SOME DYNAMIC INDICATORS OF NEIGHBORHOOD CHANGE: A CASE STUDY

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1. INTRODUCTION

Social indicators serve a number of different functions in the analysis of social policy, the description of social change and social reporting for administrative purposes (Land, 1972). Although much of the current literature concerns broad regional and national interests, there is also a need to develop indicators at the local or neighborhood level. Many planning and policy decisions concerned with actions such as zoning or the location of public facilities need both sounder background evaluation and subsequent monitoring, procedures which would benefit from the development of appropriate indicators.

Data inputs to planning and policy activities serve three main functions: (1) to provide basepoint information such as the need for specific services; (2) to generate insights regarding processes thereby providing a greater understanding of the way in which a given problem arises or changes; and (3) to provide a basis for evaluation of the impact of decisions. Our particular concern in this paper is with data relating to population composition and housing. All too often, the decennial census is the only source of such data available to the planner. Unfortunately, the Census can only serve the first of these three functions adequately; both the time between successive censuses and the inability to link individual records longitudinally greatly restricts its value in explanation and evaluation.

In this paper we demonstrate the potential value of comprehensive micro-level longitudinal files for neighborhood analysis. Such files permit the identification of the sets of transactions which underly the changes in population and housing characteristics and thereby provide planners with a basis for assessing the extent to which changes in such characteristics are responsive to public actions. Essential to the development of this argument is a conceptualization of change processes at the local level. Such a framework was established in an earlier paper (Gale and Moore, 1972) and we reproduce its basic elements in Figure 1. The most important points are (i) the concept of an occupancy pattern which is the specific assignment of households with given characteristics to dwellings with given characteristics (the A matrices), and (ii) the differentiation between changes in occupancy which arise from residential mobility (the M matrices) and the changes due to demographic processes and structural modification which take place in units which do not experience a household relocation (the S matrices). Our purpose here is to apply this conceptualization to a specific problem, namely the analysis of changes in the degree of overcrowding in one neighborhood in Wichita, Kansas.

2. ANALYSIS

2.1 The Definition of Overcrowding

A very simple definition of overcrowding is adopted to keep the amount of computing to a minimum. Although Federal guidelines contain far more complex definitions (taking into account sex, age, and relationships of all members of the household), this simplified procedure is sufficient in exploring the relative contribution of different transactions to change in overcrowded units. In the subsequent analysis, the following situations are defined as being overcrowded:

i) a one-bedroom dwelling containing three or more persons
ii) a two-bedroom dwelling containing four or more persons
iii) a three-bedroom unit containing five or more persons.

Dwellings with four or more bedrooms were excluded from the analysis.

2.2 Data

The necessary data were obtained from the annual enumeration of population and housing of Wichita-Sedgwick County Metropolitan Area, Kansas in 1971, 1972 and 1973 (for a full description of these files, see Gschwind (1973)). The enumeration includes all dwelling units in the county and records a wide range of data for both the dwelling unit and the occupant households; these data are recorded in such a way that specific dwellings and households can be linked in successive years thus permitting the detailed documentation of change.

This illustrative study focuses on one small area comprising four census tracts (15, 27, 28, 29) just to the west of the central business district. Its population is white lower middle class living mainly in single family homes. During the first year (1971-2) the degree of overcrowding remained stable but dropped markedly in the second year (1972-3). However, even in the first year, different components of the system affected overall overcrowding in different ways and it is important to realize the ways in which these components are in balance.

In each year it is possible to assign each dwelling unit to the categories

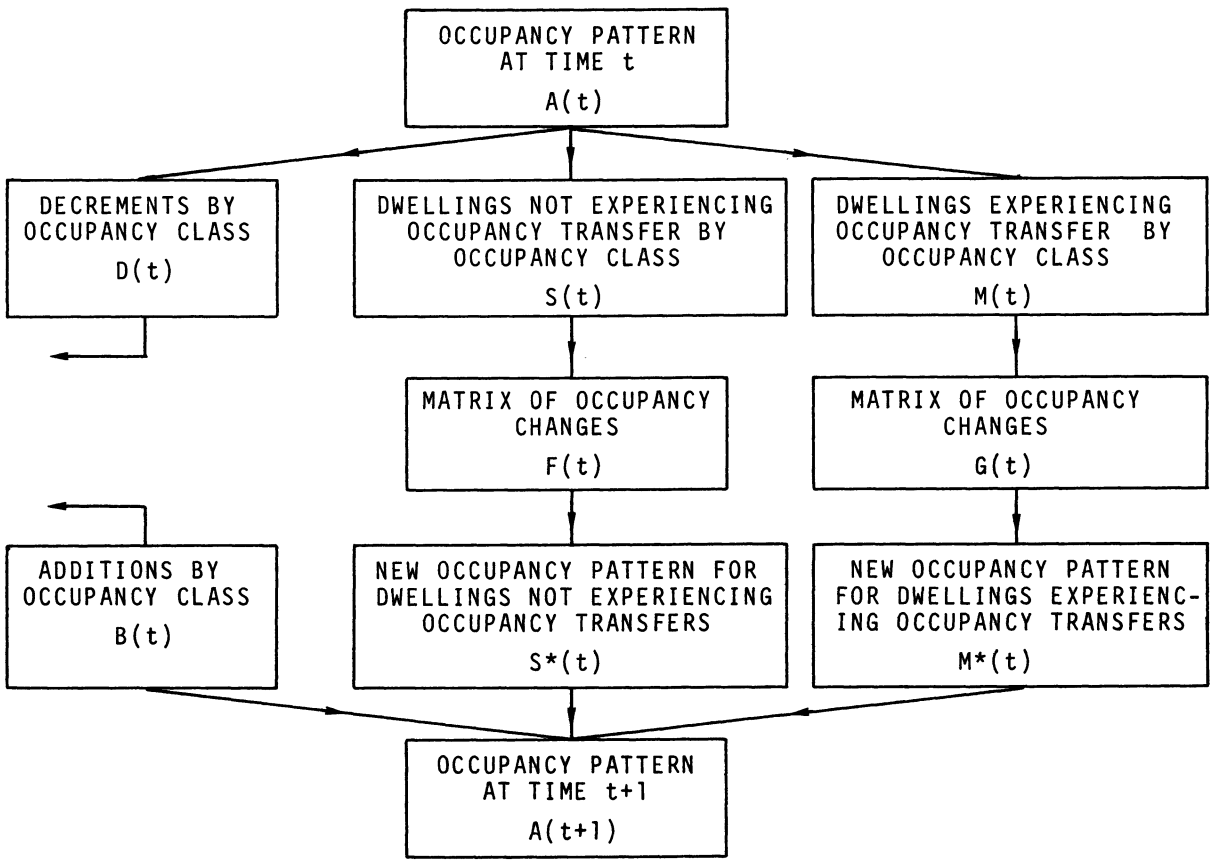


FIGURE 1: SOURCES OF CHANGE IN THE OCCUPANCY PATTERN OF A NEIGHBORHOOD

"overcrowded" (O) or "not overcrowded" (NO) according to the definition in 2.1; from this assignment the occupancy matrices can be constructed in the form shown in Figure 2. The set of occupancy matrices for the years 1971-2 and 1972-3 corresponding to the conceptual framework in Figure 1 are set out in Figure 3. The change matrices F and G are not reproduced here for lack of space but are available on request.

		O	NO
Owned Units	1 bedroom	7	158
	2 bedroom	182	1171
	3 bedroom	151	498
Rented Units	1 bedroom	62	591
	2 bedroom	170	528
	3 bedroom	88	113

FIGURE 2: INITIAL OCCUPANCY MATRIX FOR 1971

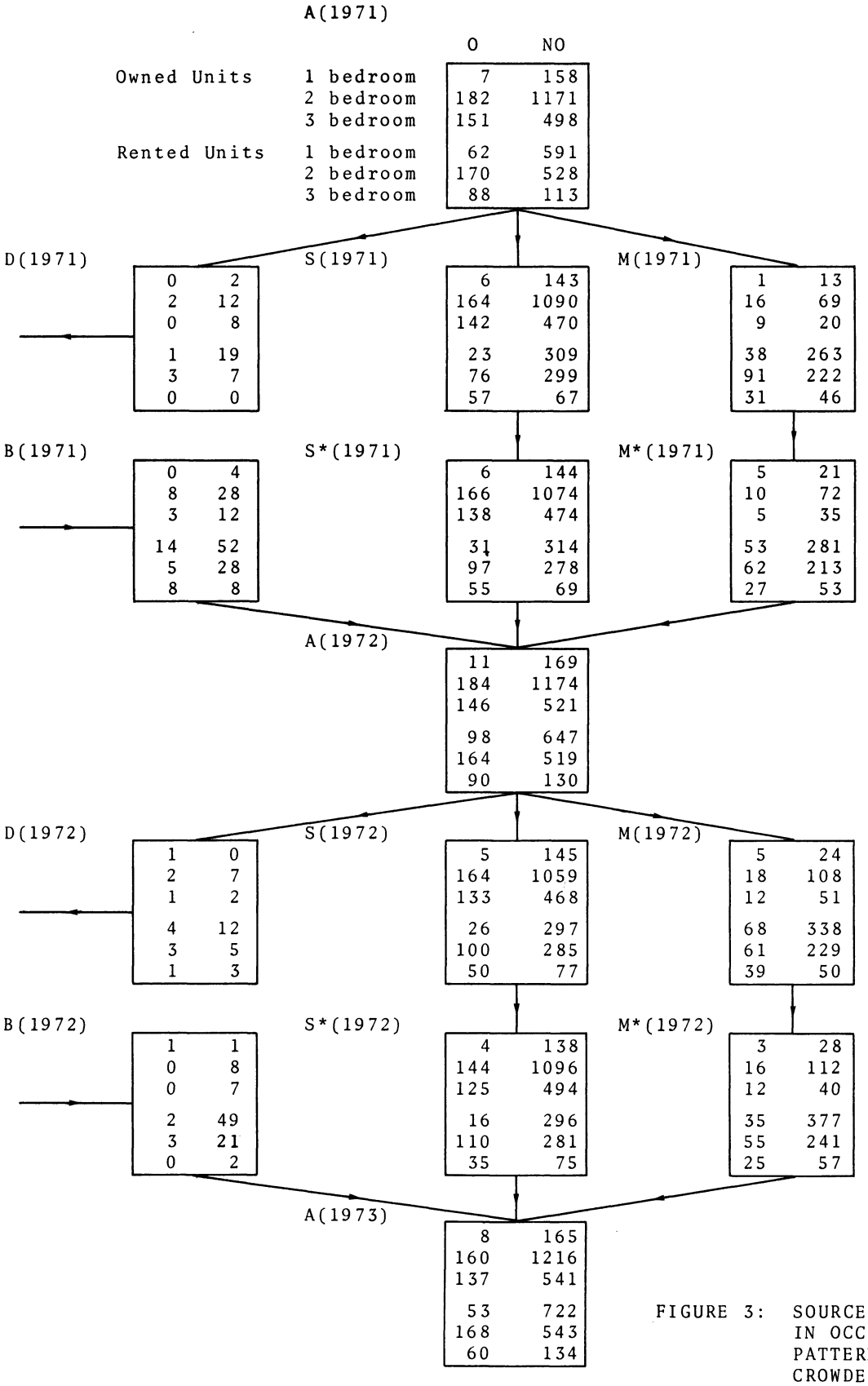


FIGURE 3: SOURCES OF CHANGE IN OCCUPANCY PATTERN FOR OVER-CROWDED UNITS 1971-3

2.3 Components of Change in Overcrowding

Shifts in the overall pattern of overcrowding arise from the four elements identified in Figure 1; from demolitions, from new construction, from residential mobility and from changes in the stable population. From the planning viewpoint, it is desirable to develop measures of the impact of these four processes. At the simplest level we can identify the proportion of overcrowded units in each component of change as is done in Figure 4. From this representation it is seen that each process acts in different ways. Both demolition and construction seem to possess little consistency from one year to the next reflecting the locational specificity of decisions in this sector. The relative behavior of the S and M matrices is more revealing; in both years, the dwellings experiencing occupancy transfers exhibited noticeably greater reductions in overcrowding than those which did not. This might lead to the inference that it is mobility which is the most important component of change but such a conclusion requires more critical analysis.

In the previous paper (Gale and Moore, 1972, p. 258), we defined rates of change for each occupancy class due to each of the four elements. Using the notation that a_{jk} represents the number of observations in cell jk of the matrix A, (in this study, for example, a_{11} (1971) has the value 7 representing the number of overcrowded units in 1 bedroom owned units at the beginning of the period, 1971-2) we define the following proportionate rates:

i) due to demolitions: $d_{jk}/a_{jk} = \gamma_{jk}$

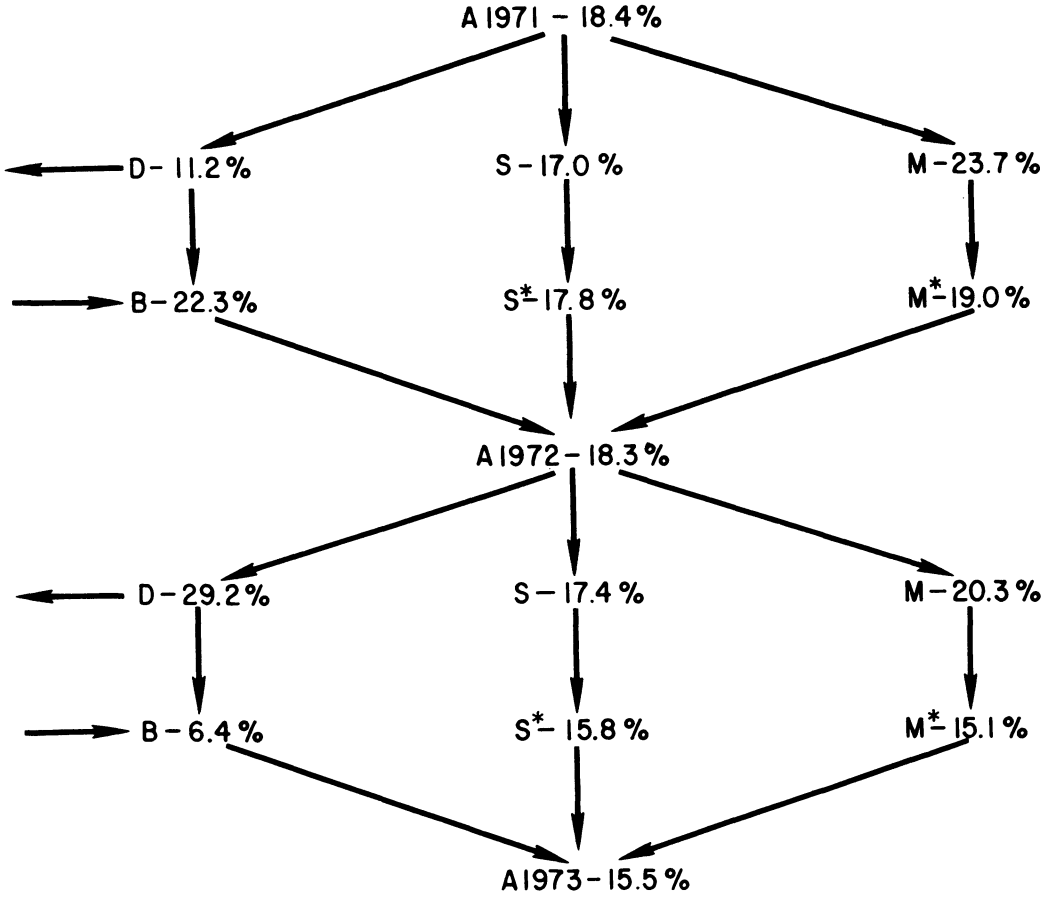
ii) due to additions: $b_{jk}/a_{jk} = \delta_{jk}$

iii) due to occupancy transfers: $(m^*_{jk}-m_{jk})/m_{jk} = \alpha_{jk}$

iv) in the remaining stock: $(s^*_{jk}-s_{jk})/s_{jk} = \beta_{jk}$

The composite rate for iii) and iv), λ_{jk} is the rate of change in that part of the stock unaffected by construction activity and is defined by

$$\lambda_{jk} = \theta_{jk}.\alpha_{jk} + (1-\theta_{jk}).\beta_{jk}$$



% OVERCROWDED UNITS FOR EACH COMPONENT – CENSUS TRACTS 15,27,28,29

Figure 4

Parameter		γ		δ		α		β		θ		λ	
Year		1	2	1	2	1	2	1	2	1	2	1	2
Structure Type													
	1	*	-090†	*	090	*	*	*	*	*	*	*	*
Owned	2	-011	-011	044	*	-375	-111	012	-122	088	099	-022	-121
	3	*	-007	020	*	*	*	-028	-060	060	083	-052	-055
	1	-016	-041	226	020	395	-485	350	-385	613	723	377	-457
Rented	2	-018	-018	030	018	-320	-098	278	100	535	379	-047	024
	3	*	-011	091	*	-129	-359	-035	-300	352	438	-068	-326
All Owned		-006	-011	032	001	-231	-114	-006	-096	076	103	-023	-098
All Rented		-012	-022	084	014	-113	-315	173	-085	500	488	030	-197
All Units		-009	-017	043	009	-129	-232	053	-092	282	298	002	-134

*insufficient observations

†decimal point omitted

TABLE 1: PARAMETER VALUES FOR COMPONENTS OF CHANGE, 1971-2 AND 1972-3

		Mobility Rate		Fraction Becoming Overcrowded	
		O	NO	0	NO
Structure Type					
	1	*	082†	*	*
Owned	2	088	059	308	100
	3	060	040	*	187
	1	613	444	281	102
Rented	2	535	424	152	180
	3	352	408	364	235
All Owned		076	056	286	133
All Rented		500	378	225	147
All Units		282	210	234	145

*insufficient observations

†decimal point omitted

TABLE 2: DIFFERENTIAL IMPACTS OF MOBILITY FOR OVERCROWDED (O) AND NOT OVERCROWDED (NO) UNITS, 1971-2

where θ_{jk} is the mobility rate of occupancy class jk. The values of γ, δ, α, β, θ, λ for overcrowded units by structure type for 1971-2 and 1972-3 are given in Table 1.

The parameter values in Table 1 provide a more critical perspective on the nature of change. It shows that although the total number of events involved in the demolition and construction processes are relatively small, they are critical if the changes generated by mover and nonmover households are in balance; such was the case in the first year with the building activity resulting in an overall 3.4% increase in overcrowded units and the other two elements essentially cancelled each other out. In the second year, however, there was both a reversal of the impact of nonmover households resulting in a reduction in overcrowded units and an increased rate of reduction in overcrowding due to mobility. These two effects result in 13.4% decrease in overcrowded units as against a 0.8% reduction from the building sector. From a planning perspective, perhaps the most important point is that the major effects are found in the rented sector. In particular, 1 bedroom rented units possess large changes for all parameters in the direction of reduced overcrowding. Such an observation would suggest that this particular sector of the market should be examined in greater detail to determine if a single apartment block or localized set of units are the ones most responsible for the change and, if so, the specific reasons for these effects.

The relationship between population mobility and overcrowding is of particular importance given the large changes which are effected in the study area through mobility. Two further questions are of interest here. Are overcrowded units more likely to experience a household relocation than those which are not overcrowded? Once a relocation takes place, is an overcrowded unit more likely to be overcrowded with its new occupants than one which was originally not overcrowded? Table 2 provides a comparison of mobility rates and of the proportion of units overcrowded after relocation for each occupancy class for 1971-2. From this we can see that overcrowded units, in general, are subject to higher levels of mobility, but that there is a much greater likelihood of an overcrowded unit remaining overcrowded after a new household moves in for almost every structure type. Given these counteracting tendencies, the precise role of mobility is still indeterminate. Further analysis is required, the most promising direction being to distinguish dwelling units on the basis of condition, the inference being that it is the overcrowded poorer units which are more likely to remain overcrowded.

3. CONCLUSION

The material presented in this paper is illustrative and the specific parameters only refer to one area for a short period of time. Perhaps of greater interest is the degree to which these parameters vary over different neighborhoods within a city. For example, the study area is characterized by an older population which appears to be in the process of "thinning out". A systematic examination of these parameters for rooming house areas or for upper income suburban neighborhoods would undoubtedly tell us more about the dynamics of small area change within a metropolitan area. However, even within the limited context of this study, we have identified important differences in the contribution of various processes to changes in overcrowding. The types of files available in Wichita permit identification of specific sectors in which change is occurring most rapidly and which deserve more detailed examination from the planner. The development of such files and the search for dynamic indicators in a wide variety of problem areas offers much promise for improvement of the base for planning decisions.

REFERENCES

Gale, S. and E.G. Moore, "Some Dynamic Indicators of Neighborhood Change", Proceedings of the Social Statistics Section, American Statistical Association, 1972, 255-259.

Gschwind, R.A. (1973), "The Intergovernmental Enumeration, Wichita-Sedgwick County, Kansas: 1971-1973", Working Paper No. 2, Research on Metropolitan Change and Conflict Resolution, Philadelphia, Peace Science Unit, University of Pennsylvania.

Land, K.C. (1972), "Social Indicator Models: An Overview", paper presented at the Annual Meetings of the American Association for the Advancement of Science, Washington, D.C.

ACKNOWLEDGEMENT

The support of the National Science Foundation Grant GS-39387 and the assistance of the Wichita-Sedgwick County Metropolitan Area Planning Department are gratefully acknowledged.