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ABSTRACT

The monograph presents a set of social and economic indicators developed for each of the 118 counties in Arizona, California, Nevada, and Utah which comprise the joint Far West Lab/SWRL laboratory service regions. The objective of developing and mapping these indicators was to delineate major similarities and differences among these counties in terms of selected social and economic data. Factor analysis was performed on 35 data items selected from the U.S. Census 1967 "County and City Data Book." Eight categories resulted from this categorization: population size, population growth, population age, affluence, medical service, manufacturing employment, sales employment, and agriculture. Counties were then grouped together on the basis of similarities on these eight factors. Information is also presented in the form of narrative, statistics, maps, tables, and lists on location of major county groups, differences among major groups in terms of means on a number of social and economic measures, and grouping for the 58 counties in California and for the combined 60 counties in Arizona, Nevada, and Utah. Results from this statistical picture of the Far West Lab/SWRL Laboratory service regions can be grouped into three major sets. First, it has indicated how 35 county level social and economic measures are related and has produced eight statistically independent factor scores that can be employed in future studies as potential predictors of county educational and social characteristics. Second, it has demonstrated that there are both similarities and striking differences among the counties in the four states. Finally, it has provided some understanding of the general demographic and economic characteristics of each type of county on a statistically descriptive level. (DB)

SOCIAL AND ECONOMIC CHARACTERISTICS OF COUNTIES IN THE FAR WEST AND SWRL LABORATORY SERVICE REGIONS

Paul D. Hood

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FAR WEST LABORATORY FOR EDUCATIONAL RESEARCH AND DEVELOPMENT

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ABSTRACT

This study focuses on developing and mapping a set of "contextual" indicators for each of the 118 counties in the joint FWL/SWRL Laboratory service regions, comprising all of Arizona, California, Nevada and Utah, in order to delineate the major similarities and differences among these counties in terms of selected social and economic data. As part of a larger effort to develop statistical indicators of educational knowledge production, dissemination, and utilization, this study concentrates on social and economic "contextual" factors that may be used to predict or explain the patterning of the other types of indicators.

Thirty-five data items, selected from the U.S. Census 1967 County and City Data Book, were correlated for the 118 counties in Arizona, California, Utah and Nevada. Factor analysis of these items produced eight factors which were labeled: 1) population size, 2) population growth, 3) population age, 4) affluence, 5) medical service, 6) manufacturing employment, 7) sales employment, and 8) agriculture. Counties were then grouped together on the basis of similarities on the eight factor scores, using a hierarchical grouping method to create groupings of counties within the Far West Laboratory service region and also within the SWRL Laboratory service region. The location of the major county groups are mapped, and differences among the major groups are examined in terms of means on 35 social and economic measures. Grouping analyses are also reported for the 58 counties in California, and for the combined 60 counties in Arizona, Nevada, and Utah. The paper also reports the results of an analysis of all 118 counties. Nine major types of counties are identified, mapped, and compared on selected social and economic measures.

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P.H.

I. INTRODUCTION

One of the objectives of the Educational Dissemination Studies Program (EDSP) is to establish efficient means for anlyzing, monitoring, and communicating the status, needs, and accomplishments of educational dissemination and school improvement efforts. Previous EDSP reports have summarized a number of research studies, surveys, and descriptive information on federal, state, and local programs and agencies. Since the content of these studies focused on specific programs or particular types of agencies, we also looked for statistical data which could provide more comprehensive national and regional coverage.

The notion of "social indicators" (Bauer, 1966; Sheldon and Moore, 1968 Gross, 1969; Van Dusen, 1974) played an important role in the approach taken. Hood (1979a) described a model for a system of educational knowledge production, dissemination, and utilization (KPDU) indicators consisting of four components: 1) indicators of knowledge production outputs, 2) indicators of knowledge dissemination structures, 3) indicators of knowledge utilization, and 4) indicators of contextual factors that may predict or explain the patterning of other types of indicators.

Knowledge production output indicators are concerned with estimates of the type, quality, quantity, or other characteristics of units of educational knowledge (e.g. documents) as related to their origin (e.g. author, institution). Ideally these indicators should reflect the extent and ways in which the educational knowledge production community organizes and transforms knowledge in all its forms. Currently available data pertain primarily to formal documentary or oral forms or their derivatives (e.g. abstracts, citations, proceedings).

Dissemination structure indicators are concerned with the characteristics or capacity of components of the educational dissemination system (e.g. number and type of information services, number and type of linking or technical assistance agents). These indicators display how educational dissemination resources--funds, people, products, services, and technology--are allocated across educational sectors and geographic areas.

Utilization indicators provide information regarding service request and usage rates, adoptions, impact, benefits, etc., by geographic and educational sectors, for types of institutional and individual consumers of educational knowledge, products, and services.

Contextual indicators provide information concerning distribut[illegible]across geographic areas of status, changing composition, and trends [illegible]ega-tive data that reflect the demographic, organizational, socia[illegible]ti-cal, economic, and educational environments for educational kn[illegible]e production, dissemination, and utilization. Contextual indicators can reflect conditions or forces that may serve to supply, support, constrain, or otherwise influence the production or consumption of educational knowledge.

The importance of contextual indicators. There is strong reason to suspect that contextual factors (e.g. population density, per capita wealth) might constitute common underlying factors that may account for much of the observed correlation between production and dissemination indicators or between dissemination and utilization indicators when aggregated by region or state. For example, one might expect that the more populous areas would display higher counts of publications, higher numbers of information search services, and higher numbers of organizational and individual requests for information searches than would less populous areas. It is is also likely that relatively wealthy areas would fund more knowledge production (e.g. research studies, innovative practices), support more extensive and expensive dissemination or technical assistance services, and create educational consumer environments with the organizational "slack" resources and incentives fostering less parochial forms of knowledge consumption. Hence contextual indicators need to be considered when examining KPDU aggregate data.

Previous EDSP studies. Three previous EDSP studies (Hood and Blackwell, 1979; Paisley, Cirksena and Butler, 1979; Hood, 1979b) illustrate the use of quantitative KPDU and contextual indicators at three levels of analysis: regional, state, and SMSA. These analyses demonstrated that there are significant, policy-relevant differences among geographic areas at all three levels of aggregation; that contextual factors such as population, level of expenditure, urban density, size of educational staff and number of educational agencies, powerfully predict many KPDU indicators based on counts; and that there are well defined patterns of relationships among KPDU indicators. Analyses of the SMSA (Standard Metropolitan Statistical Area) level demonstrated that it is possible to more closely "pinpoint" the status, quality, and equity of distribution of educational information services to various populations within states and regions.

Current EDSP work. Recent EDSP efforts have focused on building a joint FWL-SWRL regional data base (including all of Arizona, California, Utah and Nevada) that might be used by both the FWL and SWRL Regional Laboratories as part of their efforts to "map" their regions in terms of needs and resources. Several machine-readable data tapes have been acquired (e.g. the Bureau of Census County and City Data Book Tape File; the NIE American Registry of Research Organizations in Education; the American Educational Research Association Membership Data Tape; California School District Achievement Test Scores). Manual compilation and tabulations have also been undertaken to identify school district involvement in several categories of innovative project demonstration and adoption, and in school improvement efforts. This first regional report focuses on analyses of county level contextual data selected from the Bureau of Census County and City Data Book. The report is organized in the following sections.

II. Selection, Analysis, and Reduction of Contextual Measures.
III. Grouping of Counties Within Laboratory Regions and By States
IV. Grouping of Counties Across Regions
V. Concluding Comments

II. SELECTION, ANALYSIS, AND REDUCTION OF CONTEXTUAL MEASURES

Selection of Measures

The Bureau of the Census County and City Data Book lists 195 data items for counties. These include data on population, health, income, housing, government finance, elections, crime, manufacturers, wholesale and retail trade, service industries, agriculture, etc. Thirty-six of these items were selected for this analysis. They are listed in Table 1, along with two items (#37, #38) that were generated from the other variables.

Items 1 (land area) and 3 (population per square mile) provide information on the physical size of the county and its population density. Items 2, 4, 5, 6, 7 provide information on the population size and percentages of older persons, those living in urban areas, Black residents, and foreign stock residents. Items 8, 9, and 26 directly reflect population and housing changes, while items 10, 11, 12, 13 and 4 are measures of birth and death rates and percentage of the populations 65 years and over. Items 14, 15, and 29 (divorce and crime rates) were selected as measures of social problems.[1] Conversely, item 30 (% voting in 1972) was selected as a measure of voter responsibility. Items 17, 18, 22, 23, 24, 25, 27, and 28 are measures of poverty, wealth, per capita income, etc. Items 31 through 37 were selected to provide indicators of employment in manufacturing, sales, mineral, and agricultural sectors. Items 20 and 21 reflect county health facilities as indexed by physician rates and hospital bed rates. Items 16, 19 and 38 provide data on number of families, number of dependent children receiving public assistance, and population per family (population divided by number of families).

Visual inspection of the item distributions revealed that many of the items had skewed distributions. In these cases, transformations (usually log or square root) were made to generate more nearly normal distributions.

Factor Analysis

After performing the indicated tranformations, 35 of the variables were correlated and factor analyzed.[2] A principal-axis analysis produced eight factors with Eigenvalues greater than 1.0; the eight factors extracted 80 percent of the trace of the correlation matrix. These eight factors were rotated by the orthoganal Varimax method, with loadings

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1 Unfortunately, these three measures posed problems. Crime rates were missing for some Utah counties, and the divorce rates in some Nevada counties are probably inflated by temporary residents seeking divorce in Nevada. Due to these problems, these three variables were not used in all analyses.

2 The Divorce and Crime Rates were omitted; see first footnote.

Table 1

SELECTED COUNTY DATA ITEMS

Item Nr.[a]		Item Description	Transformation
1	(1)	Land Area, sq. mi.	log.
2	(3)	Population, 1975	log.
3	(4)	Population per square mi, 1975	log.
4	(5)	% Population, 65 years and over, 1975 (percent)	none
5	(8)	% Population, Urban, 1975 (percent)	none
6	(9)	% Population, Black, 1975 (percent)	log.
7	(10)	% Population, Foreign stock, 1975 (perce	sq. root
8	(11)	% Population Change 1970-75 (percent)	sq. root (+25)
9	(14)	% Population Change 1960-70 (percent)	sq. root (+50)
10	(17)	Birth Rate, 1975 (per 1,000)	log.
11	(18)	Birth Rate, 1970 (per 1,000)	log.
12	(20)	Death Rate, 1975 (per 1,000)	log.
13	(21)	Death Rate, 1970 (per 1,000)	log.
14	(26)	Divorce Rate, 1975 (per 1,000)	log.
15	(27)	Divorce Rate, 1970 (per 1,000)	log.
16	(49)	Number of Families, 1970 (x100)	[illegible]
17	(50)	% Families Income Below Poverty, 1969 (percent)	sq. root
18	(52)	% Families Income $15,000 and over, 1969 (percent)	sq. root
19	(54)	Dependent Children Receiving Public Assistance, 1976	log.
20	(40)	Physician Rate, 1975 (per 100,000 pop.)	log.
21	(43)	Hospital Beds Rate, 1975 (per 100,000 pop.)	log.
22	(45)	Per Capita Income, 1974	none
23	(48)	Median Family Income 1969	none
24	(75)	Median Value Owner Occupied, Single Family Home, 1970	sq. root
25	(76)	Median Gross Rent, 1970	sq. root
26	(69)	% Change Housing Units, 1960-70 (percent	log. (+50)
27	(70)	% In One Unit Housing Structures, 1970 (percent)	squared
28	(74)	% Occupied Units With 1.01 or more persons per room, 1970 (percent)	log.
29	(104)	Serious Crime Rat 975 (per 100,000 pop.)	none
30	(102)	% Voting, 1972 (pa. : of citizens of voting age)	none
31	(31)	% Employed in Manufacturing, 1970 (percent)	none
32	(32)	% Employed in Wholesale and Retail Trade, 1970 percent)	none
33	(34)	% Employed in Manufacturing, 1975 (percent)	none
34	(36)	% Employed in Wholesale and Retail Trade, 1975 (percent)	none
35	(162)	Number of Mineral Industry Establishments, 1972	log.
36	(176)	% Land in Farm, 1974 (percent)	sq. root
37	(b)	% Farm Population, 1970 (percent)	sq. root
38	(c)	Population per family	none

a. County and City Data Book item number appears in parentheses
b. 1970 Population divided by 1970 Farm Population
c. Population divided by Number of Families

indicated in Table 2.[3] Note that the order of the items in Table 2 has been rearranged to more clearly display the factor loading patterns.

Population size. Factor I is easily interpreted as a population size factor. Population (variable #2), number of families (#16), and number of dependent children (#19), all highly intercorrelated measures of the number of persons in a county, display high loadings of this factor. It is also remarkable that population per square mile (#3), percentage of urban population (#5), percentage of Black population (#6) and percentage of foreign stock population (#7) also display high loadings, thus indicating that all these characteristics tend to be highly intercorrelated. The presence of number of mineral establishment is not entirely unexpected, since it is a count.[4] Perhaps the major surprise is the -.70 loading on Factor I for percentage voting in 1972 (# 30). Large, dense, urban counties with significant Black and foreign stock populations tend to have relatively lower voter turnouts than other counties. In addition to these variables displaying large loadings (all loadings of .50 or higher are double underlined; those of .30 or higher are single underlined) we note that there are several other variables displaying more modest loadings. These include: percentage in one unit housing [loading = -.36], percentage of families with 1969 income over $15,000 [.43], median value of owner occupied home [.32], median gross rent [.32], physician rate [.37], hospital bed rate [.41], percentage employed in sales in 1970 [.34], percentage of land in farm [.40], and percentage farm population [-.49]. Except for percentage in one unit housing and percentage farm population, all of these variables display moderate positive loadings on this population size factor.

Population growth. Factor II is obviously a population growth factor as evidenced by the high loadings for percentage population change 1970-75 [.87], percentage population change 1960-70 [.62], and percentage change in housing units 1960-70 [.82]. Population per family [.65] is also associated with population growth. Median value of owner home (#24) displays a smaller loading [.33] on this factor.

Population age. Factor III appears to roughly index the "age" of the county population. The percentage of the population 65 years and older, and the 1970 and 1975 death rates all show loading of .85 or higher on this factor. Conversely, the loadings for birth rates display marked negative loadings [-.55, -.66]. The percentage of housing units with

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3 The Varimax method rotates each pair of factors to maximize column-variance. Rotation continues through all combinations of pairs repeatedly until a pass through all combinations does not result in a rotation of more than one degree. The Varimax method tends to associate each measure with one or only a few factors.

4 This result suggests that this variable should be converted to a rate, e.g. mineral establishments per 100,000 persons, to provide a perhaps more informative indicator.

Table 2

FACTOR LOADINGS FOR 35 COUNTY DATA ITEMS ON 8 FACTORS
(n=118 COUNTIES IN AZ, CA, NV, UT; Decimals omitted)

Nr.	Item Description	I	II	III	IV	V	VI	VII	VIII	h^2
2	Population	84	07	-12	24	33	22	10	03	95
3	Population per sq. mile	71	11	-09	42	06	32	28	08	89
5	% Urban population	72	-09	-28	34	21	15	20	-11	84
6	% Black population	85	-10	07	20	-06	-09	-02	06	79
7	% Foreign stock population	60	-06	26	40	-05	-04	20	07	64
16	Nr. Families	83	01	-09	26	35	23	09	03	95
19	Nr. Dependent children	87	06	-05	13	31	23	10	02	94
35	Nr. Mineral establishments	56	-04	-03	05	35	-10	-15	-03	47
30	% Voting 1972	-70	-15	-02	19	03	38	08	-13	72
8	% Pop. change 1970-75	-18	87	-02	-09	-13	-17	04	-06	85
9	% Pop. change 1960-70	22	62	-09	41	38	-09	-19	11	81
26	% Housing Change 1960-70	12	82	-03	35	10	05	-12	04	84
38	Population per family 1970	-09	65	-34	-28	-41	-11	-03	-11	82
4	% Population 65 and over	-10	-01	85	-05	11	27	20	-02	86
12	Death rate 1975	01	-27	88	-05	05	00	-12	01	87
13	Death rate 1970	-13	01	88	-12	-19	-03	-05	-15	87
10	Birth rate 1975	-18	-25	-55	-60	-01	00	08	00	76
11	Birth rate 1970	-03	06	-66	-52	-19	06	-06	-18	79
27	% In one unit housing	-36	-06	18	-46	-25	36	29	31	75
28	% Units more than 1 p. per room	06	05	-37	-73	-10	-33	-14	-04	82
17	% Families below poverty level	11	11	-02	-85	03	-11	03	08	77
18	% Families income over $15,000	43	08	-06	82	03	-05	06	-03	88
22	Median per capita income '74	28	-03	15	89	01	01	-11	-07	89
23	Median family income '69	26	-02	-17	89	-03	-01	-08	-11	91
24	Median value owner home	32	33	-11	75	09	05	24	-07	86
25	Median gross rent	32	23	-09	76	30	-03	-13	00	85
1	Land area	-01	-09	-05	-48	47	-28	-36	-11	68
20	Physician rate '75	37	-04	04	19	76	05	19	04	79
21	Hospital bed rate '75	41	-03	10	-04	64	06	26	-07	67
33	% Employed Mfg. '75	04	-09	10	01	-06	80	-22	18	74
31	% Employed Mfg. '70	23	-11	01	07	07	85	-07	-08	81
34	% Employed sales '75	08	-14	-01	-10	08	-17	81	11	74
32	% Employed sales '70	34	07	09	04	39	-14	59	-16	68
36	% Land in farms	40	06	-14	-11	-03	25	04	76	84
37	% Farm population	-49	-22	00	-38	-01	-20	06	57	80
	Percentage of variance extracted	19	08	10	20	07	07	05	04	80

more than one person per room (#28) also displays a small negative loading [-.37] on this factor, suggesting that counties with aged populations have somewhat less crowded housing.

Affluence. Every measure of personal or family wealth or affluence displays high loadings on Factor IV. Data items displaying positive loadings of .75 or higher include: percentage of families with 1969 incomes over $15,000, median 1974 per capita income, median 1969 family income, median 1970 value of owner occupied houses, and median 1970 gross rent. Conversely, items displaying markedly high [.50 or higher] negative loadings include both the 1975 and 1970 birth rates, and percentage of housing units with more than one person per room. Other data items with positive loading of .30 or higher are: population per square mile and percentage urban population (general level of affluence tends to be associated with dense, urban counties), percentage foreign stock, population and housing changes 1960-1970 (but not 1970-75 population change). Moderate negative loadings [-.30 or higher] are found for percentage of population in one unit housing [-.46] (large percentages of affluent county populations tend to live in multi-unit structures), land area [-.48] (median affluence is somewhat greater in the physically smaller counties), and percentage farm population [-.38] (farm populations earn less).

Medical service. Factor V shows high loadings on the couplet of medical items: physician rate [.76], and hospital bed rate [.64]. Note that these two items also display smaller positive loadings on Factor I ("Population Size"), but no substantial loadings on any other factor except perhaps Factor VII (which is identified with percentage of workers employed in sales trades). A few other data items display modest loadings on this "medical service" factor. They include population [.33], number of families [.35], number of dependent children [.31], number of mineral establishments [.35], population change 1960-70 [.38] (but not population change 1970-75), population per family [-.41], median gross rent [.30], land area [.47] and percentage employed in sales 1970 (but not 1975) [.39]. We thus see that county medical services rates are slightly associated with some (but not all) measures of population size and growth and also with land area, but with very few measures of affluence or employment by sector.

The three remaining factors are all "couplets", each displaying high loadings on related pairs of measures of employment by industry.

Manufacturing employment. Factor VI displays high loadings [.80, .85] on both of the percentages of civilian labor force employed in manufacturing. Population per square mile [.32], percentage voting [.38], percentage of population in one unit housing [.36], percentage of units with more than one person per room [-.33], are other items displaying moderate loadings on this factor.

Sales employment. Factor VII shows high loadings on the two sales employment items. Note, however, that the loading of 1970 sales employment is lower on this factor than the 1975 item, but higher on Factor

I ("population size") and Factor V ("medical service"). The only other county data item displaying a loading over .30 on this factor is land area [-.36], suggesting that physically large counties (often predominantly desert or mountain areas) have lower percentages employed in sales trades.

Agriculture. Factor VIII displays high loadings on only the two farm items: percentage of land in farm [.76] and percentage farm population [.57]. The only other item to show even a modest loading is percentage in one unit housing [.31] (predominantly urban and suburban counties contain higher percentages of multi-unit housing than do predominantly rural, agricultural counties).[5]

Communalities. The right most column is Table 2 (labeled h2) displays the communalities (decimals omitted) indicating the proportion of all the variance of each variable that is accounted for by the eight factors.[6] In all but two instances, the eight factors have extracted (accounted for) two-thirds or more of the item variance. In more than half of the items the communalities exceed .80. Mineral establishments, land area, hospital bed rate, and percentage employed in sales in 1970 are four measures that are perhaps not adequately represented in this eight factor solution. The eight factors account for quite substantial portions of the variance for all other items.

Summary. Thirty-five county data items were correlated for the set of 118 counties in Arizona, California, Utah, and Nevada. A principal-axis factor analysis produced eight orthoganal (uncorrelated) factors that were rotated by the orthoganal Varimax method. The rotated factors were identified as:

- Population Size
- Population Growth
- Population Age
- Affluence
- Medical Service
- Manufacturing Employment
- Sales Employment
- Agriculture

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5 We note that the two farm data items display a zero order correlation of .13 (the inner product of the two rows of factor loadings is .22); hence these two farm measures are not at all strongly associated. In fact there is one anomalous county in the data set (Esmerada, NV) where proportion of all land in farm is reported at 109.9% (possible due to method of reporting and calculation), but where the percentage of farm population is zero. Additional measures will be needed if consistent agricultural indicators are required.

6 The communalities may be computed by finding the row sums of squares of the loadings.

III. GROUPING OF COUNTIES WITHIN LABORATORY REGIONS AND BY STATES

Grouping Counties By Factor Score Similarity

Introduction. During the preliminary phase of analysis, distributions for each raw data item were separately prepared for each of the four states. In many cases there were substantial differences in the location and shape of the distributions across the states. However there was also much variation (spread of score) within states. Both between and within state differences among counties were evident for most of the data items. In a previous report (Hood and Blackwell, 1979 pp. 45-53) it was demonstrated that a typology of states could be generated through hierarchical grouping analysis of measures aggregated at the state level. The same method was employed here to develop typologies of counties within the FWL region and within the SWRL region.

Description of the method. This analysis began be generating factor scores for each county for the eight factors described above. Each factor score was then standardized over the set of counties in each region. This step equalized the variability among the eight factor scores within each laboratory region so that each of the eight factors would contribute equally to the computation of differences among the groups of counties in that region.

Ward's (1963) agglomerative hierarchical grouping method was employed to group the counties.[7] This method compared the series of county factor score profiles and progressively associated the counties into groupings in such a way as to minimize an overall estimate of variation within groups. The method began by defining each county as a "group." These groups were then reduced in number by a series of step-decisions until all counties in the laboratory region had been classified into one or the other of two groups.

After grouping of counties within a region had been accomplished, a series of one-way analysis of variance tests of differences among groups in the region were run to determine the nature of the differences among groups.[8]

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7 The HGROUP program (Veldman, 1967).

8 Since the counties constitute the "universe" rather than a "sample" of each region, tests of significance would seem to be inappropriate. However, the counties in each region may be grouped in a very large number of different ways; hence some test of the significance of the particular groupings is useful. Exact tests are possible but quite time consuming. The analysis of variance tests provide useful if inexact results.

FIGURE 1

HIERARCHICAL GROUPING OF 89 COUNTIES IN THE FAR WEST LABORATORY REGION ON THE BASIS OF DIFFERENCES ON EIGHT STANDARDIZED FACTOR SCORES

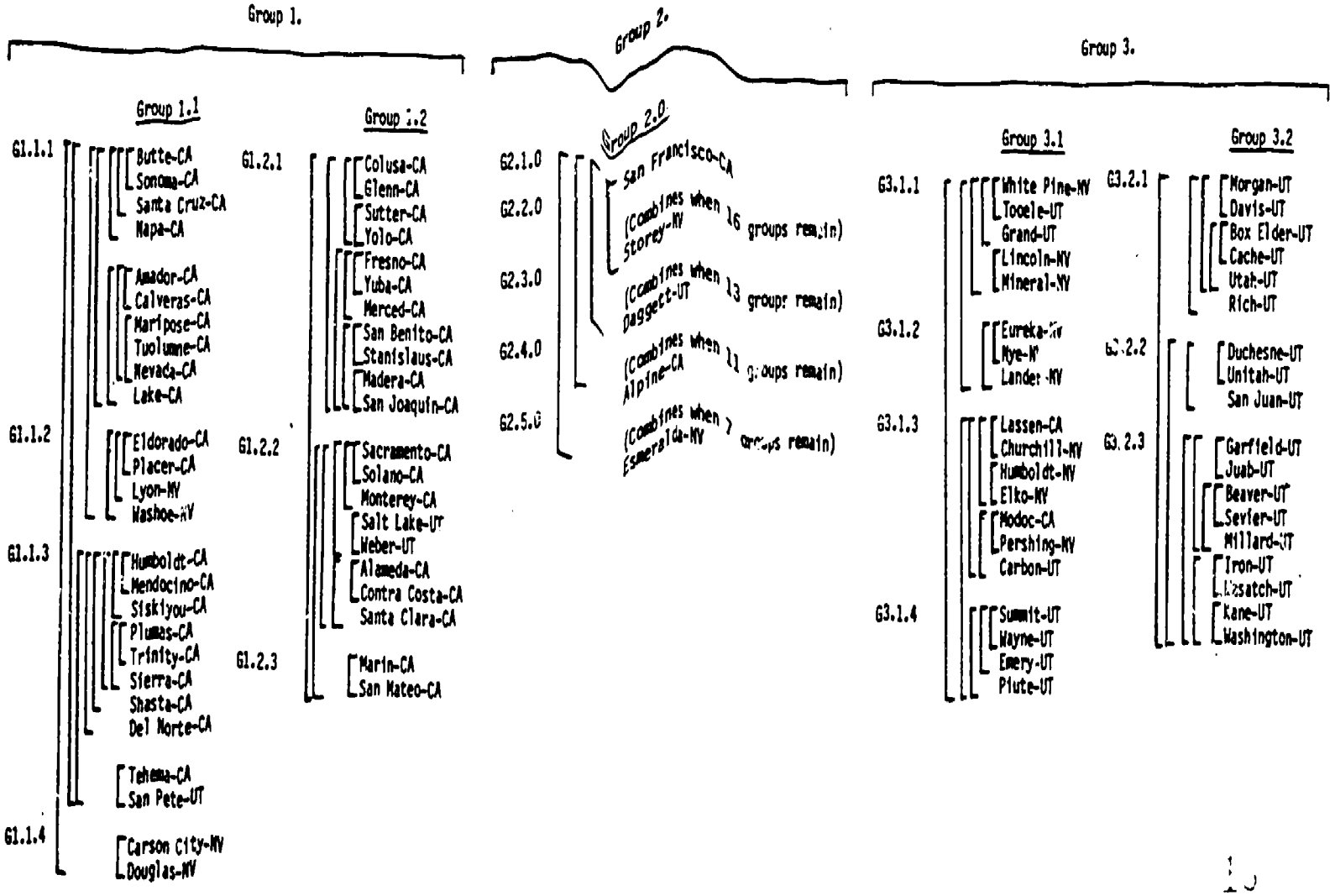

FIGURE 2

MAP OF MAJOR GROUPINGS OF 89 COUNTIES IN THE FAR WEST LABORATORY SERVICE REGION

G1.1.1
G1.1.2
G1.1.3
G1.1.4

G1.2.1 G1.2.2 G1.2.3

G2.1 San Francisco-CA
G2.2 Storey-NV
G2.3 Daggett-UT
G2.4 Alpine-CA
G2.5 Esmeralda-NV

G3.1.1
G3.1.2
G3.1.3
G3.1.4

G3.2.1
G3.2.2
G3.2.3

Grouping of Counties in the Far West Laboratory Region.

Figure 1 displays the results of the hierarchical grouping analysis for the region served by the Far West Laboratory. The successive levels of grouping are indicated by brackets. For example, under group 1, we find two major subgroups, 1.1 and 1.2. Subgroup 1.1, is further divided into four subgroups (1.1.1, 1.1.2, 1.1.3 and 1.1.4). Subgroup 1.1.1 first combined with G.1.1.2, then this grouping combined with G.1.1.3, and finally, G.1.1.4 joined this grouping. Within subgroup G.1.1.1 we find that Butte county-CA first combined with Sonoma-CA, then with Santa Cruz, and then with Napa. Amador-CA combined with Calaveras-CA. Mariposa-CA, Tuolumne-CA, and Nevada-CA combined. The Amador-Calaveras group then combined with the Mariposa-Tuolumne-Nevada group, Lake-CA then joined, and then this group of six counties combined with the Butte-Sonoma, Santa Cruz-Napa group to form group G.1.1.1.

The physical location of the five major groups, displayed in separate columns in Figure 1 (G.1.1, G.1.2, G.2.0, G.3.1. and G.3.2), are displayed in Figure 2. Due to the great population density of group 1.2, each of its three subgroups are identified by a different cross hatch direction.

There are 19 groups (G.1.1.1 through G.3.2.3) identified in Figure 1. At this level of grouping, analysis of variance tests demonstrated that differences among the 19 groupings were significant beyond the .0001 level on all eight factor scores and that differences among the 19 county groupings were significant at or beyond the .0001 level for all but one of 36 original county data items.[9]

Comparison of Northern California vs. Nevada-Utah groups. The two largest groups are group 1 (47 counties, all but seven in California) and group 3 (37 counties, all but 2 either in Nevada or Utah). One-way analysis of variance tests were run comparing these two groups on each of 35 county data items. Table 3 displays the results. The county data items in this table (and following tables) have been grouped by factor loading patterns (displayed in Table 2), e.g. population size items are first, followed by population change items, population age items, affluence items, etc.

When the two major groups are compared (group 1, primarily Northern California counties, versus group 3, primarily Nevada and Utah counties) we see that the "California" group displays significantly larger values on nearly all of the population "size" measures, including--population, population per square mile, percentage Urban, percentage Black, percentage foreign stock, number of families and number of dependent children;

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9 The 37th item, serious crime rate (#29) was omitted due to missing data. The nonsignificant item is hospital bed rate (#21).

Table 3

COMPARISON OF THE TWO MAJOR GROUPINGS OF COUNTIES (GROUP 1 WITH GROUP 3) IN THE FAR WEST LABORATORY REGION ON 35 COUNTY DATA ITEMS

Nr.	Item Description	Mean Group 1	Mean Group 3	Significance Test /a
2	Population	176,079	17,247	***
3	Population per sq. mile	189	16	***
5	% Urban population	51.2	30.2	**
6	% Black population	2.2	0.5	**
7	% Foreign stock population	18.3	9.5	****
16	Nr. Families	40,738	3,454	***
19	Nr. Dependent children	7,330	285	**
35	Nr. Mineral establishments	12.7	10.0	
30	% Voting 1972	64.0	71.8	***
8	% Pop. change 1970-75	15.7	13.4	
9	% Pop. change 1960-70	25.0	8.8	**
26	% Housing Change 1960-70	38.6	11.7	***
38	Population per family 1970	4.5	4.7	
4	% Population 65 and over	10.9	9.2	*
12	Death rate 1975	8.9	8.0	*
13	Death rate 1970	9.6	8.9	
10	Birth rate 1975	14.5	23.6	****
11	Birth rate 1970	17.1	22.1	****
27	% In one unit housing	79.1	79.7	
28	% Units more than 1 p. per room	7.9	11.8	***
17	% Families below poverty level	5.8	11.3	
18	% Families income over $15,000	19.5	12.2	****
22	Median per capita income '74	4,581	3,786	****
23	Median family income '69	9,424	8,332	***
24	Median value owner home	18,404	12,784	****
25	Median gross rent	106	87	***
1	Land area	1,770	4,758	***
20	Physician rate '75	145.4	61.6	***
21	Hospital bed rate '75	497.7	423.1	
33	% Employed Mfg. '75	23.4	15.1	**
31	% Employed Mfg. '70	14.3	9.6	**
34	% Employed sales '75	32.7	33.3	
32	% Employed sales '70	19.8	18.4	
36	% Land in farms	43.5	22.2	***
37	% Farm population	4.4	8.9	***

a. Significance levels for one-way analysis of variance

T-tests: **** - P < .0001
*** - P < .001
** - P < .01
* - P < .1

however, percentage voting (which displays a high negative Factor I loading on Table 2) is significantly lower in the "California" counties than in the "Nevada-Utah" group.[10]

Population changes and housing changes 1960-1970 were signficantly larger for the California counties; however the more recent population change values for 1970-1975 show no significant difference.

The percentage of the population over 65 and the 1975 death rates (but not the 1970 death rates) are slightly higher for the "California" counties; but both the 1970 and the 1975 birth rates are substantially higher for the "Nevada-Utah" counties.

Although there are no significant differences between the group of counties for percentage in one unit housing or percentage of families below poverty level, all of the remaining "affluence" items favor the California group.

The average land area of the Nevada-Utah group of counties is over two and two-thirds greater than the average land area of the Northern California group of counties. Conversely, the physician rate for the Northern California group is two and one-third greater than that for the Nevada-Utah group.

Percentages of the civilian labor force employed in manufacturing are significantly larger for the Northern California group than the Nevada-Utah group; but the percentages employed in wholesale and retail sales are quite similar. (Note that the percentages for 1975 are markedly higher than the percentages of 1970 in manufacturing and in sales in both groups of counties.)

Finally, we encounter a minor paradox. The Northern California counties have approximately twice as high a percentage of land in farms as do the Nevada-Utah counties (please recall that substantial portions of Nevada and Utah are desert areas); but the Nevada-Utah counties have twice as high a percentage of farm population.

Comparison of the two major "Northern California" county groups. Group 1.1 includes 26 counties. Four counties (Lyon, Washoe, Carson City and Douglas) are in Nevada and one (Sanpete) is in Utah. The remaining 21 counties are in California, located principally in the extreme northern and in the mountainous north-western and central-western portions of the state. Group 1.1 will be labeled Northern/Mountain. Group 1.2 includes 21 counties. Two are located in Utah (Salt Lake, Weber). The remainder are in California and are located principally along the Pacific

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10 The reader should note that these are all "unweighted" means, e.g., percentage data are summed over counties and then divided by the number of counties, with no weighting for differences in county populations.

Table 4

COMPARISON OF GROUP 1.1 WITH GROUP 1.2 COUNTIES IN THE FAR WEST LABORATORY REGION ON 35 COUNTY DATA ITEMS

Nr.	Item Description	Mean Group 1.1	Mean Group 1.2	Significance Test /a
2	Population	56,093	324,634	***
3	Population per sq. mile	48	363	**
5	% Urban population	32.6	74.2	****
6	% Black population	0.8	4.0	***
7	% Foreign stock population	15.2	22.0	***
16	Nr. Families	12,312	75,933	***
19	Nr. Dependent children	1,906	14,046	***
35	Nr. Mineral establishments	6.7	20.0	**
30	% Voting 1972	66.2	61.2	*
8	% Pop. change 1970-75	22.4	7.4	***
9	% Pop. change 1960-70	26.2	23.4	
26	% Housing Change 1960-70	47.0	28.1	*
38	Population per family 1970	4.6	4.3	*
4	% Population 65 and over	12.4	9.2	***
12	Death rate 1975	9.8	7.9	**
13	Death rate 1970	10.8	8.1	***
10	Birth rate 1975	13.0	16.4	***
11	Birth rate 1970	15.6	19.0	***
27	% In one unit housing	80.4	77.3	
28	% Units more than 1 p. per room	7.3	8.7	*
17	% Families below poverty level	9.9	9.7	*
18	% Families income over $15,000	17.2	22.4	*
22	Median per capita income '74	4,387	4,822	*
23	Median family income '69	9,046	9,893	*
24	Median value owner home	17,423	19,619	
25	Median gross rent	102	110	
1	Land area	2,071	1,397	
20	Physician rate '75	131.9	162.2	
21	Hospital bed rate '75	545.5	483.4	
33	% Employed Mfg. '75	24.5	22.0	
31	% Employed Mfg. '70	14.8	13.8	
34	% Employed sales '75	30.1	35.9	**
32	% Employed sales '70	19.0	20.9	*
36	% Land in farms	26.9	64.1	****
37	% Farm population	4.0	4.9	

a. Significance levels for one-way analysis of variance

T-tests: **** - P < .0001
*** - P < .001
** - P < .01
* - P < .1

coast and in the Sacramento-San Joaquin "Great Valley." Group 1.2 will be labeled Coastal/Valley. The comparative data for these two groups of counties are displayed in Table 4.

We see that the Coastal/Valley group of counties is significantly larger on every measure of population "size": the average population is nearly six times as large as the Northern/Mountain counties; population densities are seven and a half times greater, the percentage of urban population is over twice as great, the percentage of Black population is five times greater, the percentage of foreign stock is half again as large, etc. However, the percentage voting is somewhat lower.

Although the Coastal/Valley counties substantially exceed the Northern/Mountain counties on all measures of population size, the Northern/Mountain group display substantially higher percentages of growth (for housing 1960-70 and for population 1970-75; but not for population 1960-70).

The Northern/Mountain (group 1.1) counties have significantly larger percentages of population over 65 years, significant higher death rates, but significantly lower birth rates than do the Coastal/Valley (group 1.2) counties.

Although the significance test levels are marginal, five of the affluence measures favor the Coastal/Valley group over the Northern/Mountain group.

There are no significant differences for average land area, medical service rates, or percentages employed in manufacturing; however, percentages of the civilian labor force employed in sales are slightly higher in the Coastal/Valley counties.

The Coastal/Valley group has twice the percentage of land in farm, but approximately the same percentage of farm population as the Northern/Mountain counties.

Although further significance testing will not be reported, Table 5 displays the county data item means for groups 1.1.1 through 1.2.3. Comparison of row means for adjacent columns will reveal ways in which these groups of counties differ.

Comparison of the two major Nevada-Utah county groups. The 37 counties in group 3 subdivide nearly evenly into 19 counties in group 3.1 and 18 counties in group 3.2. Group 3.1 contains a mixture of two California counties (Lassen and Modoc), ten Nevada counties and seven Utah counties. All 18 of the counties in group 3.2 are in Utah. The differences between the "mixed" group (3.1) and the "all-Utah" group (3.2) are displayed in Table 6.

The "all Utah" counties are significantly larger in population (and in number of families), but they have significantly lower percentages of Black and foreign stock populations than do the "mixed" Nevada, Utah and California county group. However, there are no significant differences between groups (due in part to substantial variation among county

Table 5

ITEM MEANS OF GROUPS OF (PRIMARILY) CALIFORNIA COUNTIES
IN THE FAR WEST LABORATORY REGION ON 35 COUNTY DATA ITEMS

Nr.	Item Description	G.1.1.1	G.1.1.2	G.1.1.3	G.1.1.4	G.1.2.1	G.1.2.2	G.1.2.3
2	Population	73,768	76,329	37,925	18,082	125,382	579,591	400,693
3	Population per sq. mile	81	32	12	91	73	637	862
5	% Urban population	31.9	41.1	26.3	50.0	57.6	91.9	95.4
6	% Black population	1.0	0.6	0.6	0.6	2.7	5.9	3.6
7	% Foreign stock population	17.3	15.2	13.2	14.7	22.2	20.1	28.4
16	Nr. Families	15,960	16,375	8,910	2,950	28,918	134,712	99,400
19	Nr. Dependent children	2,760	1,612	1,525	136	7,334	24,822	7,855
35	Nr. Mineral establishments	7.2	11.8	4.7	4.0	16.4	28.6	6.0
30	% Voting 1972	68.8	60.5	67.4	59.4	58.2	63.0	71.0
8	% Pop. change 1970-75	23.6	24.2	11.9	65.4	8.2	7.4	3.2
9	% Pop. change 1960-70	32.1	40.5	0.9	94.8	17.4	29.0	33.8
26	% Housing Change 1960-70	53.3	62.8	19.1	123.0	21.5	34.4	39.5
38	Population per family 1970	4.6	4.8	4.3	6.0	4.3	4.4	4.1
4	% Population 65 and over	15.5	9.6	11.4	7.2	10.1	8.0	8.5
12	Death rate 1975	11.1	8.2	9.8	6.1	8.7	7.0	7.0
13	Death rate 1970	12.5	8.9	10.4	8.0	9.0	7.2	6.9
10	Birth rate 1975	11.5	13.3	14.5	12.2	17.0	17.1	10.7
11	Birth rate 1970	14.3	16.0	16.5	16.8	19.0	19.9	15.2
27	% In one unit housing	82.9	73.9	83.2	67.2	82.3	71.8	72.3
28	% Units more than 1 p. per room	6.4	8.1	8.3	5.6	10.4	7.5	4.2
17	% Families below poverty level	10.5	8.6	10.7	5.8	12.1	7.8	4.4
18	% Families income over $15,000	16.3	20.7	14.8	27.2	16.7	25.4	41.6
22	Median per capita income '74	4,250	4,818	4,164	5,320	4,338	4,973	6,886
23	Median family income '69	8,651	9,913	8,693	11,048	8,599	10,752	13,574
24	Median value owner home '70	17,900	20,000	14,200	26,000	16,000	21,500	32,000
25	Median gross monthly rent '70	101	118	88	150	94	120	165
1	Land area	1,202	2,886	2,943	426	1,738	1,154	484
20	Physician rate '75	164.8	130.0	105.1	105.0	121.2	187.6	286.5
21	Hospital bed rate '75	727.1	509.0	457.7	150.0	388.6	529.8	346.5
33	% Employed Mfg. '75	18.9	11.7	37.7	12.1	23.8	21.3	14.3
31	% Employed Mfg. '70	12.4	7.5	22.0	4.8	11.4	17.2	13.7
34	% Employed sales '75	33.0	30.4	29.8	16.3	37.8	34.0	33.4
32	% Employed sales '70	20.3	19.0	18.6	14.1	20.6	21.1	21.8
36	% Land in farms	32.8	19.0	23.9	28.0	72.8	59.4	35.0
37	% Farm population	3.6	4.9	4.1	3.0	8.6	0.9	0.3
	Number of Counties in group	10	4	10	2	11	8	2

Table 6

COMPARISON OF GROUP 3.1 WITH GROUP 3.2 COUNTIES IN THE FAR WEST LABORATORY REGION ON 35 COUNTY DATA ITEMS

Nr.	Item Description	Mean Group 3.1	Mean Group 3.2	Significance Test /a
2	Population	8,264	26,730	*
3	Population per sq. mile	2.1	31.2	
5	% Urban population	26.1	34.5	
6	% Black population	0.9	0.1	*
7	% Foreign stock population	11.0	7.8	*
16	Nr. Families	1,910	5,083	*
19	Nr. Dependent children	150	427	
35	Nr. Mineral establishments	8.5	11.5	
30	% Voting 1972	70.2	73.6	
8	% Pop. change 1970-75	7.5	19.7	*
9	% Pop. change 1960-70	8.1	9.6	
26	% Housing Change 1960-70	5.0	18.8	*
38	Population per family 1970	4.3	5.1	**
4	% Population 65 and over	9.3	9.1	
12	Death rate 1975	9.3	6.7	***
13	Death rate 1970	9.8	7.8	*
10	Birth rate 1975	20.0	27.4	***
11	Birth rate 1970	19.8	24.4	**
27	% In one unit housing	75.4	84.2	*
28	% Units more than 1 p. per room	10.9	12.7	
17	% Families below poverty level	10.1	12.6	
18	% Families income over $15,000	13.3	11.1	
22	Median per capita income '74	4,092	3,463	***
23	Median family income '69	8,689	7,955	*
24	Median value owner home	11,947	13,667	
25	Median gross rent	90	83	
1	Land area	6,274	3,159	*
20	Physician rate '75	61.2	61.9	
21	Hospital bed rate '75	446.2	398.8	
33	% Employed Mfg. '75	9.3	21.3	**
31	% Employed Mfg. '70	6.7	12.6	**
34	% Employed sales '75	30.5	36.2	
32	% Employed sales '70	16.4	20.6	*
36	% Land in farms	14.7	30.1	*
37	% Farm population	8.8	9.0	

a. Significance-levels for one-way analysis of variance

T-tests: **** - P < .0001
*** - P < .001
** - P < .01
* - P < .1

subgroups) in: population density, percentage urban population, number of dependent children, number of mineral establishments, and percentage voting.

The county growth items show significantly greater growth for the "all-Utah" counties (housing change 1960-1970 and population change 1970-1975, but not 1960-1970).

Although there is no difference in the two groups of counties in percentage of population 65 years and over, there are significant differences in death and birth rates with more births and fewer deaths (per 100,000) in the "all-Utah" group.

The higher birth rates in the "all Utah" group significantly depress the per capita income figures for this group of counties as compared to the "mixed" group. Comparison on median family income still favors the "mixed" group, but the significance level is much lower. There are no other differences on the "affluence" measures, except for percentage in one unit housing favoring the "all-Utah" group.

The "mixed" group of counties have approximately twice the average land area. There are no differences in medical service rates. The "all-Utah" group has significantly larger (approximately double the) percentages of the labor force employed in manufacturing. This group also has a slightly larger proportion of persons employed in sales.

The "all-Utah" counties have over twice the percentage of land in farms as do the "mixed" counties; however, the percentages of farm population are nearly equal.

Table 7 displays the item means for subgroups of counties within these two groups Nevada-Utah counties.

Five "unique" FWL counties. Figure 1 identifies (by three digit numbers) the county grouping that were found at the level of nineteen groups. When grouping had proceeded this level, 84 of the FWL region counties had combined to form 14 multiple-county groups. However, five counties were so unusual in their factor score profiles that each remained isolated as a single county "group." At the level of 16 groups, Storey-NV combined with San Francisco county. At the level of 13 groups, Daggett-UT joined this pair. With 11 groups remaining, Alpine-CA joined the triad. And finally, when only seven grouping remained, Esmeralda-NV, the most unusual of all the FWL counties in terms of its factor score pattern, also joined this group. These five counties constitute group 2, which retained its peculiar identity until only three groups remained. Finally, when two groups were created, this five county group combined with group 1.

Table 8 displays the item means for this set of five unusual counties. Inspection of the values for San Francisco show that it is highly unusual. With a population of 664,520, it exceeds the population averages of any other group (see Tables 5 and 7), but is closest to G.1.2.2 and G.1.2.3 (which include the other major San Francisco Bay Area counties plus the

Table 7

ITEM MEANS OF GROUPS OF (PRIMARILY) NEVADA AND UTAH COUNTIES IN THE FAR WEST LABORATORY REGION ON 35 COUNTY DATA ITEMS

Nr.	Item Description	G.3.1.1	G.3.1.2	G.3.1.3	G.3.1.4	G.3.2.1	G.3.2.2	G.3.2.3
2	Population	9,734	3,218	11,791	4,040	60,614	14,213	8,312
3	Population per sq. mile	1.6	0.3	3.1	2.0	87.2	3.3	3.2
5	% Urban population	47.7	0.0	36.7	0.0	49.0	10.9	32.7
6	% Black population	1.5	0.2	1.0	0.1	0.3	0.1	0.0
7	% Foreign stock population	9.1	10.2	14.9	7.3	9.8	5.3	7.3
16	Nr. Families	2,360	767	2,686	850	11,550	2,200	1,733
19	Nr. Dependent children	164	33	254	41	815	600	111
35	Nr. Mineral establishments	9.4	11.7	8.4	5.2	4.2	46.7	4.7
30	% Voting 1972	71.2	75.8	61.5	79.8	73.8	58.6	78.5
8	% Pop. change 1970-75	-2.9	7.0	11.5	14.0	11.8	45.5	16.4
9	% Pop. change 1960-70	9.2	40.6	3.3	-9.2	24.7	5.8	0.8
26	% Housing Change 1960-70	2.2	18.0	2.7	2.8	33.3	13.7	10.8
38	Population per family 1970	4.1	4.0	4.3	4.6	4.9	6.6	4.7
4	% Population 65 and over	8.1	6.6	10.1	11.3	7.3	5.3	11.6
12	Death rate 1975	8.7	8.8	10.4	8.4	5.8	5.3	7.7
13	Death rate 1970	7.2	9.3	11.6	10.3	5.6	7.0	9.6
10	Birth rate 1975	20.6	19.7	17.1	24.6	27.9	29.0	26.5
11	Birth rate 1970	22.0	20.1	16.6	22.6	25.3	27.3	22.9
27	% In one unit housing	71.0	58.7	77.6	89.4	82.1	80.7	86.7
28	% Units more than 1 p. per room	12.0	11.8	9.4	11.4	10.9	23.3	10.4
17	% Families below poverty level	8.5	11.7	9.3	12.2	8.2	20.3	12.9
18	% Families income over $15,000	16.6	12.0	15.7	6.0	16.0	9.4	8.5
22	Median per capita income '74	4,150	4,279	4,405	3,332	3,736	3,057	3,417
23	Median family income '69	9,384	9,201	8,883	7,098	8,923	7,417	7,489
24	Median value owner home '70	13,000	9,000	14,000	9,250	16,167	12,667	12,333
25	Median gross monthly rent '70	92	107	93	70	98	87	79
1	Land area	6,785	9,289	6,840	2,382	1,786	5,150	3,411
20	Physician rate '75	50.0	77.3	71.4	45.2	70.7	36.0	64.8
21	Hospital bed rate '75	494.4	434.3	642.0	52.0	165.7	315.3	582.00
33	% Employed Mfg. '75	10.1	5.6	13.6	3.3	37.3	5.2	15.9
31	% Employed Mfg. '70	9.5	1.8	5.3	9.4	17.0	5.3	12.2
34	% Employed sales '75	33.8	10.2	37.2	30.0	30.8	29.0	42.2
32	% Employed sales '70	16.5	12.9	20.4	11.9	16.6	19.1	25.7
36	% Land in farms	7.2	10.3	22.1	14.2	56.7	26.0	13.8
37	% Farm population	3.6	8.9	10.3	12.6	9.3	18.4	5.6
	Number of Counties in group	5	3	7	4	6	3	9

Table 8

FIVE "UNIQUE" COUNTIES IN THE FAR WEST LABORATORY REGION
MEANS ON 35 COUNTY DATA ITEMS

Nr.	Item Description	San Fran-CA	Storey-NV	Daggett-UT	Alpine-CA	Esmeralda-NV
2	Population	664,520	995	776	796	748
3	Population per sq. mile	14,767	4	1	1	0.2
5	% Urban population	100.0	0.0	0.0	0.0	0.0
6	% Black population	13.4	1.2	0.0	0.2	0.2
7	% Foreign stock population	44.3	23.3	6.0	8.0	8.1
16	Nr. Families	165,300	200 /a	100 /a	100 /a	100 /a
19	Nr. Dependent children	35,979	3	6	27	14
35	Nr. Mineral establishments	20.0	1.0	3.0	1.0	3.0
30	% Voting 1972	63.7	22.3	70.0	99.9 /b	80.0
8	% Pop. change 1970-75	-6.5	43.2	16.7	64.5	18.9
9	% Pop. change 1960-70	-3.3	22.4	-42.8	21.9	1.6
26	% Housing Change 1960-70	0.2	35.1	-20.8	251.7	37.2
38	Population per family 1970	4.0	5.0 /a	7.8 /a	8.0 /a	7.5 /a
4	% Population 65 and over	15.3	8.3	6.7	8.3	12.4
12	Death rate 1975	12.4	13.1	5.2	5.0	12.0
13	Death rate 1970	13.1	18.7	7.5	14.5	14.3
10	Birth rate 1975	11.2	12.1	25.8	10.1	18.7
11	Birth rate 1970	15.6	11.5	24.0	53.7	25.4
27	% In one unit housing	33.1	69.2	88.7	89.7	82.8
28	% Units more than 1 p. per room	6.8	11.4	8.6	16.4	6.8
17	% Families below poverty level	9.9	2.6	16.5	8.9	10.6
18	% Families income over $15,000	27.1	33.8	10.6	21.7	2.9
22	Median per capita income '74	5,990	4,983	3,703	4,405	4,912
23	Median family income '69	10,495	11,867	10,054	8,909	8,545
24	Median value owner home '70	28,165	14,118	16,667	27,308	7,778
25	Median gross monthly rent '70	135	90	75	73	90
1	Land area	45	262	682	727	3,570
20	Physician rate '75	585.0	0.0	0.0	0.0	0.0
21	Hospital bed rate '75	1,114.5	0.0	0.0	0.0	0.0
33	% Employed Mfg. '75	10.0	6.6	0.0	0.0	87.1
31	% Employed Mfg. '70	11.7	2.7	0.0	4.6	22.0
34	% Employed sales '75	19.8	33.3	60.9	5.7	1.2
32	% Employed sales '70	20.4	29.0	5.8	10.3	3.3
36	% Land in farms	0.0	0.0	8.4	0.0	99.9 /c
37	% Farm population	0.0	0.0	13.8	0.0	0.0

a. Since number of families were reported to the nearest hundreds, these values can range ±50; for the same reason, population per family estimates for these counties are crude.
b. Actually exceeds 100% (115.2%) since voting residence is not the same as "usual place of of residence" used by the Bureau of the Census.
c. Actually exceeds 100% due to method of reporting.

two most populous Utah counties). With only 45 square miles land area (as opposed to land area averages that often exceed a thousand square miles for other county groups listed in Tables 5 and 7). San Francisco county has a population density of 14,767 person per square mile, seventeen times the average density of the next most dense group of counties (G.1.2.3, consisting of Marin-CA and San Mateo-CA). San Francisco county is 100 percent urban and has zero percent land in farm and a zero percent farm population. Among the county groups, it is the only "group" displaying negative population growth in both the 1960-1970 and the 1970-1975 periods. Its percentage Black population (13.4%) is more than twice that of the next highest average (5.9% for G.1.2.2) and its foreign stock population percentage is far higher than for any other group of counties. As a major population center with extensive medical education and research facilities, both its physician rate and its hospital bed rate are far higher than any other group of counties. Only the Marin and San Mateo group (G.1.2.3) exceed San Francisco on median home value and median gross rents, and San Francisco exceeds most, but not all groups, in median per capita income and median family income. We thus see why San Francisco county qualifies as a "unique" county.

The remaining "unique" counties (Storey-NV, Daggett-UT, Alpine-CA, Esmeralda-NV) are also quite different, but we can see some possible reasons for their combining with each other rather than joining other county groups. First, their populations are extremely small, all under 1,000 persons. Their population densities are also extremely low. They all have zero percent urban populations. Their Black and foreign stock populations are quite small. The four are also extremely unusual in displaying zero level medical service rates (no physicians or hospital beds reported). Beyond these highly atypical similarities the counties also display some substantial differences from one another, e.g. the population growth rates are quite diverse for similar periods, but are also remarkable in terms of differences in percentage changes between periods.[11] There are substantial differences in the percentages of families with incomes over $15,000 (and only the 41.6% for Marin-CA and San Mateo-CA exceeds the 33.8% of Storey-NV).

The differences in per capita income and family income are evident but not large. There are unusually large differences in home values. There are also substantial differences among these counties in proportions of their work force employed in manufacturing or in sales. Finally, while Esmeralda has all of its land in farm, the other counties have little or none of their land in farm. However, Daggett is the only county in this group with other than zero farm population.

If the grouping had been made solely on the basis of population size and density, Storey, Daggett, Alpine and Esmeralda might have formed a third

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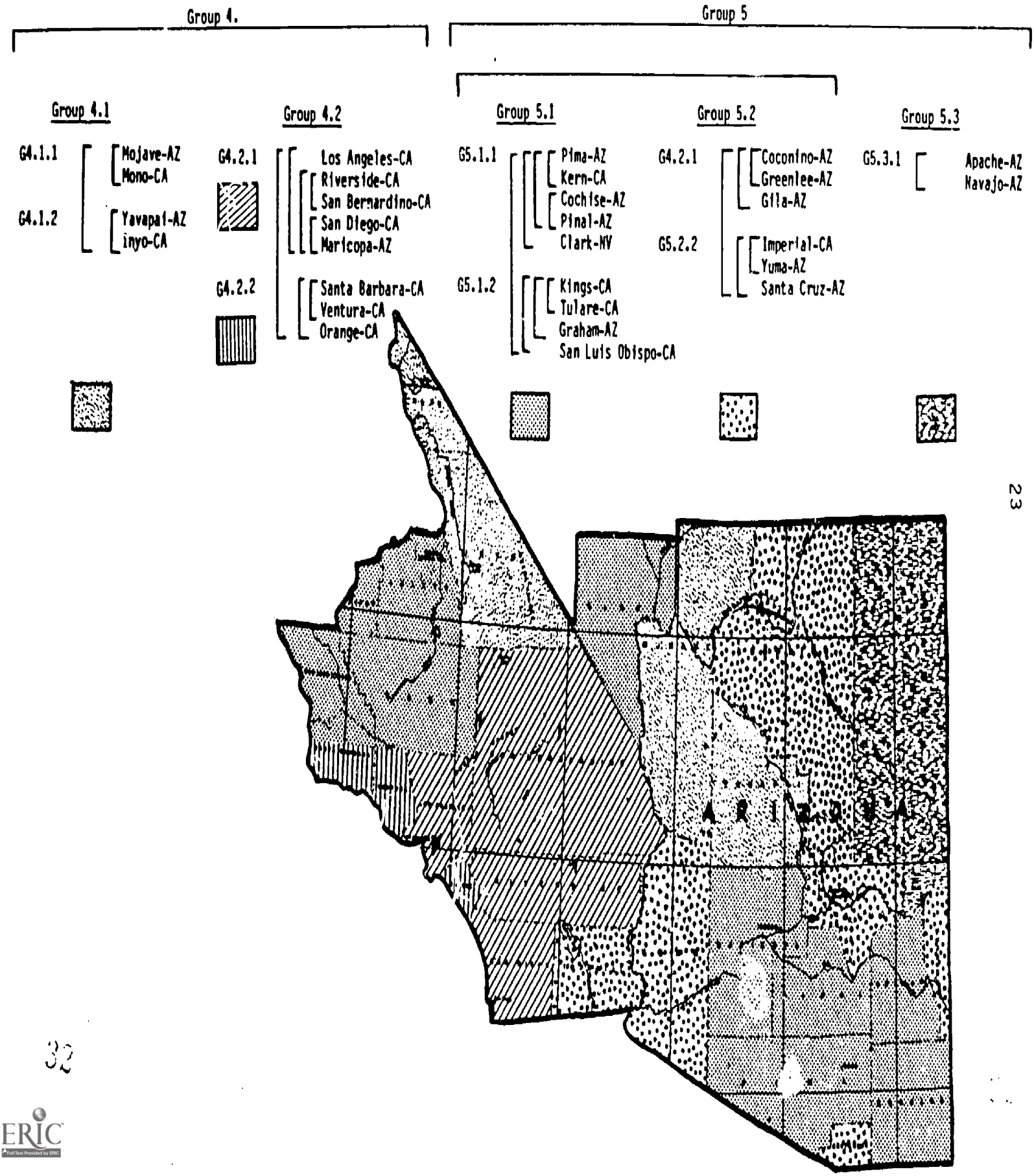
11 If uniform linear population growth existed, the 1970-75 percentage would be half the percentage for 1960-70. In fact the growth rates for the 1970-75 period are substantially greater than the 1960-70 period in all four counties.

FIGURE 3

MAP AND HIERARCHICAL GROUPING OF 29 COUNTIES IN THE SWRL REGION ON THE BASIS OF DIFFERENCES ON EIGHT STANDARDIZED FACTOR SCORES



group by themselves, and San Francisco would have formed a fourth group by itself, anchoring the other end of the population size-density continuum.

Grouping of Counties in the SWRL Laboratory Region

Figure 3 displays the grouping of the 29 counties in the SWRL laboratory service region. To maintain consecutive numbering of groupings the two major SWRL groups are numbered 4 and 5. The map portrays the location of the five major subgroups corresponding to the five columns in Figure 3. Differences in the orientation of cross hatching further distinguish the next level of subgrouping for group 4.2, the most populous counties in the SWRL region.

At the level of nine groups (numbered G.4.1.1. through G.5.3.1 in Figure 3) analysis of variance tests indicated that between group differences were significant at the .01 level or beyond on all eight of the standardized factor scores, and over half of the raw county data items were significant at this level.

To examine the nature of these group differences, we begin by comparing group 4 with group 5. The results are displayed in Table 9. It should be first noted that the combination of group 4.1, consisting of Mohave, Mono, Yavapai and Inyo, four of the least populated (but not least dense) counties in the SWRL region, with group 4.2, (consisting of the seven most populous counties in Southern California and Maricopa (Phoenix) in Arizona, creates some major within data group variations in group 4, along with some lowering of means for this group (See Table 10 for the comparison of groups 4.1 and 4.2). Consequently, some of the population comparisons are not as large as they would be if group 4 consisted only of "metropolitan" counties.

Although large within group variation substantially depresses the levels of between group significance tests, we see that there is a massive difference on some of the population items. The average population in group 4 is over nine times that of group 5, and the population per square mile is more than 18 times as dense as that in group 5. Population change both for the 1960-1970 and the 1970-1975 periods are well over twice as high for group 4.

The percentage of the population over 65 years is higher in group 4, but the birth rates for both periods are significantly higher for group 5. The percentage housing units with more than one person per room and the percentage of families below the poverty level are approximately twice as high in group 5 as group 4. Conversely, group 4 is significantly higher on every positive measure of affluence. Perhaps for this reason, the physician rate (per 100,000 population) is substantially higher in group 4. Finally, there is a sharp contrast in employment patterns with substantially higher percentages of the labor force employed in manufacturing in group 4, while the two agricultural measures are significantly higher in group 5.

Table 9

COMPARISON OF THE TWO MAJOR GROUPINGS OF COUNTIES (GROUP 4 WITH GROUP 5) IN THE SWRL REGION ON 35 COUNTY DATA ITEMS

Nr.	Item Description	Mean Group 4	Mean Group 5	Significance Test
2	Population	1,128,826	123,115	* /a
3	Population per sq. mile	404	22	*
5	% Urban population	69.0	56.3	
6	% Black population	2.8	2.9	
7	% Foreign stock population	18.5	19.4	
16	Nr. Families	264,350	25,488	* /a
19	Nr. Dependent children	50,973	4,602	* /a
35	Nr. Mineral establishments	67.7	27.5	
30	% Voting 1972	60.3	49.3	
8	% Pop. change 1970-75	22.5	18.8	
9	% Pop. change 1960-70	67.0	23.0	*
26	% Housing Change 1960-70	78.0	29.3	*
38	Population per family 1970	4.7	5.1	
4	% Population 65 and over	10.6	7.9	*
12	Death rate 1975	8.4	7.4	
13	Death rate 1970	8.7	8.1	
10	Birth rate 1975	14.5	21.2	***
11	Birth rate 1970	17.7	23.6	**
27	% In one unit housing	70.6	78.1	*
28	% Units more than 1 p. per room	8.7	18.8	**
17	% Families below poverty level	9.2	17.1	**
18	% Families income over $15,000	21.6	14.0	**
22	Median per capita income '74	4,709	3,740	***
23	Median family income '69	10,014	8,177	***
24	Median value owner home	20,750	13,294	***
25	Median gross rent	118	85	***
1	Land area	7,052	6,624	
20	Physician rate '75	166.9	92.2	**
21	Hospital bed rate '75	553.5	446.2	
33	% Employed Mfg. '75	19.7	12.9	*
31	% Employed Mfg. '70	15.2	8.4	**
34	% Employed sales '75	32.6	34.8	
32	% Employed sales '70	21.6	21.0	
36	% Land in farms	24.6	51.4	**
37	% Farm population	1.0	3.4	**
	Number of Counties	12	17	

a. The massive size of Los Angeles County creates a large within variance when raw population is tested. When log 10 (Population) is tested, the P level is .023. Logs of other size measures produced P levels of .10 or higher.

Table 10

COMPARISON OF GROUP 4.1 WITH GROUP 4.2 COUNTIES IN THE SWRL REGION ON 35 COUNTY DATA ITEMS

Nr.	Item Description	Mean Group 4.1	Mean Group 4.2	Significance Test
2	Population	27,464	1,679,506	*** /a
3	Population per sq. mile	3	605	** /a
5	% Urban population	23.4	91.7	****
6	% Black population	0.2	4.1	*
7	% Foreign stock population	12.8	21.4	**
16	Nr. Families	5,700	393,675	** /a
19	Nr. Dependent children	276	76,321	** /a
35	Nr. Mineral establishments	10.8	96.1	** /a
30	% Voting 1972	60.1	60.4	
8	% Pop. change 1970-75	42.8	12.4	*
9	% Pop. change 1960-70	94.3	53.4	/b
26	% Housing Change 1960-70	123.5	55.2	/b
38	Population per family 1970	5.1	4.5	
4	% Population 65 and over	11.4	10.1	
12	Death rate 1975	9.9	7.6	
13	Death rate 1970	10.6	7.8	*
10	Birth rate 1975	13.0	15.3	*
11	Birth rate 1970	15.6	18.8	***
27	% In one unit housing	68.2	71.7	
28	% Units more than 1 p. per room	10.2	8.0	*
17	% Families below poverty level	10.8	8.4	*
18	% Families income over $15,000	15.6	24.6	*
22	Median per capita income '74	4,438	4,845	
23	Median family income '69	9,237	10,403	
24	Median value owner home	19,000	21,625	
25	Median gross rent	105	124	
1	Land area	8,616	6,270	
20	Physician rate '75	109.8	165.5	**
21	Hospital bed rate '75	537.0	562.8	
33	% Employed Mfg. '75	11.4	23.8	*
31	% Employed Mfg. '70	6.0	19.9	**
34	% Employed sales '75	33.4	32.2	
32	% Employed sales '70	21.4	21.7	
36	% Land in farms	21.2	26.2	
37	% Farm population	2.0	0.6	*
	Number of Counties	4	8	

a. Log 10 (Population) P level = .0002
Log transformation of other population figures P<.01
b. See item means, Table 11.

Table 11

ITEM MEANS OF GROUPS 4.1.1., 4.1.2, 4.2.1, and 4.2.2 IN THE SWRL REGION ON 35 COUNTY DATA ITEMS

Nr.	Item Description	G.4.1.1	G.4.1.2	G.4.2.1	G.4.2.2
2	Population	22,395	32,532	2,203,768	805,738
3	Population per sq. mile	2.5	4	466	837
5	% Urban population	14.2	32.7	90.8	93.2
6	% Black population	0.05	0.3	5.6	1.6
7	% Foreign stock population	12.4	13.2	21.1	21.9
16	Nr. Families	4,200	7,200	526,640	172,067
19	Nr. Dependent children	196	356	110,321	19,655
35	Nr. Mineral establishments	5.5	16.0	100.0	89.7
30	% Voting 1972	59.2	61.0	57.9	64.6
8	% Pop. change 1970-75	63.8	21.8	11.5	13.9
9	% Pop. change 1960-70	157.8	30.6	35.8	82.8
26	% Housing Change 1960-70	211.5	35.9	38.2	83.7
38	Population per family 1970	5.9	4.4	4.5	4.6
4	% Population 65 and over	7.8	15.0	11.0	8.6
12	Death rate 1975	7.4	12.4	8.2	6.6
13	Death rate 1970	7.6	13.6	8.5	6.5
10	Birth rate 1975	11.9	14.0	15.6	14.7
11	Birth rate 1970	15.6	15.4	19.0	18.3
27	% In one unit housing	64.2	72.2	71.6	71.8
28	% Units more than 1 p. per room	11.2	9.2	8.5	7.0
17	% Families below poverty level	10.2	11.4	9.3	6.8
18	% Families income over $15,000	17.0	14.3	22.1	28.6
22	Median per capita income '74	4,474	4,402	4,773	5,966
23	Median family income '69	9,790	8,683	9,876	11,282
24	Median value owner home '70	20,000	18,000	20,000	24,333
25	Median gross monthly rent '70	125	85	116	137
1	Land area	8,122	9,110	8,956	1,794
20	Physician rate '75	78	141.5	199.4	189.0
21	Hospital bed rate '75	326.0	748.0	535.6	605.3
33	% Employed Mfg. '75	11.6	11.2	24.0	23.5
31	% Employed Mfg. '70	5.3	6.6	20.0	19.6
34	% Employed sales '75	29.6	37.2	31.1	34.1
32	% Employed sales '70	21.5	21.4	21.7	21.6
36	% Land in farms	16.5	26.0	19.2	38.0
37	% Farm population	2.7	1.3	0.5	0.6
	Number of Counties in group	2	2	5	3

Although group 4.1 (Mohave, Mono, Yavapai, and Inyo) and group 4.2 (Los Angeles, Riverside, San Bernardino, San Diego, Maricopa, Santa Barbara, Ventura, and Orange) were sufficiently similar that they combined to form group 4, Table 10 also indicates that there are massive differences, primarily in the population size for the metropolitan counties of group 4.2 as compared to the highly rural counties of group 4.1. Not surprising is the fact that percentage employed in manufacturing are much higher in the metropolitan counties while percentage farm population is significantly less. That the physician rate would be much higher is also no surprise. The metropolitan counties also have somewhat larger percentages of families with 1969 incomes over $15,000, smaller percentages of families under the poverty level, and fewer units with more than one person per room.

Although the metropolitan counties display significantly higher birth rates (in both periods), the surprise is that it is the rural group that shows higher growth rates. The note in Table 10 refers the reader to Table 11 where we see group 4 further subdivided. Growth rates are obviously one basis for this subdivision. Here (Table 11), group 4.1.1 (Mohave and Mono) has growth rates that are several times those of Yavapai and Inyo. However, we also see that group 4.2.2 (San Barbara, Ventura, and Orange) display growth rates that are over twice those of group 4.2.1 (Los Angeles, Riverside, San Bernardino, San Diego and Maricopa).

Returning to Table 10, we note that despite these massive differences in population size, density, birth rates, etc., the two sets of counties are not very different in per capita income, family income, home value or gross monthly rents. Moreover, percentage employed in sales are similar, as is the percentage of land in farm.

Group 5 contains a broad mixture of counties that divide into three major subgroups. Group 5.1 contains the more populous and dense counties in group 5. Groups 5.2 and 5.3 have much smaller populations and are much less dense. Although groups 5.2 and 5.3 are somewhat similar on measures of population size and density, group 5.3 (Apache and Navajo) has such markedly lower socio-economic values that this group of two counties combined only after all of the 15 counties in groups 5.1 and 5.2 had combined with each other. Table 12 examines the differences between group 5.1 and 5.2.

We see in Table 12 that there are relatively few significantly differences between groups 5.1 and 5.2. Group 5.1 is more populous, more dense, has a larger percentage of Black population and has more land in farms; while group 5.2 displays consistently higher birth rates and perhaps for this reason has significantly higher percentages of housing units with more than one person per room. The two groups are not significantly different on measure of population growth, measure of affluence, in medical service rates, or in percentages of persons in manufacturing, in sales or on farms.

Table 13 displays the sets of means for the pairs of subgroups in group 5.1 and 5.2, and also displays the means for 5.3. Comparing 5.1.1 (Pima,

Table 12

COMPARISON OF GROUP 5.1 WITH GROUP 5.2
IN THE SWRL REGION ON 35 COUNTY DATA ITEMS

Nr.	Item Description	Mean Group 5.1	Mean Group 5.2	Significance Test
2	Population	190,343	46,639	* /a
3	Population per sq. mile	33	10	**
5	% Urban population	65.4	56.8	
6	% Black population	4.0	1.8	*
7	% Foreign stock population	18.3	26.5	
16	Nr. Families	40,244	9,217	*
19	Nr. Dependent children	6,924	1,355	*
35	Nr. Mineral establishments	46.0	5.	/b
30	% Voting 1972	49.9	52.0	
8	% Pop. change 1970-75	17.4	19.0	
9	% Pop. change 1960-70	30.7	13.8	
26	% Housing Change 1960-70	32.7	22.2	
38	Population per family 1970	4.9	5.1	
4	% Population 65 and over	8.9	7.4	
12	Death rate 1975	7.9	7.0	
13	Death rate 1970	8.5	7.7	
10	Birth rate 1975	18.5	22.0	*
11	Birth rate 1970	20.5	24.0	*
27	% In one unit housing	78.0	76.1	
28	% Units more than 1 p. per room	12.9	18.7	*
17	% Families below poverty level	13.7	15.0	
18	% Families income over $15,000	15.3	14.2	
22	Median per capita income '74	4,000	3,834	
23	Median family income '69	8,457	8,508	
24	Median value owner home	14,778	13,167	
25	Median gross rent	93	80	
1	Land area	5,655	6,773	
20	Physician rate '75	111.9	85.7	
21	Hospital bed rate '75	486.4	410.2	
33	% Employed Mfg. '75	13.0	12.6	
31	% Employed Mfg. '70	8.3	7.6	
34	% Employed sales '75	35.4	37.7	
32	% Employed sales '70	20.3	23.(	
36	% Land in farms	58.1	27.7	*
37	% Farm population	3.6	2.4	
	Number of Counties in Group	9	6	

a. Significance level based on test of log transformed data, $P < .02$.
b. See variable means in Table 13.

Table 13

ITEM MEANS FOR GROUPS 5.1.1., 5.1.2, 5.2.1, 5.2.2 and 5.3.0
IN THE SWRL REGION ON 35 COUNTY DATA ITEMS

Nr.	Item Description	G.5.1.1	G.5.1.2	G.5.2.1	G.5.2.2	G.5.3.0
2	Population	256,852	107,209	37,331	55,946	50,010
3	Population per sq. mile	32	35	6	14	5
5	% Urban population	74.5	54.1	48.9	64.7	13.4
6	% Black population	5.0	2.8	1.0	2.5	1.6
7	% Foreign stock population	18.8	17.7	13.2	39.8	3.1
16	Nr. Families	54,080	22,950	6,733	11,700	7,900
19	Nr. Dependent children	7,582	6,102	974	1,736	3,894
35	Nr. Mineral establishments	72.6	12.8	8.0	2.7	10.5
30	% Voting 1972	47.2	53.2	54.1	49.9	39.0
8	% Pop. change 1970-75	19.9	14.4	20.5	17.5	24.4
9	% Pop. change 1960-70	36.5	23.4	6.3	21.4	15.6
26	% Housing Change 1960-70	39.6	24.0	20.3	24.0	36.0
38	Population per family 1970	4.9	4.8	5.2	5.1	6.4
4	% Population 65 and over	8.2	9.7	6.2	8.7	5.1
12	Death rate 1975	7.3	8.5	6.4	7.5	7.0
13	Death rate 1970	8.1	8.9	7.6	7.9	7.6
10	Birth rate 1975	18.2	18.8	22.5	21.5	31.4
11	Birth rate 1970	20.9	20.0	24.5	23.4	36.2
27	% In one unit housing	72.4	84.9	78.6	73.6	84.8
28	% Units more than 1 p. per room	13.0	12.8	18.6	18.8	45.2
17	% Families below poverty level	12.3	15.4	13.3	16.6	39.2
14	% Families income over $15,000	17.6	12.4	12.8	15.7	7.8
22	Median per capita income '74	4,233	3,710	3,985	3,684	2,284
23	Median family income '69	9,002	7,775	8,885	8,131	5,924
24	Median value owner home '70	15,400	14,000	11,333	15,000	7,000
25	Median gross monthly rent '70	100	85	77	83	65
1	Land area	7,372	3,502	8,389	5,157	10,540
20	Physician rate '75	123.0	98.0	88.7	82.7	23.5
21	Hospital bed rate '75	442.8	566.0	487.7	332.7	373.0
33	% Employed Mfg. '75	11.4	15.2	16.9	8.3	13.2
31	% Employed Mfg. '70	8.4	8.2	9.6	5.6	11.0
34	% Employed sales '75	30.0	42.2	26.2	49.2	23.4
32	% Employed sales '70	19.5	21.4	19.4	27.7	16.5
36	% Land in farms	49.4	69.0	34.3	21.0	92.5
37	% Farm population	1.9	5.6	2.7	2.1	5.6
	Number of Counties in group	5	4	3	3	2

Kern, Cochise, Pinal and Clark) with 5.1.2 (Kings, Tulare, Graham, and San Louis Obispo) we note that the former group is over twice as populous, displays somewhat larger growth rates; and appears to have a small advantage in several of the affluence measures. However, birth and death rates are similar. Employment percentages are not grossly different, but the later group appears to have more land in farms and a larger farm population.

When we compare group 5.2.1 (Coconino, Greenlee, Gila) with group 5.2.2 (Imperial, Yuma, Santa Cruz) we see that the later group of counties is somewhat more populous, more dense, and more urban. Recent population growth is similar, but the later group grew more during the 60's. The affluence measures are all fairly similar. There seems to be a small reversal in employment proportions with larger portions of the former group in manufacturing and larger portions of the later group in sales. The farm population percentages are similar.

It was previously noted that group 5.3 (Apache and Navajo) was markedly different from the other counties in group 5. Indeed, this pair of counties are at the bottom of the SWRL (and combined FWL/SWRL) distributions for nearly all measures of financial affluence. The unusual degree of poverty in these two counties is also reflected in the percentage of families below the poverty level and in the percentage of housing units with more than one person per room. The physician rate is also extraordinarily low.[12]

Grouping of California Counties. Figure 4 displays the four major groups of California counties, and the thirteen primary subgroupings.[13] (To avoid confusion with the major regional laboratory groupings, the major groups in the state analysis are labeled with leading letters rather than numbers.) Horizontal brackets across the top of the figure indicate the order of combination of major groups. Vertical brackets before each set of subgroups indicating their order of combination within major groups. Among the four major groups, groups A and B, the two most populous groups of counties, combined; then group C, consisting primarily of the larger, predominantly agricultural counties, joined this upper group; leaving group D, the much less populated counties as the remaining group. Differences in levels of affluence, rates of population growth, and population age account for the separation of subgroups A.1, A.2, A.3. The combination of group B2 (all heavily populated SWRL counties) with group B.3 (all significantly less populated FWL "northern and mountain" counties) appears strange. It is due to substantial similarities in (moderate) levels of affluence, similar (near average) rates of growth, very similar (slightly

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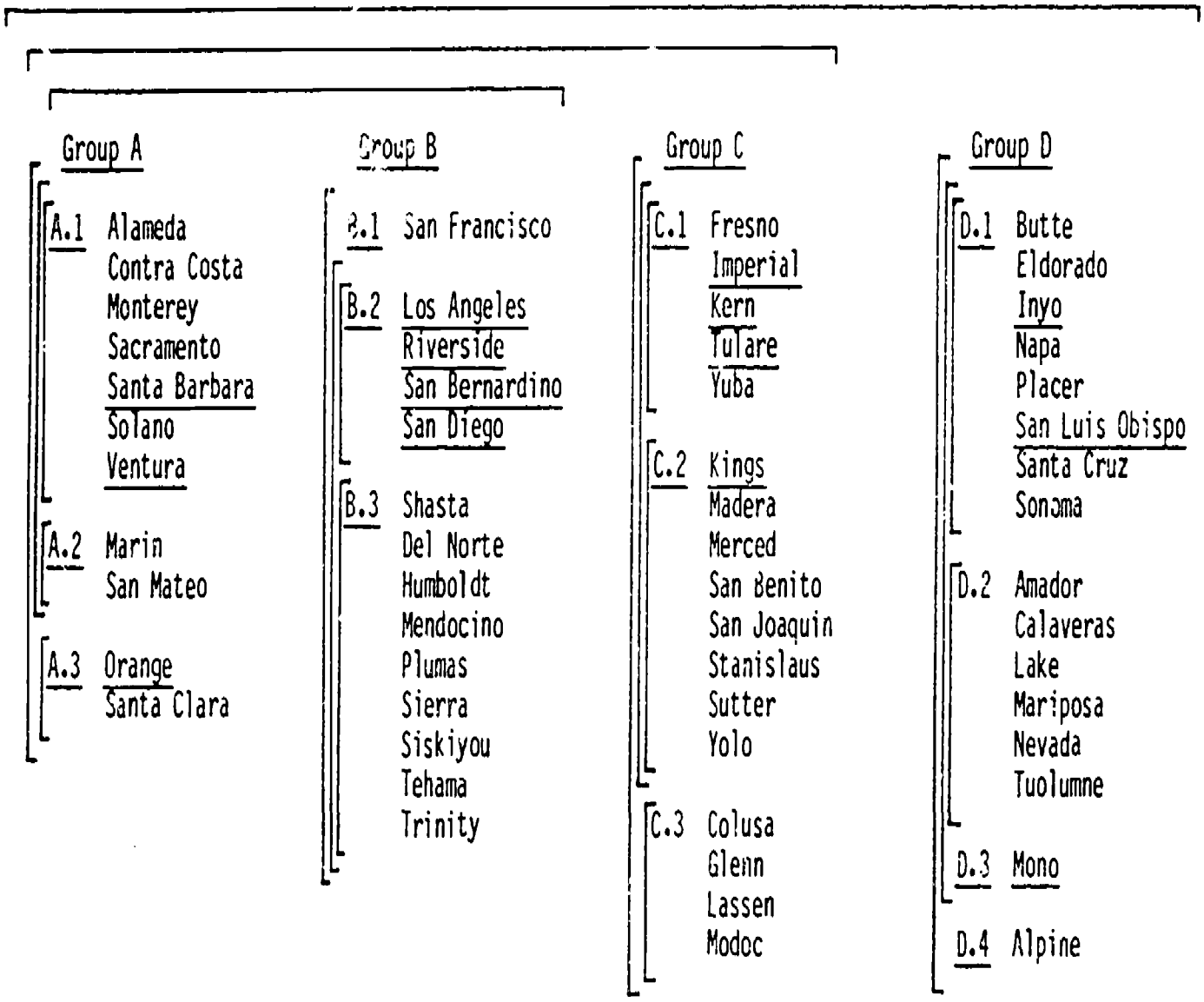
12 It is 17.3 in Apache and 30.2 in Navajo compared to the Arizona state average of 180.3 and the California state average of 216.0 physicians per 100,000 population.

13 Counties are listed alphabetically within subgroupings rather than by subgrouping order. The 14 SWRL region counties are underlined.

FIGURE 4

HIERARCHICAL GROUPING OF 58 CALIFORNIA COUNTIES



below average) percentage employed in sales, and (below average) agricultural scores, that overide the very large differences in population size. San Francisco county, again a subgroup by itself, finally joins the remainder of group B, when there are only six groups remaining (groups A, B, C, D.1 & D.2, D.3, and D.4).

The "agricultural" county subgroups within group C are grossly similar in the higher levels of agriculture, similar (very slightly above average) in levels of sales employment and comparable (near average) in levels of medical service. The three subgroups differ substantially in population size (C.1 is largest and C.3 smallest) and affluence (C.3 is highest and C.1 lowest). Subgroup C.3 (Colusa, Glenn, Lassen and Modoc) is also set off from the other two subgroups by substantially higher population "age" factor scores.

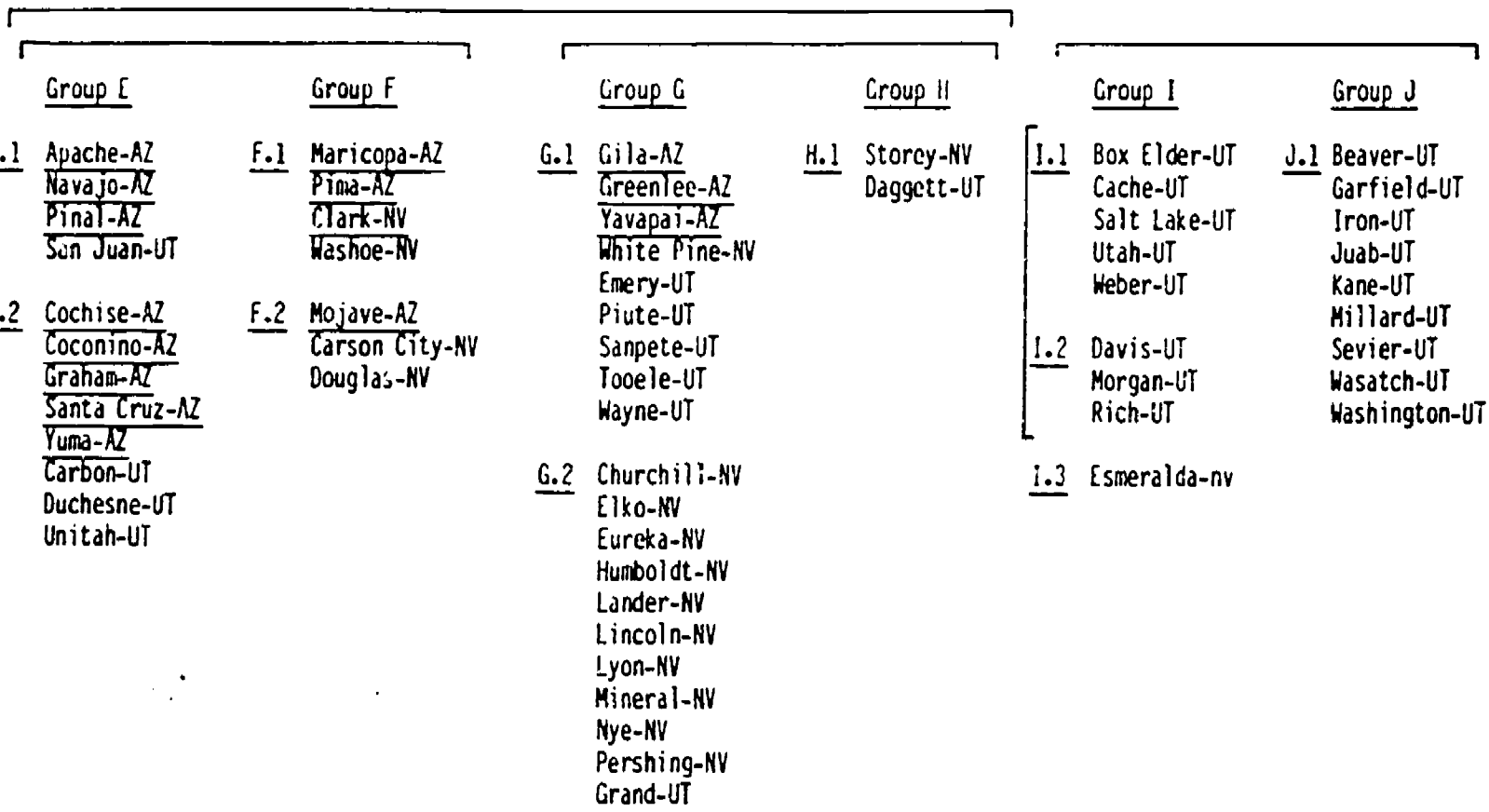
Group D is a composite of unusual counties. Subgroups D.1 and D.2 are most similar in levels of affluence (slightly below average), employment (approximately average in manufacturing and slightly above average in sales, and agriculture), and in levels of medical services (very slightly above average). However, subgroup D.2 (Amadore...Tuolumne) is smaller than D.1 (Butte...Sonoma) in average population, but displays higher growth rates and an older population. Mono county remains unassociated with any group until only five groups remain. It combines with the larger part of group D at the step just before groups A and B combine. Alpine county joins the remainder of group D, at the step immediately after groups B and C have combined.

Grouping of Arizona, Nevada, and Utah counties. Figure 5 displays six major groupings and 11 subgroupings of the 60 counties in Arizona, Nevada, and Utah. (The major groups in their analysis are identified with letters E through J). Group E represents larger than average population counties, that are low in affluence, relatively young in age, are below average in percentages employed in manufacturing, and slightly below average in medical services. Compared to subgroup E.2, subgroup E.1 (Apache, Navajo, Pima, and San Juan) is much lower in affluence (by far the most impoverished of all groups), is larger in population, has a somewhat higher population growth rate, and a higher birth rate; however, it has one of the lowest group averages for proportion employed in sales trades.

Group F combines one of the most populous groups of "urban" counties (F.1: Maricopa, Pima, Clark, Washoe) with a group of three much less populous counties (F.2: Mohave, Carson City and Douglas). Their similar characteristics are: above average affluence, average population age, somewhat similar (slightly above average medical service rates), and comparable (below average) percentages of employment in manufacturing and in sales. However, subgroup F.2 is not only less populous; it is also much more affluent, and it displays the highest population growth rate of the eleven primary subgroups listed in Figure 6.

FIGURE 5

HIERARCHICAL GROUPING OF 60 ARIZONA, NEVADA AND UTAH COUNTIES ON EIGHT STANDARDIZED FACTOR SCORES



Group G contains just over one-third of all the counties in this analysis. The two primary subgroups are similar in population size (below average), population age (average), population change (below average), sales employment (below average), and agriculture (very slightly below average). The major differences between G.1 and G.2 are that G.1 (Gila...Wayne) is relatively less affluent, and has relatively lower medical service levels, but G.2 (Churchill...Grand) has a much lower average percentage employed in manufacturing.

Group H is only a pair of counties. The reader may recall that Storey and Daggett were both among the "unique" groups of counties in the FWL groupings. They combined in this analysis when only 13 groups remained, and then retained their separate identity until after group E had combined with F, and I had combined with J. At that point group H combined with G. Groups G and H are similar in population size (below average) and population age (average); however group H is set apart from group G by extremely low medical rates (91 per 100,000 in Storey and and no physicians reported in Daggett), by very low employment proportions in manufacturing, but by relatively higher proportions in sales.

With the exception of Esmeralda-NV (another "unique" FWL county), which combined with the remainder of group I when only group E through J remained, all of the counties in groups I and J are Utah counties.

Subgroups I.1 and I.2 are quite similar in population age (very much below average), population change (only very slightly below average) proportion employed in sales (about average), and in proportion employed in manufacturing (well above average). However, I.2 (Davis, Morgan, Rich) is relatively less populous, has a lower medical service rate, but is somewhat more affluent, and has a much higher agricultural score.

Group J counties are among the least populous of all groups. However, they are above average in affluence and in medical service, and are near (slightly below) average in population growth, population age, and manufacturing employment. Sales employment for this group is well above average, but agriculture scores are well below average.

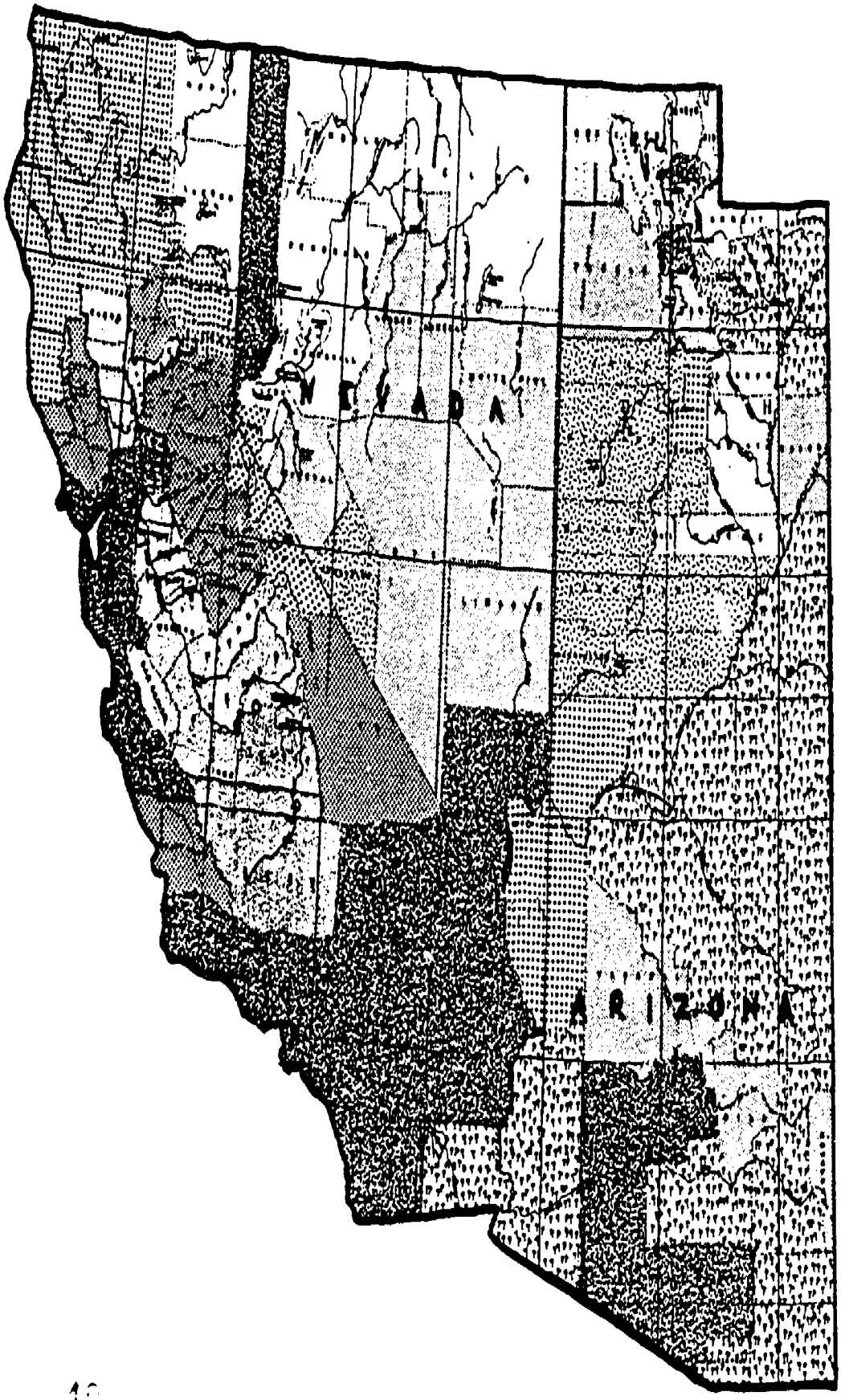
Comparison of FWL and SWRL Regional Groupings in Terms of the State Groupings

Referring to Figure 4 (California grouping) and Figure 5 (Arizona, Nevada and Utah grouping), note that the SWRL counties are underlined. Focusing first on Figure 4, we see that the most populous SWRL counties emerged as group B.2. However, three other highly populous, but more affluent (and high growth) counties in the SWRL region (Santa Barbara, Ventura, and Orange) combined with similar FWL counties in group A. Three of the five "large agricultural" counties in group C.1 are in the SWRL region. The four remaining California counties in the SWRL region are located in subgroups C.2 (Kings), D.1 (Inyo and San Louis Obispo), and in D.3 (Mono, by itself). Thus half of the SWRL counties are located in only two of ten of the multi-county subgroups; they are the only counties in one of these two groups and the majority in the other group.

The results for the Arizona, Nevada and Utah analysis (See Figure 5) are almost as neat. The SWRL region includes all 14 Arizona counties and Clark county (Las Vegas) in Nevada. These 15 counties are located in only five of the 11 subgroup groups and three of the six major groups. Twelve of the 15 counties are located in the adjacent groups E and F. Only Gila, Greenlee, and Yavapai (all in G.1) are found outside these two major groups. Considered from the FWL regional perspective, just over two-thirds of its 45 Nevada and Utah counties are located in exclusively FWL county subgroups (G.2, H.1, I.1, I.2, I.3, J.1).

Figure 6

118 FAR WEST AND SOUTH WEST COUNTIES GROUPED INTO NINE MAJOR TYPES
ON THE BASIS OF SIMILARITIES IN POPULATION, ECONOMIC AND EMPLOYMENT CHARACTERISTICS



Nr.	
22	URBAN COUNTIES
14	CALIFORNIA VALLEY COUNTIES
14	COASTAL AND SIERRA MOUNTAIN COUNTIES
6	NORTHERN UTAH COUNTIES
15	NORTHERN CALIFORNIA MOUNTAIN (+MOHAVE, AZ)
12	SOUTHEASTERN DESERT AND MOUNTAIN COUNTIES
14	NORTHERN NEVADA-DESERT AND UTAH MOUNTAIN COUNTIES
11	CENTRAL BASIN DESERT COUNTIES
10	SOUTHERN UTAH DESERT COUNTIES (+ESMERALDA, NV)
118	

IV. GROUPING OF COUNTIES ACROSS REGIONS

We conclude this analysis with an examination of the results of the hierarchical grouping of all 118 counties in the four states. Figure 6 displays the geographic location of the nine major groupings found in this analysis, and Table 14 lists the counties in each group along with selected data for each group (and the rankings of data items across the nine groups).

Turning to Figure 6, we first note that the large land areas of some (primarily southern) urban counties seriously distorts what would otherwise be a fairly accurate picture of population densities.[14] Due to the relatively smaller county areas, population densities are rather accurately depicted in Northern California. Here the populous urban counties surround the San Francisco Bay, extending up to Sacramento and down the coast to Monterey County. The Sacramento-San Joaquin "Great Valley" counties are well defined. Adjoining these Valley counties on the east and the west are the non-urban Coastal Range and Sierra Mountain counties. In the extreme north and in the highest elevations of the Sierras are the Northern California/Mountain counties.

Aside from the urban Washoe and Clark Counties, almost all of Nevada is divided between two types of counties, "Northern Desert" and "Central Basin." Aside from Maricopa and Pima (both "urban" counties), all of Arizona's remaining 12 counties are relatively low density counties. The majority (8) are of one type, "Southeastern Desert and Mountain." Yavapai, Gila, and Greenlee, forming a diagonal slash through the state are more like the "Central Basin Desert" counties of Nevada. Finally, Mohave, in the northwest corner of Arizona, seems strangely out of place as to type, since it most closely resembles the Northern California Mountain group, due primarily to its population growth rates.[15]

In terms of numbers of types, Utah exhibits a complexity that exceeds all other states (including California), with its counties located in seven of the nine types of groups. Two of its counties, Salt Lake and Weber

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14 The great portions of the populations in San Benardino and Riverside are located within sixty miles of the Pacific Coast, and most of the population of Clark County is concentrated in the Las Vegas area. Similarly, most of the Maricopa County population is in the Phoenix area and most of Pima County is in the Tucson area. If we could map these areas at a sub-county level, much of the area in these counties would be an extension of the "Southeastern Desert and Mountain" type.

15 Mohave displayed a remarkable 234 percent population growth in 1960-70, and 44.5 percent growth in 1970-75, by far the largest percent increases among all Arizona counties in both periods. It thus joined the Northern California Mountain group of counties which displayed above average growth rates in the 1970-75 period.

are among the urban group. Six "Northern Utah" counties constitute a special group of moderately dense, non-urban counties that display some of the highest birth rates to be found among any of the county groups. At the other extreme in population density (approximately 3 persons per square mile) but similar in high birth rates are nine counties in the "Southern Utah Desert" group. Another six sparsely populated Utah counties are part of the "Northern Nevada Desert and Utah Mountain" group. Finally, two Utah counties are members of the Central Basin Desert type, three are most similar to the "Southeastern Desert and Mountain" counties of Arizona, and one (Sanpete) is most similar to the "Northern California Mountain" group.[16]

In the following paragraphs the major characteristics of each type are described.

Urban Counties.[17] Although this group of counties represents less than one fifth of the 118 counties in the combined region (18%) and occupy only 18 percent of the land, they contain over 80 percent of the population. They are almost totally urban (average 92% urban population), and exhibit population densities over ten times as high as the next four groups (Northern Utah, Coastal and Sierra, California Valley, N. Cal. Mountain) and over a hundred times as high as the remaining four groups. Although the Urban group displayed the highest average rates of population growth of all nine groups in the 1960-70 period, their population growth in the 1970-75 period fell to seventh rank. This is mirrored in

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16 Sanpete is similar to the Northern California group and unlike most Utah counties in its age indicators, i.e. high percentages over 65 years, relatively low birth rates and relatively high death rates.

17 Due to the very large proportion of the population represented in the urban counties, we examined the internal grouping of these 22 counties. At the 8 group level Los Angeles, Marin, and San Francisco maintained separate identities. At 7 groups, Marin joined the Alameda, Contra Costa and San Mateo group. At 6 groups, this combination paired with Monterey, Sacramento, Santa Barbara, Solano, Ventura, Salt Lake and Weber. Then with only 3 groups remaining Orange and Santa Clara joined this group. Meanwhile, at the 6 group level Los Angeles joined with Maricopa, Pima, Riverside, San Bernardino, and San Diego. With 4 groups remaining Washoe and Clark counties joined this "Southern" group. At three groups, there were two major groups, one consisting primarily of Northern California and Utah counties, and the other consisting of Southern California, Arizona, and Nevada counties. The third "group" was San Francisco. At two groups, it combined with the Northern California/Utah group. Analysis of variance tests indicated that there were significant differences ($p < .05$) on five of the eight factor scores: the "Southern" group of urban counties scored significantly higher on population size and population age factor scores, while the "Northern" group of urban counties scored significantly higher on the affluence, sales employment, and agricultural factor scores. There were no significant differences on the population growth, medical service, or manufacturing employment factor scores.

Table 14

TABLE LISTING OF FAR WEST AND SOUTH WEST COUNTIES
BY GROUP WITH SELECTED DATA (AND DATA RANKINGS)*

	ALL URBAN	CALIFORNIA VALLEY	COASTAL & SIERRA	NORTHERN UTAH
	Alameda-CA Contra Costa-CA Los Angeles-CA Marin-CA Monterey-CA Orange-CA Riverside-CA Sacramento-CA San Bernardino-CA San Diego-CA San Francisco-CA San Mateo-CA Santa Barbara-CA Santa Clara-CA Solano-CA Ventura-CA Maricopa-CA Pima-AZ Clark-NV Washoe-NV Salt Lake-UT Weber-UT	Colusa-CA Fresno-CA Glenn-CA Kern-CA Kings-CA Madera-CA Merced-CA San Benito-CA San Joaquin-CA Stanislaus-CA Sutter-CA Tulare-CA Yolo-CA Yuba-CA	Amador-CA Butte-CA Calaveras-CA El Dorado-CA Inyo-CA Lake-CA Mariposa-CA Napa-CA Nevada-CA Placer-CA San Luis Obispo-CA Santa Cruz-CA Sonoma-CA Tuolumne-CA	Box Elder-UT Cache-UT Davis-UT Morgan-UT Rich-UT Utah-UT
% of Population	(1) 81.11	(2) 7.97	(3) 4.10	(6) 1.44
Population	(1) 929,914	(2) 143,542	(3) 73,868	(4) 60,614
Density	(1) 1,206	(4) 67	(3) 68	(2) 87
% Urban	(1) 92	(2) 59	(5) 36	(3) 49
P. Chg. 1970-75	(7) 10	(8) 8	(3) 23	(6) 12
P. Chg. 1960-70	(1) 42	(6) 18	(3) 34	(4) 25
Birth 1975	(7) 15.3	(6) 17.5	(9) 11.9	(1) 27.9
Birth 1970	(7) 18.7	(5) 19.3	(9) 14.4	(2) 25.3
% over 65	(6) 9.2	(5) 9.9	(1) 14.3	(8) 7.3
% Poverty	(9) 7.8	(2.5) 12.6	(5) 10.2	(8) 8.2
% $15,000	(1) 26.5	(4) 16.1	(3) 17.0	(5) 16.0
Fam. Inc.	(1) 10,811	(7) 8,473	(5) 8,884	(4) 8,923
Physician Rate	(1) 218	(3) 116	(2) 164	(5) 71
Crime Rate	(1) 7,424	(3) 6,414	(4) 5,348	(8) 2,028
Vote 1972	(7) 61.2	(8) 56.7	(5) 67.2	(2) 73.8
% Mfg. 1975	(5) 19.3	(4) 22.8	(6) 16.1	(1) 37.3
% Sales 1975	(6) 31.9	(2) 38.0	(5) 34.5	(7) 30.8
% Farm Population	(9) 0.6	(3) 7.9	(8) 3.1	(2) 9.3

* Second and third place decimal values not reported in Table 14 were used to assign ranks. Tied ranks are exactly equal.

Table 14 (Continued)

NORTHERN CAL./MTN.	S/E DESERT & MTN.	N. NV DESERT/UT.MTN	CENTRAL BASIN DES.	SO. UTAH DESERT
Alpine-CA Del Norte-CA Humboldt-CA Mendocino-CA Mono-CA Plumas-CA Shasta-CA Sierra-CA Siskiyou-CA Tehema-CA Trinity-CA Mohave-AZ Carson City-NV Douglas-NV Sanpete-UT	Imperial-CA Apache-AZ Cochise-AZ Coconino-AZ Graham-AZ Navajo-AZ Pinal-AZ Santa Cruz-AZ Yuma-AZ Duchesne-UT San Juan-UT Unitah-UT	Lassen-CA Modoc-CA Churchill-NV Elko-NV Humboldt-NV Lyon-NV Pershing-NV Storey-NV Carbon-UT Daggett-UT Emery-UT Piute-UT Summit-UT Wayne-UT	Gila-AZ Greenlee-AZ Yavapai-AZ Eureka-NV Lander-NV Lincoln-NV Mineral-NV Nye-NV White Pine-NV Grand-UT Tooele-UT	Esmeralda-NV Beaver-UT Garfield-UT Iran-UT Juab-UT Kane-UT Millard-UT Sevier-UT Wasatch-UT Washington-UT
(5) 1.83	(4) 2.21	(8) 0.94	(7) 0.60	(9) 0.30
(6) 30,733	(5) 46,437	(8) 7,927	(7) 13,660	(9) 7,556
(5) 21	(6) 8	(7.5) 3	(9) 2	(7.5) 3
(8) 26	(4) 38	(9) 18	(6) 34	(7) 29
(1) 29.4	(2) 28.6	(5) 16	(9) 6	(4) 17
(2) 36	(7) 14	(9) -0.02	(5) 18	(8) 1
(8) 13.5	(3) 25.0	(5) 19.4	(4) 20.1	(2) 27.8
(6) 18.9	(1) 26.9	(8) 18.6	(4) 20.8	(3) 23.2
(3) 10.1	(9) 6.7	(4) 10.0	(7) 8.4	(2) 11.7
(7) 9.8	(1) 21.4	(6) 10.2	(4) 10.5	(2.5) 12.6
(2) 17.2	(8) 11.8	(6) 13.8	(7) 13.8	(9) 7.9
(2) 9,168	(9) 7,561	(6) 8,702	(3) 9,079	(8) 7,594
(4) 94	(8) 55	(9) 51	(6) 69	(7) 58
(2) 7,377	(5) 3,975	(6) 2,482	(7) 2,457	(9) 1,484
(4) 67.4	(9) 49.2	(6) 64.4	(3) 68.4	(1) 78.6
(2) 28.3	(8) 9.6	(9) 9.4	(7) 11.2	(3) 23.0
(8) 26.4	(3) 36.0	(4) 35.7	(9) 24.0	(1) 38.1
(7) 3.5	(4) 7.6	(1) 10.8	(6) 4.6	(5) 5.0

their seventh rank in birth rates for both 1970 and 1975. Despite relatively low birth rates, the Urban county populations are not especially composed of aged residents, ranking only 6th out of the nine groups. On measure of affluence the Urban counties fare best on all measures, ninth ranking in percentage of families below poverty level, first in percentage of families with 1969 incomes over $15,000, and first in median 1969 family income. Perhaps because of this affluence, the Urban counties enjoy the highest physician rates, but they suffer from the highest crime rates. The Urban voter turn out is not impressive (61%, seventh rank). In terms of percent employed in manufacturing or in sales, the Urban counties are intermediate among the groups, but, not surprising, they are last in percentage of farm population.

California Valley Counties. This group of 14 California counties, all located in the Sacramento-San Joaquin "Great Valley," is the second most populous group. With an average population of 143,543 persons per county, the Valley group accounts for eight percent of the region's population. This group ranks second among the groups in percentage urban population (59%), and is fourth in rank in population density (67 /sq. mi.). The Valley group displays some of the lower population growth rates in the region (averaging 8% per county and ranking 8th in the 1970-75 period, and averaging 18% per county and ranking 6th in the 1960-70 period). Birth rates and percentage of persons over 65 are at intermediate ranks (5th or 6th) among the nine groups. With an average of 12.5 percent of their families below the poverty level in 1969, the Valley counties were tied (with Southern Utah Desert counties) for second place in high proportion of poverty families. However, some Valley county families were more affluent. Although lagging well behind the urban group, an average of 16.1 percent of the families per county had incomes over $15,000 in 1969, ranking fourth among the nine groups. But the median family income for this group ($8,473 in 1969) places the Valley group in seventh place. Both the physician and the crime rates are relatively high (3rd ranking), but voter turnout in 1972 was next to lowest among the nine groups (56.7 percent). With approximately 23 percent of its labor force in manufacturing, and 38 percent in sales, and 8 percent of its population on farms, the California Valley counties rank respectively 4th, 2nd, and 3rd on these measures.

Coastal and Sierra Counties. This group of 14 California counties, border the Valley counties on both the east and the west sides. Although located in much more hilly and mountainous areas than the Valley counties, the Coastal and Sierra counties are just as dense as the Valley counties (68 persons/sq. mi., 3rd ranking), but because of their smaller physical size, they have a much lower average population, 73,868 per county vs. 143,542 for the Valley counties. Still, in terms of the region's population, this group contributes four percent and ranks third (behind the Urban and California Valley group). With slightly over a third of its population (36%) living in urban areas, the group ranks 5th among the nine groups. The Coastal and Sierra counties rank third in population growth for both the 1960-70, and the 1970-75 period. However, much of this growth is apparently due to immigration rather than births, since the

1970 and 1975 birth rates for this group are the lowest in the region. The area appears to be a favorite retirement area since its percentage of population over 65 (14.3%) is the highest of the nine groups. Poverty percentage and median family income figure are exactly intermediate (5th), but the percent of families with incomes over $15,000 in 1969 is third ranking (only behind the Urban and the Northern California groups). The physician rate (164/100,000) is the second highest of all nine groups. Crime rates and voter turnout percentages are intermediate among the groups. Percentage of the labor force in manufacturing ranks 6th, and percentage in sales ranks 5th, but the farm population (at 3.1%) is lower than all but the Urban county group.

Northern Utah Counties. While the previous two groups were composed entirely of California counties, this is a group consisting entirely of Utah counties. Although representing only one and a half percent of the combined population of the four states, this group of six counties presents a particular profile. In population size (60,614) and percentage urban population (49%) the group ranks 4th and 3rd, but average population density (87/sq. mi.) the group ranks second. Compared to the other groups, the population growth rates for this group are intermediate (4th in the 1960-70 period, dropping to 6th in the 1970-75 period). However, the birth rates are among the highest of all the groups (2nd in 1970 and 1st in 1975), and the percentage of the population over 65 is 8th. The over $15,000 family income and the median family income indicators are intermediate (5th and 4th respectively), but the percentage of families below poverty level is among the lowest (8.2%, ranking 8th). The physician rate is 5th, but the crime rate is 8th (data available on 5 of 6 counties) and the voter turnout percentage is 2nd. This group of counties has the highest percentage (37%) employed in manufacturing, and the second highest percentage farm population (9.3%), but it ranks seventh in percentage employed in sales (30.8%).

The above four groups (Urban, California Valley, Coastal and Sierra, Northern Utah) represent the larger, denser and more urbanized counties in the region. Although the 56 counties in these four groups represent less than half the total group of 118 counties, and occupy only 34 percent of the land area, they contain almost 95 percent of the population in the combined region: the remaining five groups are characterized by substantially lower population densities, and lower percentages of urban populations.

Northern California/Mountain Counties. There are 15 counties in this group, and 11 of them are located in the extreme northwest of California or in the eastern High Sierra region of the state (Alpine and Mono). Carson City and Douglas, NV, which are adjacent to Alpine-CA are also in this group. Less obvious members of this group in terms of its label, are Mohave-AZ and Sanpete-UT.

The Northern California/Mountain group is different from the other groups in several ways. First, it has an average population density (21 persons per square mile) that is much lower than the four preceeding groups, but

substantially higher than the next four groups. Although it ranks 6th in average population size per county, it is 8th ranking in percentage of urban population. Moreover, it is the new high population growth area in the region. Ranking second (only behind the Urban counties) in population growth (36%) in the 1960-1970 period, its counties take first place for average population growth (29%) in the 1970-75 period.[18] Although marked by substantial population increases during this 15 year period, these counties are similar to the Coastal and Sierra county groups in their pattern of relatively low birth rates and relatively high percentages of population over 65 years old. This group is also remarkable in terms of measures of affluence. They rank only behind the Urban counties in median family income ($9,168 in 1969) and in percentage of families with incomes over $15,000, moreover, they exhibit one of the lower rankings (7th) in average percentage of families below the poverty income level. Along with this relative affluence goes the second highest crime rate. The group ranks fourth in physician rate and in 1972 voter turnout, second in average percentage employed in manufacturing, but eighth in percentage in sales, and seventh in percentage of farm population.

Southeastern Desert and Mountain Counties. A glance at Figure 6 will indicate that much of the extreme eastern and southern portion of the region falls into this group of twelve counties. Geographically, most of the area is mountain and/or desert. However, irrigation permits some farming, as indicated by the 7.6 percent farm population.[19] As a consequence the region sustains population densities (8/sq. mi.) that are somewhat higher than the 2 to 3 per square mile found in the remaining three groups of counties.

Although among the lower ranking of the county groups (7th) in population growth in the 1960-70 period, this group of counties ranked second (at 28.6%) in the 1970-75 period. The population of the area is apparently a young one, as evidenced by the very high birth rates, and the lowest average percentage of persons over 65. However, the group (which includes several Indian reservations) is also the poorest in the region, with the lowest median family income ($7,561) and by far the highest percentage of families below poverty level (21.4%). With only an average 55 physicians per 100,000 population the counties rank 8th on this indicator.

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18 Part of the high percentage 1970-75 is due to the 44.5 percent growth in Mohave-AZ. If the effect of Mohave is removed, the rate is still 28.3, which drops to second place just behind the average growth in the Southern Utah Desert counties.

19 Although not reported in Table 14, counties in this region have an average of 47 percent land in farm, ranking third only behind the California Valley (71%) and the Northern Utah (57%) counties.

The average 1972 voter turnout (49.2%) is the lowest for the nine groups. The region ranks eighth in average percentage employed in manufacturing, but third in percentage employed in sales, and fourth in farm population.

We now turn to three very low density groups. Although comprising 35 counties and occupying 37 percent of the land area in the combined region, these three groups contain less than one and a half percent of the population. The population densities average 2 to 3 persons per square mile in each group. The three groups occupy approximately adjacent areas, lying in the north central area of the region. However, there are important differences that separate these three groups both geographically and in terms of the county data measures.

Northern Nevada Desert and Utah Mountain Counties. This group of 14 counties straddles the northern portions of California, Nevada, and Utah. Were it not for the "urban" Washoe County, extending to the north border of Nevada, there would be a contiguous stretch of counties in this group including Lassen and Modoc in California, and Humboldt, Elko, Pershing, Churchill, Lyon and Storey in Nevada. The Utah portion of the group contains two small contiguous counties in the extreme north-east (Summit and Daggett) and four contiguous counties in the central portion of the state (Carbon, Emery, Wayne, and Piute). This group of counties has the lowest percentage of urban population of all nine groups (18%). Although the population change for 1960-70 was zero (actually -0.02%; 9th ranking), by the 1970-75 period the average percentage change was 16 percent (5th ranking). The birth rates (19/1,000) are the same in 1970 and 1975; however, due to a regional (and national) decrease in birth rates between 1970 and 1975, the rankings are 8th in 1970 and 5th in 1975. With an average 10 percent of their population over 65, these counties rank 4th in proportion of older populations. The group ranks sixth in all three affluence measures. (However, the percent poverty measure is in the reverse direction; hence, a consistent ranking on this measure would be fourth ranking. Thus, relatively fewer families are below poverty than might be expected given the county rankings on the other two affluence measures). The physician rate is the lowest in the region (only 51/100,000, less than a fourth the rate found in the urban counties).

The crime rate is relatively low (6th ranking) as is the 1972 voter turnout (64.4%, also 6th ranking). The employment indicators are mixed. This group ranks highest in percentage farm population (10.8%), lowest in percentage employed in manufacturing (9.4%), and fourth in percentage employed in sales (35.7%).

Central Basin Desert Counties. There are 11 counties in this group. Seven are contiguous counties in Nevada and (Tooele in) Utah. Three form an almost contiguous diagonal swath across Arizona (Yavapai, Gila, Greenlee). And one (Grand) is isolated on the eastern Utah border. Consequently, it is misleading to consider all these counties as lying in the Central Basin (actually this is a high plateau region crossed by several alternating chains of mountains and desert valleys), but this is the predominant geographical character of this group. Although similar to the other two groups of very low density "desert" counties, this

group has the lowest average density (approximately 2.5) but a slightly higher urban population percentage (34% vs. 18% and 29%). This group of counties ranked 5th in population growth in the 1960-70 period (average 18% growth per county over the ten year period), however its ranking plummeted to last place (only 6% growth) during the 1970-75 period. The birth rate dropped almost imperceptably (from 20.8 to 20.1) between 1970 and 1975, placing the group in fourth rank among the nine groups of counties in both 1970 and 1975. Only 8.4 percent of its population is over 65. The group is fourth highest in average percentage of families below poverty (10.5%), and it ranks 7th in average percentage of families with incomes over $15,000 (13.8). However, the median family income in 1969 averages $9,079 for this group of counties, placing them third highest (only below the Urban and the Northern California/ Mountain groups). In common with the other "desert" groups, this group has a relatively low physician rate (6th ranking), and a low crime rate (7th ranking). However, the voter turnout is relatively high (68.4%, 3rd ranking). The group ranks relatively low in all three employment sector indicators, seventh (11.2%) in manufacturing employment, ninth (24%) in sales employment, and sixth (4.6%) in farm population.

Southern Utah Desert Counties. This group contains nine contiguous counties located in southeastern Utah. Esmeralda-NV (one of the five "unique" FWL counties) share some characteristics with this group. Aside from middling rankings on 1970-75 population change (4th ranking) and in farm population (5th ranking) this group of ten counties is marked by extreme rankings on all other measures reported in Table 14. This set of counties has the smallest average population, is tied for next to last place in population density and ranks seventh in percentage urban population. During the 1960-1970 period, there was virtually no population growth (an average of one percent growth per county over the entire decade, ranking 8th), however, in the 1970-75 period there was an average 17 percent increase, ranking 4th among the nine groups. The birth rates are relatively high, ranking third in 1970, and second in 1975. High birth rates are usually accompanied by low percentages of population over 65. This trend is not found in these Southern Utah Desert counties. They display the second highest average percentage over 65 (11.7%). In terms of affluence, the counties are among the poorest in the region. They tie for second highest in percentage of families with incomes below the poverty level (12.6%); they are lowest among the nine groups in average percentage of families with 1969 incomes over $15,000 (7.9%); and their county average for median family income ($7,594) ranks eighth, just $33 above that for the Southeastern Desert and Mountain Counties. With an average of only 58 physicians per 100,000, this group ranks seventh. However, the crime rate (available on 9 of the 10 counties) is the lowest of all groups (only a fifth that of the urban counties), and the average percentage for 1972 voter turnout is the highest of all nine groups (78.6%). The group displays the third highest average percentage employed in manufacturing (23%) and the highest average percentage employed in sales (38%); however, the average percentage farm population (5%), ranks fifth among the nine groups.

V. CONCLUDING COMMENTS

This study has produced at least three sets of results. First, it has indicated how 35 county level social and economic measures are related to one another and has produced a much smaller set of eight statistically independent factor scores that will be employed in future studys as potential predictors of county educational characteristics and "KPDU" characteristics.

Second, the study has demonstrated perhaps obvious findings, namely that there are both similarities and quite large differences among the counties in the four states (AZ, CA, NV, UT), and in the two laboratory service regions. Given the number of counties involves in these analyses, and the statistical method of grouping that was employed, it was virtually certain that there would be statistically significant differences among various groups of counties on at least some of the measures. However, both the number and the size of the significant differences may be surprising to many readers. These differences suggest that the county groups we have mapped (in figures 2, 3, and 6) represent vastly different areas within the states and regions that may have important implications for understanding and dealing with differences in educational needs and opportunities in those areas.

Finally, the study has provided, on a statistically descriptive level, some understanding of the general demographic and economic characteristics of each type of county, and of how types of counties differ from one another.

In general, this particular statistical "picture" of the region is probably consonant with other images of the region. Certainly, the people who work in educational service organizations or state agencies and who have had the opportunity to attend to the needs or deal with the probems of educators throughout their region know that there are many similarities as well as many differences as they attend to clients in one area and then attend to those in another area.

This study takes one or two steps back from the immediate foreground of educational organizations, their problems, and resources, and also from the immediate background of research, training, technical assistance, and other support organizations and projects that serve education, to look at the deeper background of more fundamental social and economic conditions that provide the environment within which schools and educational support agencies operate.

The motivation for examining the measures of social and economic characteristics was to provide a subregional "map" of "contextual" background factors that might help to identify, explain, or perhaps even predict subregional differences in local educational needs and differences in local knowledge production, dissemination, or technical assistance services that may respond to those needs.

Our previous studies (Hood and Blackwell, 1979; Paisley, Cirksena and Butler, 1979; Hood 1979b,) demonstrated significant relationships between selected contextual measures and measures of educational knowledge production, dissemination, and utilization (KPDU) with data aggregated at higher levels including: USOE Regions, RDx Regions, States, and Standard Metropolitan Statistical Areas. These previous studies demonstrated that population size, population density, and economic affluence were often powerful predictors of many educational KPDU measures based on counts. Population growth also played a minor role in some prediction equations. Hence, when we began to look for contextual data at lower levels of aggregation, we began with a selection of county level measures that might represent these factors.

The selection of our other measures was somewhat more conjectural. We know that agricultural measures, aggregated at the state level, had served as (negatively signed) predictors of the distribution of educational researchers, psychologists, psychiatrists, and clinical social workers (Richards and Gottfredson, 1978; Richards, 1979).[20] The manufacturing and sales employment measures were seen as having the potential to define, at least partially, some aspects of county labor economic conditions that go beyond the affluence measures (which reflect per capita income, median family income, housing costs, and gross distribution of income at poverty and affluence thresholds). After examining the distributions for these employment measures, it is apparent that in some cases they account for less than half the county labor force. Additional measures (e.g. service industry employment) may be needed to round out the county employment picture if the employment factors are found to have any significant relations to educational or KPDU measures.

The two medical service measures (physician rate and hospital bed rate) were selected on the assumption that there might be some relation between educational and medical services. As we have seen, there is some relation of medical services to population size measures, but most of the correlational variance in these measures was associated with a separate Medical Services Factor, that carried only quite modest loadings on other measures (see Table 2, p. 6). In the subsequent grouping analyses we also saw that the hospital bed rate was virtually the only one of 35 measures to display no significant differences across the various comparisons of county groups, while the physician rate was often significantly and substantially different from one county group to another. At this point, our hunch is that the physician rate may serve as a proxy for a broader set of "professional social services," and that geographic areas that attract (or repel) physicians at rates beyond what would be accounted for by other contextual measures (e.g.

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20 Richards (1979) in a study of the distribution of American Education Research Association membership in the U.S. found that after controlling for "population size" and "affluence-urbanization," the third largest predictor (with a negative sign) of AERA members per 100,000 population was a measure of "large scale agriculture."

density, per capita income) may also attract other professionals, perhaps including educational researchers, educational technical assistance specialists, and other professional specialists in education.

However, from previous EDSP studies as well as a vastly larger body of literature in sociology, demography, human ecology, and social geography we have good reason to expect that population size, density, urbanization, and affluence will usually be the more powerful predictors of the distribution of professionals, the generation of knowledge in its more formal, scientific or technical guises, and the availability of specialized technical and support services.

Development of appropriate educational and KPDU "foreground" measures at the county level has proved to be a difficult and time consuming task. Consequently, it may be some time before we can report whether or how these contextual "background" measures may be related to the educational and KPDU "foreground." Although we can not yet answer the question "But what does it mean for education?" (or for school improvement, or for dissemination), we think these results may provoke some readers to give their own answers to the question.

References

Bauer, R. A. (ed.). Social Indicators. Cambridge, MA: MIT Press, 1966.

Gross, B. M. (ed.). Social Intelligence for America's Future. Boston, MA: Allyn and Bacon, 1969.

Hood, P. D. Indicators of Educational Knowledge Production, Dissemination and Utilization: A Conceptual Framework (Far West Laboratory, February 1979a).

Hood, P. D. Differences Among the R&D Exchange Service Areas in Educational Knowledge Production, Dissemination and Contextual Indicators (Far West Laboratory, May 1979b).

Hood, P. D. and Blackwell, L. R. Indicators of Educational Knowledge Production, Dissemination, and Utilization: Exploratory Data Analyses (Far West Laboratory, February 1979).

Paisley, W., Cirksena, M. K. and Butler, M. Conceptualization of Information Equity Issues in Education (Far West Laboratory, February 1979).

Richards, J. M. and Gottfredson, G. D. Geographic Distribution of U.S. Psychologist: A Human Ecological Analysis. American Psychologist, 1978, 33, 1-9.

Richards, J. M., Jr. The Human Ecology of the American Educational Research Association. Educational Researcher, 1979, 8, 10-12.

Sheldon, E. G. and Moore, W. E. (eds.). Indicators of Social Change. New York, NY: Russell Sage, 1968.

U.S. Bureau of the Census. County and City Data Book 1977 (A Statistical Abstract Supplement). Washington, D.C.: U.S. Government Printing Office, 1977.

Van Dusen, R. A. (ed.). Social Indicators 1973: A Review Symposium. Washington, DC: Social Science Research Council, Center for Coordination of Research on Social Indicators, 1974.

Veldman, D. J. Fortran Programming for the Behavior Sciences. Austin, TX: Holt, Rinehart, and Winston, 1967.

Ward, J. H., Jr. "Hierarchical Grouping to Optimize an Objective Function," American Statistical Association Journal, 1963, 58, 236-244.

APPENDIX A

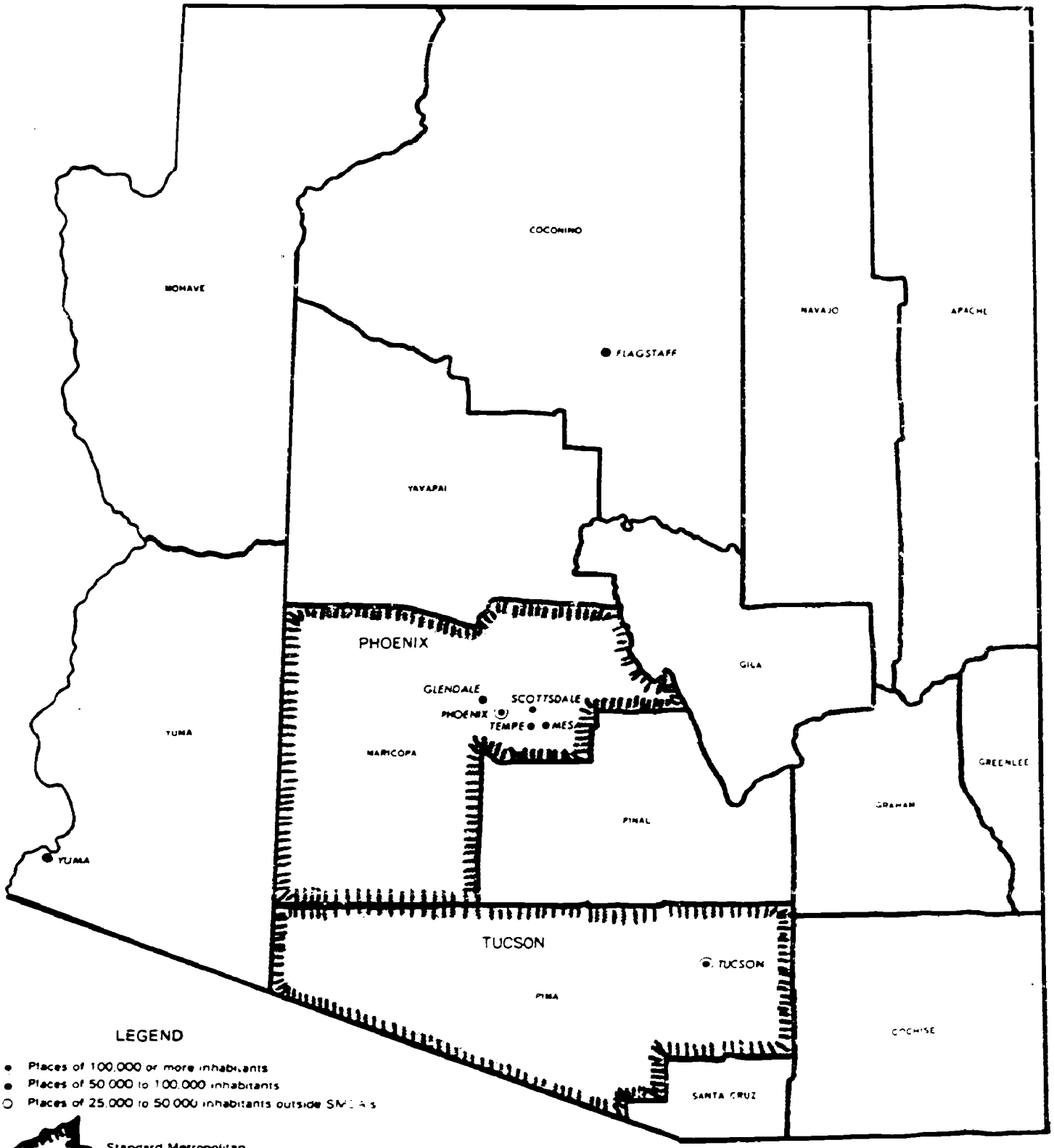
COUNTY MAPS FOR

ARIZONA

CALIFORNIA

NEVADA

UTAH



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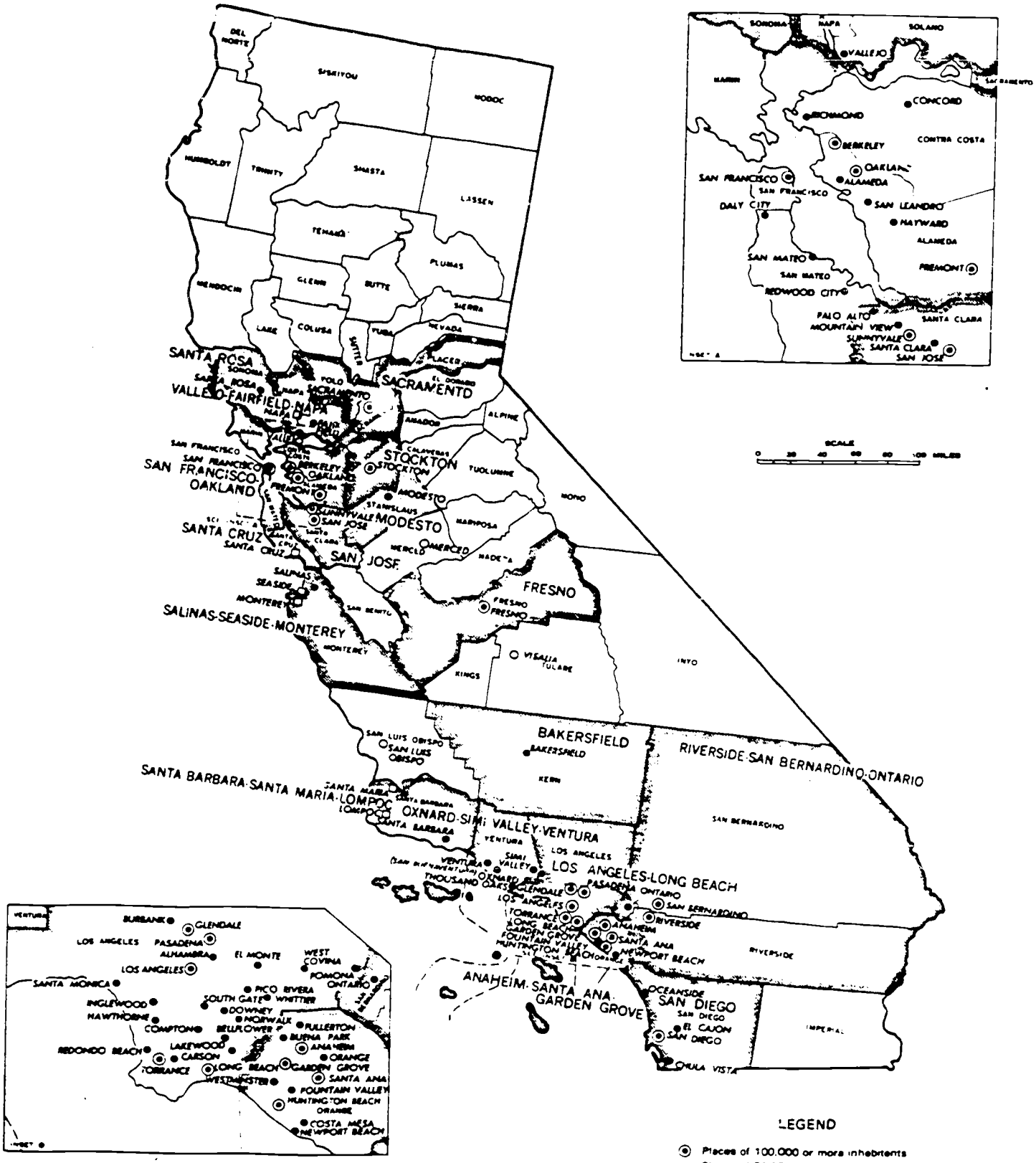

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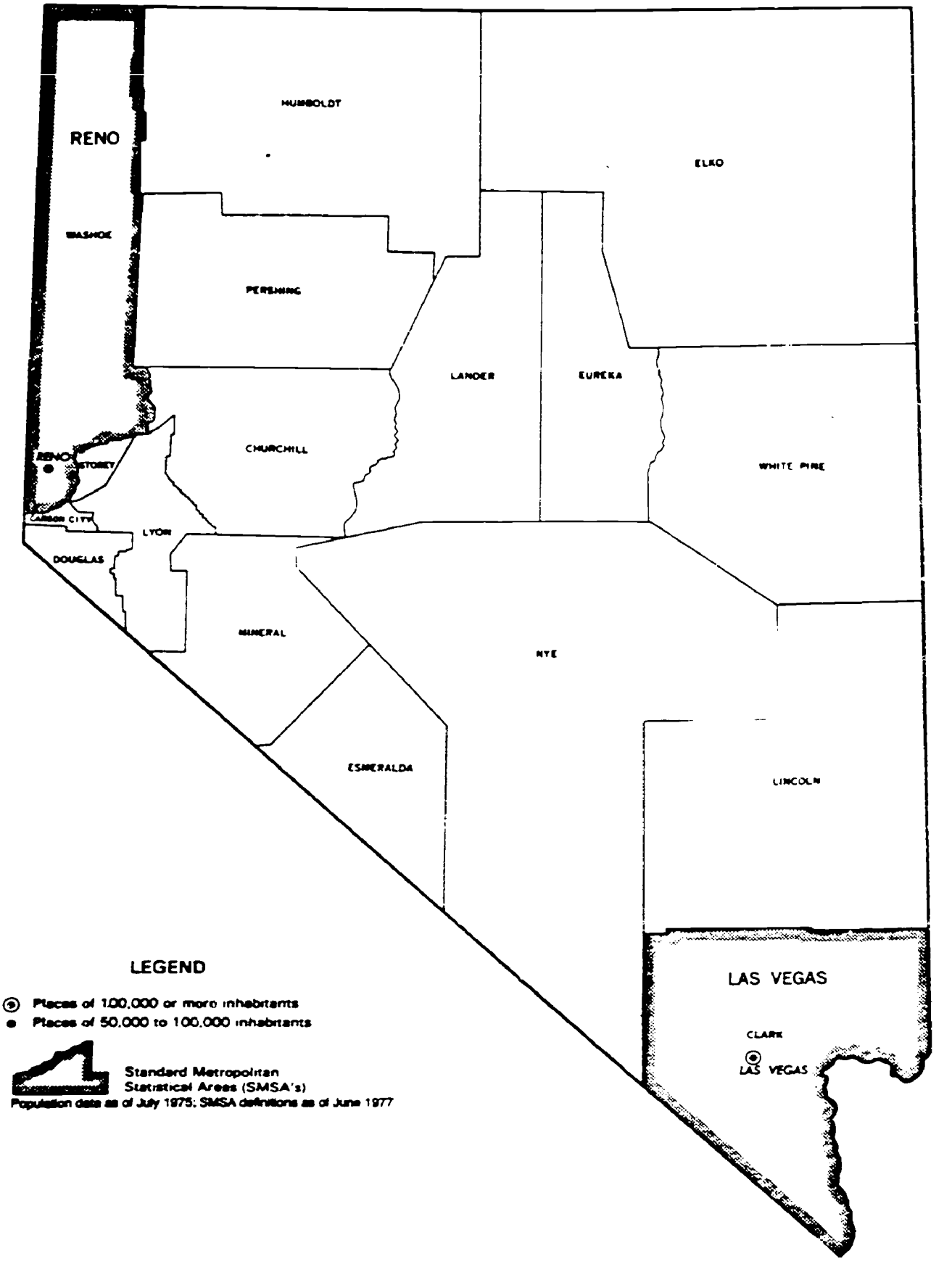

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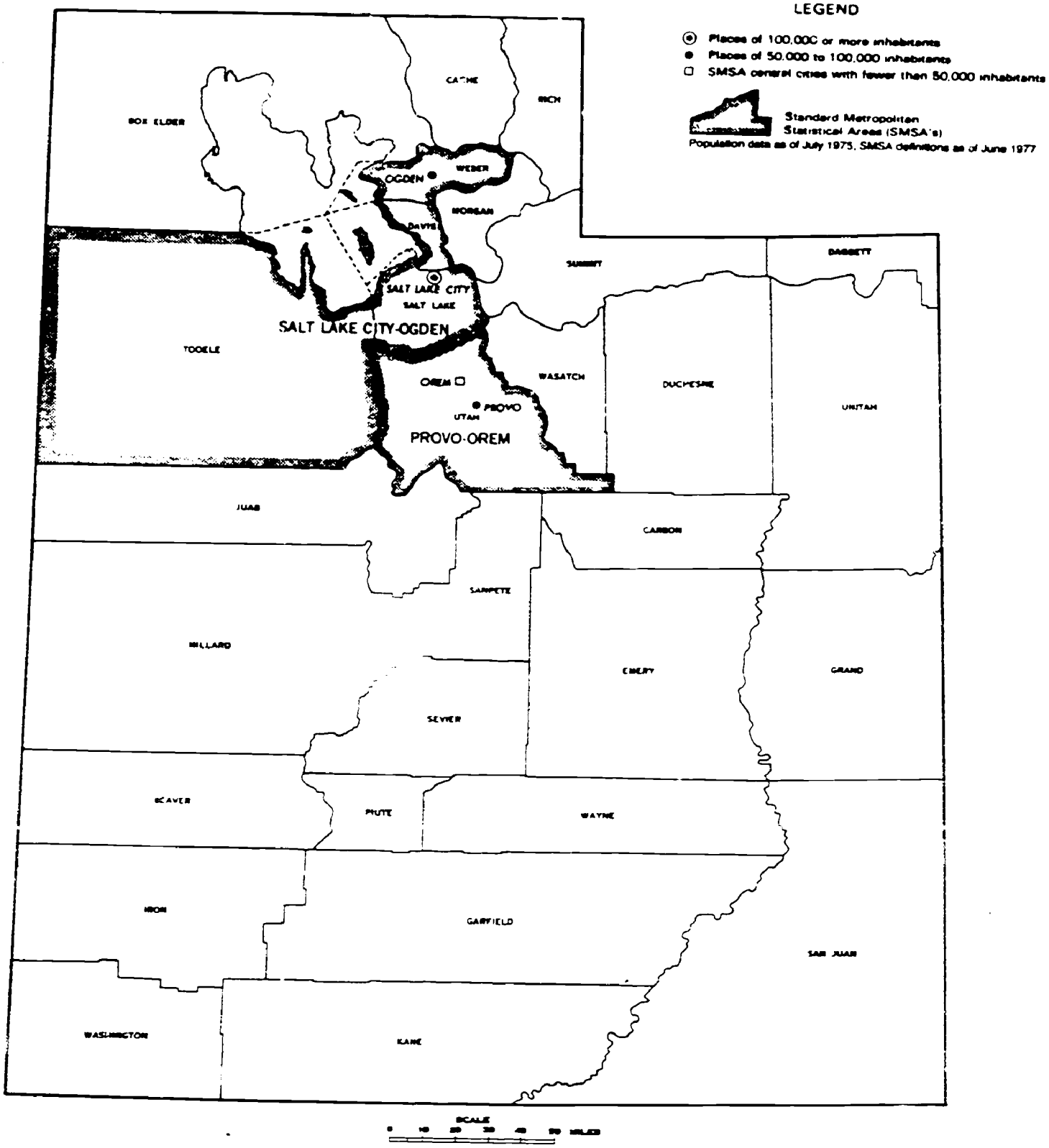

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