

Estimating emigration as a residual

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Outline

- Motivation – Research question
- Methods
- Results
- Conclusions - More questions

Motivation – Research question

- Working on a County level projection model based on gross migration flows
- What about emigration?
 - How large is emigration compared to immigration?
 - Can we find information on age of emigrants?

Method 1

- $NIM = I - E \Rightarrow E = I - NIM$
- I - In migration from abroad
 - ACS table B07001: Where did you live one year ago? Answer: outside US
- NIM – Net International Migration
 - Population estimates: NIM is a component of change in the annual estimates

Results: US Totals, Method 1

	Moved in from abroad ACS table C07001	Net internation migration (POPEST)	Emigration
2006/07	1,813,675	1,037,657	776,018
2007/08	1,895,103	888,825	1,006,278
2008/09	1,687,595	854,905	832,690
2009/10	1,750,145	#N/A	
2010/11	1,826,277	703,824	1,122,453
2011/12	1,833,217	885,804	947,413
2012/13	1,903,247	843,145	1,060,102
2013/14	2,042,205	995,944	1,046,261
2014/15	2,085,698	1,150,528	935,170

Method 2

Year Y

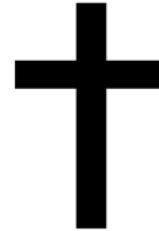
Year Y+1

Population in
area of interest

Mortality

Still in US

Emigration



Method 2

Population in area of interest in year Y =
Population that was in area and
died before Y+1
+ is still in the US at Y+1
+ emigrated before Y+1

OR

$$E = \text{Pop}_Y - \text{Deaths-US}_{Y+1}$$

Method 2

- Pop_Y :
 - population in year Y from population estimates
- Deaths
 - From Vital Statistics
- US_{Y+1}
 - **ACS table C07401: Population 1 year and over that lived in the area one year ago**

Method 2

Year Y

Year Y+1

Population in
area of interest

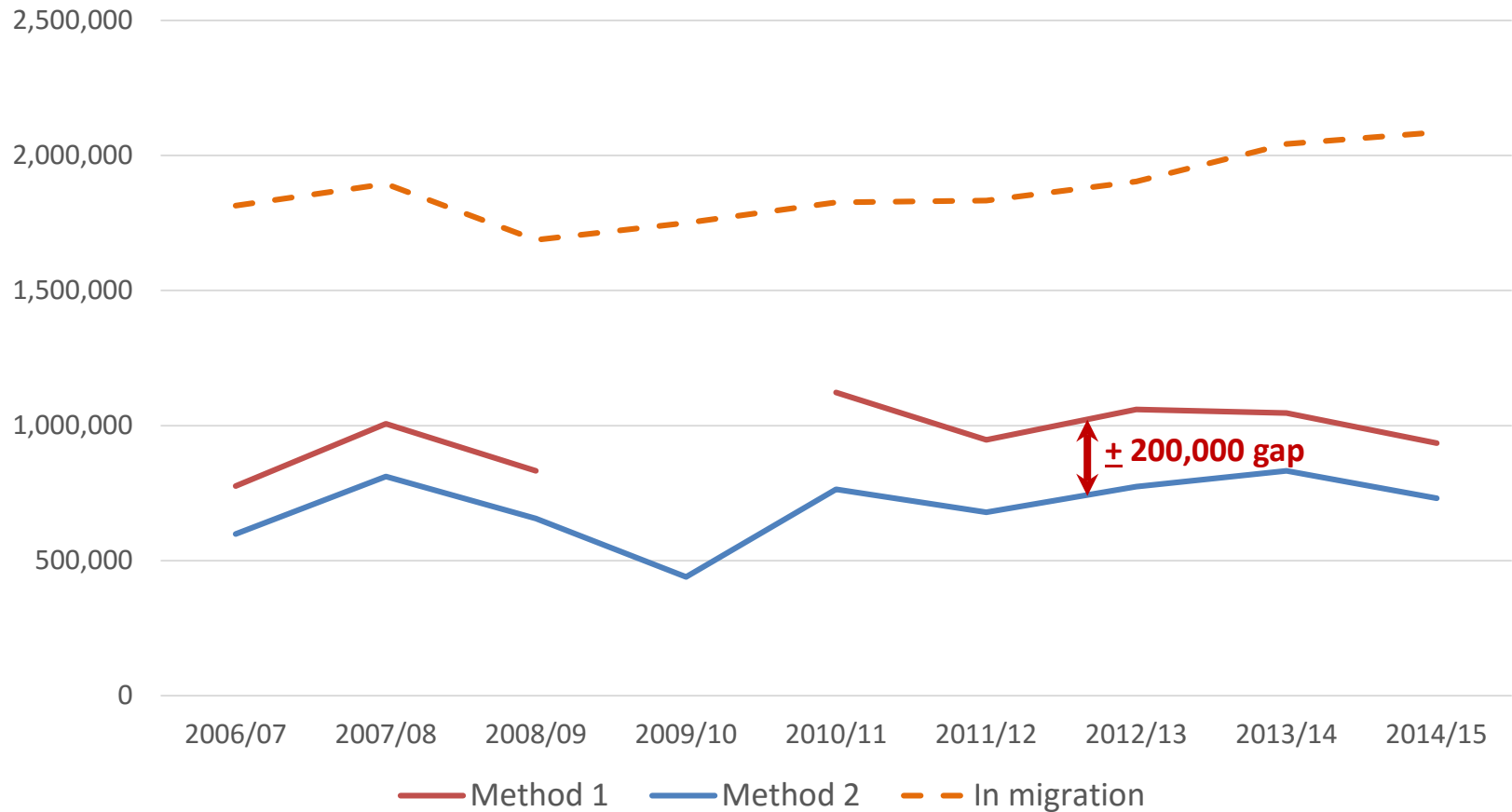


ACS table C07401: Population 1 year and over that lived in the area one year ago

Results: US Totals, Method 2

	Pop _Y	US _{Y+1}	Deaths	Emigration
2006/07	298,754,819	295,731,474	2,426,264	598,357
2007/08	301,290,332	298,030,784	2,423,712	811,700
2008/09	304,374,846	301,263,957	2,471,984	656,316
2009/10	306,771,529	303,878,462	2,437,163	440,268
2010/11	309,330,219	306,074,042	2,468,435	764,231
2011/12	311,587,816	308,379,538	2,515,458	678,910
2012/13	313,873,685	310,529,573	2,543,279	773,976
2013/14	316,497,531	313,053,188	2,596,993	832,638
2014/15	318,907,401	315,550,022	2,626,418	730,961

US total emigration estimates



Difference between the methods

Method 1 – Method 2 =

$$(I_{ACS} - NIM_{popest}) - (Pop_{y,popest} - D - US_{y+1,ACS}) = I_{ACS} + US_{y+1,ACS} - (Pop_{y,popest} - D + NIM_{popest})$$

Given:

$$Pop_{y+1,popest} = Pop_{y,popest} + B_{popest} - D_{popest} + NIM_{popest}$$

$$ACS_{y+1,totpop} = I_{ACS} + US_{y+1,ACS} + Pop(\text{age} < 1)_{ACS}$$

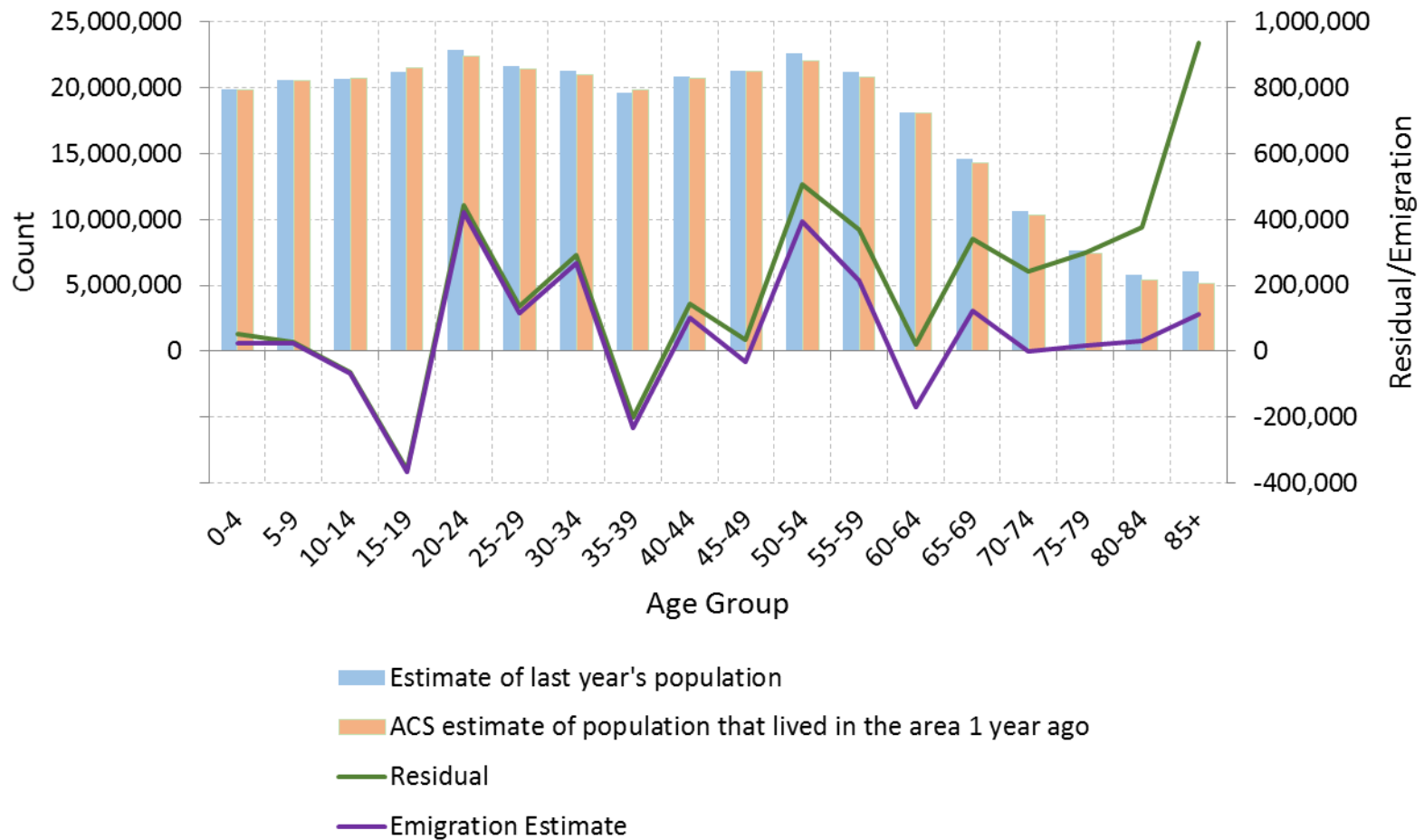
$$\text{Method 1 – Method 2} = B - Pop(\text{age} < 1)_{ACS}$$

Comparing

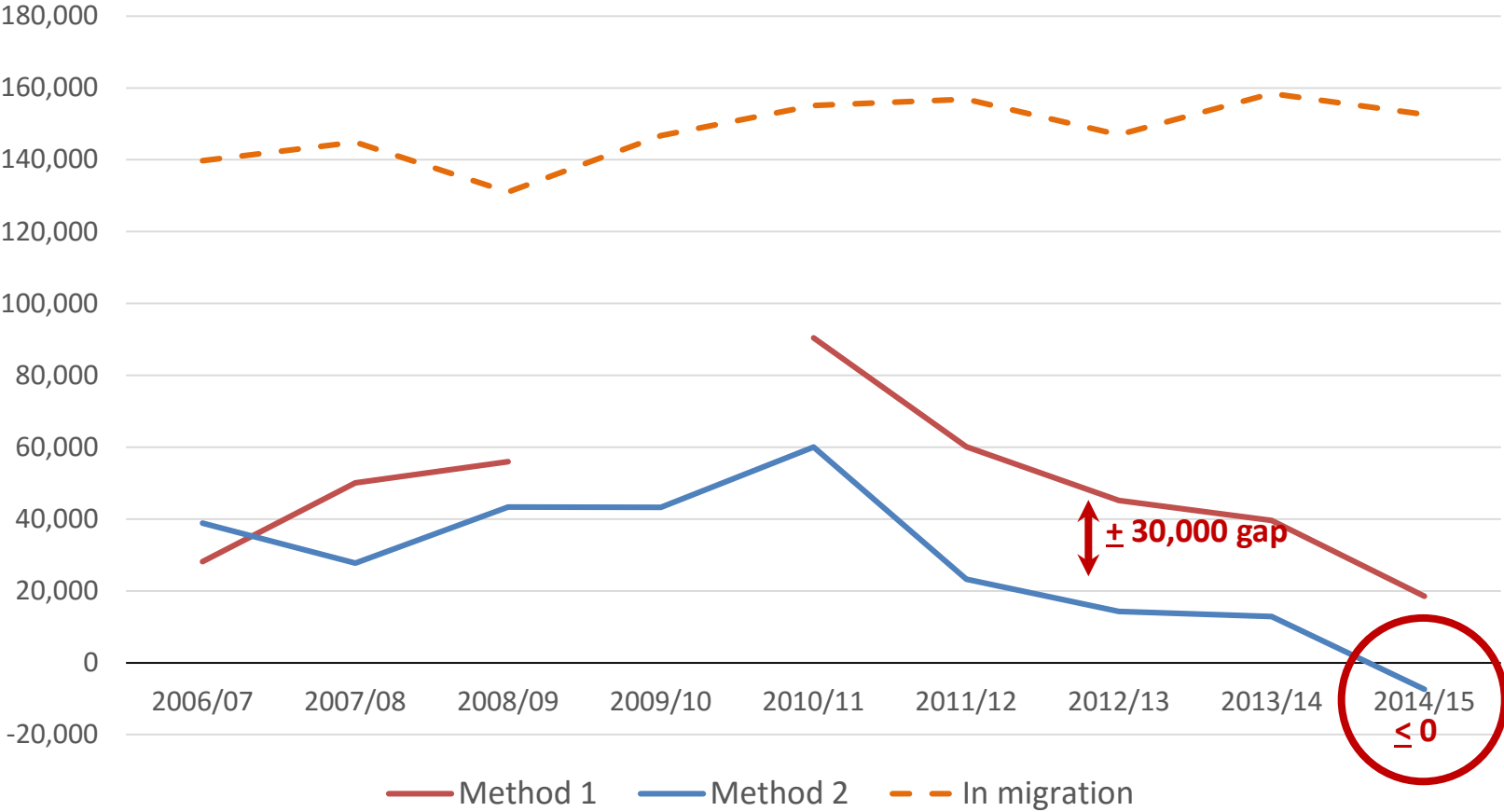
Method 1 – Method 2 and B – Pop(age < 1)_{ACS}

	Method 1	Method 2	M1 – M2	B - ACS _{<1}	Births	ACS _{<1}
2010/11	1,122,453	764,231	358,223	316,402	4,008,000	3,691,598
2011/12	947,413	678,910	268,504	252,308	3,953,593	3,701,285
2012/13	1,060,102	773,976	286,126	256,918	3,952,937	3,696,019
2013/14	1,046,261	832,638	213,624	195,914	3,957,577	3,761,663
2014/15	935,170	730,961	204,209	202,824	3,985,924	3,783,100

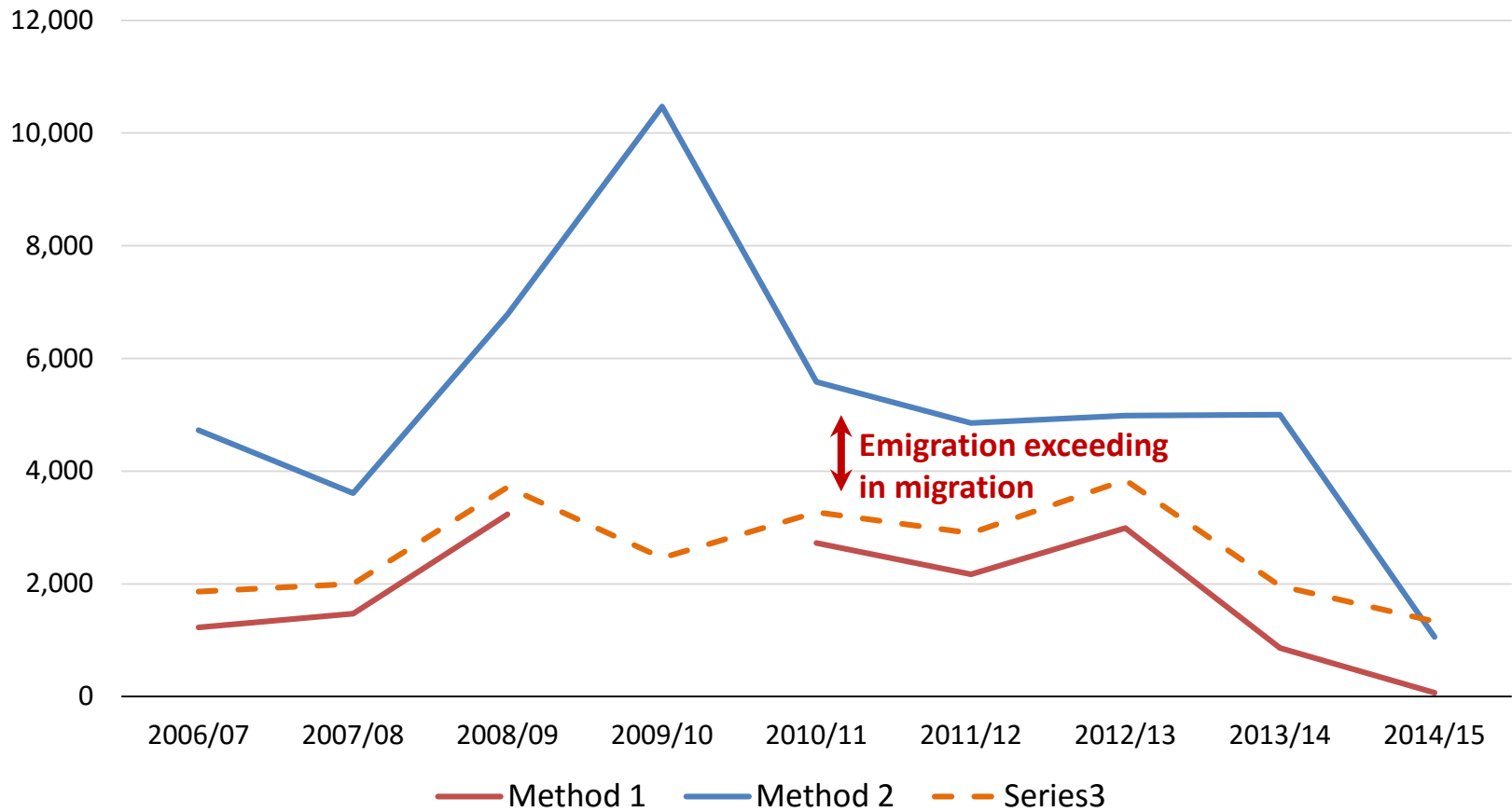
Age distribution of emigration



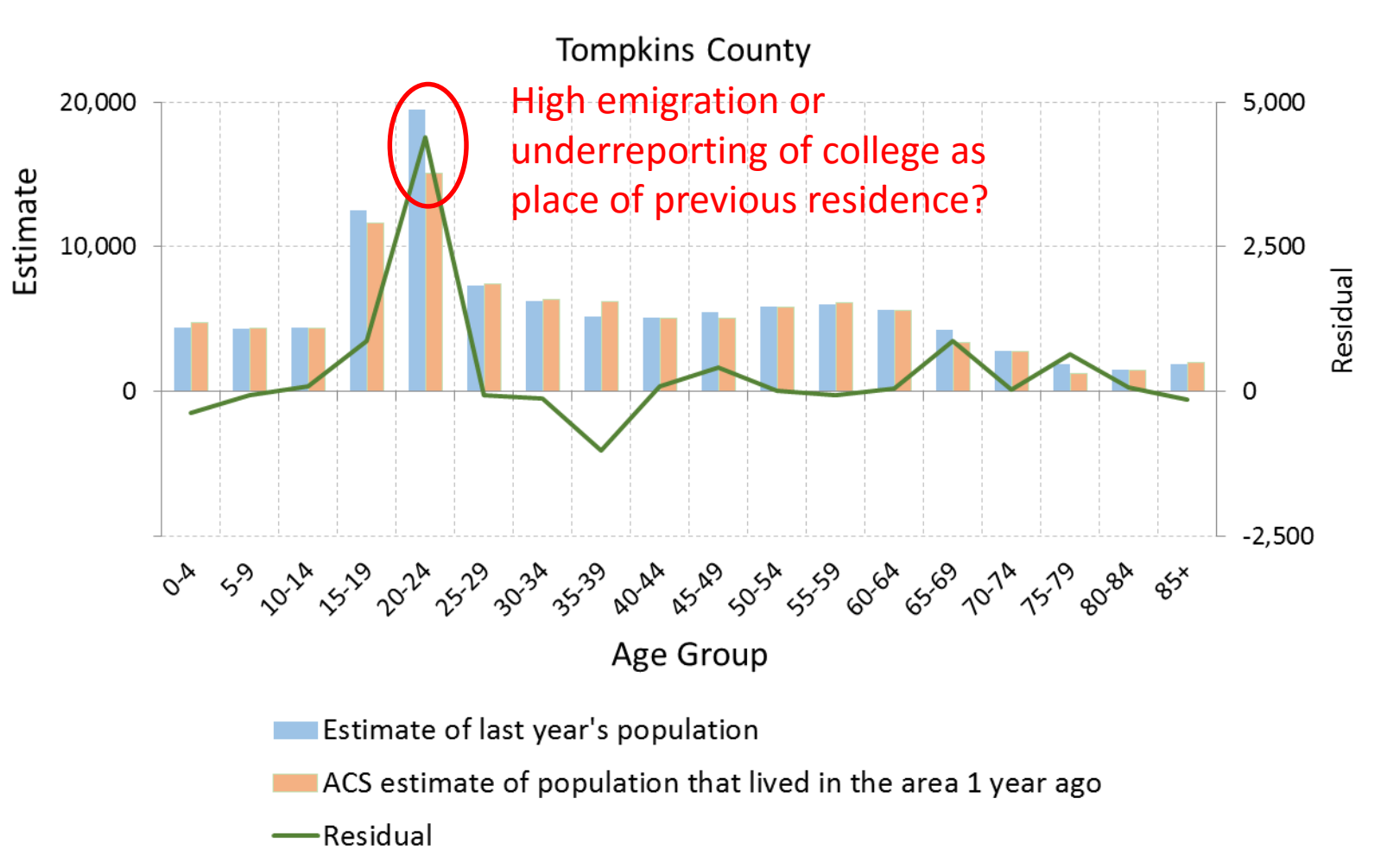
NY State emigration estimates



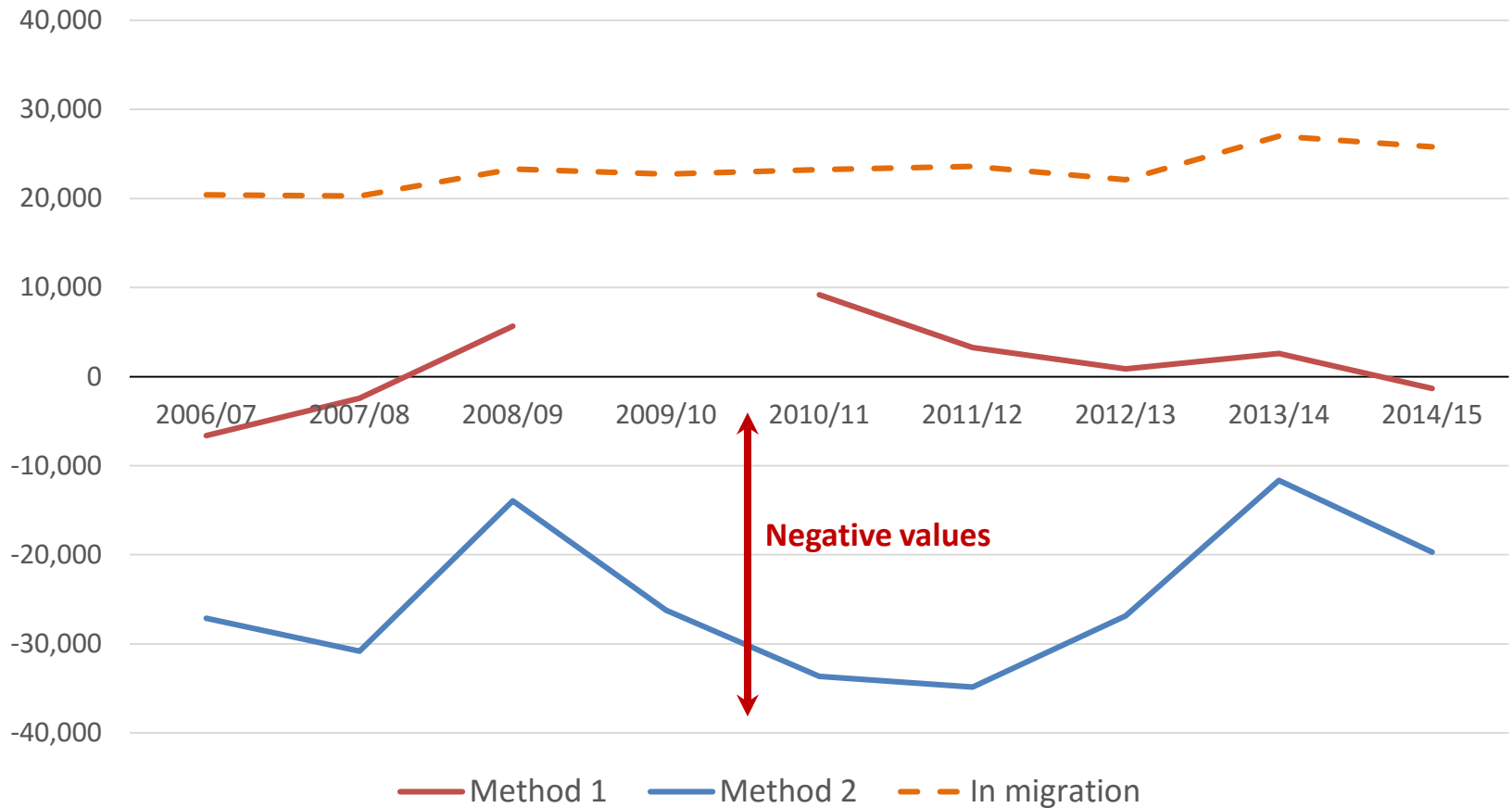
Tompkins County, NY



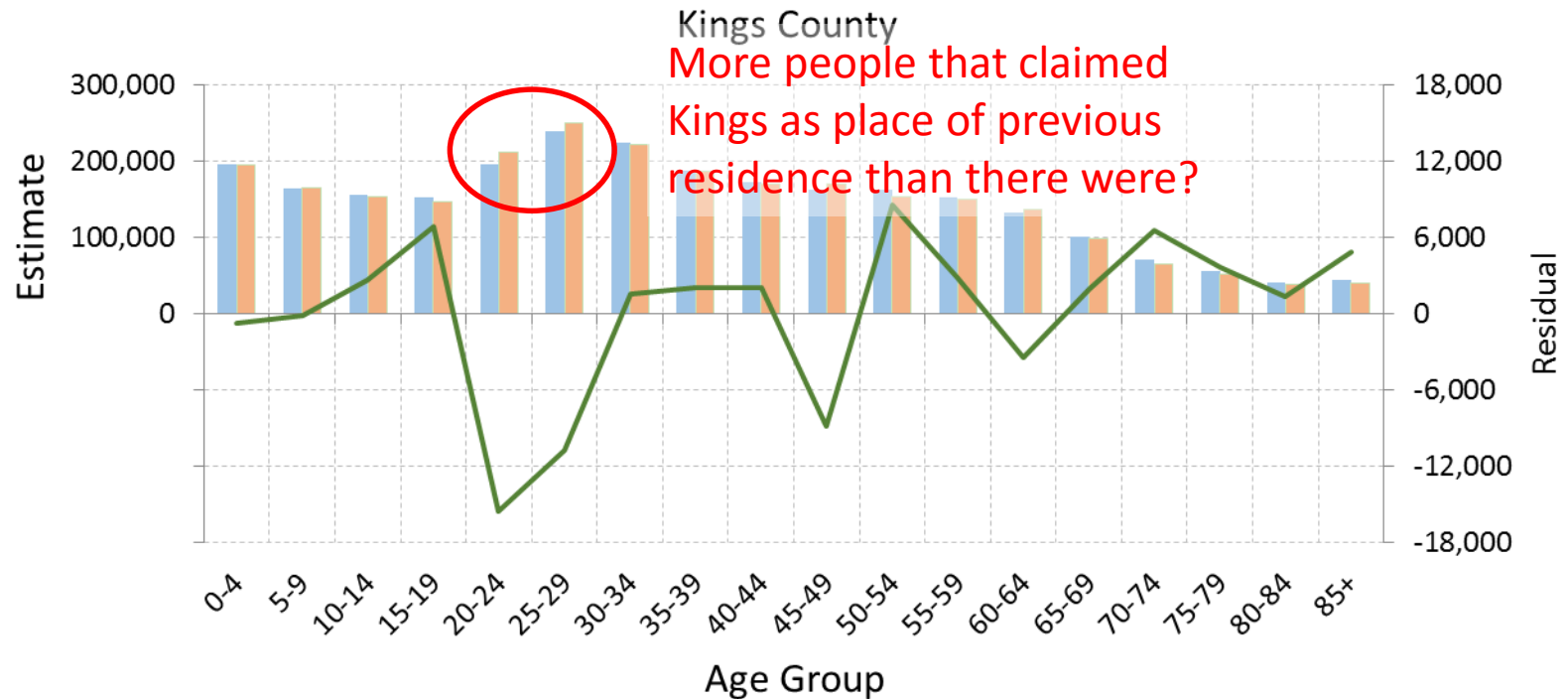
Age distribution of residual



Kings County, NY (Brooklyn)



Age distribution of residual



- Estimate of last year's population
- ACS estimate of population that lived in the area 1 year ago
- Residual

Selected other counties (2015 data)

	ACS estimate of persons living in area previous year	Population estimate of previous year	Deaths	Emigration residual	ACS estimate of immigration
Pasco County, Florida	497,417 (\pm 5,986)	485,640	5,742	-17,519	2,657(\pm 949)
Jackson County, Mississippi	146,761 (\pm 5,270)	141,504	1,305	-6,562	228 (\pm 268)
Brazos County, Texas	195,095 (\pm 4,376)	209,201	1,018	13,088	2,679 (\pm 1,227)
Spokane County, Washington	464,421 (\pm 6,716)	484,418	4,298	15,699	1,787 (\pm 768)

Conclusions – more questions

- Emigration is a component to be dealt with, but how?
- Method 2 does not lead to reliable numbers.
 - Use Method 1 for totals?
 - How to get an age distribution?
 - How do others do it?

And even more questions

- Implausible differences between ACS and POPEST estimates of people living in area a year prior
 - Controls/weights problems?
 - Imputation problems?
 - Reporting problems?
 - Geocoding problems?
- If there is an error in the ACS estimate of people living in the area the prior year, is that error more likely to be in the number of people still there or in the number of people that are now elsewhere (domestic out migration)?