American Community Survey

Comparing Trends Over Time

PRESENTATION BY **BETH JAROSZ OF THE POPULATION REFERENCE BUREAU**

PRB

INFORM
EMPOWER
ADVANCE

Five Key Questions For Comparing ACS Data Over Time

- Where do I get the data?

- What product should I use?

- When is a change significant?

- How do I adjust for inflation?

- What else might affect data comparisons over time?

Where To Access Trend Data

Choosing An ACS Data Product

1-year

When *current* matters most
Large geographies
Large population groups

5-year

When *precise* matters most
Small geographies
Small population groups

Choosing An ACS Data Product

Product Considerations When Comparing Estimates

- Compare equivalent data products.
  - e.g. 1-year to 1-year, 5-year to 5-year
- Note: Years overlap in 5-year products
  - Label data accordingly

2012 5-year	2013 5-year
2008	
2009	2009
2010	2010
2011	2011
2012	2012
	2013

When Is A Change Significant?

Trend Example: Median Income, Prince George's County, MD

	Median Income	MOE
2009-2013	73,623	735
2008-2012	73,568	818
2007-2011	73,447	806
2006-2010	71,260	789
2005-2009	70,753	816
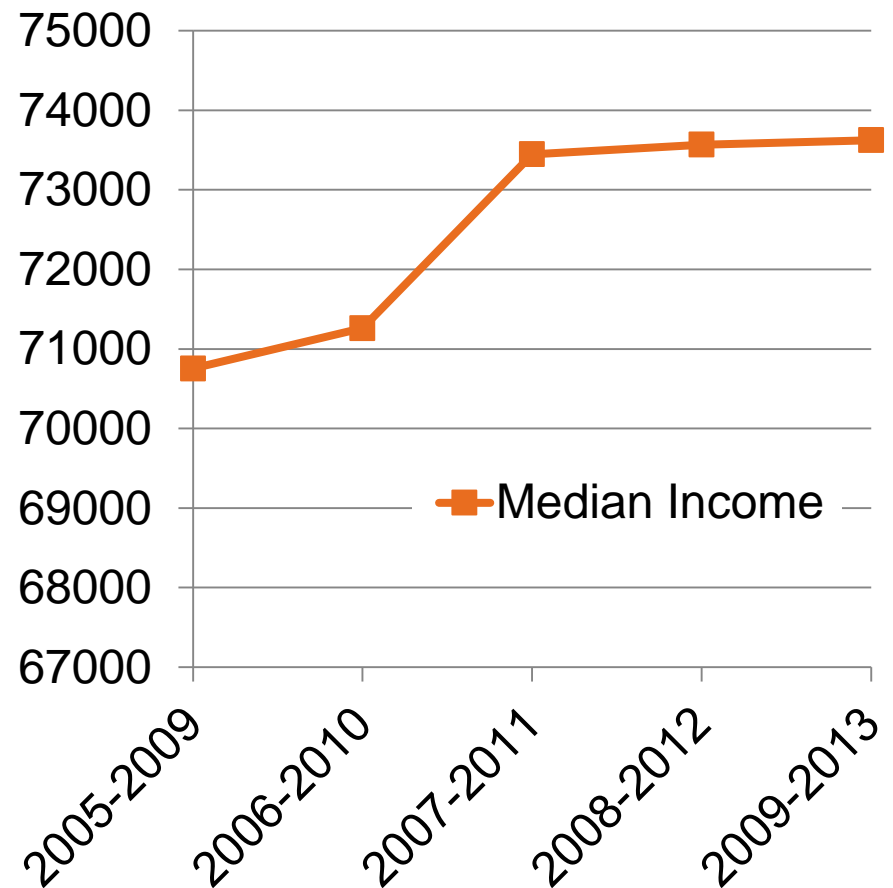
Is A Change Significant? (Statistics Refresher)

- Sampling error is the error introduced by taking a sample survey rather than a complete census

Statistics Refresher, cont'd.

- Standard Error (SE) = a measure of sampling error

- Margin of Error (MOE) = standard error for a given confidence interval (90% for ACS)
  - MOE = 1.645 x Standard Error
  - MOE used to define probable range (lower and upper bounds) of estimate

Lower and Upper Bounds

Estimate = 73,623 (MOE = 735)

Lower Bound

    = Estimate - MOE

    = 73,623 - 735 = **72,888**

Upper Bound

    = Estimate + MOE

    = 73,623 + 735 = **74,358**

90% of the time, "true" value will be between lower and upper bounds of estimate

Example: Median Income, Prince George's County, MD

	Median Income	MOE	Lower	Upper
2009-2013	73,623	735	72,888	74,358
2008-2012	73,568	818	72,750	74,386
2007-2011	73,447	806	72,641	74,253
2006-2010	71,260	789	70,471	72,049
2005-2009	70,753	816	69,937	71,569

Example: Median Income, Prince George's County, MD
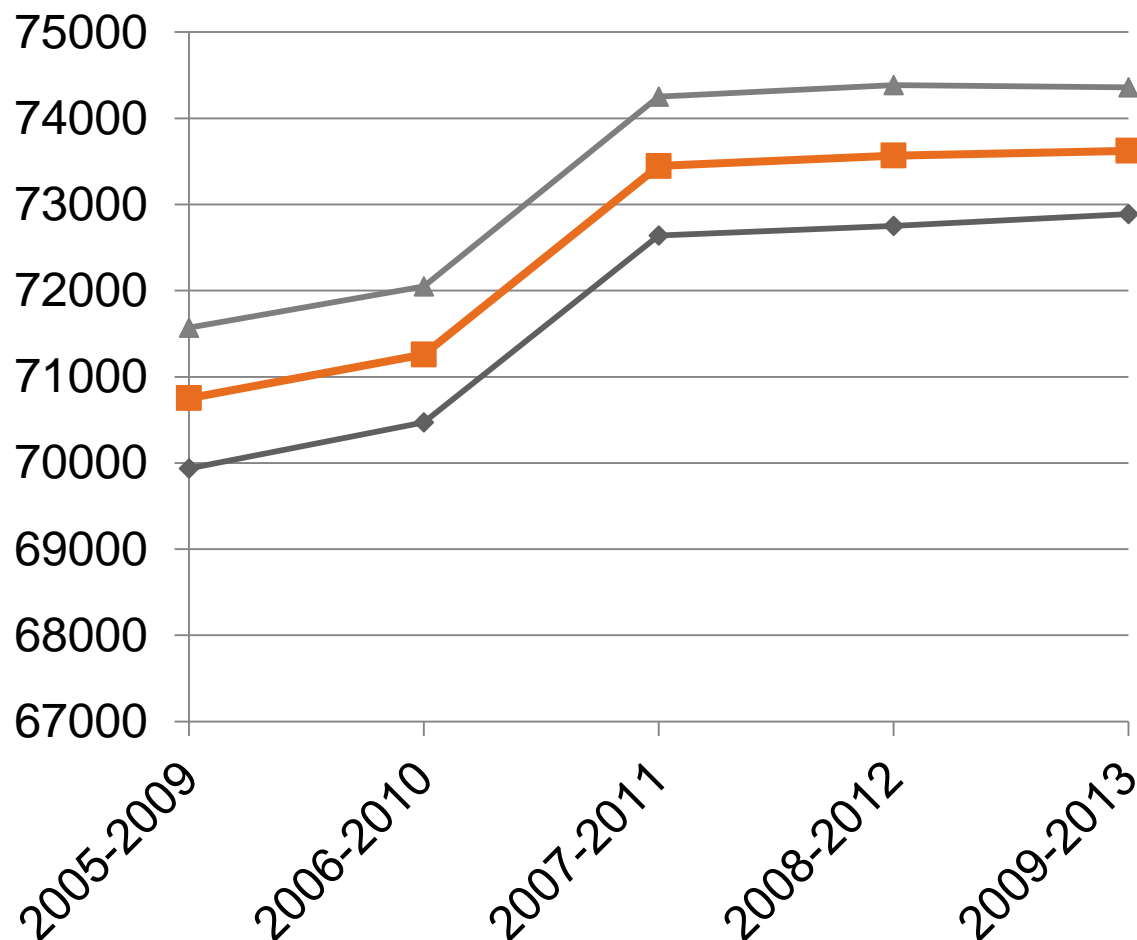
We can be 90% confident that "real" median is between lower & upper bound

Legend:
- Lower
- Median Income
- Upper

X-axis labels: 2005-2009, 2006-2010, 2007-2011, 2008-2012, 2009-2013

Y-axis: 67000, 68000, 69000, 70000, 71000, 72000, 73000, 74000, 75000

Is the Change Significant?

- Is margin of error wider than difference in the estimates?
- Quick test:
  - If upper and lower bounds of estimates do not overlap, difference is significant
- Statistical test:
  - If upper and lower bounds do overlap, difference may still be significant - must test

Example: Median Income, Prince George's County, MD
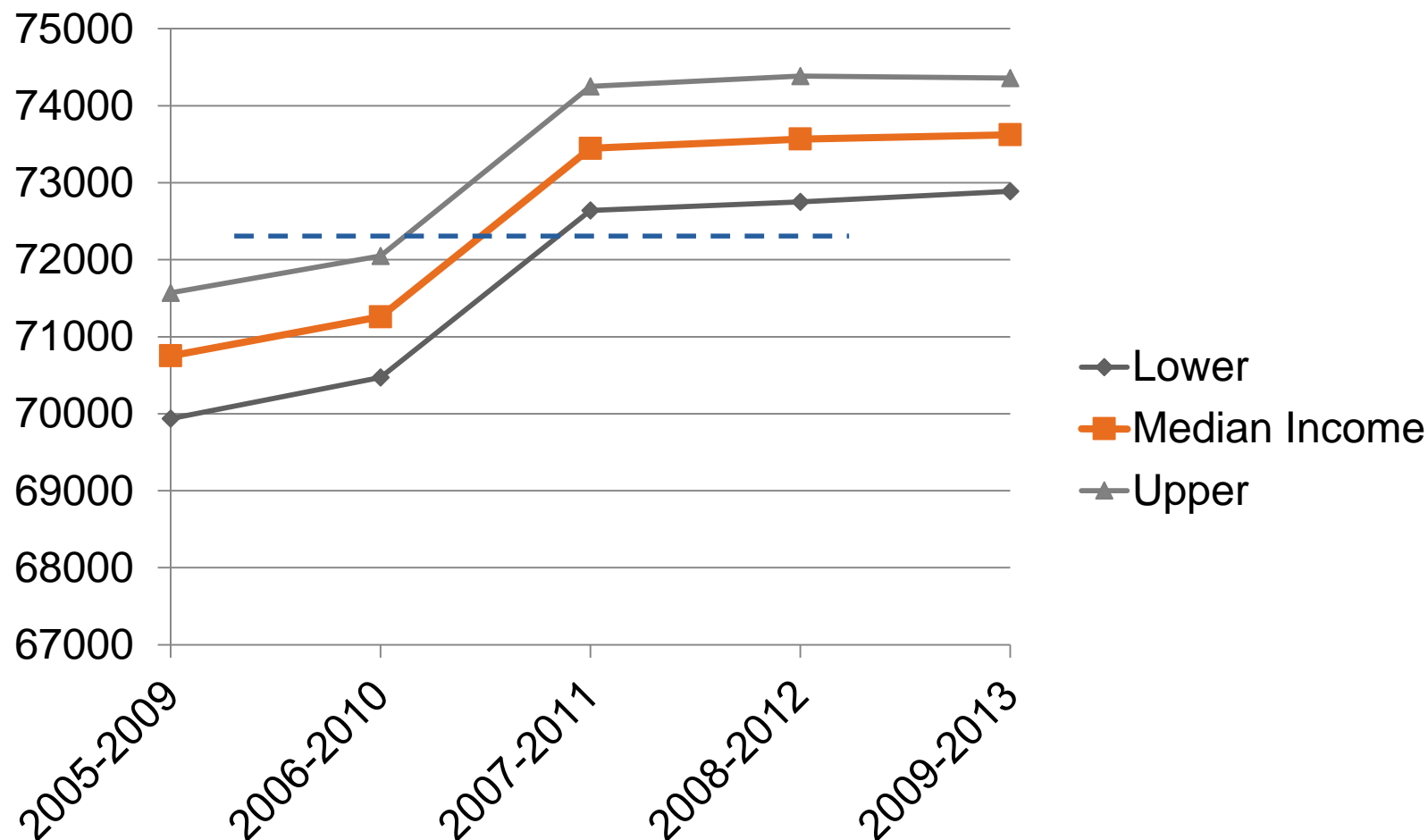
Example: Median Income, Prince George's County, MD

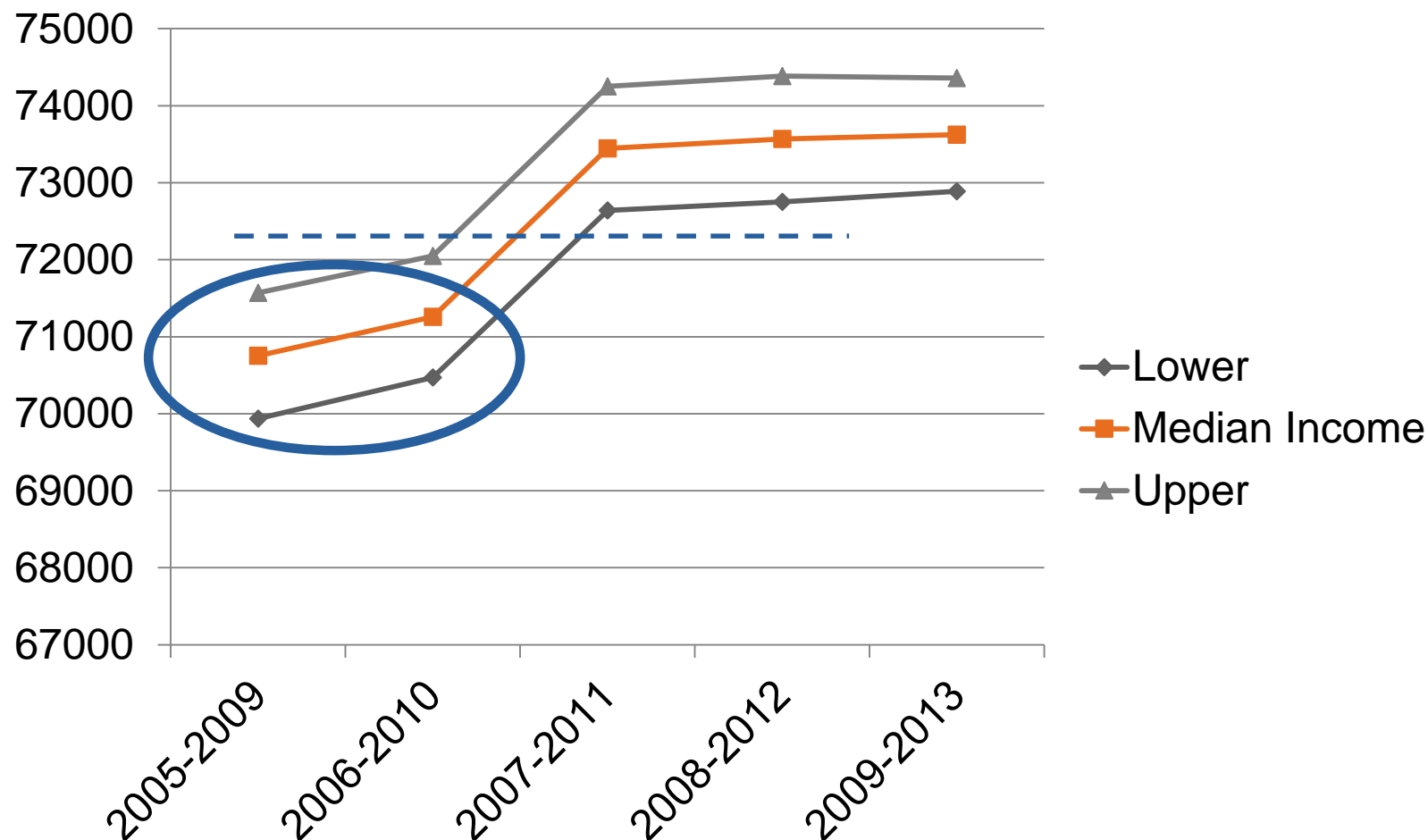|	Median Income	MOE	Lower	Upper
2009-2013	73,623	735	72,888	74,358
2008-2012	73,568	818	72,750	74,386
2007-2011	73,447	806	72,641	74,253
2006-2010	71,260	789	70,471	72,049
2005-2009	70,753	816	69,937	71,569

Quick test: We know the changes between 2006-10 and 2009-13 are significantly different.
But what about 2009 to 2010?

Example: Median Income, Prince George's County, MD

Formula for Testing Significance (90% confidence interval)

- Formulas:
  - Absolute Value of Difference = ABS(a-b)
  - $SE(a) = MOE_a/1.645$
  - $SE(b) = MOE_b/1.645$
  - $SE(a\text{-}b) = \sqrt{SE_a{}^2 + SEb^2}$
  - MOE(a-b) = SE(a-b)*1.645
- TEST: If ABS(a-b) > MOE (a-b) difference is significant

Example: Median Income, Prince George's County, MD

	Median Income	MOE	Lower	Upper
2009-2013	73,623	735	72,888	74,358
2008-2012	73,568	818	72,750	74,386
2007-2011	73,447	806	72,641	74,253
2006-2010	71,260	789	70,471	72,049
2005-2009	70,753	816	69,937	71,569

Example: Formula for Testing Significance (90% conf. interval)

- Formulas:
  - ABS(a-b) = 71,260 - 70,753 = 507
  - $SE(a) = MOE_a/1.645 = 789/1.645 = 479.6$
  - $SE(b) = MOE_b/1.645 = 816/1.645 = 496$
  - $SE(a-b) = \sqrt{SE_a^2 + SEb^2} = \sqrt{479.6^2 + 496^2} = 690$
  - MOE(a-b) = SE(a-b)*1.645 = 690*1.645 = 1135
- TEST: If ABS(a-b) > MOE (a-b) difference is significant

Example: Formula for Testing Significance (90% conf. interval)

- TEST: If ABS(a-b) > MOE (a-b) difference is significant
  - ABS(a-b) = 507
  - MOE(a-b) = 1135.1
  - ABS(a-b) *is less than* MOE(a-b)
- Change 2009 to 2010 is NOT significant

Online Tools for Significance Testing

- Online calculator tool: http://pad.human.cornell.edu/acscalc/
- Excel file "calculator" available for download from http://www.statswmaryland.iupui.edu/topic/acs.asp

Inflation Adjustment

Inflation Adjustment

- Source for inflation rate: http://www.bls.gov/cpi/cpiurs.htm

- Inflation Adjusted to New Year = $\text{Median}_{OrigYear} \times (CPI_{NewYear} / CPI_{OrigYear})$

Example: Inflation Adjustment

- **Convert 2012 median to 2013 dollars:**

  $= Med_{OYr} \times (CPI_{NYr} / CPI_{OYr})$

  $= 73{,}568 \times (342.2\ /\ 337.3)$

  $= 74{,}637$ *in 2013 dollars*

	Median Income	CPIURS
2013	73,623	342.2
2012	73,568	337.3
2011	73,447	330.4
2010	71,260	320.3
2009	70,753	315.2

Other Caveats in Comparing Data Over Time?

http://www.census.gov/acs/www/guidance_for_data_users/comparing_2013/

BETH JAROSZ

Research Associate

U.S. Programs

Population Reference Bureau

BJarosz@prb.org

@DataGeekB