WHITE FLIGHT AND CENTRAL CITY LOSS: APPLICATION OF AN ANALYTIC MIGRATION FRAMEWORK[1]

William H. Frey, Center for Demography and Ecology
Department of Sociology, University of Wisconsin-Madison

This paper[2] utilizes an analytic migration framework to assess the aggregate impact of selected community-level factors on white population losses experienced in central cities of large metropolitan areas. The framework parameterizes analytically distinct components of local and long distance migration streams which contribute directly to central city population change. Each component can be specified as a function of community-level attributes which are relevant to the explanation of specific in- and out-migration streams.

In this application, previously advanced racial and nonracial attributes of central cities and their surrounding suburbs are used to estimate framework components based on 1970 census data for white movement streams associated with the central cities of large SMSAs. These estimates are then used to ascertain the impact that the central city racial composition exerts on net white out-migration from selected cities. The data demonstrate that the aggregate impact of racially linked "white flight" has been minimal.

I. Analytic Migration Framework

The framework was developed in order to analyze population change in both the city and suburbs of a metropolitan area through community determinants of movement streams that contribute directly to such change (see Frey, 1977a). Because each contributing stream responds to different sets of community attributes, the framework can be used to assess the net-migration consequences of city, suburb, and metropolitan attributes which influence movement levels in one or more streams. The core of the framework consists of a series of stream-specific parameters which can be linked to a demographic accounting equation, Through this linkage, relationships can be specified between community attributes, stream movement levels and aggregate population change in cities and suburbs.

The Framework Parameters

Each of the framework parameters are associated with one of the following movement streams:

I. Intrametropolitan City-to-Suburb or Suburb-to-City Mobility Streams
II. In-migration Streams to Cities or suburbs from outside the SMSA
III. Out-migration Streams from Cities or Suburbs to places outside the SMSA

The framework assumes that city and suburban population change are linked to population change at the metropolitan level and that the streams listed above represent all avenues whereby the city or suburb population is affected by movement within and from outside the metropolitan area. With one exception, the framework parameters associated with each stream represent rates which are applied to various "at risk" populations of residents and movers. These are listed in Figure A.

Beginning with the intrametropolitan city-to-suburb stream (stream IA), the rate at which a city resident will move to the suburbs during an interval is defined as the product of the parameters i_c and $p_{c\rightarrow s}$. This separation of parameters is prompted by empirical studies which show that residential mobility results from two major stages of decision-making -- the decision to move (made by a resident) and the choice of destination (made by the mover), and that each stage is influenced by different causal factors (Butler et al., 1969; Speare, Goldstein and Frey, 1975). Therefore, the i_c parameter denotes the rate at which a city resident will move anywhere within the SMSA, and the $p_{c\rightarrow s}$ parameter denotes the rate at which a city-origin mover will relocate in the suburbs. As will be demonstrated below, this distinction permits the analyst to causally relate different sets of community attributes to each stage of the mobility process. In a similar manner, the rate at which a suburban resident will move to the city (stream IB) is defined as the product of framework parameters i_s and $p_{s\rightarrow c}$.

In-migration to the central city or suburbs from outside the SMSA (streams IIA and IIB) is also seen to be the product of two framework parameters. For each stream, the number of in-migrants rather than the rate of in-migration is specified. In-migrants to the central city are defined as the product of parameters M_o and $p_{o\rightarrow c}$. M_o denotes the number of in-migrants to the SMSA as a whole, and $p_{o\rightarrow c}$ denotes the rate at which SMSA in-migrants locate in the central city. This separation of parameters is justified on the basis of findings that long-distance migrants are initially attracted to metropolitan-wide economic or labor market attributes (Lansing and Mueller, 1967). The city or suburb residential location within the metropolitan area then becomes a secondary decision for SMSA in-migrants which is made on the basis of different sets of factors.

Finally, only one framework parameter is associated with out-migration streams from metropolitan cities and suburbs (streams IIIA and IIIB).

The Demographic Accounting Equation

The framework parameters are linked to a demographic accounting equation which allows their effects to be translated into aggregate changes in city and suburb population sizes during an interval. If one begins with P_c^t, the city population at time t, and P_s^t, the suburb population at time t, it is possible to compute the city and suburb populations of age n and over at time t+n using the relationships in Figure B.

By employing these relationships, the migration framework can be used to relate community attributes to aggregate population change in central cities and suburbs. The key mechanisms for the analysis are the framework parameters which are assumed to be causally related to various attributes. More specifically, each

Figure A: Movement Streams and Associated Framework Parameters

IA - INTRAMETROPOLITAN CITY-TO-SUBURB MOBILITY

i_c MOBILITY INCIDENCE RATE OF CITY RESIDENTS
The rate at which city residents* move anywhere within the SMSA between t, t+n

$p_{c\to s}$ SUBURB DESTINATION PROPENSITY RATE OF CITY MOVERS
The rate at which city-origin movers relocate to a suburb destination between t, t+n

IB - INTRAMETROPOLITAN SUBURB-TO-CITY MOBILITY

i_s MOBILITY INCIDENCE RATE OF SUBURB RESIDENTS
The rate at which suburb residents* move anywhere within the SMSA between t, t+n

$p_{s\to c}$ CITY DESTINATION PROPENSITY RATE OF SUBURB MOVERS
The rate at which suburb-origin movers relocate to a city destination between t, t+n

IIA - IN-MIGRATION TO THE CITY FROM OUTSIDE THE SMSA

M_o MIGRATION INTO THE SMSA
Total number of migrants into the SMSA between t, t+n

$p_{o\to c}$ CITY DESTINATION PROPENSITY RATE OF IN-MIGRANTS
The rate at which SMSA In-Migrants relocate to a city destination between t, t+n

IIB - IN-MIGRATION TO THE SUBURBS FROM OUTSIDE THE SMSA

M_o MIGRATION INTO THE SMSA
Total number of migrants into the SMSA between t, t+n

$p_{o\to s}$ SUBURB DESTINATION PROPENSITY RATE OF IN-MIGRANTS
The rate at which SMSA In-Migrants relocate to a suburb destination between t, t+n

IIIA - OUT-MIGRATION FROM THE CITY TO OUTSIDE THE SMSA

$m_{c\to o}$ OUT-MIGRATION INCIDENCE RATE OF CITY RESIDENTS
The rate at which city residents migrate out of the SMSA between t, t+n

IIIB - OUT-MIGRATION FROM THE SUBURBS TO OUTSIDE THE SMSA

$m_{s\to o}$ OUT-MIGRATION INCIDENCE RATE OF SUBURB RESIDENTS
The rate at which suburb residents migrate out of the SMSA between t, t+n

*residents who do not out-migrate between t, t+n

Figure B: Demographic Accounting Equations

$$(1)\quad P_{c*}^{t+n} = sP_c^t - sP_c^t m_{c\to o} - s(P_c^t - P_c^t m_{c\to o})i_c p_{c\to s} + s(P_s^t - P_s^t m_{s\to o})i_s p_{s\to c} + sM_o p_{o\to c}$$

$$(2)\quad P_{s*}^{t+n} = sP_s^t - sP_s^t m_{s\to o} - s(P_s^t - P_s^t m_{s\to o})i_s p_{s\to c} + s(P_c^t - P_c^t m_{c\to o})i_c p_{c\to s} + sM_o p_{o\to s}$$

where:

P_{c*}^{t+n} = city population age n and over at time t+n

P_{s*}^{t+n} = suburb population age n and over at time t+n

s = survival rate for movers, migrants, or nonmovers

P_c^t = city population at time t

P_s^t = suburb population at time t

framework parameter can be expressed as a function of a number of community attributes which serve as independent variables. For example:

$$i_c = f(X_j)$$

where X_j denotes one of k community attributes which are related to the residential mobility incidence rate of city residents.

The other framework parameters can be specified as functions of the same or different attributes. After the parameters have been specified as functions of relevant community attributes, the demographic accounting equations can be used to assess the aggregate impact of an attribute (or combination of attributes) on population change in an individual city or suburb during an interval t, t+n.

II. Application to Central City "White Flight"

In this application of the analytic framework, we are interested in ascertaining the extent to which the size of the city's Black population influences aggregate white loss due to the selective suburban relocation of residential (intrametropolitan) movers, and the suburban destination choices of in-migrants to the metropolitan area.

The motivation for this investigation draws from an earlier study we had undertaken to assess the relative importance of both racial and nonracial influences on recent white city-to-suburb movement in large SMSAs (Frey, 1977b). Based on a cross-sectional analysis of movement streams in 39 SMSAs during the 1965-70 period, our findings indicated that racial influences did not predominate. Significant racial desegregation in central city schools and the occurrence of racial disturbances during the period contributed little to the explanation of city-to-suburb white flight, while ecological features of the SMSA and city-suburb fiscal disparities proved to be important determinants. One racial factor -- the percent of the central city population which was Black -- did influence white out-movement, particularly in non-Southern cities, and prevented us from dismissing racial factors completely as flight determinants.

The present analysis represents a somewhat restricted application of the framework in the sense that community attributes will only be assessed as determinants of the destination propensity parameters $p_{c\to s}$, $p_{s\to c}$, and $p_{o\to c}$. This focus on the destination propensity parameters only can be justified on the basis of our earlier finding that the racial factor, percent city Black, influences white city-to-suburb movement primarily through the city-suburb destination choices of city-origin movers, and only minimally through the mobility incidence of city residents (denoted by framework parameter i_c) (Frey, 1977b). It is also consistent with studies of residential mobility motivations which indicate that the decision to move is affected less by "white flight" considerations than by the family's need to make housing adjustments coincident with changes in its size and composition (Rossi, 1955; Speare, Goldstein and Frey, 1975).

One further restriction will be the focus only on movement-induced changes to the size of the white city population, thus disregarding the effects of fertility and mortality on aggregate change.

The Data

The data for the investigation are taken from the Census subject report Mobility in Metropolitan Areas (U.S. Bureau of the Census, 1973) which classifies 1970 residents of cities and suburbs of the 65 largest SMSAs according to their 1965 residence locations, and from which it is possible to compute white (nonBlack) population and framework parameters for the 1965-70 interval that are necessary to pursue this analysis. These data will be used for two purposes: (a) to specify framework parameters $p_{c\to s}$, $p_{s\to c}$, and $p_{o\to c}$ as functions of community attributes; and (b) to calculate the increment to white city population loss in selected SMSAs that can be attributed to the community attribute, percent city Black. Specification of the destination propensity rates as functions of community attributes will be accomplished in cross-sectional multiple regression analyses, using as cases, the 39 SMSAs which were examined in the earlier study.

In order to calculate incremental white population change in selected SMSAs that is associated with different values of $p_{c\to s}$, $p_{s\to c}$, and $p_{o\to c}$ using equation (1) in Figure B, it is necessary to obtain actual values for the remaining framework and population parameters in that equation. These can also be computed from the 1970 Census subject report, although for this purpose it is useful to rearrange the terms of that equation (see footnote to Table 1).

Specifying Framework Parameters

The community attributes that are used to estimate destination propensity parameters $p_{c\to s}$, $p_{s\to c}$, and $p_{o\to c}$ constitute those racial and nonracial attributes which proved to be the most important determinants of white city-to-suburb movement in our earlier study. These attributes and their abbreviations are as follows.[3]

- BLK -- Percent City Black
- CIT -- City Share of SMSA Population
- EDX -- Suburb/City Educational Expenditures Per Capita (x 100)
- TAX -- Suburb/City Tax Revenues Per Capita (x 100)
- CRM -- City Crime Rate
- PSD -- Postwar Suburban Development
- CMT -- City-Suburb Commuters
- CTA -- Central City Age: The number of years between the census year when the city first attained a population of 50,000 and the year 1970
- SRG -- Southern Region: (South=1, Other Regions=0)
- S×B -- Interaction of SRG and BLK

We now proceed to specify the framework parameters $p_{c\to s}$, $p_{s\to c}$, and $p_{o\to c}$ as functions of the community attributes just presented in regression analyses. Each parameter is regressed on all of the attributes for the 39 SMSAs that form the basis of this investigation. The resulting equations appear as follows:

$$p_{c\to s} = +.3164 +.0024\,BLK -.0076\,CIT +.0008\,EDX -.0012\,TAX +.0003\,CRM +.0038\,PSD +.0024\,CMT +.0006\,CTA +.0411\,SRG -.0006\,S\times B \qquad (3)$$

$$R^2 = .92$$

$$p_{s\to c} = +.0671 -.0004\ BLK +.0059\ CIT +.0003\ EDX -.0007\ TAX -.0008\ CRM -.0013\ PSD +.0027\ CMT -.0012\ CTA -.0492\ SRG +.0019\ S\times B \quad (4)$$

$R^2 = .84$

$$p_{o\to c} = +.0249 -.0038\ BLK +.0113\ CIT +.0004\ EDX -.0012\ TAX +.0001\ CRM -.0018\ PSD +.0036\ CMT -.0007\ CTA -.0606\ SRG +.0029\ S\times B \quad (5)$$

$R^2 = .93$

It is difficult to evaluate the relative importance of each attribute from the unstandardized coefficients presented here. It is, nevertheless, apparent that the percent city Black increases the suburb propensity of city movers and decreases the city propensity of suburb movers and SMSA in-migrants. Each of these effects is greatly moderated in Southern cities.

The Aggregate Impact on White City Loss

We move on to the major aim of this analysis: to ascertain the aggregate impact on white city loss which can be attributed to the city's Black population size as it affects the destination choices of white residential movers and SMSA in-migrants. This aggregate impact will be assessed in three SMSAs: Cleveland, Dayton, and Dallas. Each of these had a fairly sizeable percentage of Blacks in the central city at the beginning of the migration interval: 33% for Cleveland, 26% for Dayton, and 22% for Dallas.

Presented in Table 1 are the 1965-70 population and framework parameters for Cleveland, Dayton, and Dallas which are necessary to estimate P_{c*}^{1970} for each city. The values for parameters $p_{c\to s}$, $p_{s\to c}$, and $p_{o\to c}$ are estimated from equations (3), (4), and (5) based on actual values for the community attributes shown in Table 2. The values for the remaining framework and population parameters were computed from actual mobility and population data for the SMSAs reported in the 1970 census.

To assess the aggregate impact of BLK, the following strategy will be taken: First, we assume various actual and hypothetical numbers of Blacks in each city for 1965. Second, we translate these actual and assumed numbers into values of Percent City Black (BLK). Third, we compute parameters $p_{c\to s}$, $p_{s\to c}$, $p_{o\to c}$ from the actual and hypothetical values of BLK using equations (3), (4), and (5). Fourth, we compute 1970 white city population figures (P_{c*}^{1970}) based on actual and hypothetical values of $p_{c\to s}$, $p_{s\to c}$, and $p_{o\to c}$ using the demographic accounting equation (1). The latter figures will allow us to compare the aggregate changes to each city's white population which would have resulted from different racial mixes in the city at the beginning of the movement interval.

The results of this analysis appear in Table 3. For each of the three SMSAs, the following series of assumptions is made about the number of central city Blacks in 1965: (A) the actual number of Blacks, (B) a 50 percent increase in the actual number, (C) a 25 percent increase in the actual number, (D) a 25 percent decrease in the actual number, and (E) a 50% decrease in the actual number. Shown in column (1) are the corresponding values of BLK which are used to estimate the destination propensity parameters in columns (2) through (4). The final three columns display results of the computations using the demographic accounting equation (1): the white city population age 5 and over (column 5), the difference from the actual total (column 6), and the percent difference from the actual total (column 7).

As our review of equations (3), (4), and (5) suggested, an increase in the Percent City Black is associated with a net decrease in the white population. Yet the level of impact resulting from the drastic differences in the number of city Blacks is not substantial in any of the three cities. This effect is extremely small in Dallas -- resulting in part from the lesser influence of Percent City Black in Southern SMSAs. Clearly, the aggregate "flight" impact of the central city racial composition -- as transmitted through the destination choices of local movers and in-migrants -- is slight, over a five-year migration interval.

III. Use of the Framework in "White Flight" Research

The investigation undertaken here represents an initial step toward a causal analysis of white central city population change utilizing the analytic migration framework. This framework, which we have described in more detail elsewhere (Frey, 1977a), allows the researcher to identify city, suburb, and metropolitan determinants of movement streams which contribute directly to population change in the central city. Using this framework in conjunction with readily available census data, it is possible to calculate incremental changes in a city's population associated with specific community attributes that serve as determinants of one or more movement streams. In this manner, the framework can be employed to establish causal relationships between community attributes, stream movement levels, and aggregate population change in the central city, over the course of a migration interval.

In the present application, we focused our attention on one causal attribute -- city racial composition -- as it affects white central city change through the selective destination choices of white intrametropolitan movers, and white in-migrants to the metropolitan area. Based on aggregate movement data from selected large SMSAs, our findings indicate that such effects were minimal over the 1965-70 interval. Hence, not only does the city's racial composition play a relatively minor role in explaining white movement from the city to the suburbs (Frey, 1977b), but the total impact of its influence on aggregate white city loss seems also to be exceedingly small, at least in the short-run.

Although restricted in its focus to one causal attribute and three framework parameters, this application of the analytic framework serves to illustrate its utility in an investigation of central city "white flight" determinants. In future reports, we plan to extend our causal analysis of white population loss beyond this re-

strictive focus in order to incorporate a greater number of community attributes as causal factors, and to provide a more refined assessment of "flight" consequences for central city change.

FOOTNOTES

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[2] A more extented treatment appears in Center for Demography and Ecology Working Paper 77-27 University of Wisconsin-Madison.

[3] Fuller definitions and rationale for these factors appear in Frey (1977b).

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Table 1: Population and Framework Parameters for the 1965-70 interval[a] used as inputs to Equation (1)[b]

SMSAs	$s(P_c^{1965} - P_c^{1965}m_{c\to o})$	$s(P_c^{1965} - P_c^{1965}m_{c\to o})i$	$p_{c\to s}$	$s(P_s^{1965} - P_s^{1965}m_{s\to o})i_c$	$p_{s\to c}$	sM_o	$p_{o\to c}$
Cleveland	435015	195720	.422	261724	.101	141307	.228
Dayton	167571	89756	.507	120206	.080	101326	.189
Dallas	445161	204591	.342	158816	.214	261200	.453

[a] Framework parameters $p_{c\to s}$, $p_{s\to c}$, and $p_{o\to c}$ are estimated from equations (3), (4), and (5) in the text based on actual community attributes (see Table 2). The other population and framework parameters are computed from the 1970 Census subject report Mobility in Metropolitan Areas (U.S. Bureau of the Census, 1973).

[b] Equation (1) can be rewritten as:

$$P_{c*}^{t+n} = s(P_c^t - P_c^t m_{c\to o}) - s(P_c^t - P_c^t m_{c\to o})i_c p_{c\to s} + s(P_s^t - P_s^t m_{s\to o})i_s p_{s\to c} + sM_o p_{o\to c}$$

where t = 1965, n = 5, and s represents the appropriate survival rate for each mover, migrant, or nonmover group.

Table 2: Community Attributes used to Estimate Framework Parameters $p_{c\to s}$, $p_{s\to c}$, and $p_{o\to c}$ for 1965-70 Interval in Cleveland, Dayton, and Dallas SMSAs

Community Attributes[a]	Cleveland	Dayton	Dallas
BLK	33.1	26.0	22.3
CIT	41.0	32.1	57.0
EDX	92.9	103.6	109.9
TAX	77.7	54.2	50.7
CRM	59.3	66.1	59.7
PSD	58.8	62.4	71.3
CMT	23.9	21.7	10.9
CTA	100.0	80.0	60.0
SRG	0.0	0.0	1.0
SxB	0.0	0.0	22.3

Table 3: The Effects of Actual and Hypothetical Numbers of City Blacks in 1965 on Migration Framework Parameters $p_{c\to s}$, $p_{s\to c}$, and $p_{o\to c}$ during the 1965-70 Interval, and on the 1970 City White Population Age 5 and over, in Cleveland, Dayton, and Dallas SMSAs

Assumed Number of City Blacks in 1965:	BLK Value[a] (1)	1965-70 Parameter Values[b] $p_{c\to s}$ (2)	$p_{s\to c}$ (3)	$p_{o\to c}$ (4)	1970 City White Population Age 5 and Over: Population Size[c] (5)	Difference from (A) (6)	Pct Difference from (A) (7)
Cleveland SMSA							
A. Actual Number	33.1	.422	.101	.228	411153	--	--
B. Increase by 100%	49.7	.462	.095	.165	392848	-18305	- 4.5
C. Increase by 50%	42.6	.445	.098	.192	400701	-10452	- 2.5
D. Decrease by 50%	19.8	.391	.106	.279	425751	+14598	+ 3.6
E. No Blacks	0.0	.344	.114	.354	447570	+36417	+ 8.9
Dayton SMSA							
A. Actual Number	26.0	.507	.080	.189	150777	--	--
B. Increase by 100%	41.2	.544	.074	.131	140959	- 9818	- 6.5
C. Increase by 50%	34.5	.528	.076	.157	145304	- 5473	- 3.6
D. Decrease by 50%	14.9	.481	.084	.231	157884	+ 7107	+ 4.7
E. No Blacks	0.0	.446	.090	.288	167482	+16705	+11.1
Dallas SMSA							
A. Actual Number	22.3	.342	.214	.453	527378	--	--
B. Increase by 100%	36.4	.367	.235	.440	522362	- 5016	- 1.0
C. Increase by 50%	30.1	.356	.225	.446	524619	- 2759	- 0.5
D. Decrease by 50%	12.5	.324	.199	.461	530828	+ 3450	+ 0.7
E. No Blacks	0.0	.302	.180	.472	535268	+ 7890	+ 1.5

[a] BLK is computed for each assumed number of city Blacks in 1965 as: $\frac{\text{(assumed number of 1965 city Blacks)}}{\text{(assumed number of 1965 city Blacks + actual number of 1965 city whites)}} \times 100$

[b] Computed from equations (3), (4), and (5) based on column (1) value of BLK and the actual values of CIT, EDX, TAX, CRM, PSD, CMT, CTA, SRG, and SxB which appear in Table 2.

[c] Computed from equation (1) [see footnote to Table 1], based on values of $p_{c\to s}$, $p_{s\to c}$, and $p_{o\to c}$ in columns (2), (3), and (4) and on actual values for the other framework parameters which appear in Table 1.