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AWARENESS, PREFERENCE, AND INTERURBAN MIGRATION*

Stephen E. White**

The intent of this paper is to stimulate interest in examining interurban migration as a product of urban awareness and preference. Evidence is presented which suggests that out-migration from Topeka, Kansas to thirty-two metropolitan areas in the United States is more closely associated with awareness and preference indices than with size, distance, economic, demographic, environmental, crime, recreation, and education characteristics.

While several researchers have investigated the relationships between cognitive maps and human mobility at the intraurban and interstate scales, very few have focused on interurban images and migration. [1,4,7] This is unfortunate for several reasons. First, a substantial majority (68 percent) of Americans live in Standard Metropolitan Statistical Areas (SMSAs) and recent evidence indicates that most urban inmigrants are former urbanites. [21, 28]. Secondly, while a knowledge of intraurban migration is important for understanding the changing social and economic character of a city, only by understanding and predicting interurban migration can we anticipate the total metropolitan demand for all of those goods and services that we pay planners and politicians to provide. Thirdly, there are substantial differences in the migration attraction of SMSAs in different parts of the United States which are not adequately understood [22]. Finally, a shift to cognitive predictors seems in order as economic, demographic, and gravity formulations have not provided the levels of explained variation that permit us to adequately predict interurban migration. [2, 25]

Cognitive Maps and Migration

Downs and Stea have argued that ". . .human spatial behavior is dependent on the individuals' cognitive map of the spatial environment" [10] . Cognitive maps affect migration in two fundamental ways. First, they define awareness spaces; the areal limits within which a person has awareness. If we assume that people generally migrate to areas from which they have received stimuli, cognitive maps define the limits of a potential migration surface.

Secondly, cognitive maps reflect the character of places as perceived. An evaluation of the residential desirability of a place based on one's awareness of its site and situational characteristics is referred to as a place utility evaluation [34]. Place utilities for alternative destinations can be compared with that of the present location. Place utility and the results of such evaluations promote both the decision to move and the choice of destination.

Cognitive maps are devices that indicate what a person knows and where a person knows what [9]. They result from perceiving and placing differential evaluations on the landscape. In this study, both the awareness component

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**Associate Professor and Head, Department of Geography, Kansas State University.

and the character component of cognitive maps are investigated.

Some past awareness space — migration studies have concentrated on revealing patterns of awareness within the city from observations of intraurban mobility [13]. The intent of these studies was to define awareness; not to predict behavior from awareness. Several other studies have focused on measuring urban and environmental preferences, [8, 11, 23, 26] while studies by Jones [15] and White [31] have focused on measuring how awareness differences affect urban preferences. Very few studies have actually measured the association between long distance migration streams and awareness levels for places. Exceptions include works by Lloyd, [18] Jones and Zannaras, [14, 16] and White [32, 33] which indicate strong positive associations between cognitive variables and migration patterns. Their findings offer promise to researchers who want to extend the understanding of spatial process by examining cognitive predictors.

Purpose of Study

Intraurban migration researchers have supported the notion that residential search behavior is often confined to a very limited space about which residents have awareness [3, 19]. Can we make this assumption at the interurban scale? If so, how can awareness best be defined to reveal migration?

The specific objectives accomplished by this research include:

1) defining four types of awareness indices that 321 residents in Topeka, Kansas exhibit for 32 uniformly distributed SMSAs in 1977,
2) determining the degree to which awareness decay explains past outmigration from Topeka to 32 SMSAs,
3) comparing the degree to which awareness decay indices exceed distance and size variables in explaining migration within a migration potential context,
4) examining awarness decay differences among groups of residents having different propensities to migrate, and
5) assessing the general value of using place utility (residential desirability) instead of objective pull factors to predict interurban migration.

Awareness space can be divided into differing levels of awareness to include:

1) action space	-any area about which one is cognizant,
2) activity space	-that part of the action space from which awareness results from frequent direct physical contact, and
3) indirect contact space	-that part of the action space from which awareness results from second hand information and communications [5, 12].

Four types of awareness characteristics are used here as surrogates of action space, activity space, and indirect contact space. Action space is reflected by Topekans' knowledge of other SMSAs. Knowledge is simply defined as a respondent's ability to make a residential preference evaluation for a particular SMSA. If the respondent had enough information to make a place

utility evaluation about a place, then that place is assumed to be a part of the respondent's action space. Knowledge reflects both direct and indirect contacts.

Activity space demands physical presence. At the intraurban level, activity space includes that part of the environment routinely visited. At the interurban level this notion loses validity. Most people do not routinely visit a sizeable number of other cities. They do, however, have cognition derived from infrequent visits that permit them to develop a much stronger foundation for place utility evaluations than for places they have never visited. Here activity space is defined as including those places that a respondent has visited at least once in the past ten years.

Information about cities may be gathered from friends or relatives without visitation. Indirect contact space is defined as those places in which a repondent feels that he has at least one "friend" or "relative". The definition of "friend" and "relative" was left to the imagination and judgement of the respondent. While numerous studies have indicated that friends and relatives are important pull factors, there is a surprising absence of studies that attempt to measure the statistical association between the distribution of friends and relatives with migration volumes at the interurban scale [6, 20].

The Topeka Survey

During the summer of 1977, 1,000 households in Topeka, Kansas were mailed a survey requesting information about their preferences for, knowledge of, visitation to, and friends and relatives in 32 SMSAs. Three hundred fifty-two surveys were returned and 321 were declared usable. Due to funding restrictions, no follow-up letters were mailed. The sample was determined by systematic selection from the most recent telephone directory.

The age distribution of Topeka respondents is not significantly different from that expected based on the distribution of persons aged twenty and over in the 1970 Census (Chi-Square = 9.08, DF = 4). However, respondent incomes and educational background exceed those of the general population. The median respondent household income is $16,600 (1977 dollars) while 42 percent of the respondents have a college education. Representativeness is not a crucial condition because, for much of the analysis, the conclusions are drawn for groups of respondents having specified socioeconomic characteristics.

The 32 SMSAs evaluated by the respondents were selected to provide a uniform distribution of places of varying size, thus assuring a wide range of awareness and preference values (Figure 1). The nearest neighbor statistic for the sample cities is 1.40 suggesting a distribution between uniform and random.

Topeka Awareness Spaces

Individual awareness values are combined to reveal the aggregate awareness values for the Topeka sample (Table 1). The value for a specific urban place reflects the percentage of Topekans who have awareness (knowledge, visitation, friends, or relatives) of that place. Least squares analysis indicates that distance explains only 20.3 percent of the variation in knowledge and 37.7 percent of the visitation variation.

Topekans have an awareness bias that is oriented toward their south and

FIGURE 1

SAMPLE CITIES

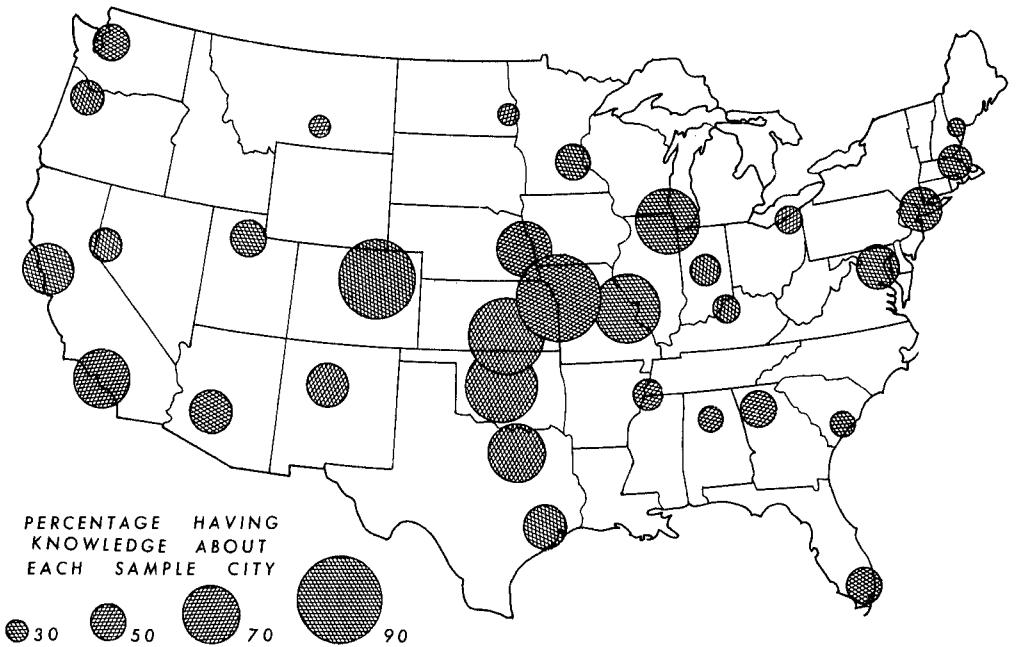
TABLE 1. Topekans' Awareness of Urban Places

	Percent Having Knowledge	Percent Having Visited	Percent Having Friends	Percent Having Relatives
Albuquerque	58.3	50.5	19.3	11.8
Atlanta	49.8	28.7	15.0	5.9
Billings	31.8	15.0	5.0	1.6
Birmingham	36.4	15.0	4.4	2.2
Boston	48.9	20.2	15.3	4.0
Charleston	36.1	12.1	6.2	2.2
Chicago	77.3	55.1	34.3	19.0
Cleveland	40.2	18.4	7.5	2.8
Dallas	70.1	60.4	32.7	15.9
Denver	87.2	77.6	46.4	30.8
Fargo	31.2	12.8	5.6	1.6
Houston	59.8	41.7	22.1	13.1
Indianapolis	44.2	28.0	11.8	9.3
Kansas City	94.7	92.8	68.8	44.9
Los Angeles	71.7	50.8	34.0	30.8
Louisville	40.2	24.6	8.1	4.4
Memphis	46.4	31.5	7.2	2.2
Miami	51.1	24.6	11.8	4.0
Minneapolis	50.5	29.3	16.2	9.3
New York	66.4	33.0	13.1	9.0
Oklahoma City	75.7	64.2	31.5	17.8
Omaha	72.0	58.3	27.7	14.0
Phoenix	57.9	34.3	24.0	15.9
Portland Ore.	47.0	19.0	12.1	10.9
Portland Me.	22.7	5.6	1.2	0.3
Reno	43.3	23.1	3.1	1.9
Salt Lake City	51.1	30.8	10.6	5.0
San Francisco	64.5	41.7	24.0	14.0
Seattle	49.8	19.9	12.5	10.0
St. Louis	79.1	72.3	31.2	12.1
Washington	61.4	34.3	19.9	8.4
Wichita	87.5	76.3	53.0	29.0

southwest. For example, their awareness values for Los Angeles are about the same as those for Chicago despite the fact that Los Angeles is almost three times more distant (Figure 2). Another interesting pattern that deviates from that expected, if we assume that awareness is a function of distance, is Topekans' general lack of awareness for a relatively close corridor of urban areas extending from Cleveland to Birmingham and including Indianapolis, Louisville, and Memphis. If, as hypothesized, migration is a function of aware-

FIGURE 2

TOPEKAN'S AWARENESS OF URBAN PLACES



ness, then distance should provide a much smaller degree of explanation of the out-migration volumes from Topeka to each of the other 32 SMSAs than any of the awareness variables.

Migration and Awareness Space

Migration from Topeka to each sample city is defined as the number of residents, 5 years and older, residing in the sample city's state economic area (SEA) in 1970 who lived in Topeka's SEA in 1965 [30]. There are some conceptual difficulties in associating 1970 migration data with 1977 awareness spaces. The most obvious is the time gap between data. It is assumed that the error introduced by the time lag is logically biased toward reducing the degree of association between migration and awareness space. For example, if there is a significant positive association between migration and awareness, one would expect the degree of association using the 1975-1980 migration data to be at least as strong as that using the 1965-1970 data. Therefore, the results that follow can be considered as "no worse than" associations even if not completely accurate.

Two other problems are that the Census migration estimates are based on a 15 percent sample and that they do not account for intervening moves. The migration data is computed by comparing a snapshot of household locations in 1965 with another snapshot taken in 1970. For example, if a household moved from Topeka to Omaha in 1965, proceeded to Reno in 1966, moved to Denver in 1968, and finally moved to Minneapolis in 1970, the Census data would only reflect the move from Topeka to Minneapolis. Although the data does not yield the total flow of migrants between places over a five year period, it is assumed that relative comparisons of the magnitudes of the flow volumes between pairs of cities can be made using the Census data.

It is hypothesized that distance decay is not as valid a measure of migration probability as awareness decay because migration generally reflects free choices and these choices are products of a decision making process that is confined to that space about which people have awareness. The degree of awareness directly affects the probabilities of migration to alternative destinations while distance is an indirect effect in that it affects migration only to the degree it is perceived accurately and to the degree which it inhibits the development of awareness. The data support these notions.

Awareness values were converted from the percentage of Topekans having awareness to the percentage without awareness so that their direction of association with migration is the same as that for distance and migration. Thus each variable can be viewed as a decay function. An examination of awareness-migration plots revealed non-linear relationships. A series of data transformations were conducted to determine the best fit between migration and the awareness and distance variables. Exponential, normal, square root exponential, pareto, and log-normal transformations were examined. A single log-normal equation of the following form provided the smallest standard errors and the largest R-square values.

$$M_{tj} = c - b_1 (\log X_{tj})$$

Where M_{tj} = the number of migrants from Topeka (t) to city (j).
X_{tj} = the distance from t to j or the percentage of Topekans without awareness of j (awareness can be expressed in terms of knowledge, visitation, friends or relatives)

The correlation coefficients are extremely high for the awareness variables and underscore the potential for using cognitive predictors to explain interurban migration (Table 2). The relatives variable is most strongly associated with migration, followed closely by friends, visitation, and knowledge and not so closely by distance. The awareness variables are highly correlated with each other, and it is doubtful that the collection of all would be necessary to adequately predict migration.

Partial correlations reveal that the association between distance and migration is insignificant when the effects of knowledge, visitation, and friends are controlled (Table 3). A significant negative association between migration and distance is qresent when controlling for the effects of relatives. Because the least squares residuals for r_{mr} and r_{md} are associated, the relatives decay function does not adequately explain how the indirect effects of distance influences migration. It makes sense to use distance as a supplemental variable to explain migration if relatives is the primary awareness variable. However, the effects of distance on migration should be included if we use any of the other three awareness variables.

TABLE 2. Correlation Results

	Log Distance	Log Knowledge	Log Visitation	Log Friends	Log Relatives	Migration
Log Distance	-	.714	.792	.725	.595	-.688
Log Knowledge		-	.972	.974	.925	-.861
Log Visitation			-	.964	.899	-.879
Log Friends				-	.958	-.908
Log Relatives					-	-.911
Migration						-

All correlation coefficients are significant at the .01 level.

TABLE 3. Partial Correlation Results

rmk.d = -.727*	rmd.k = -.207
rmv.d = -.753*	rmd.v = + .028
rmr.d = -.860*	rmd.r = -.440*
rmf.d = -.818*	rmd.f = -.103

*Significant at the .01 level

m = migration
d = log distance
k = log knowledge

v = log visitation
r = log relatives
f = log friends

Size of place is assumed to be accounted for by the awareness decay values and this assumption is empirically verified. The partial correlation between size and migration controlling for the effects of knowledge is r = +.01, while r = -.08 controlling for relatives, r = +.17 controlling for friends and r = -.21 controlling for visitation. None of these values are significant at the .05 probability level. The partial for size and migration controlling for distance is r = +.43.

A comparison of stepwise multiple regression equations reveals that each of the awareness indices is more important than the combined effects of distance and size in explaining migration (Table 4). Over 83 percent of the variation in interurban migration flows from Topeka can be explained by the relatives index while distance and size collectively provide only 57 percent of the explanation. A comparison of standardized beta weights for size and awareness variables reflects the lack of importance of size and place in adding explanation to migration. Indirect contacts (relatives and friends) seem to better explain migration than direct contacts (visitation) or their action space (knowledge). In summary, distance and size are not adequate surrogates of awareness. Instead the awareness variables, with the exception of relatives, subsume the indirect effects of distance on migration.

Urban Preferences and Migration

Thus far awareness has simply been expressed as the intensity of contact that Topekans have had with various urban places. Beyond the intensity of awareness, another important aspect that should be considered is the desireability associated with alternative destinations, or the whatness aspect of awareness. It is hypothesized that the perceived attributes of urban places add more to the explanation of migration from Topeka than objective urban characteristics.

To test this notion, three indices of urban desirability are treated as independent variables and are regressed with the awareness decay and distance variables to predict migration. Two indices are objective measurements, while one is a measure of perceived desirability. The first is the 1970 median family

TABLE 4. Regression Results

	R	R^2	R^2 Change	Beta
1. Log Distance	.688	.474		-.756
Population	.756	.572	.098	+.322
2. Log Knowledge	.861	.740		-.860
Population	F not sufficient for entry		-	-
3. Log Friends	.908	.824		-.900
Population	.911	.829	.005	+.054
4. Log Relatives	.911	.830		-.914
Population	.912	.831	.001	+.054
5. Log Visitation	.879	.772		-.878
Population	.889	.791	.019	+.161

income [20]. The second is an index of urban attractiveness established by Ralph Todd and based on an aggregation of 80 variables reflecting economic, demographic, environmental, crime, recreation, and educational characteristics for 100 selected standard metropolitan statistical areas [27] (Table 5). Only 27 of the 32 cities selected for this study are included in Todd's study. Todd ranked cities from most attractive to least attractive. Here, the attraction value for each city is defined as 101 minus Todd's attraction rank. Therefore, a value

TABLE 5. Urban Attraction Values

	1970 Median Family Income	Preference	80 Variable Index
Albuquerque	9,031	4.49	49
Atlanta	10,695	4.18	18
Billings	8,584	4.05	--
Birmingham	8,562	2.69	21
Boston	11,312	3.44	16
Charleston	8,068	4.14	--
Chicago	11,931	2.57	11
Cleveland	10,801	2.90	5
Dallas	10,534	5.00	60
Denver	10,730	5.73	62
Fargo	8,688	3.52	--
Houston	10,348	4.44	78
Indianapolis	10,819	3.78	95
Kansas City	10,900	4.52	36
Los Angeles	11,196	3.30	23
Louisville	9,819	4.26	40
Memphis	8,671	3.96	57
Miami	9,245	4.04	24
Minneapolis	11,682	4.54	66
New York	10,870	2.00	10
Oklahoma City	9,392	4.68	79
Omaha	10,392	4.42	97
Phoenix	9,856	5.05	55
Portland Ore.	10,503	5.36	64
Portland Me.	9,289	3.88	--
Reno	10,481	3.19	--
Salt Lake City	9,771	4.16	86
San Francisco	11,697	4.33	35
Seattle	11,886	5.05	83
St. Louis	10,760	3.66	6
Washington	9,583	2.42	26
Wichita	9,559	4.55	92

-- Cities not included in Todd's Study

of 100 represents the most attractive city while a value of 1 represents the least attractive.

A third index of attraction is a cognitive index based on the perceived residential desirability of urban places as evaluated by Topeka residents. Residential preference was measured on a scale from 1 to 7 such that 1 is least desirable while 7 is most desirable (Table 5). Residential preference is not associated with median family income ($r = +.002$), however, it is significantly positively associated with Todd's index of attraction ($r = +.640$).

Size of place presents a conceptual problem when attraction is associated with migration. For example, if place X is twice as large as place Y, and each have an equal level of residential appeal, we would hardly expect place X to draw the same number of migrants as Y. This is so because the migration decision is made at the household level. If the per capita out or in-migration probabilities for each city are similar, place X must experience both larger outflows and inflows because of its greater size. To compensate for this difficulty, the attraction value for a city was multiplied by the city's 1970 population size for all three attraction indices.

Regression results indicate that residential preference is more important than the objective attraction indices for adding explanation to the awareness decay variable (Table 6). Preference adds 17.6 percent more explanation of the migration variation when combined with distance, while income adds 10.1 percent and the objective attraction index adds 7.6 percent. All three indices add very small increases when regressed with awareness decay variables, however, in no case does income or attraction add more explanation than preference. It is not conclusive from this analysis that a combination of awareness and preference variables explain migration better than a combination of objective attraction indices and awareness decay variables. It is clear, however, that a combination of distance and preference variables provides a substantially greater explanation of migration than distance and objective attraction indices.

TABLE 6. Migration Explanation Added by Urban Attraction Variables

Income Regressions			Attraction Index Regressions			Preference Regressions		
	R^2	Increase		R^2	Increase		R^2	Increase
Distance	47.4		Distance	45.4		Distance	47.4	
Income	57.5	10.1	Attraction	53.0	7.6	Preference	65.0	17.6
Knowledge	74.0		Knowledge	73.8		Knowledge	74.0	
Income	74.0	0.0	Attraction	73.8	0.0	Preference	74.4	0.4
Visitation	77.2		Visitation	76.0		Visitation	77.2	
Income	79.1	1.9	Attraction	77.8	1.8	Preference	80.3	3.1
Friends	82.4		Friends	81.8		Friends	82.4	
Income	82.9	0.5	Attraction	82.6	0.8	Preference	83.2	0.8
Relatives	83.0		Relatives	82.7		Relatives	83.0	
Income	83.1	0.1	Attraction	82.7	0.0	Preference	83.2	0.2

Awareness Differences Among Socioeconomic Groups

Although aggregate 1977 awareness decay surfaces reveal a great deal about past migration patterns, an important point that must be considered is that migration is a selective process. Migrants from a particular origin are usually better educated, younger, and wealthier than the population they leave behind [17, 24]. If we attempt to explain migration using cognitive variables, would awareness decay surfaces for those socioeconomic groups most prone to migrate provide better explanations of migration than aggregate awareness decay maps? The answer must be yes if there is a significant difference in the levels of awareness for different socioeconomic groups. This certainly appears to be the case for Topekans.

Topeka respondents were divided by age, education, and income categories. Each socioeconomic category's percent knowledge, visitation, friends and relatives were determined for each city (Table 7). An F test was made to determine if age, income, and education categories exhibit significantly different knowledge scores. For example, only 46.3 percent of persons 60 years and older had knowledge of the sample cities while 61.1 percent of persons 20-30 years of age had knowledge. Likewise, persons with post college educatons had 16.5 more knowledge percentage points than persons with a high school education or less, while high income persons had 11.4 knowledge percentage points than persons from low income households (Table 8).

Percent visitation and percent friends were not significantly different for persons having different ages or incomes but were significantly different for persons with different educational levels.

No significant differences were found among socioeconomic groups for percent relatives. This suggests that if percent relatives were used as the awareness decay variable to predict migration, aggregate values would yield as much explanation as a series of values categorized by socioeconomic differences. However, if knowledge was used, those most prone to migrate probably have different awareness levels than the remainder of the population

TABLE 7. Average Awareness Values for Different Socioeconomic Groups

	Knowledge	Visitation	Friends	Relatives
		Age		
20 — 39 years	61.6	35.8	20.5	11.0
40 — 59 years	56.6	38.6	17.5	11.3
60 — over	46.3	37.2	21.5	13.2
		Education		
High school or less	46.3	28.1	13.7	13.2
1 — 4 years of college	58.6	37.9	20.4	11.0
Post college	62.8	44.9	25.0	10.4
		Income		
$0 — $11,999	50.4	30.9	19.2	12.7
$12,000 — $17,999	57.5	37.8	18.4	10.7
$18,000 — over	61.9	43.6	22.2	10.8

TABLE 8. F Values. Urban Awareness Variation Within Socioeconomic Groups

	Age	Education	Income
Knowledge	5.26*	6.76*	3.16*
Visitation	0.12	4.34*	2.51
Friends	0.50	4.18*	0.51
Relatives	0.39	0.61	0.34

* Significant at the .05 level

and selective awareness mapping should provide better results. Awareness decay defined by visitation and friends should be sensitive to the education differences of potential migrants.

Conclusion

An examination of the awareness spaces for residents in Topeka, Kansas yields three conclusions.

(1) Regression equations using awareness indices explain past out-migration volumes from Topeka to 32 uniformly distributed SMSAs much better than regressions of size and distance variables.
(2) Topekans' levels of awareness for urban places are significantly different for residents having different migration propensities.
(3) When controlling for the effects of distance on migration, perceived residential desirability, explains more of Topeka's out-migration variation than income or an objective index of urban attraction based on the cumulative effects of 80 economic, demographic, environmental, crime, recreation, and education characteristics.

Although this study does not operationalize a predictive model, it promotes the notion that our migration prediction research methods should be guided by a philosophy that cognition influences interurban migration to a greater degree than objective landscape elements.

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