer to the number of recorded apprehensions, not the number of distinct persons apprehended. Some persons will be apprehended more than once, so using apprehensions as a proxy would tend to inflate estimates of the actual number of persons caught while attempting entry. Many aliens, however, are never apprehended at all, deflating the estimates. In addition, the number of apprehensions depends not only on the number of persons attempting entry, but also on the level of INS effort in trying to stop this inflow.

The repeated trials method is an attempt to deal with these problems by combining monthly time-series data on total apprehensions with information on the number of persons repeatedly apprehended to arrive at estimates of the number of distinct individuals actually entering the United States. The key to the method is the "repeater fraction," the proportion of all illegal aliens apprehended on second or more attempts to enter the United States. Repeaters are identified by Border Patrol agents as having already been apprehended in the same month. These data are used to estimate both the inflow of illegal aliens and the probability of apprehension for any given month.

A major assumption underlying the method is that all aliens attempting illegal entry across the southern border, even those caught and returned to Mexico, will succeed by the end of the month. This is a strong assumption. If it is wrong—that is, if many illegal aliens take longer to enter or fail to enter at all —it would lead to an overestimate of the inflow of illegal aliens.

[12]The majority of apprehensions are "linewatch" apprehensions or those performed by the units of the Border Patrol most closely patrolling the border. In addition, the Border Patrol apprehends aliens through secondary checks, traffic checks, and workplace inspection.

The method has been used to generate gross inflow estimates for the period January 1977 through September 1988. The estimated monthly inflows ranged from a low of approximately 60,000 for December 1977 to a high of approximately 340,000 for February 1986. Cumulatively, the estimated 11-month inflow from November 1987 through September 1988 was over 2 million persons (Espenshade, 1990). This accumulation apparently overstates the actual inflow in that it represents a composite of first and repeated stays in the United States. Nevertheless these inflows are up to 10 times larger than those estimated through the nonimmigrant overstay method, illustrating how Mexicans and Central Americans dominate the composition of the U.S. illegal alien population.

These estimates also show plausible seasonal and annual patterns. For example, the monthly inflows tend to be highest in the spring, when agricultural workers are likely to be moving north to find jobs, and lowest in November and December, when such jobs are less plentiful and migrants may be heading home for the holidays. Similarly, the annual inflow rose after 1982, possibly reflecting adverse economic conditions in Mexico, and declined after passage of IRCA in 1986.

Data and Analysis Limitations

The major assumption underlying the repeated trials method—that all persons attempting entry over the southern border will succeed—is consistent with reported survey data in Mexico and the United States (Donato, Durand, and Massey, 1992). Whether that success occurs within one month is less clear. Moreover, the unwillingness of some respondents to admit giving up efforts to enter the United States could prevent obtaining valid information through these surveys and lead to overestimates of the actual inflow.

The main area of concern for this method centers not on the analytic technique but on the repeater data provided by the Border Patrol. These data were collected by having the most experienced field agents in each sector identify those persons who had already been apprehended during the month, relying essentially on facial recognition.

The aggregated repeater data across all sectors varied between 20 percent and 40 percent from January 1977 to September 1988. Surveys in aliens' communities of origin also have found probabilities of apprehension in this range. For example, a 1979 survey in Mexico determined that 25 percent to 40 percent of those entering the United States were apprehended on the initial trip, although much higher probabilities of

apprehension (53 percent to 94 percent) were observed on additional trips after initial apprehension (Kossoudji, 1992). More recent research in Mexican communities calculated the probability of apprehension at about 50 percent throughout the 1980s (Donato, Durand, and Massey, 1992). This is higher than the range for INS repeater data, but the difference may be explained by the fact that these data relate to trips to the U.S. border rather than individual attempts to cross the border, as in the INS data. Finally, INS calculated from a survey of IRCA applicants conducted by Westat, Inc., that the ratio of total apprehensions of those who entered illegally to all those making illegal entries was nearly 27 percent, close to the middle of the range of apprehension probabilities in the INS data (U.S. Department of Justice, 1990).

Nonetheless, the Border Patrol stopped collecting these data in September 1988. Officials told us that they regarded the data as unnecessary for their workload purposes and unreliable. The question of reliability centers on three related issues. First, the data are based on subjective estimates made by Border Patrol officers rather than on systematic counts of those repeatedly apprehended. Second, officers cannot be expected to recognize as repeaters those apprehended at Border Patrol stations other than their own. That is, a person apprehended at Chula Vista, California, would not be identified as a repeater if subsequently apprehended at San Clemente checkpoint over 65 miles north, to say nothing of other crossing points hundreds of miles more distant. Third, the data do not address those apprehended more than once in a year, but only in the same month.

The importance of sound data for making these estimates is demonstrated in table 3.2. The table shows the estimated inflow of illegal aliens based on various probabilities of apprehension, using the repeated trials method and assuming 100,000 apprehensions in a given month.[13] The probability levels all fall within the ranges of the studies cited above. If the true probability of apprehension were 20 percent, that would imply 400,000 persons entering in the month, whereas a probability of 40 percent would imply only 150,000 entrants. Note that most of the variation in estimated inflow arises from the number of persons who are never apprehended. All of these persons are assumed to have entered successfully on their first attempt.

[13]This level of monthly apprehensions could be considered high. In fiscal year 1989, the Border Patrol apprehended a low of 35,739 deportable aliens entering without inspection from Mexico in December 1988 and a high of 97,174 in July 1989.

Table 3.2: Estimated Inflow of Illegal Aliens by the Repeated Trials Method[a]

Probability of apprehension[b]	Persons entering the United States[c]	Persons apprehended	Persons never apprehended
0.20	400,000	80,000	320,000
0.25	300,000	75,000	225,000
0.30	233,300	70,000	163,300
0.35	185,700	65,000	120,700
0.40	150,000	60,000	90,000

[a]Based on 100,000 observed apprehensions and selected probabilities of apprehension.

[b]The monthly probability of apprehension was estimated from 1977 to 1988 as the proportion of all persons apprehended by the Border Patrol who were apprehended more than once.

[c]Estimated inflow.

Surveys such as the Westat study cited above may not be the optimal method to collect data on repeat apprehensions. Such surveys are subject to recall error and respondent's unwillingness to admit confidential information. Moreover, the persons sampled may have been more highly motivated to remain in the United States than other border crossers. One way to avoid some of these problems is to improve the identification of apprehended border crossers. This was done in a study of aliens apprehended by the Border Patrol in the San Diego sector between June 20 and August 3, 1989 (U.S. Department of Justice, 1989). Each person apprehended was fingerprinted, which allowed more definite identification of those apprehended more than once. As a result, the Border Patrol identified 39,579 apprehended persons whose illegal entries resulted in a total of 52,697 apprehensions. This implies an overall repeat apprehension rate of 25 percent. However, because not all the fingerprint matches were identified, the actual repeater rate apparently was somewhat higher. Moreover, the number of persons never apprehended, though critical to making the estimates, remains unknown.

Evaluation of the Flow Estimation Methods

We now turn to a summary evaluation of these flow estimation methods. As in our evaluation of the population size estimation methods, we use the terms higher and lower to represent the ratings of the data and assumptions comparing the two methods. However, this comparison is limited by the fact that the two methods were designed to estimate different populations, unlike the case in chapter 2. Here, the evaluation more accurately represents our relative confidence in the underlying data and assumptions. Our summary is presented in table 3.3.

Table 3.3: Summary of the Methods to Estimate the Flow of the Illegal Alien Population

	Method	
Evaluation criterion	**Nonimmigrant overstay**	**Repeated trials**
Measures illegal status directly	Yes	Yes
Validity of the data	Higher[a]	Lower[a]
Reliability of the data	Higher[a]	Lower[a]
Soundness and appropriateness of the assumptions	Higher	Lower
Sensitivity to the assumptions	Lower	Higher

[a]Legal arrival data are complete in comparison to incomplete data on illegal entries as indicated by apprehensions.

The data for the nonimmigrant overstay method are evaluated on validity and reliability in two parts: arrival and departure. The arrival data rate higher on both criteria because nonimmigrants arriving into the country undergo INS inspection, and arrival records are created, maintained, and updated with most departure records. We rank this method higher in reliability since the data have been collected consistently. Face validity is evident since the data clearly represent persons entering the United States and citizens of foreign countries could potentially become illegal aliens through overstay. The departure data are less completely collected. They still rate high on validity because collected forms clearly represent actual departures. However, reliability is lower than for arrivals because many forms are not collected. Overall, however, arrival and departure data rate higher on both validity and reliability than the data for the repeated trials method.

The key assumption about the 12 countries chosen with few illegal aliens in the United States, and whose shortfall of departure records represents noncollection and other system errors only, is sound. Estimates prove somewhat sensitive to this assumption, however, because even small variation among these 12 country error rates over time in comparison to the huge numbers of nonimmigrants processed by this system can highly affect the total measured rate of overstay.

The repeated trials method receives somewhat lower ratings on the evaluation criteria. It employs a reasonable technique, but the validity of the repeater data formerly collected by the U.S. Border Patrol is subject to question because they were created through subjective measurement by Border Patrol personnel based on facial recognition only, rather than

through a records check. Apprehensions data are subject to large seasonal variation and to fluctuation from deployment of INS resources. In addition, aggregating monthly estimates almost certainly overestimates the actual inflow because persons entering in several different months apparently are counted more than once. These problems reduce the reliability of the data. Overall, then, this method rates lower on the validity and reliability of the data used to calculate apprehension probabilities. Moreover, the flow estimates it produces are sensitive to knowledge of these probabilities. However, the assumption that all those who try eventually will enter is apparently consistent with survey data.

The Size and Flow of the Illegal Alien Population

In this chapter, we answer our third evaluation question: What are the current size and flow of the illegal alien population? We examine the latest available estimates and use additional information to produce our own estimates of the maximum likely size and flow of this population. We are confident that our maximum ranges represent upper bounds. We adjust 1988 flow estimates from INS and from private research, the latest year with both available. Finally, we discuss the implications of return migration of illegal aliens when comparing the size and flow estimates together and the need for more precise information on individual characteristics of illegal aliens.

In addition to the data and studies cited in chapters 2 and 3, this chapter relies on information from two major sources. First, we use information from Census Bureau studies relating to undercounting in the 1990 census. These include a demographic model of population change, a post-enumeration survey, and a series of ethnographic studies of small areas containing populations that are difficult to enumerate. We also use data from the 1990 Mexican census and U.S. Census Bureau estimates of the undercount in this census based on their independent analysis. These data allow us to estimate the maximum number of persons from Mexico who could have been in the United States in 1990 and thus allow us to narrow the likely range of estimates of the total illegal alien population on April 1, 1990.

We recognize that many of the data sources we rely on in this chapter have weaknesses, such as those discussed in chapters 2 and 3. Nevertheless, these are the best data available for estimating the size and flow of the illegal alien population. To compensate for weaknesses in the data, we generally use only the most conservative assumptions; that is, those that provide the largest likely ranges of size and flow estimates supported by the data. We further recognize the problems inherent in matching data from different sources. Where possible, we have made adjustments or explicitly stated where such problems occur.

Size of the Illegal Alien Population

The most recent direct information on the size of the illegal alien population is from the November 1989 Current Population Survey (Woodrow, 1991b, 1992). As described below, the Census Bureau, in its preliminary evaluation of undocumented residents in the 1990 census, has adjusted this residual method estimate to account for growth to the April 1990 census date and also has provided a range of estimates of the uncounted portion of the illegal alien population. Table 4.1 shows a point

estimate of 3.3 million and a maximum of 5.5 million illegal aliens as of 1990.[1] Note that we assume this breakdown by country of birth and whether counted or uncounted based on other information. There are no equivalent time period size estimates derived from the death registration or sex ratio methods. The point estimate assumes no SAWs were counted; to the extent that SAWs were counted, this estimate would be lower.

Table 4.1: Estimates of the Counted and Uncounted Illegal Alien Population on April 1, 1990[a]

Source country	Census Bureau point estimate	Census Bureau maximum estimate	GAO likely maximum estimate
Mexico[b]			
Counted	2,000[c]	2,200[d]	2,030[c]
Uncounted	670	2,200	680
Total	**2,670**	**4,400**	**2,700[e]**
Other[b]			
Counted	500[c]	540[d]	510[c]
Uncounted	160	540	170
Total	**660**	**1,090**	**680[f]**
All countries			
Counted	2,500[g]	2,750	2,540
Uncounted	830	2,750	840
Total	**3,330**	**5,500**	**3,380**

[a]In thousands; categories may not sum to totals because of rounding.

[b]Woodrow (1991b) did not estimate by country of birth for 1990. We assume growth to be proportional for both Mexicans and all others from the November 1989 estimate date.

[c]Implicit in the Census Bureau's point estimate is a 25-percent rate of undercount based on research on the 1980 census and the number of legalization applicants (see Woodrow, 1991b). We use a rate of undercount of 25 percent for our likely estimate.

[d]Implies a maximum of 50-percent undercount. We assume this to apply for both Mexicans and non-Mexicans.

[e]Based on estimates of 2.4 million Mexicans arriving between 1980-90 (as described in the text) and 0.4 million who entered before 1980 but did not apply for legalization under IRCA.

[f]We adjust our non-Mexican estimate in proportion to our estimate of Mexicans from the implied Census Bureau point estimate.

[g]Based on the 1980 census, the Census Bureau assumed 18 percent more complete coverage in the 1990 census than in the November 1989 CPS, and growth of 73,000 illegal aliens from 1989 to 1990 (see Woodrow, 1991b).

Source: Woodrow (1991b), with additional assumptions made on distribution by country of birth and possible inclusion by the Census Bureau, and our own estimates.

[1]Census Bureau researchers reported a likely range of 1.9 million to 4.5 million illegal aliens in 1990, but a broader range of 1.7 million to 5.5 million taking account of uncertainties of estimation and for conservative evaluation of 1990 census coverage.

In the remainder of this section, we discuss why estimates vary and compare our estimates to the 1990 census net undercount and the 1990 Census Bureau research on populations that are difficult to count in order to narrow the plausible range for the size of the illegal alien population. Also, through the use of information from the Mexican census, we are able to suggest the possible number of Mexican illegal aliens in the United States, thereby further narrowing the plausible range for estimates of the total illegal alien population. Lastly, we examine what the 1990 census counts on the Mexican-born suggest as the Mexican illegal alien population.

Most Recent Census Bureau Estimates

There were an estimated 2.1 million illegal aliens counted in the United States in the November 1989 CPS, the most recent estimate at the time of our work. The Census Bureau adjusted this figure to the April 1990 census date in two ways. First, it added 73,000 persons, which is consistent with an illegal alien population growing by 200,000 a year, and prorated this figure over the nearly 4-1/2 months between the CPS and census dates. Second, based on an analysis of 1979 CPS and 1980 census data, the Bureau increased its estimate of the total foreign-born population in 1990 by approximately 18 percent to account for better coverage in the census than in the CPS, increasing the estimated number of illegal aliens by 375,000. In combination, these adjustments raised the overall estimate of the number of illegal aliens counted in the census to nearly 2.5 million.

Based on estimates of the total illegal alien population in 1980 and taking account of subsequent IRCA legalization applicants, the Census Bureau determined an approximate level of undercount of 25 percent in the 1980 census. Assuming this level for 1990 implies that 830,000 illegal aliens would have been uncounted in the 1990 census. Adding the counted and uncounted figures produces the point estimate of over 3.3 million total illegal alien residents.

Undercount of Illegal Aliens by the 1990 Census

To get information on the reasons for the undercount of special population groups (such as American Indians and rural populations) in the 1990 census, the Census Bureau funded a series of special alternative enumeration studies. Nine of the sites selected were thought to contain significant proportions of illegal aliens.[2] The data were collected by ethnographic researchers who spent several weeks getting to know the

[2]The selection criteria were judgments by the researchers specified in proposals that the areas contained large numbers of illegal aliens.

entire resident population in small areas of approximately 100 households each in 28 different communities in the continental United States.[3] The researchers attempted to document the entire population of these areas after examining the informal networks and actual residences of persons on April 1, 1990. The quantitative information on how many persons were missed by the census and the qualitative information on the reasons for undercount help to pinpoint how and to what extent the Census Bureau is missing these difficult-to-count populations in general and illegal aliens in particular. As shown in table 4.2, the total undercount in these areas ranged from 5 percent to 72 percent for the Hispanic populations in each site.

Table 4.2: Undercount of Hispanics in the 1990 Census at Ethnographic Enumeration Sites

Research area[a]	Primary nationality	Sample size	Within household undercount	Whole household undercount	Total undercount
Long Island	Salvadoran	113	12%	60%	**72%**
Rural Marion County, Oregan	Mexican	124	8	20	**28**
Houston	Guatemalan	215	20	5	**25**
Bronx	Dominican and Mexican	325	11	12	**23**
San Diego[b]	Mexican	385	10	7	**17**
San Francisco[b]	Mexican	173	4	12	**16**
Miami[c]	Haitian	217	2	9	**12**
Rural Santa Barbara County	Mexican	603	3	2	**5**
New Orleans[b]	Central American	163	1	4	**5**

[a]The actual sites at which these studies were conducted generally were only a few city blocks or even single buildings, not entire cities or counties.

[b]These sites were chosen for reasons other than the presence of a large number of undocumented residents. Only after conducting the alternative enumeration did researchers discover that considerable numbers of illegal aliens were present.

[c]The Miami site is the only site chosen to include all residents, because of the presence of large numbers of undocumented residents. Miami includes all residents whereas the other sites include only Hispanic residents.

Source: Puente (1991).

These studies were not primarily designed to collect quantitative data, but rather qualitative information on the reasons for the undercount. They are representative of neither the nation as a whole nor the areas from which

[3]There were a total of 29 different ethnographic evaluations conducted, 28 in the continental United States and one in Puerto Rico.

they were collected. However, they illustrate the difficulties of enumerating the illegal alien population.

Reasons for the undercount varied. Most of the undercount in Houston and San Diego is attributable to missing aliens within households, while the majority of the undercount in the Long Island and Marion County undocumented sites resulted from missing entire households. In Long Island, entire households were missed, apparently because landlords illegally had divided large houses into multiple housing units to help pay property taxes. One house in Long Island containing 14 housing units received only one census form. In contrast, census enumerators in Santa Barbara County and New Orleans missed only 7 and 5 percent, respectively, of the Hispanic population.

Considering the undercount information helps to demonstrate the likely upper limits of the illegal alien population. For example, the Census Bureau estimated the total net national undercount of the entire U.S. population in the 1990 census using two methods: demographic analysis and a post-enumeration survey.[4] The larger of these two net estimates is 4.7 million persons. The high estimate of the undocumented population is 5.5 million persons. If we assume that this maximum census day estimate of 5.5 million has a 50-percent undercount rate, that would imply that 2.8 million illegal aliens were uncounted. This figure is substantial in comparison to the 4.7 million estimated total net undercount. It would mean that all legally resident subpopulations (blacks, legally resident aliens, non-Hispanic whites, and so forth) would constitute, at most, only 40 percent of the net undercount, or 1.9 million persons. We find this unlikely. However, the estimates of net undercount include erroneous enumerations and double counts, which may or may not occur proportionally among the legally resident and illegal alien populations.

By contrast, the Census Bureau point estimate of 3.3 million resident aliens implies a 25-percent rate of undercount among illegal aliens, representing 18 percent of the total post-enumeration survey undercount. Except for one extreme value, the rates of undercount among illegal aliens in table 4.2 are 28 percent or less. While not from a generalizable sample, this information does not contradict an implied total national undercount rate for illegal aliens of up to 25 percent.

[4]Through demographic analysis, the Census Bureau estimated the total net undercount of all persons in the United States was 4,684,000 (1.85 percent of 253,394,000). Through the post-enumeration survey, it estimated 4,002,949 total net undercount (1.58 percent of 252,712,822).

Mexican-Born Illegal Aliens

In consultation with various Mexican government departments, researchers from El Colegio de Mexico estimated that between 1.5 million and 3 million Mexicans left Mexico between 1980 and 1990 and did not return (Corona Vasquez, 1991). INS recorded approximately 2 million Mexicans who both entered the United States and obtained permanent residence during this period (without regard to return migration).

Adjusting for this Mexican consensus estimate of 1.5 million to 3 million net migrants, and assuming a high rate of natural population increase during the decade (a net increase of 20 million[5]), there would have been a maximum of 89.5 million Mexicans on census day 1990, 8.4 million more than the 81.1 million actually counted. These persons can be partially accounted for by the estimated undercount in Mexico and legal migration to the United States. We assume those unaccounted for are illegal aliens in the United States.

In 1985, the Mexican government projected a 1990 population of 85 million, 4 million more than actually counted. Also, the U.S. Census Bureau estimated that the 1990 Mexican census day population was about 85 million.[6] However, in the absence of any migration, El Colegio de Mexico estimated there would have been 89.5 million Mexicans in 1990, 8.4 million more than actually counted. Using the estimate of 4 million Mexicans missed in the Mexican census, and considering the 2 million legal migrants to the United States leaves an estimate of 2.3 million illegal Mexican migrants who arrived during the decade.[7] We also estimate that about 400,000 Mexicans who qualified for IRCA did not apply for amnesty, for a total of 2.7 million Mexican-born illegal aliens on the U.S. census date.

Data from the 1990 U.S. census are consistent with the totals reported in table 4.1 on page 47 (though not necessarily with the breakdown by counted and uncounted). Those data show 4.3 million Mexican-born residents were counted in the 1990 census (U.S. Bureau of the Census). The Census Bureau estimated 3 million Mexican-born persons were legally

[5]Assumes 25 million births in Mexico during the decade (see Corona Vasquez, 1991).

[6]The Census Bureau has calculated a 4.6-percent undercount rate in the Mexican census. This estimate is itself based on calculated estimates of net migration from Mexico of approximately 3.1 million during the decade without regard to legal status. Since 2.1 million legal Mexican migrants arrived, the difference of 1 million represents growth of illegal migrants beyond the emigration of legal residents. Hence, our estimate of 2.3 million implies a maximum return of 1.3 million legal migrants to Mexico.

[7]The 2.1 million legal migrants represent all those whom INS reported by fiscal year as having entered the United States and adjusted to permanent residence in the 1980-90 period (including IRCA pre-1982 and SAW adjustments).

resident in November 1989, which suggests perhaps 1.3 million illegal aliens from Mexico were counted in the 1990 census. Of course, this figure can only be regarded as a rough indicator because we have not made allowance, as was done in the residual method, for Mexicans reporting an unknown foreign country of birth or misreporting themselves as U.S.-born, both of which would increase the illegal alien estimate.[8] Also, there has been no carrying forward of the legally resident foreign-born population from November 1989 to April 1990 or counting of the IRCA special agricultural workers, both of which would decrease the estimate. Overall, it is likely these factors would increase the number of Mexican-born illegal aliens counted in the census, but not to more than our 2 million maximum estimate (see table 4.1). Thus, it is unlikely that our maximum estimate would be exceeded.

Non-Mexican Illegal Aliens

Based on the 1989 CPS, we estimated that the number of illegal aliens from countries other than Mexico was equal to 25 percent of those from Mexico for a total of nearly 0.7 million. We further assumed that 25 percent of these illegal aliens were uncounted in 1990.

Total Illegal Alien Population

Based on our estimate of 2.7 million Mexican-born illegal aliens and adding an adjusted figure of non-Mexican illegal aliens of just under 0.7 million, we estimate that there were about 3.4 million illegal aliens from all sources in the United States in 1990. This is slightly higher than the Census Bureau's point estimate of 3.3 million, but well below its maximum estimate of 5.5 million.

Flow of the Illegal Alien Population

The size of the illegal alien population, as discussed in chapter 1, ultimately represents the accumulation of the net flow over time of individuals into the United States. Again, the major component of this flow is across the southern border, including primarily Mexicans but also Central Americans. Recognizing the limitations of the data as described in chapter 3, we are much less certain of our flow than of our size estimates because of the major uncertainties in estimates of the inflow of such border crossers.

The combined published estimates based on the methods we evaluated is approximately 2.3 million entries by illegal aliens in 1988 (the last year for

[8]The 1990 census counted 808,000 foreign-born persons with no specified country of birth. Simple allocation would assign 176,000 (21.7 percent) as born in Mexico.

which we have both border crosser and nonimmigrant overstay estimates). By making different assumptions about the degree of error, we estimate there could have been between 1.3 million and 3.9 million such entries.

The published estimate of border crossers uses a probability of apprehension of approximately 30 percent.[9] We adjust this estimate upward using a 21-percent probability every month during the year (the lowest recorded monthly apprehension rate for the 1977-88 period), which maximizes the yearly estimated number of such entries in 1988 to about 3.3 million. By contrast, if we assume a 40-percent probability of apprehension, the estimated number of successful border crossings would be only 1.3 million.[10] This lower figure represents the other extreme of a 40-percent probability of apprehension given by the repeater data. Note that these estimates relate to successful border crossings, not to actual individuals, hence the number of persons is biased upward. Given the data limitations on the probability of apprehension noted, we are confident that this upward adjustment provides an estimate of the flow of illegal alien entries across the southern border unlikely to have been exceeded. The published and GAO maximum estimates are shown in table 4.3.

[9]The probability of apprehension as measured by the repeater data and used during fiscal year 1988 actually varied above and below 0.30.

[10]Note that our minimum estimate does not include any nonimmigrant overstayers.

Table 4.3: Gross Flow Estimates of the Illegal Alien Population in 1988[a]

Source and type	Published estimates	GAO maximum estimate
Mexican-born		
Border crossers	1,990[b]	3,200[c]
Nonimmigrant overstayers	60[d]	80[e]
Total	**2,050**	**3,280**
Non-Mexican		
Border crossers	80[b]	130[c]
Nonimmigrant overstayers	200[d]	460[e]
Total	**280**	**600**
All countries of birth		
Border crossers	2,080	3,330
Nonimmigrant overstayers	250	540
Total	**2,330**	**3,870**

[a]In thousands; categories may not sum to totals because of rounding.

[b]Espenshade (1990) calculated 2,077,000 successful entries (which used a probability of apprehension of approximately 0.30). We assume the composition to be 96-percent Mexican based on the composition of INS Border Patrol apprehensions in 1988.

[c]We adjusted the total estimate by a probability of apprehension of 0.21 (the lowest measured Border Patrol repeater fraction from 1977 to 1989). We assume the composition to be 96-percent Mexican.

[d]Warren (1990) calculated this estimate based on the average criterion country error rate in the NIIS system of 8.1 percent.

[e]We adjusted the estimate based on the minimum criterion country error rate for tourist arrivals by air of 5.3 percent.

Source: Espenshade (1990) and Warren (1990), with our adjustments.

The repeated trials method measures gross inflow through the southern border without regard to possible multiple successful trips in different months. Hence, it overstates the number of individuals entering since certain aliens will make more than one trip during the year. In the absence of data on the extent to which this is occurring, we made no downward adjustment to the data to account for this situation. Based on the composition of the 1988 INS apprehensions data, we estimate the inflow of border crossers to be 96-percent Mexican. This implies a range of just over 1.2 million to a maximum of 3.2 million entries by Mexicans. In addition, from virtually zero to nearly 80,000 Mexican-born persons are estimated to have overstayed their legal periods of admission as nonimmigrants, as discussed below.

We estimate an inflow of between 50,000 and 600,000 non-Mexican illegal aliens in 1988. Our estimated border crossers range from 50,000 to 130,000, while the nonimmigrant overstays range from practically zero to 460,000. These estimates are consistent with the data on the legalized population under the pre-1982 residency provisions of IRCA by country of origin. Most non-Mexican and non-Central American illegal aliens have entered the United States as legal nonimmigrants and overstayed.[11]

Lack of information on the probability of apprehension along the southern border after 1988, needed for the repeated trials method, prevents estimating the actual inflow systematically as has been done for the 1977-88 period. Total Border Patrol apprehensions of those entering without inspection from Mexico in fiscal year 1988 were 954,000. They fell in 1989 to 872,000 and have since risen to 1.17 million in 1992, a 35-percent increase from 1989. Based on the assumption that the Border Patrol is equally effective at apprehending illegal aliens, from this information it appears that the illegal alien inflow from southern border crossers has increased. But in the absence of a way to measure the frequency of apprehension of individuals, we currently have no way of consistently estimating the probability of apprehension and hence the actual inflows owing to this increase. However, if the Border Patrol has become more effective through apprehending a larger proportion of the total number of aliens attempting entry, such productivity improvements could result in a higher apparent inflow when none has actually occurred, while lower productivity could understate an actual increase.

The remainder of the flow of illegal aliens consists mostly of visa overstayers. INS estimated 250,000 persons (200,000 non-Mexicans) remained in the United States beyond their legal periods of admission in 1988. By assuming the lowest single criterion country system error rate for tourists arriving by air (5.3 percent compared to the current INS practice, which calculated a total rate of 8.1 percent), we estimate that there could have been more than 540,000 overstays (460,000 non-Mexicans) in 1988. We consider this to be a maximum estimate.

[11]The Westat survey of legalization applicants indicates that 53 percent of those from Western Hemisphere countries other than Mexico and Central America and 88 percent of those from Eastern Hemisphere countries entered the United States legally as nonimmigrants and then overstayed.

Implied Emigration When Comparing Size and Flow

The Census Bureau analyses (Passel and Woodrow, 1987) imply an annual of growth of about 115,000 to nearly 180,000 Mexican illegal aliens (excluding extreme values). Subtracting these figures from the 1988 flow estimates suggests at least 1.1 million and perhaps as many as 3.2 million Mexican-born persons either returned to Mexico or remained uncounted by the Census Bureau.[12] If all these illegal aliens did return to Mexico, the uncounted illegal alien population would not grow from this flow. But to the extent that they do not return, either (1) the illegal alien population uncounted by the Census Bureau will increase and possibly be detected by vital statistics, or (2) the Census Bureau will detect this growth in future residual estimates as the uncounted population establishes itself in sampled housing units. The extent to which the uncounted illegal alien population may increase and still remain undetected is unknown and remains one of the largest difficulties in estimating this hidden population.

In comparison, the Census Bureau's residual method measures 50,000 to 100,000 annual growth among non-Mexicans. This implies that as many as 550,000 non-Mexican persons could have either left the United States or remain uncounted by the Census Bureau if these growth measures are consistent. In 1988, INS estimated that 73,500 non-Mexican illegal aliens who had overstayed their visas before 1988 departed during 1988. Even considering the limited information on the uncounted illegal alien population nationally, this return migration is likely to be accounting for most of the difference between the INS and Census Bureau estimates, hence minimizing the growth of uncounted non-Mexican illegal aliens.

In these comparisons, flow estimates are based on INS data for 1988, while the Census Bureau net growth estimates were calculated using data from throughout the 1980s. These Census Bureau averages are not perfectly comparable to the INS data for one year, but serve to illustrate the contrast between the total flow on the one hand and net size growth and implied return migration on the other.

Summary

In summary, based on the Census Bureau data and on our analysis, it appears that there were likely to have been no more than 3.4 million illegal aliens resident in the United States in 1990. The estimate is lower than the 5.5 million maximum likely estimate derived by the Census Bureau for its evaluation of census coverage. To reach our estimate, we compared the residual method estimate to data from the 1990 Mexican census,

[12]Some of those included in the Census Bureau's residual estimates are non-Mexicans, primarily Central Americans, but Border Patrol apprehensions data suggest that 96 percent of border crossers are Mexicans.

suggesting a total of 2.7 million Mexicans illegally in the U.S., 2.3 million of whom were neither in Mexico at the time of the census nor had migrated legally to the United States during the preceding decade, and 400,000 of whom had entered the U.S. before 1980.

The total flow of illegal aliens is less certain. Based on published estimates 2.3 million illegal aliens entered the United States in 1988, the last year for which we have both border crosser and nonimmigrant overstay estimates. Under various assumptions, this number could have been as low as 1.3 million or as high as 3.9 million. This flow is composed of at least 86 percent border crossers. The 1988 published estimated flow of 2.3 million is nearly 70 percent of the total 1990 Census Bureau point estimate of 3.3 million. Since the Census Bureau measures a net growth in the illegal alien resident population of only 100,000 to 300,000 annually (see appendix III), there clearly are large return flows of illegal aliens out of the United States, perhaps accounting for up to 3.8 million entries in 1988. But with the current data systems, the exact level cannot now be estimated precisely.

Conclusions, Recommendations, and Agency Comments

In this chapter, we answer our final evaluation question: What data collection or methodological changes, if any, can contribute most to improving the measures or estimates of the size and flow of the illegal alien population? We answer this question by identifying the main limitations remaining in making estimates and present procedural and data collection recommendations that could improve future estimates.

As we have seen, a number of methods were developed during the 1980s to estimate the size and flow of the illegal alien population. Several of these methods appear to employ reasonable analytic techniques and assumptions, but as we have noted, the data required by these methods often are deficient for illegal alien estimation and contain unknown error quantities. Methods to estimate the national size of the illegal alien population have been refined by employing careful statistical adjustments for unknowns in the Census and INS data bases and using vital statistics on the foreign-born collected by the National Center for Health Statistics. The primary refinement in estimates of the flow of illegal aliens since our 1982 evaluation has been the development of independent criteria by INS for estimating the proportion of departing aliens whose departure forms are uncollected or unaccounted for in the NIIS data base. Another development has been the estimating of successful illegal alien entries from southern border apprehensions data.

Limitations Remaining

There are seven major remaining limitations in estimating the overall size of the illegal alien population: (1) lack of current information on the legal status of the foreign-born population; (2) lack of these data on individuals for assessing the geographic distribution and, hence, local area impacts of illegal aliens; (3) lack of any precise way to determine the number of illegal aliens uncounted by the decennial census or Current Population Survey; (4) uncertainty about the birth and death rates applying to foreign-born persons in the United States; (5) a continuing need for more information on the emigration of legal immigrants from the United States; (6) uncertainty over whether the legal special agricultural worker applicant population was counted in the 1990 decennial census or in the most recent CPS (with a question on nativity); and (7) a general inconsistency between the decennial census and CPS in measuring the foreign-born population.

There are also two main limitations preventing precise estimates of the flow of illegal aliens into the United States: (1) uncertainties over the number and length of illegal alien overstays from the NIIS as well as some

quality control problems in that data base, and (2) a lack of information from INS apprehensions data on repeated illegal entry attempts by individuals, generalizable probabilities of apprehension, length of stay of individuals, or the actual volume of flow of the illegal alien stream through the southern border.

Potential Improvements

The Immigration and Nationality Act (INA) specifically states that the Commissioner of the INS shall provide information useful in evaluating the social, economic, environmental, and demographic impact of immigration laws to include information on the alien population, emigration of resident aliens, and nonimmigrants in the United States (by occupation, basis for admission, and duration of stay).[1] Improvements in illegal alien estimation can come after the data bases have been improved to meet these legal immigration measuring mandates. There would be multiple benefits from such improvement, which would allow INS not only to meet these reporting requirements of the INA, but also to specifically measure the number, geographic distribution, and potential impacts of illegal aliens on the United States.

Based on our review of the estimation methods used, we concluded that the techniques for estimating the size and flow of the illegal alien population are largely restricted by data limitations rather than methodological problems. Significant improvements in estimation, therefore, will require more valid and reliable information on this hidden population. We discuss in the following sections the potential improvements in data collection that would address the nine problems identified above.

Improvements in Measuring the Illegal Alien Population Size

Legal Status of the Foreign-Born

The number of recently arriving illegally resident aliens in the United States could be obtained through a careful comparison of Census Bureau information on foreign-born persons with recent INS data on individual records (without identifiers) on legal admission. Such a comparison would be most useful if done by geographic area, time period of entry, country of birth, and age. For example, areas with more foreign-born persons who report having arrived in the United States in the 2 years before the census

[1]Section 103 [8 U.S.C. 1103], (c)(1) and (2).

or CPS than are in INS records of legal residents reporting these areas as settlement destinations are likely to contain illegal aliens. (Using a relatively short and recent period, such as 2 years, would minimize discrepancies arising from return migration over time.)

Geographic Distribution of Aliens

To determine the economic impact of illegal aliens, their concentration in different communities needs to be identified. The implied information on legal status discussed above would also provide information on the geographic distribution of illegal aliens because it examines data on residence. This information, if collected annually or more often in coordination with the CPS or other intercensal survey, will provide opportunities to regularly measure the size, growth, and distribution of the illegal alien population through the residual method.

Uncounted Foreign-Born

The uncounted foreign-born population remains difficult to measure. The Census Bureau-sponsored research of hard-to-enumerate populations is providing the reasons for their omission. Acting on this information and working to improve census response rates through shortened survey forms and other procedures could improve the counting of those difficult to enumerate.

Birth and Death Rates

Currently, to estimate the uncounted foreign-born, the vital statistics-based method assumes that the overall national death rates and infrequently collected CPS-based birth rates apply to the foreign-born. However, the method is sensitive to assumptions about these rates, and there is evidence that, at least for some groups of the foreign-born, the birth rates in particular may be quite different from the national rates. Thus, the assumed rates may be inaccurate and need to be improved. Supplemental questions on fertility in the CPS, as planned for 1994, could provide more data on the birth rates of the foreign-born. These rates could then be used with vital statistics to estimate both the uncounted female foreign-born population and, by proportional estimation, the entire illegal alien population with more confidence. Continuing to ask these supplemental questions, along with the foreign-born questions scheduled to begin regularly in the CPS in 1994, could provide this information for further illegal alien estimation. This indirect approach, however, is of lower priority than the more direct method using INS data.

Estimates of Emigration

A possible source of error introduced in estimates of the legally resident foreign-born population since 1980 is from the scarcity of data on emigration. Currently, this is assumed to be a fixed number of 133,000 foreign-born persons annually, but that magnitude was measured from the

Alien Registration and the age-sex-period of entry distribution from the 1960 and 1970 censuses. This information needs updating, possibly based on the 1980 and 1990 censuses. This analysis, while planned by the Census Bureau, has been constrained by staffing levels and an inability to remove illegal aliens from the count in the 1990 census. Another useful approach to address this problem, using the CPS, could be to update regularly the information on the foreign-born (planned to begin in 1994 as noted above). In the past, a supplemental CPS question on relatives living abroad has been asked to determine the emigration of the foreign-born, but at the time we did our work, the Census Bureau had no plans to ask it in future surveys.

SAW Coverage Uncertainty

To resolve the coverage issue of the special agricultural workers, a special survey may be needed to determine the extent to which the SAW legalized population are residents of the United States, were counted by the 1990 census, and are being counted by the CPS. An analysis by occupation cannot distinguish between legal and illegal farmworkers nor determine possible movement by SAWs out of agriculture into other occupations.

Census and CPS Coverage

There is currently considerable inconsistency in the coverage of the foreign-born population of the United States between the CPS and the decennial census.[2] Detailed analysis of the 1990 census data on the foreign-born by country of birth, age, sex, and race could help determine the reasons for the coverage differences between the census and CPS and improve postcensus estimates of the foreign-born. Monthly measurement of the foreign-born in the CPS beginning in January 1994 will provide the opportunity to monitor the growth and examine the potential sources of error in CPS measurement (nonresponse, misreporting, and so forth).

Improvements in Measuring the Flow of Illegal Aliens

NIIS Data Base Control and Error Estimation

Improvements in estimating the flow of illegal aliens could come through improving the capability of the NIIS to handle and process the increasing volume of data on arrivals and departures of nonimmigrants, now approaching 20 million arrivals annually. Efforts by INS to improve the

[2]Based on the 1989 CPS, there should have been approximately 18 million foreign-born residents in the country. The 1990 census counted 19.8 million. This difference may arise partly from including 1.3 million SAW applicants in the census.

collection of departure forms or studies of the system to estimate this error more accurately can produce more confidence in the overstay estimates. A study could be performed that follows a sample of arriving nonimmigrants to examine the status of their departure forms: uncollected by the airlines, lost by the nonimmigrant before departure, incorrectly coded or keypunched, or held by an overstaying illegal alien. A comparison of collected departure forms with passenger manifest lists for the same departing flights could establish more precise estimates of the noncollection of departure forms.

In addition, if INS continues its repeated tabulations from the NIIS data base, it could determine the length of time illegal aliens remain in the country after overstaying their visas. This information could be used to estimate the extent to which overstays are becoming permanent additions to the U.S. population. It could also help determine coverage levels in the census and CPS, and help profile which nonimmigrants illegally remain in, and hence have the largest economic impact on, the United States.

INS Apprehensions Data

The INS Border Patrol is beginning to fingerprint aliens apprehended in the San Diego Border Patrol Sector with a new, more efficient processing technology. The primary use of this information will be for identifying criminals and smugglers. However, release of compilations of the frequency of apprehension of individuals, the time between multiple apprehensions, alien characteristics, and other relevant information can also be used to improve flow estimates with the repeated trials method (and possibly other methods). This information will be even more useful if INS begins to fingerprint aliens in other border patrol sectors as well. Automating the records of apprehension with individuals identified could be especially helpful in making timely estimates.

Interagency Working Group

Lastly, the Interagency Working Group on Immigration Statistics, composed of representatives of the Departments of Justice, Commerce, Health and Human Services, and Labor and other agencies provides a forum for open discussions of possible improvements in immigration measurement. The proceedings and publications of this group could provide valuable information if made widely available to interested public and private parties. Where appropriate, these efforts could help to encourage cooperative and joint research to improve the measurement of immigration in general and illegal aliens in particular.

Recommendations

First, we recommend that the Commissioner ensure that INS further explore ways in which Census Bureau data can be used to improve information on the foreign-born population (including illegal aliens and special agricultural workers) with as much geographic detail as possible, such as estimates of the distribution of this population across states and metropolitan areas. A detailed analysis by age, country of birth, and period of entry would be needed to produce such estimates. Also, INS could use the information on legal immigrants to assist in meeting its reporting requirements specified in the INA.

Second, INS should also work with the Census Bureau to improve the coverage of the foreign-born in the CPS, including the Bureau's planned analysis updating estimates of those foreign-born persons permanently leaving the United States. This information would help to improve national population estimates as well as provide a more current basis for estimating the total foreign-born population (and hence, the number of illegal aliens) in the future. Also, further emigration supplements using the regularly collected foreign-born data in the CPS could provide a continuing update of this important component of population change.

Third, INS should work with the Secretary of Health and Human Services to assess the feasibility of conducting research on the birth and death rates that apply to the foreign-born population through sample surveys of both the vital events themselves and the population bases.[3] These data, if collected by age group, could be combined with the estimates of the counted illegal alien population and, by implication, measure the uncounted illegal alien population.

Fourth, to improve the collection of departure forms, INS should examine the quality control of the NIIS data base and determine why departure forms are not being recorded. For example, this could involve examining a sample of the passenger manifest lists of flights with foreign destinations to determine the extent of airline compliance and possibly developing penalties on airlines for noncompliance. Discovery of the incidences of various causes of departure loss could allow more precise estimation of their occurrence and development of possible remedies.

Fifth, we recommend that INS regularly tabulate the NIIS data base to identify long-term visa overstays. These data will be valuable in showing the net growth of the illegal alien population through overstaying as well

[3]Surveys could solve the problem of the uncounted missing from the population bases used to compute rates, but they also introduce survey error. Hence, large sample sizes will need to be considered.

as developing profiles of those most likely to remain in the country illegally.

Sixth, we also recommend that if INS decides to implement the new Software Assisted Screening System for fingerprint identification, currently being tested by the Border Patrol to identify individual aliens apprehended, processing capability could be implemented for statistical tabulations of the data to be made publicly available on a regular and timely basis. Data from this system could assist not only in enforcing the law, but also in estimating the flow of illegal aliens by providing information on the number of distinct individuals apprehended, the frequency of apprehension, the time between apprehensions, and the probability of apprehension. These data, provided periodically, will assist in making estimates of the flow of border-crossing illegal aliens. Once a data base of individuals who attempt entry is established, monthly tabulations of this system could be very useful by providing timely information on the number of additional individuals who are apprehended. Data on the characteristics and origin of those attempting illegal entry could be used not only to improve estimates of the flow of illegal aliens, but also to continue to formulate policy addressing the causes of illegal migration to the United States.

Agency Comments and Our Evaluation

We received written comments on this report, reproduced in appendix V, from the Departments of Justice, Commerce, and Health and Human Services (HHS). All three agencies agreed in principle with the thrust of our six recommendations. However, the Commerce Department argued that the first three recommendations should have been directed to the Census Bureau, which has experience in conducting the types of analyses we suggested. The Department of Justice agreed that the second recommendation—concerning coverage of the foreign-born in the CPS—should be directed to the Census Bureau, but argued that the third—concerning research on birth and death rates among the foreign-born—should be addressed to HHS. However, HHS concurred with our recommendation as written and indicated a willingness to work with INS on this issue.

We continue to believe that all the recommendations are appropriately directed to INS, given its overall responsibilities under the Immigration and Nationality Act. We recognize that Census and HHS likely will have lead responsibility for carrying out some of the analyses implied in the recommendations, but are encouraged that mechanisms, such as the

Interagency Working Group, are available to help INS participate in directing those analyses toward resolving the data problems we have identified.

Both the Justice and Commerce Departments also made numerous comments concerning our use of specific estimates, presentation of data, and citations of extant studies. We have addressed these comments throughout the report as appropriate. In addition, both departments raised questions about the analyses in chapter 4, especially the use of 1990 Mexican census data and estimates that we have characterized elsewhere in the report as weak. In response, we have modified chapter 4 to take account of additional information on the 1990 Mexican census and to clarify how the estimates we derived were affected by weaknesses in the underlying data.

Assessment of the Predictive Validity of the Residual Method

One way to assess an estimation method is by testing its ability to predict known outcomes—its predictive validity. In this appendix, we present detailed information on our assessment of the ability of the residual method to estimate the age and geographic distribution of the illegal alien population. The criterion data come from published and unpublished studies and from INS data on the applicants under the pre-1982 provisions of section 245(A) of the Immigration Reform and Control Act.

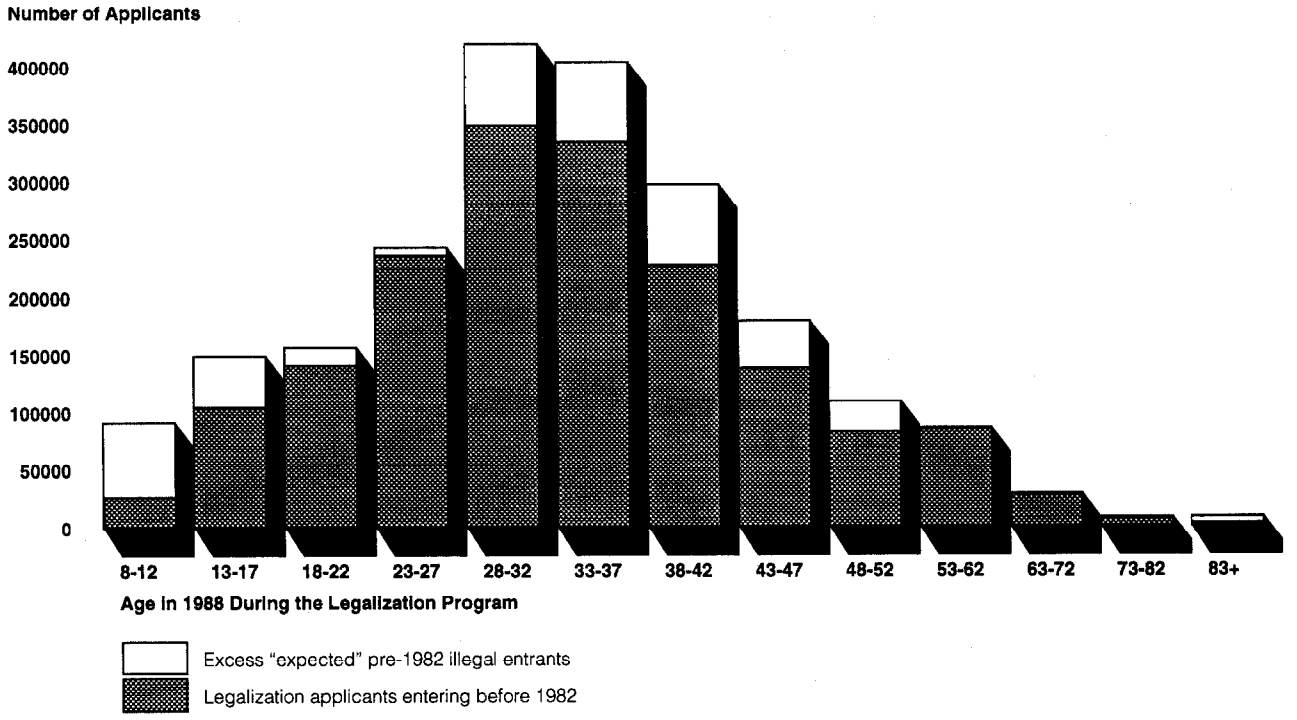
Age

First, we used the 1980 residual method estimate to predict the number of persons, by age group, who would have been eligible for legalization under IRCA in 1988. Next, we compared these estimates to those actually applying for legalization. This procedure resulted in an estimate of 2.17 million illegal aliens expected to have qualified for the pre-1982 provisions.[1] However, only 1.76 million applied, or 407,000 (19 percent) fewer than our estimate. This difference could reflect a number of factors. For example, some qualified aliens may not have applied for legal status, and others may have attained it by means other than IRCA. Some of the assumptions we used may have introduced inaccuracies: (1) growth during the 1980-81 period (between the census and the legalization qualifying date), (2) number and age distribution of those apprehended, and (3) number and age distribution of those dying. Given these limitations, the approximation we were able to calculate is not unreasonable.

This approximation is shown graphically in figure I.1. Here, we compare the number of persons applying for legalization with the number estimated to be eligible, by age group. Figure I.1 shows a general convergence between the actual and expected number of applicants, both overall and in terms of the age distribution. This suggests that the residual method as applied by the Census Bureau can provide reasonable estimates by age, given the limitations noted above.

[1]We estimated the apprehension and removal of 198,000 aliens between 1980 and 1988 of those entering before 1982 and approximately 41,000 deaths before 1988. We have no estimate for emigration of illegal aliens or adjustment to legal status. These two components tend to reduce the illegal alien population size; however, since the uncounted illegal alien population in 1980 would increase the population who could legalize, the two biases cancel each other out to some extent.

Figure I.1: Comparison, by Age, of Actual to Expected Applicants for Legalization[a]



[a]Expected population based on the 1980 residual estimate of illegal aliens counted in the 1980 census. The actual number of applicants exceeds the expected population for age groups 63-72 and 73-82 by 6,280 and 357 persons, respectively.

Geographic Distribution

We also have assessed the ability of the residual method to predict the geographic distribution of the illegal alien population through comparing the 1980 residual method results with the applicants under the pre-1982 provisions of IRCA. We made these comparisons for the five states and five metropolitan areas with the largest illegal alien populations. Admittedly there are time-period differences, which we have been unable to account for through estimates of internal migration, emigration, or deaths. However, a plausible trend to those states and metropolitan areas known to contain large numbers of illegal aliens should be detectable.

The comparisons of the geographic distribution presented in table I.1 show where illegal aliens were counted on April 1, 1980, compared to where those entering illegally before January 1, 1982, resided when they

applied for amnesty. Hence, as with the age comparison, the applicant pool has 21 months of growth not included in the census. The census population has nearly 8 years of internal migration, mortality, and emigration unaccounted for. Notwithstanding these deficiencies, no other method can provide any comparable set of information. Up-to-date information on the geographic distribution and characteristics of illegal aliens could be very useful for policy and program evaluation, estimation of local economic impacts, and assessment of cultural assimilation barriers.

Table I.1: Comparison of the Geographic Distribution of Illegal Aliens[a]

Residence	Counted in 1980 census	1988 IRCA applicants	Difference
State			
California	1,024	956	–7%
New York	234	118	–50
Texas	186	308	66
Illinois	135	121	–10
Florida	80	50	–37
Metropolitan area			
Los Angeles	658	611	–7
New York City	212	106	–50
Chicago	127	107	–16
Anaheim-Santa Ana	79	89	13
Washington, D.C.	70	21	–70
Total	**2,057**	**1,760**	**–15%**

[a]In thousands.

Source: U.S. Department of Commerce, 1985, and INS 1991 Statistical Yearbook.

Given the time period in this comparison, we can only speculate on the reasons for the distributional differences. By state, California and Illinois show the least deviation from those counted in the 1980 census (7 and 10 percent shortfalls, respectively), which may indicate high lengths of stay and employment assimilation among illegal aliens residing in these states. New York City received only half as many applicants as illegal aliens were counted in 1980. This information is consistent with both a suspected shortfall of legalization applicants for metropolitan areas and high mobility of the illegal alien population originally arriving legally as nonimmigrants (Helton, 1988). This also appears to be the case for Washington, D.C. In contrast, Texas and Santa Ana-Anaheim, California,

had more applicants in 1988 than counted illegal aliens in 1980, perhaps owing to large increases in 1980-81 (between the census and the legalization qualifying date), and highly mobile uncounted aliens in 1980 near the Mexican border.

Use of Registered Births to Estimate the Illegal Alien Population Size

In this appendix, we present detailed information on our assessment of using birth data with the death registration method to estimate the size of the illegal alien population.

Registered Births

As a supplement to the death registration method, the number of births by age of mother can be used to estimate the number of foreign-born women of child bearing age. For example, using 1983 births to Mexican-born women, we can estimate that there was a total of 562,000 female Mexican illegal aliens aged 18-38 in the United States. This is 270,000 more uncounted Mexican females so aged than the approximately 292,000 counted by the residual method in 1980 (Borjas, Freeman, and Lang, 1991). Female estimates can be used to assess the potential future population growth of illegal aliens as well as to indicate the total size.[1]

For vital statistics purposes, a woman reports her own place of birth to the doctor completing her baby's birth certificate. In mid-1992, these data were available only up to 1989. As with registered deaths, births to women of unknown nativity are less than one percent.

Fertility Rates

Fertility rates have been calculated for foreign-born women using supplemental questions on the CPS that ask women about all the children ever born to them. Fertility rates for all women aged 20 to 24 in the United States have varied from 107.3 per 1,000 in 1984 to 115.4 per 1,000 in 1989. However, research on the 1986 and 1988 CPS data suggests a rate of 140 births per 1,000 for Mexican-born women of this age group.[2]

Our analysis of the method using birth rates indicates the need for more accurate fertility rates for the foreign-born. These estimates are sensitive to assumptions about age- and nationality-specific fertility rates, so even relatively small errors can have large effects on the estimates. The total U.S. fertility rates for the female immigrant population aged 15 to 44 from countries other than Mexico appear to bias upwardly the estimation of this population, while Mexican-born fertility rates calculated from the CPS appear to underestimate the Mexican-born female population when

[1]For example, the 292,000 counted Mexican females aged 18-38 represent 26 percent of the total counted Mexican illegal alien population of 1.3 million in 1980. Hence the total estimate of 562,000 Mexican females aged 18-38 could indicate a total Mexican illegal alien population of 2.2 million (562,000/0.26).

[2]Birth rates for married women aged 20 to 24 varied from 203.8 per 1,000 in 1983 to 211.5 per 1,000 in 1988. The range of birth rates that could apply to foreign-born women in the United States introduces uncertainty in the estimates using this method.

compared to those counted in the CPS itself. Also, the delay in availability of vital statistics data prevents their timely and current use to make uncounted foreign-born estimates.

Use of the Residual Method to Estimate the Net Growth of Illegal Aliens

One of the uses of the residual method is to measure the net growth of the illegal alien population through examining the difference between two estimates separated by time.[1] The extent to which the second estimate exceeds the first represents the net growth owing to those illegal aliens who have entered and remained in the United States. This growth is represented by the following equation.

Net growth	=	$(I^t - I^{t-1})$
	=	Gross Inflow - Sum of (emigrants + deaths + adjustments to legal status + deportees + voluntary departures)
where I	=	Population of illegal aliens and
t	=	Second measurement date
$t-1$	=	First measurement date

Growth Between Measurement Dates

The emigrant component above consists of both those illegal aliens who enter the United States after the first measurement date and leave before the second date, and those leaving after being measured at the first date. Deaths and adjustments to legal status occur between the measurement dates. To the extent that the total number of entries exceeds the sum of the other components, there could be a measurable net growth.

As table III.1 shows, the Census Bureau has consistently measured this average annual net growth of illegal aliens as between 100,000 and 300,000. These estimates measure the counted net average annual growth in the number of illegal aliens, which represents the most important component of change. Since these illegal aliens are those who remain in the United States, they presumably have a longer term impact on local labor markets and service use than those who stay for shorter periods.

[1]Net inflow includes accounting for emigration, death, and adjustment to status while gross inflow discussed in this report looks only at arrivals during a given year.

Table III.1: Estimates of the Average Annual Net Growth in the Illegal Alien Population[a]

Time period	Country of birth: Mexico	Country of birth: Other	Total
CPS to CPS comparisons			
1979-83	183	108	**291**
1979-86	115	103	**218**
1979-88	103	121	**224**
1979-89	137	62	**199**
Census to CPS comparisons			
1980-83	211	–53	**158**
1980-86	170	6	**176**
1980-88	144	49	**193**
1980-89	173	–2	**171**

[a]In thousands.

Source: Woodrow (1991b, 1992), Woodrow and Passel (1990), Passel and Woodrow (1987).

As the table indicates, the net growth is larger when comparing two CPS estimates than when comparing census to CPS estimates. When comparing two different CPS estimates, the coverage level of the foreign-born population is approximately the same, resulting in a consistent measure of the net growth of illegal aliens.

The larger sample in the 1980 census reflects the more thorough coverage of the foreign-born than in the CPS samples. As a result, the growth between dates appears smaller. Even accounting for legal immigration to make the measurement intervals comparable, this information suggests that the coverage in the CPS is up to 10 percent less complete than that of the decennial census.

The sampling error associated with all these estimates is relatively large. For the November 1989 CPS, the 90-percent confidence interval of a point estimate of 200,000 for all countries is 107,000 to 293,000.

A more accurate measure of annual net growth should come through a comparison of the 1980 and 1990 census estimates, both having large samples and more complete coverage of the foreign-born relative to the CPS. A careful analysis taking account of the legalization applicants and potential adjustments to status of illegal aliens during the intercensal period could further test the reasonableness of the 200,000 average annual net growth estimate.

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Robert Warren, U.S. Immigration and Naturalization Service, Chief, Statistics Division, Washington, D.C.

Comments From the Departments of Justice, Commerce, and Health and Human Services

U. S. Department of Justice

Washington, D.C. 20530

APR 26 1993

Ms. Eleanor Chelimsky
Assistant Comptroller General
Program Evaluation and Methodology Division
U.S. General Accounting Office
Washington, D.C. 20548

Dear Ms. Chelimsky:

The Department appreciates the opportunity to provide comments on the General Accounting Office (GAO) draft report entitled, "Illegal Aliens: Probably No More than Four Million in the United States in 1990." The Department generally agrees with GAO's overall finding that methods of estimating the illegal alien population have been improved since the last GAO report on this subject. The Immigration and Naturalization Service (INS) continues to refine its methodology and improve the data for making estimates. The GAO assessment of procedures that have been used to measure this inherently difficult-to-estimate population should be useful to policy makers as well as other researchers. We also note that implementation of the recommendations in this report could lead to further improvements in the estimation of illegal immigration. The INS has been taking action in areas covered by the recommendations and will continue to do so.

The first three recommendations suggest some cooperative effort between INS and other agencies. In recommendations 2 and 3 GAO specifically suggests that INS work with other agencies (the Census Bureau and the Department of Health and Human Services) in the collection of additional information to assist in estimating the illegal alien population. Although INS has no objection to working with these agencies, responsibility for the actual collection of data will lie with those agencies. We, therefore, urge that GAO make the recommendations directly to the Census Bureau and the Department of Health and Human Services and provide them the opportunity to review this report. We distinguish the first recommendation from the two that suggest we work with other agencies. Recommendation 1 states that "INS explore ways in which INS and Census Bureau data can be used jointly to improve information on the foreign-born population,

Ms. Chelimsky

including illegal aliens." As we read this, GAO recommends that INS review data currently collected by INS and the Census Bureau, and identify ways that INS may combine currently collected INS and Census data to better determine the foreign-born population in the United States. If this is not the intent of the recommendation, we believe it should be rewritten. If the recommendation is that we work with the Census Bureau to improve Census data collection efforts, then we would urge that, like recommendation 2, this recommendation be addressed to the Census Bureau.

Finally, the Department would like to note that INS found several errors in GAO's analysis of, and reporting on, the methods and data collection for estimates of the illegal alien population. The Department has sent its comments on these weaknesses under separate cover. We understand that GAO will incorporate our comments, as appropriate, into the final report.

Sincerely,

Stephen R. Colgate
Assistant Attorney General
for Administration

UNITED STATES DEPARTMENT OF COMMERCE
Chief Financial Officer
Assistant Secretary for Administration
Washington, D.C. 20230

MAY 5 1993

Ms. Eleanor Chelimsky
Assistant Comptroller General
General Accounting Office
Washington, D.C. 20548

Dear Ms. Chelimsky:

Thank you for the opportunity to review your draft report entitled "Illegal Aliens: Probably No More than 4 Million in the United States in 1990."

We have reviewed the enclosed comments of the Acting Director, Bureau of Census and believe they are responsive to the matters discussed in the report.

Sincerely,

Gloria Gutierrez
Acting Chief Financial Officer and
Assistant Secretary for Administration

Enclosure

UNITED STATES DEPARTMENT OF COMMERCE
Bureau of the Census
Washington, DC 20233-0001

OFFICE OF THE DIRECTOR

APR 19 1993

Ms. Eleanor Chelimsky
Assistant Comptroller General
General Accounting Office
Washington, DC 20548

Dear Ms. Chelimsky:

Thank you for the opportunity to review the draft General Accounting Office (GAO) report, "Illegal Aliens: Probably No More Than 4 Million in the United States in 1990." We find the report is comprehensive in its review of five existing methods to estimate the size and flow of undocumented "illegal" aliens. The report discusses the logic of each method and the estimation techniques and spells out the assumptions and data limitations. The report is very effective in separately analyzing estimation methods that measure the size of the illegal alien population (residual method, death registration method, sex ratio method) versus methods that measure the flow of illegal aliens (nonimmigrant overstay method, repeated trials method). The report also contributes to the understanding of the various estimation methods by assessing each in terms of their ability to measure the "counted" and "uncounted" undocumented populations.

We agree in principle with the six recommendations to improve data collection and data processing and strengthen interagency cooperation on immigration research. However, the current draft gives the Immigration and Naturalization Service (INS) the lead role in all six areas, whereas the first three recommendations deal with the collection and analysis of census data--(1) and (2) coverage in the Current Population Survey (CPS) and emigration supplements, and (3) research on birth and death rates--areas in which the Census Bureau has expertise and clearly should be assigned the lead role. A cooperative partnership between the Census Bureau and the INS is essential in all areas.

Our major reservations with the draft report are twofold. First, the quality of some sections in the report suffers because of a failure to adhere to conventional standards of professional research. Specifically, the sources of the work being reviewed in Chapters 2, 3, and 4 are rarely cited; the tables are not properly footnoted and are difficult to understand (especially Table 4.1); and the figures are poorly designed. And second, these deficiencies lead to the major limitation of the report--Chapter 4, where GAO presents its own estimates of the size and flow of undocumented aliens. The analysis presented in that chapter is weak and poorly substantiated. In particular, by not giving an evaluation of the techniques used by "researchers" to estimate the expected Mexican population in 1990 and the size of

the Mexican census undercount, the report fails to establish that GAO's own estimates are better than others. In fact, the GAO estimation techniques simply refine the available data sources of the illegal estimation methods they critique; GAO does not suggest any significant restructuring of these methods or any investigation of new methods.

In summary, the lack of attention to research standards in parts of the current report undermines the quality of an otherwise very useful and important document. We recommend that the report be rewritten with more attention paid to its clarity, proper citations, and properly footnoted tables and figures. We also recommend that Chapter 4 be revised to substantiate the analyses undertaken by GAO and to clearly explain the techniques used by the "researchers" (who are never cited nor their methods clearly explained). We also believe that the report should encourage the search for, testing of, and application of newer estimation methods.

We have enclosed specific comments on the draft report and examples of where it can be strengthened.

Sincerely,

Harry A. Scarr

Harry A. Scarr
Acting Director
Bureau of the Census

Enclosures

DEPARTMENT OF HEALTH & HUMAN SERVICES

Office of Inspector General

Washington, D.C. 20201

APR 30 1993

Ms. Eleanor Chelimsky
Assistant Comptroller General
United States General
Accounting Office
Washington, D.C. 20548

Dear Ms. Chelimsky:

Enclosed are the Department's comments on your draft report, "Illegal Aliens: Probably No More Than 4 Million In The United States In 1990." The comments represent the tentative position of the Department and are subject to reevaluation when the final version of this report is received.

The Department appreciates the opportunity to comment on this draft report before its publication.

Sincerely yours,

Bryan Mitchell

Bryan B. Mitchell
Principal Deputy Inspector General

Enclosure

COMMENTS OF THE DEPARTMENT OF HEALTH AND HUMAN SERVICES ON THE GENERAL ACCOUNTING OFFICE DRAFT REPORT "ILLEGAL ALIENS: PROBABLY NO MORE THAN 4 MILLION IN THE UNITED STATES IN 1990"

GENERAL COMMENTS

The General Accounting Office (GAO) report describes the complexity of determining the size and flow of the illegal alien population in the United States. A major problem encountered is the inherent lack of certainty in the measurement and estimation of any "hidden" population. The size and distribution of the illegal population has always been difficult to measure and there is no precise way of estimating the illegal alien population. Ordinarily reliable methods cannot be used. Consequently, researchers must use indirect analytic techniques to measure or estimate the number of illegal aliens.

Since GAO's previous evaluation in 1982, the methods used to measure the size and flow of the illegal alien population have been refined to produce a narrower range of estimates. A method developed by the Bureau of the Census, for example, has narrowed the range of estimates of the total number of illegal aliens considerably from the widely varying bands of 2 million to 12 million speculated to be the total in the late 1970's to a maximum of 5.5 million in 1990. By combining this estimate with data from the Mexican census, GAO further narrowed this estimate to a maximum of 4.0 million.

The GAO report contains six recommendations, one of which applies to the Department of Health and Human Services (HHS). The following is the Department's comment on the recommendation directed to HHS.

GAO RECOMMENDATION

The INS should work with the Secretary of Health and Human Services to assess the feasibility of conducting research on the birth and death rates that apply to the foreign-born population through sample surveys of both the vital events themselves and the population bases. If feasible, these data should be collected by age group. It could be combined with the estimates of the counted illegal alien population, and by implication measure the uncounted illegal alien population.

DEPARTMENT COMMENT

We concur. The National Center for Health Statistics (NCHS), Centers for Disease Control and Prevention, Public Health Service, collects and publishes vital statistics data including estimates of foreign-born and hispanic births and deaths. Birth data on the country of birth of the mother and death data on the country of birth of the decedent, which are

collected by NCHS in cooperation with the States, can be shared with the Immigration and Naturalization Service (INS) without personal identifiers. NCHS currently has data available for Mexico, Cuba, Canada, all other foreign countries combined, and U.S. possessions. NCHS could assist INS by negotiating with the States to begin coding vital statistics data on additional countries if resources to fund the additional coding are provided.

The NCHS collects, in cooperation with the States, nationwide birth and death data; however, the information to be collected in the surveys alluded to in this recommendation (Chapter 5, page 10) would appear to go beyond what could be collected in a health survey.

Major Contributors to This Report

Program Evaluation and Methodology Division

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