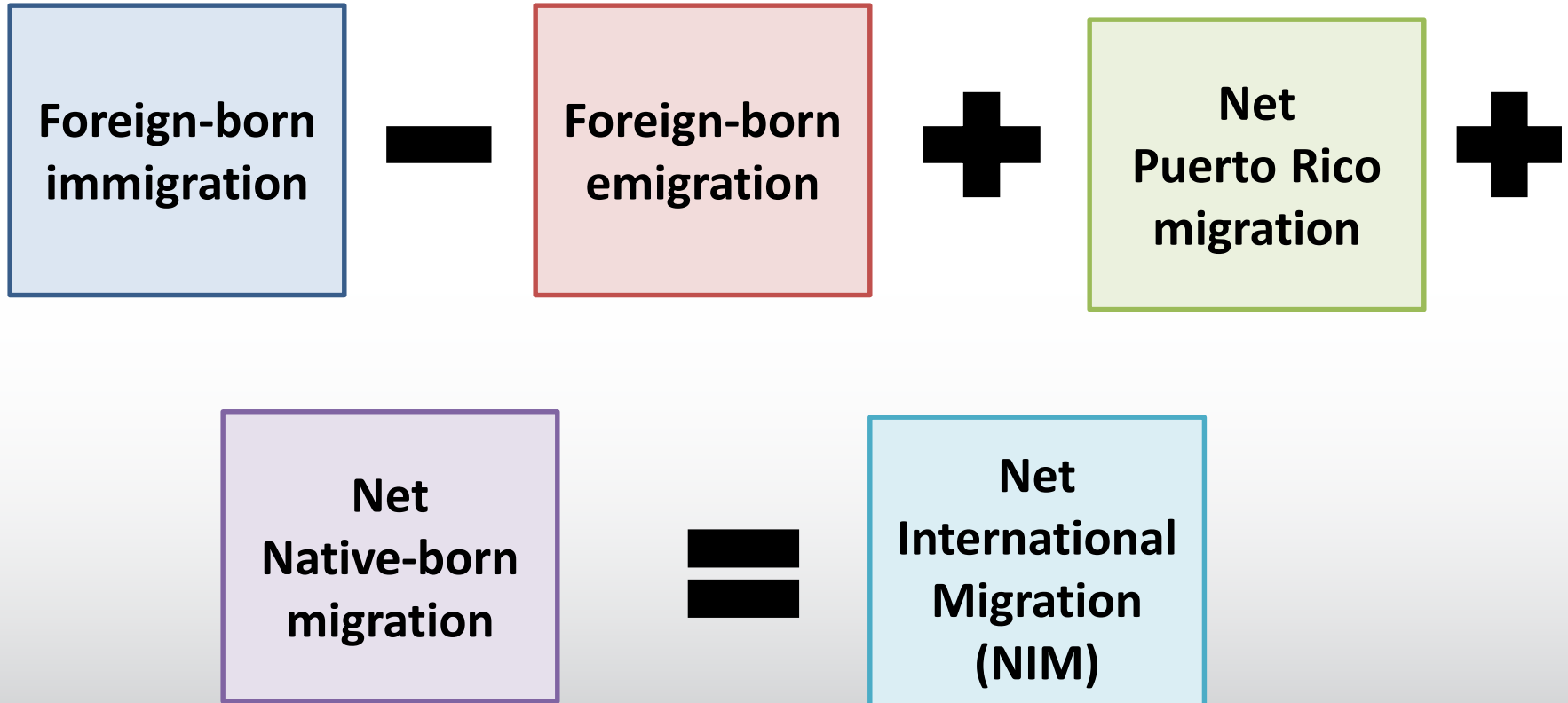# Net International Migration Emigration Methodology

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UNSD/UNESCAP Regional Workshop on International Migration
Bangkok, Thailand
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U.S. Estimates of Net International Migration (NIM)

- The U.S. Census Bureau estimates international migration in several parts:
  - Foreign-born immigration
  - Foreign-born emigration
  - Net migration between the United States and Puerto Rico
  - Net migration of the native born

Components of NIM

Foreign-born immigration − **Foreign-born emigration** + **Net Puerto Rico migration** +

Net Native-born migration = **Net International Migration (NIM)**

Foreign-Born Emigration

- The annual *outflow* of migrants who are not a U.S. citizen at birth
  - Number of people leaving the country in a given time period
- Second largest component of NIM
  - 18% of gross migration
- The most difficult international migration component to estimate, since we do not collect information on people leaving the country
- National total estimated using multiple American Community Survey (ACS) single-year files to calculate emigration rates for certain foreign-born populations based on country of birth, sex, and length of stay in the U.S.
  - Residual method for selected immigrant groups
    - 7 place-of-birth, sex, and period-of-entry cohort groups

ACS Questions

7 **Where was this person born?**

☐ In the United States – *Print name of state.*

☐ Outside the United States – *Print name of foreign country, or Puerto Rico, Guam, etc.*

8 **Is this person a citizen of the United States?**

☐ Yes, born in the United States ➜ *SKIP to 10a*

☐ Yes, born in Puerto Rico, Guam, the U.S. Virgin Islands, or Northern Marianas

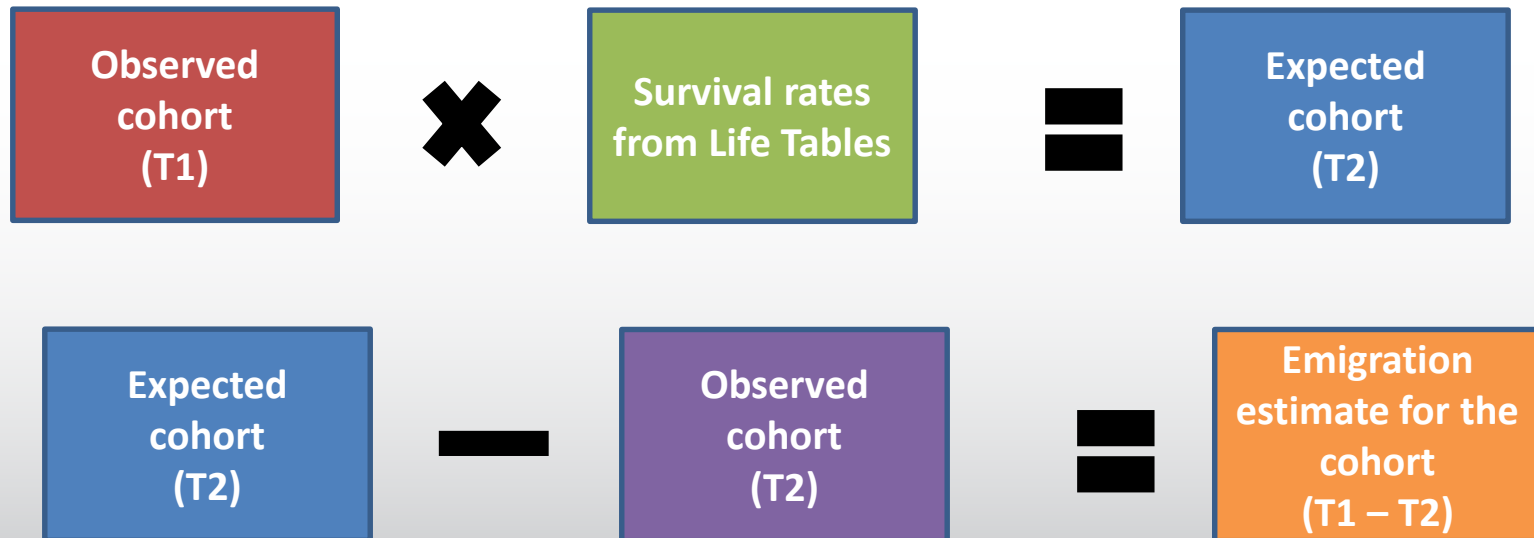☐ Yes, born abroad of U.S. citizen parent or parents

☐ Yes, U.S. citizen by naturalization – *Print year of naturalization* ↙

☐ No, not a U.S. citizen

9 **When did this person come to live in the United States?** *Print numbers in boxes.*

Year

Foreign-Born Emigration

1. Use the residual method to calculate emigration rates
2. Annualize the rates
3. Apply the rates to *at risk* populations from the ACS

Observed cohort (T1)	✖	Survival rates from Life Tables	=	Expected cohort (T2)

Expected cohort (T2)	▬	Observed cohort (T2)	=	Emigration estimate for the cohort (T1 – T2)

Residual Method Formula

$$P_2 - I_{1-2} = P_1 - D_{1-2} - E_{1-2}$$

National population leaves cohort due to death and out-migration, where:

P_1: cohort alive at Time 1

I_{1-2}: new immigration between Time 1 and 2

$P_2 - I_{1-2}$: cohort alive and present in U.S. at Time 2

D_{1-2}: deaths between Time 1 and 2
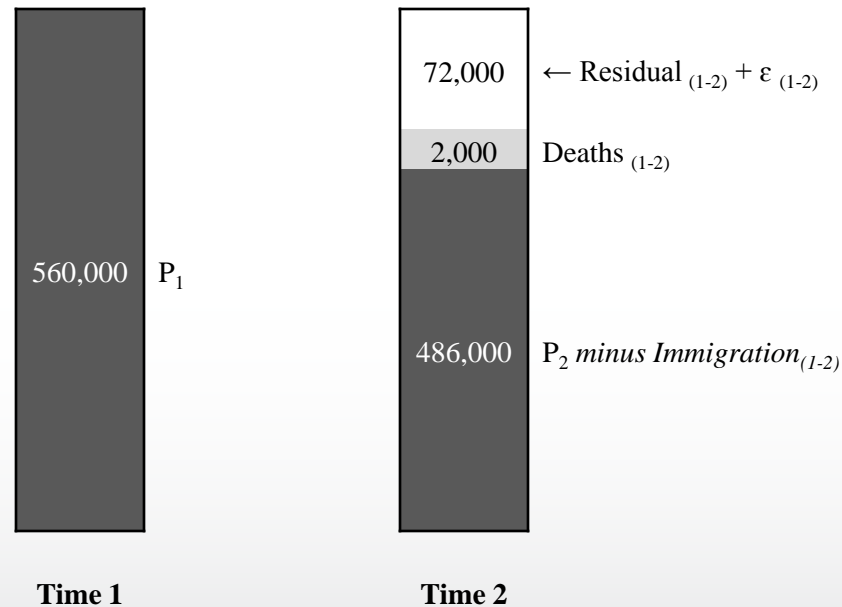
E_{1-2}: total emigration between Time 1 and 2

How the T1 and T2 populations and residual are measured

- P1 is the observed stock of a specific foreign-born population at Time 1 (e.g. 2014, Mexican males)

- P2 is the Time 2 (e.g. 2017) observed stock of the same foreign-born population (those who entered the United States in 2014 or earlier "minus recent immigration")

- Deaths calculated by applying survival rates to the T1 (e.g. 2014) stock population (e.g. for 3-years to 2017)

- Remaining difference (residual) between P1 and P2 stock is assumed to be emigration, since difference is not attributable to deaths or recent immigration

  - When P2 is greater than P1, we get negative rates, which are implausible, so set emigration rate to "0," or hold rates constant for some groups (average of previous years)
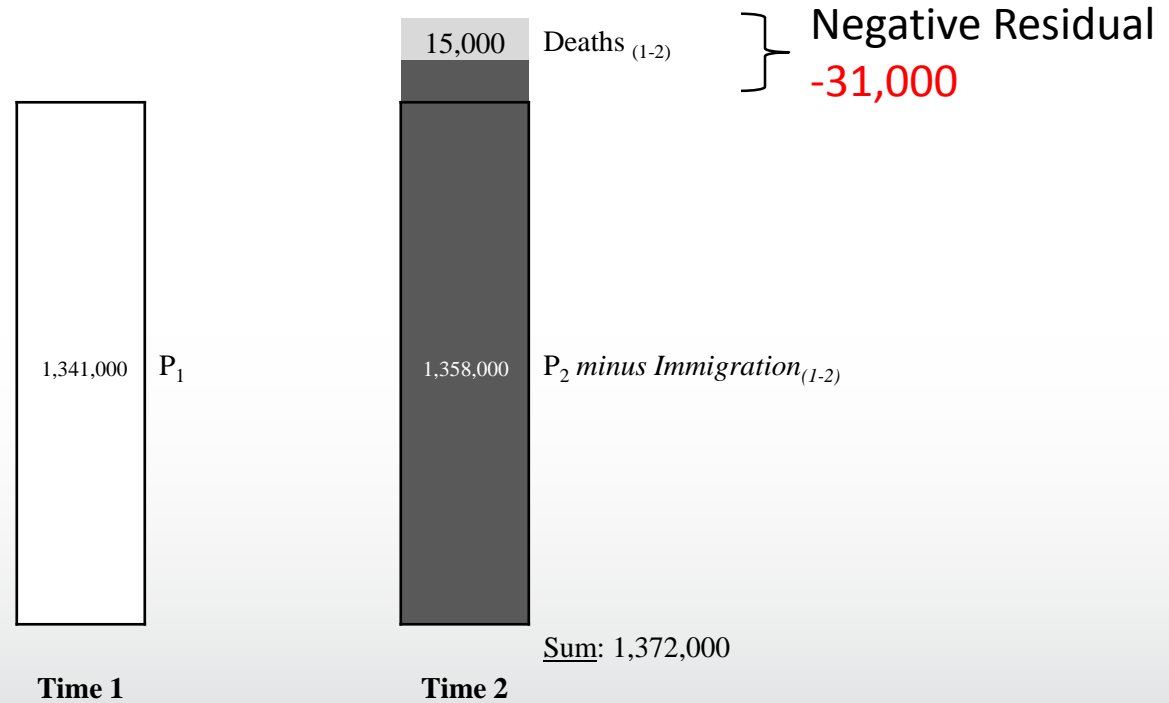
ACS-ACS Residual: Recent Mexican Males

Not real data

72,000	← Residual $_{(1-2)}$ + ε $_{(1-2)}$
2,000	Deaths $_{(1-2)}$
486,000	P_2 *minus Immigration$_{(1-2)}$*

560,000 P_1

Time 1

Time 2

P_1 observed foreign-born population at Time 1
P_2 observed foreign-born population at Time 2
ε survey variability (sampling and non-sampling)

ACS-ACS Residual:
Non Recent Mexicans

Not real data

| 15,000 | Deaths $_{(1-2)}$ |

Negative Residual
-31,000

| 1,341,000 | P$_1$ |

| 1,358,000 | P$_2$ *minus Immigration*$_{(1-2)}$ |

Sum: 1,372,000

Time 1   **Time 2**

P_1 observed foreign-born population at Time 1
P_2 observed foreign-born population at Time 2
ε survey variability (sampling and non sampling)

ACS-ACS Residual Method Rate Calculation

- Data Source: five consecutive 1-year ACS files

- Steps:

  1. Calculate six residuals from the time period

  2. Convert residuals to rates

  3. Average the six rates *(convert negative rates to 0)*

  4. Apply the **average rate** to the **at-risk population** (foreign-born population) to derive annual national foreign-born emigrant flow (FBEMIG)

     - Calculate rates for seven groups

Calculate Emigration Rates for Seven Foreign-Born Groups

Place-of-birth, sex, and period-of-entry cohort groups
Recent Mexican Males (entered US within last 10 years)
Recent Mexican Females (entered US within last 10 years)
Non-Recent Mexicans (entered US more than 10 years ago)
Recent European and Canadians (entered US within last 10 years)
Recent Asians (entered US within last 5 years)
Recent Other (entered US within last 10 years)
Non-Recent Other (entered US more than 10 years ago (Asians more than 5 years ago))

6-Rate Calculation
Ex: 2010 through 2014 ACS

Within a 5-year period, 3 out of 6 rates will be based on the same starting year (e.g. 2010)
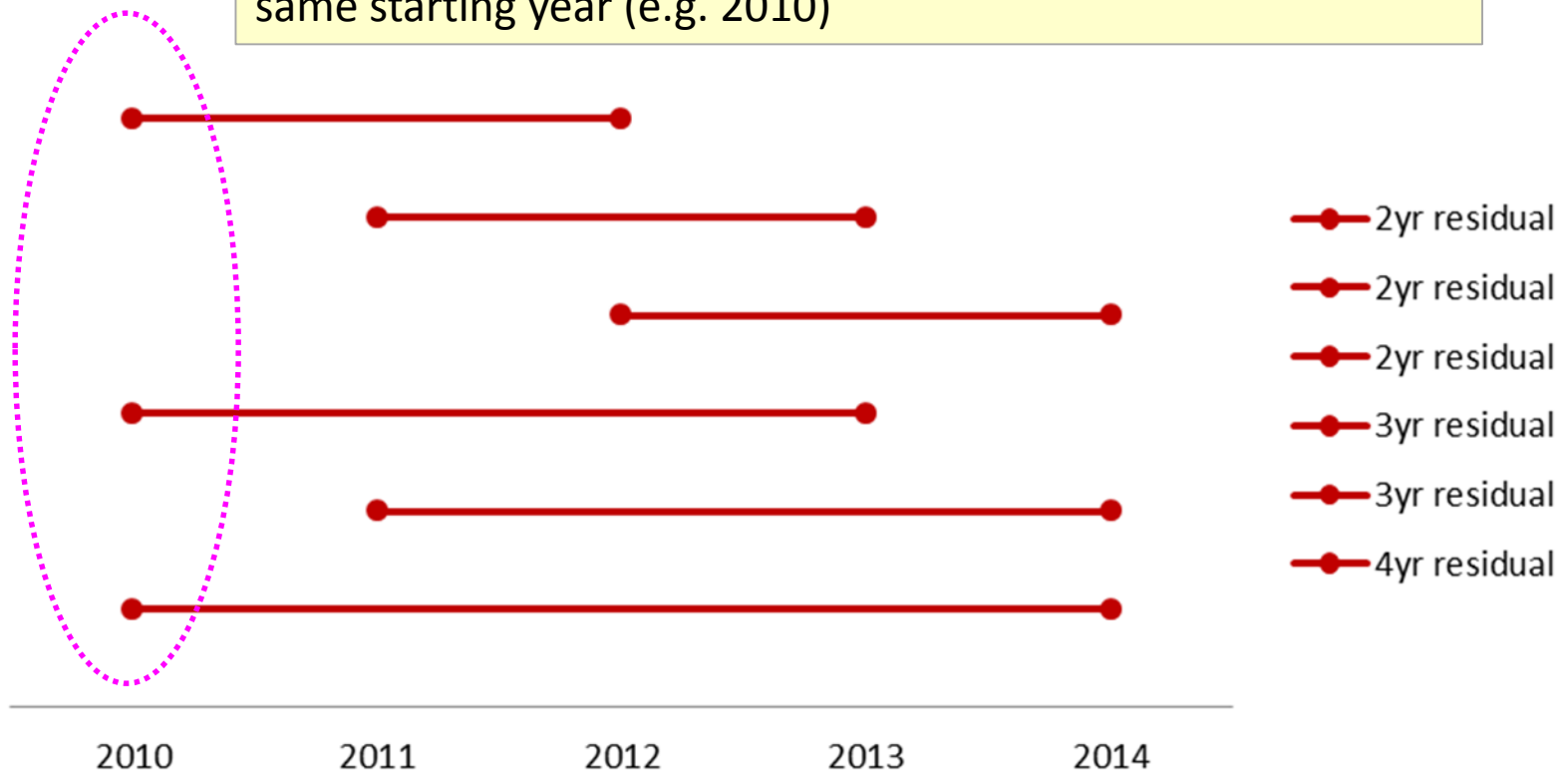
1-Year ACS files used for V2016

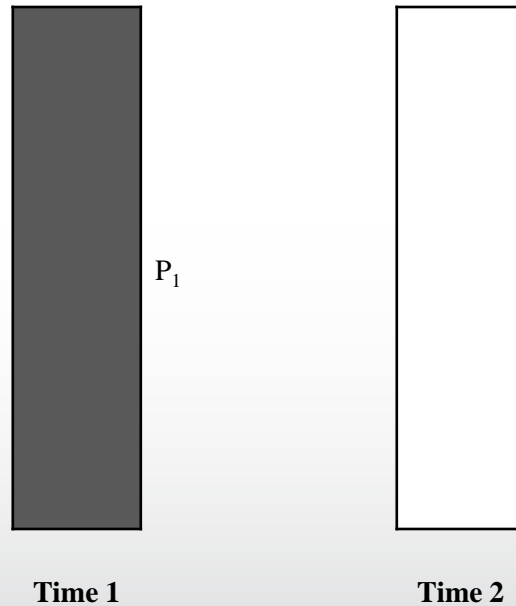| Estimates Year	Period	1-Year ACS Files
2010	4/1/2010 – 6/30/2010	2006-10
2011	7/1/2010 – 6/30/2011	2007-11
2012	7/1/2011 – 6/30/2012	2008-12
2013	7/1/2012 – 6/30/2013	2009-13
2014	7/1/2013 – 6/30/2014	2010-14
2015	7/1/2014 – 6/30/2015	2011-15
2016	7/1/2015 – 6/30/2016	2011-15*

* 2016 ACS not released in time for V2016 production

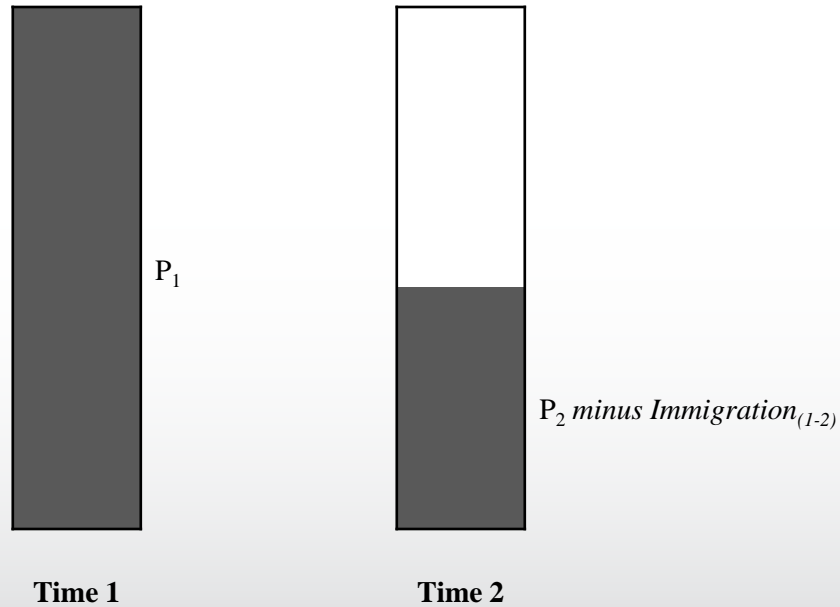# Example 1: Residual Method Population Experiencing <u>High</u> Emigration
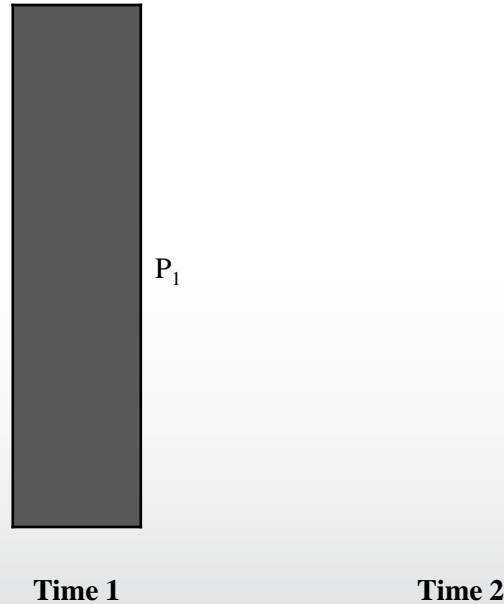
P_1

Time 1   **Time 2**

P_1 foreign-born population at Time 1

Example 1: Residual Method Population Experiencing <u>High</u> Emigration

P_1

Time 1   Time 2

P_1 foreign-born population at Time 1

Example 1: Residual Method Population Experiencing <u>High</u> Emigration

P_1

P_2 *minus Immigration$_{(1-2)}$*
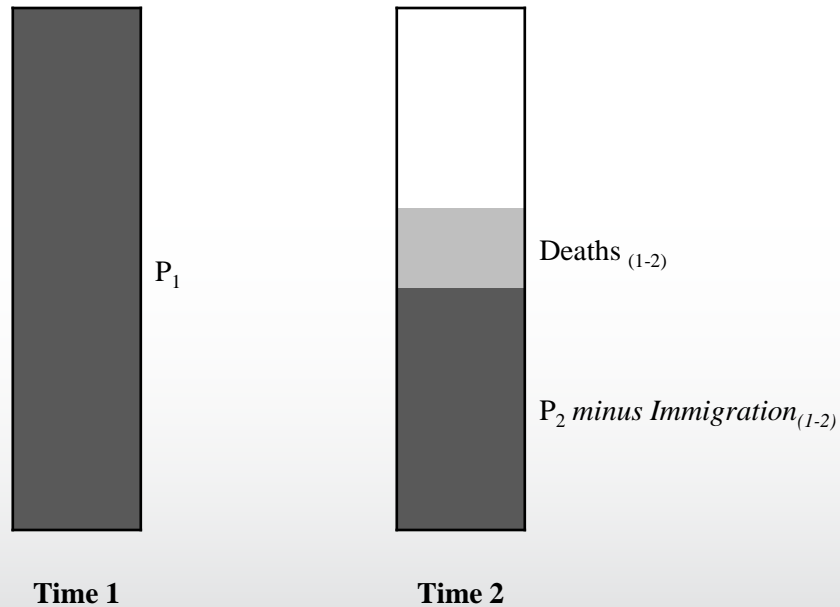
Time 1

Time 2

P_1 foreign-born population at Time 1
P_2 foreign-born population at Time 2

Example 1: Residual Method Population Experiencing <u>High</u> Emigration

P_1

Deaths $_{(1-2)}$

P_2 *minus Immigration*$_{(1-2)}$

Time 1　　　　　**Time 2**

P_1　　foreign-born population at Time 1
P_2　　foreign-born population at Time 2

Example 1: Residual Method Population Experiencing <u>High</u> Emigration
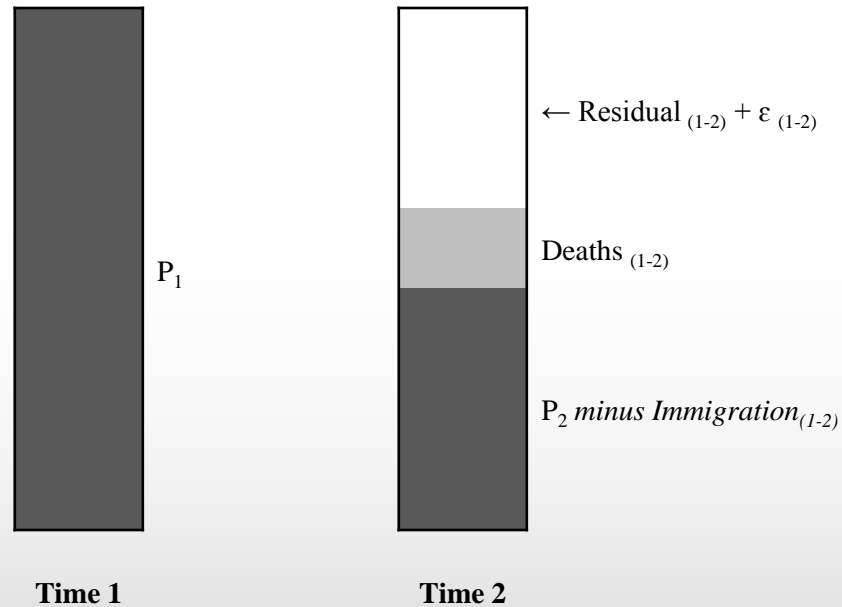
P_1

← Residual $_{(1-2)}$ + ε $_{(1-2)}$

Deaths $_{(1-2)}$

P_2 *minus Immigration$_{(1-2)}$*
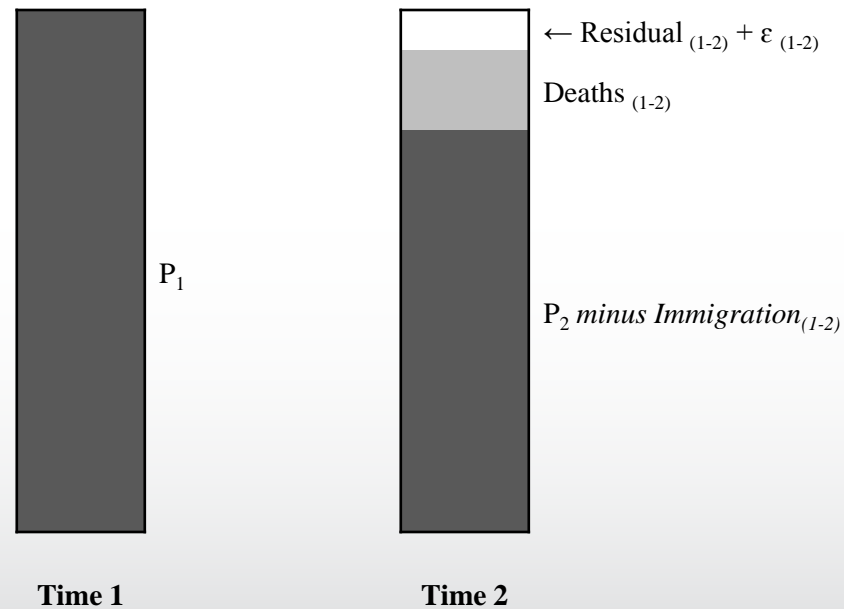
Time 1

Time 2

P_1 foreign-born population at Time 1

P_2 foreign-born population at Time 2

survey variability (sampling and non sampling)

Example 2: Residual Method Population Experiencing <u>Low</u> Emigration

P_1

$\leftarrow$ Residual $_{(1-2)}$ + ε $_{(1-2)}$

Deaths $_{(1-2)}$

P_2 *minus Immigration$_{(1-2)}$*
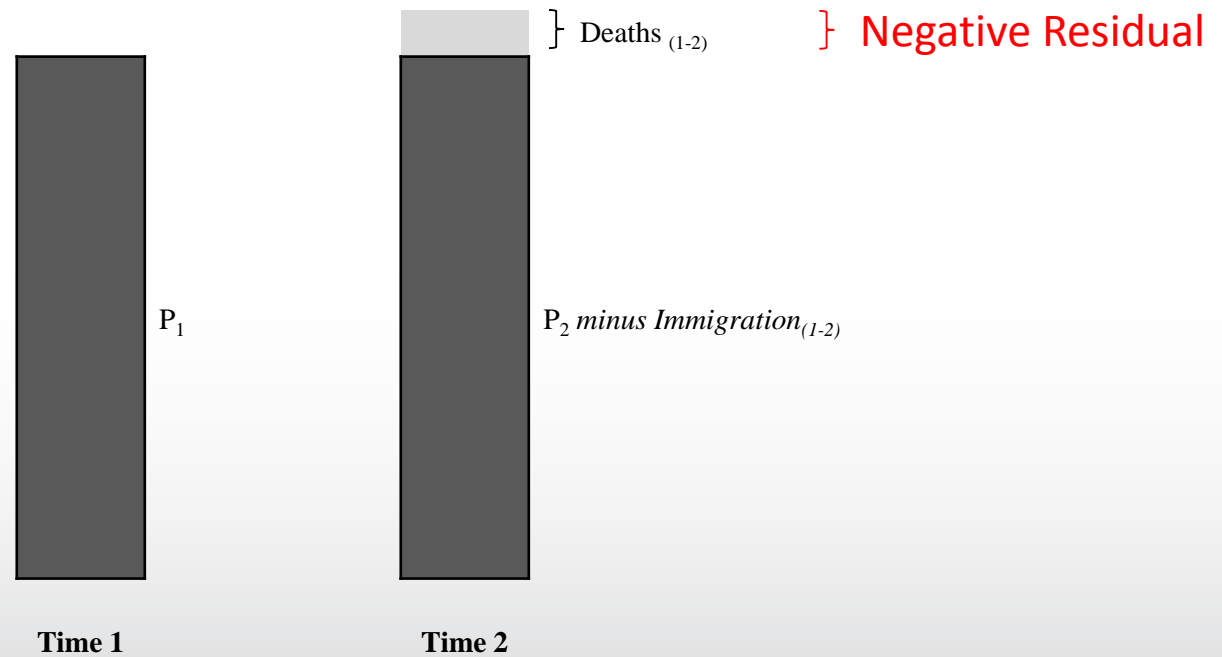
Time 1

Time 2

P_1 foreign-born population at Time 1
P_2 foreign-born population at Time 2
         survey variability (sampling and non sampling)

Example 3: Residual Method
An Extreme Case

} Deaths $_{(1-2)}$ } Negative Residual

P$_1$

P$_2$ *minus Immigration$_{(1-2)}$*

Time 1   **Time 2**

P$_1$ foreign-born population at Time 1
P$_2$ foreign-born population at Time 2
                 survey variability (sampling and non sampling)

Subnational distribution

- Distribute national emigration totals for the 7 emigrant groups by age, sex, race/Hispanic origin at the subnational (state and county) level

- Subnational distributions determined by using a "proxy" universe based on the recent stock of the foreign-born population

- States sum to the national total, while counties sum up to county total

ACS Residual Method Evaluation

- This sample survey-based method appears to be stable for groups that exhibit high levels of emigration

- Less so for groups that exhibit little-to-no emigration (e.g. non-recent groups)

- Large at-risk populations are more sensitive to changes in FBEMIG rates
  - Non-Recent Mexico rate increased by **+0.004** between 2013 and 2014, which increased FBEMIG by **+153,000**

A Sensitive Method

- Fundamental assumption/requirement for residual method is that the T1 and T2 population are the same universe

  - Small changes in coverage/estimation between T1 and T2 can result in large changes in emigration estimates

    - Underestimation at T1$\rightarrow$lower emigration estimates (higher NIM)
    - Overestimation at T1$\rightarrow$ higher emigration estimates (lower NIM)
    - Overestimation at T2$\rightarrow$lower emigration estimate (higher NIM)
    - Underestimation at T2$\rightarrow$higher emigration estimate (lower NIM)

Questions/Discussion?