

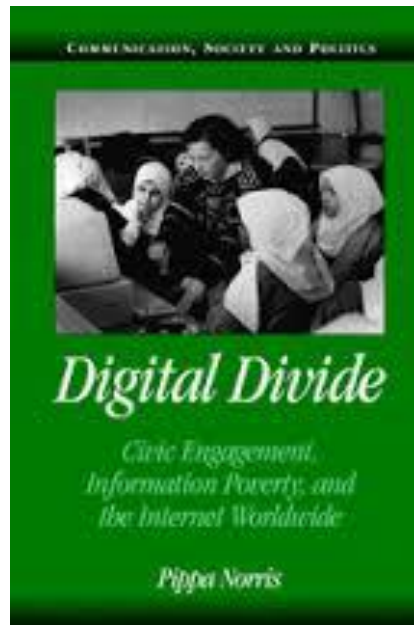
Diversity Considerations in the Use of Mobile and Sensor Technologies for Clinical Research

William Riley, Ph.D.

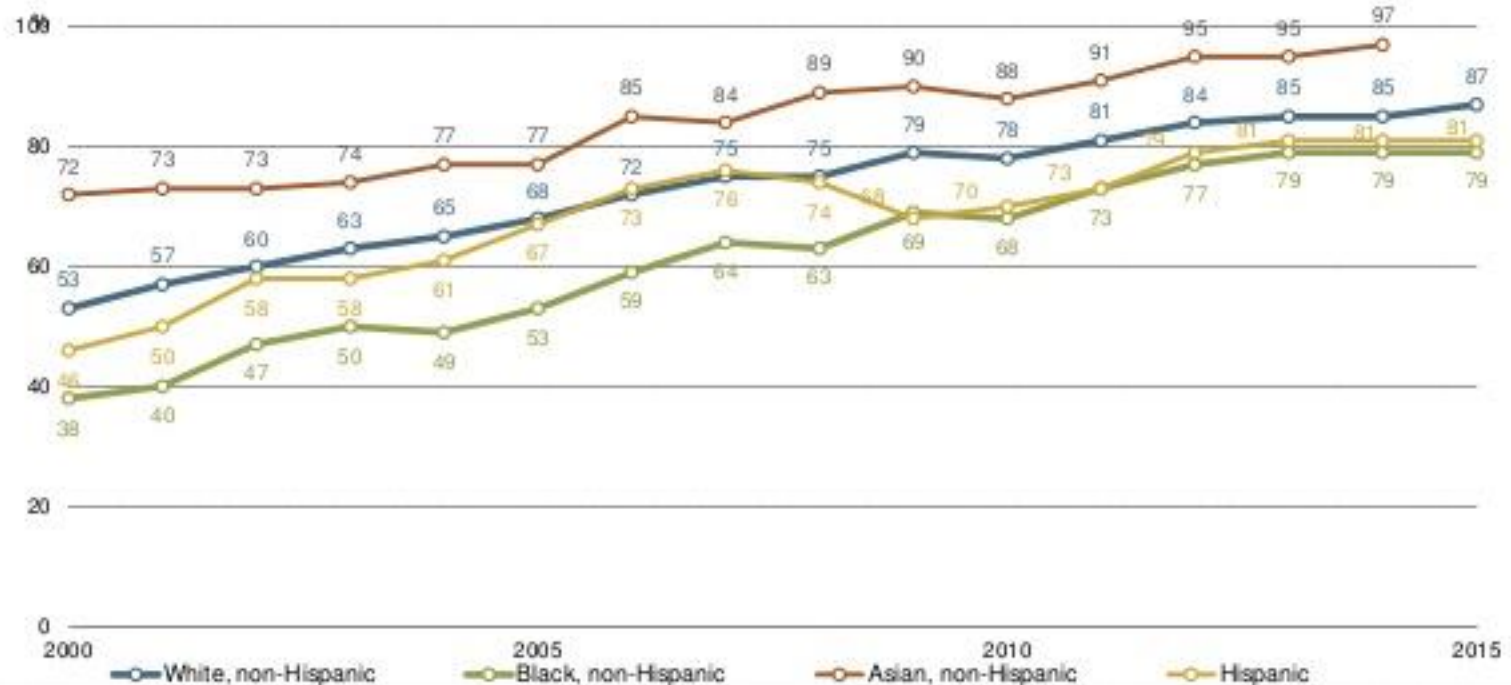
Director, Office of Behavioral and Social Sciences Research



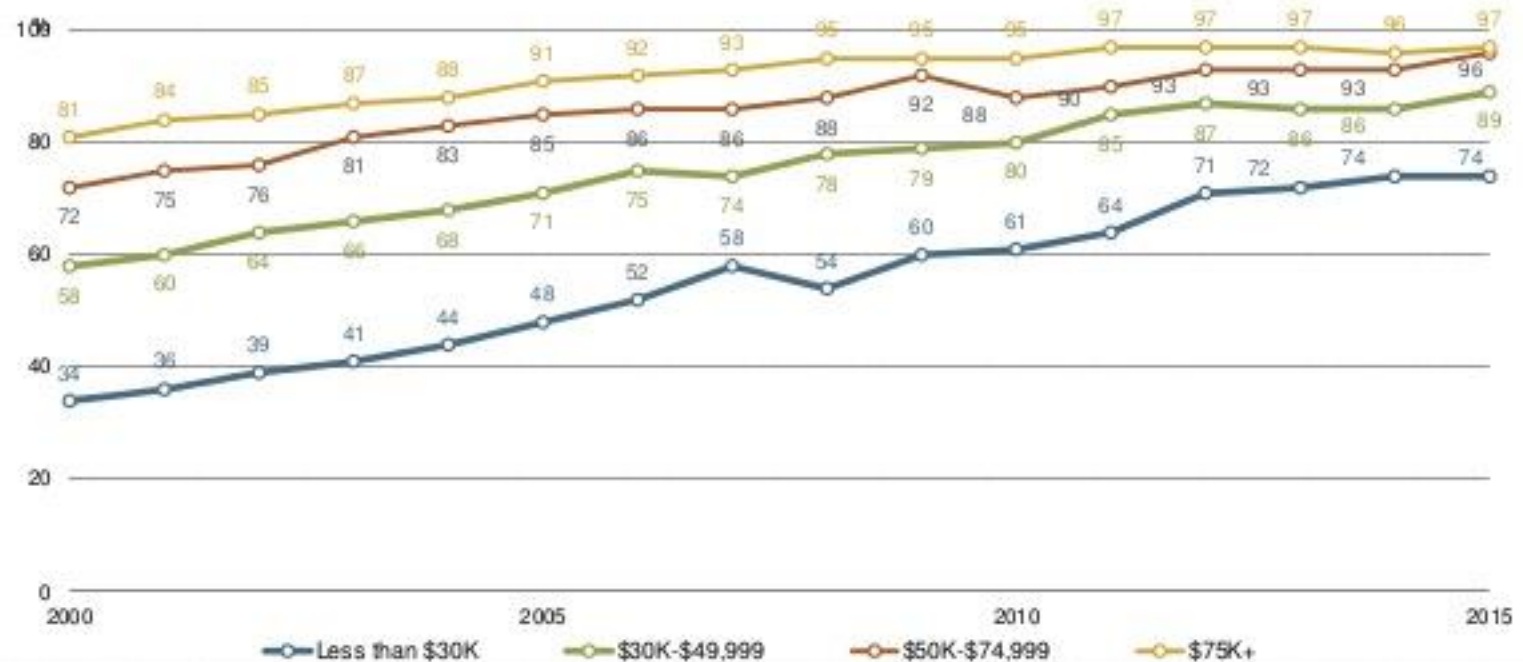
Does the Digital Divide Still Exist?



Internet users by race/ethnicity over time (Pew Research)



Internet users over time by household income (Pew Research)



Internet use by age over time (Pew Research)

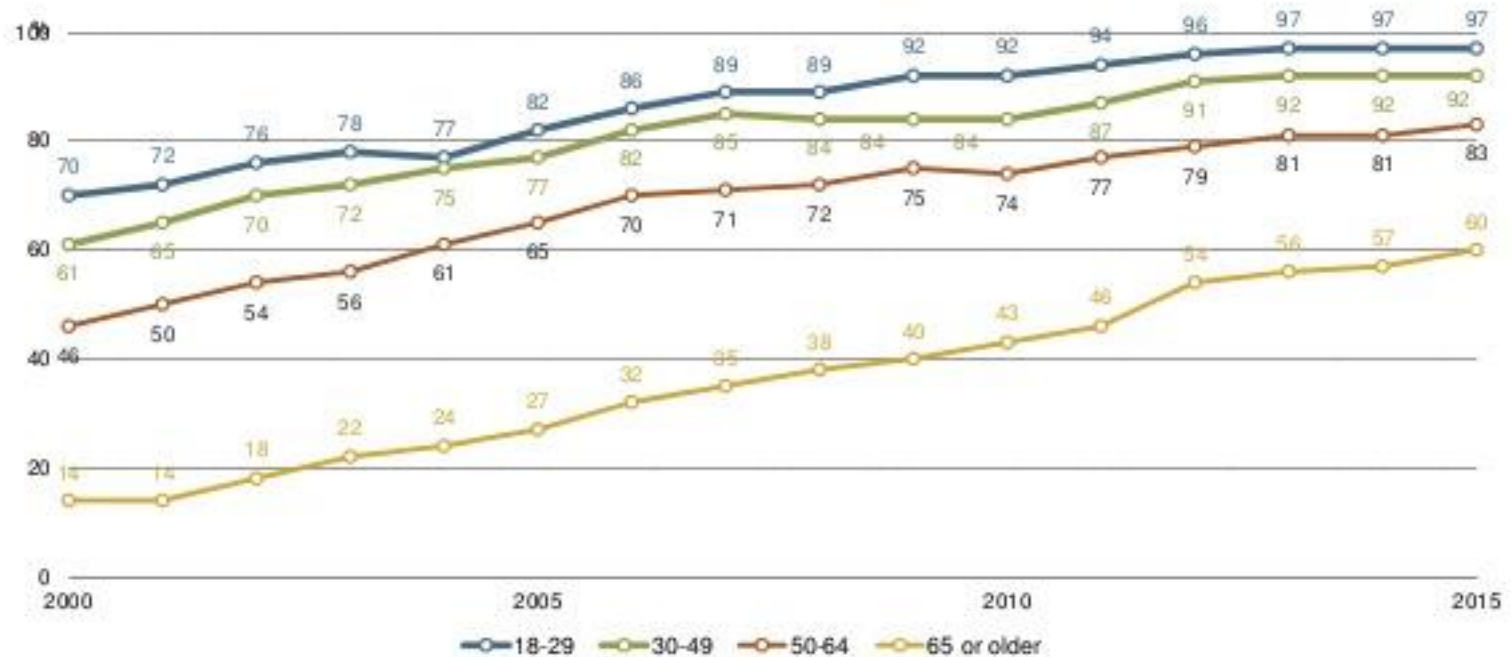
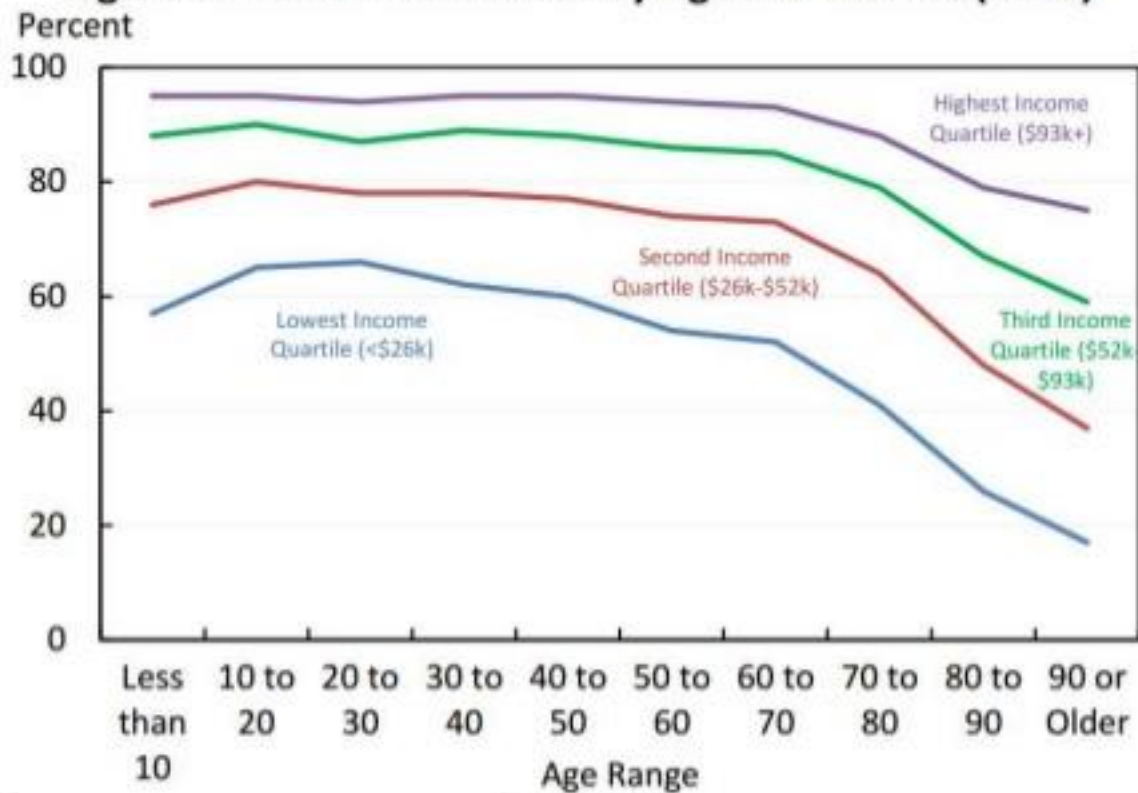


Figure 2: Home Internet Use by Age and Income (2013)



Providing Access Only a Partial Fix

Reasons why they don't use internet

Just not interested	21%
Don't have a computer	13
Too difficult/frustrating	10
Don't know how/Don't have skills	8
Too old to learn	8
Don't have access	7
Too expensive	6
Don't need it / Don't want it	6
Think it's a waste of time	4
Physically unable (e.g. poor eyesight or disabled)	4
Too busy/Just don't have the time	3
Worried about privacy / viruses / spam / spyware / hackers	3
Summary of reasons	
Relevance (not interested + waste of time + too busy + don't need/want)	34%
Usability (difficult/frustrating + too old + don't know how + physically unable + worried about virus/spam/hackers/etc.)	32
Price (too expensive + don't have computer)	19
Lack of availability / Access	7

1981-1985

1986-1990

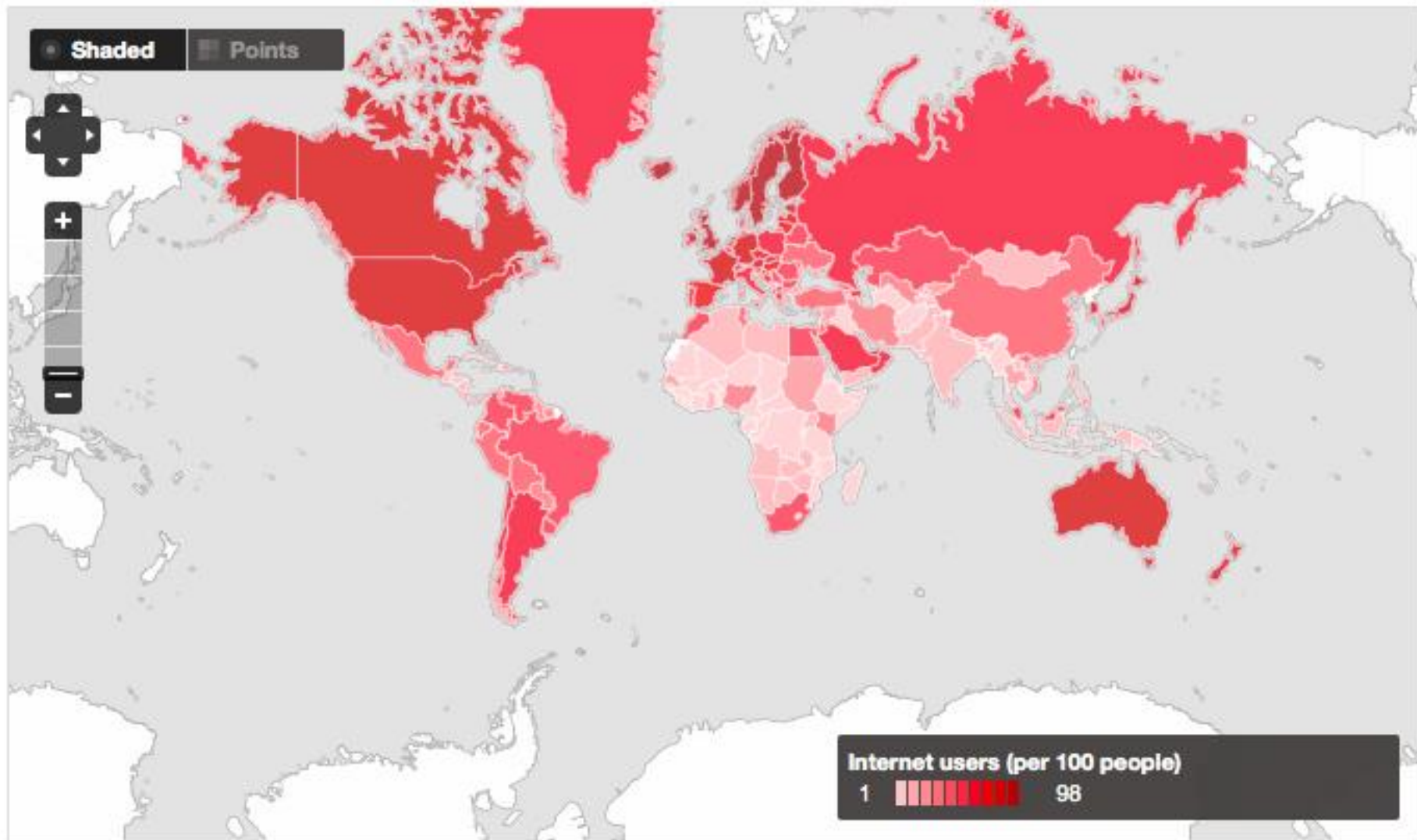
1991-1995

1996-2000

2001-2005

2006-2010

2011-2015



1981-1985

1986-1990

1991-1995

1996-2000

2001-2005

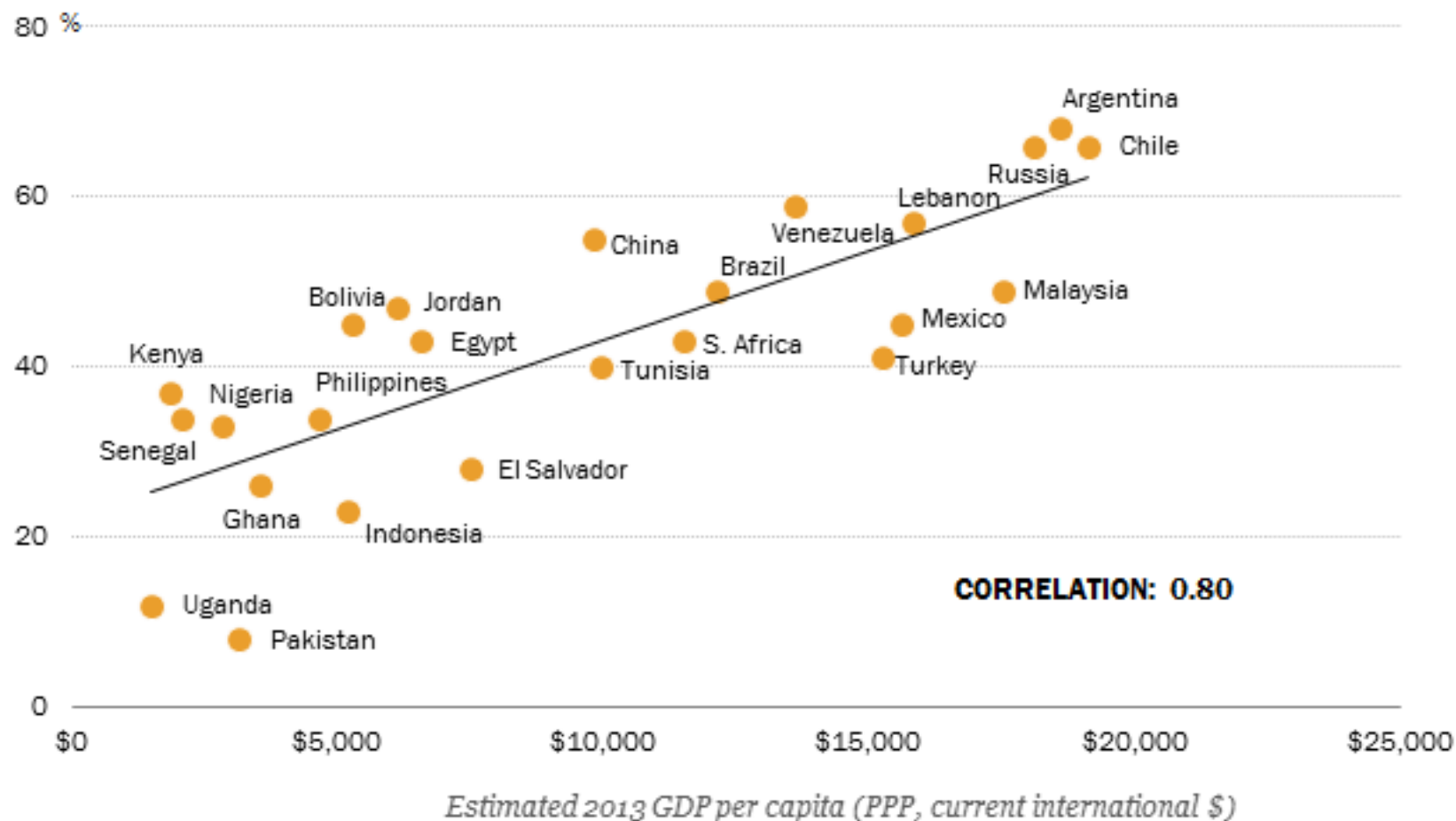
2006-2010

2011-2015

The maps displayed on the World Bank web site are for reference only and do not imply any judgment on the legal status of any territory, or any endorsement or acceptance of such boundaries.

Internet Use Linked to National Income

*% who use the internet**



*Based on total sample.

Source: Spring 2013 Global Attitudes survey. Q66. Data for GDP per capita (PPP) from IMF World Economic Outlook, October 2013.

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Minimizing the Digital Divide

MOBILE AND WIRELESS ACCESS

Cell owners in 2014

Among adults, the % who have a cell phone

	Have a cell phone
All adults	90%
Sex	
a Men	93 ^b
b Women	88
Race/ethnicity*	
a White	90
b African-American	90
c Hispanic	92
Age group	
a 18-29	98 ^{cd}
b 30-49	97 ^{cd}
c 50-64	88 ^d
d 65+	74
Education level	
a High school grad or less	87
b Some college	93 ^a
c College+	93 ^a
Household income	
a Less than \$30,000/yr	84
b \$30,000-\$49,999	90
c \$50,000-\$74,999	99 ^{ab}
d \$75,000+	98 ^{ab}
Community type	
a Urban	88
b Suburban	92
c Rural	88

Source, Pew Research Center Internet Project Survey, January 9-12, 2014. N=1,006 adults. Note: Percentages marked with a superscript letter (e.g., ^a) indicate a statistically significant difference between that row and the row designated by that superscript letter, among categories of each demographic characteristic (e.g., age).

* The results for race/ethnicity are based off a combined sample from two weekly omnibus surveys, January 9-12 and January 23-26, 2014. The combined total n for these surveys was 2,008; n=1,421 for whites, n=197 for African-Americans, and n=236 for Hispanics.

Cell phone activities

The % of cell phone owners who use their cell phone to...

81	send or receive text messages
60	access the internet
52	send or receive email
50	download apps
49	get directions, recommendations, or other location-based information
48	listen to music
21	participate in a video call or video chat
8	“check in” or share your location

Source: Pew Research Center’s Internet & American Life Project Spring Tracking Survey, April 17 – May 19, 2013. N=2,076 cell phone owners. Interviews were conducted in English and Spanish and on landline and cell phones. The margin of error for results based on all cell phone owners is +/- 2.4 percentage points.

Device Ownership Over Time

As of July 2015, 68% of American adults **have a smartphone**.

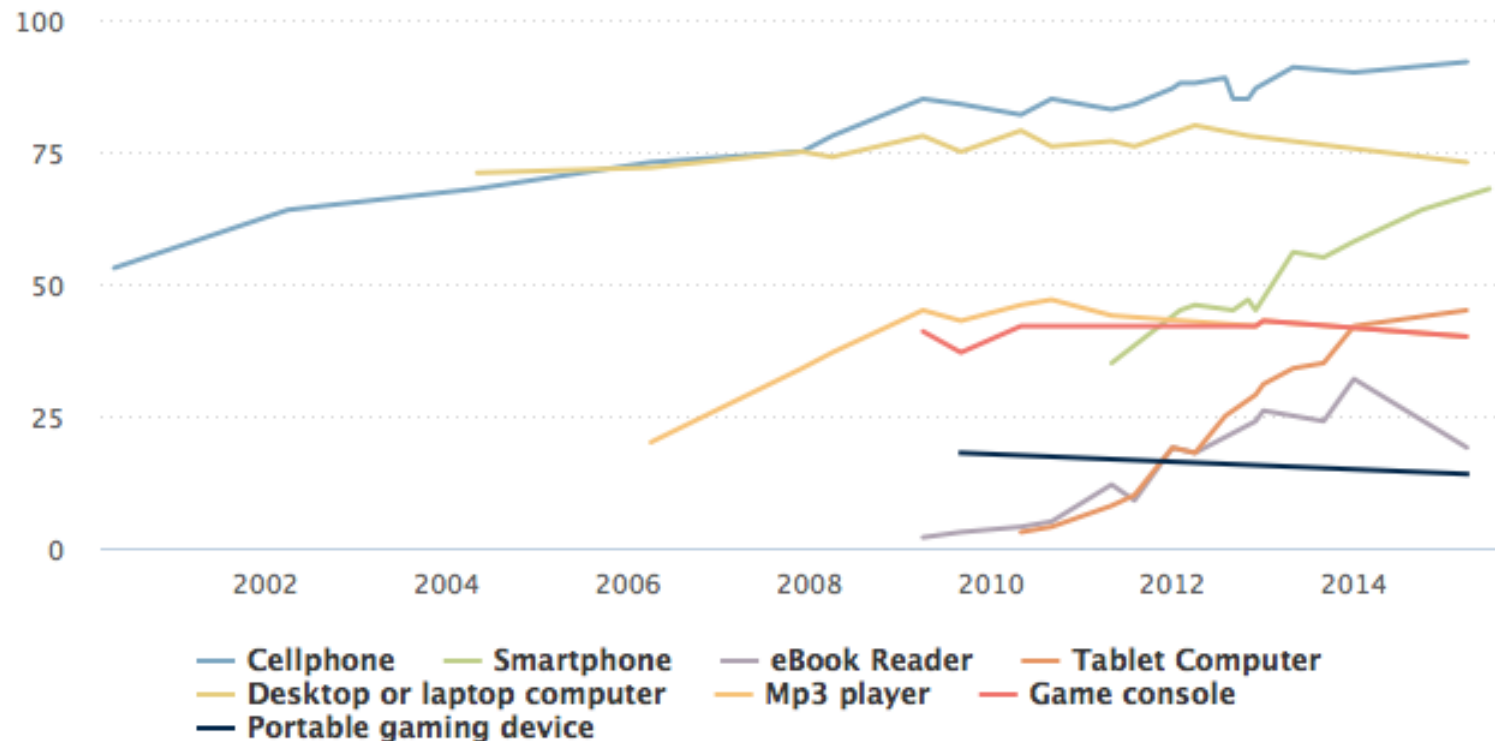
Mobile Device Ownership Over Time

Chart

Data

Embed

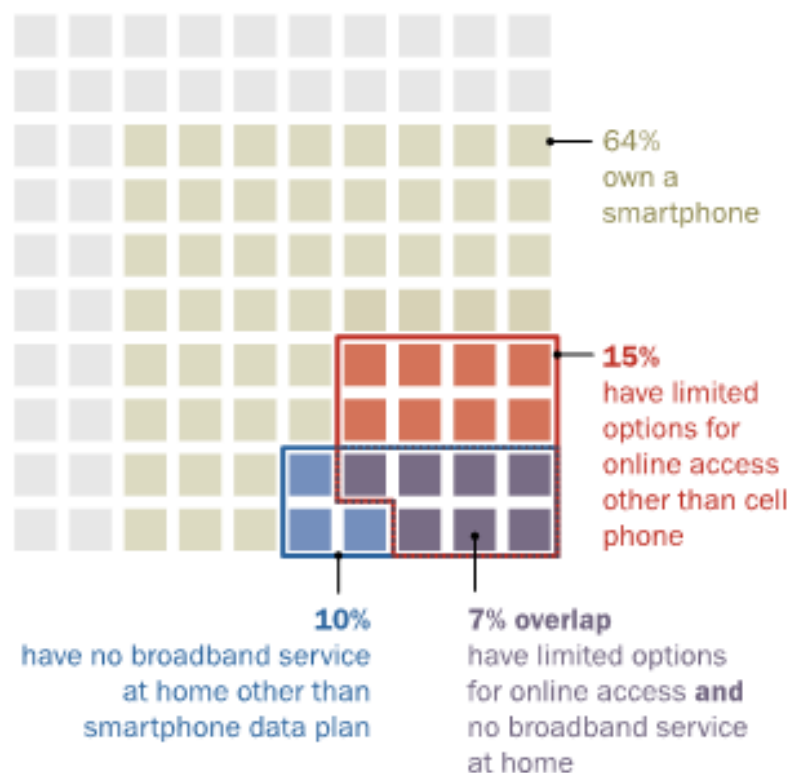
% of American adults who own a ...



The “Smartphone-Dependent” Population: 7% of Americans Rely Heavily on a Smartphone for Online Access

% of U.S. adults who have a smartphone, but lack other broadband internet service at home, and/or have limited options for going online other than their cell phone

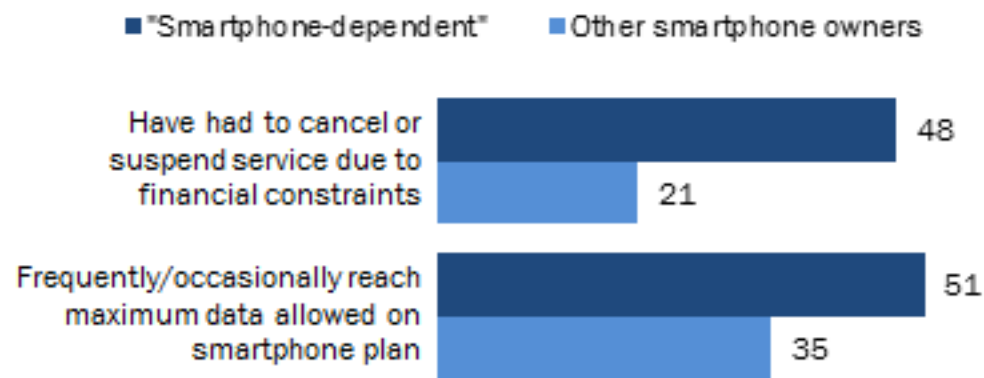
ALL ADULTS



Pew Research Center American Trends Panel survey, October 3-27 2014.

Smartphone Ownership is Often Most Tenuous for Those Who Rely on Their Devices the Most

% of smartphone owners in each group who have experienced the following

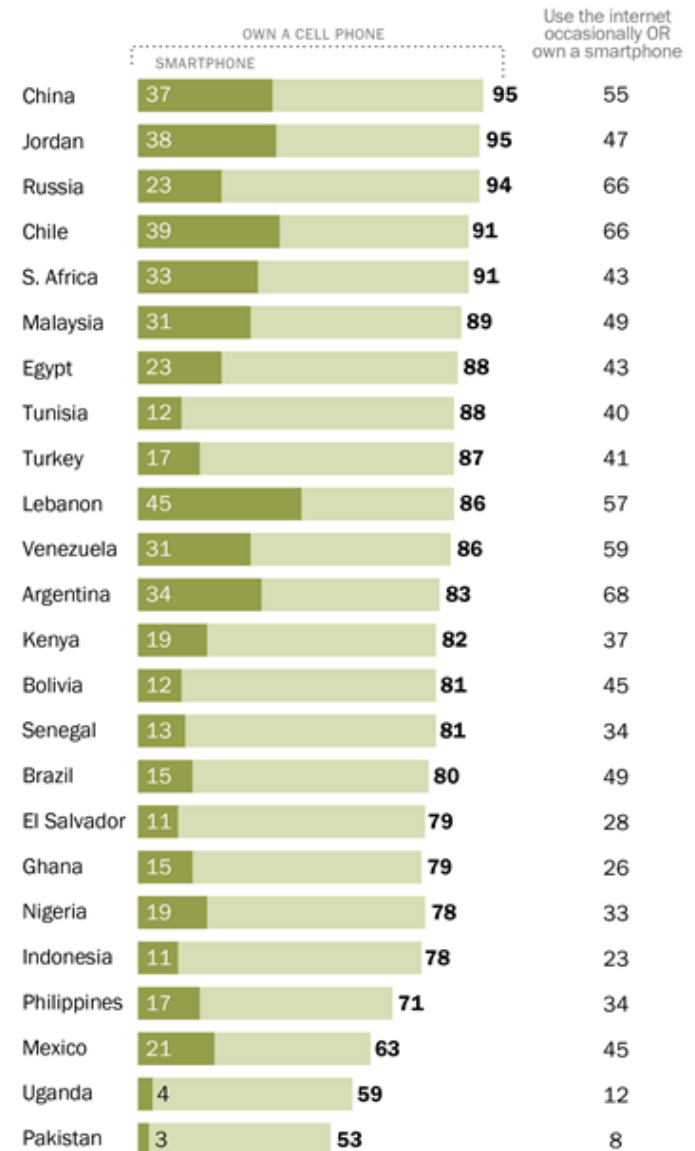


Pew Research Center American Trends Panel survey, October 3-27 2014. "Smartphone dependent" users lack broadband service at home, and/or have limited options for internet access other than their cell phone.

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Cell Phone, Smartphone Ownership and Internet Access

% who ...



International Usage

- Cell phone usage high
- Internet access moderate
- Smartphone usage low

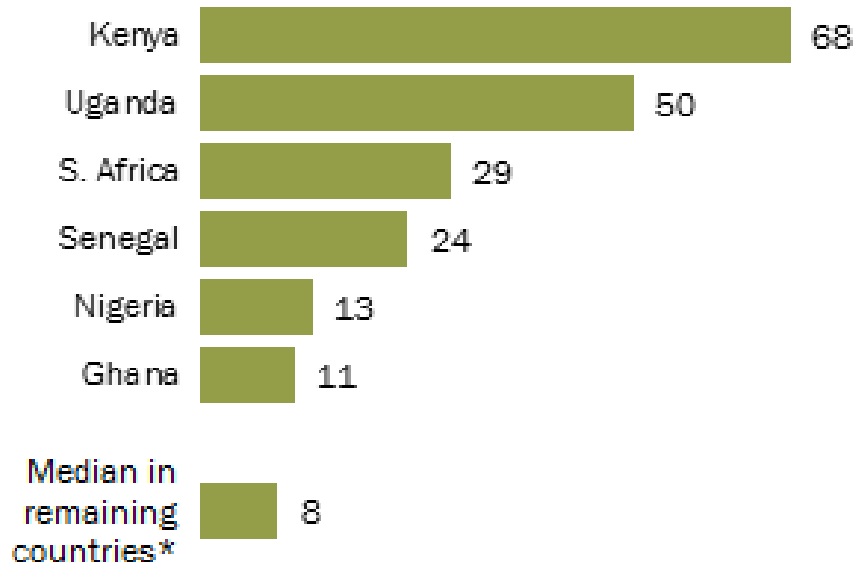
Source: Spring 2013 Global Attitudes survey. Q66-Q68.

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Mobile Payments Popular in Africa

% yes

*% of cell phone owners who regularly
make or receive payments on their phones*



But potentially easier to
incentive research
participation in low
resource countries via
mobile payments

* Median percentages based on 18 non-sub Saharan African countries.

Source: Spring 2013 Global Attitudes survey. Q76g.

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Smartphones for Research: One vs. Two

- Preferable to upgrade current phone and plan than to provide a separate phone and plan
 - Already have some form of phone and plan
 - Integrates research efforts with routine use
 - Requires working with multiple networks and device providers to upgrade current phone and plan
 - Requires considerations of:
 - Non-research use of call and data plan
 - Continuation of upgrade once research study ends

Other Considerations

- Mobile PROs also have DIF (differential item function)
 - Given limited number of items administered via mobile platform, even more critical that items selected are free from DIF
- Differences in responses to prompts unknown
 - Will lower SES respond more or less than higher SES
 - Need to consider both missingness and lag from prompt to response by subgroups
- For phone resident sensors (e.g., location, movement) do different subgroups use their phones differently?
 - Are physical activity estimates for men more or less accurate than for women?

And What about Wearables?

- Wearables currently used predominately by young and affluent
- In contrast to phones, less concern about providing wearable sensors to research participants
- Unknown differences in use by subgroups
- Differences in wearing wearables needs study



QUESTIONS