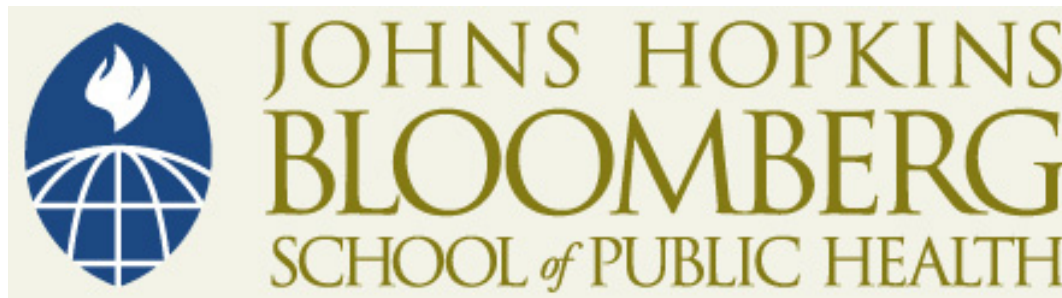


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Measurement of Migration

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Section A

Definition of Migration, Types of Migration, and Estimation of Net Migration

Definitions

- ◆ *Mover*—A person who changes residence
- ◆ *Migrant*—A person who moves from one political area to another
- ◆ *Non-migrant*—Non-movers and local movers

Definitions

- ◆ *Migration*—Geographic or spatial mobility involving a relatively permanent change in usual residence between clearly defined political or statistical units; has dimensions of time and space

Definitions

- ◆ *In-migrant*—A person who moves in a political area within the same country
- ◆ *Immigrant*—An international migrant who enters the area from a place outside the country
- ◆ *Out-migrant*—A person who moves out of a political area within the same country
- ◆ *Emigrant*—An international migrant departing to another country by crossing the international boundary

Definitions

- ◆ *Net Migration*—In-migrants - Out-migrants
- ◆ *Net Immigration*—Immigrants - Emigrants
 - Note: Net migration for an area often includes both international and internal migration
- ◆ *Gross Migration*—In-migrants + Out-migrants = Migration turnover

Definitions

- ◆ *Migration stream*—A group of migrants having a common origin and destination in a given migration period
- ◆ *Migration counterstream*—In opposite direction of stream

Estimating Net Migration

Residual Method

- ◆ Let I = Number of in-migrants
- O = Number of out-migrants
- P_0 = Population at time "0"
- P_t = Population at time "t"
- B = Number of births
- D = Number of deaths

Estimating Net Migration

Residual Method

$$(I - O) = (P_t - P_0) - (B - D)$$

- ◆ Estimates net migration as difference in population counts at two time points and net vital events in-between, i.e., subtracts an estimate of natural increase during the period from the net change in population during the period
- ◆ Also known as the bookkeeping method or balancing equation

Estimating Net Migration

Residual Method

- ◆ Because the census counts and vital statistics are subject to unknown and usually differing degrees of error, the residual estimate of net migration may be in substantial error
- ◆ The relative error in net (in-) migration may be considerable when the amount of migration is small
- ◆ The residual method can be used to estimate net migration for sex, race, etc

Estimating Net Migration

Cohort-Component Method

- ◆ Involves the calculation of estimates by age groups on the basis of separate allowances for the components of population change
- ◆ Estimates net migrants as the difference between actual population at time "t" and the population at time "0" survived to time "t" (must do age-specific and then add)

Estimating Net Migration

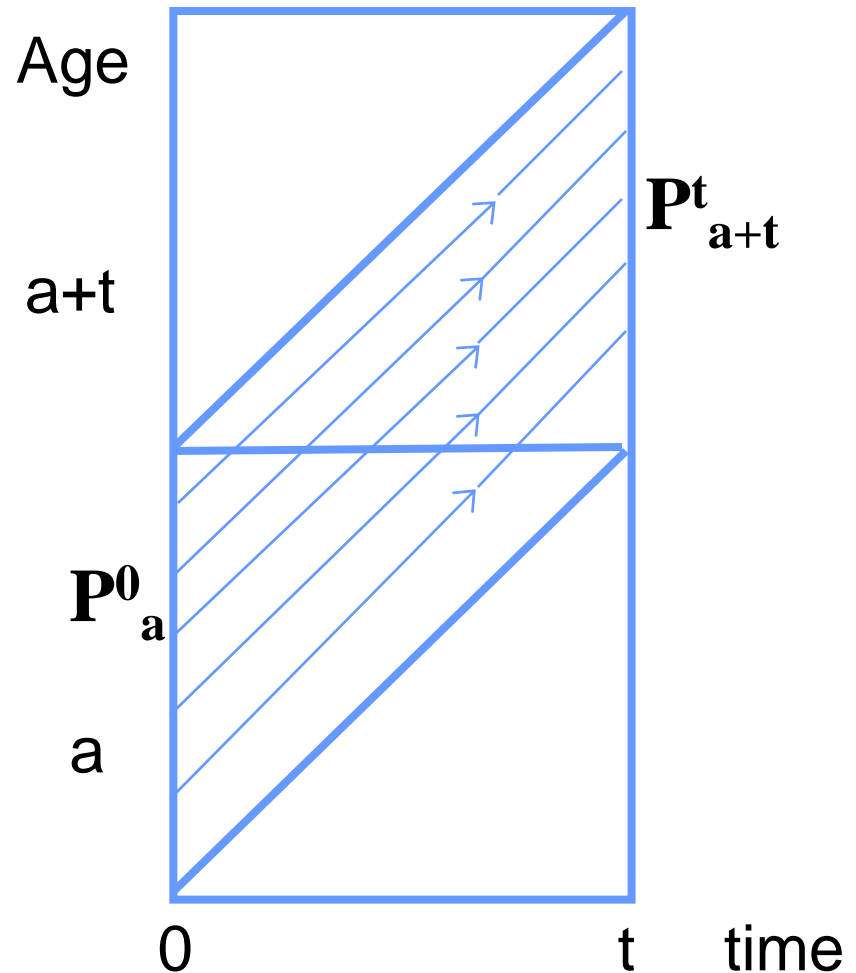
Cohort-Component Method

- ◆ Survival rates are used instead of death rates because the compilation of death statistics is often laborious, even when basic statistics on death are available
- ◆ Let P_a^0 = Population in age group "a" at time "0"
- P_{a+t}^t = Population in age (group) "a+t" at time "t"
- s = Life table survival ratio = $\frac{L_{a+t}}{L_a}$

Three Ways of Estimating Net Migration

- ◆ Forward estimate

$$M_1 = P_{a+t}^t - sP_a^0$$



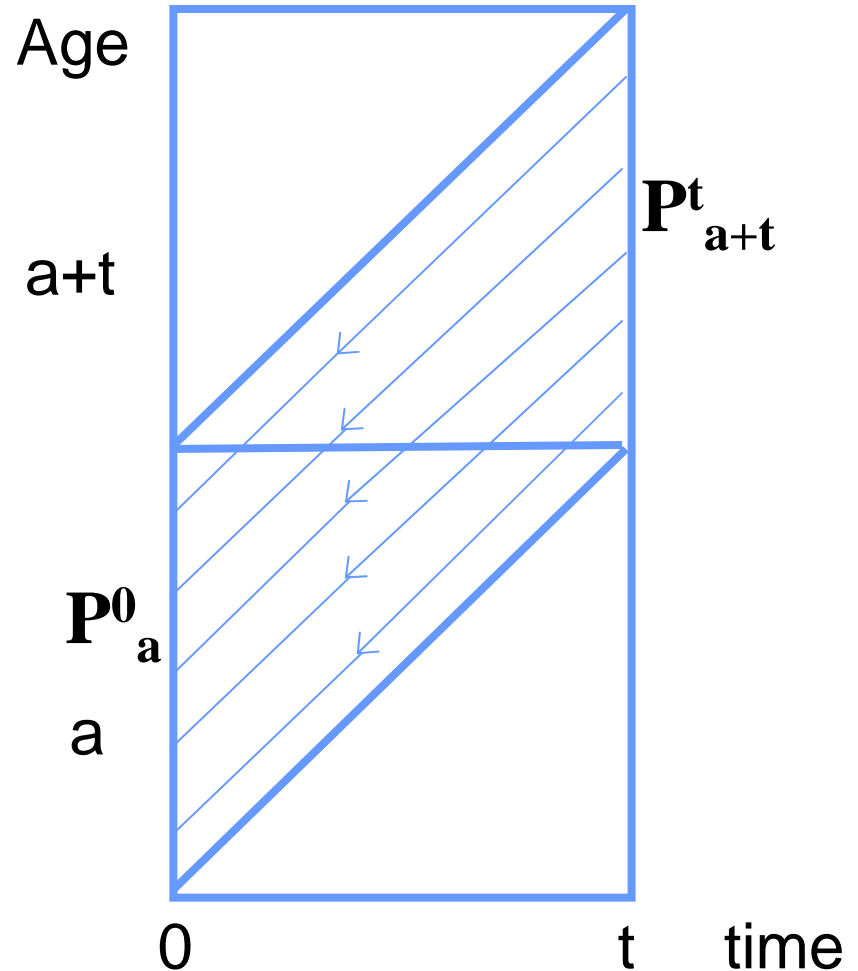
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Three Ways of Estimating Net Migration

- ◆ Reverse estimate

$$M_2 = \frac{P_{a+t}^t - P_a^0}{s}$$

Note $M_2 > M_1$



Continued

Three Ways of Estimating Net Migration

- ◆ Average estimate

$$M_3 = \frac{M_1 + M_2}{2}$$

Forward Estimation

- ◆ All migrants come at the end of the time interval (or, none of the migrants die for the period between time "0" and "t")

Reverse Estimation

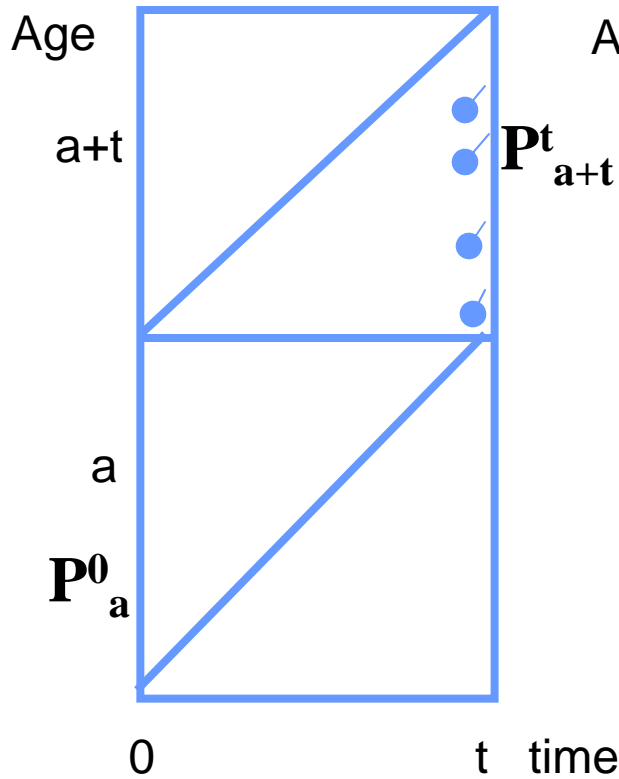
- ◆ All migrants come at the beginning of the time interval (or, all migrants are subjected to population's mortality for the entire period between time "0" and "t")

Average Estimation

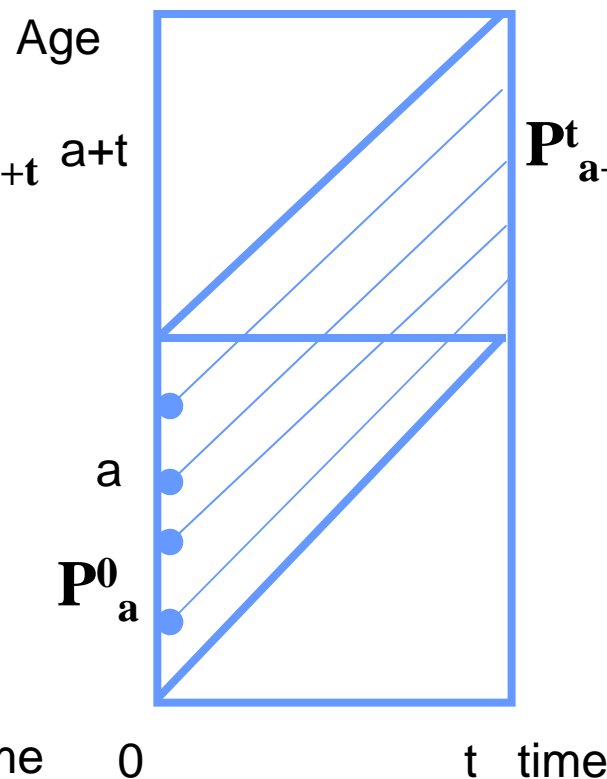
- ◆ All migrants come at the middle of the time interval (or, all migrants are subjected to population's mortality for the half of the period between time "0" and "t")

Implicit Assumption Regarding Time of Immigration

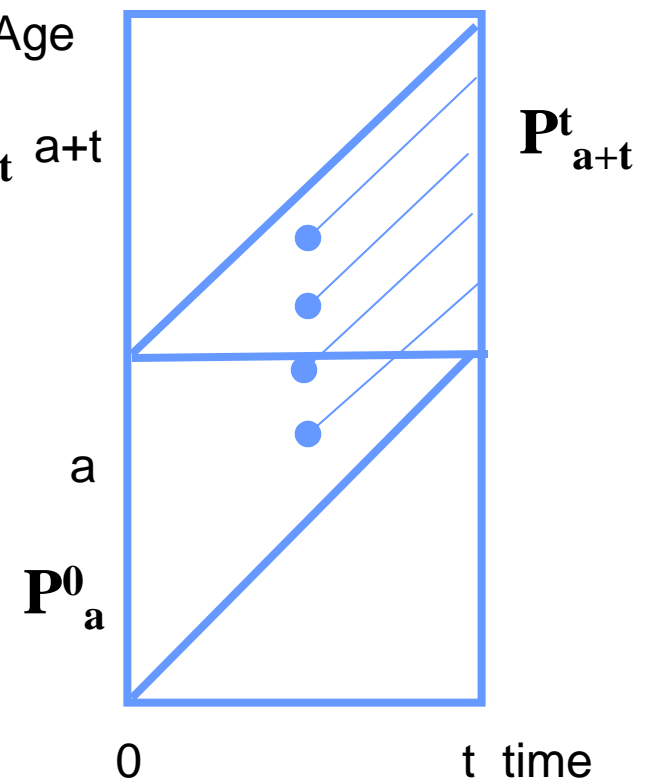
Forward



Reverse



Average



Calculating the Estimates

- ◆ When calculating the estimates, it is important to remember that the survival rates for children born during the period are of a different form from those for the older ages, i.e., for the case of five years between population counts:

$$S_{0-4} = \frac{{}_5L_0}{5l_0}$$

$$S_{5-9} = \frac{{}_5L_5}{5L_0}$$

Cohort-Component Method

- ◆ Does not require accurate vital statistics but does require a life table
- ◆ This method yields estimates of net migration by age and sex without nearly as much labor as is involved in the use of deaths by age

Cohort-Component Method

- ◆ Unlike the residual method, none of the variants of the cohort-component method measure net migration exactly even when there are no errors in the underlying population and vital statistics
- ◆ The average estimate implies a more meaningful assumption regarding the timing of net migration than does either the forward or reverse method

Estimating Net Migration

- ◆ The amount of difference between the migration estimates from the forward and reverse methods depends on the amount of net migration and on the level of the survival rate

Summary

- ◆ Migration is an important element in the growth of the population and the labor force of an area
- ◆ International and internal are the two broad types of migration
- ◆ Many indicators have been developed to measure migration under its multiple facets

Section B

Indicators and Ways of Studying Migration

Crude In-Migration Rate

- ◆ *Crude In-Migration Rate*—Number of in-migrants per 1,000 population

$$= \frac{I}{P} * 1000$$

Crude Out-Migration Rate

- ◆ *Crude Out-Migration Rate*—Number of out-migrants per 1,000 population

$$= \frac{O}{P} * 1000$$

Crude Net Migration Rate

- ◆ *Crude Net Migration Rate*—Difference between the number of in-migrants and the number of out-migrants per 1,000 population

$$= \frac{I - O}{P} * 1000$$

Exercise

Crude Net Migration Rate

- ◆ Calculate the crude net migration rate for Zimbabwe in 1987, based on the following data

Zimbabwe, 1987

Long-term immigrants:	3 925
Long-term emigrants :	5 330
Total population	: 8 640 000

You have 15 seconds to calculate the answer. You may pause the presentation if you need more time.

Exercise Answer

Crude Net Migration Rate

- ◆ The correct answer is as follows:
 - **Crude net migration rate = -0.16**

Zimbabwe, 1987

Long-term immigrants:	3 925
Long-term emigrants :	5 330
Total population	: 8 640 000

Specific Rates

- ◆ Let M_a = Number of in-migrants (or out-migrants) in age group "a"
 P_a = Midyear population in age group
 M_s = Number of in-migrants (or out-migrants) of sex "s"
 P_s = Midyear population of sex "s"

Age-Specific Migration Rates

- ◆ *Age-Specific Migration Rates*—Number of migrants of age group “a” per 1,000 population of age group “a”

$$= \frac{M_a}{P_a} * 1000$$

Sex-Specific Migration Rates

- ◆ *Sex-Specific Migration Rates*—Number of migrants of sex “s” per 1,000 population of sex “s”

$$= \frac{M^s}{P^s} * 1000$$

Age-Sex-Specific Migration Rates

- ◆ *Age-Sex-Specific Migration Rates*—Number of migrants of age “a” and sex “s” per 1,000 population of age “a” and sex “s”

$$= \frac{M_a^s}{P_a^s} * 1000$$

Exercise

Age-Sex-Specific Migration Rates

- ◆ Calculate the in- and out-migration rate for men age 20–24 from Zimbabwe in 1987, based on the following data

Zimbabwe, 1987
Men age 20-24

Long-term immigrants:	302
Long-term emigrants :	666
Male population 20-24:	391 968

You have 15 seconds to calculate the answer. You may pause the presentation if you need more time.

Exercise Answer

Age-Sex-Specific Migration Rates

- ◆ The correct answers are as follows:
 - **0.77 in-migrants age 20–24 per 1,000 men 20–24**
 - **1.70 out-migrants age 20–24 per 1,000 men 20–24**

Zimbabwe, 1987
Men age 20-24

Long-term immigrants:	302
Long-term emigrants :	666
Male population 20-24:	391 968

Ratios

- ◆ Various types of ratios can be computed to indicate the relative magnitude of in-migration, out-migration, net migration, and gross migration to or from a country:
- ◆ Let I = Number of in-migrants
 O = Number of out-migrants
 $I+O$ = Gross migration
 $I-O$ = Net migration

Ratios

- ◆ Ratio of out-migration to in-migration = magnitude of out-migration compared to in-migration

$$\frac{O}{I}$$

- ◆ Ratio of net migration to in-migration

$$\frac{I - O}{I}, \text{ where } I > O$$

Exercise

Ratios

- ◆ Calculate the ratio of out- to in-migration and the ratio of net to in-migration for Zimbabwe in 1987

Zimbabwe, 1987

Long-term immigrants:	3 925
Long-term emigrants :	5 330
Total population	: 8 640 000

You have 15 seconds to calculate the answer. You may pause the presentation if you need more time.

Exercise Answer

Ratios

- ◆ The correct answers are as follows:
 - **Ratio of out- to in-migration = 1.36**
 - **Net to in-migration is not calculated because $I < 0$**

Zimbabwe, 1987

Long-term immigrants:	3 925
Long-term emigrants :	5 330
Total population	: 8 640 000

Ratios

- ◆ Ratio of net (out-) migration to out-migration

$$\frac{O - I}{O}, \text{ where } O > I$$

- ◆ Ratio of in-migration to gross migration = magnitude of in-migration to the overall migration movement

$$\frac{I}{I + O}$$

Exercise

Ratios

- ◆ Calculate the ratio of net to out-migration and the ratio of in- to gross migration for Zimbabwe in 1987

Zimbabwe, 1987

Long-term immigrants:	3 925
Long-term emigrants :	5 330
Total population	: 8 640 000

You have 15 seconds to calculate the answer. You may pause the presentation if you need more time.

Exercise Answer

Ratios

- ◆ The correct answers are as follows:
 - **Net to out-migration = 0.26**
 - **In- to gross migration = 0.42**

Zimbabwe, 1987

Long-term immigrants:	3 925
Long-term emigrants :	5 330
Total population	: 8 640 000

Ratios

- ◆ Ratio of out-migration to gross migration = magnitude of out-migration to the overall migration movement

$$\frac{O}{I + O}$$

Ratios

- ◆ Ratio of net migration to gross migration = migration effectiveness (magnitude of the effective addition [or loss] through migration to the overall gross movement)

$$\frac{I - O}{I + O}$$

Exercise

Ratios

- ◆ Calculate the ratio of out- to gross migration and the ratio of net to gross migration for Zimbabwe in 1987

Zimbabwe, 1987

Long-term immigrants:	3 925
Long-term emigrants :	5 330
Total population	: 8 640 000

You have 15 seconds to calculate the answer. You may pause the presentation if you need more time.

Exercise Answer

Ratios

- ◆ The correct answers are as follows:
 - **Out- to gross migration = 0.58**
 - **Net to gross migration = -0.15**

Zimbabwe, 1987

Long-term immigrants:	3 925
Long-term emigrants :	5 330
Total population	: 8 640 000

Partial Migration Rate

- ◆ Let I_{ij} = Number of in-migrants to area "i" from area "j"
- O_{ij} = Number of out-migrants from area "i" to area "j"
- $I_{ij} = O_{ji}$ (by definition)

- ◆ Also let
- P_i = Midyear population in area "i"
- P_j = Midyear population in area "j"

Partial Migration Rate

- ◆ *Partial Migration Rate*—Number of migrants to an area from a particular origin, or from an area to a particular destination, per 1,000 of the population at either origin or destination

$$\frac{I_{ij}}{P_i} * 1000 \quad \text{or} \quad \frac{I_{ij}}{P_j} * 1000$$

$$\text{or} \quad \frac{O_{ij}}{P_i} * 1000 \quad \text{or} \quad \frac{O_{ij}}{P_j} * 1000$$

Gross Rate of Population Interchange

- ◆ *Gross Rate of Population Interchange*—
Proportion of in-migration (or out-migration) between two populations

$$= \frac{I_{ij} + I_{ji}}{P_i + P_j} \quad \text{or} \quad \frac{O_{ij} + O_{ji}}{P_i + P_j}$$

Distribution

From Census Data

- ◆ Migration can be studied by considering the distribution of the following:
 - Place of birth
 - Place of residence at some specified earlier date
 - Nationality
 - Duration at current residence

Distribution

From Administrative Data

- ◆ Migration can be tabulated by the following:
 - Nation of origin
 - Destination
 - Age
 - Sex

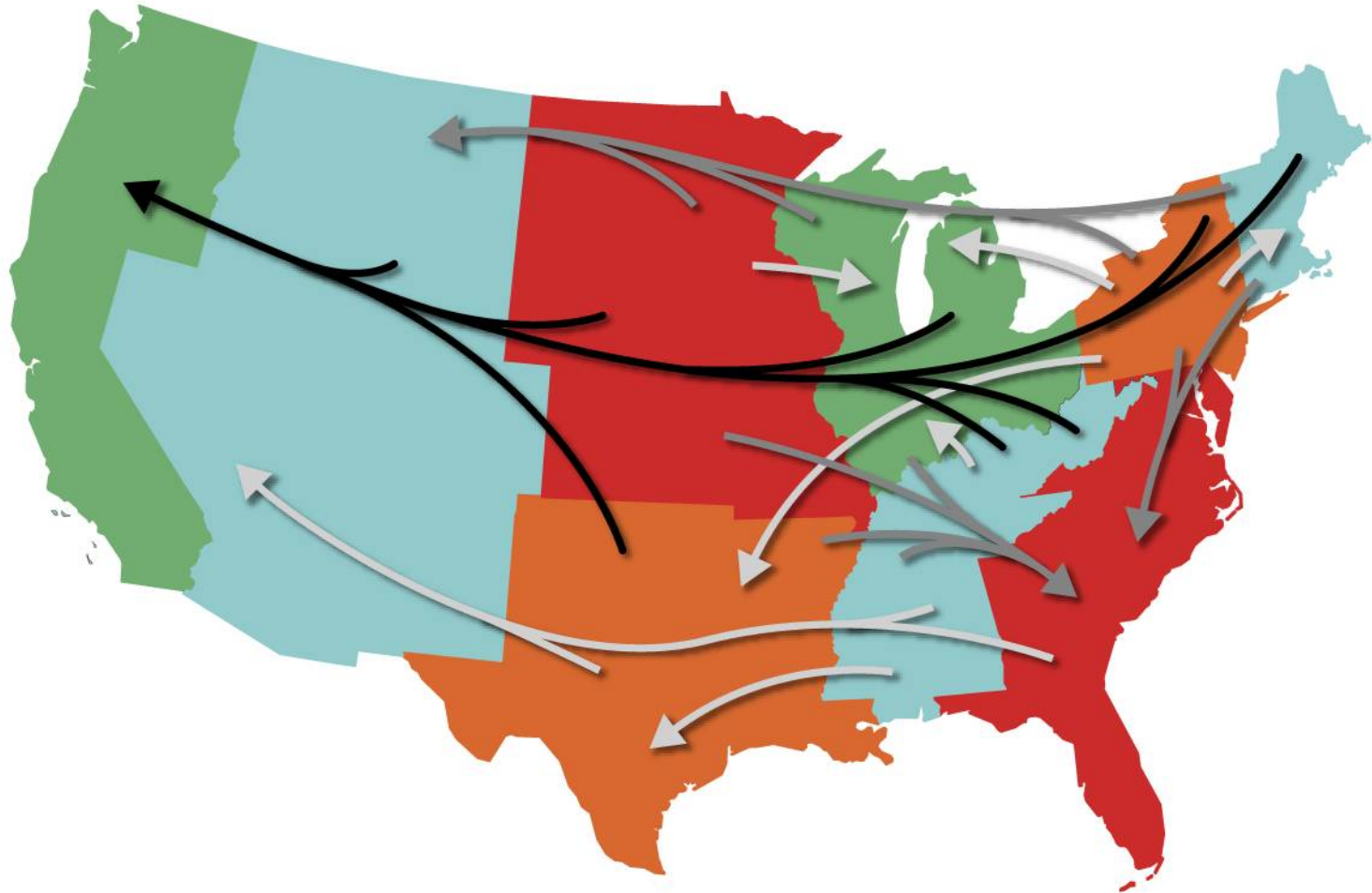
Measures from Surveys with Migration Histories

- ◆ Number of moves
 - Mean/median
 - Moves per unit of time
- ◆ Probability of ever moving
 - Can be calculated by age, sex, race, etc.

Measures from Surveys with Migration Histories

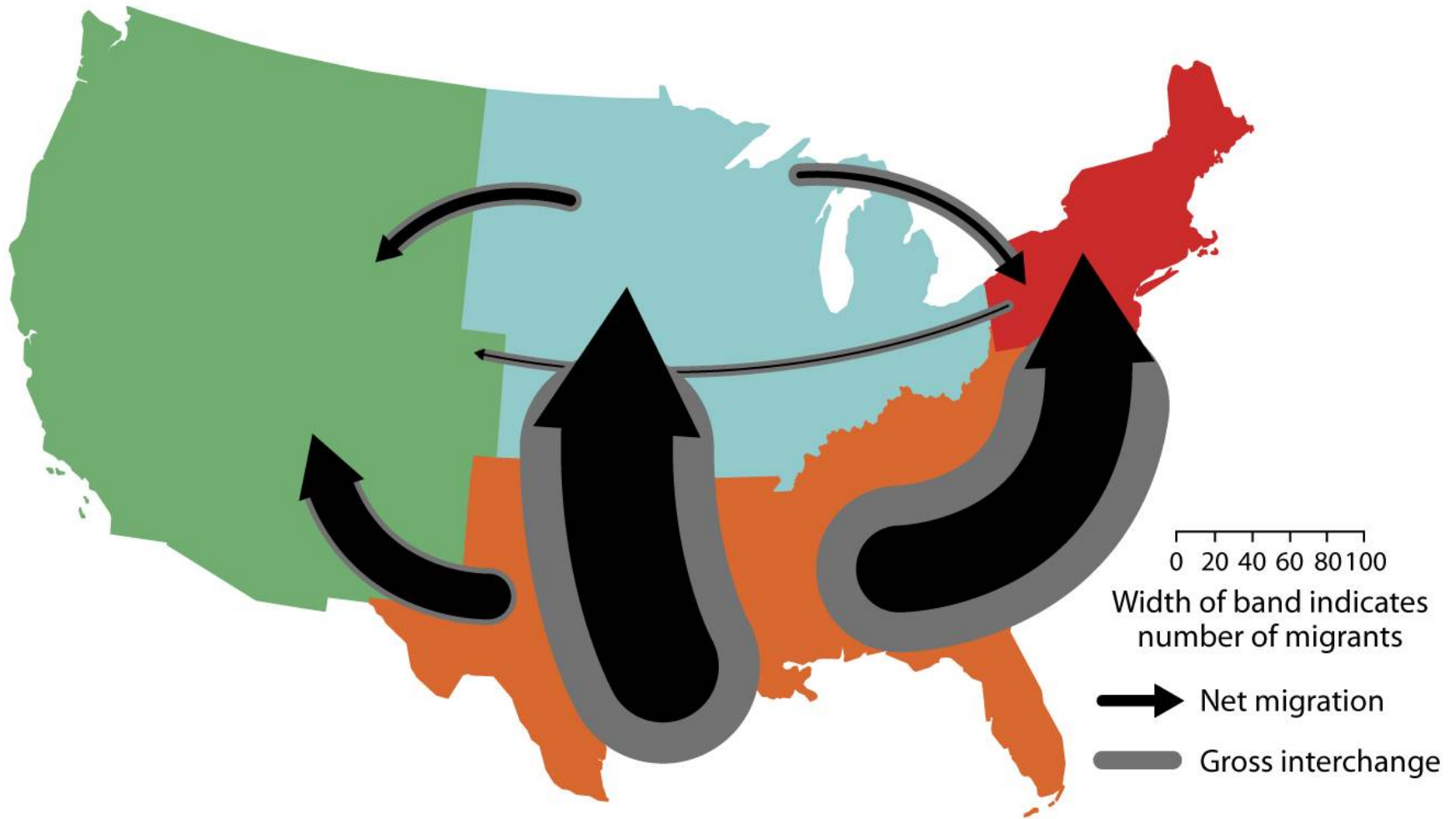
- ◆ Note:
 - The reference population is selected for current presence in area and survival
 - There may be problems of recall error

Net Streams Between Divisions, Native Whites 10 Years and Over, Conterminous United States, 1950 to 1960



Adapted by CTLT from Henry S. Shyrock and Jacob S. Siegel, *The methods and materials of demography*, Academic Press 1976.

Net and Gross Interchange of Nonwhite Migrants Between Each Pair of Regions for the United States, 1935 to 1940



Adapted by CTLT from Henry S. Shyrock and Jacob S. Siegel, *The methods and materials of demography*, Academic Press 1976.

Summary

- ◆ Migration is an important element in the growth of the population and the labor force of an area
- ◆ International and internal migration are the two broad types of migration
- ◆ The measurement and analysis of migration are important in the preparation of population estimates and projections