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What Happened to the Percent Able to Speak English in  
Puerto Rico Between 1940 and 1950?:  
The Aggregate Reliability of a Census Language Question

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## Abstract

The percent able to speak English in Puerto Rico decreased between 1940 and 1950, even though it has increased in every other inter-censal period. What explains 1950? Were figures in error? Was there a systematic failure of reliability? This paper fits an expected percent able to speak English for 1950 to the time-series. Selective out-migration of speakers of English and the effect of changes in school language policy account for almost all the difference between the actual and expected percent able to speak English in Puerto Rico in 1950.

Lieberson (1969:286) observes that although the data collected in censuses tend to be too simple to be of linguistic interest, the enormous coverage of the census and its other data make language questions in censuses of great interest in studying the place of language differences in society. Doubts have been raised about the reliability of language questions in censuses (Kloss, 1929; Fellegi, 1964) and methods of checking the reliability of such questions have been proposed (Lieberson, 1966; Fellegi, 1964). Fishman (1969) conducted his own mini-census of a two block Puerto Rican neighborhood to evaluate the reliability of his measures. He found them to be acceptably reliable on the basis of internal consistency.

Fellegi (1964:1037) using the technique of the inter-penetrating sample found that the items on bilingualism, mother-tongue, and ethnic origin in the 1961 Canadian Census had lower reliability than other items. Lieberson (1969:292) points out that the reliability of these items is still not bad by comparison to the conventional standards of reliability in social research. Although the U.S. Bureau of the Census, to my knowledge, has made no evaluation of the reliability of the language data it has collected, an evaluation of a similarly subjective item, ethnic origin, has been made (U.S. Bureau of the Census, 1974). Sixty-four percent of the people interviewed in a Current Population Survey were coded as having the same ethnic origin a year later (U.S. Bureau of the Census, 1974:15). The test was repeated two years running with the same results. This test of reliability is relevant to open-ended questions on language such as "What was the

language usually spoken in your home when you were a child?" but not to close-ended dichotomies such as "Is this person able to speak English?" with the only possible answers being 'yes' or 'no'. With a dichotomy there is a greater possibility of being right if only by accident, so it is expected that a dichotomy should have a higher reliability than an open-ended polytomy categorizing about the same kind of information.

Even with poor reliability in individual measurement, the reliability of statistics improves greatly with aggregation, as long as the error is random. An evaluation of the reliability of some housing statistics in the 1960 Census showed that although reliability in individual measurements was poor, statistics at the census tract level of aggregation were adequate (U.S. Bureau of the Census, 1967:5). Aggregation, however, provides no check against systematic changes in measurements. This paper discusses the possibility of bias, a systematic failure of reliability, in measuring ability to speak English in the 1950 Census of Population in Puerto Rico.

From 1910 to 1970 each succeeding census in Puerto Rico, including a special census in 1935 funded by the Works Progress Administration, has asked a question such as "Is this person able to speak English?" or "Does this person know how to speak English?". This question is asked only of persons ten years of age and older. It is asked in Spanish as the whole Puerto Rican schedule is in Spanish. It and the instructions to enumerators for it are direct translations of the question on ability to speak English and its set of instructions for enumerators in the U.S. Census of Population of 1890. On the mainland, the question remained through the 1930 census.

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Table 1 about here

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Table 1 presents the wordings, explanations, and instructions to enumerators from various censuses down to 1970. They are essentially unchanged. The question can only be answered 'yes' or 'no'. What does a 'yes' or a 'no' answer mean? A person who knows no English would be classified a 'no' and a fluent speaker would be classified as a 'yes'. Intermediate facility is categorized by the enumerator with the guidance of the instructions to enumerators. The question was never a self-enumerated item. Instructions to enumerators indicate that the criterion is ability to carry on a conversation, with nothing said about fluency. In fact, the phrase "make himself understood" is used. As anyone who has carried on a conversation in a second language knows, this phrase is used to describe a situation in which one speaks with a heavy accent, makes a mess of the grammar, but succeeds in communicating simple, unnuanced thought. The criterion then is a minimal conversational ability. This must be the criterion, for although 37.7% of the Puerto Rican population were classified as able to speak English in 1970, nowhere near that percentage has a native-like control of both English and Spanish, a fact recognized by the United States-Puerto Rico Commission on the Status of Puerto Rico in its 1966 Report (United States-Puerto Rico Commission on the Status of Puerto Rico, 1966:145).

As Table 2 shows the percent able to speak English has steadily increased from census to census, with the one exception of 1950, when there was a decline of 1.7 percentage points. Between 1910 and 1940, each decennial census showed an average increase of 8.1 percentage points. 1950 is an anomaly. There are two writers who have commented that it seems unusually low and offered explanations (Epstein, 1966, 1968; and Rodriguez, 1966). The 1950-1960 difference shows a large increase, suggesting that the 1950 measurement simply understates the true figure.

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Table 2 about here

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A precise expectation of what the 1950 figure should have been can be constructed two ways: by extrapolation of past trends or by interpolation from the whole time-series. Extrapolation from previous data shows what 1950 would have been like if change had proceeded during the '40's as it had from 1910 to 1940. Interpolation from the whole time-series assumes that change during the 1940 to 1960 period occurred in a way which lies on a curve fitting the other points of the time-series. Interpolation takes any permanent lowering of the percent able to speak English in Puerto Rico in the '40's into account. Extrapolation of the 1910 to 1940 trend does not. If the two expected values are close together, it is an indication that there was no permanent lowering of the percent able to speak English in 1950. If the

interpolated value is much lower than the extrapolated expected value, then there is reason to think that there was a permanent lowering of the percent able to speak English in 1950.

A third-degree polynomial was fit with least squares first to the time-points 1910 to 1940, and extrapolated to 1950, and then to the full time-series minus 1950, and 1950 was interpolated. The two expected values are virtually identical, indicating that there was no permanent lowering of the percent speaking English in Puerto Rico in 1950. The extrapolated percent for 1950 is 33.8; the interpolated percent is 33.4. The average 33.6 will be taken as the expected value.

The simplest explanation of a temporary lowering of the percent able to speak English is either a failure of reliability or an error in tabulating results. There is clear evidence of at least some errors in tabulation. The variable, ability to speak English, appears in two tables in the 1950 Census (U.S. Bureau of the Census, 1953:33, 134-135). The numbers in the two tables do not agree. Table 57 cross-classifies ability to speak English by age in addition to a cross-classification for urban/rural residence and sex in both tables. Table 3 displays the discrepancies. The differences are not due to Table 57 missing age data. Missing age data was assigned a value by the census (U.S. Bureau of the Census, 1953:vi). Most of the error is concentrated in the 'urban female' category. There is hardly any discrepancy in the category totals. This kind of error cannot be corrected. Table 17's percent able to speak English is

26.1%; Table 57's 25.9%. Table 17's is slightly closer to the expected value. Thus the figures of Table 17 are kept.

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Table 3 about here

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Liebertson (1966:146) suggests intra-cohort comparison to check the consistency of language data. That strategy is adopted here to isolate the peculiarity of 1950 from age and cohort effects. A cohort analysis is performed on data from 1935 through 1970. The logit of percent able to speak English is regressed on dummy variables for age, cohort, and time, the equivalent of multiple classification analysis. Several categories have to be combined to avoid the identification problem (Mason *et al.*, 1973). The two oldest age groups and the three oldest cohorts were combined. Inspection of the data showed the percent able to speak English in these groupings to be approximately equal. This procedure is a variation of the interpolation strategy: to see if, controlling on measurements on age groups at other times, there is something unusual about 1950.

The cohort table on which the multiple classification analysis is based has 7,920 cells, 440 of which are non-zero. It is defined by the variables: age (11 five-year groups, 10-14 to 60-64), birth cohort (18 five-year groups, from 10-14 in 1970 to 95-99 in 1970), time (5 census dates from 1935 to 1970), sex, urban/rural residence and ability to speak English, yes or no. After the logit transformation, the dummy variable regression has 220 "cases". Each "case" is a com-



combination of the categories of the predictors, weighted by the number of people in that particular combination of categories of the predictor variables. The 1960 and earlier censuses published some age data in ten-year age groups. The ten-year groups were split into five-year groups with Sprague multipliers. People older than 64 at any time period are excluded because in the 1935 census, 55-64 was the oldest close-ended age group.

When the logit of ability to speak English is regressed on the dummy variables of age, cohort, and time, the following coefficients for the time periods are obtained.

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Table 4 about here

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The coefficients of interest are those for time. The negative sign indicates that the effects of 1935 through 1960 are all below that of 1970, the omitted category. All the coefficients except 1950 fit a straight trend line. 1950's coefficient lies far below the line, about where one would expect the 1930 coefficient to be, if there were observations for 1930. Thus with age and cohort effects controlled, 1950 appears to be a low measurement.

#### Explanations

There are four explanations for a low percent speaking English in 1950 besides error or a systematic change in the criterion used to distinguish those who spoke and those who did not speak English. Two strategies are used in evaluating each

explanation. First an accounting equation was used to identify factors which could affect the percent speaking English between two census dates (See Appendix). Secondly, the numerator and denominator of the 1950 proportion able to speak English are adjusted by estimates of the numbers of people each alternative explanation can account for to see if the gap between actual and expected percent able to speak English in 1950 can be closed, a reconstruction of what 1950 would have been had change not occurred.

The four plausible explanations are:

- 1) Speakers of English tended to migrate out of Puerto Rico more than non-speakers
- 2) De-emphasis of English instruction in the public schools in the '40's led to the youngest age group in 1950 being less likely to speak English than the same age group ten years before
- 3) Over-crowding in the public schools impaired the effectiveness of the school system, lowering the ability to speak English of the youngest age groups
- 4) Nationalism led to the refusal of some people who would otherwise be classified as able to speak English from claiming an ability to speak English.

There are several other possibilities: explanations which involve in-migration, return migration, and differential mortality rates. These are highly implausible. A note in the appendix, with the accounting equation, explains why.

Explanation #1: Selective Out-migration

Epstein (1966:47 and 1968:361) has suggested that speakers of English were among those most likely to migrate to the mainland in the 1940's. Massive migration to the U.S. mainland began at the end of World War II. See Table 4. Epstein (1968:361) thinks that the young and better educated were over-represented in the out-migration, which would mean that speakers of English would be over-represented as well. In addition Epstein thinks that speaking English would be a facilitating factor in the migration from Puerto Rico to the U.S. mainland, also insuring an over-representation of speakers of English in the out-migration. Two questions must be asked about this explanation. First, was the out-migration large enough to have an impact? Secondly, what was the percent able to speak English in the out-migration?

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Table 5 about here

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There are two ways to estimate the size of the out-migration. The Immigration and Naturalization Service has kept count of people entering and leaving the island and their destination and origin. Deduction of entries from exits gives the net out-migration. Senior and Watkins (1966:701) have found that nearly all migration out of Puerto Rico is to the U.S. mainland. Table 5 presents the Immigration and Naturalization Service's figures. The Immigration and Naturalization Service is the original source of all statistics on out-migration during the 1940's (Senior and Watkins, 1966:704).

The Commonwealth Bureau of Labor Statistics figures are slightly different. (Jaffe, 1959:65).

The other way to estimate the out-migration is to subtract the number of Puerto Rican born people in the continental U.S. in 1940 from the number in 1950 and add the number of those who were in the U.S. in 1940 and who died. The difference between the 1950 and 1940 figures for Puerto Rican born people in the continental U.S. is 156,143. The age structure of the 1940 Puerto Rican born population in the U.S. is not available so estimating the number of deaths to be expected in ten years is difficult. The estimate of 162,275 out-migrants based on Immigration and Naturalization Service figures and the difference of 156,143 in the number of Puerto Rican born people in the continental U.S. between 1940 and 1950 agree insofar as the latter figure should be somewhat smaller than the former due to deaths.

If all the out-migrants could speak English, the expected percent able to speak English in Puerto Rico would be 33.5% if they were all repatriated. The difference between actual and expected percent would disappear. But all the out-migrants did not speak English. The Puerto Rican Journey Study found that considerably fewer than all of the migrants could speak English.

Mills, Senior, and Goldsen (1950) surveyed people born in Puerto Rico who were living in several New York City neighborhoods with dense Puerto Rican populations in late 1947 and early 1948,

right in the middle of the surge of migration of the last half of the decade. Mills et al. may have over-sampled poorer migrants somewhat, but minor sampling problems are not an issue here. What is at issue is establishing a plausible range of values for the percent able to speak English among migrants from Puerto Rico to the continental U.S.

Mills et al. (1950:143) classified ability to speak English into four categories where the census uses only two.

Categories for Ability to Speak English  
Puerto Rican Journey Study

Bien	well
Regular	fairly well
Poquito	very little
Nada	nothing

"Nothing" would fall into the census "no" category. "Well" and "fairly well" would be classified as "yes" because according to the instructions to enumerators in the census any ability to converse in English even if in a broken, halting way constitutes an ability to speak English. "Very little" does not fit easily into the census dichotomy. The percent able to speak English in the migrant stream will be figured both ways, with "very little" part of "yes" and part of "no". The former will be the high estimate, the latter the low.

Of migrants arriving during the period of the interviewing and several months before, July 1947 through January 1948, 36.6% (N=71) spoke English "well" or "fairly well." Their short length of stay in New York had probably not altered their level of ability to speak English much. The Puerto Rican Journey Study amply documents

the fact that many Puerto Ricans spent years, even decades, in New York City without learning English.<sup>1</sup> 69.0% would be classified as able to speak English if "very little" were enough to be classified as "yes" in the census. The true figure is probably closer to the average, 52.8%, than either 36.6% or 69.0%. 52.8% is almost twice the island average in 1950.

There is another set of figures on the percent able to speak English of the migrant stream. The Commonwealth Bureau of Labor Statistics conducted a ramp survey in the late 1950's, after the period of interest, of out-migrants. The following percentages of the out-migrants were able to speak English (Senior and Watkins, 1966:713):

1957	45.1%	
1958	47.2%	
1959	46.6%	Island average 1960: 37.7%
1960	43.4%	
1961	50.6%	

These figures are below the high and middle estimates of ability to speak English in the out-migration of Mills et al. but they confirm the general finding that the ability to speak English of the migrants was substantially above the island average, although substantially below 100%.

Table 6 presents the calculations of the impact on the percent speaking English in Puerto Rico in 1950 of the combinations of the high and low estimates of out-migration with the high, low, and middle estimates of ability to speak English in the migrant stream.

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Table 6 about here

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Not even the high estimate of ability to speak English in the migrant stream can account for the difference between the actual and expected percent able to speak English in 1950. Although selective out-migration may be a factor, it does not explain the whole anomaly of 1950.

Explanation #2: Change in Public School Language Policy

Another plausible explanation of the percent speaking English in 1950 is that policy changes with regards to English instruction in the '40's greatly reduced the effectiveness of the English program, leaving the youngest age groups of 1950 with a much lower level of ability to speak English than they had had in 1940. There was such a change in policy. It is described in a number of sources (Osuna, 1949; Fife and Manuel, 1951; Hull, 1965; Rodríguez, 1966; and Epstein, 1966). Nearly all students in the '40's were in public schools (Epstein, 1966:63), so changes in public school policy would have an impact on all the schooling of the young.

From the time that the American military occupation government organized a system of public education in Puerto Rico after the invasion of 1898 until 1934 when President Roosevelt appointed Dr. Jose Padin Commissioner of Education, the public schools of Puerto Rico were primarily operated for the purpose of making the population bilingual. Educational goals besides teaching English

were made secondary. Under some commissioners an attempt was made to use English as the language of instruction even in the lower elementary school grades (Osuna, 1949:344).

Use of English as the medium of instruction, particularly in elementary school, was untenable. The average number of years in school completed in Puerto Rico in the first half of this century was very low, for a large proportion of the population, just several years if any at all. A study done for the Department of Education in 1915 pointed out the foolishness of interfering with what little basic education much of the island's population would get by teaching a foreign language, or worse, teaching in a foreign language (Osuna, 1949:347-350). This report led to some retrenchment of the English program in the earliest elementary years but the program as a whole remained in place. It was very unpopular. Members of the Insular Legislature protested the program as early as 1913. In 1918 the Puerto Rico Teachers' Association advocated the abolition of English as a medium of instruction (Pife and Manuel, 1951:9,14). Testimony of a retired teacher before the United States-Puerto Rico Commission on the Status of Puerto Rico indicates that even in San Juan's high schools, the best on the island, considerable liberty was taken with the regulation to speak only English with the tacit approval of school inspectors (United States-Puerto Rico, 1966:180).

Jose Padin, the first Puerto Rican appointed to the post of Commissioner of Education, restricted use of English as the language



of instruction to the high schools in 1934. His attitude toward English instruction was not liked in Washington and in 1937 Jose Gallardo was appointed Commissioner and specifically charged by President Roosevelt in his letter of appointment to use the school system to spread bilingualism (Osuna, 1949:376). Gallardo made an effort to comply with his instructions but his policy changes met resistance. In 1947 the U.S. Senate blocked confirmation of Mariano Villaronga, appointed Commissioner of Education by President Truman. Villaronga told the Senate during his confirmation hearings that he planned to abolish English as the medium of instruction. The Teachers' Association announced that its members would stop using English as the medium of instruction without a formal directive (Fife and Manuel, 1951:47). The matter was settled permanently when in January, 1949 the first popularly elected Governor of Puerto Rico appointed Villaronga Commissioner of Education.

Rodriguez (1966:169-171) points to the abolition of English as the medium of instruction as the reason the percent able to speak English went down in 1950. A comparison of ability to speak English by age group (See Table 7) shows that only among the young did ability to speak English decline in 1950. The changes among the young are important. Figure 1 shows that the age pattern of speaking English changed dramatically in 1950. The percent speaking English among the 10-14 year olds more than dropped in half. If the 1940 percent able to speak English for the 10-14 year olds and the 15-19 year olds is standardized on the 1950 numbers in these age groups, an additional

64,708 speakers of English appear. This is the number of people who were not classified as able to speak English because of the change in the age pattern of learning English during the '40's. By itself, this number of people able to speak English would bring the overall 1950 percent able to speak English up to 30.3%, and together with the estimates of the effect of selective out-migration (See Table 8) almost account for the difference between the expected the actual

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Table 7 about here

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Table 8 about here

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percent able to speak English in 1950. The high estimate very closely reconstructs the expected percent able to speak English in Puerto Rico in 1950 of 33.6%. The middle estimate comes reasonably close to the expected figure. The low estimate of the reconstructed percent able to speak English is noticeably below the expected percentage.

#### Conclusions

The anomaly has been largely explained. The variable, ability to speak English, appears to be reliable. Selective out-migration of speakers of English and the changing age pattern of learning English largely account for the unusual decrease in the percent able to speak English between 1940 and 1950. There are four remaining questions,

however: 1) Was the change in the age pattern of learning English due to a change in school language policy or overcrowding? 2) Was there a tendency to deny an ability to speak English out of nationalistic feelings? 3) Could there have been a change in the census criterion for ability to speak English? and 4) Why was the increase in ability to speak English between 1950 and 1960 so large?

It is possible that a very small part of the change in the age pattern of learning English is due to overcrowding in the schools. There were 332,596 school children between 7 and 13 years of age enrolled in 1940. There were 75,039 more in 1950, 22.6% more (U.S. Bureau of the Census, 1953:31). The enrollment rate for children this age went up between 1940 and 1950 from 66.8% to 68.4%. Fife and Manuel (1951:73) note the possibility that school facilities in the '40's may have been overcrowded. It is unlikely there was much new school construction during the war or depression years.

In fact, there is evidence that the quality of public school education declined. Literacy among 10-14 year olds in 1950 was 2.4 percentage points lower than in 1940, a decline from 82.1% to 79.7% (U.S. Bureau of the Census, 1953:134). This small an effect cannot explain how the percent able to speak English more than dropped in half among 10-14 year olds between 1940 and 1950. Overcrowding has to be ruled out as a major factor in affecting the percent speaking English in Puerto Rico in 1950.

There may have been a systematic, one-time bias in the collection of data on ability to speak English in 1950. The percents able to speak English calculated by reversing the effects of selective out-migration and the change of the age pattern in learning English do not quite close the 7.5 percentage point gap between the actual percent and the expected percent of 1950. Systematic bias can account for between 0.3 and 2.8 percentage points of the 7.5 percentage point gap, depending on whether the high or low estimates of the effect of selective out-migration are used.

There is no clear evidence that systematic bias existed at all. If it did, it was small relative to the other factors which affected the percent speaking English in 1950. There are three plausible types of systematic bias: 1) improved enumeration of Spanish monolinguals, 2) nationalism on the part of enumerators or respondents, causing some, who have been classified as able to speak English, not to claim such an ability, and 3) a raising of the criterion of what constitutes ability to speak English. Each type of bias has its rationale but since their effects are small and impossible to disentangle with available data, there is no reason to discuss them.

The last loose end to tie up is the question of why the decrease in the percent speaking English between 1940 and 1950 was followed by such a large increase between 1950 and 1960. The percent able to speak English sprang from 26.1% to 37.7% in 1960, the largest intercensal increase. There was still out-migration in the '50's and Spanish remained the medium of instruction in the schools.

There are two explanations. First, there is evidence that as the out-migration developed in the '50's, the origins of the migrants became more rural (Senior and Watkins, 1966:714). This change probably meant that more people who could not speak English were migrating since ability to speak English had always been lower in rural areas than in urban areas (U.S. Bureau of the Census, 1943:35-38; 1953:33; 1963:121). Secondly, as Figure 1 shows, the 10-14 year olds of 1950, although much lower in ability to speak English than the 10-14 year olds of 1940, had by 1960 more or less caught up with where they would have been, had the school language policy not changed in the '40's. It is not possible with published census data to tell whether it was schooling, return migration, or industrialization, or some combination of these factors, which explains this learning process. The 10-14 year olds of 1960, although below the 10-14 year olds of 1940, were well above the 10-14 year olds of 1950 in their percent able to speak English.

TABLE 1. Interpretations of Meaning of the Census Question on Ability to Speak English

1890 (instructions to enumerators):

If the person is able to speak English so as to be understood in ordinary conversation, write "English"; (Wright, 1900:192)

1940 Census of Population in Puerto Rico:

Ability to speak English - This classification is based on the replies to the question, "Can he speak English?" The answer "yes" was doubtless given for some persons who could speak only a little English, but the rapid increase from one census to the next in the numbers of English-speaking persons indicates substantial progress in this respect. (U.S. Bureau of the Census, 1943:3)

1950 Census of Population in Puerto Rico:

The data on ability to speak English were derived from answers to the question "¿Sabe esta persona hablar inglés?" (Does this person know how to speak English?) (U.S. Bureau of the Census, 1953:ix)

1960 Census of Population in Puerto Rico:

The data on ability to speak English were derived from answers to the question: "Does he know how to speak English?" . . . Persons were classified as able to speak English if they reported that they could make themselves understood in English. However, persons who could speak only a few words, such as "Hello" and "Goodbye" were classified as unable to speak English. (U.S. Bureau of the Census, 1963:xxviii)

1970 Census of Population in Puerto Rico  
(instructions to enumerators):

Mark "yes" for a person who can make himself understood in English conversation. Mark "no" for a person who can speak only a few words, such as "hello" and "goodbye". (U.S. Bureau of the Census, 1970:67)

Fife and Manuel, The Teaching of English in Puerto Rico, 1951:

The census measures of language ability are obviously only rough ones. Many persons who truthfully answer in the affirmative such questions on their ability to read, write, or speak a language, possess this ability at a very low level. (Fife and Manuel, 1951:172)

TABLE 2. Percent Able to Speak English in Puerto Rico -  
U.S. Census Data

Date of Census	% Able to Speak English	Inter-Censal Difference	Average Annual Increase in % Able to Speak English Between Censuses
1910	3.6	-	-
1920	9.9	+6.3	+6.3
1930	19.4	+9.5	+9.5
1935	22.9	+3.5	+7.0
1940	27.8	+4.9	+9.8
1950	26.1	-1.7	-.17
1960	37.7	+11.6	+1.16
1970	42.7	+5.0	+.50

Sources:

1910 and 1920: U.S. Bureau of the Census, 1922:1207  
 1930: U.S. Bureau of the Census, 1932:143  
 1935: U.S. Bureau of the Census, 1933: 32  
 1940: U.S. Bureau of the Census, 1943: 23  
 1950: U.S. Bureau of the Census, 1953: 33  
 1960: U.S. Bureau of the Census, 1963:121  
 1970: U.S. Bureau of the Census, 1972:194

TABLE 3. Tables 17 and 57 from 1950 Census of Population  
in Puerto Rico

Table 17

	Urban Male	Urban Female	Rural Male	Rural Female
Able to speak English	122,743	115,780	91,495	68,275
Total	307,652	345,347	456,912	416,243

Table 57

	Urban Male	Urban Female	Rural Male	Rural Female
Able to speak English	122,723	113,161	91,470	68,260
Total	307,581	345,335	456,905	416,237

Differences

Table 57 subtracted from  
corresponding entries of Table 17

	Urban Male	Urban Female	Rural Male	Rural Female
Able to speak English	20	2,619	25	7
Total	71	12	7	6

Source: U.S. Bureau of the Census, 1953:33,134-135



TABLE 4. Regression of Logit of Ability to  
Speak English on  
Age, Cohort, and Time Period

R-square = .62

Unstandardized Regression Coefficients

Age		Cohort		Time	
10-14	.503	10-14 in 1970	1.661	1935	-.889
15-19	.928	15-19 " "	1.852	1940	-.718
20-24	.799	20-24 " "	2.030	1950	-.925
25-29	.662	25-29 " "	2.200	1960	-.320
30-34	.620	30-34 " "	2.038	1970	0.0*
35-39	.386	35-39 " "	2.419		
40-44	.314	40-44 " "	2.395		
45-49	.190	45-49 " "	2.334		
50-54	.179	50-54 " "	2.049		
55-59	0.0*	55-59 " "	1.873		
60-64	0.0*	60-64 " "	1.676		
		65-69 " "	1.507		
		70-74 " "	1.260		
		75-79 " "	1.003		
		80-84 " "	.590		
		85-89 " "	0.0*		
		90-94 " "	0.0*		
		95-99 " "	0.0*		

\*indicates that these coefficients have  
been constrained to be zero

TABLE 5. Immigration and Naturalization  
 Service Estimates of Net Migration  
 Out of Puerto Rico, 1940 to 1950

Year	Net Out-Migration
1940	400
1941	600
1942	1,700
1943	3,200
1944	11,200
1945	13,600
1946	39,900
1947	24,600
1948	32,800
1949	25,700
1950	34,700

Estimate of Ten Year Out-Migration from  
 April 1, 1940 to April 1, 1950: 162,275

Source: Friedlander, 1965:170

TABLE 6. Steps in Estimating Effect of Selective Out-Migration of Speakers of English on Percent Speaking English in Puerto Rico in 1950

Step 1	Estimate of total out-migration from April 1, 1940 to April 1, 1950: 162,275	
Step 2	Deduction of those 9 years of age or under in out-migration	
	Estimate of proportion 9 or under in out-migration from Mills, <u>et al.</u> , page 28: 21.0% or 34,078	
	Out-migration of 128,197 10 years of age or older	
Step 3	Calculation of number able to speak English in out-migration, those age 10+ in age	
	Low estimate of proportion able to speak English:	.366      .366 x 128,197 = 46,920
	High estimate of proportion able to speak English:	.69      .69 x 128,197 = 88,456
	Mid estimate of proportion able to speak English:	.528      .528 x 128,197 = 67,688
Step 4	Reconstruction of percent able to speak English by re-populating out-migrants	
	Low estimate	$\frac{398,293 + 46,920}{1,526,154 + 128,197} = .269$
	High estimate	$\frac{398,293 + 88,456}{1,526,154 + 128,197} = .294$
	Mid estimate	$\frac{398,293 + 67,688}{1,526,154 + 128,197} = .282$
Step 5	Difference between actual 1950 percent, 26.1%, and expected 1950 percent, 33.6%: 7.5 percentage points	
	Difference between reconstructed percents and actual percent:	
	Low estimate	26.9% - 26.1% = 0.8%
	High estimate	29.4% - 26.1% = 3.3%
	Mid estimate	28.2% - 26.1% = 2.1%

TABLE 7. Comparison of Ability to Speak English  
by Age Group, 1940 and 1950

Age	1940	1950	Percent in 1940 Subtracted from Percent in 1950
10-14	41.8	19.2	-22.6
15-19	42.8	41.1	-1.7
20-24	33.1	35.8	2.7
25-29	29.5	35.5	6.0
30-34	24.8	31.1	6.3
35-39	19.6	25.0	5.4
40-44	15.5	20.4	4.9
45-49	11.4	17.9	6.5
50-54	8.2	14.6	6.4
55-59	5.6	10.5	4.9
60-64	3.6	7.0	3.4

Sources: U.S. Bureau of the Census, 1943:35-38  
U.S. Bureau of the Census, 1953:134-135

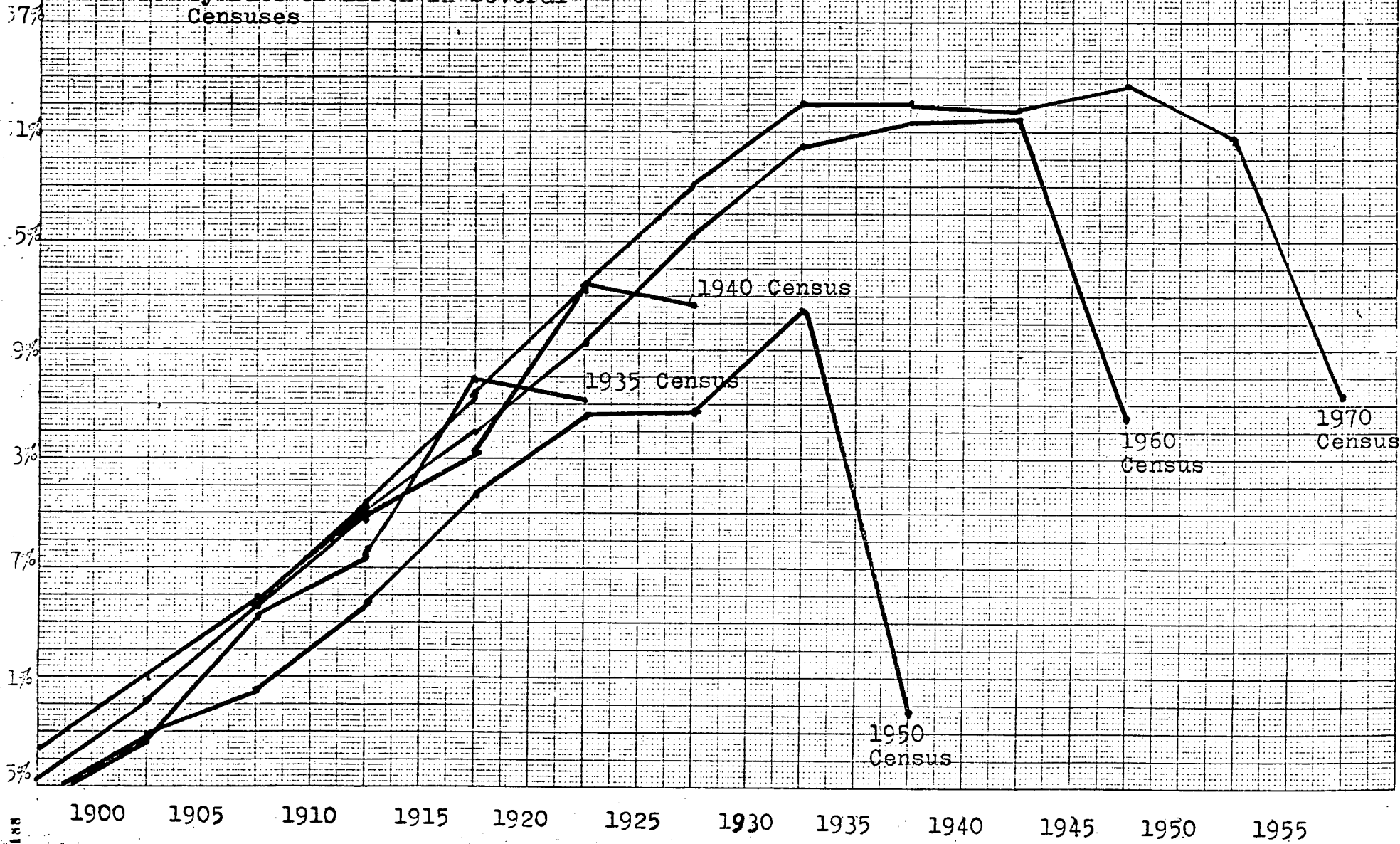
Note: Some five-year age groups were estimated  
by applying Sprague multipliers to ten-  
year age groups.

TABLE 8. Steps in Estimating the Combined Effects of Selective Out-Migration of Speakers of English and the Changed Age Pattern of Learning English on the Percent Speaking English in Puerto Rico in 1950 (a continuation of Table 6)

Step 1	Reconstruction of percent able to speak English by re-patriating out-migrants	
Low estimate	$\frac{398,293 + 46,920}{1,526,154 + 128,197}$	= .269
High estimate	$\frac{398,293 + 88,456}{1,526,154 + 128,197}$	= .294
Mid estimate	$\frac{398,293 + 67,688}{1,526,154 + 128,197}$	= .282
Step 2	Number of 10-19 year olds who would speak English if percent able to speak English in 1950 in this age group were the same as in 1940: 64,708	
Step 3	Reconstruction of percent able to speak English by re-patriating out-migrants and adding in 10-19 year olds who would speak English if percent able to speak English in 1950 in this age group were the same as in 1940	
Low estimate	$\frac{398,293 + 46,920 + 64,708}{1,526,154 + 128,197}$	= .308
High estimate	$\frac{398,293 + 88,456 + 64,708}{1,526,154 + 128,197}$	= .333
Mid estimate	$\frac{398,293 + 67,688 + 64,708}{1,526,154 + 128,197}$	= .321
Step 4	Difference between actual 1950 percent, 26.1%, and expected 1950 percent, 33.6%: 7.5 percentage points	
	Difference between reconstructed percents and actual percent:	
Low estimate	30.8% - 26.1% = 4.7%	
High estimate	33.3% - 26.1% = 7.2%	
Mid estimate	32.1% - 26.1% = 6.0%	

FIGURE I

Percent Speaking English  
by Date of Birth in Several  
Censuses



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FOOTNOTES

1. Special tabulations prepared by Prof. Philip Hastings,  
Roper Public Opinion Research Center, Williams College.

Appendix: The Accounting Equation

The following equation accounts for the 1950 proportion able to speak English in terms of changes between 1940 and 1950.

$$P_{1950} = \frac{a - b + c - d + e + f + g - h + i}{A - B + C - D + E + F}$$

a = the number of people 10 years of age or older in 1940 counted as able to speak English

A = the number of people 10 years of age or older in 1940

b = the number of people 10 years of age or older in 1940 counted as speaking English in 1940 who died before 1950

B = the number of people 10 years of age or older in 1940 who died before 1950

c = the number of people 9 years of age or younger in 1940 who were counted as speaking English in 1950

C = the number of people in 1950 who were 9 or younger in 1940

d = people counted as speaking English in Puerto Rico in 1940 living in the continental U.S. in 1950

D = people living in Puerto Rico in 1940 living in the continental U.S. in 1950

e = people not born in Puerto Rico who migrated there between 1940 and 1950 and who speak English

E = people not born in Puerto Rico who migrated there between 1940 and 1950

f = Puerto Ricans in the continental U.S. in 1940 counted as able to speak English in Puerto Rico in 1950

F = Puerto Ricans in the continental U.S. in 1940 in Puerto Rico in 1950

g = people 10 years of age or older in 1940 but not enumerated then, counted as able to speak English in 1950

G = people 10 years of age or older in 1940, but not enumerated then, enumerated in 1950



Appendix: The Accounting Equation (cont'd.)

$h$  = people 10 years of age or older in 1940 counted as able to speak English then, not able to speak English in 1950

$i$  = people 10 years of age or older in 1940 counted as not able to speak English then, able to speak English in 1950

There are several factors in the accounting equation which could not possibly decrease the percent speaking English between 1940 and 1950. Return migration from the continental U.S. would not decrease the number of speakers of English relative to the whole population. There was virtually no in-migration into Puerto Rico during the '40's (U.S. Bureau of the Census, 1961:33). Higher mortality among speakers of English than among Spanish monolinguals is extremely improbable. People who speak English tend to be young (U.S. Bureau of the Census, 1953:134-135) and wealthy (U.S. Bureau of the Census, 1953:209), not a group expected to have a higher mortality than the population as a whole.

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