

# Surveying in a Wireless World

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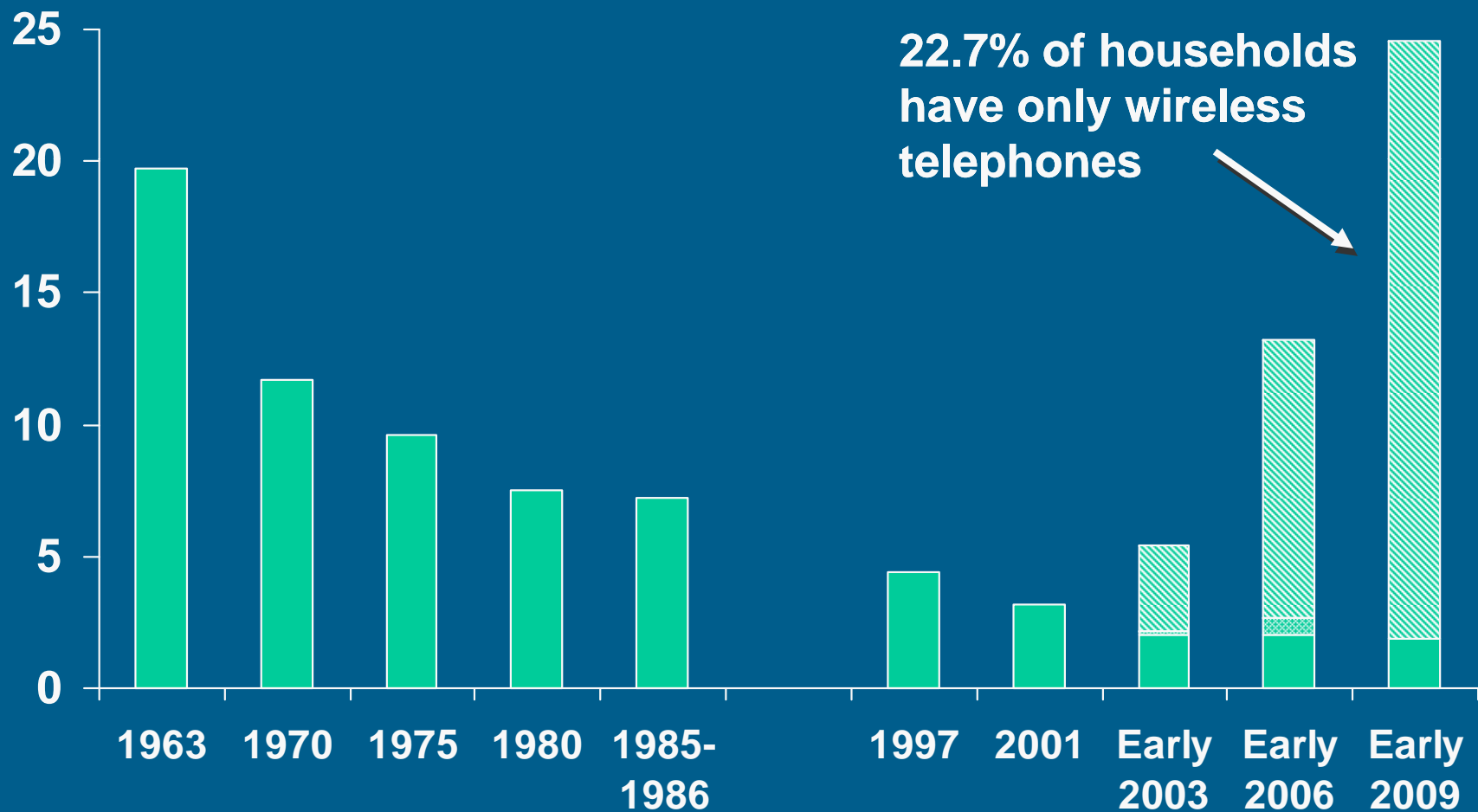


Centers for Disease Control and Prevention  
National Center for Health Statistics

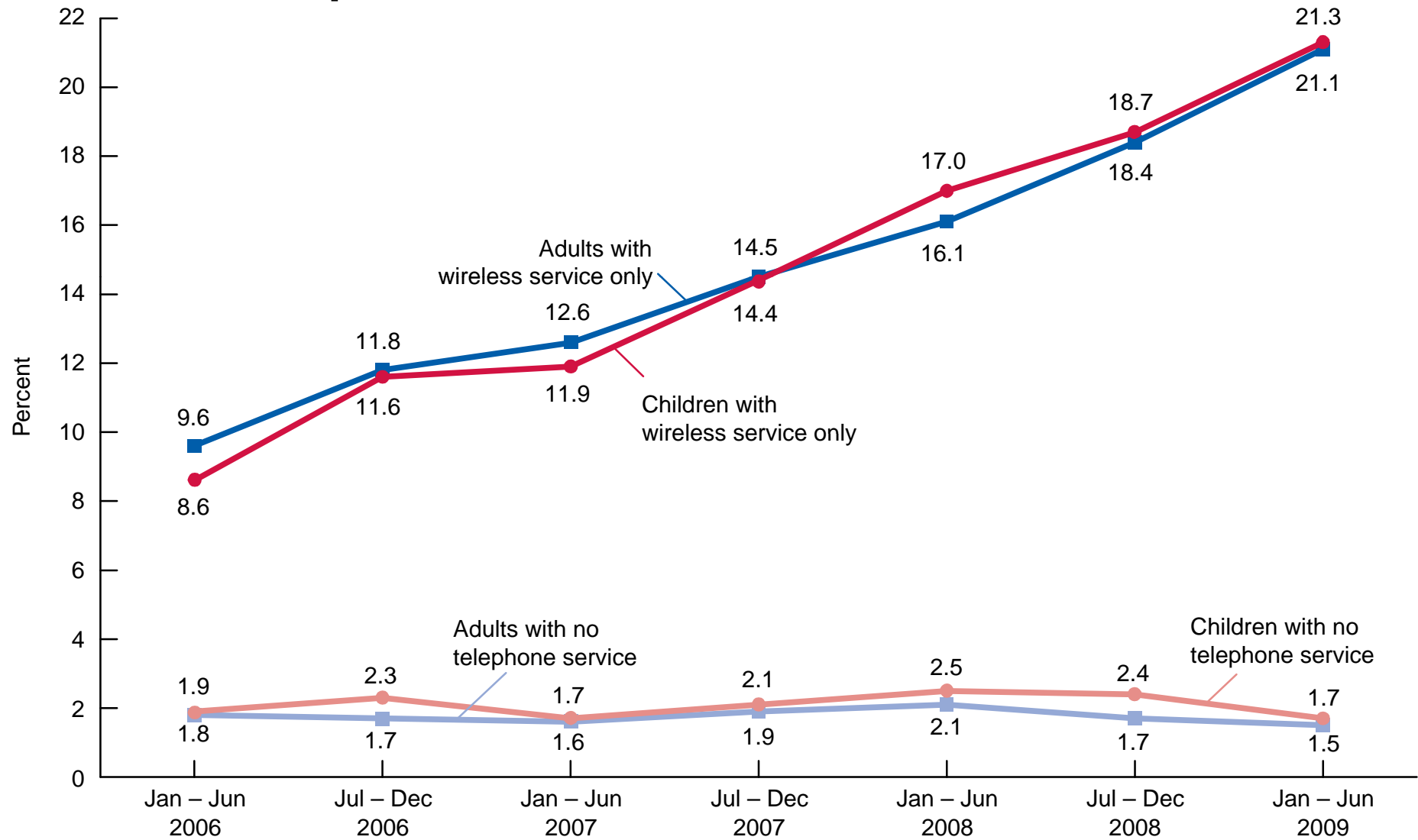
SAFER • HEALTHIER • PEOPLE™

# Percentage of U.S. Households Without Landline Telephones

■ Based on National Health Interview Survey data

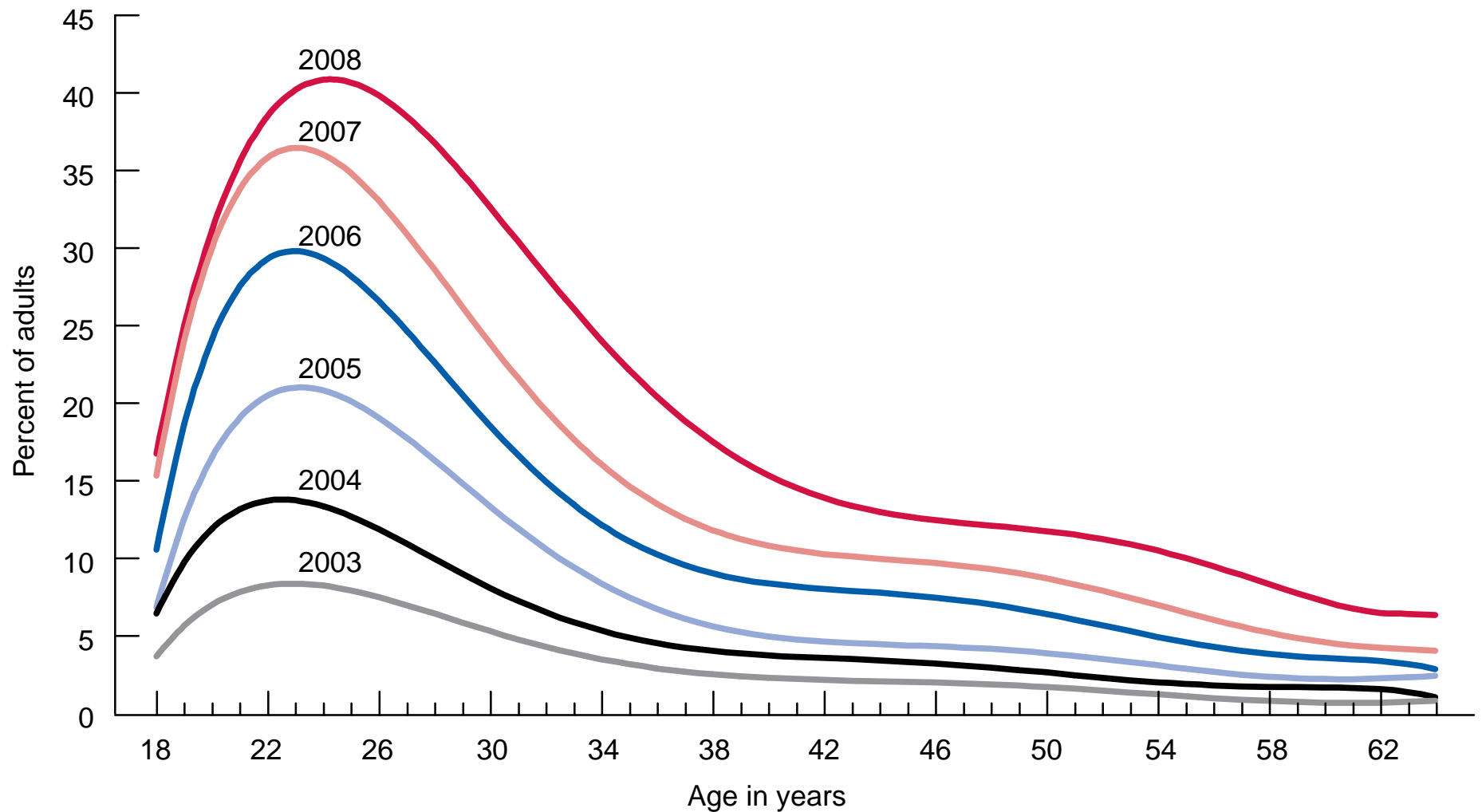


## Percentages of adults and children living in households with only wireless telephone service or no telephone service: United States, 2006–2009

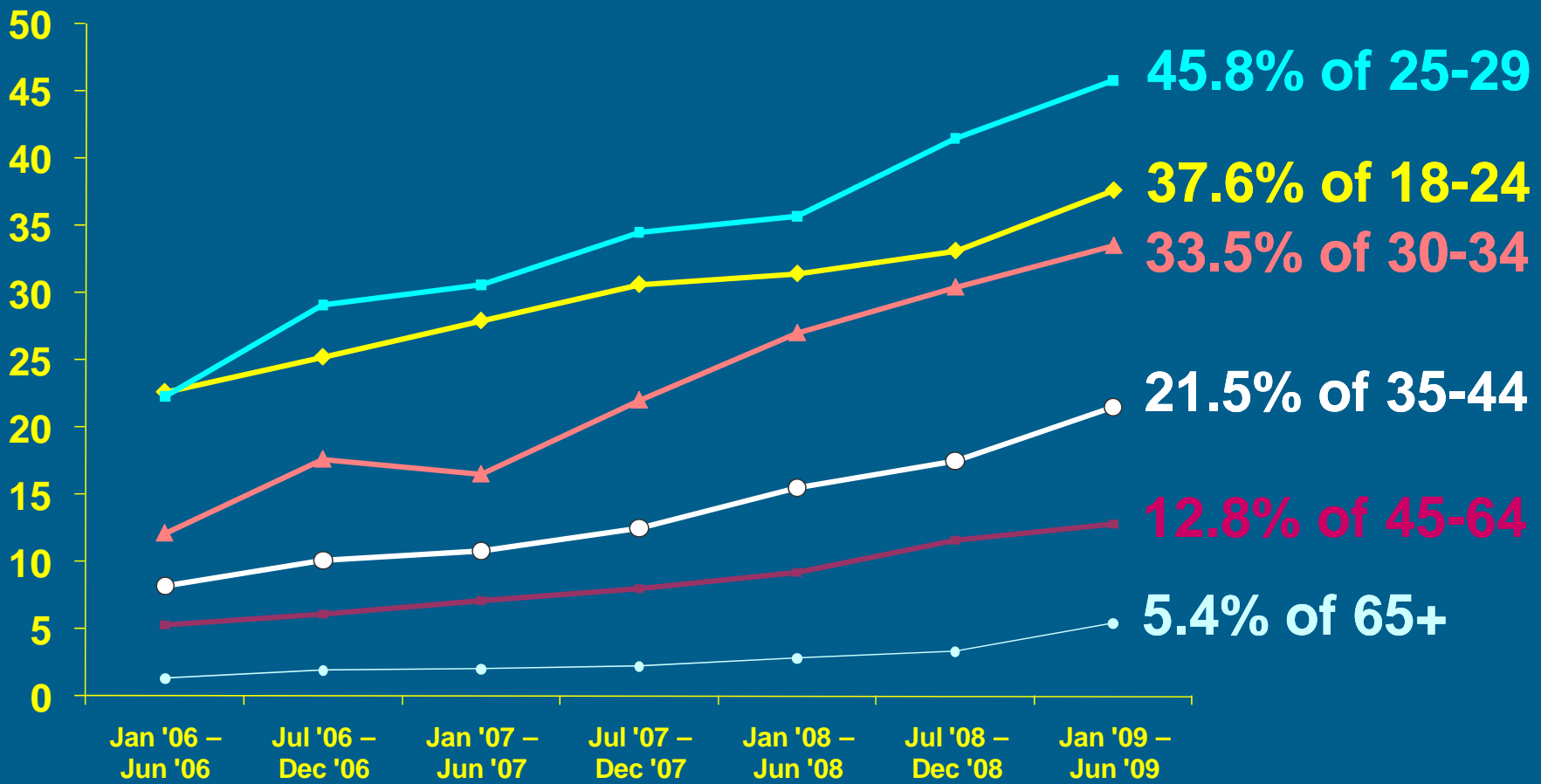


DATA SOURCE: CDC/NCHS, National Health Interview Survey.

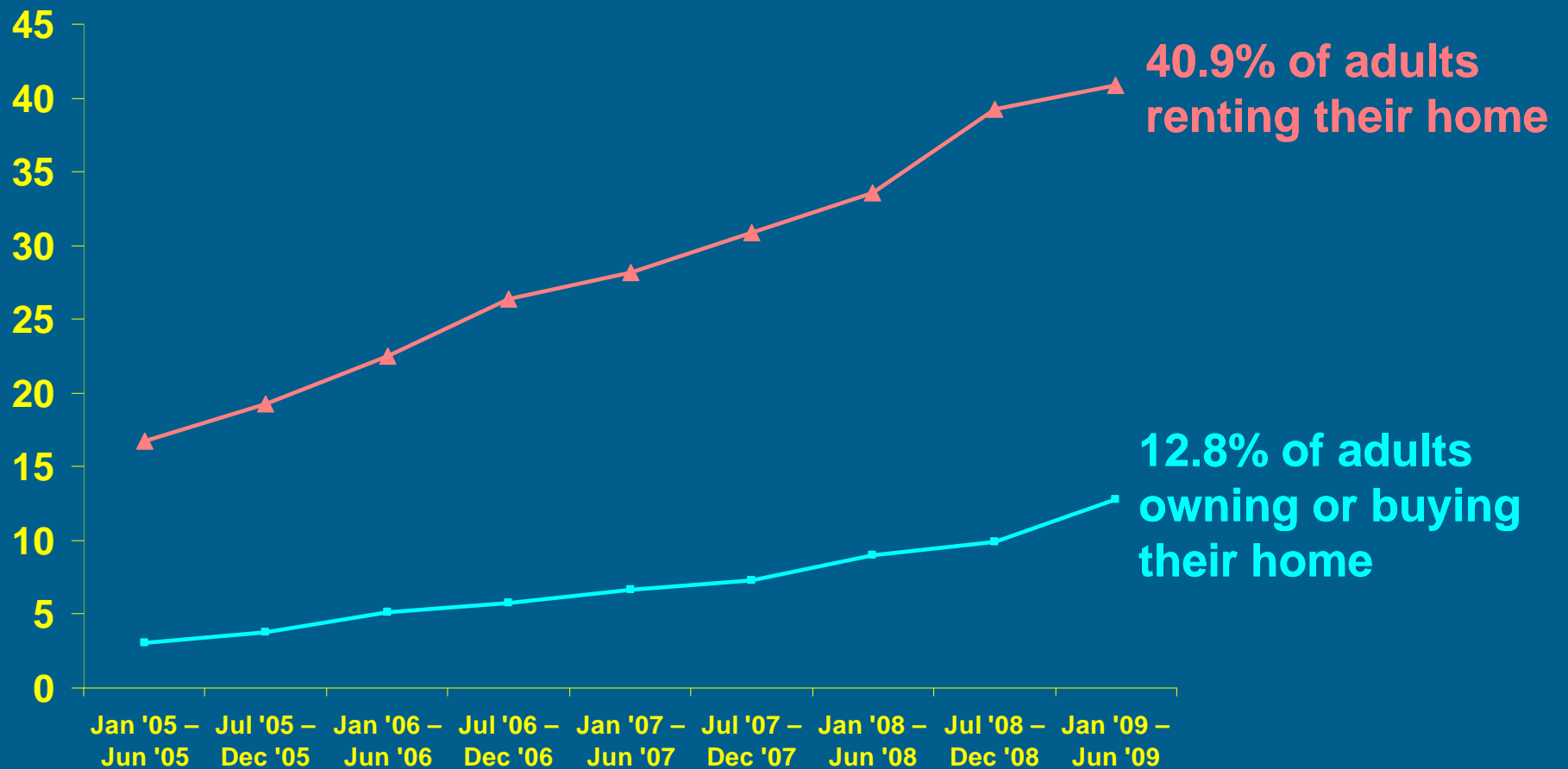
# Polynomial regression equations fitted to a plot of the percentage of adults living in households with only wireless telephone service, by single year of age and by year of interview: United States, 2003–2008



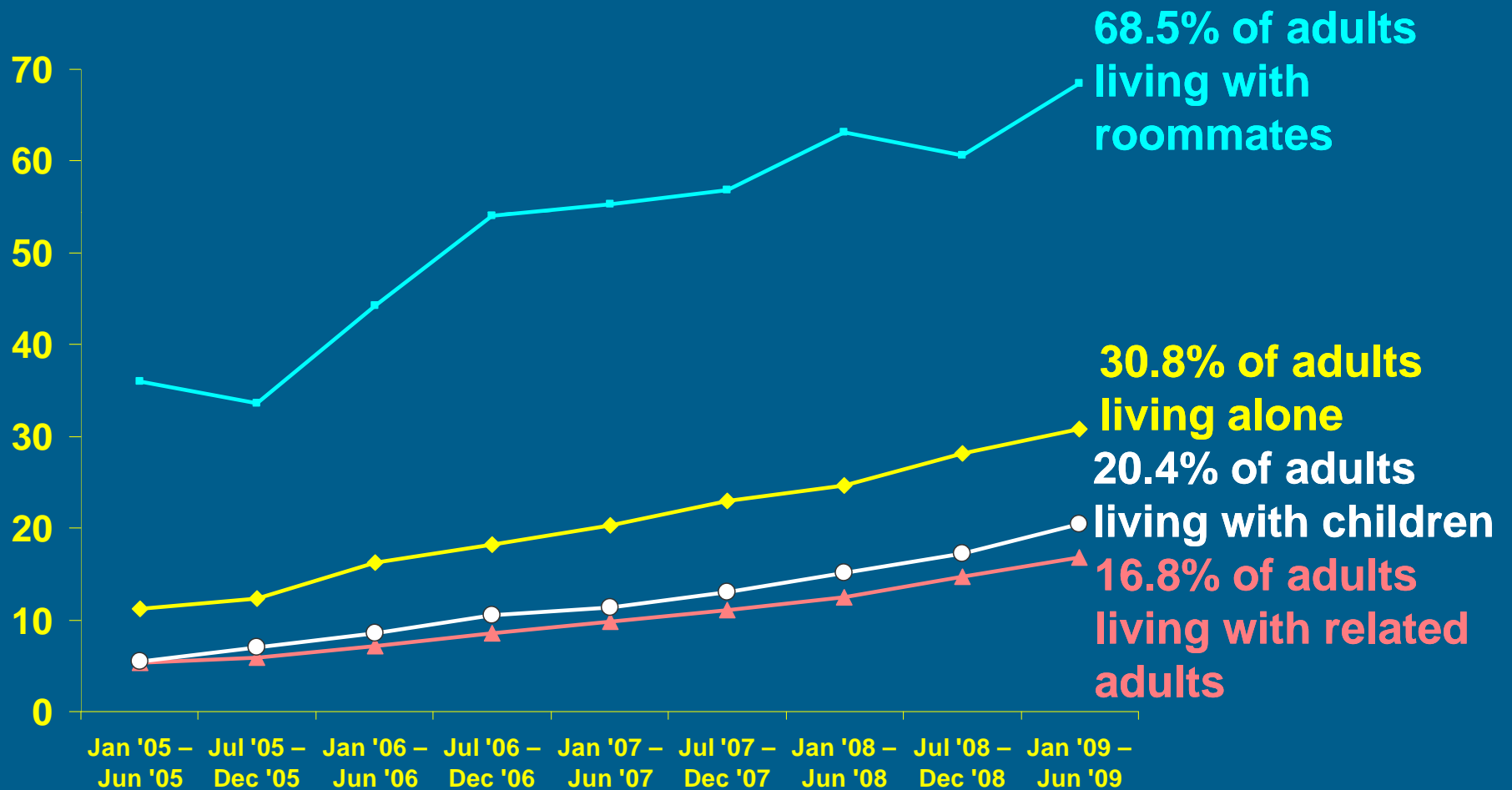
# Prevalence of Wireless-Only Adults by Age



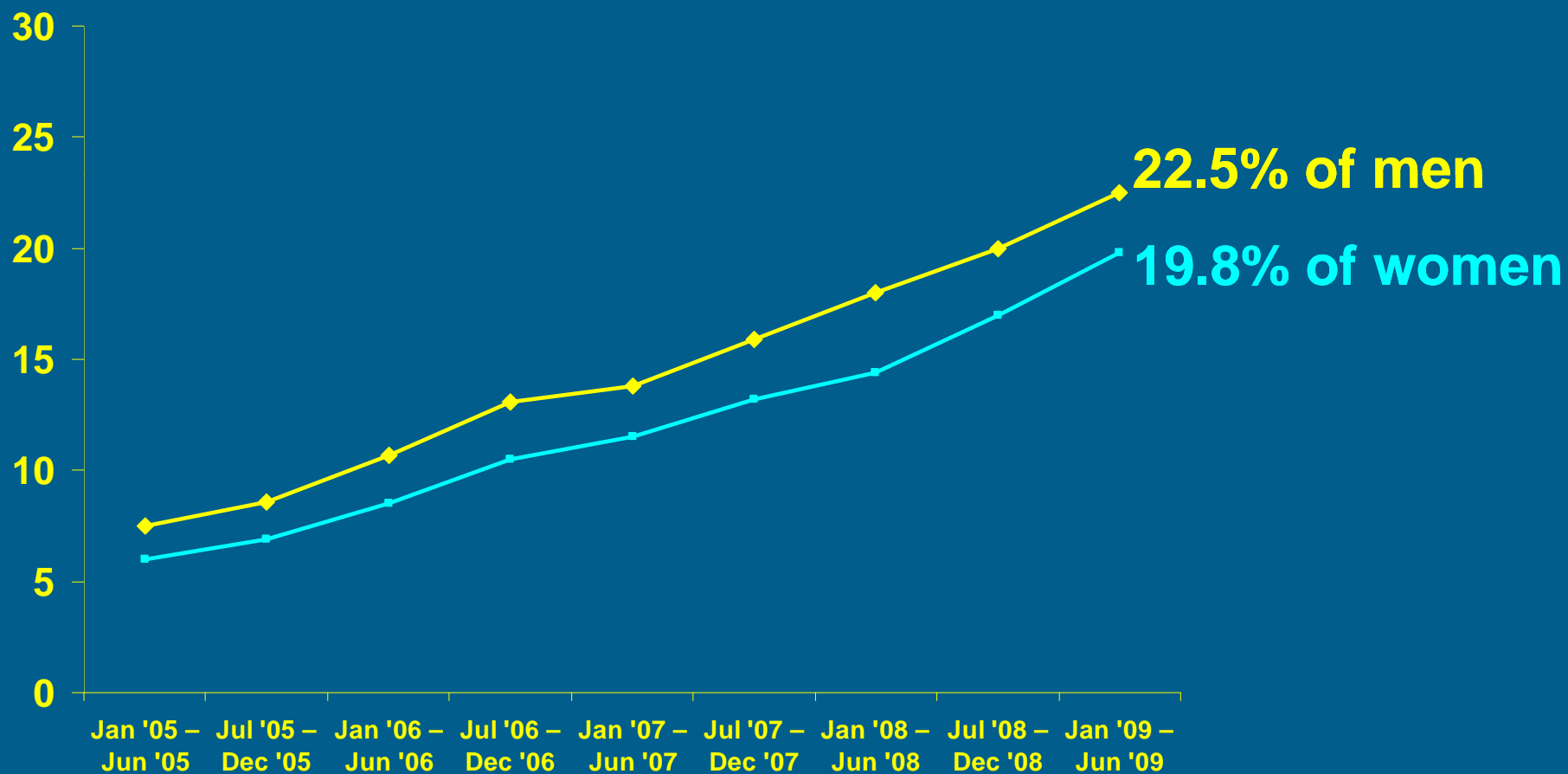
# Prevalence of Wireless-Only Adults by Home Ownership Status



# Prevalence of Wireless-Only Adults by Household Structure

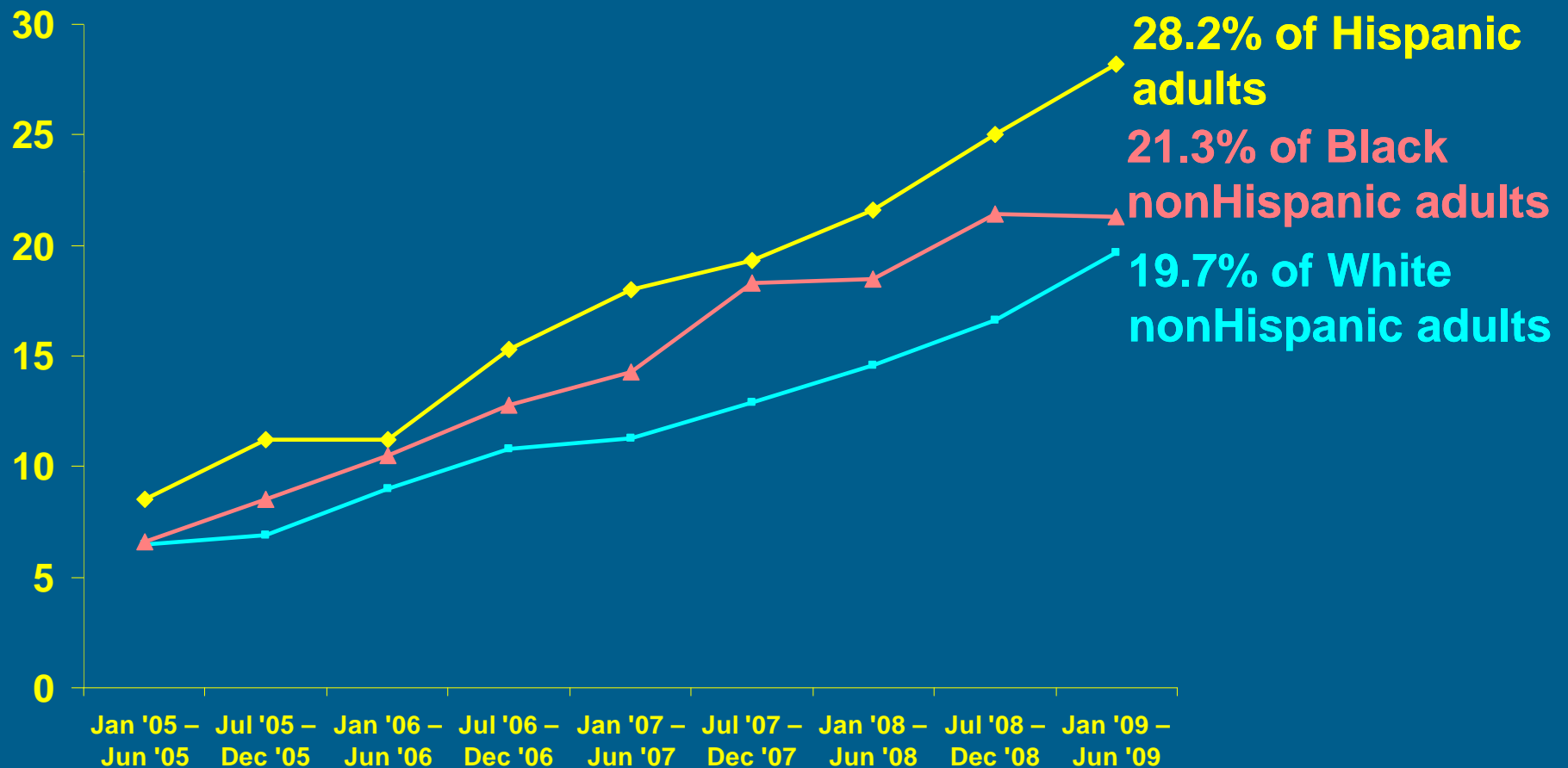


# Prevalence of Wireless-Only Adults by Sex

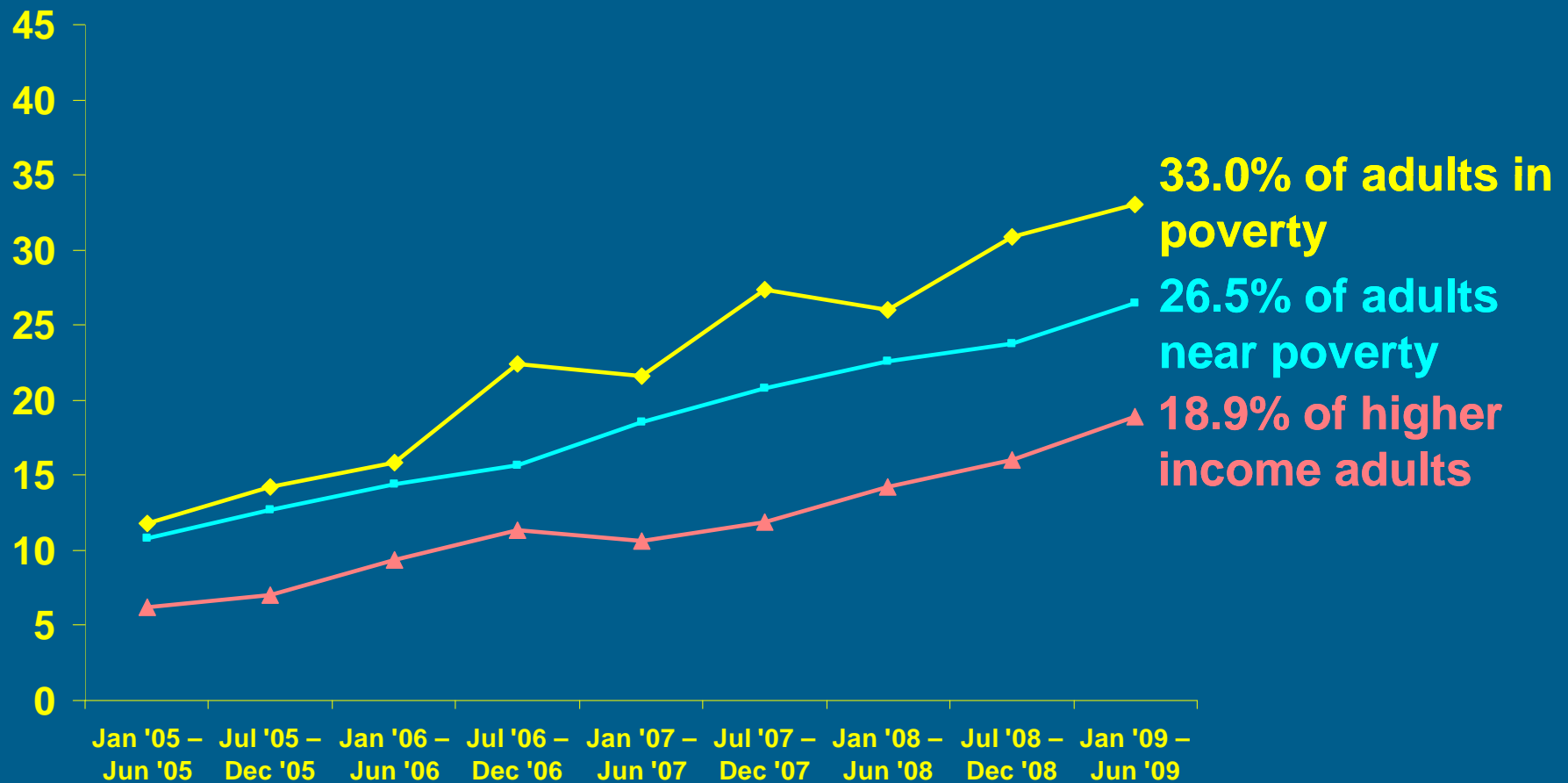




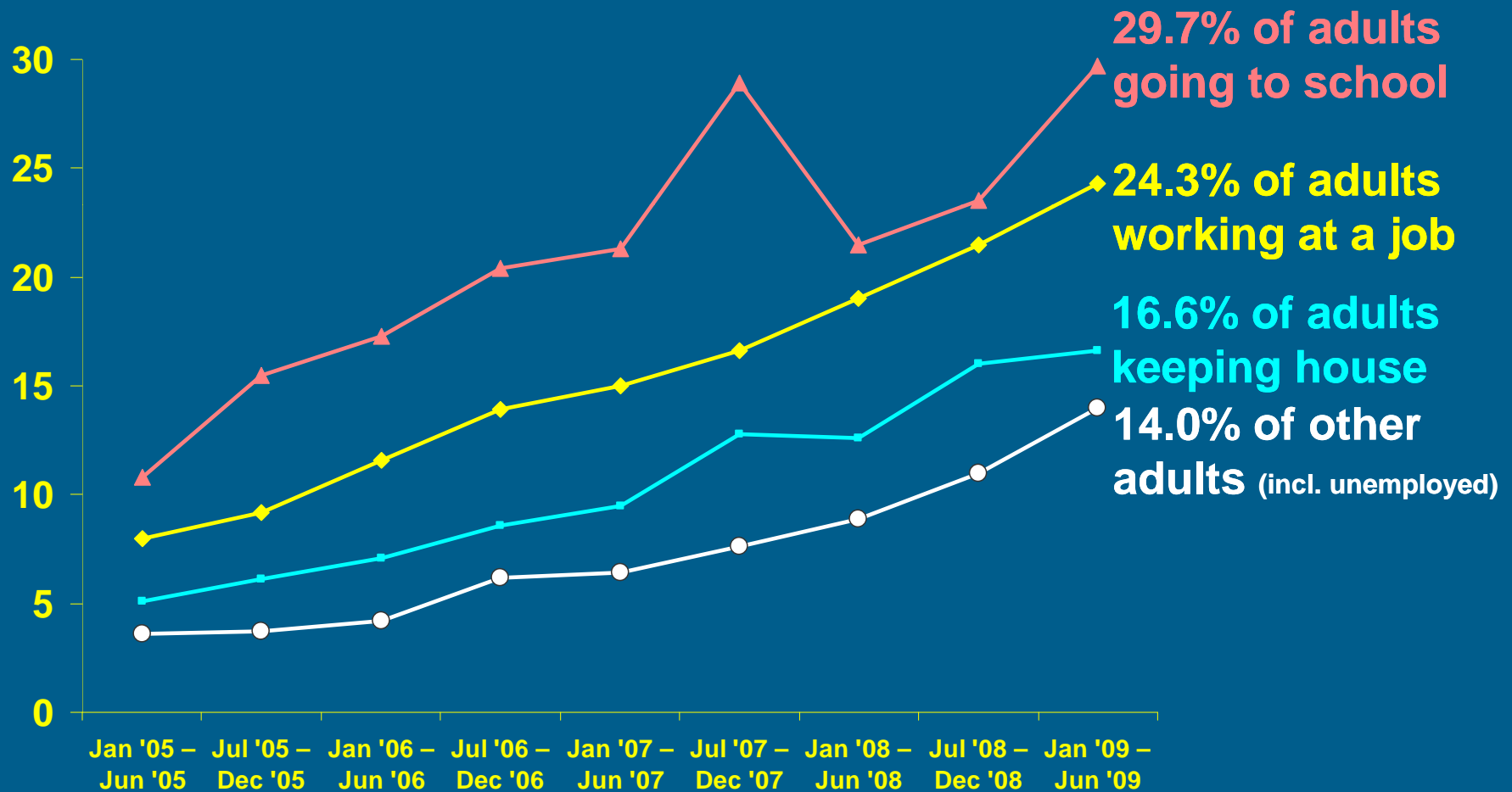
# Prevalence of Wireless-Only Adults by Race/Ethnicity



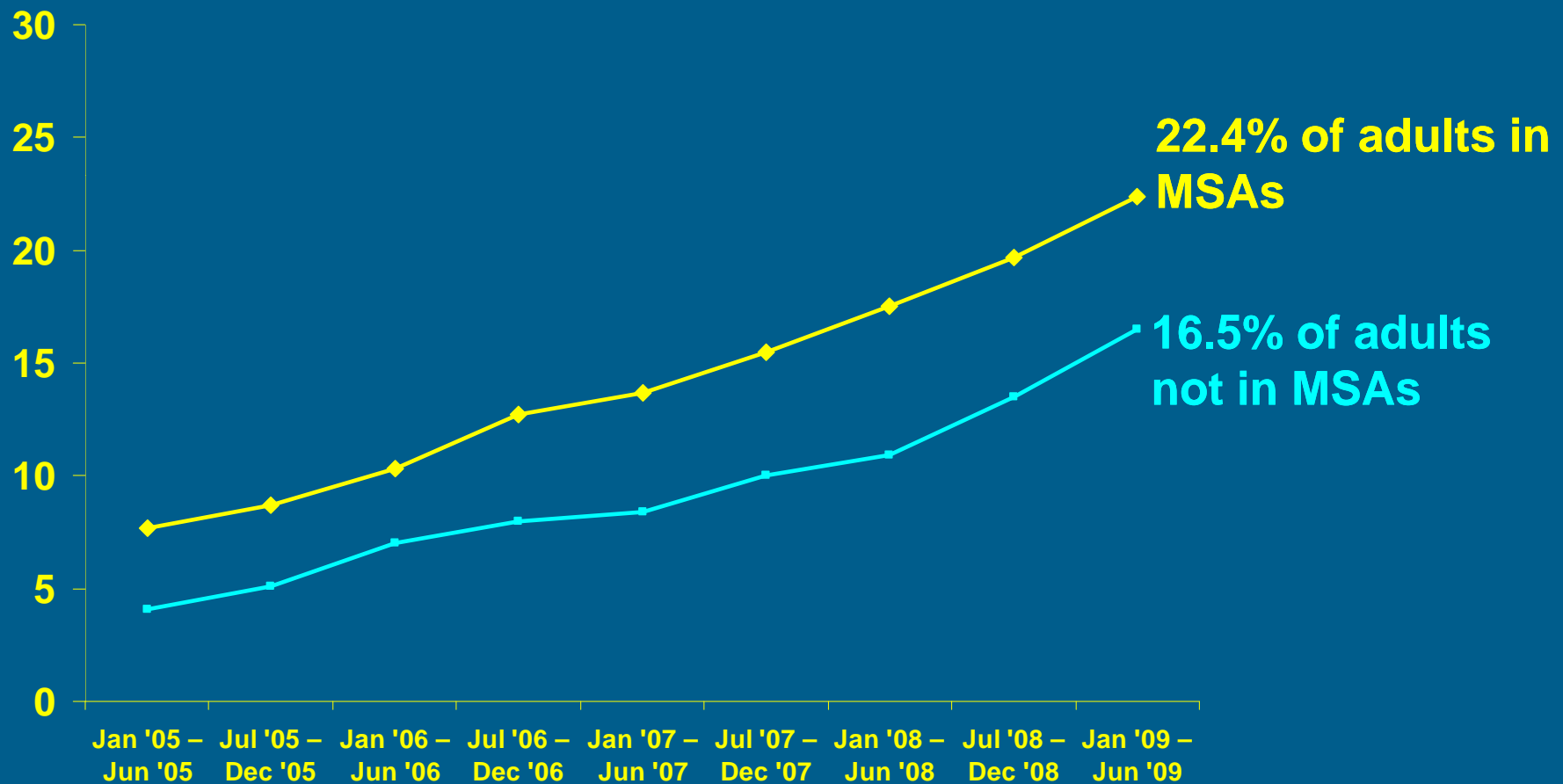
# Prevalence of Wireless-Only Adults by Household Poverty Status



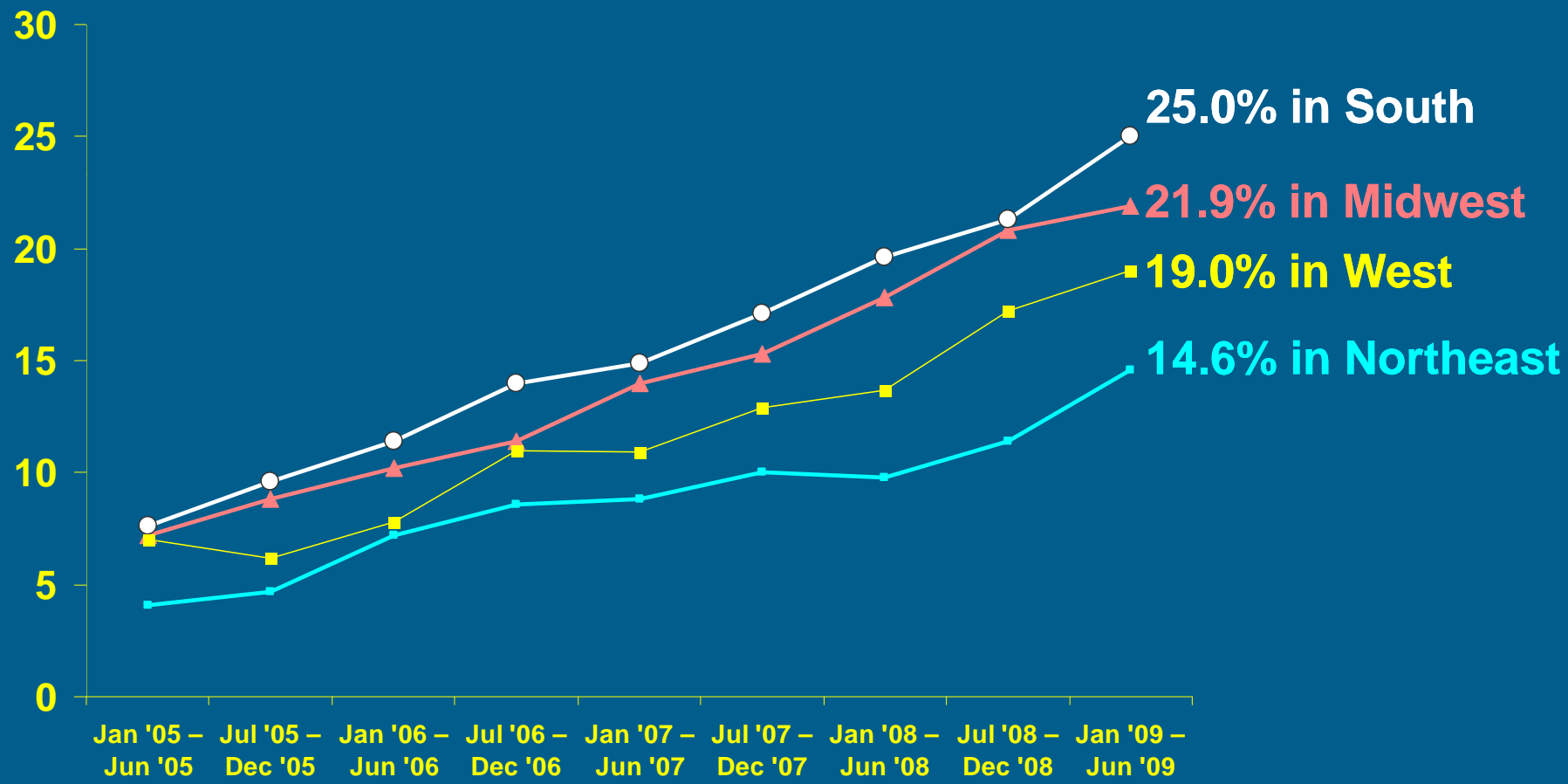
# Prevalence of Wireless-Only Adults by Employment Status Last Week



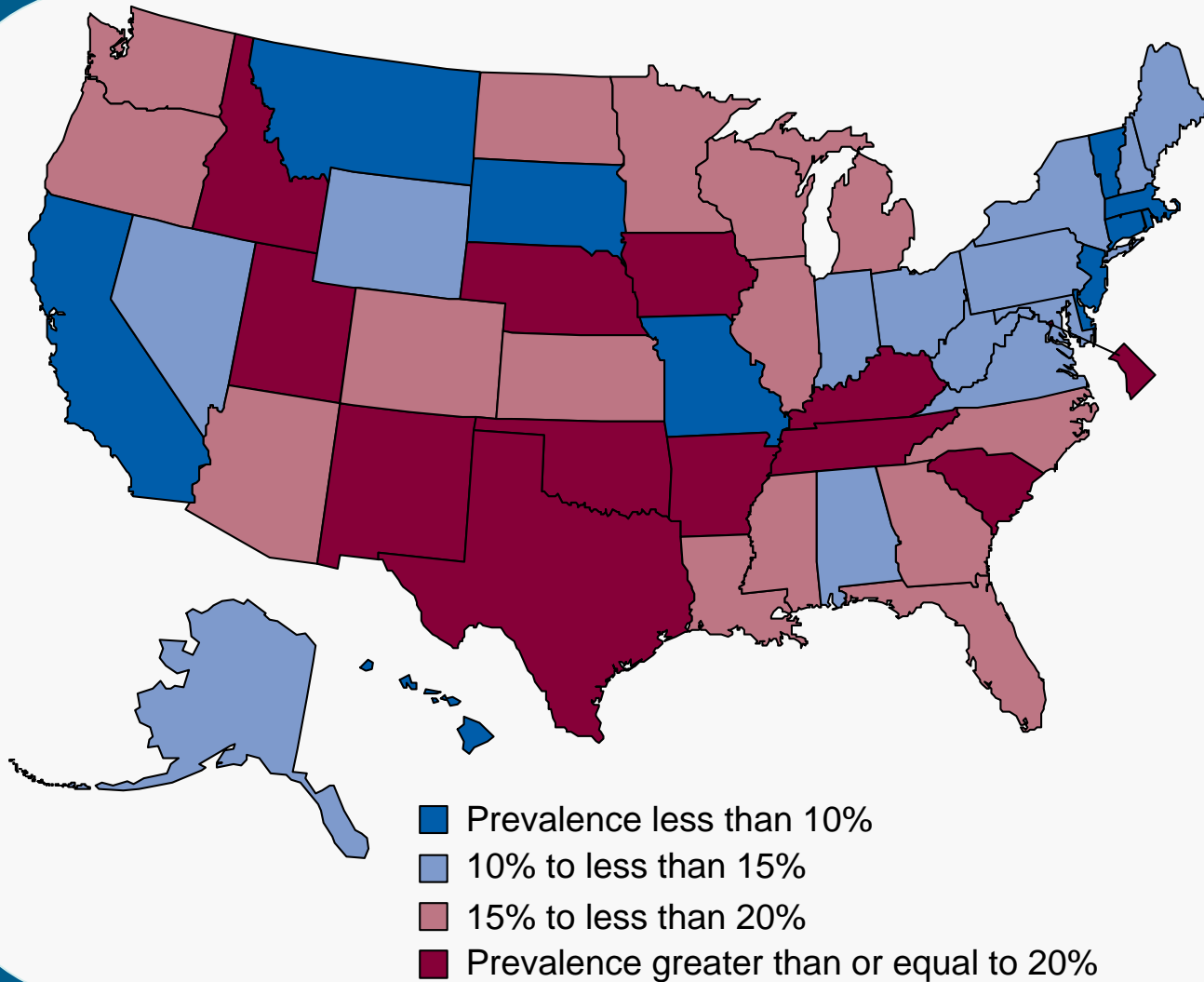
# Prevalence of Wireless-Only Adults by Metropolitan Statistical Area Status



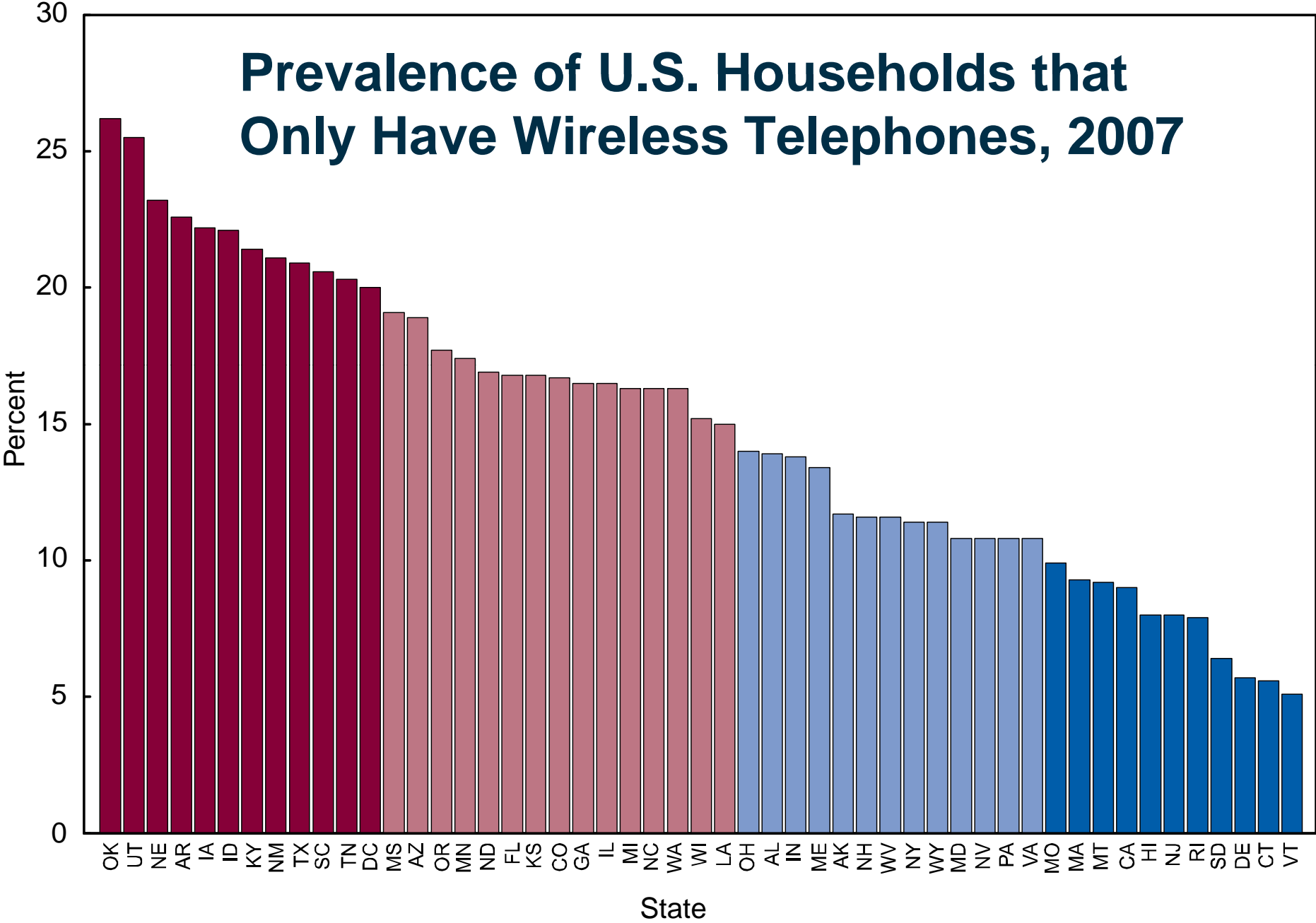
# Prevalence of Wireless-Only Adults by Geographic Region



# Prevalence of U.S. Households that Only Have Wireless Telephones, 2007



# Prevalence of U.S. Households that Only Have Wireless Telephones, 2007

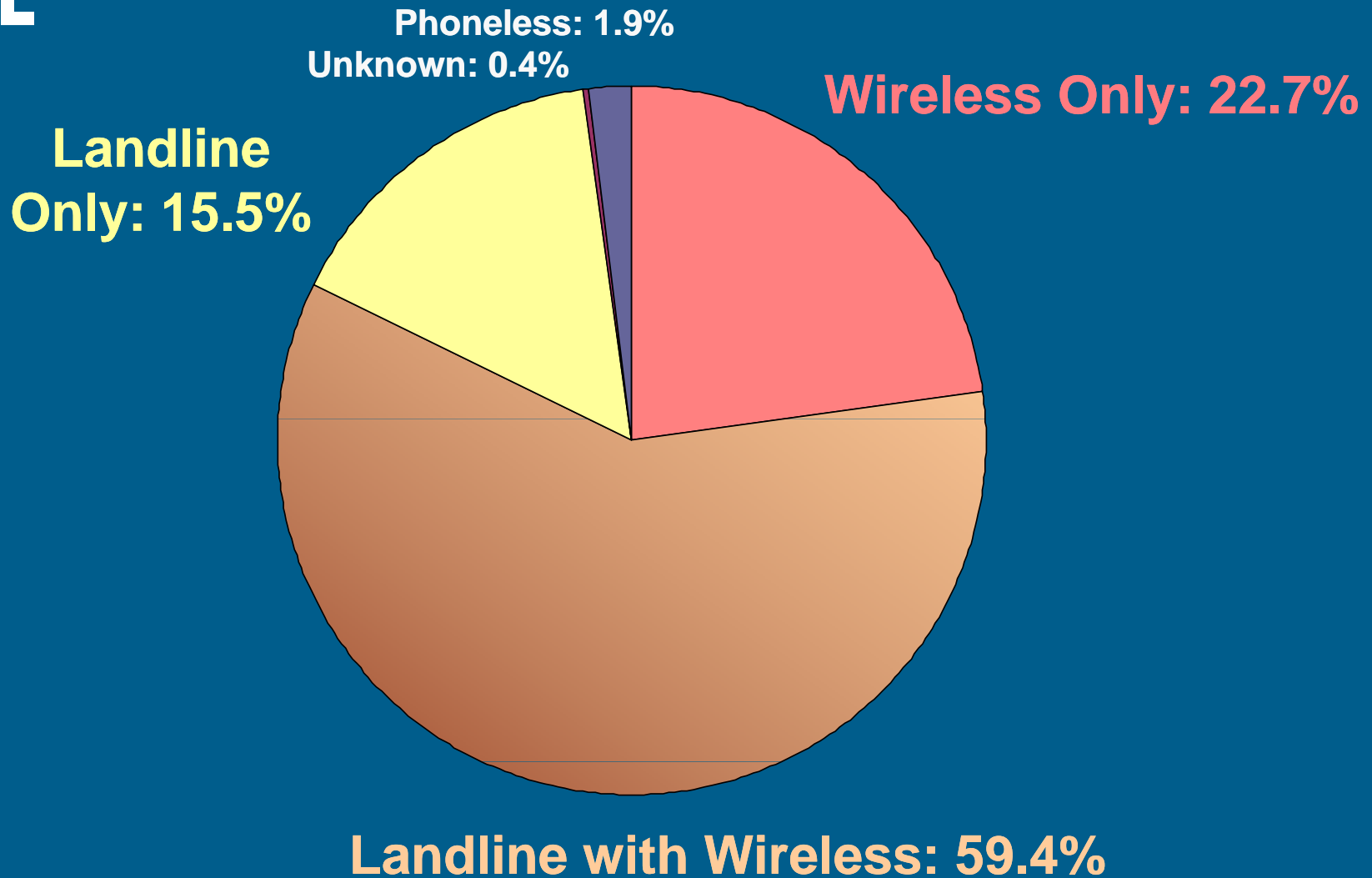


# National Health Interview Survey

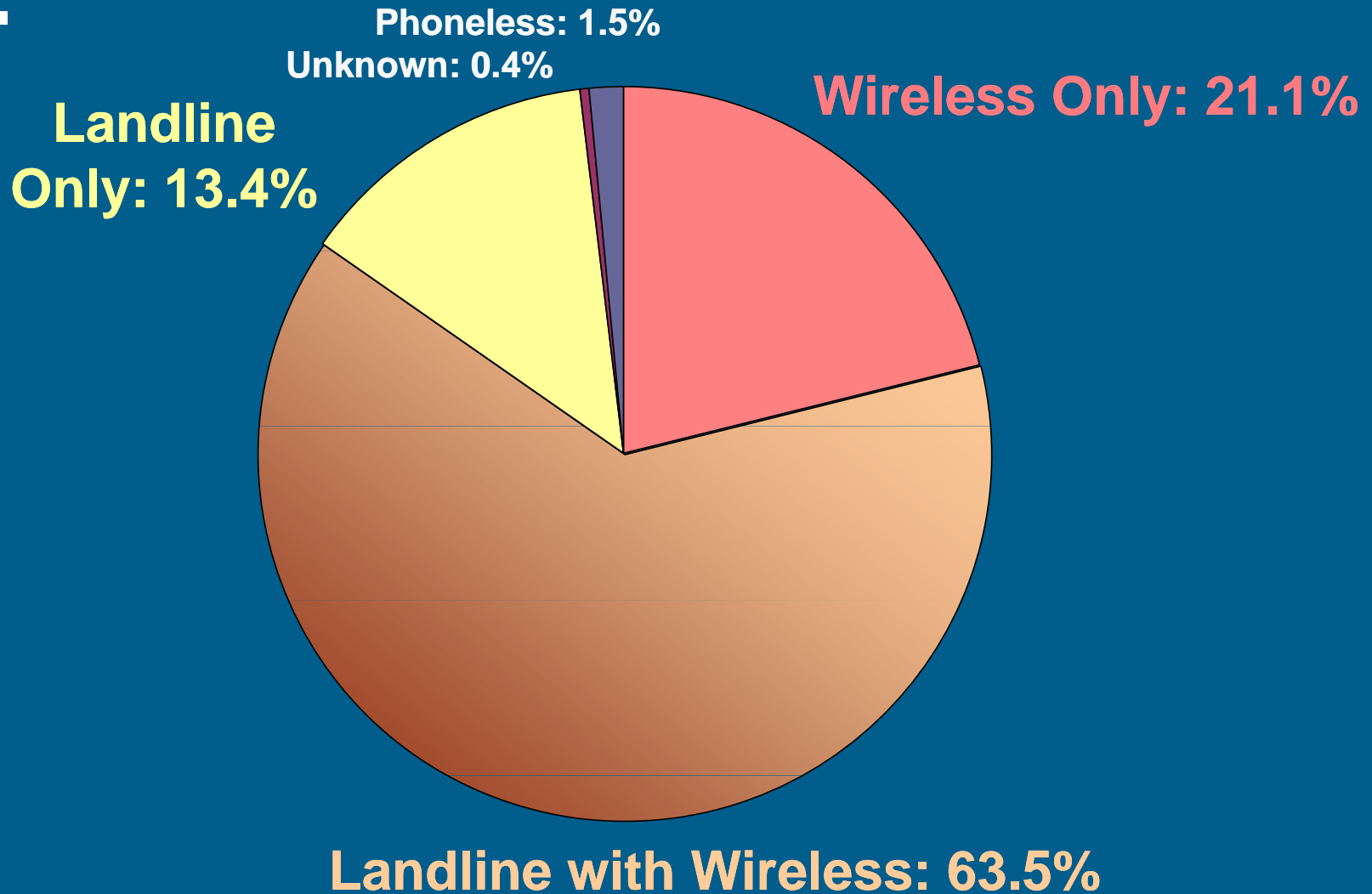
- Conducted by CDC's National Center for Health Statistics
- In-person survey of the civilian noninstitutionalized U.S. population with high annual household-level response rates
- Includes questions on residential telephone numbers to permit recontact of participants
  - 2003: Added questions on working cellular telephones
  -



# Percent Distribution of Household Telephone Status, January-June 2009



# Percent Distribution of Adults by Telephone Status, January-June 2009



# Lexus Hybrid “Milestones”

#t=12 - Windows Internet Explorer

[http://www.youtube.com/watch\\_popup?v=dGF8s1TH7-0&pop\\_ads=null#t=12](http://www.youtube.com/watch_popup?v=dGF8s1TH7-0&pop_ads=null#t=12)



0:12 / 0:32 360p

Done

Internet | Protected Mode: Off

100%

# Why is NCHS Studying Whether Households have Telephones?

- Random-digit-dial telephone surveys usually did not call wireless telephones
- As more people give up their landline telephones and live only with wireless telephones, more people will be excluded from RDD landline surveys
- To understand the impact of this noncoverage and how to correct it, a personal visit survey is needed to monitor the growing size and characteristics of the wireless-only population

# Coverage Bias

- Two factors determine the degree of coverage bias due to telephone ownership in a telephone survey:
  - The percentage of persons without landline telephones in the population of interest
  - The magnitude of the difference between persons with and without landline telephones for the variable of interest

# Health Characteristics Examined

## ■ Health-related behaviors

- 5+ alcoholic drinks in one day (past year)
- Smoking (current)
- Leisure-time physical activity (regularly)

## ■ Health status

- Excellent or very good health status
- Serious psychological distress (past 30 days)
- Obesity
- Asthma episode (past year)
- Diabetes (ever diagnosed)




## ■ Health care service use

- Has a usual place to go for medical care
- Received influenza vaccine (past year)
- Tested for HIV (ever)
- Financial barrier to needed care (past year)
- Uninsured (current)

**For these 13 estimates, preliminary weighted data were produced by the NHIS Early Release Program.**




# Percent of U.S. Adults with Various Health Characteristics, by Phone Status

January – June 2009

	Has a landline telephone 	Wireless-only 	No telephone 
5+ alcoholic drinks in 1 day	19.3	35.3	27.4
Current smoker	17.9	28.4	29.4
Psychological distress	2.7	4.6	6.2
Health excellent / very good	59.3	64.5	55.8

# Percent of U.S. Adults with Various Health Characteristics, by Phone Status

January – June 2009

	Has a landline telephone 	Wireless-only 	No telephone 
Uninsured (when interviewed)	13.7	29.4	45.0
Financial barriers to care	7.1	14.8	14.2
Has a usual place for care	86.5	69.8	59.3
Flu vaccination	39.0	22.3	18.9
Ever tested for HIV	37.1	48.6	39.7





# Percent of Young Adults with Various Health Characteristics, by Phone Status

January – December 2007

	Has a landline telephone 	Wireless- only 
Health excellent / very good	75.0	75.8
Psychological distress	2.2	2.4
Uninsured (when interviewed)	26.9	28.5

# Percent of Young Adults with Various Health Characteristics, by Phone Status

January – December 2007

	Has a landline telephone 	Wireless- only 
5+ alcoholic drinks in 1 day	28.1	43.9
Current smoker	22.0	27.2
Flu vaccination	13.9	12.9
Ever tested for HIV	38.9	45.9

# Potential Bias in Prevalence Estimates If an RDD Survey Only Includes Landlines

**Statistically significant bias after controlling for demographic characteristics**

	Young Adults 18-29	
	(Percentage Points)	
<b>January – December 2007</b>		
5+ alcoholic drinks in 1 day	– 6.4	– 5.9
Current smoker	– 2.5	– 2.5
Ever tested for HIV	– 1.9	– 2.2
Has a usual place for care	4.0	4.3
Financial barriers to care	– 1.9	– 2.0
Uninsured (when interviewed)	– 2.2	– 2.9

# National Health Interview Survey

- In-person survey of the civilian noninstitutionalized U.S. population with high annual household-level response rates
- Includes questions on residential telephone numbers to permit recontact of participants
  - 
  - **2007: Added questions on relative frequency of calls received on landlines and cell phones**

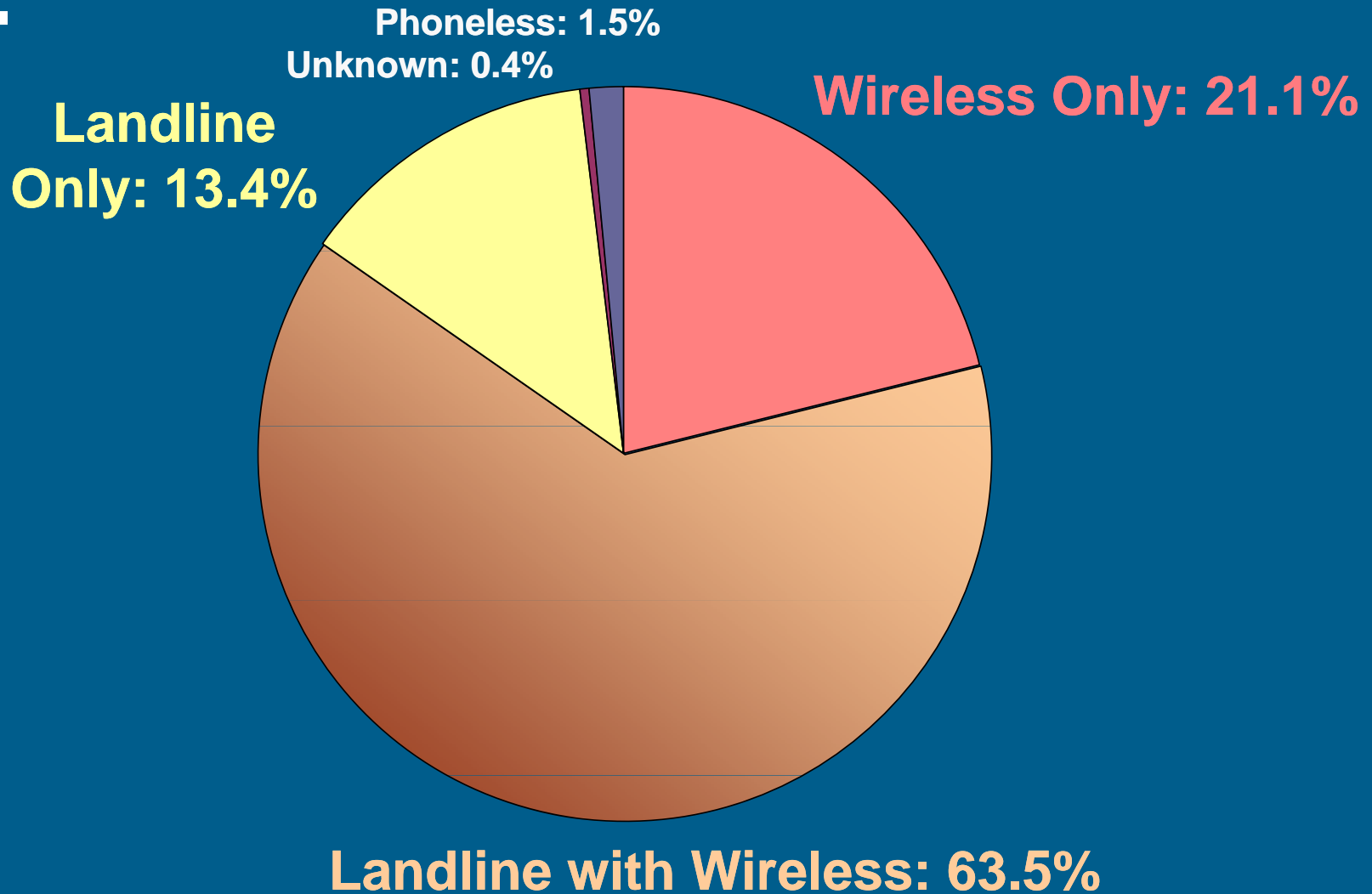
# National Health Interview Survey

- In-person survey of the civilian noninstitutionalized U.S. population with high annual household-level response rates
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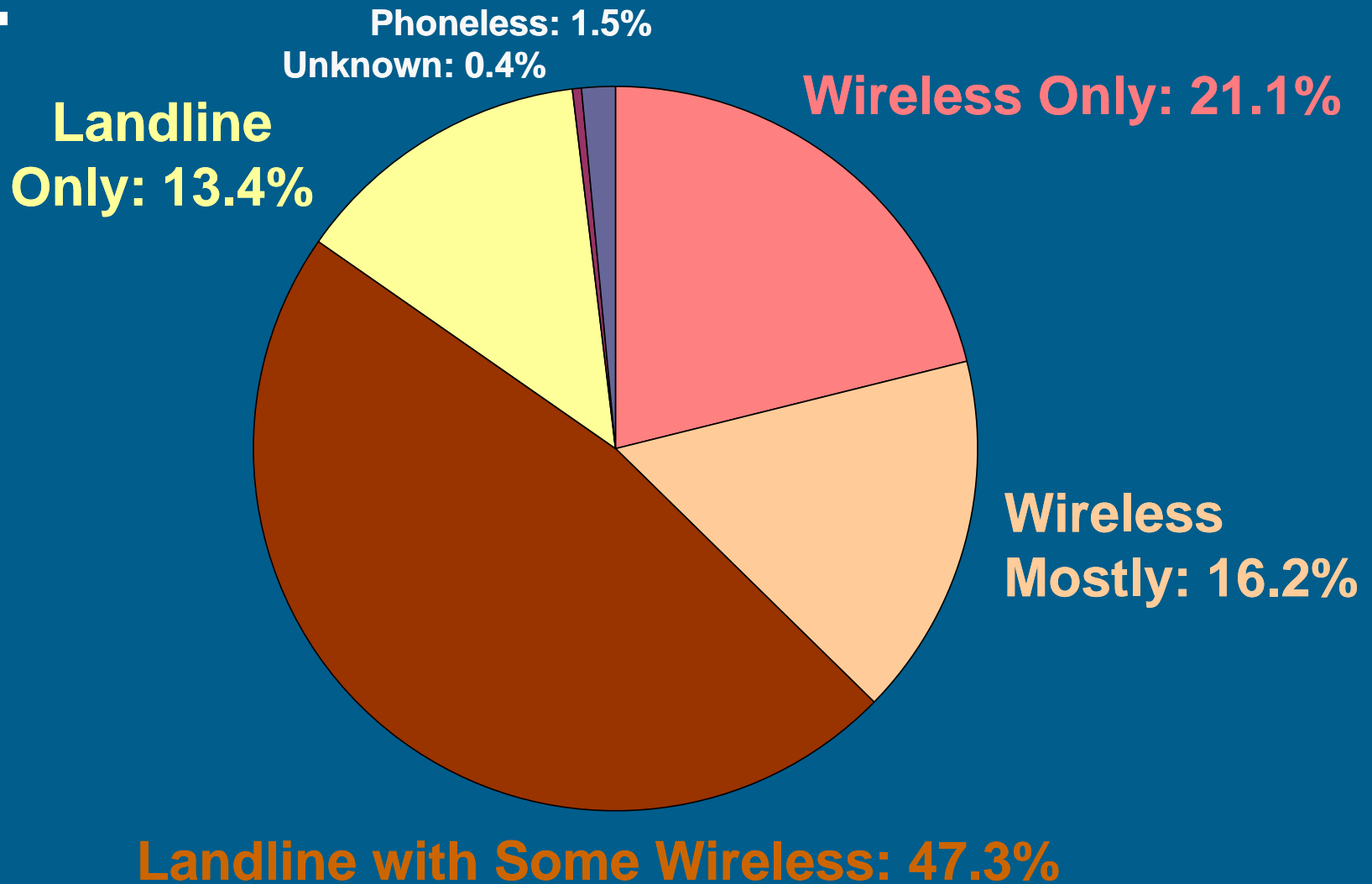
**“Of all the calls that your family receives, are ...**

- (1) All or almost all calls received on cell phones?**
- (2) Some received on cell phones and some on regular phones?**
- (3) Very few or none received on cell phones?”**

# Percent Distribution of Adults by Telephone Status, January-June 2009

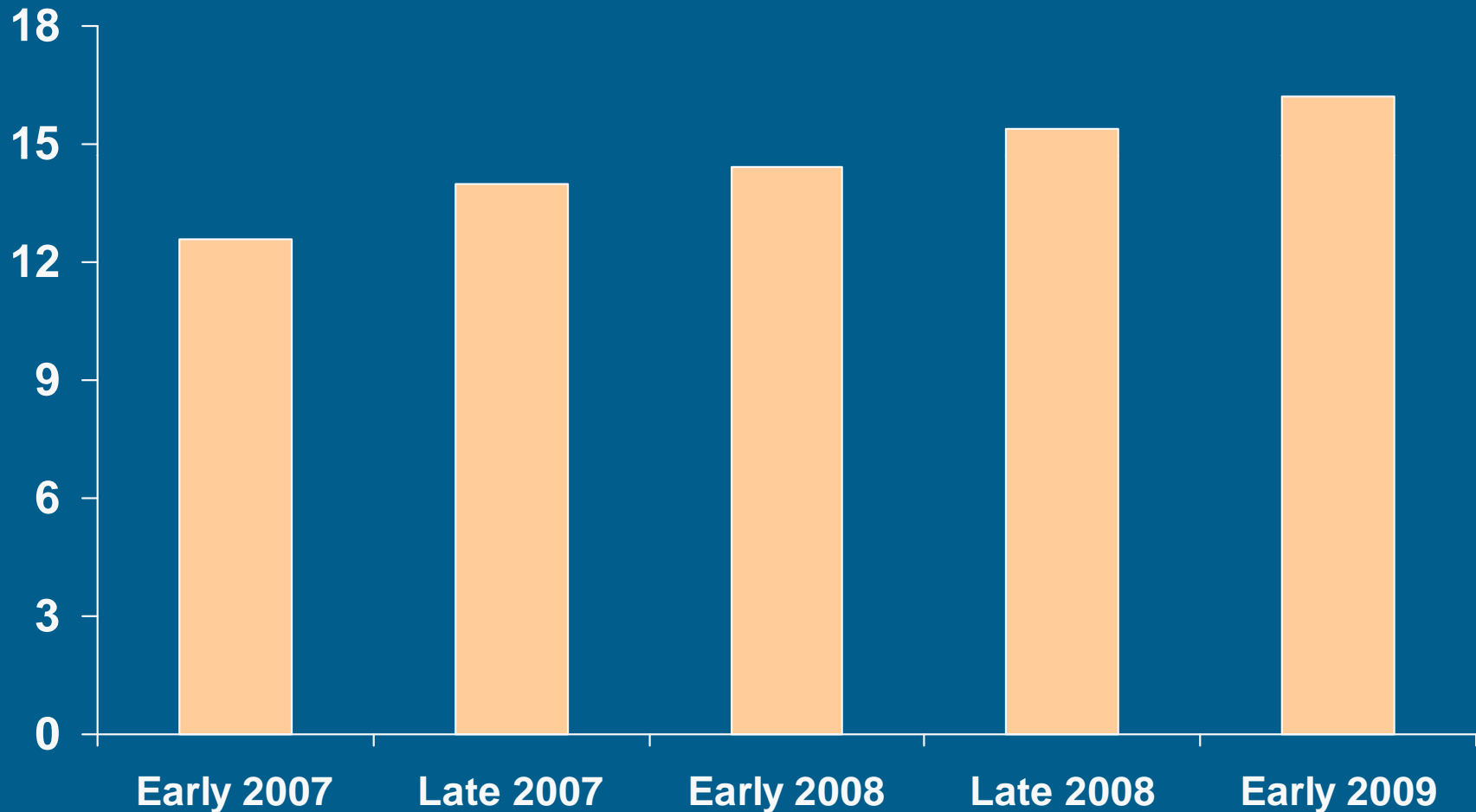


# Percent Distribution of Adults by Telephone Status, January-June 2009



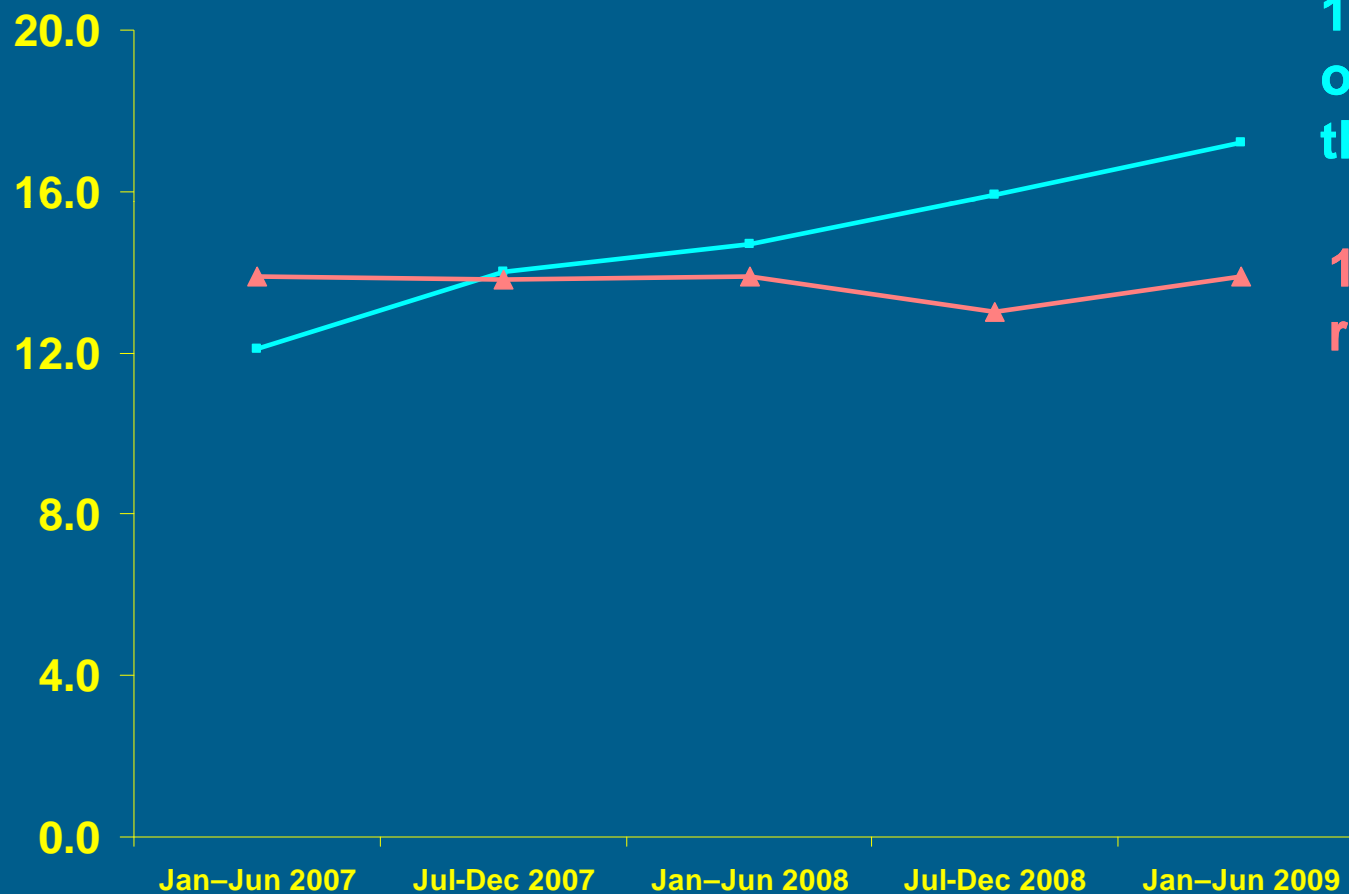
# Percentage of Adults Living in Wireless-Mostly Households

■ Based on National Health Interview Survey data





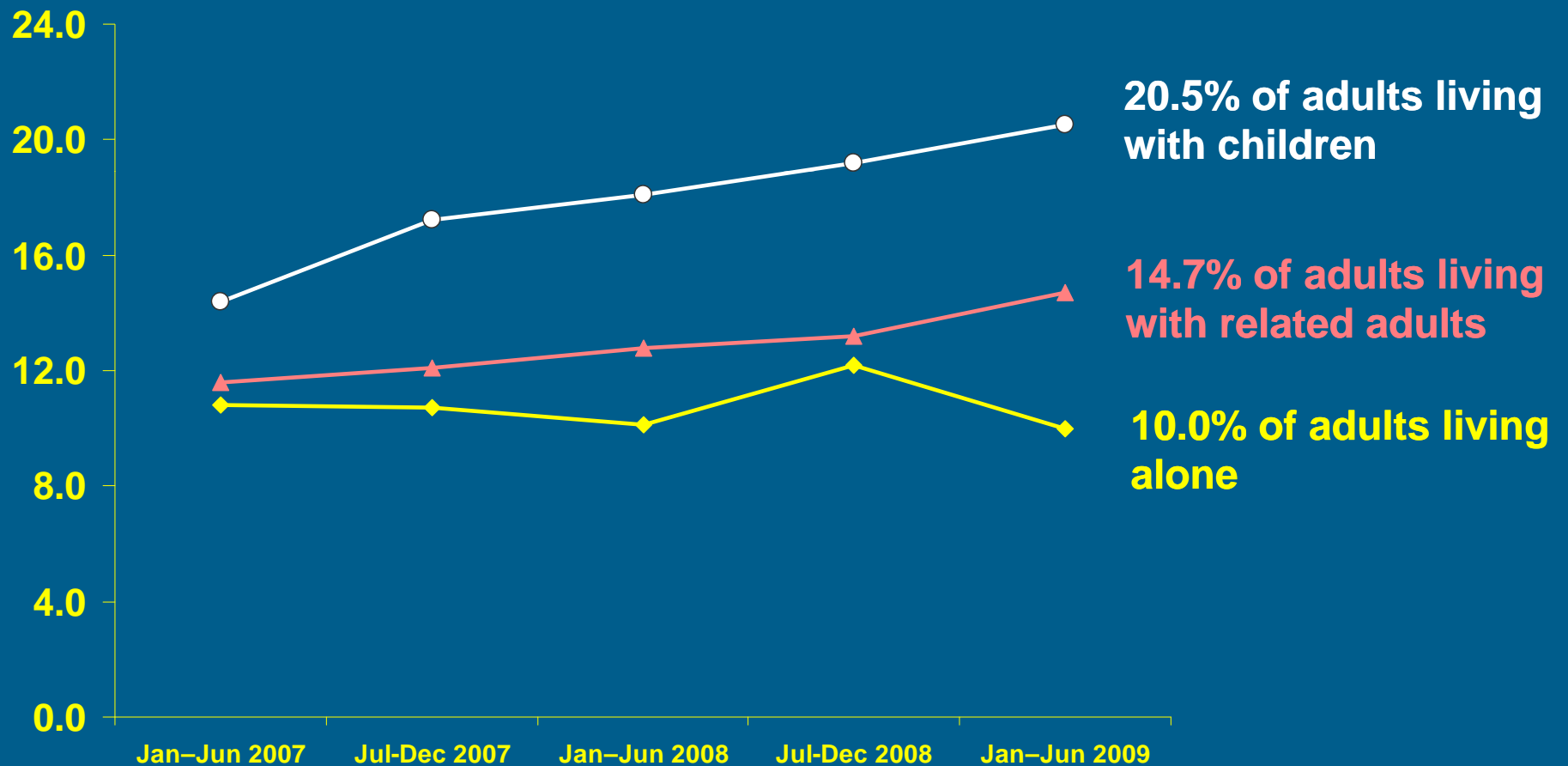
# Prevalence of Wireless-Mostly Adults by Home Ownership Status



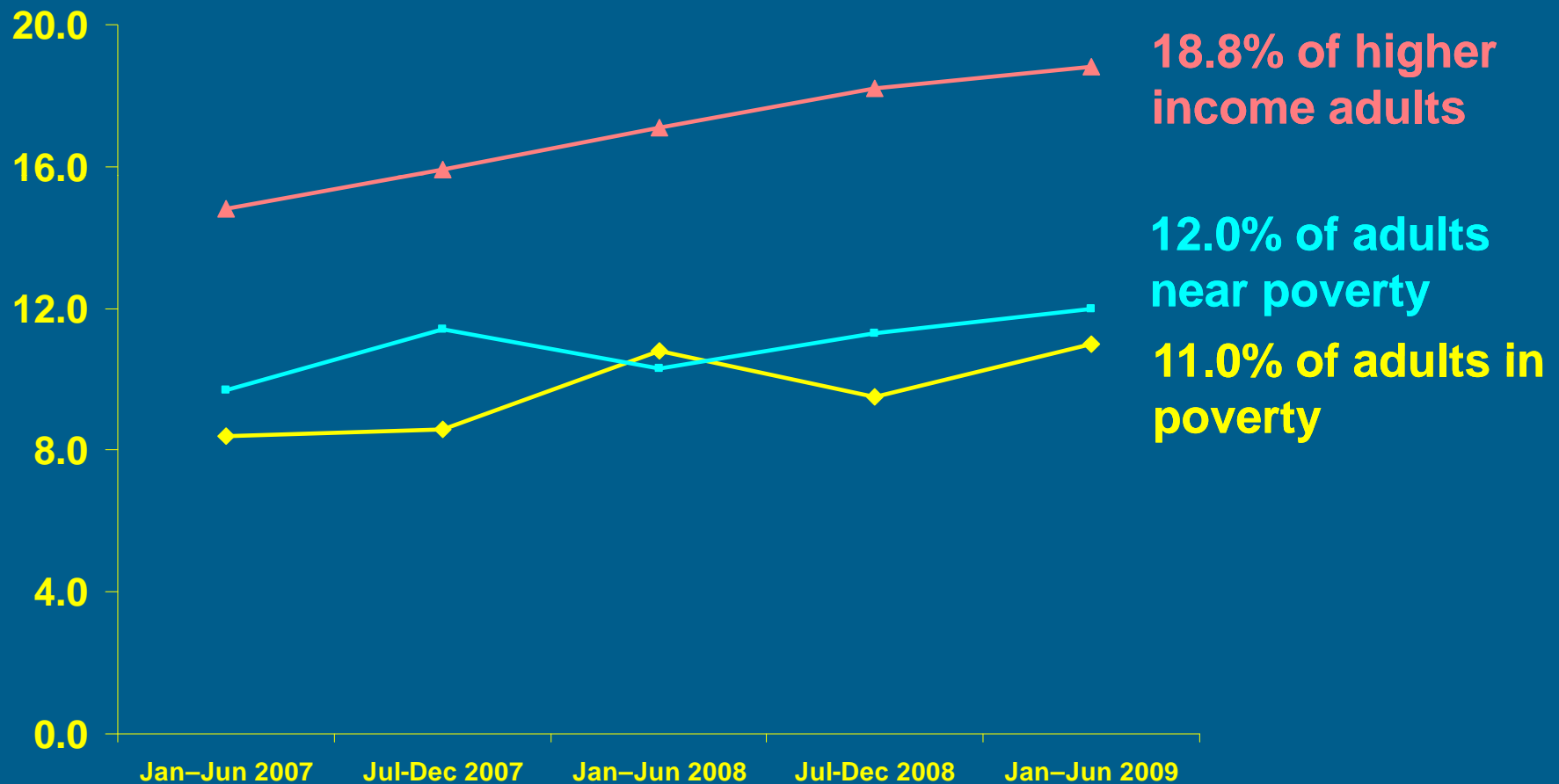
**17.2% of adults  
owning or buying  
their home**

**13.9% of adults  
renting their home**

# Prevalence of Wireless-Mostly Adults by Household Structure



# Prevalence of Wireless-Mostly Adults by Household Poverty Status



# Percent of U.S. Adults with Various Health Characteristics, by Phone Status

NHIS July - December 2007

	Wireless Some	Wireless Mostly	Wireless Only
5+ alcoholic drinks in 1 day	18.5	< 25.4 <	37.3
Current smoker	16.4	< 20.5 <	30.6
Ever tested for HIV	34.5	< 45.0 ≈	47.6
No usual place for care	10.3	< 17.7 <	32.0
Uninsured	11.2	< 16.9 <	28.7

## “Wireless-Mostly” Do Answer Landlines

- “Thinking just about the landline, if it rang and someone was home, under normal circumstances, how likely is it that it would be answered?”
  - **28% of the wireless-mostly population reached on a cell phone said they would be somewhat unlikely, very unlikely, or not-at-all likely to answer the landline**
  - **17% of the wireless-mostly population reached on a landline said they would be somewhat unlikely or very unlikely to answer the landline, and 3% said they would be not-at-all likely to answer the landline.**

*from Cell Phone Mainly Households: Coverage and Reach for Telephone Surveys Using RDD Landline Samples, by John Boyle, Faith Lewis, and Brian Tefft (Survey Practice, December 2009)*

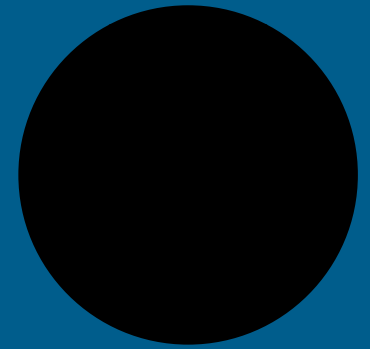
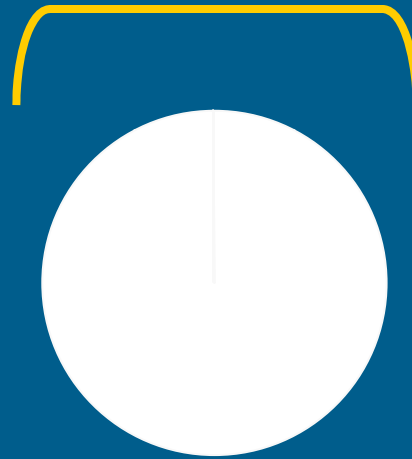
# What To Do About Undercoverage?

- Ignore the issue
- Make statistical adjustments to the sampling weights to account for coverage bias
- Add cell-phone frames to RDD surveys and conduct interviews on cell phones
- Move away from RDD sampling frames

# [ Adding a Cell-Phone Frame ]

**Landline Frame**

**Wireless Frame**



**Landline Only**

**Landline and  
Wireless**

**Wireless Only**

**Phoneless**

**Landline Frame**

**Wireless Frame**

# To Screen or Not to Screen? (for Wireless-Only Status)

- Wireless-only and wireless-mostly adults are more likely to complete interviews on cell phones than landline-only and landline-mostly adults

	Landline Sample	Cell Sample
All or almost all calls on cell	23%	33%
Some on cell, some on landline	41%	48%
Very few or none on cell	36%	19%

Denominator: Households with both landline and cell phone service

Source: California Health Interview Survey (Brick, 2008, FCSM conference)



# To Screen or Not to Screen? (for Wireless-Only Status)

From Brick and Morganstein,  
CDC workshop, Sept 2009

- Wireless-only and wireless-mostly adults are more likely to complete interviews on cell phones than landline-only and landline-mostly adults
  - When the response propensity differences are large, the screening approach has lower nonresponse bias
  - When the differences are small, the overlap approach has lower nonresponse bias

# To Screen or Not to Screen? (for Wireless-Only Status)

From Brick and Morganstein,  
CDC workshop, Sept 2009

- Major concern: Information available for weighting
  - The screening approach requires information on the prevalence of wireless-only households/persons in the geographic area
  - The overlap approach requires information on the prevalence of landline-only, landline plus wireless (dual users), and wireless-only households persons in the geographic area
- Additional concern: Decision to screen should also consider data collection costs, operational efficiencies, variances, and measurement biases
  - For example, if screening cost is low relative to cell-phone interviewing cost, screening would be more efficient

# Cell Phone Surveys are Expensive

- Based on 26 surveys conducted by 8 nationally known research organizations...
  - Cell interviews 2-2½ times as costly as landline interviews

# Contacting Cell Phones

- Random-digit-dial samples of cell phones are readily available from most suppliers
- But...Information available for individual members of the sample is far less than that available for landline samples
  - Just a frame
  - Contains rate center and service provider only
- No address information
  - No advance mailings, no prepaid incentives  
*and text messaging may be prohibited by anti-Spam laws*

# No Ability to Target Materials or Procedures

- Subscribers can move to a different city or state and keep their phone number
  - No information on where subscriber resides
  - Cannot even be sure of time zone
- ➔ More important than for landline RDD to determine location of residence
  - 40% do not live in the county of the Rate Center
  - 10% do not live in the state of the Rate Center

# [ No Sample Efficiencies ]

- Can't identify "working" numbers or blocks
- Can't identify business numbers
- Can't target specific service types
  - Don't know if subscriber also has landline service or is cell-only
  - Can't identify pre-paid phone cards or disposable phones

# [ No Sample Efficiencies ]

- Can't assume call will reach an adult
  - 33% of cell-phone respondents are under 18
- Can't assume call will reach someone who speaks English
  - Prevalence of non-English-speaking respondents is about 50% greater in cell-phone surveys
- Can't assume call will reach someone who lives in a household
  - Cell-phone surveys are more likely to reach persons in group quarters

# Restrictions on Automatic Dialing

- Federal Telephone Consumer Protection Act (TCPA) prohibits any call made (without consent) using an automatic dialing device to a cellular telephone number, when the party is charged for the call
  - It includes predictive dialers
  - No exclusion for “research purposes”
- Interviewers must place calls manually
- Can’t pre-screen for disconnects



# Cell Phone Users Will Hit Redial

- Most cell phones have caller-ID
  - Displays inbound phone number
  - Does not display name of caller
- Cell phone owners are more likely than landline owners to redial the survey number
- Call center telephone system must be able to handle this situation
  - Number displayed must be appropriate for redial
  - Redialed number should ring to person or VM

# [ Safety and Privacy ]

- Respondent may not be in place where they can safely answer questions
  - Ask: “Are you in a place where you can safely talk on the phone and answer my questions?”
- Respondent may not be in a private place where they are willing and able to respond fully to sensitive survey questions
  - Need to be able to schedule appointment
  - Need to be able to call back at different number

# Are Cell Phones Personal or Household Devices?

- If treated as individual devices, it assumes all persons in household have a cell phone
  - Not true: 19% of households with wireless telephones have fewer phones than adults
- If treated as household devices, how do we do within-household selection?
  - Ask for phone to be handed to selected respondent?
  - Call back at another number?

# Data Quality Issues

- Is there less cognitive engagement?
  - Do we need to worry about bad connections, ambient noise, or lower volume?
  - Do we need to worry about people engaging in other simultaneous activities?
  - Do we need to worry about people rushing to complete the interview?
- To date, little evidence of differences in quality between cell and landline interviews
- Minor reduction in quality when respondent completes cell interview away from home

# Response Rates Are Lower

- Contact rates similar
  - Voice mail much more common for cell phones
- Eligibility determination rates lower for cell-phone surveys
  - Out of geographic area, minors
  - Business-use only, group quarters
  - Landline status (if screening for cell-only)
- Refusal rates higher for cell-phone surveys
  - Cell phones are considered private
  - Refusal conversion has lower success
- Break-off rates similar

# [ Users Still Pay for Incoming Calls ]

- Remuneration is used to compensate for costs
  - Common approach: Average cost per minute by major carriers times survey length ( $\approx$  \$10)
  - Little impact on participation
    - *But is it ethical to not remunerate?*
- Incentives are used to encourage behavior
  - Contingent post-paid incentives have little impact

# Cell Phone Surveys are Expensive

- Based on 26 surveys conducted by 8 nationally known research organizations ...
  - Cell interviews 2-2½ times as costly as landline interviews
- Where does the extra money go?  
*(based on 13 surveys by Pew Research Center in 2008)*
  - Reimbursements ~ 30%
  - Screening costs ~ 30%
  - Manual dialing ~ 20%
  - Staffing & scheduling ~ 10%
  - Administration ~ 10%

# What To Do About Undercoverage?

- Ignore the issue
- Make statistical adjustments to the sampling weights to account for coverage bias
- Add cell-phone frames to RDD surveys and conduct interviews on cell phones
- Move away from RDD sampling frames



# Address-Based Frame

List adapted from  
Link et al., AAPOR 2008

## ■ Positive features

- High coverage rate and highly efficient
- Fixed geography
- Lots of sample frame information for nonresponse analysis
- Majority of addresses match to telephone numbers
- Facilitates multiple modes of data collection

## ■ Negative features

- Heavy reliance on mail contact for cases without matched telephone numbers
- Potentially limits complexity and length of questionnaire
- Potentially limits ability to screen/select eligible respondents
- Response rates may be lower
- Adds logistical / operational complexity
- Small degree of multiplicity (HHs with 2+ addresses)
- Multiple HHs may share an address (e.g., trailer park)

# Final Thoughts

- Cell-phone interviewing is not easy and not cheap!
  - **All processes and procedures need to be retooled**
- Cell-phone interviewing is not the ideal solution
  - **Multi-mode surveys with address-based frames are likely to be more efficient and economical, but...**
    - **Eligibility screening will need to become simpler**
    - **Surveys will need to be more straight-forward**
    - **Data collection periods will need to become longer**
- Survey research using cell phone samples has been ongoing since 2002 and has indeed been successful!

<http://www.cdc.gov/nchs/nhis.htm>

(Released 05/08/2009)



## Wireless Substitution: Early Release of Estimates From the National Health Interview Survey, July-December 2008

by Stephen J. Blumberg, Ph.D., and Julian V. Luke  
Division of Health Interview Statistics, National Center for Health Statistics

### Overview

Preliminary results from the July-December 2008 National Health Interview Survey (NHIS) indicate that the number of American homes with only wireless telephones continues to grow. More than one of every five American homes (20.2%) had only wireless telephones (also known as cellular telephones, cell phones, or mobile phones) during the second half of 2008, an increase of 2.7 percentage points since the first half of 2008. This is the largest 6-month increase observed since NHIS began collecting data on wireless-only households in 2003. In addition, one of every seven American homes (14.5%) received all or almost all

and whether anyone in the household has a wireless telephone.

Two additional reports are published as part of the NHIS Early Release Program. *Early Release of Selected Estimates Based on Data From the National Health Interview Survey* is published quarterly and provides estimates for 15 selected measures of health. *Health Insurance Coverage: Early Release of Estimates From the National Health Interview Survey* is also published quarterly and provides additional estimates regarding health insurance coverage.

### Methods

were asked, to determine whether the family's telephone number was a landline telephone. All survey respondents were also asked whether "you or anyone in your family has a working cellular telephone."

A "family" can be an individual or a group of two or more related persons living together in the same housing unit (a "household"). Thus, a family can consist of only one person, and more than one family can live in a household (including, for example, a household where there are multiple single-person families, as when unrelated roommates are living together).

In this report, families are identified as "wireless families" if

# American Journal of Public Health, October 2009, pp. 1806-1810

## SURVEY RESEARCH METHODS

### Reevaluating the Need for Concern Regarding Noncoverage Bias in Landline Surveys

Stephen J. Blumberg, PhD, and Julian V. Luke, BA

In 2006, in this journal, we examined nationally representative survey data from 2004 and early 2005 to determine whether the exclusion of adults without landline telephones biased population-based estimates derived from health-related random-digit-dial telephone surveys.<sup>1</sup> Noncoverage bias is determined both by the magnitude of the difference between persons with and without landline telephones for the variable of interest and by the percentage of persons without landline telephones in the population of interest.<sup>2</sup> In 2004 and early 2005, only 7.2% of adults did not have landline telephones, and we concluded that "noncoverage is not presently a reason to reject the continued use of general population tele-

*Objectives.* We used recent data to reexamine whether the exclusion of adults from households with no telephone or only wireless phones may bias estimates derived from health-related telephone surveys.

*Methods.* We calculated the difference between estimates for the full population of adults and estimates for adults with landline phones; data were from the 2007 National Health Interview Survey.

*Results.* When data from landline telephone surveys were weighted to match demographic characteristics of the full population, bias was generally less than 2 percentage points (range=0.1–2.4). However, among young adults and low-income adults, we found greater bias (range=1.7–5.9) for estimates of health insurance, smoking, binge drinking, influenza vaccination, and having a usual place for care.

*Conclusions.* From 2004 to 2007, the potential for noncoverage bias increased. Bias can be reduced through weighting adjustments. Therefore, telephone surveys limited to landline households may still be appropriate for health surveys of all adults and for surveys of subpopulations regarding health status. However, for some behavioral risk factors and health care service use indicators,

## [ For More Information... ]

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