Surveillance of seasonal influenza vaccination coverage among pregnant women and health care personnel in the United States

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Background

- **CDC uses national surveillance data to inform activities for promoting influenza vaccination and monitoring the effectiveness of vaccination efforts**

- **Two special populations of interest are pregnant women and health care personnel (HCP)**
  - Pregnant women are at increased risk of influenza-related severe illness and hospitalization
  - Routine vaccination of HCP can help reduce influenza-related illness among HCP and in health care settings

Background (cont)

- **The relatively low prevalence of these two groups in the U.S. general population makes it difficult to survey a sufficient number of respondents in a short time frame using general population surveys**
  - Vaccination coverage data are needed during and immediately following each influenza season to inform public health acitivities in current and future influenza seasons
- **Existing surveillance systems do not provide timely data and do not not capture in-depth information regarding vaccine-related knowledge, attitudes, and behaviors (KAB) that are specific to pregnant women or HCP**
  - specific detailed information related to pregnancy or occupation may not be available

Background (cont)

- The CDC has used non-probability based internet panel surveys to monitor infleunza vaccination coverage among HCP (since the 2009-10 influenza season) and pregnant women (since the 2010-11 influenza season)

Objectives

- **To describe the methodology of the Internet panel surveys**
- **To compare the methodology and results of the Internet panel surveys to those of existing national probability-based surveys**
  - Results of the HCP internet panel surveys will be compared to the National Health Interview Survey (NHIS)
  - Results of the pregnant women internet panel surveys will be compared to the Behavioral Risk Factor Surveillance System (BRFSS) and the Pregnancy Risk Assessment Monitoring System (PRAMS)

Methodology – Internet panel survey (HCP)

- **Large-scale opt-in web-based survey of HCP in the United States (n ~2000 HCP each survey)**
- **Sample Sources:**
  - **Professional HCP** (physicians, nurse practitioners, physician's assistants, nurses, dentists, pharmacists, allied health professionals, technicians, and technologists) sample from WebMD Internet portal with >2.5 million U.S. members.
  - **Other Support HCP** (assistants, aides, administrators, clerical support workers, janitors, food service workers, and housekeepers) sample from Survey Sampling International, a general population panel of >1 million U.S. households.
- **Panelists recruited by email invitation and intercept method**

Methodology – Internet panel survey (HCP)

- **Self-administered online survey**
- **Administered twice during each influenza season (November and April)**
  - Data from April survey are used to generate coverage estimates for the entire influenza season
- **Post-stratification weighting to estimate the national population of HCP**
  - Weighted by age groups, gender, race/ethnicity, occupational settings, and census regions
- **No statistical testing performed since sample is non-probability based**
  - 5 percentage points used as notable difference

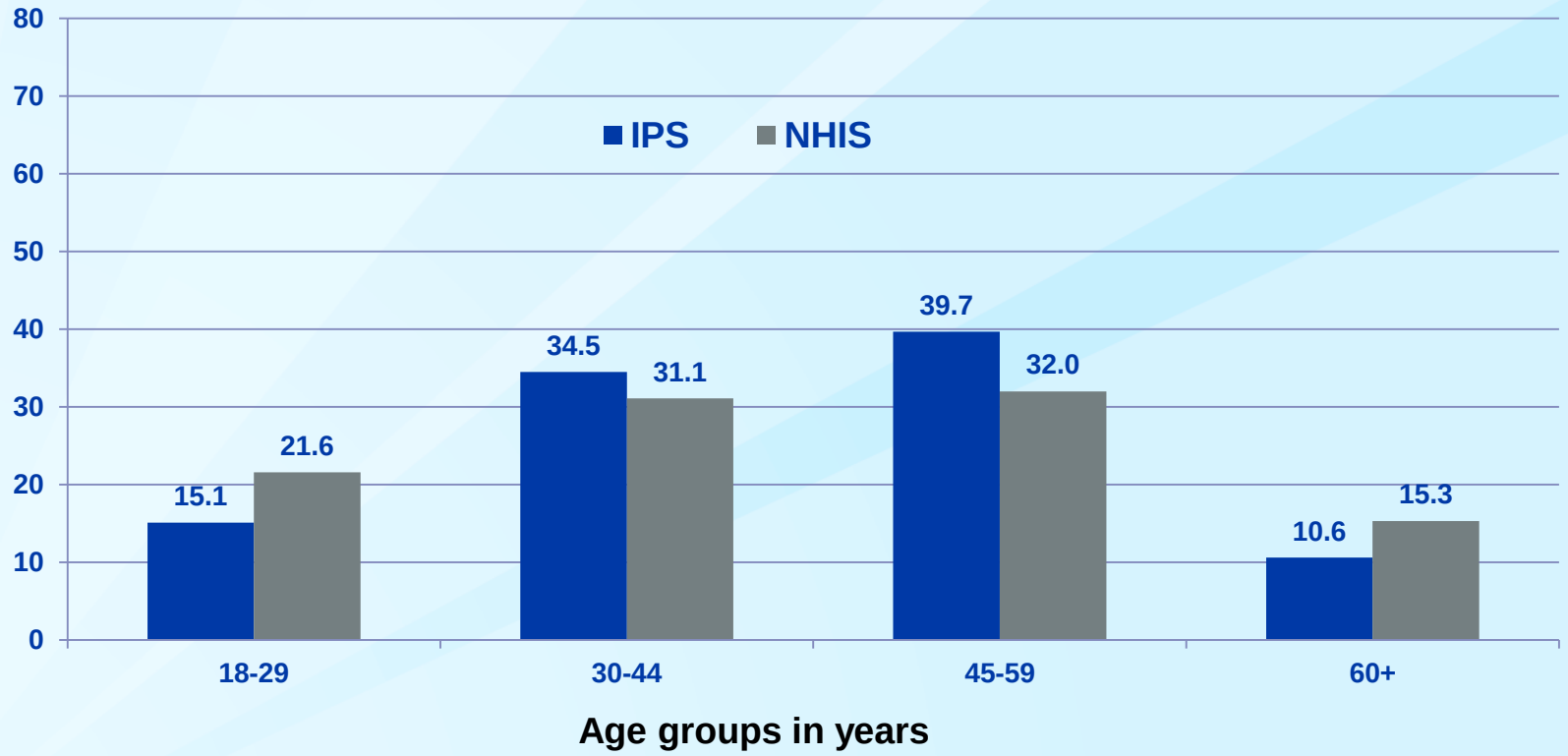
Comparison of survey methodologies (HCP)

	Internet panel survey	NHIS
Recruitment method	Non-probability sample from a volunteer Internet panel	Complex sampling design involving stratification, clustering, and multistage sampling
Survey mode	Self-administered online	In-person interview
Timing of influenza vaccination	During flu season	Within past 12 months*
Geographic level	National	National
Data collection schedule	Nov and April of each flu season	Monthly
Timeliness of reporting	2 weeks	16 months
Typical response/completion rate	90%	61%
Approx. sample size	2000 per survey	2000

* Since 2005 can determine whether during influenza season

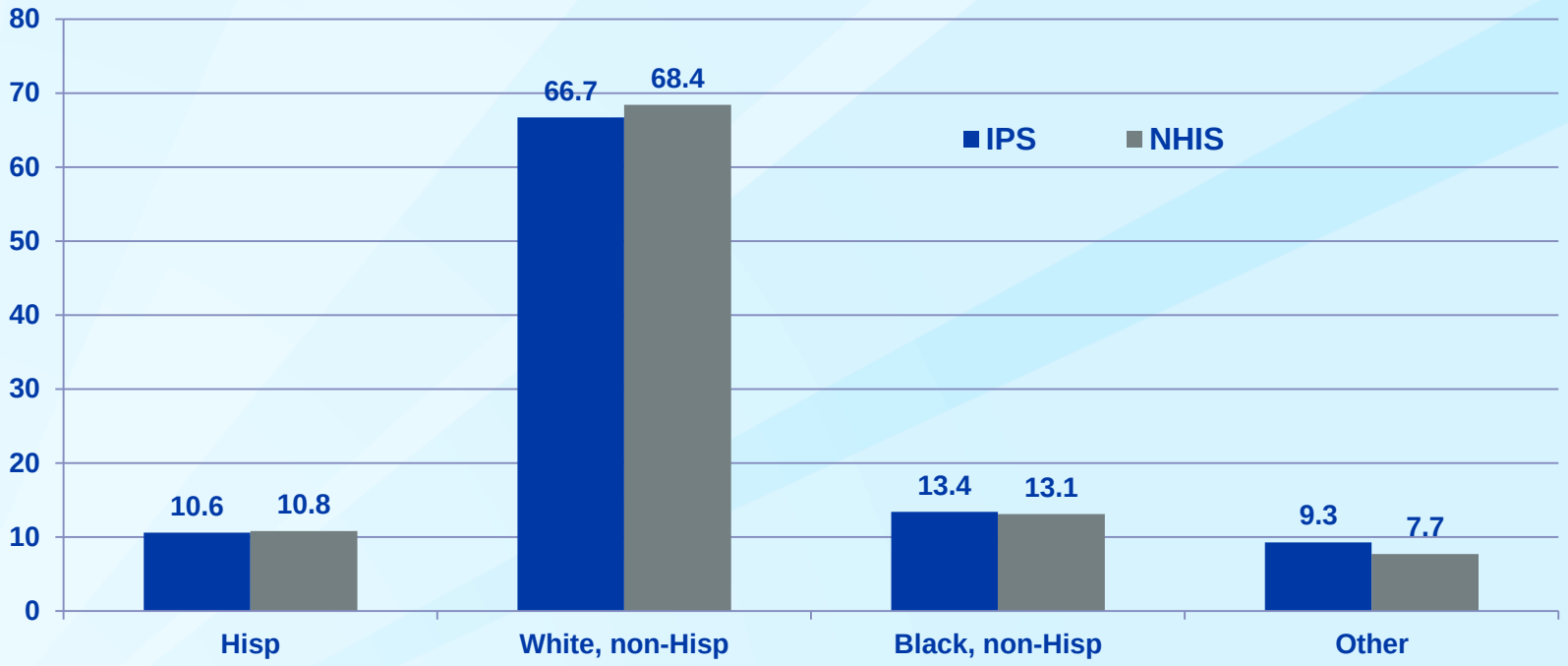
Comparison of survey demographics – Internet panel survey and NHIS

Final weighted distribution of age groups in HCP sample 2011-12 influenza season, Internet Panel Survey vs. NHIS



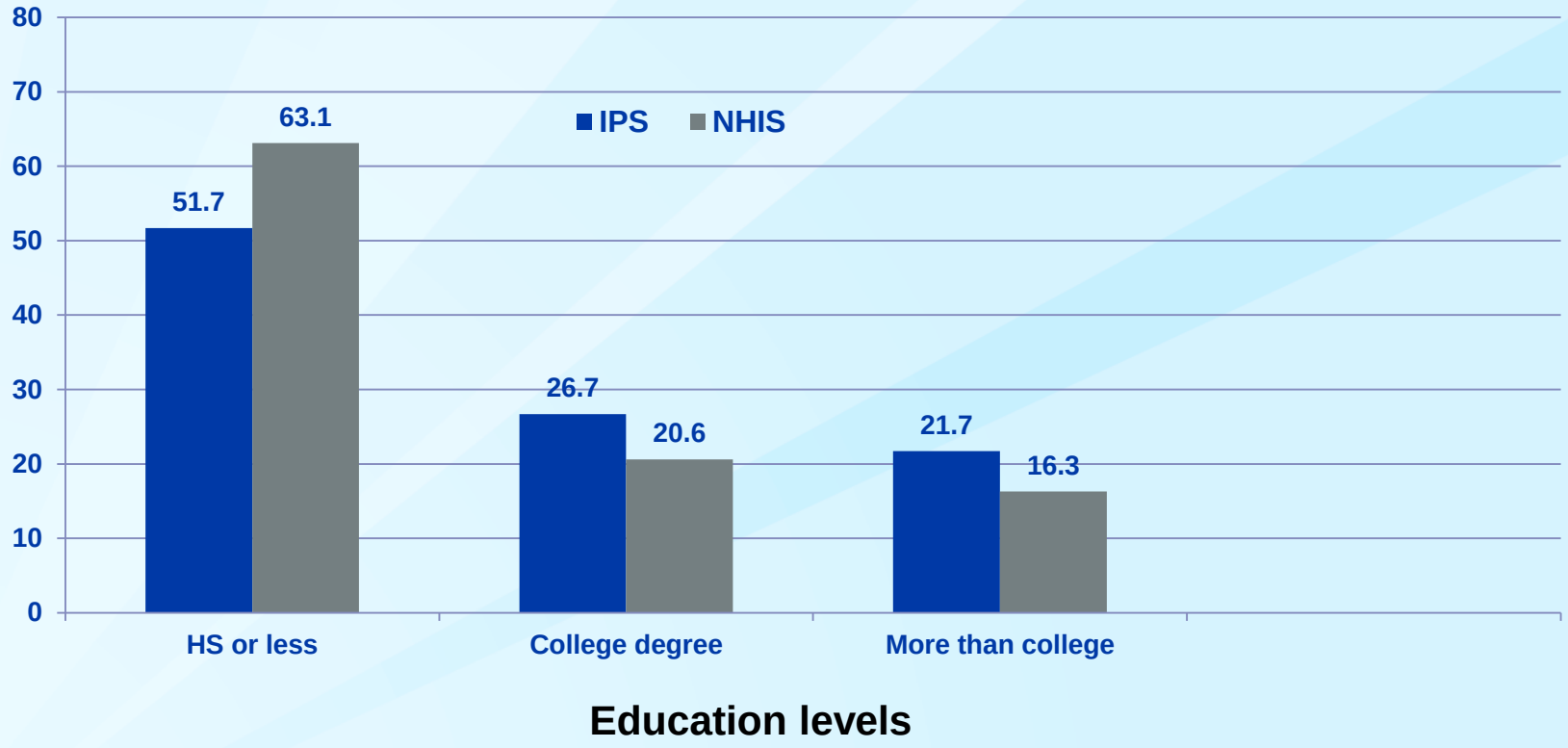
Comparison of survey demographics – Internet panel survey and NHIS

Final weighted distribution of racial/ethnic groups in HCP sample 2011-12 influenza season, Internet Panel Survey vs. NHIS

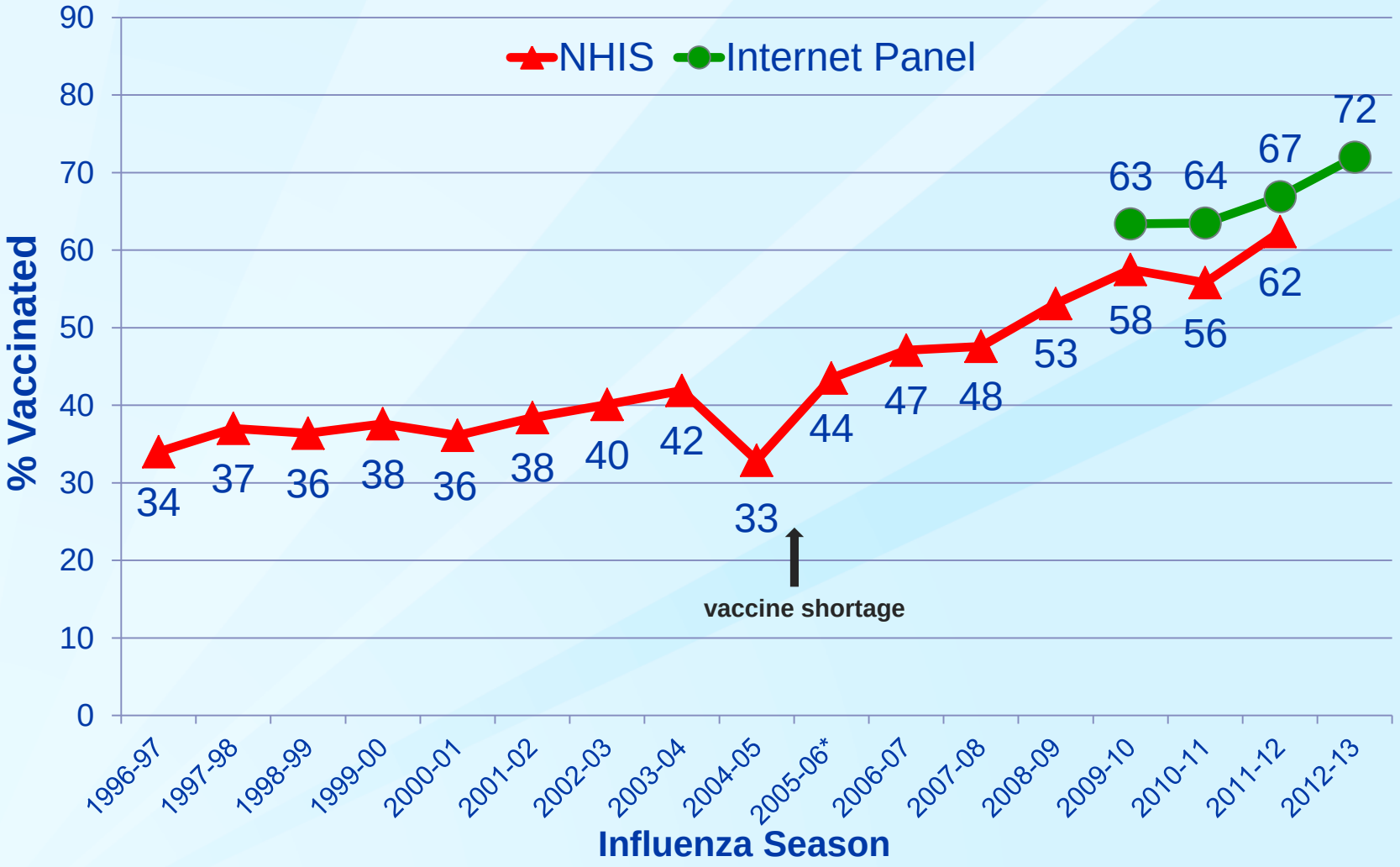


Comparison of survey demographics – Internet panel survey and NHIS

Final weighted distribution of education levels in HCP sample
2011-12 influenza season
Internet Panel Survey vs. NHIS

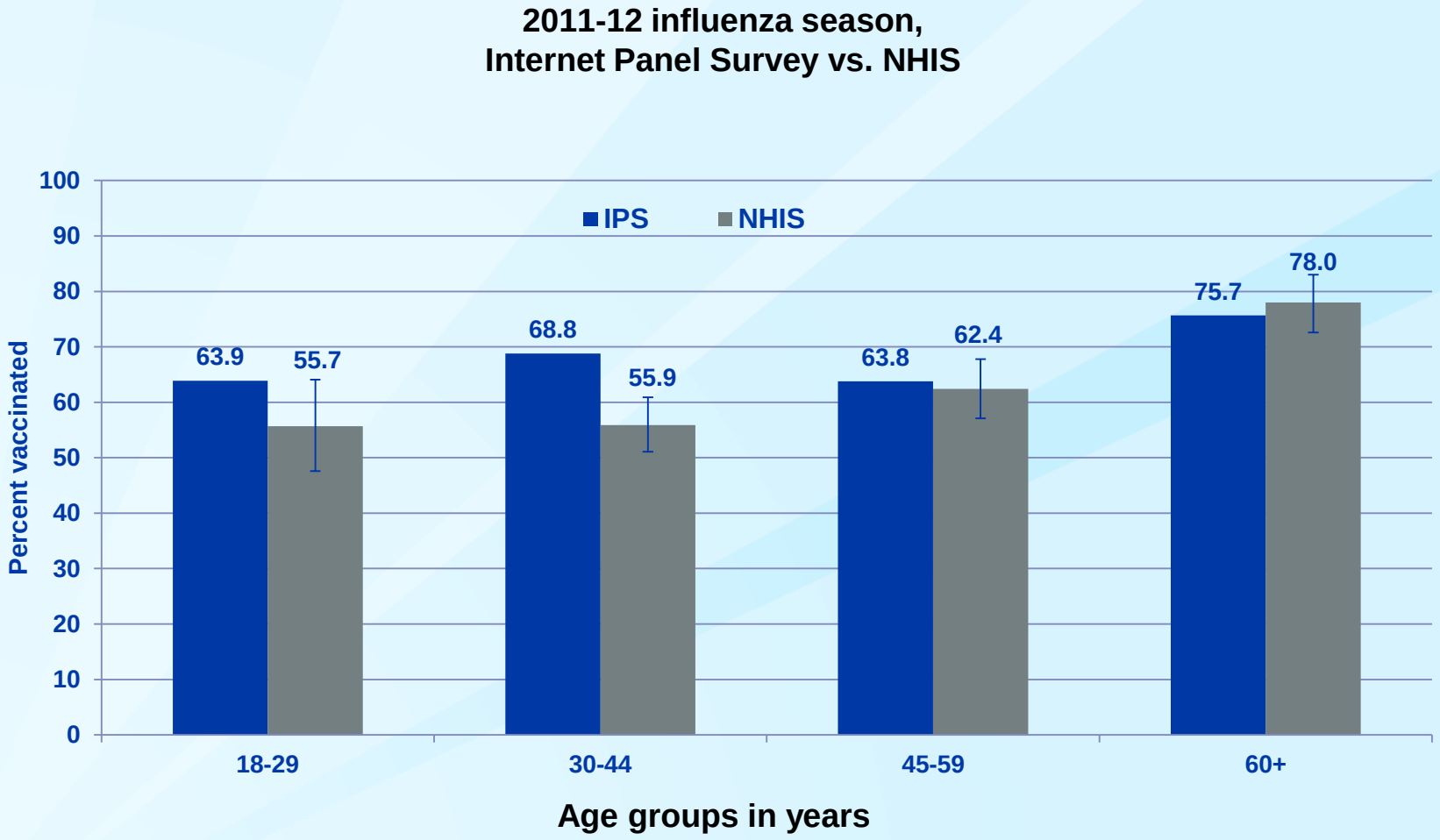


Estimated Influenza Vaccination Coverage, Healthcare Personnel, United States, 1996-2013

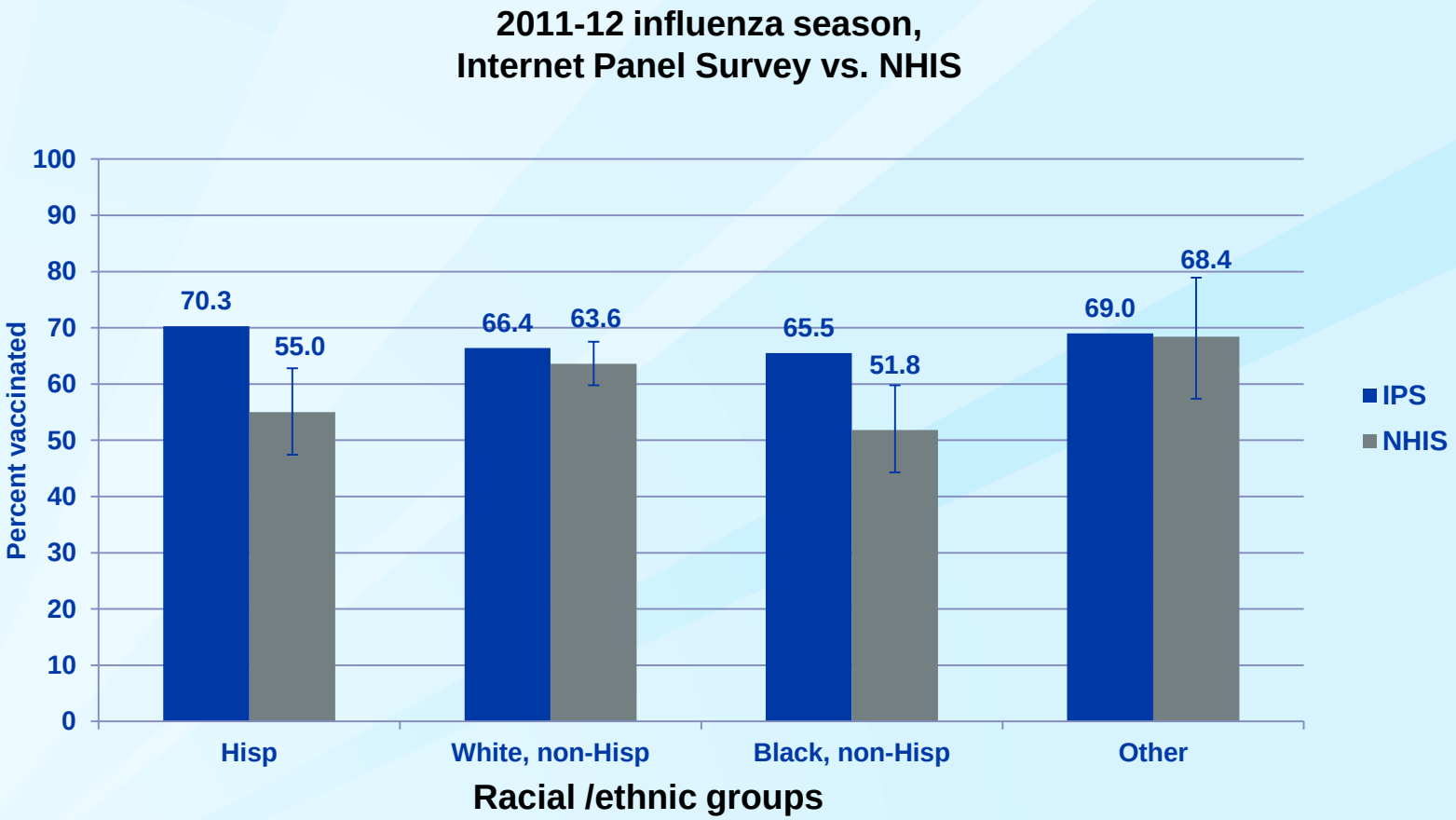


** Methodology used to estimate influenza vaccination coverage among healthcare personnel changed during the 2005-06 season*

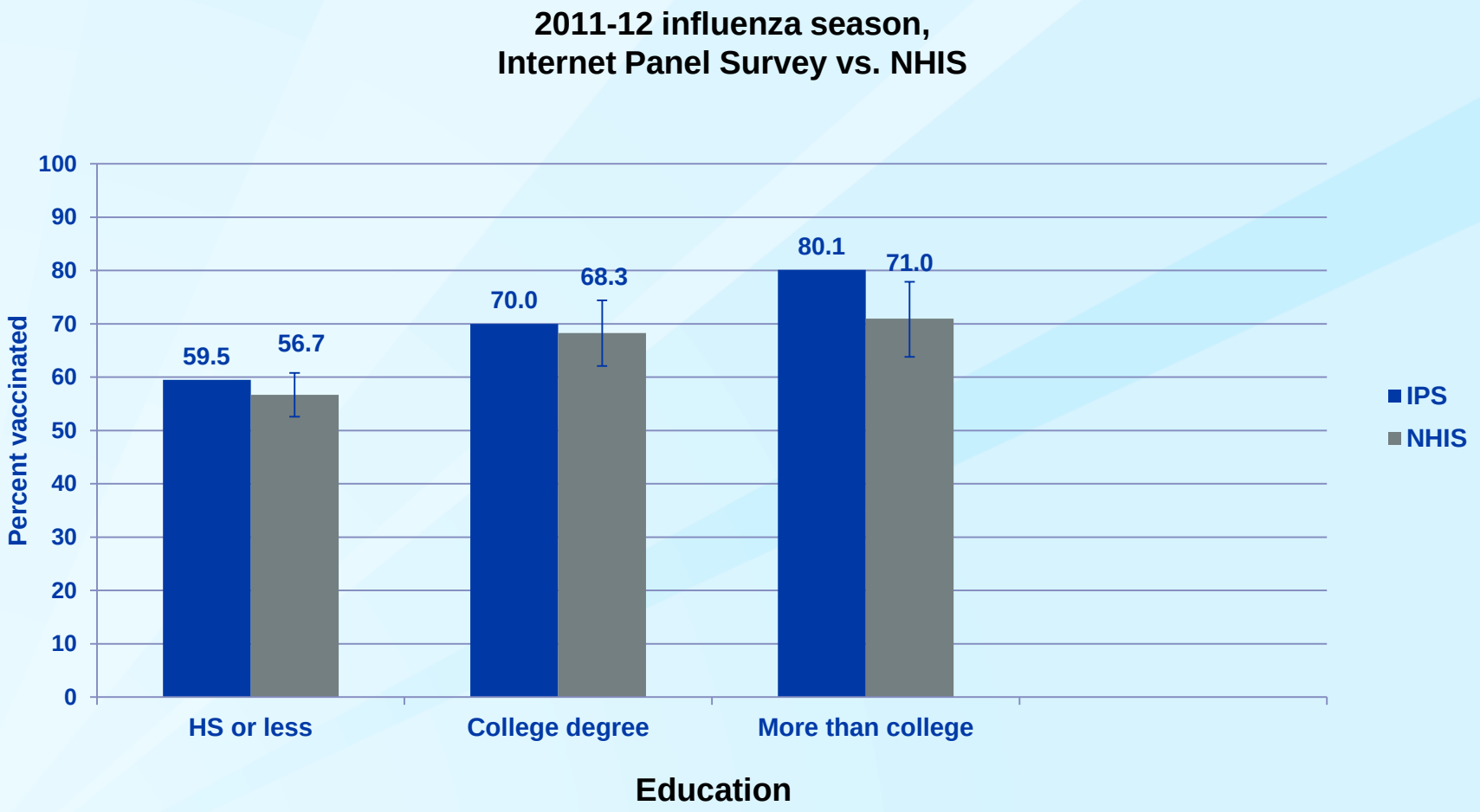
Vaccination coverage by age – Internet panel survey and NHIS



Vaccination coverage by race/ethnicity – Internet panel survey and NHIS



Vaccination coverage by education – Internet panel survey and NHIS



Discussion -- HCP

- **Internet panel survey sample was older and more highly educated than the NHIS sample**
  - Racial/ethnic distribution was similar between the samples
  - In future, could consider calibrating the internet panel sample to the NHIS sample
- **Both surveys indicated that vaccination coverage was highest among the oldest HCP and those with a college education or higher**
  - The Internet panel survey found no differences in coverage among HCP by race, while black and Hispanic HCP had lower coverage compared to white and other HCP in the NHIS sample
- **While overall influenza vaccination coverage estimates from the Internet panel survey were higher than those from NHIS for each season, the trends in coverage over time were similar**

Discussion -- HCP

- **Higher estimates from Internet panel survey might be attributable to:**
  - Higher percentages of older and more highly educated HCP in the Internet panel survey sample
  - Exclusion of HCP without Internet access from the Internet panel survey sample
  - Differential selection (nonresponse) bias in IPS vs. NHIS, after weighting adjustments made

Methodology – Internet panel survey (pregnant women)

- **Opt-in web-based panel survey**
- **Pregnant women recruited from a general population panel (www.surveyspot.com)**
  - Approximately 1 million members
  - Dynamic panel with members opting in and out
  - Recruiting methods: by Email invitation and Internet intercept
- **Women 18-49 years who were pregnant any time since August 1st were eligible for the survey**
- **Sampled women were weighted to represent the national population of pregnant women**
  - Weighted by age groups, race/ethnicity, geographic distribution

Methodology – Internet panel survey (pregnant women)

- **Estimation of influenza vaccination coverage**
  - Data from April survey are used to generate coverage estimates for the entire influenza season
  - Women pregnant from October-January included in final season estimate
  - Only vaccinations received before or during pregnancy were counted as vaccinated
- **No statistical testing performed since sample is non-probability based**
  - 5 percentage points used as notable difference

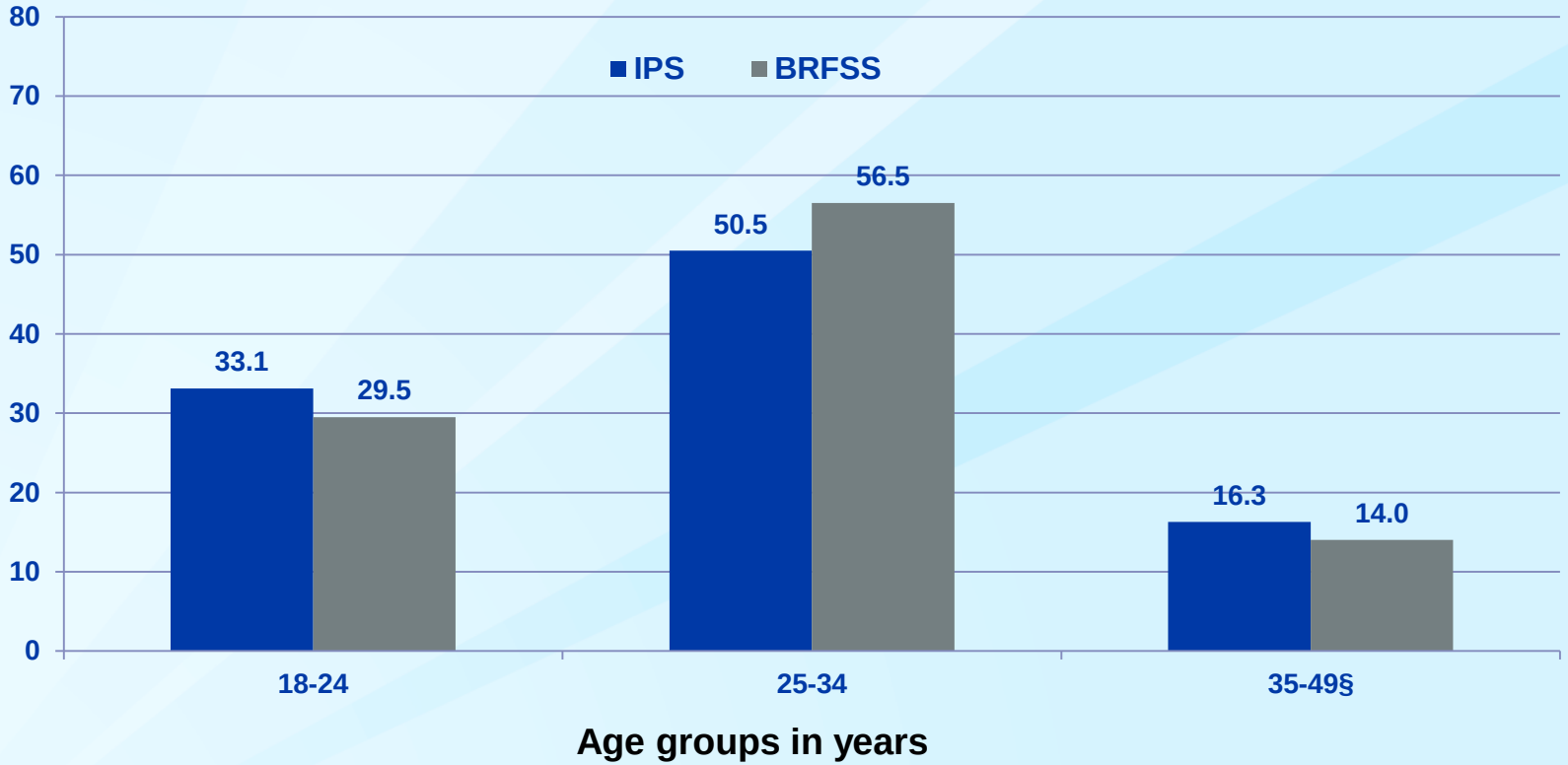
Comparison of survey methodologies (pregnant women)

	Internet panel survey	BRFSS	PRAMS
Recruitment method	Non-probability sample from a volunteer Internet panel	Stratified RDD sampling of landline and cell telephones	Stratified random sampling from state birth certificate registries
Survey mode	Self-administered online	Telephone interview	Mailed survey with telephone follow-up
Timing of pregnancy	At interview or since Aug 1	At interview (Use Dec-Feb interviews)	Had a live birth in past 2-6 months
Timing of influenza vaccination	During flu season	Within past 12 months*	During influenza season
Geographic level	National	National	State or local
Data collection schedule	Nov and April of each flu season	Monthly	Ongoing
Timeliness of reporting	2 weeks	2 months	18 months
Typical response /completion rate	90%	55%	65%
Approx. sample size	1500 per survey	400-800 per season	300-1500 per state/city

* Since 2008 can determine whether during influenza season

Comparison of survey demographics – Internet panel survey and BRFSS

Final weighted distribution of age groups in pregnant women sample 2012-13 influenza season, Internet Panel Survey* vs. BRFSS†



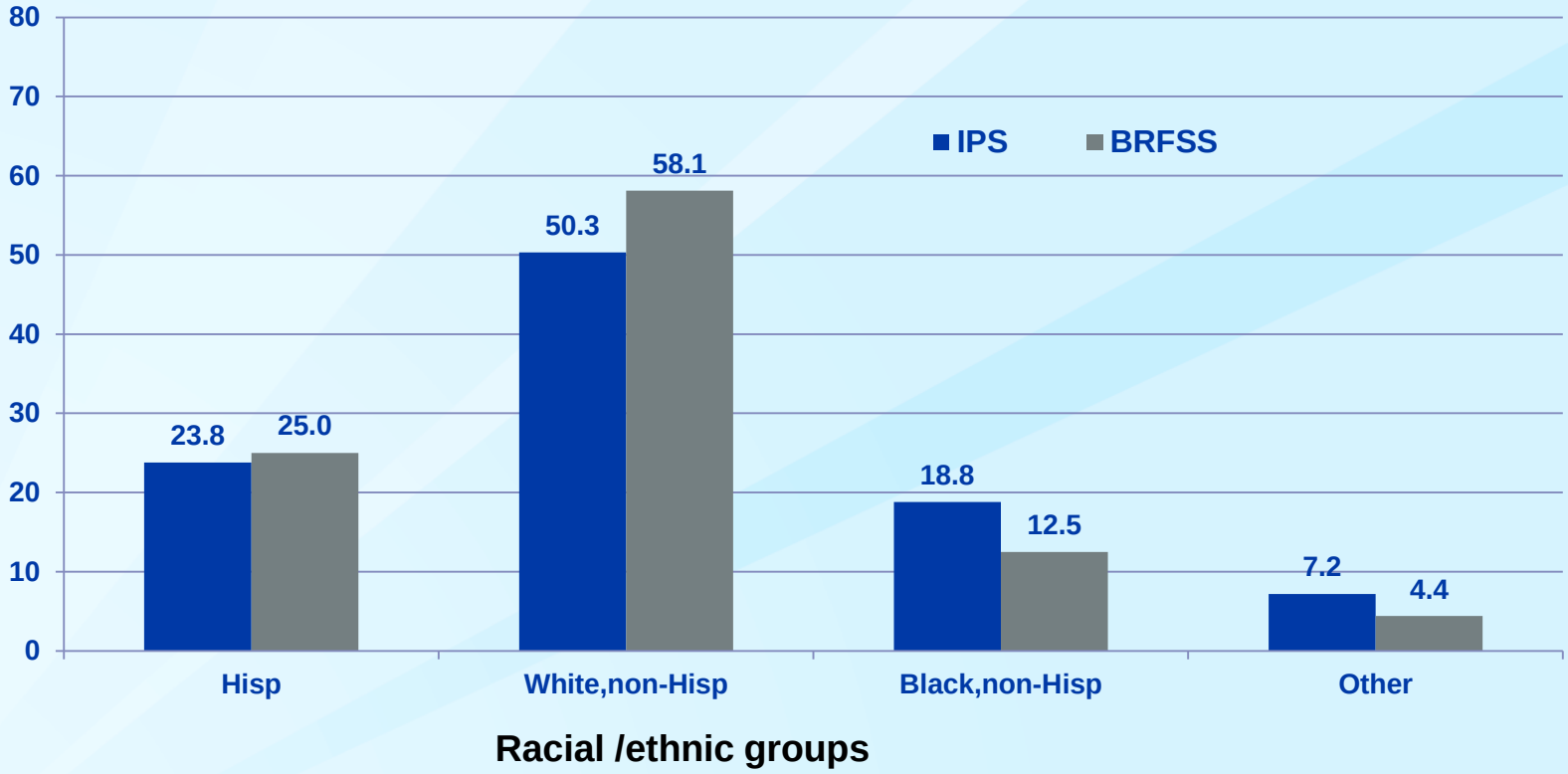
* Women pregnant any time October - January

† Women interviewed December – February who were pregnant at time of interview

§ Women in BRFSS sample were 35-44 yrs

Comparison of survey demographics – Internet panel survey and BRFSS

Final weighted distribution of racial/ethnic groups in pregnant women sample 2012-13 influenza season, Internet Panel Survey* vs. BRFSS†



* Women pregnant any time October - January

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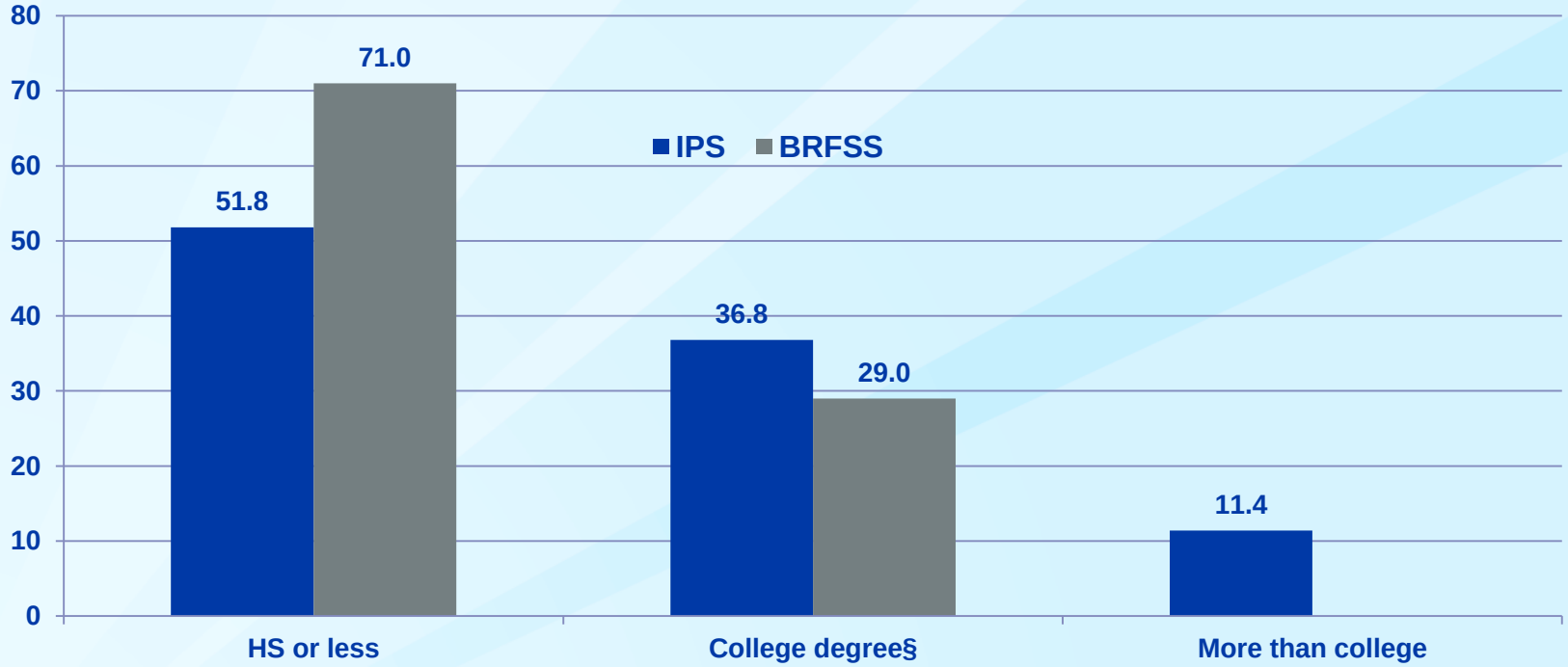
Comparison of survey demographics – Internet panel survey and BRFSS

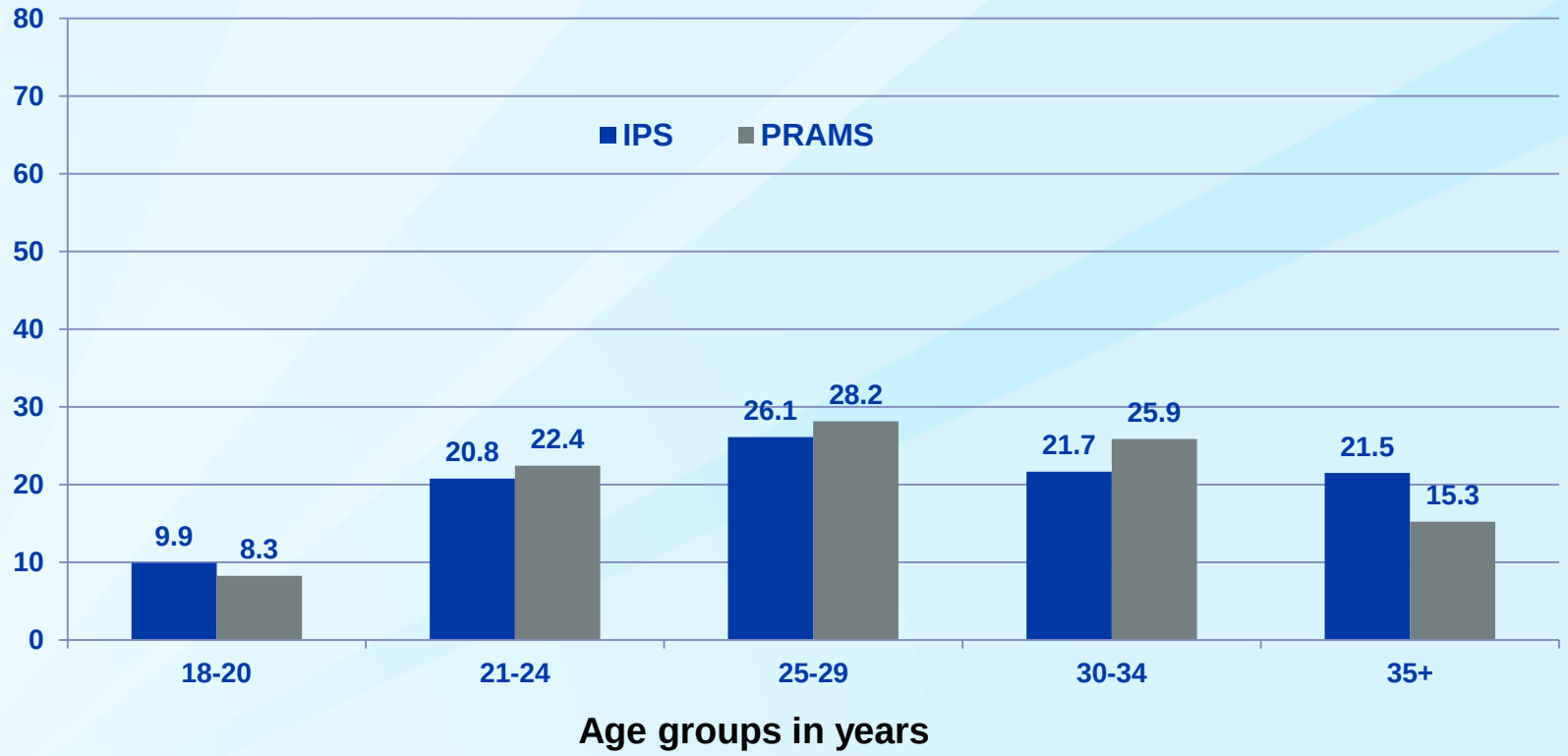
Final weighted distribution of education levels in pregnant women sample
2012-13 influenza season
Internet Panel Survey* vs. BRFSS†



* Women pregnant any time October - January
† Women interviewed December – February who were pregnant at time of interview
§ BRFSS sample includes women with college degree of higher

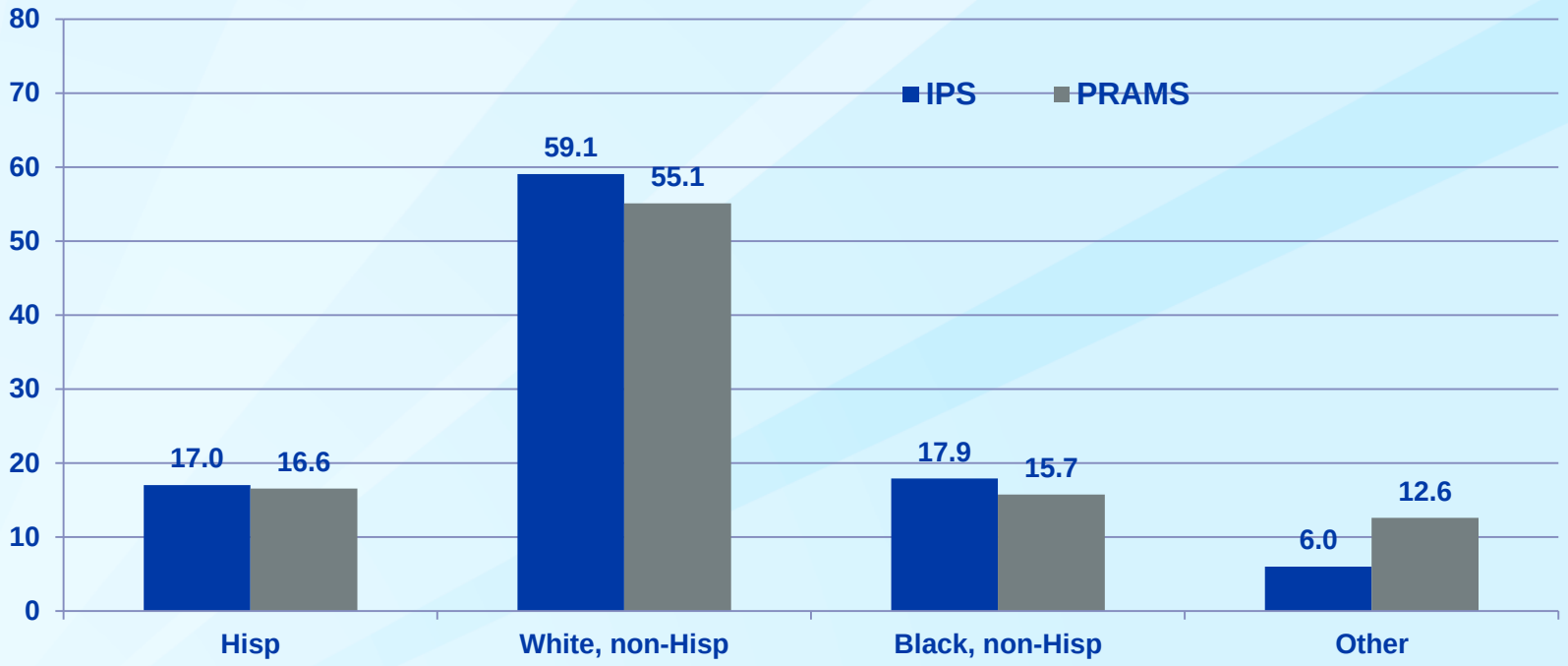
Comparison of survey demographics – Internet panel survey and PRAMS

Final weighted distribution of age groups of women pregnant anytime between October 2010-January 2011 from 18 states in United States, 2010-11 influenza season, Internet Panel Survey vs. PRAMS



Comparison of survey demographics – Internet panel survey and PRAMS

Final weighted distribution of racial/ethnic groups of women pregnant anytime between October 2010-January 2011 from 18 states in United States, 2010-11 Influenza Season, Internet Panel Survey vs. PRAMS



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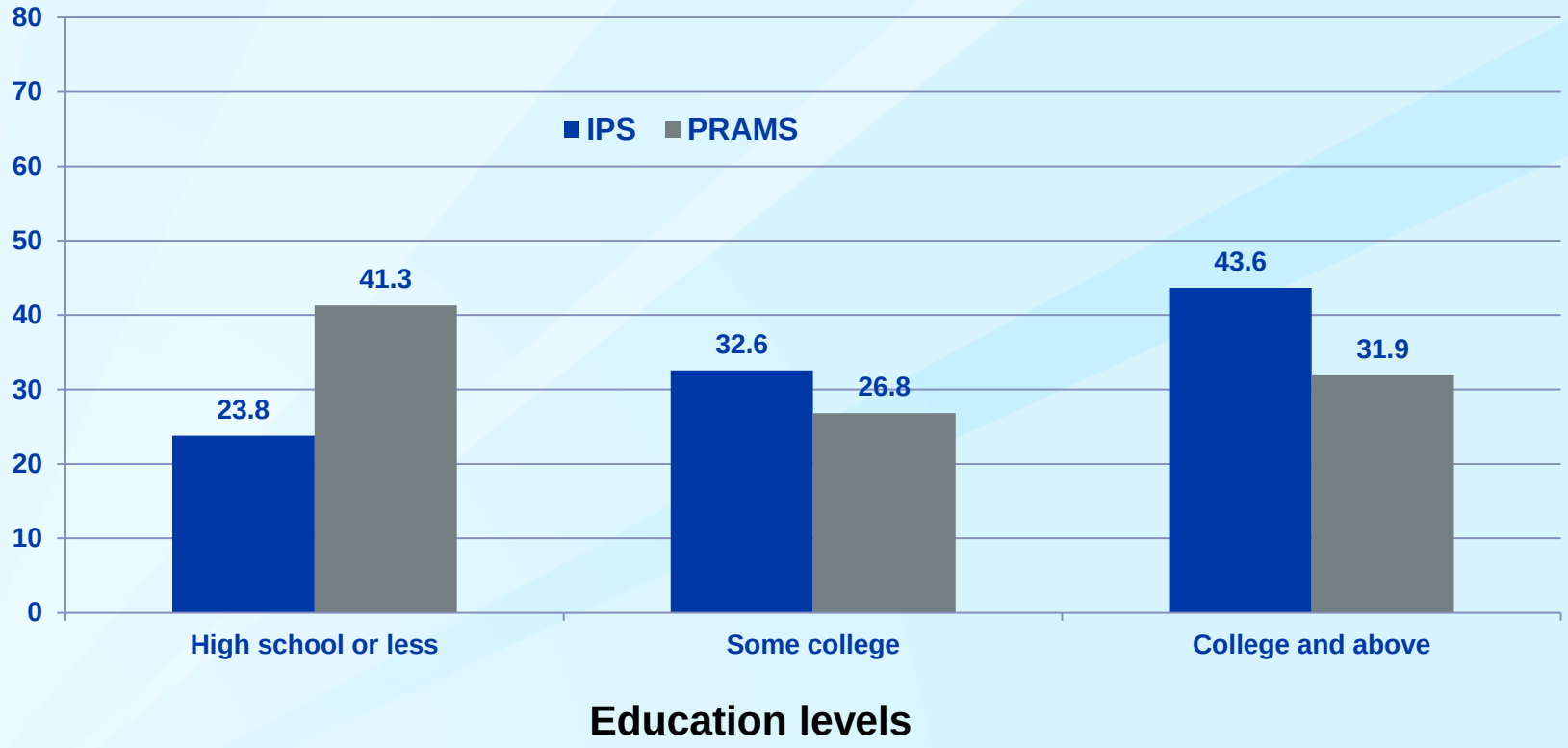
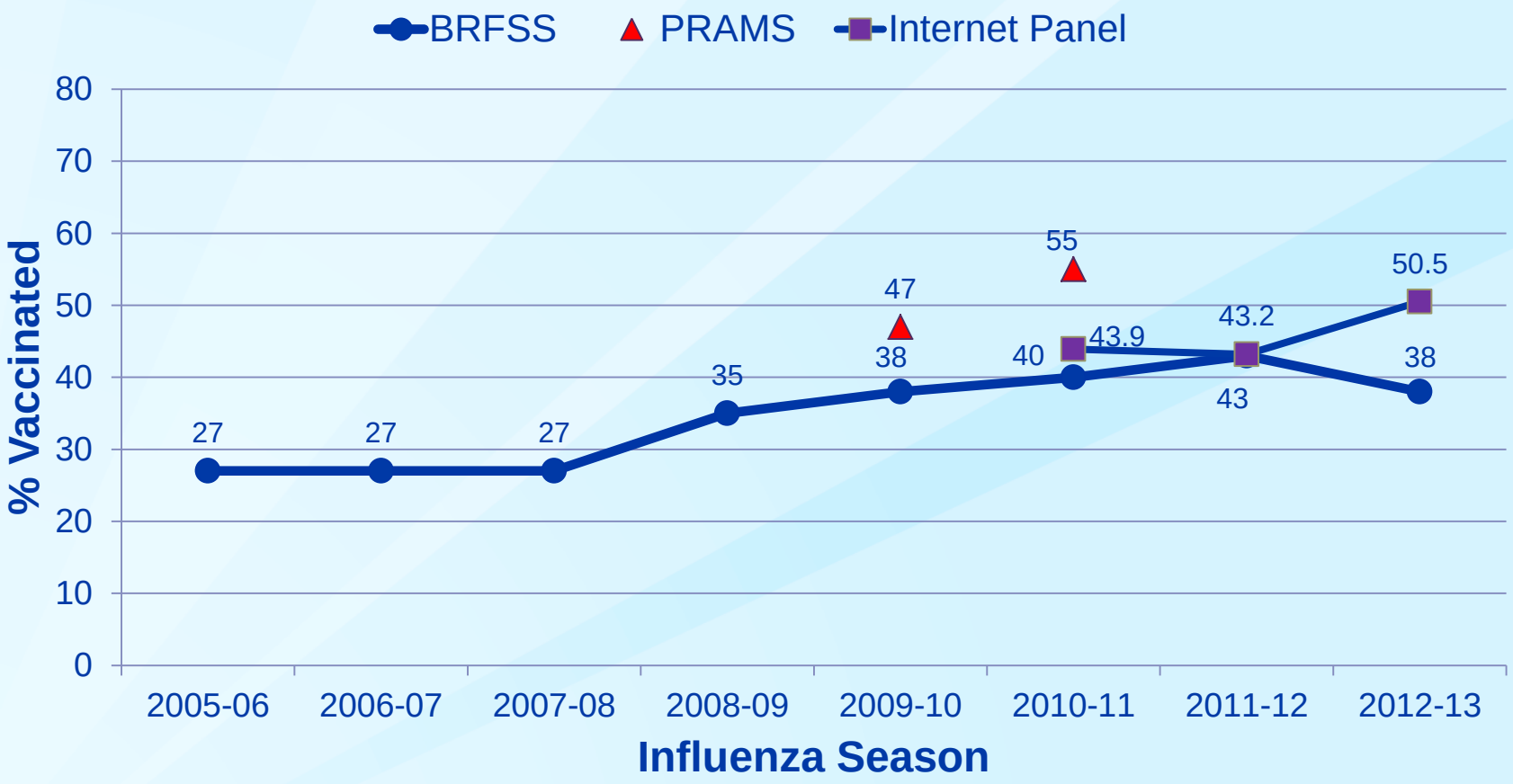
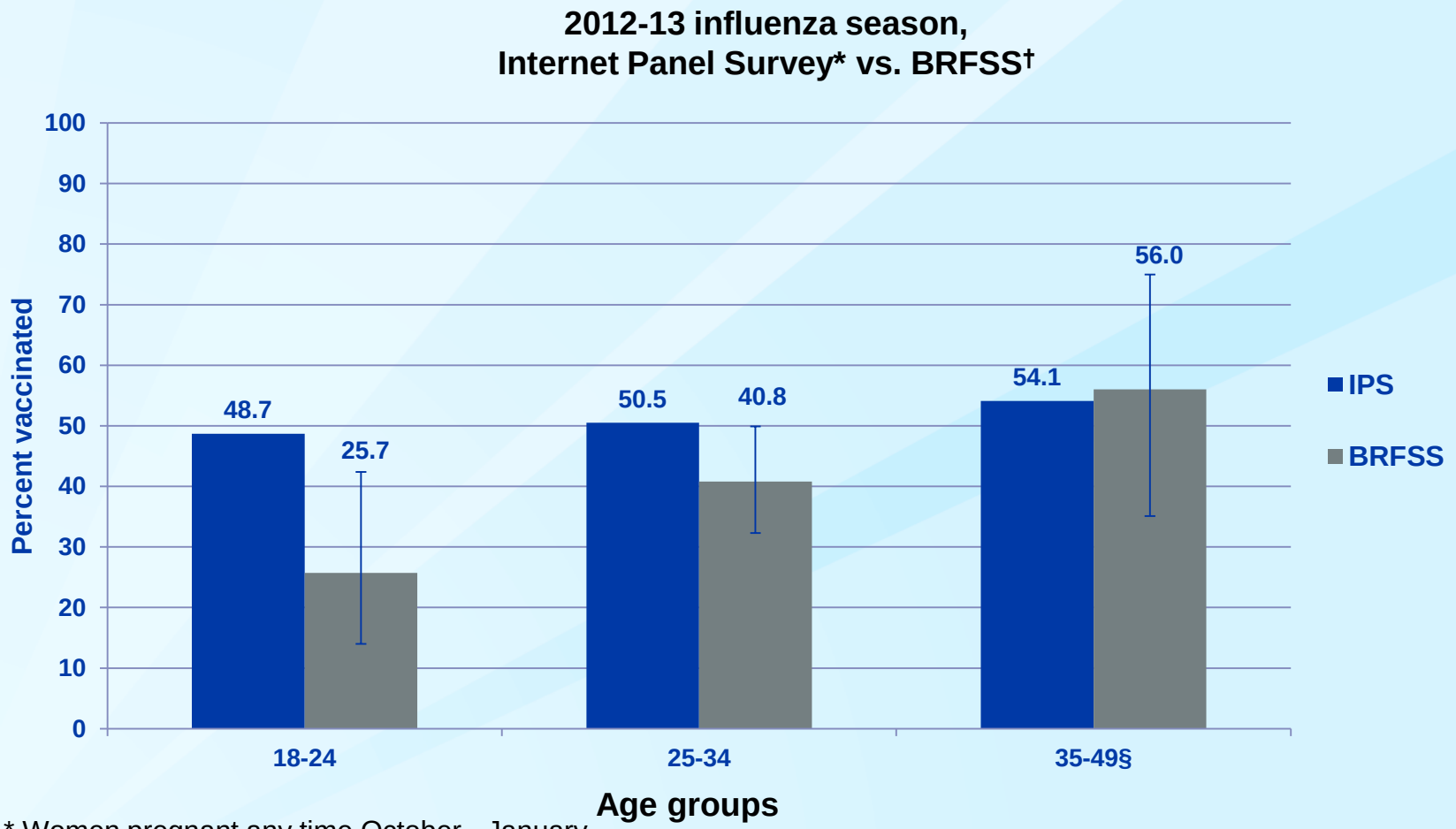


Estimated Influenza Vaccination (trivalent) Coverage, Pregnant Women*



* Behavioral Risk Factor Surveillance (BRFSS) data from December-February interviews only, for women 18-44 years pregnant at time of interview. Internet panel survey data include women pregnant from Oct-Jan who were vaccinated before or during pregnancy. PRAMS estimates may include women vaccinated after delivery.

Vaccination coverage by age – Internet panel survey and BRFSS



* Women pregnant any time October - January

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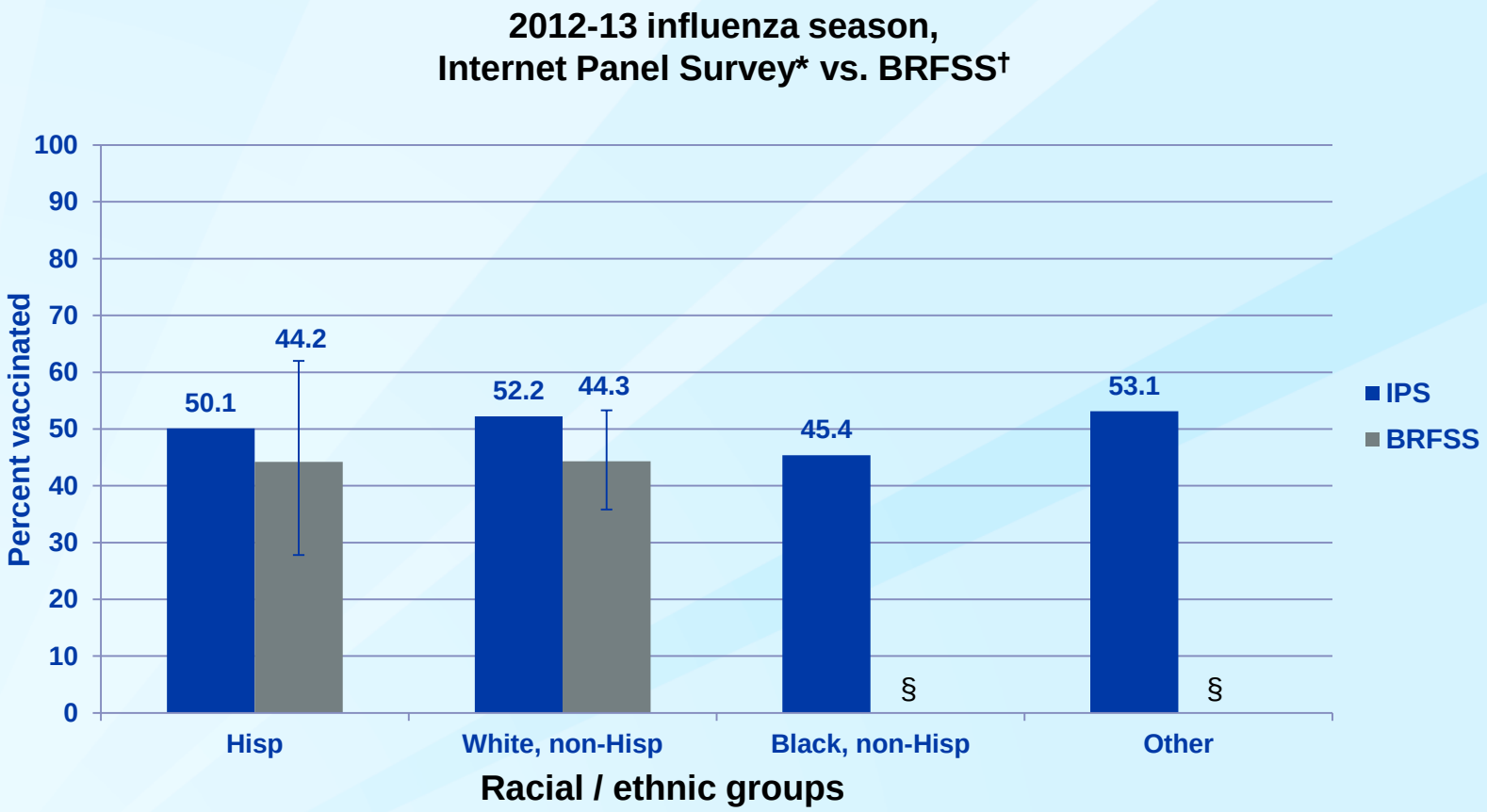
§ Women in BRFSS sample were 35-44 yrs

Vaccination coverage by race/ethnicity – Internet panel survey and BRFSS

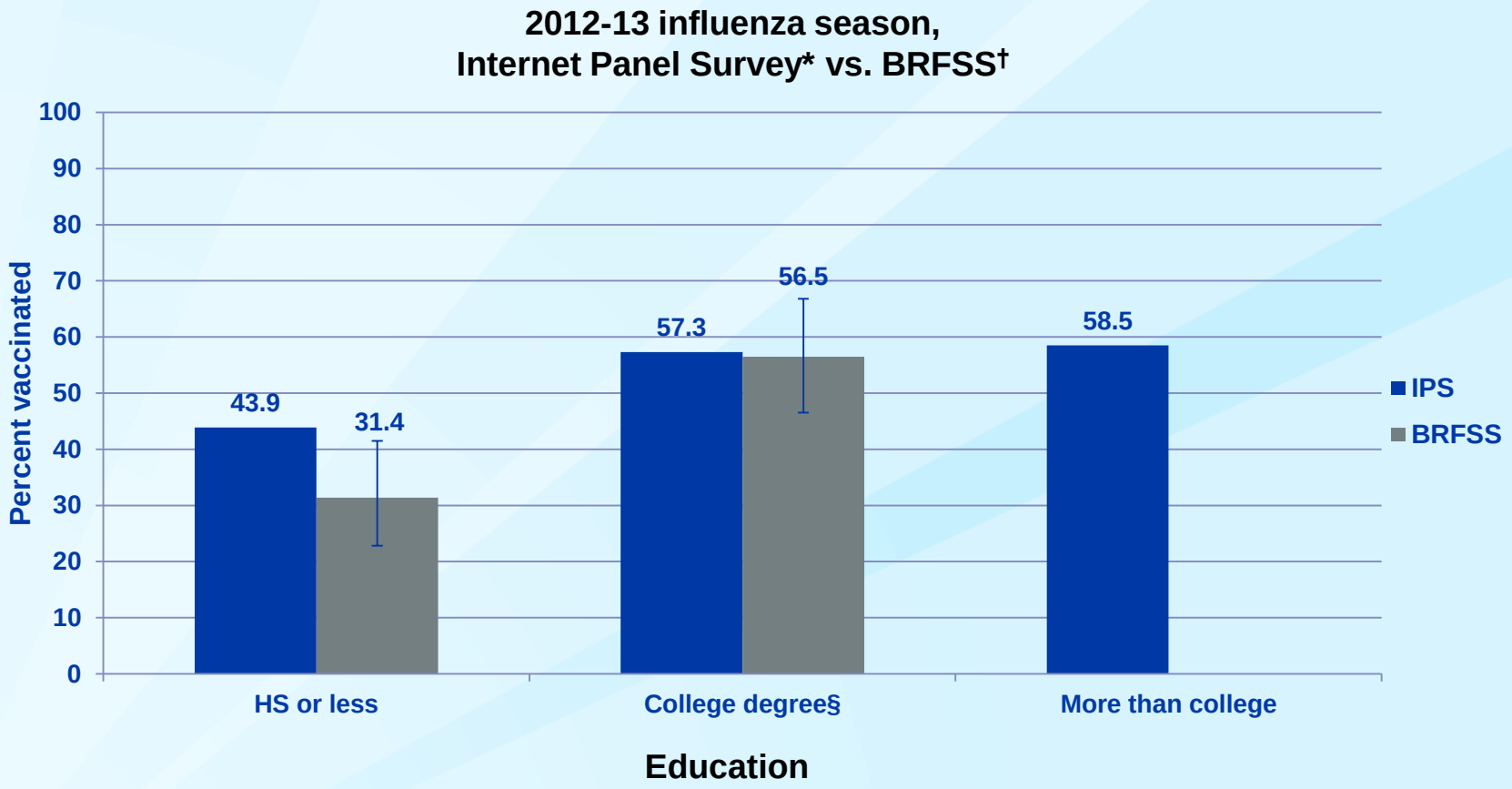


* Women pregnant any time October - January

† Women interviewed December – February who were pregnant at time of interview

§ BRFSS estimate unreliable due to relative standard error >30%

Vaccination coverage by education – Internet panel survey and BRFSS



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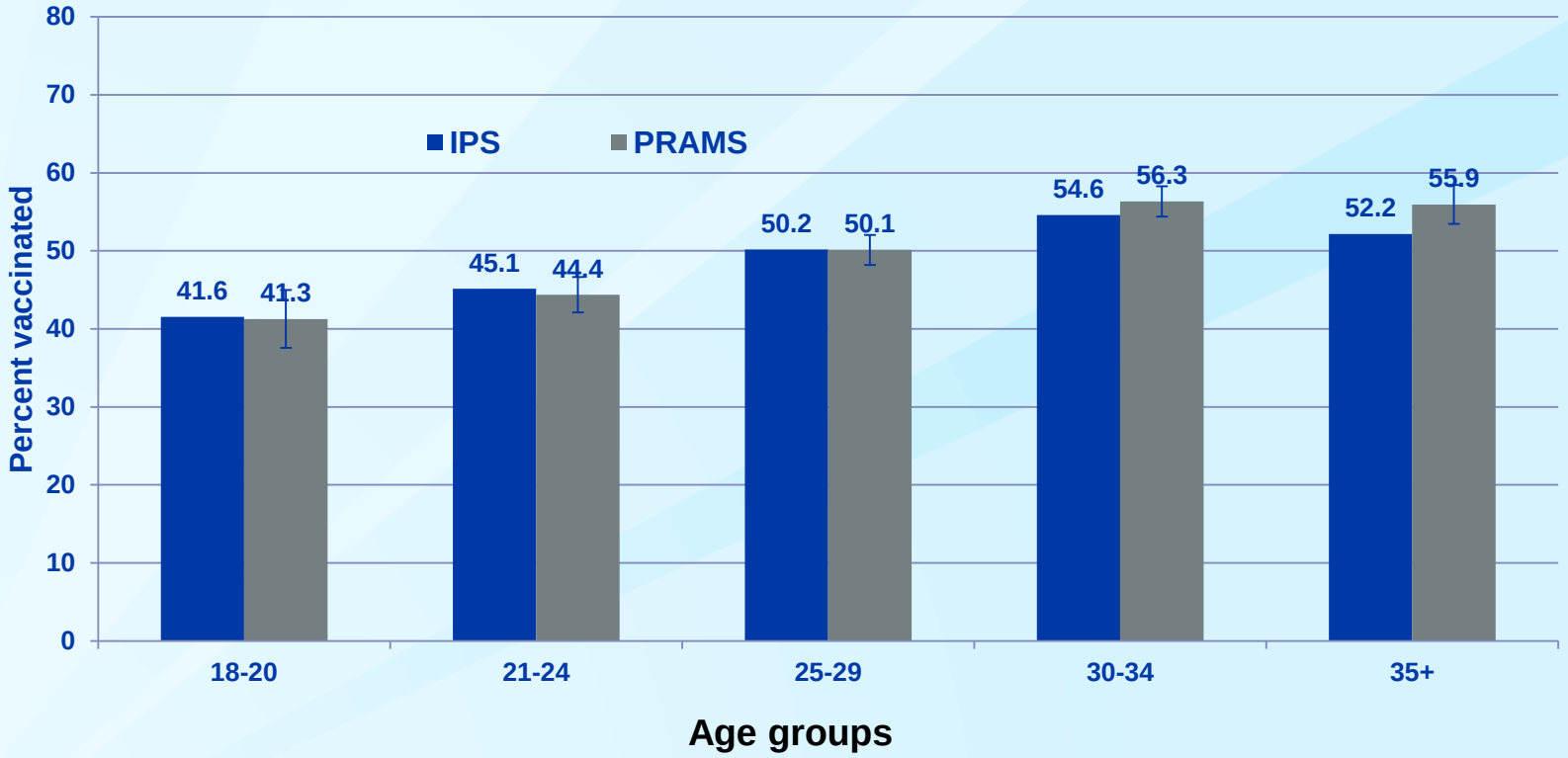
§ BRFSS sample includes women with college degree of higher

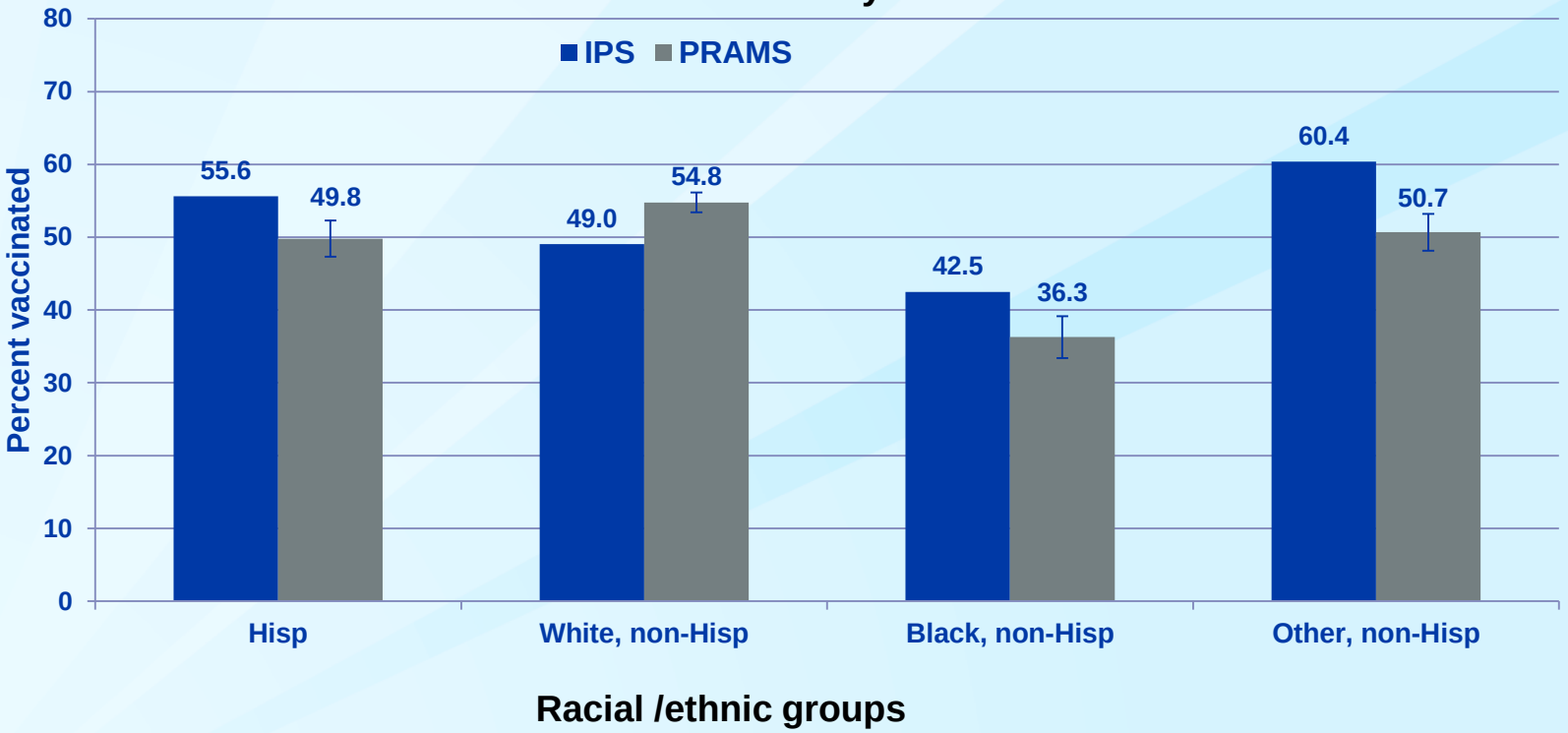
Vaccination coverage by age – Internet panel survey and PRAMS

Influenza vaccination coverage by age groups among women pregnant any time between October 2010-January 2011 from 18 states in United States, 2010-11 influenza season, Internet Panel Survey vs. PRAMS



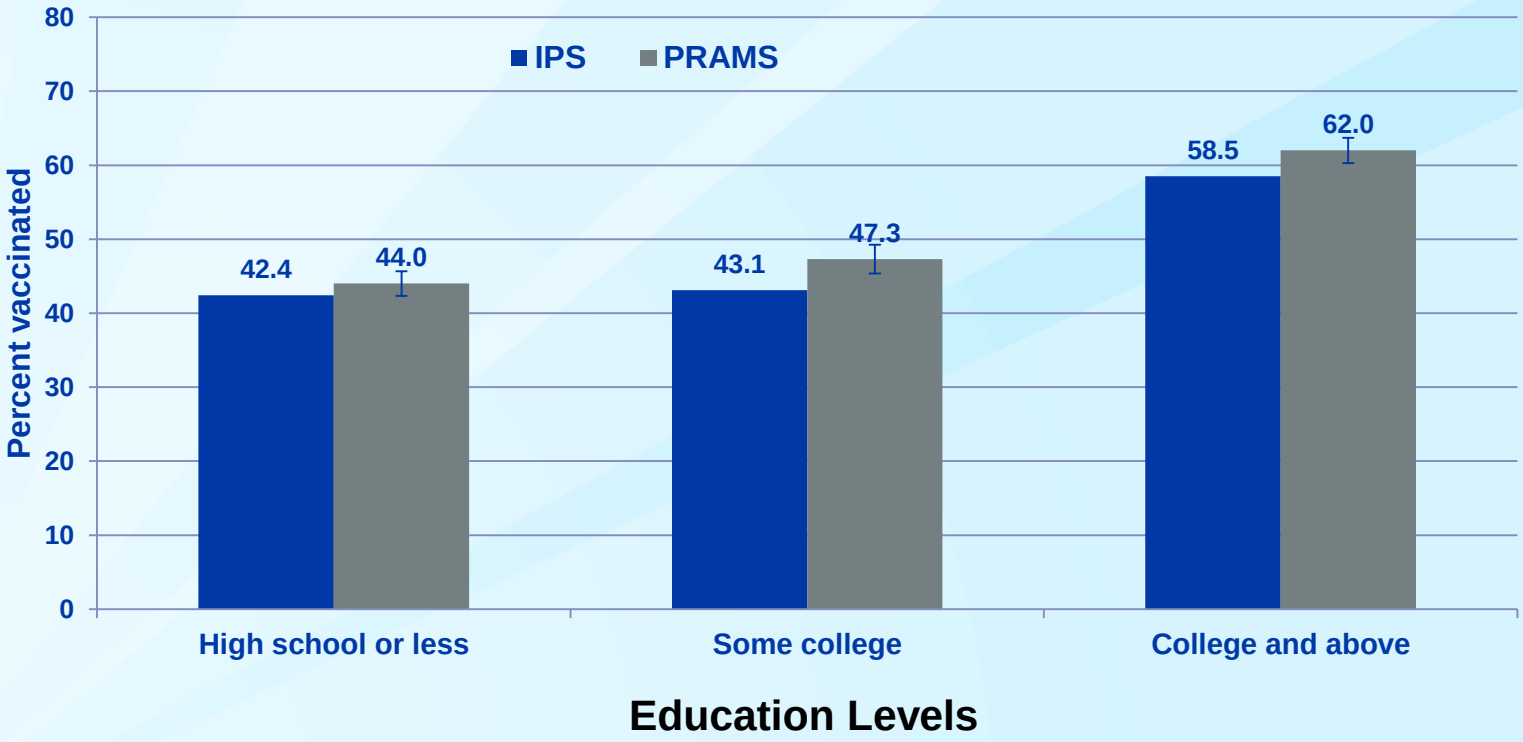
Vaccination coverage by race/ethnicity – Internet panel survey and PRAMS

Influenza vaccination coverage by race/ethnicity among women pregnant any time between October 2010-January 2011 from 18 states in United States, 2010-11 Influenza Season, Internet Panel Survey vs. PRAMS



Vaccination coverage by education – Internet panel survey and PRAMS

Influenza vaccination coverage by education levels among women pregnant any time between October 2010-January 2011 from 18 states in United States, 2010-11 Influenza Season, Internet Panel Survey vs. PRAMS



Discussion – pregnant women

- **Compared to the Internet panel sample of pregnant women:**
  - Women in BRFSS sample were
    - More likely to be 25-34 years of age
    - More likely to be white and less likely to be black
    - Less likely to have a college degree or higher
  - Women in PRAMS sample were
    - Less likely to be 35+ years
    - More likely to be ‘other’ race
    - Less likely to have a college degree or higher

Discussion – pregnant women

- **While absolute coverage by demographic factors differed in each survey, all three surveys showed that coverage was highest among women in the oldest age categories and with a college degree or higher**
  - Both the Internet panel survey and BRFSS found no difference by race/ethnicity in the 2012-13 influenza season
  - Both the internet panel survey and PRAMS found that black women had the lowest coverage in the 2010-11 influenza season
- **In general, overall vaccination coverage among pregnant women was lowest from the BRFSS sample and highest from the PRAMS sample**

Discussion – pregnant women

- **Differences in coverage estimates between surveys can be explained in part by differences in defining the cohort of pregnant women and timing of vaccination estimation**
  - The Internet panel survey includes women who were pregnant any time from Oct-Jan. Sample includes women with a pregnancy loss and thus may have a short duration of follow-up. Vaccination status was assessed at the end of influenza season. Vaccinations received after pregnancy ended were excluded from the coverage estimates.
  - The BRFSS sample includes women pregnant at the time of interview for interviews conducted Dec-Feb. Vaccination status was assessed only up through the time of interview, and duration of pregnancy at the time of interview may have been short.

Discussion – pregnant women (cont)

- PRAMS sample includes only women who have had a live birth and may differ from women with a pregnancy loss. Vaccination status can be assessed for the entire duration of pregnancy and influenza season. Coverage estimates include women vaccinated after delivery.
  - Comparing 2010-11 flu season vaccination estimates from the same 21 states in both the Internet panel survey and PRAMS, the Internet panel survey estimate for vaccination before and during pregnancy among women pregnant any time during October 2010-January 2011 (44.9%) was similar to the estimate from PRAMS (45.6%).

- **Question was added to the NHIS in 2012 to identify women pregnant during peak months of influenza vaccination period**
  - These data may provide another nationally representative sample to compare and possibly calibrate the IPS sample to

Conclusions – HCP and pregnant women

- **Internet panel surveys are useful for timely early season and post-season evaluation of influenza vaccination coverage among rare populations**
  - Also provide useful information regarding vaccination-related knowledge, attitude , behaviors, and barriers (KABBs) that cannot be obtained from existing population-based surveys
- **Results of the Internet panel surveys should continue to be validated with results from population-based surveys**
- **Both the HCP and pregnant women samples in the Internet panel surveys are skewed towards more highly educated respondents**
  - Consider weighting on education status in future surveys

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- Jim Singleton

The findings and conclusions in this presentation are those of the authors and do not necessarily

represent the views of the Centers for Disease Control and Prevention.