

# Census Coverage Measurement (CCM) Survey Overview

Webinar, May 17, 2012

Access the Audio:

Toll free number: 888-989-4394

Participant passcode: PRECCM

# Speakers

Host

Stacy Vidal  
Public Information Office

Presenter

Patrick J. Cantwell,  
Assistant Division Chief, Sampling  
and Estimation  
Decennial Statistical Studies Division

# Release of Estimates on May 22, 2012

- News conference – 10 to 11 a.m.
- Technical panel and discussants – 1 to 4:30 p.m.

# Overview

1. What is "coverage of the census"?
  - Net census coverage error
  - Components of census coverage
2. What results will we release?
3. Approach and design of the CCM

# Coverage of the Census

Several ways to measure quality of census

- Census process indicators
- Demographic analysis
- Post-enumeration survey, CCM

# Coverage of the Census (cont.)

*Net* census coverage (defined as)

$$\begin{aligned} &= \text{estimate of population from survey} \\ &\quad - \text{census count} \end{aligned}$$

if positive ( $>0$ ), referred to as net undercount

if negative ( $<0$ ), net overcount

# Coverage of the Census (cont.)

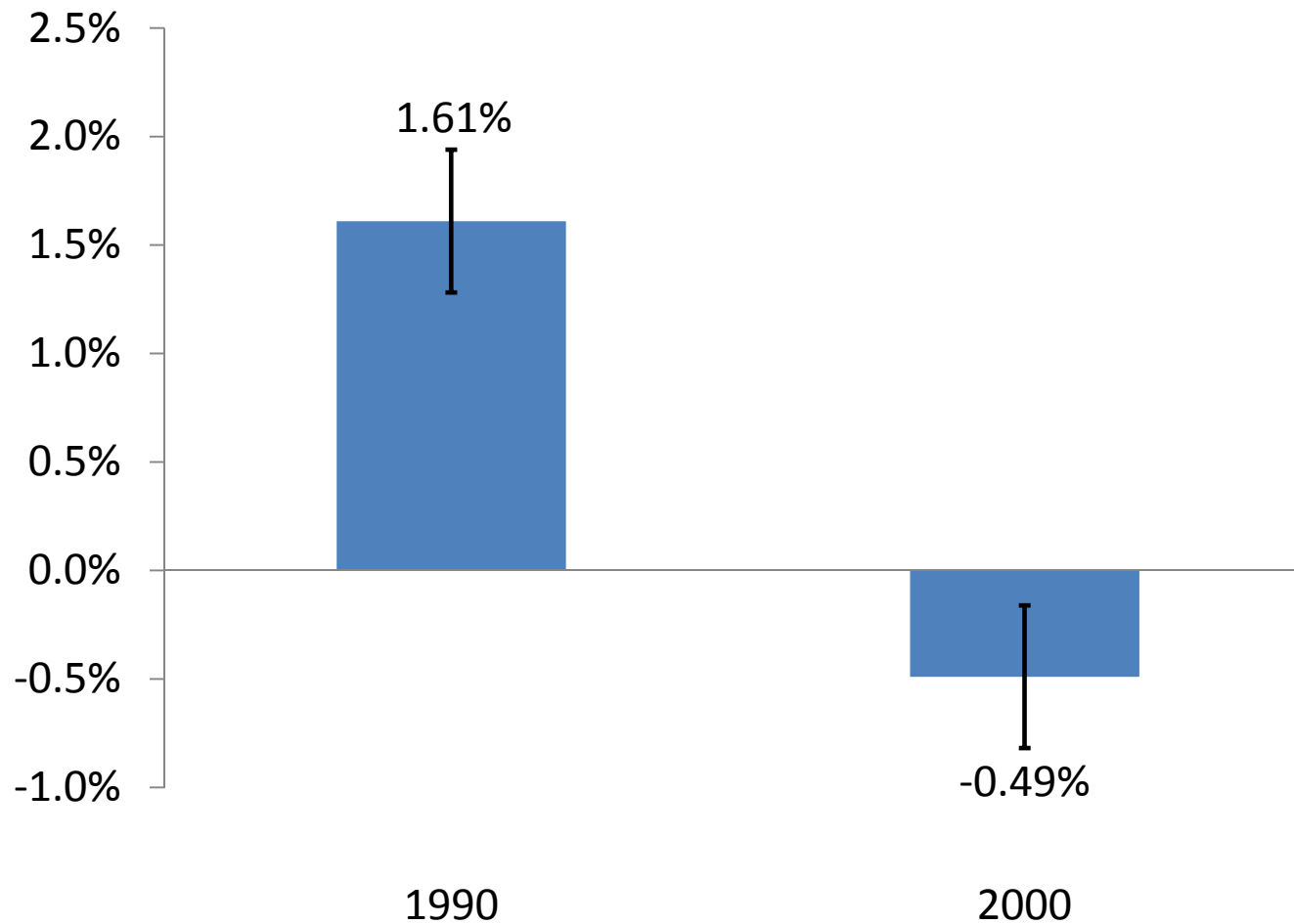
*Percent* Net coverage (defined as)

$$= \frac{\text{estimate from survey} - \text{census count}}{\text{estimate from survey}} \times 100$$

if positive ( $>0$ ), referred to as % net undercount

if negative ( $<0$ ), % net overcount

## Percent Net Coverage Error for the U.S. in 1990 and 2000





# Results from the 2000 Coverage Survey

- After the original survey:
  - extensive analyses, evaluations,  
nation-wide computer matching
- Results:
  - small net *overcount*, -0.49%
  - large number of erroneous enumerations  
and omissions

# Lessons from 2000

- Must improve determination of census-day residence
- Must improve techniques to detect and resolve duplicate enumerations

# Purpose of the 2010 CCM

- Provide estimates of
  - net coverage
  - components of census coverage

For

- persons in housing units  
(not people in group quarters)
- housing units

# Purpose of the 2010 CCM (cont.)

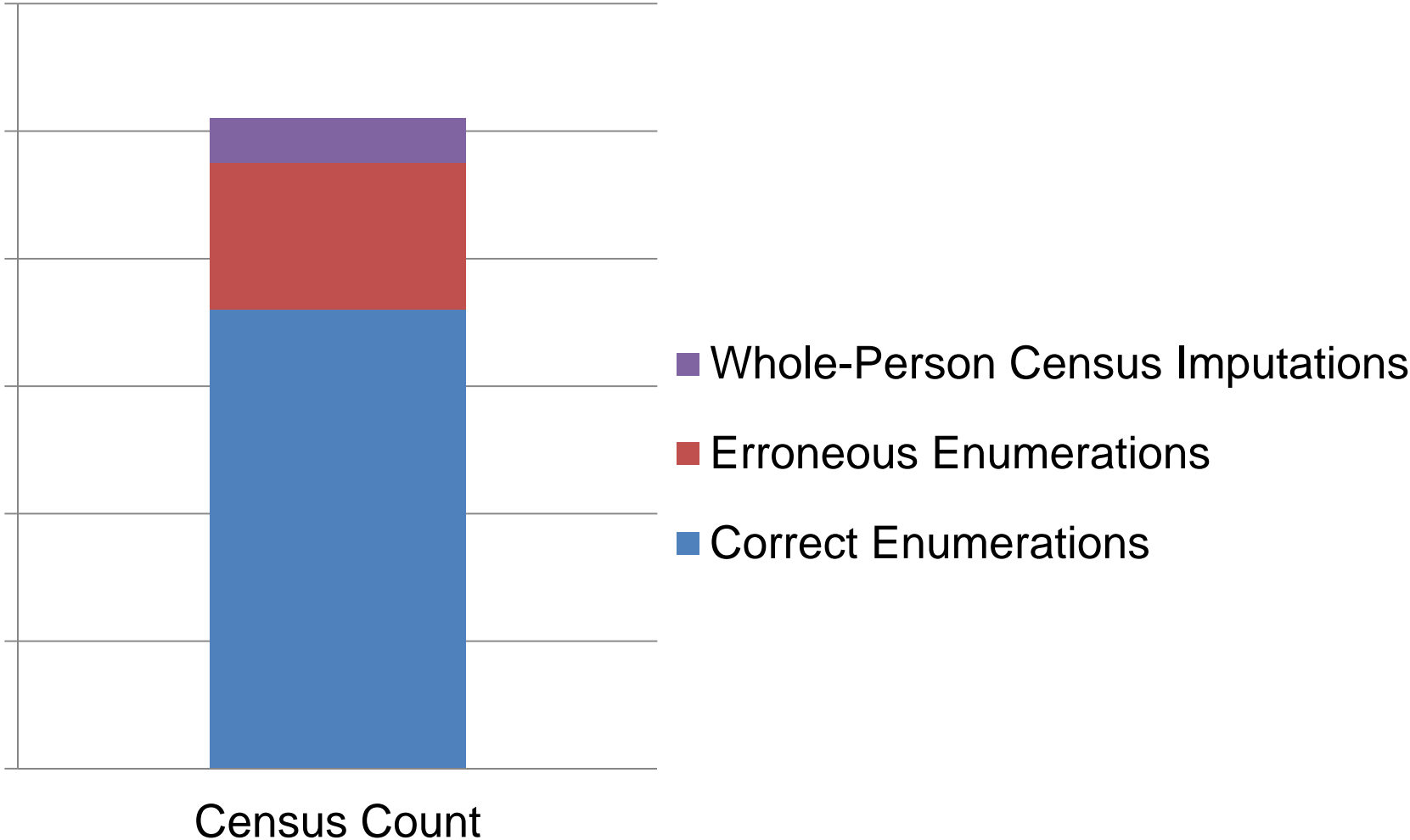
- Use results to improve future censuses, help plan tests for 2020 Census
- No intent to adjust the census counts

# Components of Coverage for Persons

## Census Count

1. Correct enumerations
2. Erroneous enumerations
  - due to duplication (1 person, 2 or more records)
  - others (died before 04/01/10, visitor, et al.)
3. Census imputations (no name, all characteristics "imputed," i.e., statistically inserted)

# Example of Components of the Census Count

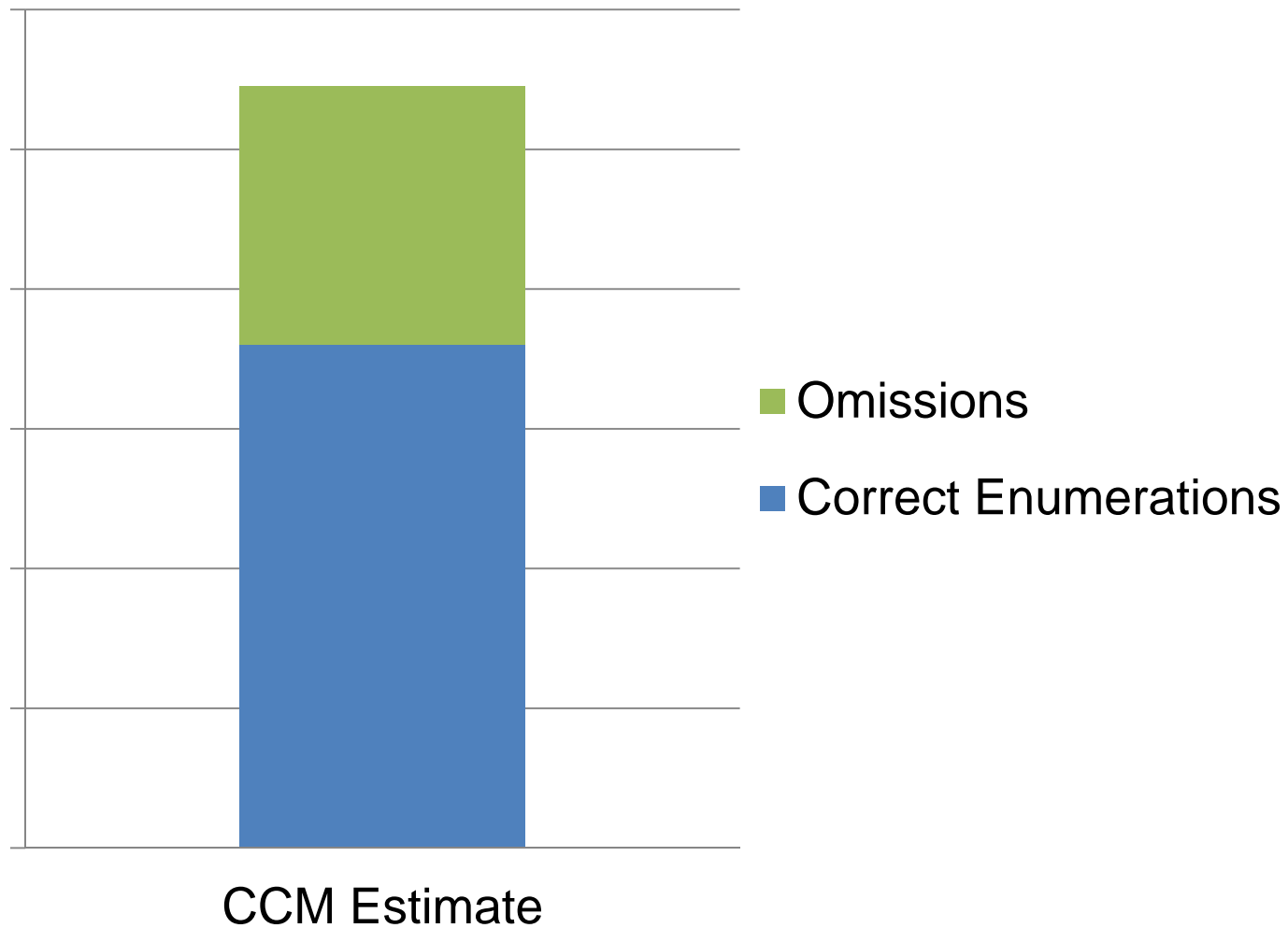


# Components of Coverage for Persons

## Estimate from CCM Survey

1. Correct enumerations (same as in census count)
2. Omissions
  - people completely missed in the census
  - people whom we can't verify were enumerated,  
e.g., census imputations

# Example of Components of the CCM Estimate

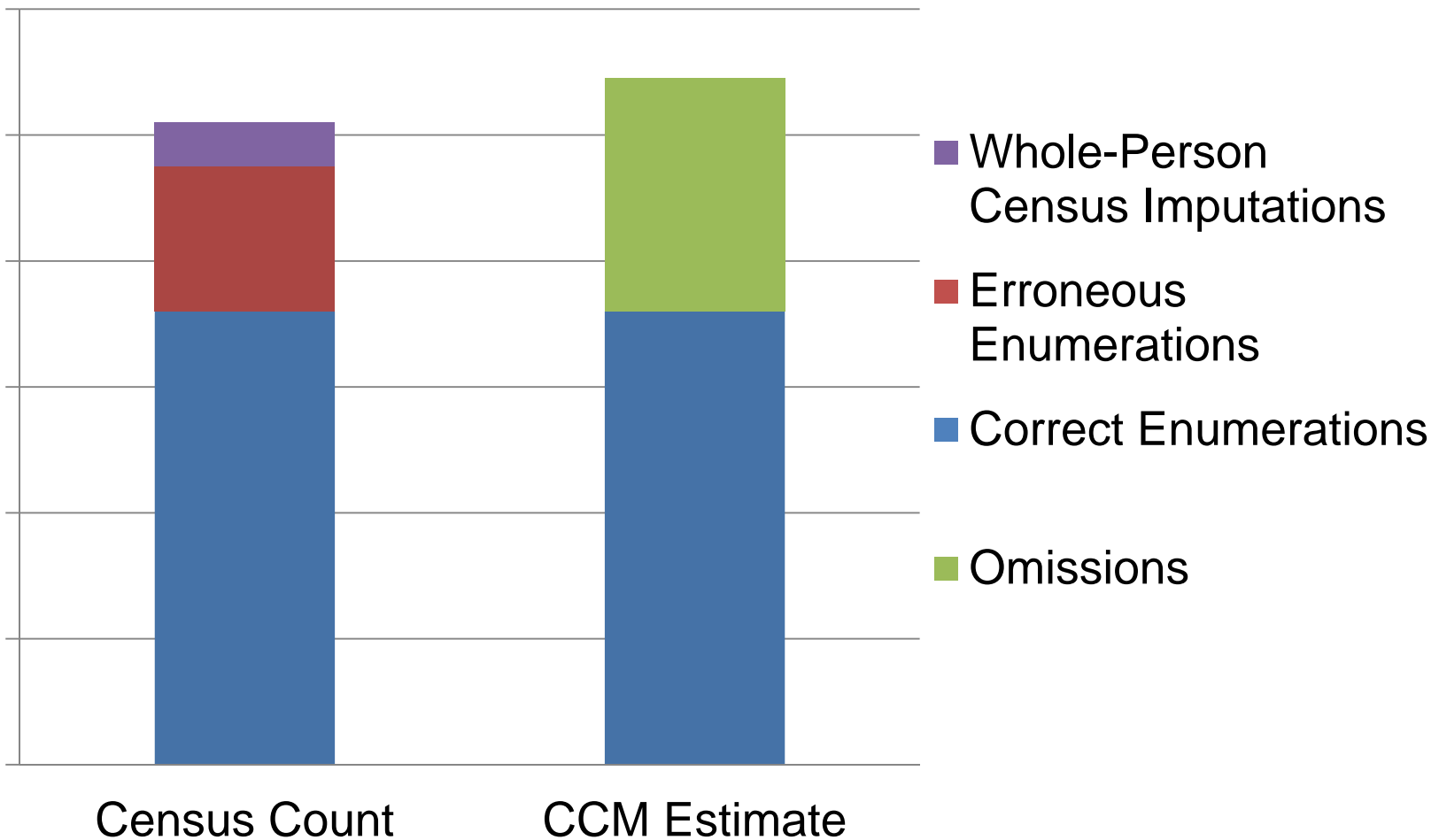




# Components of Coverage for Persons

Census Count	Estimate from CCM
<ol style="list-style-type: none"><li>1. Correct enumerations</li><li>2. Erroneous enumerations<ul style="list-style-type: none"><li>• due to duplication</li><li>• others</li></ul></li><li>3. Census imputations</li></ol>	<ol style="list-style-type: none"><li>1. Correct enumerations</li><li>2. Omissions</li></ol>

## Example of Components: Census Count and CCM Estimate



# Components of Coverage for Housing Units

Census Count	Estimate from CCM
<ol style="list-style-type: none"><li>1. Correct enumerations</li><li>2. Erroneous enumerations<ul style="list-style-type: none"><li>• due to duplication</li><li>• others</li></ul></li></ol>	<ol style="list-style-type: none"><li>1. Correct enumerations</li><li>2. Omissions</li></ol>

# Coverage Estimates from CCM

Three major groups:

- Demographic or housing unit characteristics
- Geographic areas
- Census operations

# Coverage Estimates for Demographic Groups (Generally at the U.S. Level)

- Race
- Hispanic origin
- Owner or renter
- Age-sex groups

# Coverage Estimates by Geography

- U.S. and (later) Puerto Rico
- Regions (East, Midwest, South, West)
- States and District of Columbia
- Large counties
- Large places

# Thresholds For Counties and Places (What is "Large"?)

- For net error:  
100,000+ in 2010 census population
- For components of census coverage:  
500,000+ in 2010 census population

# Coverage by Census Operations

- By type of enumeration area
  - mailout/mailback (with nonresponse follow-up)
  - leave the form, mail it back (with follow-up)
  - enumerate in person
- In bilingual mailing areas, or not



# Coverage by Census Operations

- Mail return, by weeks of return
- Nonresponse follow-up, by month of interview
- Coverage follow-up, by reason

Note: For some operations, we cannot estimate net error or omissions

# Coverage Estimates for Housing Units

- By occupied (owned or rented) or vacant
- By type of structure
  - single unit
  - small multi-unit, 2 to 9 units
  - large multi-unit, 10+ units
  - trailers and others

# Approach to Estimation

- Technique for estimating size of population, providing a measure of coverage
- Used in other population studies
- Dual system estimation

# Approach to Estimation (cont.)

- Take the census
- Take a (post-enumeration) survey (PES), completely independent of the census
- Interview the people in the PES
- Try to match the people from the PES to their census records; follow up as necessary
- Estimate how many census records are correct?  
how many PES people were enumerated in census?

# Approach to Estimation (cont.)

Take two samples:

- In the post-enumeration survey (PES), a sample of block clusters, *independent of the census*, called P Sample
- From the census, a sample of records (enumerations) in the same block clusters, called E Sample

# Approach to Estimation (cont.)

		Enumerated in PES ? ( P Sample )		
		YES	NO	Total
Enumerated in Census ? ( E sample )	YES	$N_{11}$	$N_{12}$	$N_{1+}$
	NO	$N_{21}$	$N_{22}$	$N_{2+}$
	Total	$N_{+1}$	$N_{+2}$	$N$

# Approach to Estimation (cont.)

(Shaded in green: Can be measured)		Enumerated in PES ? ( P Sample )		
		YES	NO	Total
Enumerated in Census ?  ( E sample )	YES	$N_{11}$	$N_{12}$	$N_{1+}$
	NO	$N_{21}$	$N_{22}$	$N_{2+}$
	Total	$N_{+1}$	$N_{+2}$	$N$

# Approach to Estimation (cont.)

1. E Sample: Measure proportion of correct enumerations in census
  - For each census record (enumeration): determine if it is correct or erroneous; duplicate? fictitious? correct?



# Approach to Estimation (cont.)

2. P Sample: Measure rate of coverage (capture) in census
  - For all people in P Sample: interview; try to match them to census, determine if census did or did not capture them

# Approach to Estimation (cont.)

(Shaded in red: Matches, total in P Sample)		Enumerated in PES ? ( P Sample )		
		YES	NO	Total
Enumerated in Census ? ( E sample )	YES	$N_{11}$	$N_{12}$	$N_{1+}$
	NO	$N_{21}$	$N_{22}$	$N_{2+}$
Total		$N_{+1}$	$N_{+2}$	$N$

# Sample Design for Independent (P) Sample

- Sample of block clusters, averaging 30 units
- As in 2000, exclude group quarters and remote Alaska
- Select sample from subgroups (i.e., stratify by)
  - state, DC
  - American Indian Reservation, size, tenure

# Final Size of Independent (P) Sample (approx.)

United States (not including Puerto Rico)	
Blocks Clusters (exact)	6,148
Housing Units	170,000
Persons	390,000

# Major Operations and Schedule

Operation	Schedule
Listing of Block Clusters	Aug - Dec 2009
Initial Housing Unit Operations	Jan - May 2010
Person Interview	Aug - Oct 2010
Person Matching and Follow-Up	Oct 2010 - Apr 2011
Final Housing Unit Operations	Mar - Jun 2011

# Release of Estimates on May 22, 2012

- News conference – 10 to 11 a.m.
- Technical panel and discussants – 1 to 4:30 p.m.
- Broadcast live on Census Bureau's Ustream channel:  
<http://www.ustream.tv/channel/us-census-bureau>
- If you plan to attend in-person, RSVP to [pio@census.gov](mailto:pio@census.gov)

# For Further Information

## Media

Public Information Office  
301-763-3030  
pio@census.gov

## General Public

Customer Services Center  
1-800-923-8282 or  
301-763-INFO (4636)

## Press Kit

<http://2010.census.gov/news/press-kits/briefs/briefs.html>

# Additional Slides for Reference



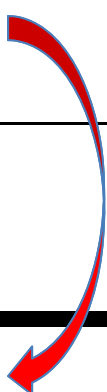
# Approach to Estimation, E Sample

(Shaded in blue: Census enumerations)		Enumerated in PES ? ( P Sample )		
		YES	NO	Total
Enumerated in Census ?  ( E sample )	YES	$N_{11}$	$N_{12}$	$N_{1+}$
	NO	$N_{21}$	$N_{22}$	$N_{2+}$
	Total	$N_{+1}$	$N_{+2}$	$N$



# Approach to Estimation, P Sample

(Shaded in red: Matches, total in P Sample)		Enumerated in PES ? ( P Sample )		
		YES	NO	Total
Enumerated in Census ? ( E sample )	YES	$N_{11}$	$N_{12}$	$N_{1+}$
	NO	$N_{21}$	$N_{22}$	$N_{2+}$
	Total	$N_{+1}$	$N_{+2}$	$N$



# Estimation, Solve for N

If we can assume that the enumerations (census and survey) are independent:

$$\frac{N_{11}}{N_{+1}} \approx \frac{N_{1+}}{N}$$

$$\hat{N} = (N_{1+}) \left( \frac{N_{+1}}{N_{11}} \right)$$

# Final Estimator

For each person  $i$  in the census (C), estimate probabilities,  $p$ , of several types :

$$\hat{N} = \sum_{i \in C} (\hat{p}_{dd,i}) (\hat{p}_{corr\ enum,i}) \left( \frac{1}{\hat{p}_{match,i}} \right) (f^{CB,i})$$