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A STUDY OF HOUSING DISCRIMINATION AGAINST FAMILIES WITH CHILDREN IN THE CITY OF SAN FRANCISCO

A Research Paper in Compliance with Requirements for the M.U.P. Degree.

Nancy B. Alexander
755 Newell Road
Palo Alto, Ca. 94303
415-328-1776
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BACKGROUND

This research was conducted to determine whether or not families with children suffer discrimination in the selection of rental housing in various neighborhoods in San Francisco.

Because of the city's increasing white-collar composition[1] and attractiveness to adults[2], there exists a high demand for housing by adults who value in-town living. At the same time, many parts of the city have a reputation for severe shortages of apartments for people with children. San Francisco also has an extraordinarily low housing vacancy rate of 2.6%[3], indicating overall high demand and short supply. Harsh competition for housing, with resultant high rental rates and high property values, imposes a heavy burden on poor families with children who can neither afford high rents nor the high costs of commuting from suburban areas.

Concurrent with the extreme competition for existing housing due to the changing composition of the labor market (more white collar tertiary and quarternary functional jobs), newly constructed housing in the city is increasingly oriented toward relatively high income adults. Lower and moderate income families with children are being squeezed into older housing (which being generally larger is more family oriented) and out to the perimeters of the city. As usual, poorer families are hurt most by this squeeze.

Specific reports of landlord discrimination against people with children have been heard many times by social welfare agencies. A survey conducted by the City Planning Department reported that

in some areas of San Francisco, 50% of the landlords contacted indicated that they would refuse to rent to people with children.[4] Based on this report, the Human Rights Commission and other social service agencies in the Spring of 1974 supported a proposal for an ordinance (introduced by San Francisco County Supervisor Quentin Kopp) which would bar housing discrimination against people with children (See Appendix A). This proposal initially failed to pass because some of the opposing supervisors thought this type of law should originate with the State of California. In the summer of 1975, an ordinance was enacted prohibiting discrimination in the rental of housing to people with children. It should be noted that during the period of the available data, landlords had the legal prerogative to discriminate along the line of family composition.

PURPOSE

This paper specifically examines whether there exists actual discrimination against people with children significant enough to affect patterns of housing within certain neighborhoods in the city. Although it may be widely believed that there is housing discrimination against people with children, the issue has not been thoroughly investigated. The popular view may in fact not exist or be due to the actions of a relatively few highly visible landlords. This paper also examines the extent of housing discrimination, and locates the areas of high discrimination to a much greater extent than a study[5] conducted by the City Planning Department.

SCOPE OF THE STUDY

This study stresses statistical rigor in locating the actual discrimination. It does not address itself to either the mechanism of discrimination or to the methods of alleviation of the discrimination found. (Regarding the mechanism of discrimination, the San Francisco Planning Commission 1973 Vacancy Report-Survey indicates landlord attitudes to be a prime cause.) The emphasis is on the documentation of housing patterns.

Because it was only possible to systematically study a small number of neighborhoods in San Francisco, in some of the subject neighborhoods no conclusions could be drawn due to the lack of sufficient units of data for statistical testing.

DATA, ASSUMPTIONS AND METHODOLOGY

The most available form of data to study housing patterns is the 1970 United States Census of the Population and Housing. (See Appendix B for further details.) It was desirable to use as specific data as possible. Census data, available at the city block level, includes the following information:

Total Population,

- Percent Negro,
- Percent in group quarters,
- Percent under 18 years of age,
- Percent over 62 years of age,

Total year-round housing units,

- Number of units lacking plumbing,
- Number of units in one unit structures, (i.e. number of houses),

Number of structures with 10 or more units,

Total number of owner occupied housing units,

Number lacking some plumbing,

Average number of rooms per unit,

Average value in dollars,

Percent Negro,

Total number of renter occupied housing units,

Number lacking some plumbing,

Average number of rooms,

Average contract rent in dollars,

Percent Negro,

Total number of units 1.01 or more persons per room,

With all plumbing facilities,

Number of one person households.

Number of households with female heads of family.

Number of units with boarders or lodgers.

More specific census information is available, but it only covers dwelling units in larger geographical areas, such as block groups, census tracts, and "areas." There is a tradeoff between the limited information for the city block and the extensive information for the larger geographical area. For the purpose of this study, information as to specific area or location was more important than that of quality, so the tradeoff leans in that direction. Block data census information was used.

Devising a suitable index of the density of children per block was the next step. Some of the indices available were:

Percent children per block (18 and under),

Number of children per block,

Average number of children per unit per block,

Number of families with children.

The index, average number of children per unit per block, was chosen because knowing the number of housing units available per block reflects the number of children. This index does not give any indication of the availability of rooms for children on the block. It would be informative to know whether any overcrowing exists. The indicator available for checking overcrowding in the block level census data is 1.01 or more persons per room.

STATISTICAL TESTING

Three statistical methods were considered for use in detecting differences in housing patterns of families with children. The first was a regression analysis of rents testing whether the density of children added to the cost of renting housing. The second was to test various areas for their variance (block to block) in the children density index to see whether any two separate areas had significantly different variances. Both tests were rejected, the first because of the necessity of access to computer time and associated costs, the latter, though procedurally simple, was inadequate in verifying the existence of discrimination. (Difference in variation does not confirm differences in housing patterns.) The test selected (described in detail below) is a chi-square test for deviance from an hypothesized probability distribution. This test was selected for the following reasons:

1. This test could be performed without the use of the computer.
2. The test produces a usable comparison even without positive outcome.
3. It is widely known.
4. It is flexible as to the number of points taken in a sample.
5. It is relatively non-abstract compared to other statistical tests.
6. The statistical tables necessary are easily accessible.

THE CHI-SQUARE TEST, USE AND LIMITATIONS

Chi-square is most simply described as a measure of distance of a distribution taken from actual experiments (or the real world) from a distribution expected from the hypothesized distribution. If the measured distance is too great, it can be said that at some level of probability that the actual level of distribution is not the hypothesized one. Unfortunately, this test does not reveal at what level of probability the actual distribution could be the hypothesized one. The test is used to calculate the percentage of the time (depending on the chi-square measure) the distribution is not the hypothesized one. Repeating, it can not be learned from the same test at what probability level the hypothesis should be accepted; that is, it cannot be told what percentage of the time it would be correct to assume that the actual distribution is the hypothesized one. This feature is critical to correct interpretation of the results. The test as used certifies to certain probability levels for the tested areas that the pattern of actual

housing is not the one that would be found if no selective process existed. But the test does not address itself to those areas which, when tested, were not found to have significant distance from the hypothesized distribution.

The main hypothesis and the related working assumptions are stated below. It should be noted that these are limiting assumptions but necessary ones in order to maintain a "sense" of rigor in the study. The assumptions also reflect the limitations of the data. The assumptions are a result of the balance between an attempt at rigor and the necessity of working with the available data.

The main hypothesis is that in a given housing area with a limited, given range of rent and range of size, the distribution of the index, average number of children per housing unit per block, is a normal distribution in the statistical sense. (See Appendix C for further details on the chi-square method.) Essentially, if the index were calculated for each city block in the area, the distribution of the index will be a "bell-shaped" curve.

Normal distributions are commonly found when there is no selective process at work distorting "natural" processes. To test the

validity of this hypothesis, the chi-square test was performed on areas of almost totally owner-occupied housing, where discrimination against families with children is unlikely and unknown. The findings presented below show no indication of a non-normal distribution in these areas and qualitatively the distributions are very, very close to the normal one.

The second assumption is that the quality and type of housing per block is generally reflected by two indices--average rental rates and average number of rooms per unit of housing. Rental price then is the proxy for all the qualitative factors per size of a rental unit. Some of the factors included in this rubric are:

Distance from the CBD,

Quality of neighborhood, and

Quality of the physical unit of housing.

This assumption is made on grounds that the market values each good in terms of money. Each block within a particular area that is similar to the next in average size of unit and average rent is assumed to be of similar housing quality and that potential renters would assume this to be true.

It was assumed that on any particular block there is not enough variance in the size and rents of rental housing units to distort the average rent and average apartment size as an adequate reflection of the type of housing on the block. This assumption is necessitated by the fact that further breakdowns of rents indicative of variance from unit to unit is only available on a "Block Group" level (an aggregation of about eight

blocks) in the census data.

As stated above in the description of the chi-square test, the hypothesis was tested in areas with predominantly owner occupied housing. In order to compare the results of the test from renter occupied housing areas to owner occupied areas, a method of inferring potential rent in owner occupied areas was necessary. The gross rent multiplier was used. This is a fraction of the value of the owner occupied home and transforms the sales value into the rental value. (1970 is the year of all data used in the study.) The factor 1/130 was derived after studying areas which were predominantly owner occupied and totally single family homes, but which also had rental units, and by dividing the average rent by the average home values in that area.

Ideally, the chi-square test would compare individual units of housing with exactly the same rental price and same number of rooms to test the normality of the distribution. Because the data are only given in terms of averages per block, there are no two blocks with exactly the same averages. Therefore, a range of averages was arbitrarily selected in order to disaggregate and differentiate between the blocks in an area. All blocks in a particular range were thus considered to be the "same."

The chi-square test requires a minimum of 15 test blocks in order to be effective. The following breakdown was devised in an attempt to maximize the number of testable categories of rent-size in a specific area. If the area tested was increased in size, a more specific breakdown could be obtained. The area used in this study generally covers two or three census tract areas. The character of the area would be significantly different

if more tracts were included, even though finer disaggregation in the rent and size indices would be permitted. This is the trade-off decision mentioned above on page 4.

CATEGORIZATION USED IN THE DATA SHEETS

TRACT	BLOCK	% UNDER 18	POPULATION	# UNITS	AVERAGE RENT	AVERAGE # ROOMS/ UNIT
Calculation #1	% rental units		# under 18			
Calculation #2			# under 18/ unit			

The categories which did not include a sufficient number of blocks in any area were not tested.

The chi-square method for this particular application requires that the axis of the index be sectioned into at least five parts with at least five blocks from the sample falling into each section, and the expected number from the hypothesized normal distribution being greater than five for each part. Because the chi-square analysis does not dictate the boundaries of the sections be fixed from test to test, the boundaries were reset from test to test. This was often necessary because there was only a minimal amount of data available.

INTERPRETATION

In interpreting the following results, only very careful and limited comparisons can be made between any two tested areas, even when taking into account the rent-size levels, because each area has its own characteristics in terms of open space, schools, distance from the CBD, etc. This chi-square test is designed to compare one area against an hypothesis, not to compare between areas. For instance, there can be situations in two categories with the same rent-size characteristic that one with a lower mean number of average children per unit per block will show no positive indication of housing discrimination. (It has a low chi-square value.) But the area with the higher mean value of average number of children per unit per block can show deviance from the hypothesis indicating discrimination against children. This can occur if the second area is more desirable to families with children, yet also desirable to others and with the resulting competition, discriminatory practices result.

FINDINGS

The following are the results of the chi-square test described above as performed on selected neighborhoods within the City of San Francisco.

Map 1 shows the areas of San Francisco that were tested and the location of the areas with residential discrimination against people with children.

INCIDENCE OF RESIDENTIAL DISCRIMINATION AGAINST FAMILIES WITH CHILDREN IN AREAS STUDIED IN SAN FRANCISCO
1970 CENSUS TRACTS AND DATA

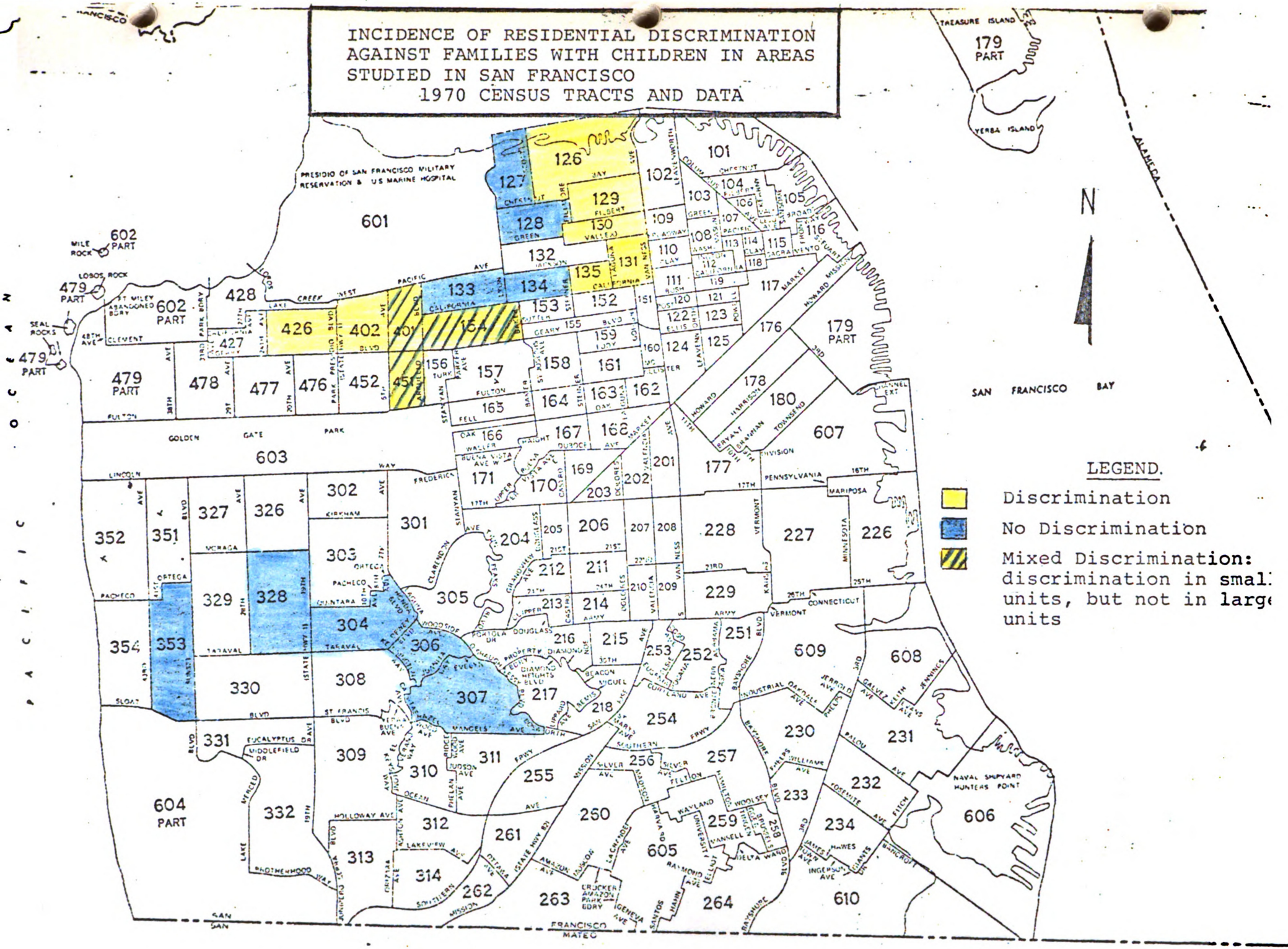


TABLE 1

SUMMARIZED CHARACTERISTICS OF TESTED CENSUS TRACTS IN 1970

Tract	% Owner Occupied	% Single Family Housing	Avg. Value of House ($)
304	82%	86%	$40,000
306	88	96	36,800
307	86	98	33,100
328	76	82	29,000
353	78	89	29,300
127	12	12	
128	27	18	
126	25	16	
129	15	8	
130	20	8	
131	12	4	
135	12	7	
133	38	32	
134	21	12	
154	28	22	
401	27	20	
451	34	22	
402	25	20	
426	36	29	

TABLE 2

SUMMARIZED FINDINGS OF THE CHILDREN DENSITY INDEX BY CENSUS TRACT

TRACTS	CHILDREN DENSITY INDEX MEAN	STD. DEV.	χ^2	
304 & 306	.98899	.24492	3.22433	not non-normal
"	.62789	.20149	.66462	not non-normal
"	.44466	.21892	2.04546	not non-normal
307	.70188	.34014	1.95396	not non-normal
328	.46255	.16923	3.46953	not non-normal
353	.77179	.19705	1.62472	not non-normal
127 & 128	.12270	.07099	7.19153	non-normal[a]
126 & 129	.15300	.12996	12.05086	non-normal
130,131,135	.08285	.04898	5.48369	non-normal
"	.12831	.08921	2.79956	not non-normal[b]
133 & 134	.76878	.33569	.15597	not non-normal
154,401,451	.62809	.42908	18.40882	non-normal
"	.48169	.18363	1.39000	not non-normal
402 & 426	.56567	.18271	2.28900	not non-normal[c]

a) Note that this tract is biased <u>toward</u> having children.

b) However, the bias is toward having fewer children.

c) However, the qualitative bias is toward not having families with children.

Table 1 summarizes some of the characteristics of each tract, while Table 2 summarizes the findings of the study. As expected, there was no evidence of housing discrimination against families with children in predominantly owner occupied areas--tracts 304, 306, 307, 328 and 353. All of these tested areas showed qualitatively normal distributions and no evidence of non-normal distributions were found in the child-density index. However, in areas of rental housing, different selection procedures seemed to be in effect. Evidence of this may be seen in the standard deviations of the index for rental areas which ranged much below and much above the deviations over the owner occupied areas. The number of children per unit per block (the density index) was lower in the rental areas than in the owner areas. This was expected because as can be seen by the distribution of housing, the owner areas had significantly larger living units. This occurred because most owner occupied housing is single family housing, whereas most rental units are in multi-unit buildings.

Four areas showing evidence of bias were:

Tracts	
127, 128	Marina District
126, 129	Marina District
130, 131, 135	Marina District
154, 401, 451	Richmond District

and in addition, tracts 402 and 426 (Richmond District) though it was not shown to be non-normal, qualitatively there was systematic bias against people with children. Oddly enough, in

Tracts 127 and 128, the bias was toward having children, whereas the rest of the biases were opposite in direction.

Among all of the biased areas, there was evidence of bias cutting across all rent categories. Tracts 154, 401 and 451 demonstrated bias in the $90 to $149 range while tracts 130, 131 and 135 showed bias in the $150 to $209 range. But, all of the biased areas fell into one size category, 2.7 to 3.8 rooms; that is, the medium size apartments. There was no evidence of discrimination in larger, higher priced apartments.

The Marina district had a very low vacancy rate of 1.2% in 1969. In the 1973 Vacancy Report, it was reported that 64% of all housing units in the Marina did not accept children. Housing in the Marina is expensive. One-third of San Francisco's total of 4,478 housing units renting for $300 or more per month were located in the Marina.[6] These factors combine to keep the number of children in the area low and also to skew the housing pattern to create areas inhabited almost totally by adults.

The Richmond District, like the Marina, had a low vacancy rate in 1969 (1.5%). Although there is no information available about landlord acceptance of children, it was noted that children were acceptable only in apartments vacant for more than two months, i.e., those of dubious value.[7]

In the City of San Francisco, a mere 41.5% of the housing units were available to families with children as stated by the landlords of those properties. Of those buildings, 80.5% actually had some children living in them.[8] A possible inference is that

discrimination is more severe than the survey of landlord attitudes indicates. This study finds that there is enough bias that the pattern of housing for families with children is definitely affected by the landlords' practices. In order for these tests to reveal bias, entire areas must be biased. This occurred, even by the conservative chi-square test.

CONCLUSION

There exists in areas in the City of San Francisco evidence of discrimination against families with children, even when the factors of rent, size of unit and location are controlled. Together with the stated preferences of landlords for families without children and singles, this study demonstrates the non-economic, non-market bias against families with children.

F O O T N O T E S

1. San Francisco 1970 Population Characteristics, Part II, San Francisco City Planning Commission, 1973, page 3.
2. Planning Report, San Francisco Unified School District, 1973, pages 12--13.
3. 1973 Vacancy Survey, San Francisco Department of City Planning, p. 11.
4. ibid., p. 18.
5. ibid.
6. ibid., p. 46.
7. ibid., p. 45.
8. ibid., p. 20.

A P P E N D I C E S

A. Proposed Amendment of Administrative Code introduced by Quentin Kopp, San Francisco County Supervisor. Final Ordinance of June 16, 1975.

B. Sample Page of Census Data Used in the Study.

C. Chi-Square Method.

D. A Step-By-Step Sample Calculation of Chi-Square for Tracts 304 and 306.

E. Detailed Summary of Data.

APPENDIX A

Proposed Amendment of Administrative Code.

Final Ordinance of June 16, 1975.

SECOND DRAFT

FILE NO. 601-73 ORDINANCE NO.

AMENDING ADMINISTRATIVE CODE BY ADDING CHAPTER 12C THERETO, PROHIBITING DISCRIMINATION IN THE LEASING OF CERTAIN RESIDENTIAL REAL PROPERTY BECAUSE OF CHILDREN.

Be it ordained by the People of the City and County of San Francisco:

Section 1. Chapter 12C is added to the San Francisco Administrative Code to read as follows:

CHAPTER 12C.

PROHIBITING DISCRIMINATION IN THE LEASING OF CERTAIN RESIDENTIAL REAL PROPERTY BECAUSE OF CHILDREN.

Sec. 12C.1. Prohibited activity.

It shall be unlawful for the owner, sublessee, real estate broker, assignee, or other person having the right of ownership, the right of possession, or the right to rent or lease any residential accommodations, or any agent or employee of such person, to refuse to rent or lease or otherwise deny to or withhold from any person such accommodations because such person has a child or children who shall occupy the leased or rented premises with such person.

Sec. 12C.2. Exemptions.

This ordinance shall not apply to dwellings containing two or three apartments, one of which is occupied by an elderly or infirm person for whom the presence of children would constitute a hardship. For the purposes of this ordinance an "elderly person" shall mean a person sixty-five years of age or over, and an "infirm person" shall mean a person who is disabled or suffering from a chronic illness and would thereby be adversely affected by children living on the premises.

Sec. 12C.3. Room occupancy.

This ordinance shall not require the rental of premises for use contrary to those standards set out in Section 501.1 of the

Housing Code, Part II, Chapter XII of the San Francisco Municipal Code.

Sec. 12C.4. Discrimination in financial obligations prohibited.

This ordinance shall not prohibit the person having the right to rent or lease the premises from requiring the same financial obligations of prospective tenants with children as he or she may require of prospective tenants without children. However, no discrimination in the amount or manner of payment of said financial obligations shall be permitted.

APPROVED AS TO FORM:

THOMAS M. O'CONNOR, City Attorney

By _____
Deputy City Attorney

AS AMENDED IN BOARD JUNE 16, 1975

FILE NO. 211-75

ORDINANCE
~~RESOLUTION~~ NO. 320-75

AMENDING PART II, CHAPTER VIII, SAN FRANCISCO MUNICIPAL CODE (POLICE CODE) BY ADDING ARTICLE 1.2 THERETO, PROHIBITING DISCRIMINATION AGAINST FAMILIES WITH MINOR CHILDREN IN THE RENTAL OR LEASING OF CERTAIN RESIDENTIAL PROPERTY: PROVIDING FOR PENALTIES FOR VIOLATIONS THEREOF; PROVIDING FOR EXPIRATION DATE; PROVIDING SEVERANCE CLAUSE.

Be it ordained by the People of the City and County of San Francisco:

Section 1. Part II, Chapter VIII, San Francisco Municipal Code (Police Code) is hereby amended by adding Article 1.2 thereto, reading as follows:

ARTICLE 1.2

DISCRIMINATION AGAINST FAMILIES WITH MINOR CHILDREN IN HOUSING

Sec. 100. Findings.
Sec. 101. Definitions.
Sec. 102. Prohibited Activity.
Sec. 103. Exemptions; Minimum Floor Area.
Sec. 104. Tenant Age Policy Not Prohibited.
Sec. 105. Requirements of Financial Obligations Not Prohibited.
Sec. 106. Penalty.
Sec. 107. Expiration Date.
Sec. 108. Severance Clause.

SEC. 100. Findings. After public hearings with the reception of testimony and documentary evidence, we find that discrimination against families with minor children in the leasing or renting of housing accommodations exists within the City and County of San Francisco. We further find that the existence of such discrimination poses a substantial threat to the health and welfare of a sizable segment of the community, namely families with minor children.

We find that a shortage of housing suitable for families with minor children exists within the City and County. We further find that a low vacancy rate exists in all rental housing throughout San

Francisco. The addition of discrimination against families with minor children to the above two factors creates an untenable situation for the children of San Francisco.

The overall effect of such discrimination is to encourage the flight of families from the City and to further diminish family-oriented neighborhoods. It has an overall detrimental effect on the composition of the City, the stability of neighborhoods, the preservation of family life within the City, the living conditions of our children, the quality of our schools, and the viability of children's activities and organizations.

This discrimination cuts across all racial, ethnic and economic levels.

SEC. 101. Definition: Housing Accommodation. Residential rental unit consisting of one or more rooms in which cooking facilities are available.

SEC. 102. Prohibited Activity. It shall be unlawful for the owner, lessor, lessee, sublessee, real estate broker, assignee, or other person having the right of ownership, the right of possession, or the right to rent or lease any housing accommodations, or any agent or employee of such person to:

(a) Refuse to rent or lease, or otherwise deny to or withhold from any person such accommodations because such person has a minor child or children who shall occupy the leased or rented premises with such person;

(b) Represent to any person because of the potential tenancy of a minor child or children that housing accommodations are not available for inspection or rental when such dwelling is in fact so available;

(c) Make, print, or publish, or cause to be made, printed or published any notice, statement, or advertisement, with respect to the rental of housing accommodations that indicates any preference,

limitation, or discrimination based on the potential tenancy of a minor child or children;

(d) Discriminate against any person in the terms, conditions or privileges of the rental of housing accommodations or in the provision of services or facilities in connection therewith, because of the potential tenancy of a minor child or children;

(e) Refuse to rent after the making of a bona fide offer, or to refuse to negotiate for the rental of, or otherwise make unavailable or deny, housing accommodations to any person because of the potential tenancy of a minor child or children;

(f) Include in any lease or rental agreement of housing accomadations a clause providing that as a condition of continued tenancy the tenants shall remain childless or shall not bear children.

SEC. 103. Exemptions; Minimum Floor Area. The provisions of Section 102 of this Article shall be applicable only to any housing accommodation which meets or exceeds the following floor area standards:

(a) Each such housing accommodation shall have at least one room which shall have not less than 120 square feet of superficial floor area.

(b) Every room which is used for both cooking and living, or both living and sleeping purposes shall have not less than 144 square feet of superficial floor area, provided that, when more than one person occupies such room, it shall have an additional 40 square feet for each occupant in excess of one.

(c) Every room used for sleeping purposes shall have not less than 80 square feet of superficial floor area.

(d) When more than two persons occupy a room used for sleeping purposes, the required superficial floor area shall be increased at the rate of 50 square feet for each occupant in excess of two.

SEC. 104. Tenant Age Policy Not Prohibited. In residential buildings otherwise covered by this ordinance, where the owner has publicly established and carried out a policy of renting exclusively to persons who are defined herein as elderly, said owner or any other person enumerated in Section 102 hereinabove shall be exempt from the provisions of this ordinance, provided, however, that deviation from or abandonment of said policy shall automatically subject said owner to all the provisions of this ordinance.

SEC. 104.1. Definition. Elderly persons. All persons who have attained the age of sixty-two (62) or more years.

SEC. 105. Requirements of Financial Obligations Not Prohibited. This ordinance shall not prohibit the person having the right to rent or lease the premises from requiring the same financial obligations of prospective tenants with minor children as he or she may require of prospective tenants without children. However, no discrimination in the amount or manner of payment of said financial obligations shall be permitted.

SEC. 106. Penalty. Any person who violates any provision of Section 102 of this Article shall be deemed guilty of an infraction, and upon conviction thereof shall be punished by a fine of not less than Two Hundred and Fifty Dollars ($250.00) nor more than Five Hundred Dollars ($500.00).

Any person believing that a violation of said section has been committed may file a complaint with the District Attorney.

SEC. 107. Expiration. This ordinance shall expire three years from the effective date hereof, subject to mandatory review by the Board of Supervisors on the anniversary dates prior thereto for the purpose of evaluating the experience of operating hereunder and considering extension of the operative date, amendments or repeal hereof.

SEC. 108. Severance Clause. If any article, section, subsection, paragraph, sentence, clause or phrase of this Code, or any part thereof, is for any reason held to be unconstitutional or invalid or ineffective by any court of competent jurisdiction, or other competent agency, such decision shall not affect the validity or effectiveness of the remaining portions of this Code or any part thereof. The Board of Supervisors hereby declares that it would have passed each Article, section, subsection, paragraph, sentence, clause or phrase thereof, irrespective of the fact that any one or more Articles, sections, subsections, paragraphs, sentences, clauses or phrases be declared unconstitutional or invalid or ineffective.

Approved as to Form:
THOMAS M. O'CONNOR, City Attorney

By James Starke
Deputy City Attorney

Passed for Second Reading
Board of Supervisors San Francisco

JUN 16 1975

Ayes: Supervisors ~~Barbagelata~~, Feinstein, Francois, Gonzales, Kopp, Mendelsohn, ~~Molinari~~, Nelder, Pelosi, Tamaras, von Beroldingen.

~~Noes~~: Supervisors MOLINARI

Absent: Supervisors BARBAGELATA

Acting Clerk

Read Second Time and Finally Passed
Board of Supervisors, San Francisco

JUL 23 1975

Ayes: Supervisors ~~Barbagelata~~, Feinstein, Francois, ~~Gonzales~~, Kopp, Mendelsohn, ~~Molinari~~, Nelder, Pelosi, Tamaras, von Beroldingen.

Noes: Supervisors BARBAGELATA, MOLINARI

Absent: Supervisors ~~GONZALES~~

I hereby certify that the foregoing ordinance was finally passed by the Board of Supervisors of the City and County of San Francisco.

Acting Clerk

233-75 File No.

6/30/75 Approved

Joseph L. Alioto Mayor

The foregoing measure having been Finally Passed by the Board of Supervisors at the meeting of June 23, 1975, was referred to his Honor, the Mayor, in accordance with the provisions of Section 2.303 of the Charter and was returned by him under date of June 30, 1975, with his disapproval and veto noted theron.

The Board of Supervisors, on July 14, 1975, voted to reconsider the foregoing measure and the Mayor's disapproval and veto was overriden by the following vote:

AYES: Feinstein, Francois, Gonzales, Kopp, Mendelsohn, Nelder, Pelosi, Tamaras, von Beroldingen

NOES: Barbagelata, Molinari

GILBERT H. BOREMAN, Clerk

APPENDIX B

Sample Page of Census Data Used in Study

Blocks Within Census Tracts	Total population	Negro	In group quarters	Under 18 years	62 years and over	Total	Lacking some or all plumbing facilities	Units in — One-unit structures	Units in — Structures of 10 or more units	Owner — Total	Owner — Lacking some or all plumbing facilities	Owner — Average number of rooms	Owner — Average value (dollars)	Owner — Percent Negro	Renter — Total	Renter — Lacking some or all plumbing facilities	Renter — Average number of rooms	Renter — Average contract rent (dollars)	Renter — Percent Negro	1.01 or more persons per room — Total	1.01 or more persons per room — With all plumbing facilities
305	185	–	–	22	18	79	1	53	–	56	1	5.2	30900	–	23	–	4.6	164	–	1	1
306	73	–	–	18	18	31	–	31	–	30	–	5.1	36100	–	1	...	...	...	–	–	–
307	123	–	–	29	12	34	–	34	–	32	–	5.8	39200	–	2	...	...	...	–	3	3
308	164	4	–	24	21	57	1	57	–	53	1	5.6	36000	4	4	...	...	...	–	–	–
309	94	–	–	20	15	40	1	40	–	36	1	5.7	40100	–	4	...	...	...	–	–	–
310	17	–	–	–	59	10	–	10	–	9	–	5.6	27800	–	1	...	...	...	–	–	–
311	122	–	–	13	17	53	–	53	–	49	–	5.6	40300	–	3	...	...	...	–	–	–
313#	82	–	–	26	10	33	–	32	–	27	–	5.6	38100	–	6	–	4.7	215	–	–	–
401	45	–	–	22	29	20	–	20	–	20	–	5.0	34900	–	–	–	–	–	–	1	1
402	26	8	–	8	19	14	–	14	–	14	–	5.3	36100	7	–	–	–	–	–	–	–
403	107	–	–	23	23	44	–	43	–	39	–	6.5	41800	–	5	–	4.2	...	–	1	1
404	105	–	–	21	24	38	–	38	–	35	–	5.7	34900	–	3	...	...	...	–	1	1
405	132	–	–	13	39	52	1	44	–	45	1	5.7	31000	–	7	–	3.0	131	–	2	2
406#	116	–	–	17	39	54	–	42	11	35	–	5.1	28700	–	19	–	3.7	163	–	1	1
407	137	7	–	22	30	60	–	29	–	31	–	5.5	28400	–	26	–	4.8	170	12	3	3
408	64	–	–	23	22	23	–	22	–	21	–	6.1	33400	–	1	...	...	...	–	–	–
409	60	–	–	28	30	23	–	23	–	22	–	6.0	32400	–	1	...	...	...	–	1	1
410	101	–	–	12	38	40	1	40	–	37	1	5.9	39500	–	3	...	...	...	–	–	–
411#	95	–	–	25	19	35	–	25	–	29	–	7.9	51300	–	5	–	2.8	133	–	–	–
412	40	–	–	13	20	21	2	20	–	18	2	5.3	47100	–	3	...	...	...	–	–	–
413	54	–	–	4	35	23	–	23	–	21	–	5.4	33900	–	2	...	...	...	–	–	–
501	106	1	–	26	6	32	–	32	–	30	–	6.9	49200	–	2	...	...	...	–	–	–
502	126	3	–	14	39	58	1	54	–	49	1	6.1	40400	2	8	–	3.8	167	–	–	–
503	110	–	–	17	23	46	3	38	–	36	2	5.9	36400	–	10	1	3.9	167	–	–	–
504	120	2	–	18	28	50	–	50	–	44	–	5.7	30300	2	6	–	5.5	177	–	–	–
505	119	3	–	30	16	46	–	27	–	23	–	5.4	32800	–	22	–	4.2	147	5	2	2
506	162	5	–	14	25	69	1	42	12	37	–	5.5	29600	3	32	1	3.9	169	3	–	–
507	128	–	–	9	40	58	1	53	–	52	1	5.4	30800	–	6	–	3.7	132	–	–	–
508	107	–	–	20	29	43	–	43	–	39	–	5.9	37200	–	4	...	...	...	–	3	3
510	118	3	–	26	9	33	–	33	–	32	–	7.2	57200	3	1	...	...	...	...	1	1
601	26	–	–	27	8	10	–	8	–	9	–	6.9	44400	–	1	...	...	...	–	–	–
602	73	–	–	27	14	25	–	25	–	24	–	6.0	40100	–	–	–	–	–	–	1	1
603	90	6	–	29	18	31	–	31	–	29	–	6.5	49000	3	1	...	...	...	...	–	–
604	81	3	–	17	10	33	–	33	–	33	–	5.7	44200	3	–	–	–	–	–	–	–
605	68	4	–	9	25	36	1	21	–	23	1	5.4	40100	4	11	–	3.9	173	–	–	–
606	39	–	–	13	18	17	–	15	–	14	–	5.4	50200	–	3	...	...	...	–	–	–
607	20	–	–	40	5	5	–	5	–	5	–	7.0	56500	–	–	–	–	–	–	–	–
611	39	3	–	13	15	24	1	8	–	11	1	4.3	30000	–	13	–	3.1	165	8	–	–
612	212	3	–	21	13	90	3	24	–	32	–	4.9	29300	3	56	3	4.2	176	5	1	–
613	63	–	–	16	11	27	1	27	–	26	1	5.1	35300	–	1	...	...	...	–	1	1
616	71	–	–	9	45	30	1	29	–	29	1	5.5	37500	–	1	...	...	...	–	–	–
701	103	–	–	14	23	45	–	39	–	38	–	6.2	36400	–	6	–	3.7	150	–	–	–
702	143	–	–	21	20	48	–	48	–	44	–	6.0	35600	–	3	...	...	...	–	1	1
703	150	–	–	18	25	62	1	41	–	42	1	5.5	31300	–	18	–	3.8	148	–	2	2
704	143	–	–	17	29	57	–	38	–	35	–	5.5	30700	–	21	–	4.0	163	–	3	3
705	136	–	–	18	33	54	1	48	–	45	1	5.5	31700	–	9	–	4.6	156	–	1	1
706	101	–	–	13	35	42	–	41	–	37	–	5.4	32800	–	5	–	4.6	242	–	1	1
707	63	5	–	13	18	27	–	18	–	17	–	5.7	41300	6	10	–	4.1	187	–	1	1
708	110	1	–	26	16	39	1	35	–	30	1	5.5	34700	–	9	–	5.3	203	11	2	2
709	67	–	–	30	19	19	–	18	–	16	–	5.6	28000	–	3	...	...	...	–	2	2
710	107	–	–	22	18	46	1	4	–	21	1	5.0	...	–	23	–	4.7	172	–	–	–
304	4805	1	–	25	21	1743	22	1505	22	1412	18	6.2	40000	–	313	4	4.6	174	2	29	29
101	120	–	–	33	17	39	1	39	–	37	1	6.8	48500	–	2	...	...	...	–	1	1
102	110	–	–	25	29	38	–	38	–	37	–	7.1	49100	–	–	–	–	–	–	–	–
104	123	–	–	40	15	34	–	34	–	33	–	7.1	55800	–	–	–	–	–	–	–	–
105	53	–	–	30	26	18	–	18	–	17	–	7.5	49300	–	1	...	...	...	–	–	–
106	52	–	–	37	12	16	–	16	–	16	–	7.1	48600	–	–	–	–	–	–	–	–
107#	155	–	–	26	18	54	3	43	10	36	3	6.9	43000	–	18	–	4.6	157	–	–	–
108	77	–	–	34	8	22	–	21	–	18	–	7.6	54400	–	4	...	...	...	–	–	–
201	49	–	–	29	12	17	–	17	–	15	–	7.2	51300	–	2	...	...	...	–	1	1
202	121	3	9	32	13	32	1	32	–	30	1	7.6	52000	–	2	...	...	...	...	–	–
203	41	–	–	15	17	15	–	15	–	15	–	7.3	54800	–	–	–	–	–	–	–	–
204	60	–	–	23	33	20	1	19	–	19	1	7.4	50800	–	1	...	...	...	–	–	–
205	71	–	–	30	18	24	–	24	–	22	–	7.0	48500	–	1	...	...	...	–	–	–
207	64	–	–	34	14	21	–	20	–	17	–	7.7	51800	–	4	...	...	...	–	1	1
208	100	9	–	34	18	27	1	27	–	25	1	7.1	44200	4	2	...	...	...	...	1	1
301	78	–	–	21	31	27	–	27	–	25	–	6.0	35900	–	2	...	...	...	–	–	–
302#	619	–	–	26	21	228	–	194	–	179	–	6.3	41000	–	45	–	4.1	166	–	3	3
303	110	–	–	26	7	37	–	37	–	34	–	6.4	49300	–	3	...	...	...	–	–	–
307	68	–	–	27	22	24	–	24	–	23	–	7.4	52300	–	1	...	...	...	–	–	–
308	82	1	–	38	12	24	–	24	–	24	–	7.4	50900	–	–	–	–	–	–	–	–
309	59	–	–	39	14	18	1	18	–	17	1	7.8	50600	–	–	–	–	–	–	–	–
310	128	–	–	28	13	39	–	39	–	38	–	7.4	53800	–	1	...	...	...	–	–	–
311	33	–	–	33	15	9	–	9	–	8	–	6.9	49100	–	1	...	...	...	–	–	–
401	135	–	–	14	23	58	–	47	–	40	–	5.8	35800	–	15	–	4.7	165	–	–	–
402	237	2	–	27	15	86	–	84	–	74	–	5.7	39500	1	12	–	5.0	205	–	–	–
403	54	–	–	7	17	26	–	26	–	25	–	4.8	31900	–	1	...	...	...	–	–	–
404	12	–	–	25	50	6	–	6	–	5	–	5.8	38900	–	1	...	...	...	–	–	–
405	64	–	–	33	16	20	–	20	–	20	–	6.0	41400	–	–	–	–	–	–	1	1
406	102	–	–	14	30	44	1	41	–	38	1	5.8	35100	–	5	–	4.2	177	–	–	–
407	115	–	–	17	30	46	–	44	–	43	–	5.1	30000	–	3	...	...	...	–	2	2
408	151	4	–	31	13	46	1	40	–	39	1	5.9	31600	3	7	–	6.0	196	–	2	2
409	164	4	–	28	22	54	3	29	–	34	2	5.5	31200	–	20	1	4.8	154	15	4	4
501	73	–	–	12	45	31	–	32	–	30	–	5.3	28500	–	3	...	...	...	–	–	–
502	150	–	–	24	15	51	–	46	–	43	–	6.0	31500	–	8	–	4.1	198	–	1	1
503	105	–	–	18	30	43	1	37	–	32	1	5.6	29300	–	11	–	5.5	200	–	–	–
504	103	–	–	25	33	38	2	37	–	33	2	5.4	31400	–	5	–	4.8	...	–	1	1
505	120	–	–	29	21	43		42	–	40		5.9	32700	–	2	...	...	...	–	–	–
506	145	–	–	14	33	62		62	–	57		5.6	31900	–	4	...	...	...	–	1	1

APPENDIX C

Chi-Square Method

parameters, the number of the degrees of freedom in the numerator and the number of degrees of freedom in the denominator. These two numbers are usually given as subscripts of F to ensure proper identification. Thus we write

$$\frac{s_1^2}{s_2^2} \sim F_{n_1-1,\,n_2-1}. \tag{5.10}$$

The values for the F distribution are available in tabulated form. Usually there are two tables, one for 5% and one for 1% level of significance. Each table gives the boundary value of F for a one-tail test. The rows in each table refer to the number of degrees of freedom in the denominator and the columns to the number of degrees of freedom in the numerator. For example, in the table for the 5% level of significance, the entry in the row labeled "10" and column labeled "15" is 2.85. This means that when we have two independent samples, one of size 16 and the other of size 11, the probability that the ratio (s_1^2/s_2^2) would exceed 2.85 is 0.05. That is, the value 2.85 stands for the lower limit of an interval which extends to $+\infty$, and the probability that a value of (s_1^2/s_2^2) would fall within this interval is 0.05.

These tests concerning population variances are strictly true only for normal parent populations. There are some indications, however, that the results apply to a large extent also to other types of parent populations, providing they do not differ from the normal population too markedly.[6] But if there are good reasons to suspect that the parent population is highly skewed or U-shaped, then the tests cannot be applied with much confidence.

Goodness-of-Fit Test

The *goodness-of-fit* test is applicable to problems of deciding whether a sample frequency distribution is compatible with some given theoretical distribution. It would be used, for instance, to test the assumption that some variable is normally distributed. In general, the null hypothesis is the proposition that a certain variable has a specified probability distribution, while the alternative hypothesis states that the proposition is not true. To test the null hypothesis, we use the frequency distribution obtained in the sample as the evidence concerning the form of the distribution in the population. The test statistic commonly used in this case is

$$\sum_{i=1}^{m} \frac{(f_i - e_i)^2}{e_i},$$

where f_i is the sample frequency in the ith interval, e_i is the frequency expected in the theoretical (hypothesized) distribution, and m is the number of intervals. It can be shown that this test statistic has a distribution which for *large samples* can be approximated by the *chi-square distribution*. In particular, if the sample is large, then

$$\sum_{i=1}^{m} \frac{(f_i - e_i)^2}{e_i} \sim \chi^2_{m-k-1}, \tag{5.11}$$

[6] For a discussion on this topic see, e.g., G. Udny Yule and M. G. Kendall, *An Introduction to the Theory of Statistics* (London: Griffin, 1950), p. 486.

where the subscript $(m - k - 1)$ refers to the number of degrees of freedom. The sample frequencies f_i are observed, and the theoretical frequencies e_i can be calculated by using the distribution formula specified by the null hypothesis. This formula will involve some unknown parameters which have to be replaced by their respective sample estimates. For instance, if the null hypothesis specifies that the population distribution is normal, it will be necessary to estimate the mean and the variance of this distribution from the sample. (Actually, if (5.11) is to hold, the estimates must be of a certain kind. Specifically, the estimates should be of "maximum likelihood" type—a term that will be explained in Section 6–2. At this stage it is sufficient to note that $\bar{X}$ *is* a maximum likelihood estimate, and s^2 is approximately so in large samples.) The number of the degrees of freedom is determined as follows:

m = number of intervals;

k = number of parameters that had to be replaced by sample estimates.

For the test to be reasonably satisfactory, it is required that $m \geq 5$ and $e_i \geq 5$ for each i.

If the null hypothesis is true, f_i can be considered as a sample estimate of e_i, and the expression in (5.11) will differ from zero only because we observe a sample rather than the entire population. Therefore, if we observe a sample for which the value of the test statistic (5.11) is large, we consider it as evidence against the null hypothesis. To carry out the test we have to determine the boundary between the acceptance and the critical region. This depends on the number of degrees of freedom and the chosen level of significance and can be looked up in the chi-square table. Note that since the statistic (5.11) cannot be negative, evidence against the null hypothesis can only take the form of very large values (and not very small ones) so that the appropriate test is a *one-tail* test.

EXAMPLE Economists are often interested in the distribution of personal incomes. Let us consider the hypothesis that family incomes are normally distributed. To test this hypothesis we may use the data in Table 5-1. These data may be considered as a sample from a population that includes all possible incomes that *could* have been received during 1962 in the United States. The statistic to be used for the test is

$$\sum_{i=1}^{9} \frac{(f_i - e_i)^2}{e_i} = \left[\frac{\sum f_i}{100}\right] \sum_i \frac{(p_i - \pi_i)^2}{\pi_i},$$

where p_i = observed percentage frequencies, and π_i = expected percentage frequencies. The expected frequencies have to be calculated by fitting a normal distribution to the observed data. To do that we have to estimate *two* parameters—the mean and the variance—from the sample. For this purpose we shall use the sample mean and the sample variance whose values are

$$\bar{x} = 6507 \quad \text{and} \quad \hat{\sigma}^2 = 4920^2.$$

Table 5-1

Interval	Midpoint*	Percent of Families†
Under $2,000	1,130	12.7
$2,000 to $2,999	2,560	9.4
$3,000 to $3,999	3,490	10.8
$4,000 to $4,999	4,510	11.7
$5,000 to $5,999	5,480	11.4
$6,000 to $7,499	6,690	14.4
$7,500 to $9,999	8,570	13.9
$10,000 to $14,999	11,960	10.5
$15,000 and over	22,780	5.2
Total		100.0
Total number	57,890,000	

* Midpoints were calculated by dividing total income (after tax) in each income class by the number of recipient families in that class.

† Includes unattached individuals.

Source: *Statistical Abstract of the United States, 1965*, U.S. Department of Commerce, Table 467.

To obtain the frequencies of the normal distribution with the above mean and variance, we shall follow the procedure described in Section 4–2 and illustrated in Table 4–7. First, we form the standard normal variable

$$Z = \frac{X - 6507}{4920}$$

(where X = income), and recalculate the interval limits in terms of this variable. Then we find the normal probabilities for each income class from the table of areas under the normal curve. The results are presented in the Table 5–2. Using these results, we find that

$$\sum_{i=1}^{9} \frac{(f_i - e_i)^2}{e_i} = 9{,}454{,}950.$$

The tabulated value of chi-square with $9 - 2 - 1 = 6$ degrees of freedom at 1% level of significance is 16.812. Values smaller than that would fall into the acceptance region and values that are larger into the critical region. Since in our case the value of the test statistic far exceeds the boundary value of 16.812, the null hypothesis is to be rejected. That is, the data do not appear to be consistent with the proposition that family incomes are normally distributed.

Conclusion

This brings us to the end of the present section containing the description of several basic tests. There was a twofold purpose to it. First, we wanted to illustrate the development of test procedures in general so that the reader could see

in concrete terms the kind of problems involved and the method of handling them. Actually, the specific problems and related tests given in this section are *not* very frequently encountered in econometrics. This is because the statistical models used are too simple to satisfy the usual demands of economic theory. In particular, the concentration on one variable to the exclusion of all other factors

Table 5–2

Intervals		Cumulative Normal Probabilities	Normal Probabilities	
x	z		$f(z)$	Percent
Under 2,000	$-\infty$ to -0.92	0.1788	0.1788	17.9
2,000 to 2,999	-0.92 to -0.71	0.2388	0.0600	6.0
3,000 to 3,999	-0.71 to -0.51	0.3050	0.0662	6.6
4,000 to 4,999	-0.51 to -0.31	0.3783	0.0733	7.3
5,000 to 5,999	-0.31 to -0.11	0.4562	0.0779	7.8
6,000 to 7,499	-0.11 to 0.20	0.5793	0.1231	12.3
7,500 to 9,999	0.20 to 0.71	0.7612	0.1819	18.2
10,000 to 14,999	0.71 to 1.73	0.9582	0.1970	19.7
15,000 and over	1.73 to $+\infty$	1.0000	0.0418	4.2
			1.0000	100.0

does not do justice to the complexity of economic relations. There is, however, one common feature between the simple tests discussed in this section and the tests applicable to more complex situations. This common feature is the use of distributions described on the preceding pages: the normal, the chi-square, the t and the F distributions. This was the second and the more important purpose of this section. The discussion of the simple tests enabled us to introduce these distributions in a natural way, and gave us an opportunity to highlight their main characteristics and to relate them to each other. For this reason this section is really indispensable for a complete understanding of econometric methods.

EXERCISES

5–1. Let $X \sim N(\mu, 81)$. The null and the alternative hypotheses are

$$H_0: \ \mu = 10,$$

$$H_A: \ \mu > 10.$$

The test statistic is to be based on a sample of size 9, and the chosen level of significance is to be 5%. Draw a diagram of the power function for this test.

Source: Kmenta, Elements of Econometrics, MacMillan, 1971, pp. 148-51.

APPENDIX D

A Step-By-Step Sample Calculation of Chi-Square for Tracts 304 and 306

A P P E N D I X D

SAMPLE CALCULATION OF THE MEAN, STANDARD DEVIATION AND CHI-SQUARE VALUES FOR CENSUS TRACTS 304 AND 306.

Steps

(1) Look at the census by block (see xerox of page).

(2) Calculate inferred rent from average value of homes for each block.

For example, Block 101 of Tract 304

$$\text{Inferred Average Rent} = \frac{\text{Average Value}}{130}$$

$$\$373 = \frac{\$48,500}{130}$$

(This procedure is used for predominantly owner occupied tracts only. On other tracts which are predominantly renter occupied, use "average rent.")

(3) Classify into Rent-Size categories.

For the above block: Rent = $373

Average Number of Rooms = 6.8

so that this would be classified into category (6.3 to 7.4 average # rooms) and ($330 or more in average rent).

Avg. # Rooms	Average Rent ($/month) to 89	90--149	150--209	210--269	270--329	330 up
to 2.6						
2.7--3.8						
3.9--5.0						
5.1--6.2						
6.3--7.4						X

(4) For each category with 15 or more blocks falling into it, do a Chi-square test.

For tracts 304 and 306 there are three categories to be tested:

(a) ($330 up) and (6.3 to 7.4 rooms)

(b) ($270 to $329) and (5.1 to 6.2 rooms)

(c) ($210 to $269) and (5.1 to 6.2 rooms)

Avg. # Rooms	Average Rent ($/month) to 89	90--149	150--209	210--269	270--329	330 up
to 2.6	0	0	0	0	0	0
2.7--3.8	0	0	0	0	0	0
3.9--5.0	0	0	0	0	0	0
5.1--6.2	0	0	0	23	15	1
6.3--7.4	0	0	0	0	2	27

(5) For each of the blocks of any one category, calculate the child density.

For Block 101 of Tract 304

$$\text{Density} = \frac{(\%\text{ under 18}) \times (\text{Population})}{(\#\text{ of housing units})}$$

$$= \frac{.33 \times 120}{39} = 1.02$$

(6) Calculate the mean and variance for the densities of each category.

$$\text{Mean} = \left\{\frac{\text{sum of all densities in a category}}{\#\text{ of blocks in a category}}\right\} = \bar{x}$$

Variance = Sum of all 'squares' of:

(densities of each block minus the mean)

$= \sigma^2$ (square of standard deviation)

for category ($330 up) and (6.3 to 7.4 rooms)

$\bar{x}$ = .98899 (child per unit)

σ = .24492 (standard deviation) (child per unit)

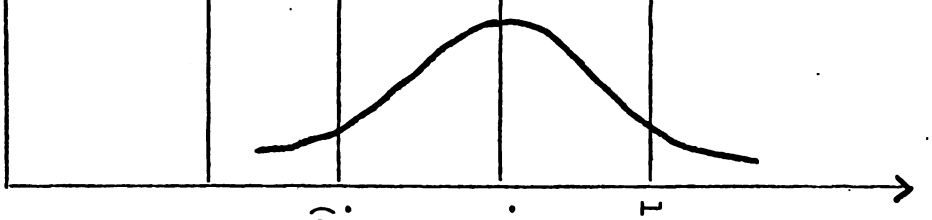
The values $\bar{x}$ and σ fully describe the hypothesized probability distribution, that is, the normal distribution.

(7) Set up the boundaries of the sectors along the density index to be tested so that for each section both the expected value of the section and the actual are greater than 5. (In practice for any size-rent category, arrange the blocks in increasing order of child density. Then

experiment with values of child density which would divide the samples into sections so that the above constraint holds).

For rent-size category ($330 up) and (6.3 to 7.4 rooms)

Actual	7	7	5	8
Expected	5.34	8.154	8.154	5.34



Density Index

.78081 (dividing lines) .98899 1.19717

The expected can be calculated from the hypothesized 'normal' distribution. (See any statistics book.)

(8) Do the chi-square sum.

$$\text{Chi-square} = \text{Sum of all } \frac{[\text{Actual in a sector} - \text{Expected}]^2}{\text{Expected}}$$

(9) The parameter of the chi-square table to be used to see whether the chi-square sum is significant is the number of sections minus 2. We can check for various significance levels.

(5% significance level means that the actual distribution is the hypothesized one only 1/20 of the time.)

For the category ($330 up) and (6.3 to 7.4 rooms):

Chi-square $= \chi^2_{2 \text{ (parameters)}} = 3.22433$

Parameters = 4 (sections) - 2 = 2

APPENDIX E

Detailed Summary of Data

DATA FOR TRACTS 304 and 306

OWNER OCCUPIED

DISTRIBUTION OF BLOCKS INTO AVERAGE RENT-SIZE CATEGORIES

Avg. # Rooms	Average Rent ($/month--inferred)					
	to 89	90--149	150--209	210--269	270--329	330 up
to 2.6	0	0	0	0	0	0
2.7--3.8	0	0	0	0	0	0
3.9--5.0	0	0	0	0	0	0
5.1--6.2	0	0	0	23	15	1
6.3--7.4	0	0	0	0	2	27

The categories (1) ($330 up) and (6.3 to 7.4 rooms)

(2) ($270--329) and (5.1 to 6.2 rooms)

(3) ($210--269) and (5.1 to 6.2 rooms)

were tested.

For the density index:

(1) The mean of the children density index

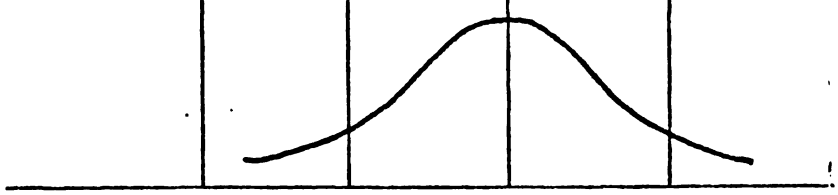
$\bar{x}$ = .98899

The standard deviation σ = .24492

The chi-square

χ^2_2 = 3.22433 (not non-normal)

Actual	7	7	5	8
Expected	5.34	8.154	8.154	5.34



Density Index

.78081 .98899 1.19717

(2) The mean

$\bar{x}$ = .62798

The standard deviation

σ = .20149

The chi-square

χ_1^2 = .66462 (not non-normal)

Actual	5	6	4
Expected	5.175	4.650	5.175

Density Index

.5478 .70858

(3) The mean

$\bar{x}$ = .44466

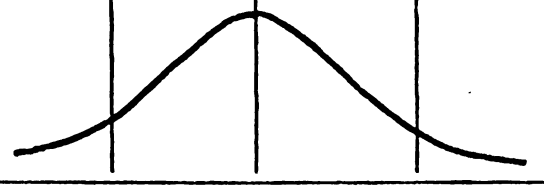
The standard deviation

σ = .21892

The chi-square

χ_2^2 = 2.04546 (not non-normal)

Actual	6	7	3	7
Expected	5.566	5.934	5.934	5.566



.34142 .49466 .64700

Density Index

Characteristics of Tracts	304	306
% Owner Occupied Housing	82.0%	88.0%
% One Unit Housing	86.0%	95.5%
Average Value of a Home ($)	$40,000	$36,800

DATA FOR TRACT 307

OWNER OCCUPIED

DISTRIBUTION OF BLOCKS INTO AVERAGE RENT-SIZE CATEGORIES

Avg. # Rooms	Average Rent ($/month) to 89	90--149	150--209	210--269	270--329	330 up
to 2.6	0	0	0	0	0	0
2.7--3.8	0	0	0	0	0	0
3.9--5.0	0	0	4	3	1	1
5.1--6.2	0	0	3	30	5	1
6.3--7.4	0	0	0	0	0	4

The category ($210--269) and (5.1 to 6.2 rooms) was tested.

For the density index:

The mean

$\bar{x}$ = .70188

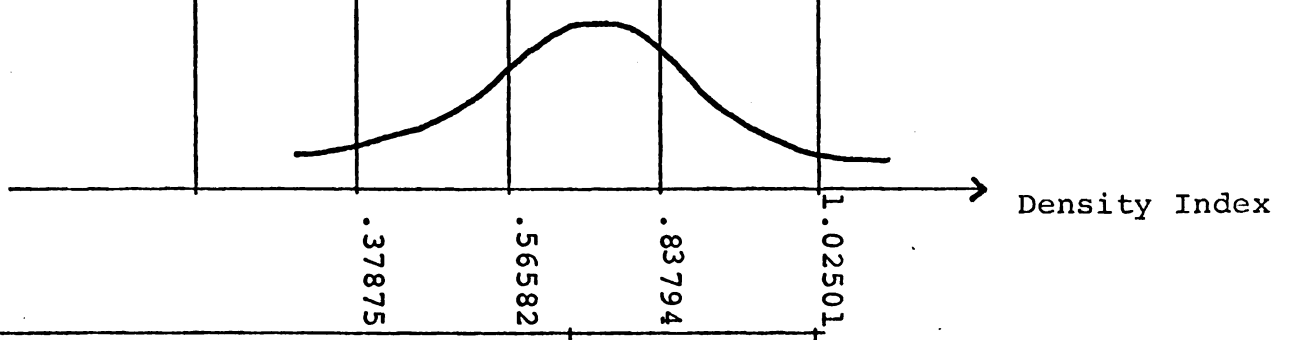
The standard deviation

σ = .34014

The chi-square

χ^2_3 = 1.95396 (not non-normal)

Actual	5	8	8	4	5
Expected	5.13	5.22	9.30	5.22	5.13



Characteristics of Tract	307
% Owner occupied housing	85.8%
% One unit housing	97.5%
Average value of a home ($)	$33,100

DATA FOR TRACT 328

OWNER OCCUPIED

DISTRIBUTION OF BLOCKS INTO AVERAGE RENT-SIZE CATEGORIES

Avg. # Rooms	Average Rent ($/month) to 89	90--149	150--209	210--269		
to 2.6	0	0	0	0	0	0
2.7--3.8	0	0	0	0	0	0
3.9--5.0	0	0	2	1	0	0
5.1--6.3	0	0	9	38	0	0

The category ($210--269) and (5.1 to 6.2 rooms) was tested. (That is, 38 blocks.)

For the density index:

The average of the children density index over the blocks in the category

$\bar{x} = .46255 \frac{\text{children}}{\text{unit}}$

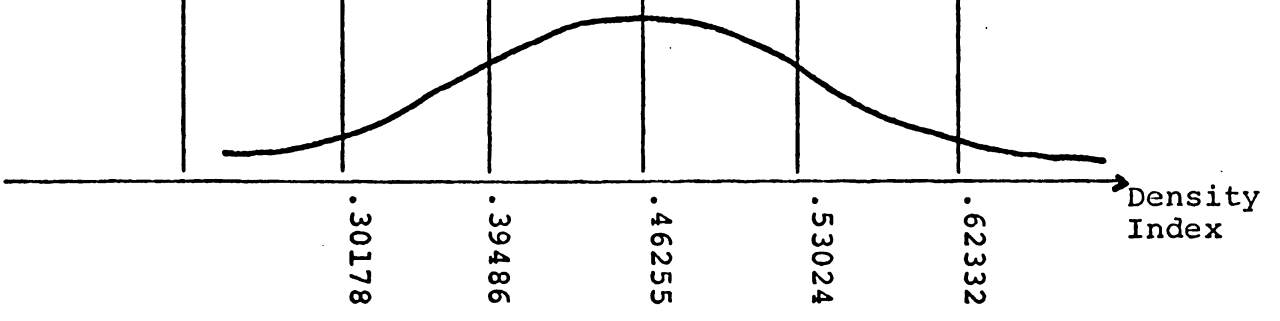
The standard deviation of the density index

$\sigma = .16923$

The chi-square

$\chi^2_4 = 3.46953$

Actual	5	10	5	6	8	4
Expected	6.498	6.612	5.890	5.890	6.612	6.498



The average rents here have been inferred by using the multiplication factor 1/130 from the average rents.

Characteristics of Tract	328
% Owner occupied housing	76.1%
% One unit housing	81.5%
Average value of a home ($)	$29,000

DATA FOR TRACT 353

OWNER OCCUPIED

DISTRIBUTION OF BLOCKS INTO AVERAGE RENT-SIZE CATEGORIES

Avg. # Rooms	Average Rent ($/month) to 89	90--149	150--209	210--269	270--319	320 up
to 2.6	0	0	0	0	0	0
2.7--3.8	0	0	0	0	0	0
3.9--5.0	0	0	2	11	0	0
5.1--6.2	0	0	2	25	1	1

The rent category ($210 to 269) and size (5.1 to 6.2 rooms) was tested (25 blocks).

For the density index:

The average of the child density index over the blocks in the category

$\bar{x}$ = .77179

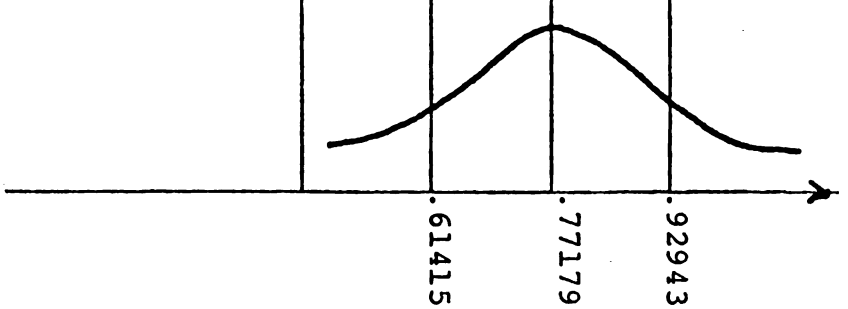
The standard deviation of the density index

σ = .19705

The chi-square

χ_2^2 = 1.62472 (not non-normal)

Actual	4	10	6	5
Expected (Hypothesis)	5.3	7.2	7.2	5.3



Characteristics of Tract	353
% Owner occupied housing	78.2%
% One unit housing	88.5%
Average value of a home ($)	$29,300

DATA FOR TRACTS 127 and 128

RENTAL AREAS

DISTRIBUTION OF BLOCKS INTO AVERAGE RENT-SIZE CATEGORIES

Avg. # Rooms	Average Rent ($/month) to 89	90--149	150--209	210--269	270--329	330 up
to 2.6	0	1	1	0	0	0
2.7--3.8	0	6	27	0	0	0
3.9--5.0	0	1	13	5	0	0
5.1--6.2	0	0	0	0	0	0
6.3--7.4	0	0	0	0	0	0

The category ($150--209) and (2.7 to 3.8 rooms) was tested.

For the density index:

The mean value

$\bar{x}$ = .12270

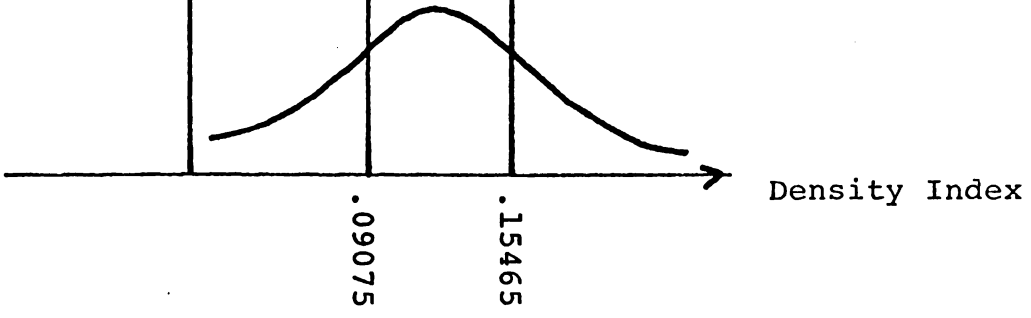
The standard deviation

σ = .07099

The chi-square

χ_1^2 = 7.19153 (non-normal at 99% accuracy)

Actual	4	8	15
Expected	8.802	9.396	8.802



Notice that this tract is biased toward having children.

Characteristics of Tracts	127	128
% Rental housing	78%	72.5%
% Single family housing	12%	18.0%

DATA FOR TRACTS 126/129

RENTAL AREAS

DISTRIBUTION OF BLOCKS INTO AVERAGE RENT-SIZE CATEGORIES

Avg. # Rooms	Average Rent ($/month) to 89	90--149	150--209	210--269	270--329	330 up
to 2.6	0	0	1	0	0	0
2.7--3.8	0	10	34	1	0	0
3.9--5.0	0	4	5	4	0	0
5.1--6.2	0	0	0	0	0	0
6.3--7.4	0	0	0	0	0	0

The category tested was ($150--209) and 2.7--3.8 rooms).

For the density index:

The mean

$\bar{x}$ = .15300

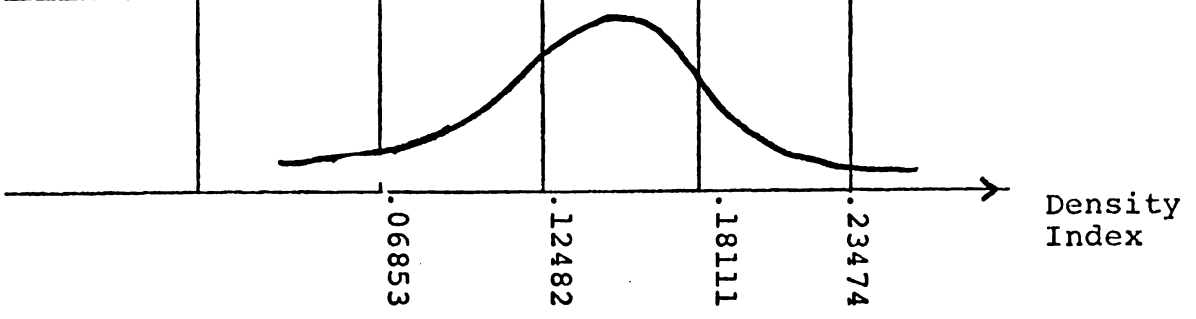
The standard deviation

σ = .12996

The chi-square

χ^2_3 =12.05086 (not normal at 99% accuracy)

Actual	6	11	7	5	5
Expected	8.772	5.270	5.916	5.270	8.772



Characteristics of Tracts	126	129
% Rental housing	75%	85%
% Single Family housing	16%	7.6%

Note that the bias is against having families with children.

DATA FOR TRACTS 130/131/135

RENTAL AREAS

DISTRIBUTION OF BLOCKS INTO AVERAGE RENT-SIZE CATEGORIES

Avg. # Rooms	Average Rent ($/month)					
	to 89	90--149	150--209	210--269	270--329	330 up
to 2.6	2	0	0	0	0	0
2.7--3.8	1	7	23	16	0	0
3.9--5.0	0	0	8	5	0	0
5.1--6.2	0	0	0	0	0	0
6.3--7.4	0	0	0	0	0	0

The categories (1) ($210--269) and (2.7--3.8 rooms)

and (2) ($150--209) and (2.7--3.8 rooms) were tested.

(1) For the density index:

The mean

$\bar{x} = .08285$

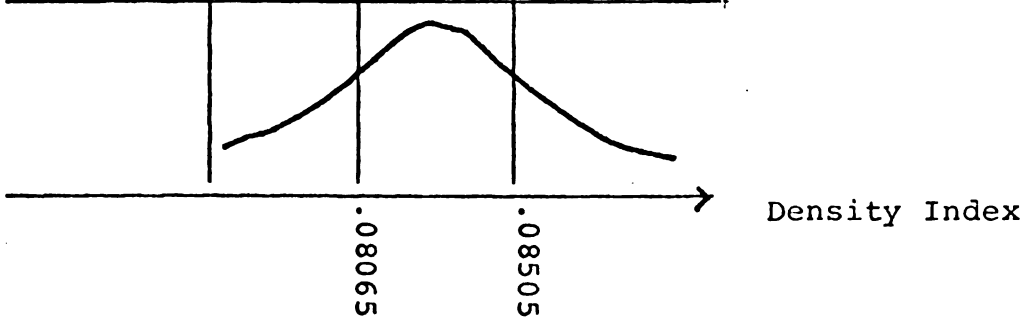
The standard deviation

$\sigma = .04898$

The chi-square

$\chi_1^2 = 5.48369$ (not normal at 97.5% accuracy)

Actual	8	1	7
Expected	5.216	5.568	5.216



Characteristics of Tracts	130	131	135
% Rental occupied	80%	88%	88%
% Single Family Homes	8%	4%	7%

Note that the distribution is bipolar. Many areas with few children and many areas with many children but few with the average numbers.

(2) For the category ($150--209) and (2.7--3.8 rooms):

For the density index:

The mean

$\bar{x} = .12831$

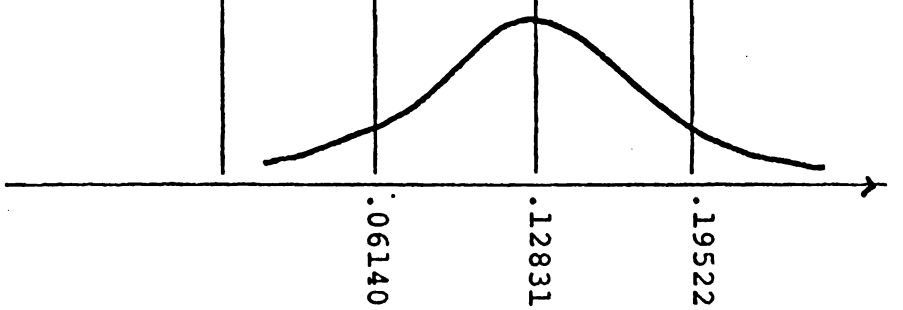
The standard deviation

$\sigma = .08921$

The chi-square

$\chi^2_2 = 2.79956$ (not non-normal)

Actual	7	8	3	5
Expected	5.221	6.279	6.279	5.221



Note however the bias is toward having fewer children.

DATA FOR TRACTS 133/134

RENTAL AREAS

DISTRIBUTION OF BLOCKS INTO AVERAGE RENT-SIZE CATEGORIES

Avg. # Rooms	Average Rent ($/month) to 89	90--149	150--209	210--269	270--329	330 up
to 2.6	0	0	0	0	0	0
2.7--3.8	0	4	6	2	0	0
3.9--5.0	0	2	13	17	0	0
5.1--6.2	0	0	0	0	0	0
6.3--7.4	0	0	0	0	0	0

The category ($210--269) and (3.9--5.0 rooms) was tested.

For the density index:

The mean

$\bar{x} = .76878$

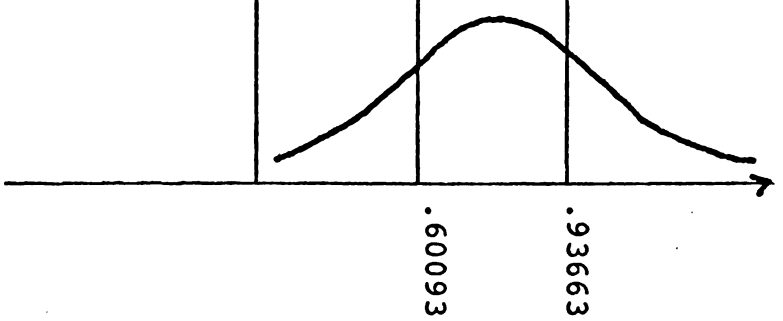
The standard deviation

$\sigma = .33569$

The chi-square

$\chi_1^2 = .15597$

Actual	5	6	6
Expected	5.253	6.494	5.253



CHARACTERISTICS OF TRACTS	133	134
% Rental Occupied	62%	79%
% Single Family Homes	31.6%	12%

DATA FOR TRACTS 154/401/451

RENTAL AREAS

DISTRIBUTION OF BLOCKS INTO AVERAGE RENT-SIZE CATEGORIES

Avg. # Rooms	Average Rent ($/month) to 89	90--149	150--209	210--269	270--329	330 up
to 2.6	0	0	0	0	0	0
2.7--3.8	0	17	11	1	0	0
3.9--5.0	0	23	13	3	0	0
5.1--6.2	0	0	0	0	0	0
6.3--7.4	0	0	0	0	0	0

The categories (1) ($90--149) and (2.7--3.8 rooms)

and (2) ($90--149) and (3.9--5.0 rooms) were tested.

(1) For the child density index:

The mean

$\bar{x}$ = .62809

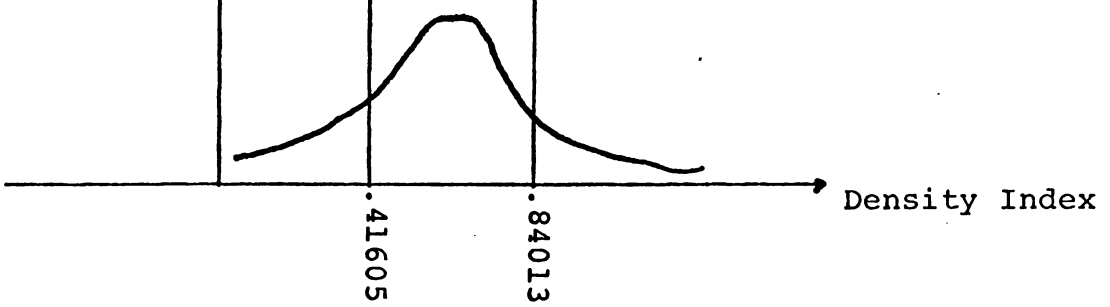
The standard deviation

σ = .42908

The chi-square

χ_1^2 = 18.40882 (not normal at 99% accuracy)

Actual	0	15	2
Expected	5.253	6.494	5.253



Note that the distribution is too concentrated about the mean to be normal.

(2) For the child density index:

The mean

$\bar{x}$ = .48169

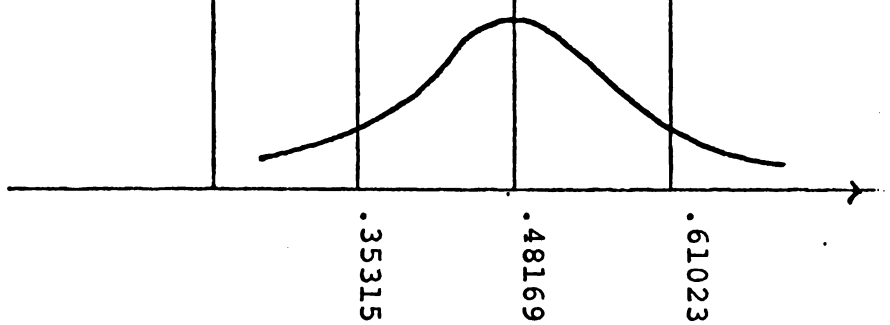
The standard deviation

σ = .18363

The chi-square

χ_2^2 = 1.39000 (not non-normal)

Actual	5	4	8	4
Expected	5.082	5.418	5.418	5.082



Characteristics of Tracts	154	401	451
% Rental housing	72%	73%	66%
% Single family housing	22%	20%	22%

DATA FOR TRACTS 402/426

RENTAL AREAS

DISTRIBUTION OF BLOCKS INTO AVERAGE RENT-SIZE CATEGORIES

Avg. # Rooms	Average Rent ($/month) to 89	90--149	150--209	210--269	270--329	330 up
to 2.6	1	0	0	0	0	0
2.6--3.8	0	13	10	0	0	0
3.9--5.0	0	7	24	1	0	0
5.1--6.2	0	0	0	0	0	0
6.3--7.4	0	0	0	0	0	0

The category ($150--209) and (3.9--5.0 rooms) was tested.

For the density index:

The mean

$\bar{x}$ = .56567

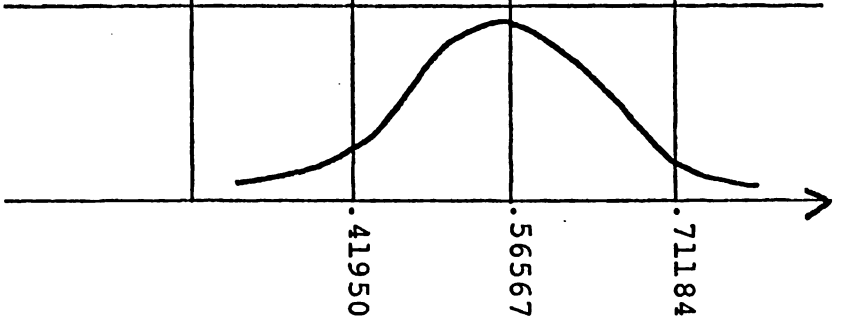
The standard deviation

σ = .18271

The chi-square

χ^2_2 = 2.28900 (not non-normal)

Actual	8	5	5	6
Expected	5.088	6.192	6.192	5.088



Note: The qualitative bias is toward not having families with children.

Characteristics of Tract	402	426
% Rental housing	74%	64.2%
% Single family housing	20%	29.0%

B I B L I O G R A P H Y

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