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ABSTRACT

Utilizing data derived from the U.S. Census, a 10 percent stratified sample of U.S. population from nonmetropolitan counties (276 counties) as of 1950 was examined in terms of 2 opposing hypotheses: (1) the higher the level of manufacturing activity, the higher the quality of the housing in rural areas; and (2) industry attracted to rural areas will have no significant impact upon the quality of housing in rural areas. Zero-order correlations were used to measure the associations among the following variables: (1) median education; (2) male; (3) female; (4) median family income; (5) median age; (6) proportion of civilian labor force in durable manufacturing; (7) proportion of civilian labor force in nondurable manufacturing; (8) quality of housing. T-tests were performed to determine which associations were significant. A multiple regression equation encompassing all of the variables was utilized to determine the total variance explained and the relative importance of each on the quality of housing. Separate correlations and regressions were used on the census data for the years 1950, 1960, and 1970. The hypothesis stating that industry would not significantly affect the quality of housing in rural areas was supported. (JC)

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LEVEL OF MANUFACTURING ACTIVITY AND QUALITY OF HOUSING IN RURAL COUNTIES IN THE U.S.A.

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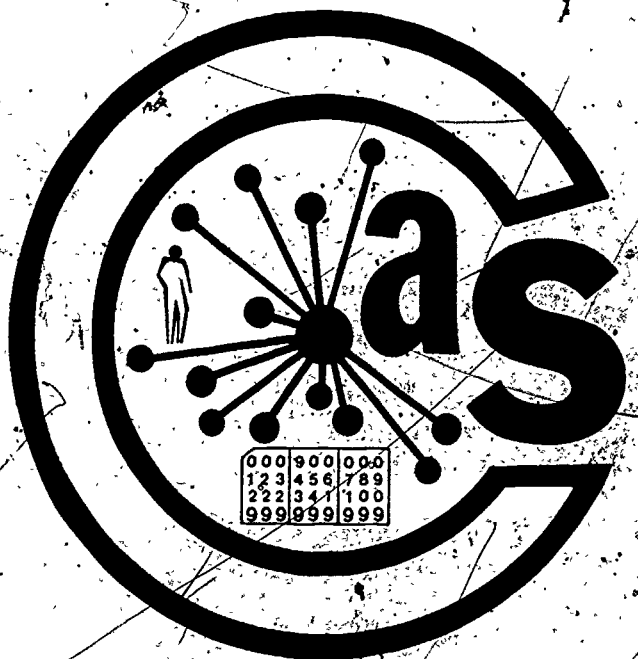

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Harriett Moyer

Rural housing is considered less adequate than urban housing.[1] In 1960 for example, 8.5 million occupied units in the United States were classified as less than sound in the U.S. Census categories. More than half were in rural areas, yet people in rural areas make up only about one-third the United States population. One farm family in four lived in dilapidated or deteriorating housing, compared with one urban family in 12. About 9 out of 10 dwellings without piped water inside were in rural areas in 1960. Of the six million dwellings without a flush toilet, more than 5.4 million were in rural areas.

Such housing conditions are one indicator of lagging economic conditions in rural areas. Industrial development of any type is seen as a means of economic revitalization in such locations. The apparent underlying theory of government programs such as the Rural Development Act and local leaders' actions is that an increase in the level of manufacturing activity will solve many of the problems involved in the development of services, systems, and shelter. Specifically, in relation to the provision of improved housing in the rural areas, the rationale is, increased level of manufacturing activity will change the income level and eventually the age structure and educational levels of the people. Since quality housing is highly valued, improved economic conditions should lead to improvements in housing quality. As disposable income rises, theoretically, some of that money should flow into improved housing which would involve less crowded conditions.

Thompson[2] found in his study of urban areas that specialization in manufacturing affects the local income patterns tending to generate a relatively high level of family income--especially specialization in

durables and that this, in turn tends to indirectly reduce educational inequality. Specialization in nondurable goods manufacturing appeared to indirectly reduce income inequality by raising the female labor participation rate. Although this study did not investigate the impact of raising levels of income and education on housing quality, it is known that housing quality is higher in urban areas. At least in the urban areas then, the usual rationale regarding industrialization appears to hold. But do the same patterns appear in the rural areas as industrialization increases there?

Hints that such a rationale may be overly simplistic in relation to the rural areas are presented in the writings of Thompson[3] who discusses a filtering-down theory of industrial location. He states, "a filter-down theory of industrial location would go far toward explaining the southern small-towns' lament that they always get the slow-growing industries. Out-of-the-way towns like these find they must run to stand still, because their industrial catches come to them only to die. . . in order to develop, it seems that the smaller, less favored area must attract each successive industry a little earlier in the industry's life cycle, while it still has substantial job-forming potential and more important, while higher-skill work is required. Only by upgrading the labor force on the job and generating the higher incomes--hence the fiscal capacity needed to finance better schools, can the area hope to break out of its under-development trap." In other words, not all industry will have the desired effects on education, income, and age structure. In fact, according to this theory, the very industries which would tend to have the least impact on these variables will be attracted to the less developed areas because they neither

need nor want highly skilled, educated labor which could demand the high incomes which would have a subsequent impact on the quality of housing in the area.

Scott and Summers[4] point out the various effects that different types of industry have on a community. They note that a factory hiring women will bring increased income for many households in the community and that there will be little increase in the number of houses, although there may be some remodeling or moving up in the world to a new house. A factory hiring mostly men will not cause the per capita income to rise much but there will be an increase in required housing.

The above readings suggest that specific types of industries will have rather specific effects and the notion that increased level of manufacturing activity per se will solve the rural area problems--especially in relation to improving the quality of housing--may not be justified. This paper is an attempt to determine whether quality of housing increases as manufacturing level rises in nonmetropolitan counties.

Review of the Literature

The field of housing encompasses many activities and professions. Among the generally acknowledged are the legal, banking, sales, design, and construction. Consequently the literature is scattered through many disciplines but there appear to be some rather glaring gaps and inconsistencies.

In 1948, Merton[5] stated "social psychologists hold that character structure is formed in early years and largely lived out in small primary groups of household, play group and neighborhood and yet run from implications that the study of these groups in their physical setting is an essential part of their scientific task." He added that in his opinion, "We can scarcely fail

to build a social psychology of housing." The field is still largely undeveloped although there has been an increasing awareness of the importance of environment, including housing and playground environments, in perhaps the last five years.

Major difficulty involved with the study of housing is how to quantify housing quality. McCue and Ewald[6] write in their book for architects of the need for comprehensive considerations in designing housing, and the difficulty of quantifying some of the elements. "A human is a rational-irrational-extrarational being. He is a compound of intellect, emotion, and spirit. His needs and his understanding of his environment are not precisely quantifiable, and at this time there is no accepted comprehensive definition of human environment nor even any accepted ordering of knowledge, thought, or wisdom concerning it." Fried[7] wrote on this same point, "I learned that although the U.S. Government has placed the number of inadequate housing units in the nation at the widely quoted figures of six million, the number is actually more like 11 million, or one out of every six housing units in the nation and that even this is a crude and conservative estimate at best because the society whose computerized technology has rocketed man to the lunar surface has been unable thus far to measure the quality of its housing in any but the most rudimentary way." Nygren[8] points out that the census statistics actually reveal little about the quality of housing or the impact that housing has on people since no valid basis has been established for comparing the livability of spacious housing, lacking in modern plumbing and perhaps with a leaky roof, with that of cramped quarters having modern plumbing and a good roof.

Wilner[9] et al reports that the oldest tradition of scientific investigation of the social effects of architecture, e.g. housing, and the planned

environment deals with their effect upon health. Several issues have emerged and current research tends to focus around three major areas: (1) the degree to which the negative or positive influence of housing on health is the result of the impact of the physical environment per se and the degree to which it can be attributed to the social characteristics of the people who live in good or bad housing, (2) the delineation in precise terms of those aspects of architecture and the environment that are principally responsible for the influence that the physical environment can exert on illness and social pathology, and (3) the clarification of the kinds of behavior or illness that are most likely to be affected by the quality of the environment

Chapin[10] wrote "housing is a complex of environmental factors--a combination of space occupied, space for ease of circulation, noise, sanitary arrangements, light and ventilation." Fruitful research must be based on an analysis of the effects of these factors.

Space and density appear to be the areas of research dealt with by sociologists. Crowding and density are important sociological attributes of housing. Crowding pertains to number of people per room within a dwelling unit while density indicates the population concentration in an area. The research appears to be inconclusive but the dimensions are clearly important as the consequences of either crowding or high density levels are not trivial. Possible linkages between social pathologies and crowdedness and density have already been mentioned in Wilmer's statement on relevant research.

Specifically in sociology there appear to be two major frameworks from which the literature most pertinent to this paper has sprung. Each

of the frameworks argues that population density has important social consequences. The Durkheim point of view emphasizes the importance and positive effects of density in relation to the development of the division of labor while the viewpoint of Simmel stresses the possible negative facets of density because of the psychological strain involved in high density living. The following studies are presented in relation to space and density without necessarily relating them back to the two major sociological frameworks cited.

Space Studies. Blake[11] studied the effects of closed cubicles versus a large open space within an army barracks and concluded that interpersonal relations intensified in closed areas. The total space was the same with or without the cubicles but the rearrangement of the space changed the relationships of the individuals to each other.

Location of the space as well as design and amount of square footage appears to have an impact on the inhabitants. The same socio-economic groups were found to have higher crime rates in high rise buildings than in low rise according to a study by Oscar Newman.[12] "Crime--is three times higher in towering elevator apartment buildings, particularly in large projects, than in neighborhoods of detached homes, townhouses, and walk-up garden apartments inhabited by the same socio-economic group." Mitchell[13] further found that people living on higher floors had more problems than those living on lower ones.

Hall's[14] and Felipe and Sommer's[15] work both deal with a personal space concept. This space is defined as an area with invisible boundaries surrounding a person's body into which no one may intrude. They state that the need to maintain such a space "bubble" is deeply rooted in the

human personality even though its boundaries vary cross-culturally. It is logical to assume, therefore, that the higher the density within a dwelling unit or an areal unit, the more difficult it would become to maintain this personal space.

Bossard and Boll[16] studied the forms of adjustment families make to cramped quarters. They found changes in eating patterns, bathroom usage, and times of rising which were mainly made "to keep the home going."

Density Studies. Calhoun's[17] studies of the Norway rat are frequently cited as possible evidence of the negative effects of crowdedness on man but usually man's superior adaptability in relation to animals is also stressed when statements are made concerning these studies.

Mitchell[18] concluded that while overcrowding produces superficial signs of psychological stress, it does not cause deeper and more basic levels of emotional strain.

Schmitt[19] does not consider crowding within a dwelling unit as important as areal density and Levy and Herzog[20] also make similar conclusions. Galle[21] et al state, "There is evidence which suggests that overcrowding in the home is detrimental to the well-being of the individual even after controlling for economic and racial factors" and in another study add, "it is density at this, the household level, that both theory and research suggest is the most important in the production of pathological behavior."[22] Winsborough[23] investigated the social consequences of high population density per areal unit and concluded that the effects of density on the young seem to be different from those on adults.

In summary the evidence on the various effects of density within an areal unit and crowdedness within the dwelling unit appear to be

inconclusive. Perhaps there is a curvilinear relationship in which the two end points, isolation and "extreme" density either within an areal or dwelling unit, are detrimental, while the "best" level of density would be in a middle range which would vary depending on what characteristic was being optimized. A conservative approach would argue for a lower rather than a higher density in both dwelling and areal units.

Definition of Terms

The terms, density and crowdedness, are used somewhat interchangeably in the literature. Further, the difficulty of defining quality of housing has already been pointed out. Level of manufacturing is also a key concept which might be interpretated in various fashions. Therefore, the following definitions of terms are offered to help clarify subsequent statements in this paper.

For purposes of this paper the term, crowdedness, will pertain to the number of people per room within a dwelling unit. The census standard of 1.01 people per room will be utilized to indicate crowdedness. Quality of housing, the dependent variable in the study, will be measured by the proportion of housing which is crowded as defined by the census standard.

The term, density, will be utilized to indicate the areal population concentration.

Level of manufacturing activity will be the term used to indicate the amount of industry in the nonmetropolitan counties under study. This concept will be measured by the proportion of the civilian labor force in durable manufacturing and the proportion of the civilian labor force in nondurable manufacturing.

Specific Problem and Basic Assumption

The specific problem investigated in this study was the determination of the amount of change in the quality of housing in relation to the amount of change in level of manufacturing activity in a population of nonmetropolitan counties.

The basic assumption was made that industries had been allowed to locate at will in the counties being studied and that no particular or consistent efforts had been made across the sample to attract industries which would specifically raise the skill levels of the people working in the sample counties.

Hypotheses

Two somewhat opposing hypotheses were suggested by the literature. The first hypothesis, the higher the level of manufacturing activity, the higher the quality of housing in rural areas, was suggested by the approaches utilized in governmental programs and local leaders in rural development.

The second hypothesis, derived from the filtering-down theory, was, there will be no significant impact on the quality of housing in rural areas from industries which are attracted to rural areas.

Methodology

A ten percent stratified sample from the United States population of nonmetropolitan counties as of 1950 was drawn. This resulted in a sample of 276 counties located in forty states.

Data from the U.S. Census were utilized. Six independent variables were readily available and suggested by Thompson's writings. They were: median education, male; median education, female; median family income;

median age, proportion of civilian labor force in durable manufacturing and proportion of civilian labor force in nondurable manufacturing.

The zero-order correlations were used to measure the associations between median age, median family income, median education, and proportion of employees in durable and nondurable manufacturing. Then the associations between age, income and education on quality of housing were, in turn, determined by zero-order correlations. T-tests were performed to determine which of the associations were significant. A multiple regression equation encompassing all the variables was utilized next to determine the total variance explained and the relative importance of each of the variables on the quality of housing. Separate correlations and regressions were used on the census data for the years, 1950, 1960, and 1970. In addition, the correlations between the 1950 data on the independent variables and the 1960 data on the dependent variable were investigated as well as the similar patterns between 1960 and 1970 to determine whether a time-lag might make a significant difference on the impact of the independent variables on the quality of housing.

Results

The zero-order correlations and the results of the t-test for significance between the indicators for level of manufacturing activity and the education, income, age, and quality of housing variables are shown in Table 1 for the years 1950, 1960, and 1970.

TABLE 1

ZERO-ORDER CORRELATIONS BETWEEN LEVEL OF MANUFACTURING INDICATORS AND SELECTED VARIABLES

Variables	Year	Md. Ed., Male	Md. Ed., Female	Md. Income	Md. Age	Quality of Housing (Prop. of Crowded Dwellings)
% of Civilian Labor Force in Dur. Mfg.	1950	-.078	.093	-.001	.004	-.073
% of Civilian Labor Force in Nondur. Mfg.	1950	.214 (s)	.250 (s)	.284 (s)	.167(s)	-.121
% of Civilian Labor Force in Dur. Mfg.	1960	.006	-.051	.158	-.044	-.099
% of Civilian Labor Force in Nondur. Mfg.	1960	-.146	-.218 (s)	.057	-.037	-.045
% of Civilian Labor Force in Dur. Mfg.	1970	-.141	-.205 (s)	-.101	-.065	.038
% of Civilian Labor Force in Nondur. Mfg.	1970	-.362 (s)	-.455 (s)	-.171	-.018	.027

(s) = significant as indicated by t-test

For the most part educational level of both males and females and percent of civilian labor force in nondurable manufacturing are significantly negatively correlated throughout the 20-year period. That is the greater the proportion of people in nondurable manufacturing, the less their educational level. Positive correlation between income and nondurable manufacturing is significant in 1950 but by 1970 the correlation has become negative although it is not significant. The only significant correlation between educational level and percent in durable manufacturing appeared in 1970. This was a negative correlation between median education of females and the percent in durable manufacturing. No significant correlation directly between the level of manufacturing activity indicators and quality of housing appeared in any of the three decades.

The zero-order correlations and the results of the t-test for significance between the education, income, and age variables and the quality of housing as measured by the proportion of crowded dwelling units are shown in Table II. The associations were significant between all variables for each of the years investigated.

In Table III the zero-order correlations are shown between the indicators of level of manufacturing activity and quality of housing in time-lag sequences. There were no significant associations between 1950 to 1960 and 1960 to 1970.

Since zero-order correlations are biased if other variables should be included and are omitted, the multiple regression equations are presented in Table IV. Means and standard deviations of the variables utilized are shown in Table V.

TABLE II

ZERO-ORDER CORRELATIONS BETWEEN QUALITY OF HOUSING INDICATOR AND SELECTED VARIABLES

Variables	Years	1950	1960	1970
	Quality of Housing (Proportion of Crowded Dwellings)			
Md. Education, Male, 1950		-.591 (s)		
Md. Education, Female, 1950		-.533 (s)		
Md. Income, 1950		-.460 (s)		
Md. Age, 1950		-.754 (s)		
Md. Education, Male, 1960			-.440 (s)	
Md. Education, Female, 1960			-.447 (s)	
Md. Income, 1960			-.341 (s)	
Md. Age, 1960			-.508 (s)	
Md. Education, Male 1970				-.373 (s)
Md. Education, Female, 1970				-.378 (s)
Md. Income, 1970				-.332 (s)
Md. Age, 1970				-.439 (s)

(s) = significant as indicated by t-test

TABLE III

ZERO-ORDER CORRELATIONS BETWEEN LEVEL OF MANUFACTURING INDICATORS AND QUALITY OF HOUSING IN TIME-LAG SEQUENCES

Variable	Quality of Housing 1960 (Prop. of Crowded Dwellings)
% of Civilian Labor Force in Durable Manufacturing, 1950	-.056
% of Civilian Labor Force in Nondurable Manufacturing, 1950	-.031
	Quality of Housing 1970
% of Civilian Labor Force in Durable Manufacturing, 1960	-.056
% of Civilian Labor Force in Nondurable Manufacturing, 1960	-.088

TABLE IV

REGRESSION EQUATION FOR QUALITY OF HOUSING FOR 276 NONMETROPOLITAN COUNTIES

$Y_{i\ 50}$ =	.838	-.10 (% in Dur. Mfg.) 1950	+.22 (% in Non-dur. Mfg.) 1950	-.015 (Md. Ed., Male) 1950	+.0009 (Md. Ed., Female) 1950	-.0167 (Md. Age) 1950	-.000017 (Md. Family Income) 1950	(Unstandardized Coefficients)
Quality of Housing 1950 (Prop. of Crowded Dwellings)		-.08	+.05	-.17	+.012	-.62 (s)	-.138	(Standardized Coefficients)
Standard error of regression coefficient		.050	.158	.007	.006	.001	.000007	
						R^2 = .63		
$Y_{i\ 60}$ =	.71	-.13 (% in Dur. Mfg.) 1960	-.15 (% in Non-dur. Mfg.) 1960	-.0088 (Md. Ed., Male) 1960	-.018 (Md. Ed., Female) 1960	-.009 (Md. Age) 1960	-.0000017 (Md. Family Income) 1960	(Unstandardized Coefficients)
Quality of Housing 1960 (Prop. of Crowded Dwellings)		-.11	-.12	-.12	-.28	-.45 (s)	-.016	(Standardized Coefficients)
Standard error of regression coefficient		.059	.061	.008	.007	.0009	.000006	
						R^2 = .43		
$Y_{i\ 70}$ =	.45	-.028 (% in Dur. Mfg.) 1970	-.14 (% in Non-dur. Mfg.) 1970	-.005 (Md. Ed., Male) 1970	-.0047 (Md. Ed., Female) 1970	-.0056 (Md. Age) 1970	-.000009 (Md. Family Income) 1970	(Unstandardized Coefficients)
Quality of Housing 1970 (Prop. of Crowded Dwellings)		-.04	-.12	-.14	-.109	-.50 (s)	-.276 (s)	(Standardized Coefficients)
Standard error of regression coefficient		.029	.063	.004	.004	.0005	.000002	
						R^2 = .40		

(s) = significant

TABLE V

MEANS AND STANDARD DEVIATION OF VARIABLES UTILIZED

Variable	Mean	Standard Deviation
Prop. of Crowded Dwellings		
Year 1950	.20	.10
1960	.14	.09
1970	.09	.05
% in Dur. Mfg.		
Year 1950	.070	.075
1960	.082	.076
1970	.056	.090
% in Nondur. Mfg.		
Year 1950	.021	.024
1960	.081	.076
1970	.048	.048
Md. Education, Male		
Year 1950	8.32	1.17
1960	9.08	1.29
1970	10.53	1.48
Md. Education, Female		
Year 1950	9.14	1.39
1960	10.03	1.45
1970	11.12	1.28
Md. Age		
Year 1950	28.47	3.79
1960	29.39	4.58
1970	30.25	5.03
Md. Family Income		
Year 1950	2208.0	789.21
1960	4004.1	1180.1
1970	7222.8	1617.1

Discussion

The zero-order correlations in Table I appear to indicate that both durable and nondurable manufacturing activity in the rural areas are associated with low educational levels and low income. Further, over the years from 1950 to 1970 these associations became increasingly significant. This trend is not particularly surprising if one considers the fact that, for the most part, the marginal farmers and poorer nonfarm families in the rural areas would logically compose the labor-shed for the manufacturing which has moved into these areas. The manufacturing firms which locate in these areas do so with the hope of capitalizing on the assets already there which include relatively unskilled labor. Members of affluent farm operations would not be logical candidates for employment in manufacturing activities as their income would already be superior to that offered at these manufacturing plants.

The idea then that increased manufacturing activity in the rural areas tends to raise both incomes and educational levels does not appear to be supported. In addition, manufacturing activities appear to have had little significant impact on the age structure in the sample of rural counties. However, perhaps the manufacturing activity has had a stabilizing effect in these areas and thereby prevented still further decline.

Table II reveals the expected association between age structure, income, and educational level and quality of housing as measured by the proportion of crowded dwellings. That is, the lower the income, educational level, and age structure, the higher the proportion of crowded dwellings. When labor force participation in manufacturing was correlated directly with the quality of housing variable on a time-lag basis in Table III, the expected relationship

of less crowded housing with a higher level of manufacturing activity is found. However, the correlations were not significant as indicated by the t-test. Therefore, the type of manufacturing which has located in the rural areas appears to have had little effect on the quality of housing, at least as measured by the proportion of crowded dwellings. As pointed out in the review of the literature, crowdedness is only one dimension of housing quality. It is possible that on some other facet not considered in this paper, housing quality may have shown significant improvement in these rural counties as level of manufacturing activity increased.

The coefficients of determination of the regression equations show that the model explains less variance with each decade. The standard deviations on the quality of housing indicator over the three decades are consistently smaller, however, so there is simply less variance to explain. This finding coincides with that of Carnahan, Gove, and Galle who concluded that crowding in the household was declining for the nation as a whole but serious household overcrowding is more of a problem on farms than other locations.

The age variable was the only significant beta across all three equations and the unstandardized coefficients indicate it decreased in weight with each decade. The decreasing weight of this variable is not surprising when one considers the migration patterns of the rural youth to the metropolitan areas. There are simply proportionately fewer young people in the rural areas.

Within each of the equations, age again had the strongest negative association with the quality of housing indicator. That is, the lower the age, the more crowdedness in dwellings. This might be explained by the

fact that single young people in farm areas would still be living with their nuclear families in most instances.

In the equation for the 1950 data, male education level was the second most important variable. The lower the education level, the more crowdedness. The same findings, in relation to education, also hold true in the equation for the 1960 data. Since it is known that education and income are highly correlated one might expect housing quality to improve with educational level.

Throughout the equations, negative associations between percent of people in manufacturing and quality of housing appear, with the exception of 1950, where there is a positive association between percent in nondurable manufacturing and quality of housing. That is generally the more people who were in manufacturing, the less crowding there was. The betas were not significant, however. This would tend to indicate that the type of manufacturing which had moved into the rural areas over the past three decades was not significantly raising the quality of housing, at least in relation to crowdedness.

Conclusions and Implications

The hypothesis derived from the filtering down theory that there would be no significant impact on the quality of housing in rural areas from industries which are attracted to rural areas appears to be supported.

The hypothesis that the higher the level of manufacturing activity, the higher the quality of housing, which was derived from the approaches utilized in governmental programs and local leaders in rural development is not supported.

Concern over the relatively large sums of money and efforts which are being poured into such governmental programs as those under the Rural Development Act, coupled with the apparent small impact on the quality of life and especially housing led to this investigation. Both governmental programs and local leaders appear geared to the concept that industry, any kind of industry, will produce the desired impact on the rural areas. Our own results cast doubt on such an idea and point to the need for reassessment of rural development policies. It is evidently necessary to attract specific types of industry which will raise the skill levels of the labor force involved if the quality of life is going to be raised rather than maintained at whatever standard is currently in effect. Our data revealed that once education and income levels rise, housing quality also rises. Our study revealed that industrialization of the type which has occurred in our sample of rural counties over the past 30 years has had a negligible effect on quality of housing as measured by amount of crowdedness.

The housing conditions as evaluated under our current measures reveal that rural people are more ill-housed than their urban counterparts. It appears that the traditional efforts to bring in industry regardless of its type will not solve the rural housing problem. Either specific growth types of industry must be attracted to the rural areas or housing must be subsidized more heavily and directly if its quality is to improve in the rural areas.

Further study and research appears to be needed to determine what specific industries would seem best suited to produce the desired improvements in quality of living and especially housing in the rural areas. Our preliminary results and the literature appear to point in the direction

of the need for concentration on durable, growth type industries if significant impact is going to be made.

Lastly, an even more basic concern must be expressed regarding the research on housing quality. What really is involved in quality of housing? It would appear to be far more than just a matter of density in either the areal or dwelling units. Density seems to be utilized in housing research simply because it is fairly tangible and relatively easy to deal with. Research on density appears to be somewhat inconclusive. Perhaps we should concentrate our efforts on better measurements in relation to the total housing environment before delving deeper into an exploration of the apparent effects of overcrowding.

FOOTNOTES

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FOOTNOTES (Cont'd.)

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