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AN ANALYSIS OF THE STABILITY OF THE GEOGRAPHIC INDEX OF REIMBURSEMENT

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The concept of the Geographic Index of Reimbursement was originally developed for use in reimbursing Health Maintenance Organizations (HMO's) with Medicare "at-risk" contracts.[1] The index is a measure of relative Medicare reimbursement per person; for instance, a county index of 1.10 indicates that on average, county Medicare enrollees were reimbursed 10% more per person than the national average. The index is calculated by dividing the county's average reimbursement per person by the national average reimbursement per person, where both rates are first adjusted to remove variations caused by the particular age and sex distribution of each group. Indices are calculated separately for each county's Hospital Insurance (HI) reimbursement and Supplementary Medical Insurance (SMI) reimbursement. The index provides a combined measure of the effects of all influences other than age and sex on Medicare costs in a given area, such as the effects of utilization, price levels, and availability of services. Further details on the geographic index may be obtained from the publication *Medicare: Health Insurance for the Aged: Geographic Index of Reimbursement by State and County*, which is published as a joint effort by the Office of the Actuary and the Office of Research and Statistics, Social Security Administration. It was anticipated that for a given county, the geographic index would tend to be fairly stable from one year to another, indicating that the factors influencing local per capita Medicare costs tend to change smoothly rather than abruptly in relation to national characteristics. It is the purpose of this Note to analyze the current situation with respect to the stability of the geographic index, based on the indices tabulated for 1969, 1970, and 1971.

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Initially, for the purposes of this study, a 10% sample[2] of all the counties in the United States was taken. A "change" in an index was defined as the difference between two successive indices as a percentage of the preceding index. As an example, for 1969 Los Angeles county in California had an HI index of 1.465. In 1970 the index dropped to 1.410. The change from 1969 to 1970 is then defined as $(1.410 - 1.465)/(1.465) = -.04$ indicating a 4% downward change. These percentage changes in the indices, were calculated for the periods 1969 to 1970, 1970 to 1971, and from 1969 to 1971, and the absolute values of the changes[3] were summarized by frequency distributions. These distributions and their graphs are shown in Table 1 and Figures 1 and 2. Based on the distributions, the proportion of all yearly changes lying within given limits from "zero change" are as follows:

Proportion of Indices Within Various Change Classes
(10% Sample of Counties)

Change Class	HI	SMI
≤ 5%	.36	.39
≤ 10%	.60	.61
≤ 15%	.76	.79
≤ 20%	.87	.87
≤ 25%	.93	.92

For comparison, the distribution of the 1969 to 1971 overall changes is shown along with the distribution of *all* yearly changes (1969 to 1970 and 1970 to 1971) in Figure 2.[4] It is interesting that the distribution of the overall two-year changes is only slightly more dispersed than the distribution of the single-year changes. This indicates that to some extent the changes are self-canceling, i.e., for a

given county, a positive change in one year is often followed by a negative change the next year. It is difficult to say whether this is a product of random effects or of actual changing conditions within the county. Of the 293 counties in the 10% sample, 163 of them, or 56% had HI geographic indices which first rose in one year and then fell in the next, or vice-versa, while 168 or 57% had SMI indices with this pattern. As one might expect, the stability of a county's index depends greatly on how many Medicare enrollees there are in the county. This relationship can be observed from Table 3, the distribution of changes by county Medicare enrollment. Clearly the changes occurring in the larger counties are less dispersed than those from smaller counties, indicating that stability increases with larger enrollments.

The analysis based on the 10% sample of counties was then repeated, this time using all the "large" counties in the United States. A "large" county in this case refers to a county with HI or SMI enrollment greater than or equal to 10,000 as of July 1, 1970.[5] This study was made because of the importance of the geographic index in cost settlements with HMO's and the fact that most HMO's tend to be located in populous areas like the "large" counties defined above. The single-year and overall two-year distributions are listed in Table 2 and graphed in Figures 3 and 4. These distributions show less dispersion than those based on the 10% sample of course, and again there is only a slight difference between the one-year and two-year change distributions. Fifty-two percent of the counties had HI changes which were self-canceling to some extent while 57% had partially self-canceling SMI changes. The proportion of all yearly changes lying within given limits from "zero change" are as follows:

Proportion of Indices Within Various Change Classes[6]
(Large Counties)

Change Class	HI	SMI
≤ 5%	.58	.57
≤ 10%	.84	.81
≤ 15%	.96	.92

From the above listing, it appears that in the past, the HI index has been slightly more stable than the SMI index.

In conclusion, the geographic index seems to show a reasonable degree of stability where there is sufficient experience to average out the effects of any random fluctuations in utilization. One can say with reasonable certainty that the stability of the county index depends greatly on the size of the county enrollment and that frequently the changes in the index will tend to partially cancel each other out over the years. It is hoped that the description of the stability of the geographic index given in this note will be of value to those working with the index, not only in HMO's, but in communities, state agencies, and insurance companies as well. In the future, as more information becomes available, it is planned to make additional and more comprehensive studies on this same subject.

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[1] Medicare "at-risk" contracts are defined in Section 1876(i)(2)(A) of the Social Security Act. Basically, they allow contracting HMO's to receive a percentage of any "savings" in health care delivery costs realized through efficient provision and management of services.

[2] The method of "Systematic sampling" was used, i.e., starting with a list of all counties, alphabetically by State and county, every tenth county was included in the sample. It is believed that the results of this study would not be significantly different if a purely random sample were chosen, and the same analysis applied. Of the 300 counties sampled in this manner, 7 had to be excluded since the county Medicare enrollment was less than 100 persons (no geographic indices are calculated for such counties) leaving a sample size of 293. In some States, for instance Maryland and Virginia, a large city is classified as being equivalent to a county. This distinction is maintained in the study.

[3] Although the distributions were not perfectly symmetrical, it was felt that one-sided distributions showing only the absolute value of a change would be sufficient. In the 10% sample distribution, 52% of the HI changes and 50% of the SMI changes were greater than *or equal to* 0%. For the large county distributions, the proportions are 52% and 51% respectively.

[4] The distribution of *all* yearly changes, 1969 to 1970 and 1970 to 1971 is the equivalent of averaging the two separate distributions of changes from 1969 to 1970 and from 1970 to 1971.

[5] There were 328 such counties.

[6] These figures are based on the raw data, rather than the frequency distributions of the data, and therefore might differ slightly from figures based on the distributions.

Table 1
Frequency Distribution of Percentage Changes in the Geographic Indices of a 10% Sample of U.S. Counties

Percentage Change in the Geographic Index	HI Frequency			SMI Frequency		
	1969 to 1970	1970 to 1971	1969 to 1971	1969 to 1970	1970 to 1971	1969 to 1971
0—2 %	.184	.184	.126	.191	.201	.126
3—5	.171	.174	.147	.205	.181	.174
6—8	.174	.164	.160	.130	.164	.154
9—11	.150	.085	.102	.123	.109	.133
12—14	.085	.092	.106	.106	.116	.096
15—17	.055	.092	.085	.061	.082	.089
18—20	.055	.075	.078	.031	.031	.044
21—23	.034	.044	.082	.034	.034	.044
24—26	.024	.038	.031	.031	.024	.044
27—29	.007	.014	.017	.017	.027	.017
30—	.061	.038	.065	.072	.031	.078

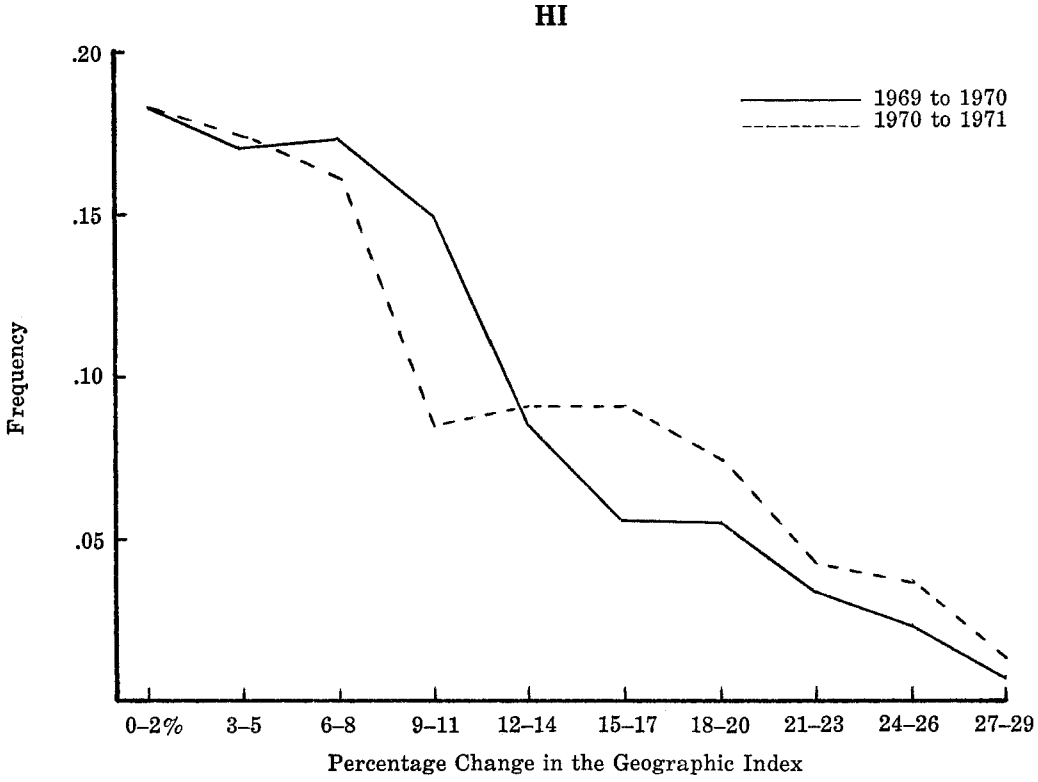
Table 2
Frequency Distribution of Percentage Changes in the Geographic Indices of all U.S. Counties with Medicare Enrollment ≧ 10,000

Percentage Change in the Geographic Index	HI Frequency			SMI Frequency		
	1969 to 1970	1970 to 1971	1969 to 1971	1969 to 1970	1970 to 1971	1969 to 1971
0—2 %	.320	.329	.250	.366	.253	.235
3—5	.299	.229	.223	.280	.235	.280
6—8	.180	.186	.183	.183	.165	.186
9—11	.095	.140	.134	.052	.137	.095
12—14	.061	.064	.079	.046	.082	.085
15—17	.027	.021	.061	.024	.073	.034
18—20	.009	.012	.024	.018	.024	.037
21—23	.003	.006	.021	.009	.012	.030
24—26	.003	.006	.006	.006	.012	.003
27—29	0	.003	.009	0	0	.012
30—	.003	.003	.009	.015	.006	.003

Table 3
Frequency Distribution of Changes in the Geographic Indices of a 10% Sample of U.S. Counties by County Medicare Enrollment
(All Yearly Changes; 1969 to 1970 and 1970 to 1971)

Percentage Change in the Geographic Index	Enrollment ≤ 999	1000 — 1999	2000 — 2999	3000 — 4999	5000 — 9999	≥ 10,000
			HI			
0—2 %	.085	.117	.213	.209	.283	.319
3—5	.170	.156	.176	.151	.133	.264
6—8	.075	.188	.185	.174	.200	.208
9—11	.094	.143	.083	.151	.100	.125
12—14	.094	.110	.074	.105	.067	.056
15—17	.094	.071	.102	.058	.100	0
18—20	.094	.078	.056	.023	.100	.028
21—23	.066	.065	.037	.023	0	0
24—26	.057	.032	.037	.035	0	0
27—29	.038	.006	0	.012	0	0
30—	.132	.032	.037	.058	.017	0
			SMI			
0—2 %	.185	.167	.102	.212	.267	.353
3—5	.130	.210	.213	.188	.217	.206
6—8	.120	.148	.176	.162	.150	.118
9—11	.139	.086	.083	.162	.117	.147
12—14	.065	.117	.139	.138	.117	.088
15—17	.074	.080	.083	.050	.067	.059
18—20	.037	.037	.028	.038	.033	0
21—23	.046	.062	.037	0	.017	0
24—26	.046	.031	.028	.012	0	.029
27—29	.046	.025	.028	0	.017	0
30—	.111	.037	.083	.038	0	0

Figure 1
Frequency Distribution of Percentage Changes in the Geographic Indices of a 10% Sample of U.S. Counties



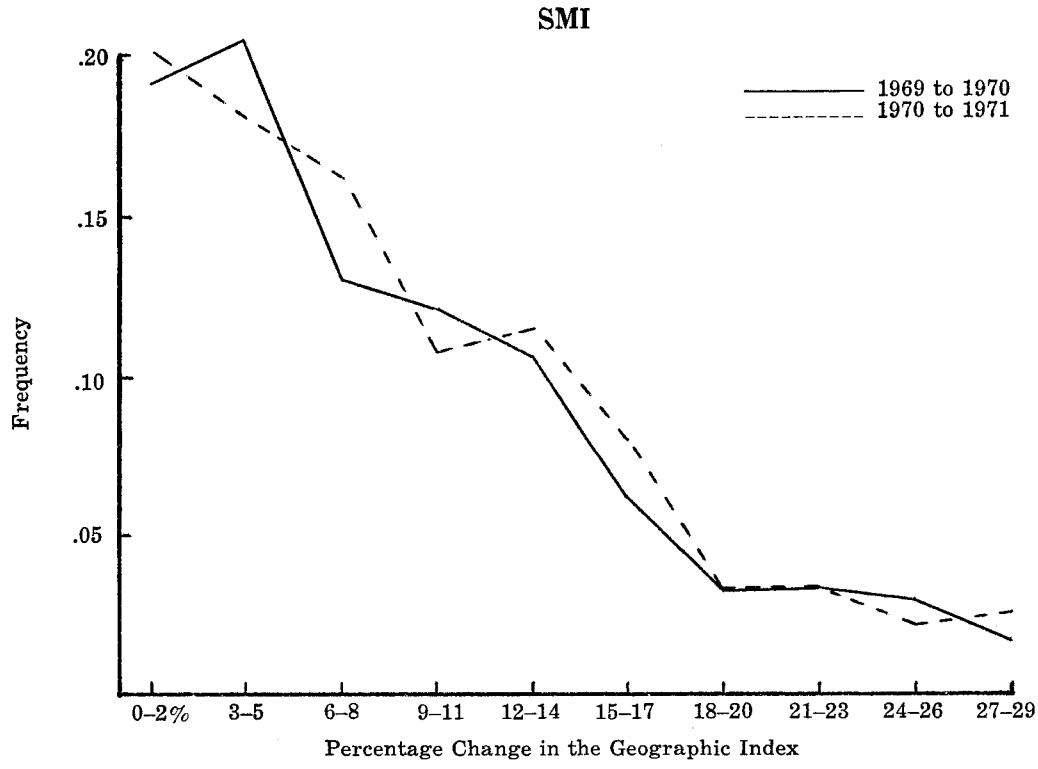
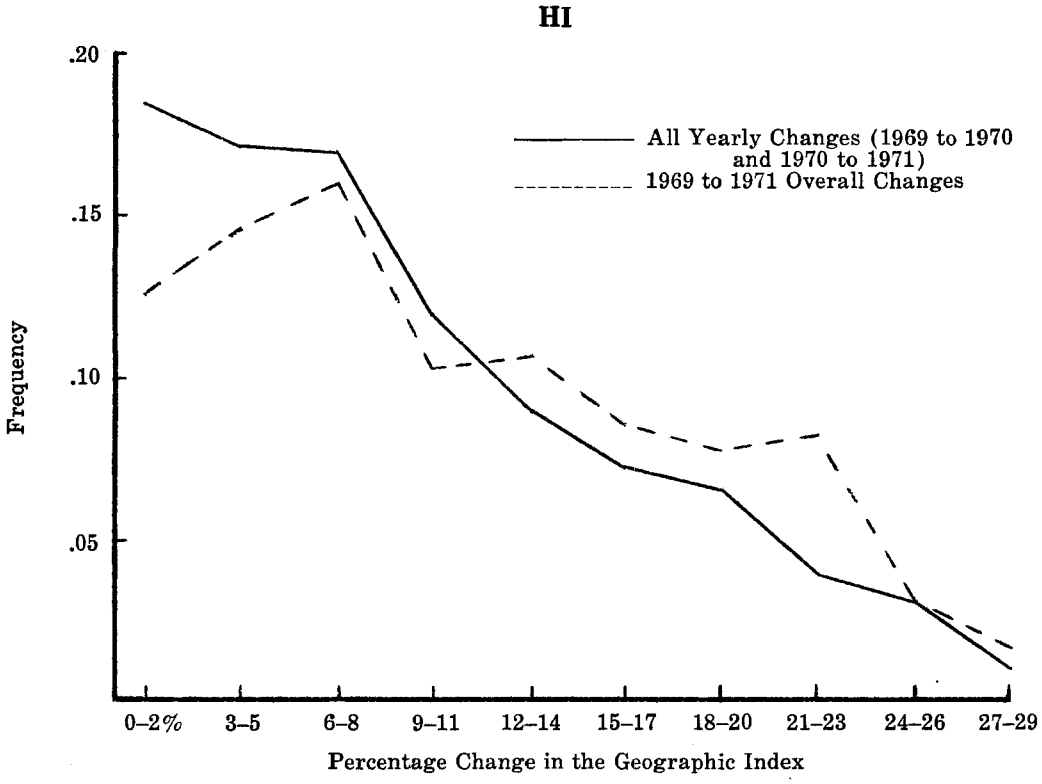


Figure 2
Comparison of Distributions of Single-Year vs Overall Two-Year Changes in the Geographic Indices of a 10% Sample of U.S. Counties



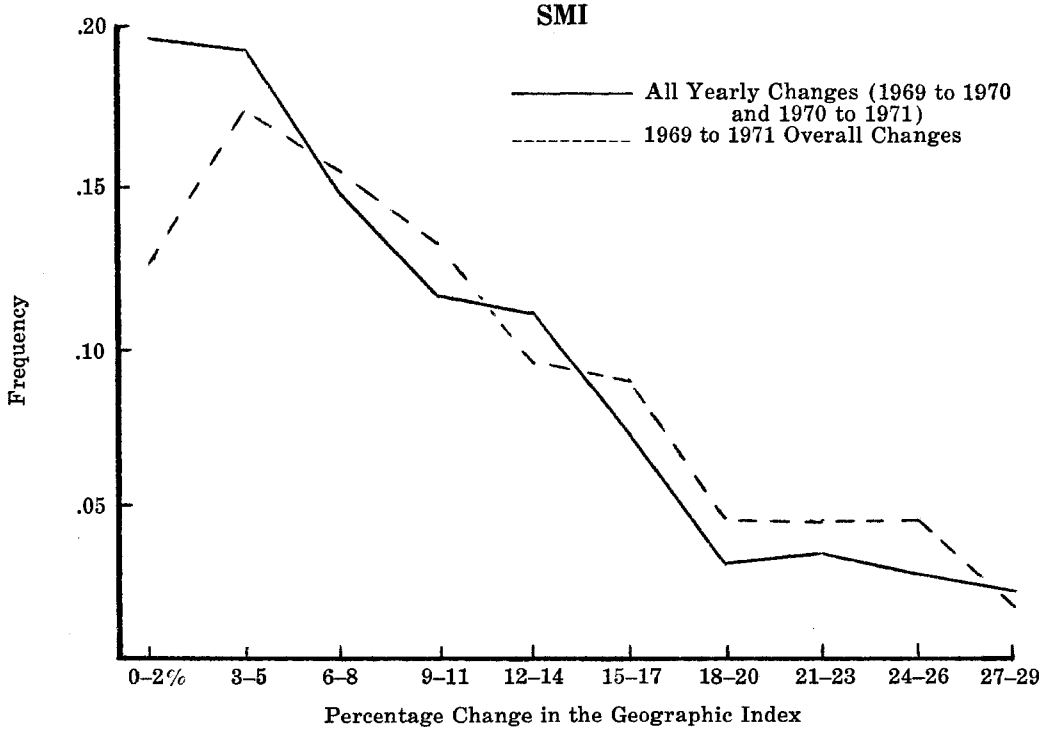
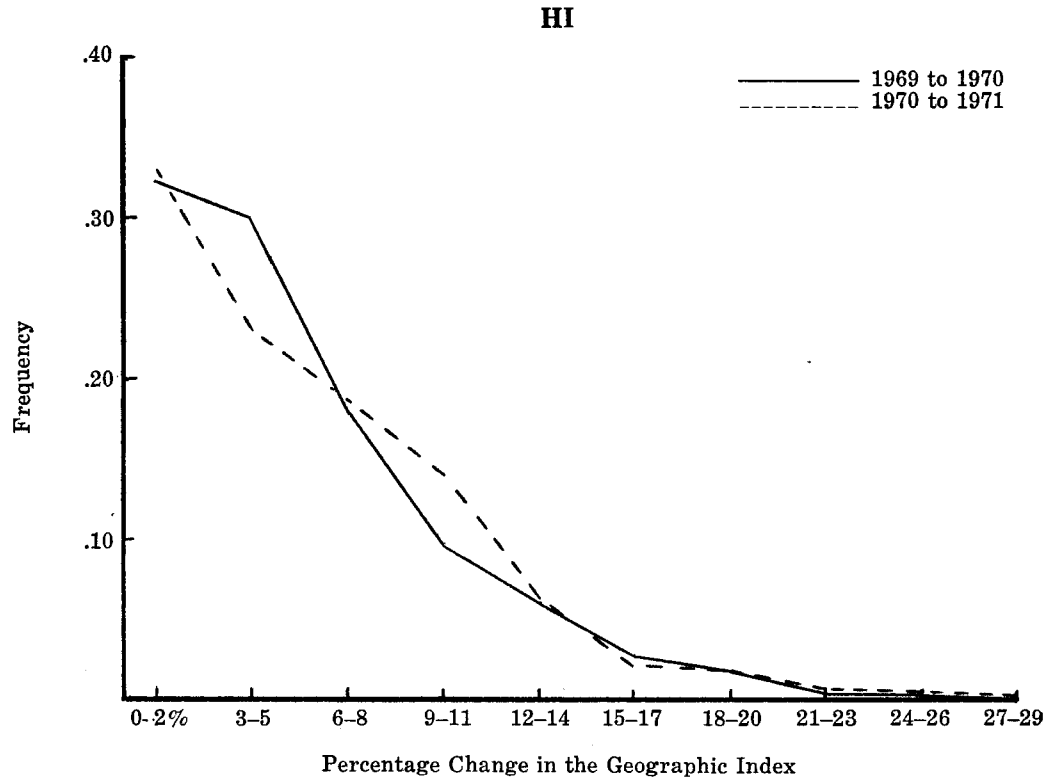


Figure 3
Frequency Distribution of Percentage Changes in the Geographic Indices of all Counties with Medicare Enrollment ≧ 10,000



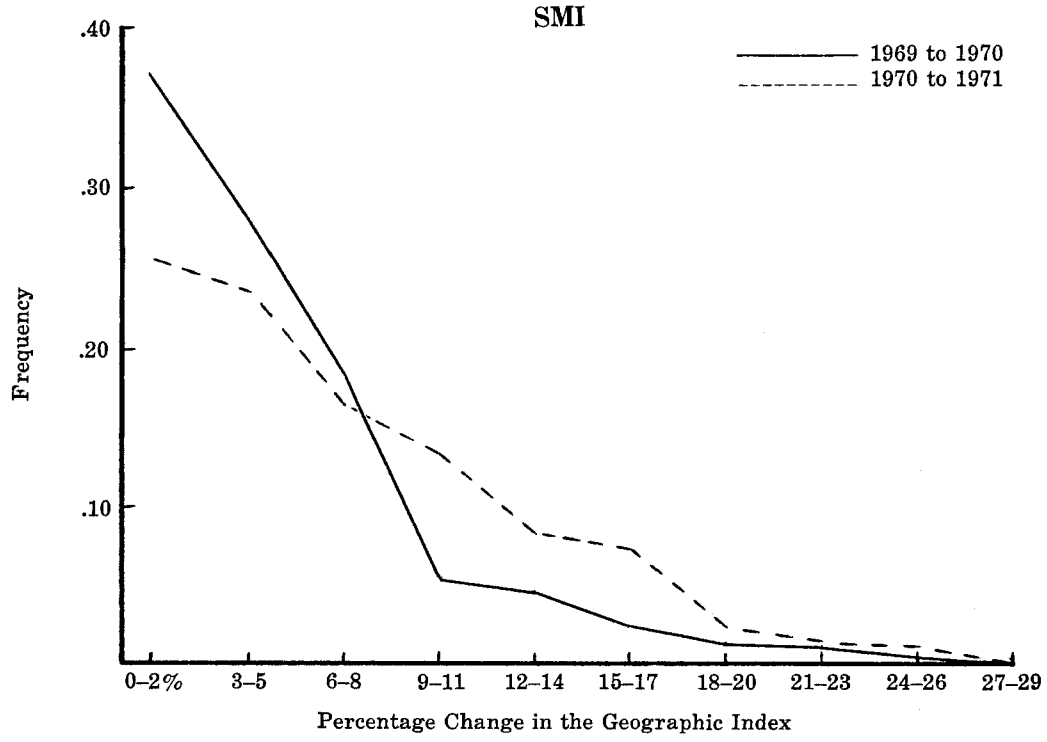


Figure 4
Comparison of Distributions of Single-Year vs Overall Two-Year Changes in the Geographic Indices of all U.S. Counties with Medicare Enrollment ≥ 10,000