

# Revisiting the First-Level Digital Divide in the United States: Gender and Race/Ethnicity Patterns, 2007–2012

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## Abstract

With the narrowing of Internet access divide, researchers have focused on Internet usage, taking for granted access issues. However, questions remain regarding who has Internet access in the United States: What is the status of the racial divide? Is there still a gender divide? How do Latinos compare to other racial and ethnic minority groups? How does gender intersect with race and ethnicity? I analyze nationally representative data to compare Internet access among adults from 2007 to 2012. I find that women are more likely to report having Internet access than men. Blacks and Latinos are equally likely to report having Internet access, and both groups are less likely to report having Internet access than Whites. Finally, Black men exhibited the greatest increase in access. This research complements Internet usage studies with a recent assessment of Internet access trends, important trends to monitor as policies and technological innovations aim for universal access.

## Keywords

digital divide, Internet access, gender, race/ethnicity

The phrase “digital divide” initially referred to differential access to computers and information technologies (Attewell, 2001; Hargittai, 2002; Selwyn, 2004; Tsatsou, 2011). Race (Hoffman, Novak, & Schlosser, 2001; Jones, Johnson-Yale, Millermaier, & Pérez, 2009), gender (Katz & Rice, 2002; Norris, 2001; Wilson, Wallin, & Reiser, 2003), and socioeconomic status (SES; Bucy, 2000; Chinn & Fairlie, 2010; Mardis, 2013; Ono & Zavodny, 2007; Talukdar & Gauri, 2011) were all axes by which access to these technologies differed and defined concerns in this area of “first-level” digital divide research. Over the years, the gap in access within the United States narrowed, leading many to move beyond this initial concern to one that examines differences in actual use, or the “second-level” divide (Attewell, 2001; Hargittai, 2002; Selwyn, 2004; Tsatsou, 2011). As a result, very few recent studies regarding patterns within the United States have focused exclusively on first-level issues.

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To be sure, there have been exceptions to this trend. Many of the studies that examine the first-level digital divide since the turn toward focusing on usage, however, focus either exclusively on developing countries (e.g., Bar et al., 2013; Payne & Barnfather, 2012; Pearce & Rice, 2013) or on cross-country comparisons (e.g., Andrés, Cuberes, Diouf, & Serebrisky, 2010; Chinn & Fairlie, 2010; Çilan, Bolat, & Coşkun, Ono & Zavodny, 2007; 2009; Zhang, 2013). The few studies during this era that do examine Internet access patterns within the United States point to a persistent divide across the common axes described previously, as well as uncover divides on axes never documented before. Using data from 2008, Talukdar and Gauri (2011) found that race and SES still determined whether adults in the United States have Internet access. Ono and Zavodny (2008) identified a never-before documented gap between immigrants and natives in the United States due largely to English-speaking ability. Accordingly, much is still to be learned regarding the first-level digital divide within the United States.

Here, I consider some of these unanswered questions and utilize recent data to examine trends in Internet access within the United States. After reviewing the existing literature, I explain that an updated look is warranted to determine the state of the racial divide. Furthermore, research on Internet access patterns rarely includes Latinos in the samples, making it unclear how this group compares to other race and ethnicities. An updated look is also necessary to determine if the gender divide still exists and, if it does, whether it has reversed in favor of women. Finally, I show that few investigations of access considered the intersection of race and gender. After reviewing these gaps in the literature, I present an analysis of a representative sample of U.S. adults that depicts trends in Internet access from 2007 to 2012. Consideration of these factors in the analysis yields the need to continuously ask the most basic question of who has access, an important question to complement second-level divide studies.

## **Race, Gender, and Access**

The surge in the proportion of U.S. homes with Internet access during the 1990s along with the government adopting the goal of universal Internet access (National Telecommunications and Information Administration, 1993) spurred numerous reports and studies that documented trends in access across population subgroups. Early on, these studies identified divides in access within the United States with respect to race and gender.

These early reports documented that Whites, compared to other racial and ethnic groups, were more likely to have Internet access (e.g., National Telecommunications and Information Administration, 1995). Research consistently characterized this divide as a consequence of these groups' differential social positions, particularly as it relates to their income and educational attainment (Chaudhuri, Flamm, & Horrigan, 2005; Katz & Rice, 2002; Wei & Hindman, 2011; Wilson et al., 2003). Yet, there are some instances where the racial divide remains even after controlling for socioeconomic variables, suggesting that the relationship between race and ethnicity and Internet access is complex (e.g., Fairlie, 2007; Talukdar & Gauri, 2011). To the degree that Internet access is paramount to social mobility, these patterns stand to reproduce and perhaps even exacerbate broader, racialized patterns of disparities (Batres & Perrett, 2014; Ono & Zavodny, 2007). Starting in the 2000s, this racial gap began to close (National Telecommunications and Information Administration, 2002). More recent data on Internet access, however, suggest that the racial divide still exists (National Telecommunications and Information Administration, 2013; Talukdar & Gauri, 2011; Wei & Hindman, 2011).

A range of studies have also consistently shown that men are more likely to access the Internet than women (Katz & Rice, 2002; Norris, 2001; Wilson et al., 2003). Part of this may have been due to gendered stereotypes regarding for whom technology use was normatively appropriate (e.g., Gefen & Straub, 1997; Venkatesh, Morris, Davis, & Davis, 2003). It is quite likely that, just as

with the racial gap in access, a multitude of complex relationships contribute to these patterns (Katz & Rice, 2002). There is some research, however, which suggests that the gender gap in access may have disappeared (Wasserman & Richmond-Abbot, 2005; Wei & Hindman, 2011) and may even be reversing to favor women over men (Ono & Zavodny, 2003). Data from 2008 also suggest that women now have greater Internet access than men (Talukdar & Gauri, 2011).

More broadly, women and racial and ethnic minorities across other countries tend to exhibit the lowest levels of access. Norris (2001), for instance, found that men were more likely to have Internet access than women across a range of European countries. Part of this, she suggests, reflects historical processes in the adoption of other types of communication technologies. Chen and Wellman (2004) documented similar gender patterns within developed and developing countries. With respect to race and ethnicity, minority groups within a given country often lag behind majority groups in Internet access (e.g., Korupp & Szydlak, 2005; Mesch & Talmud, 2011), again mirroring patterns of other types of media use seen among a country's racial and ethnic minority (Silverstone & Georgiou, 2005). Taken together, these cross-cultural assessments indicate that Internet access does indeed reflect and may even exacerbate existing inequalities (Batres & Perrett, 2014; Ono & Zavodny, 2007).

## Remaining Questions

With the proportion of U.S. households with Internet access increasing at a rapid rate, researchers and policy advocates turned their attention to understanding how individuals use the Internet (Attewell, 2001; Hargittai, 2002; Selwyn, 2004). However, there remain a number of unanswered questions regarding recent trends in Internet access. I draw attention to four research questions based on these gaps in the literature.

Recent innovations and trends suggest that the first-level digital divide may soon disappear in the United States. Individuals are increasingly adopting smartphones capable of Internet access (Smith, 2013), and for some this is their primary way of accessing the Internet (Duggan & Smith, 2013). Nonprofit organizations and entire cities (e.g., Kvasny & Keil, 2006) have focused attention in developing community-based approaches to narrowing the divide in access. These and other factors have caused overall Internet access to increase, yet demographic gaps in access still exist (Talukdar & Gauri, 2011; Zickuhr & Smith, 2012). We need a closer inspection of recent trends in Internet access to identify the effects of these changes and understand who may be the newest Internet users.

First, a recent inspection is warranted to assess the severity of the racial divide. The research reports summarized in the preceding section document a racial gap in Internet access within the United States that spans numerous years, demonstrating the persistence of this particular divide. Even more discouraging is that one of the more recent reports (Talukdar & Gauri, 2011) compared racial differences in 2002 and 2008, finding that the Black–White difference in Internet access actually widened during this time frame. Such trends necessitate the need to monitor the racial divide.

Additionally, Latinos have received less attention in the research on the racial divide. In part, this is due to small sample sizes for this subgroup in national data sets (e.g., Hoffman et al., 2001; Talukdar & Gauri, 2011) and the reliance on data from geographic locations where Latinos comprise a small proportion (e.g., Bucy, 2000; Cotten & Jelenewicz, 2006; Wilson et al., 2003). The lack of attention on this subgroup is surprising, given that they are the largest and fastest racial and ethnic minority group in the United States since the 2000 Census (Grieco & Cassidy, 2001). Research studies (e.g., Jones et al., 2009) and reports (e.g., Zickuhr & Smith, 2012) have begun to examine Latinos in reference to other racial and ethnic groups, but since this was not included in the original momentum to investigate Internet access there is a little information to compile a coherent depiction of trends. A remaining question is how recent trends in Internet access among Latinos compare to those in other racial and ethnic groups in the United States.

Inspection of recent trends will also illuminate whether the gender divide still exists within the United States and, if it does, whom it favors. Studies that Ono and Zavodny carried out using data from the early part of the 21st century suggest a point in time where the gender divide shifted. Using data from 2000, they found no gender difference (2007), while data they used from 2001 suggested that women may be more likely to access the Internet than men (2003). Consistent with this, Talukdar and Gauri (2011) found in their data—derived from a source that differed from the ones Ono and Zavodny used—that women reported greater access in 2002 and 2008.

Finally, the intersection of gender and race has received scant attention in the first-level digital divide literature. Broadly, the intersection of gender and race uncovers unique experiences of advantage and disadvantage that are often masked in research that collapses across these two axes (Dill & Zambrana, 2009; Weber, 2001). The joint effects of gender and race are never simply additive, nor are their multiplicative effects similar across contexts. For example, even confining ourselves to examining the intersections of gender and race within the workplace yields mixed patterns that are contingent based on the specific workplace outcome being investigated (for one review, see Browne & Misra, 2003). Therefore, we cannot simply assume that because women and racial and ethnic minorities have historically lagged behind others in Internet access that those who belong to both groups must be doubly disadvantaged.

Because of the weight Internet access has on life chances—from employment opportunities to health and health care—it is imperative that we continue to revisit the first-level digital divide. I revisit patterns of Internet access in the United States and examine the intersection of gender and race over a recent 5-year period. The findings will address omissions in the literature, and highlight important considerations given the increasing push of the Internet into daily lives. Specifically, I seek to address four research questions about Internet access in the United States:

**Research Question 1:** Do racial and ethnic minorities (Blacks and Latina/os) have lower Internet access than Whites?

**Research Question 2:** How does the Internet access among Latina/os compare to Blacks?

**Research Question 3:** Do women have greater Internet access than men?

**Research Question 4:** Do gendered patterns of Internet access differ by race/ethnicity?

## Data and Methods

To address the research questions regarding the first-level digital divide in the United States, I rely on recent, nationally representative data of noninstitutionalized adults. Specifically, I use data derived from the Health Information National Trends Survey (HINTS), conducted by the National Cancer Institute. Because one aim of the HINTS is to document how the Internet is used to access health information, a measure of Internet access is assessed at each iteration of data collection. The large sample size of the HINTS data sets allows me to move beyond previous analyses and examine the research questions of interest. This cannot be accomplished using other data sets, such as those available from Pew. Many of the Pew data sets are useful for documenting trends in Internet access across years, but the overall sample sizes are small thereby limiting researchers' ability to disaggregate subgroups that are of interest here. For example, researchers using Pew data collapse Latino respondents with other non-White respondents (e.g., Talukdar & Gauri, 2011), limiting the ability to compare Latinos to other racial and ethnic groups (Research Question 1: Whites, Research Question 2: Blacks) and also examine gender within Latinos (Research Question 4). Other Pew data sets track Internet access among Latinos specifically

(e.g., Lopez, Gonzalez-Barrera, & Patten, 2013), but this exclusive focus also limits the ability to compare their patterns of access with other racial and ethnic groups. I capitalize on large-scale data from HINTS collected in 2007 and 2012 in this analysis, offering an up-to-date comparison of Internet access patterns across gender, race, and ethnicity, and the intersections of the two. Another large-scale alternative, the Current Population Survey Computer and Internet Use Supplement, was last collected in July 2011, making this data set the most up-to-date profile of Internet users.

### **Data Source**

The field period for the 2007 iteration of HINTS was January through April 2008 (Cantor et al., 2009). Respondents were recruited using one of two sampling frames: random digit dialing (RDD,  $N = 4,092$ ) and random sample of U.S. addresses ( $N = 3,582$ ). With few exceptions, the latter completed a mail-in paper survey and the former completed a computer-assisted telephone interview (CATI). For this analysis, I only used data from the mail-in survey respondents, as that was the only data collection mode for the 2012 iteration. This is the recommendation for researchers combining data across HINTS iterations, because of survey mode effects (Moser et al., 2013). While certainly not preferable to lose so many respondents, I consider how relying solely on the mail-in respondents may impact findings.

Two separate data collection cycles currently comprise the 2012 iteration (Finney Rutten et al., 2012). Cycle 1 ( $N = 3,959$ ) was fielded October 2011 to January 2012, and Cycle 2 ( $N = 3,630$ ) July 2012 to November 2012. A preliminary analysis confirmed that the patterns of interest did not change appreciably between the two cycles. Therefore, I combined data from the two cycles to reflect estimates of access in 2012.

Previous HINTS data were collected in the years 2003 and 2005, but these were collected using an RDD sampling mode. As such, these years are not comparable to the most recent data collections. I considered how survey mode may impact findings. A preliminary analysis on the 2007 data showed that the survey collection mode was significantly related to reports of Internet access. Specifically, respondents who completed a mail-in survey were significantly more likely to report access. Racial and gender differences in Internet access were statistically equivalent across survey collection mode, except for one: The Latino–White difference in access is significantly larger in the data collected using RDD. This may be because the Spanish version of the questionnaire was only available through a CATI. Therefore, any Latino–White difference observed in the analyses summarized in the subsequent pages should be taken as conservative estimates of the true difference in access.

### **Analytic Sample**

Data aggregated from the mail-mode sample of the 2007 iteration and the two cycles of the 2012 iteration yield a sample size of 11,182. Of those, 11,156 have complete responses for the dependent variable, Internet access (measure described momentarily). Recall that one focus of this analysis is on comparing Internet access among Whites, Latinos, and Blacks. The number of respondents who fit this criteria is 9,761. A second focus is to compare across gender, and 9,645 respondents who fit the race criteria offered a response to the gender question. Within this sample of respondents, I estimated key associations between gender, race and ethnicity, and Internet access. Only complete cases were included in the analytic sample, resulting in an analytic sample ( $n$ ) of 8,412 respondents. A case was considered complete if responses were recorded for the gender, race, and control measures. Importantly, the key associations I initially estimated did not significantly change when I reestimated them within this analytic sample.

## *Internet Access*

I determined who had Internet access with the survey item, “Do you ever go on-line to access the Internet or World Wide Web, or to send and receive e-mail?” (yes/no).

## *Gender and Race/Ethnicity*

Respondents were asked to report their gender using two response categories, “male” or “female.” I used 2 items to determine respondents’ race/ethnicity. First, respondents were asked if they were Latino or Hispanic. Second, respondents were asked to report a single race. Respondents who responded “yes” to the first item were coded as Latino. Those who responded “no” were coded based on their response to the second item. No additional details regarding respondents’ racial and ethnic background (e.g., country of family origin and skin color) are available in these data. This is unfortunate, given that “race” is far more complex than what this simplified categorization captures (for one discussion, see Bonilla-Silva, 2004).

## *Controls*

I selected controls based on prior research on demographic characteristics that shape Internet access (e.g., Bucy, 2000; Chinn & Fairlie, 2010; Mardis, 2013; National Telecommunications and Information Administration, 2013; Ono & Zavodny, 2008; Talukdar & Gauri, 2011; Wei & Hindman, 2011). These included immigrant status, homeownership status, living in an urban versus rural area, education level, age (years), employment status, annual household income, and marital status. In a preliminary analysis, I compared a linear to a curvilinear approximation of the relationship between age and access and found that the linear approximation fitted these data better.

## *Analytic Plan*

The analysis was conducted in two stages. For each stage, I incorporated the survey weights to take into account the complex survey design. These weights adjust responses based on the sampling frame used, nonresponse, and known population totals taken from the Current Population Survey and the National Health Interview Survey (Cantor et al., 2009; Finney Rutten et al., 2012). I also adjusted any estimates that used the 2012 data with a binary variable that marked from which cycle the response was recorded.

The first stage involved a series of bivariate tests. Given that the number of respondents in the 2012 data is twice the number in 2007, I first determined if the characteristics of the sample differed significantly by survey year. Significant differences in the sample characteristic may bias results that combine data from both years, requiring additional analyses to examine the sensitivity of results to this bias. Second, I conducted bivariate tests to see if gender and race and ethnicity were associated with Internet access across the survey years.

The second stage of the analysis involved a series of multivariable tests to address the four research questions, where I examined gender and racial and ethnic differences in reporting Internet access, adjusting estimates for all the controls. Following others who examined racial and gendered patterns of Internet access (Jones et al., 2009), I first collapsed respondents across race (Research Question 1), then gender (Research Question 3). For the analysis of race, I extended previous research by examining how Latinos compare to Blacks (Research Question 2). I followed up these analyses by examining the intersection of gender and race (RQ4), a step rarely taken in previous research. For each of these multivariable tests, I included interaction terms to determine if there were any significant changes in Internet access between 2007 and 2012.

**Table 1.** Comparison of Weighted Analytic Sample Characteristics, by Survey Year.

Characteristic	2007 (n = 2,801)	2012 (n = 5,611)	Significance of Difference
<b>Race/ethnicity</b>			
White	74.0 (2,142)	72.5 (3,871)	*
Black	11.8 (373)	11.6 (900)	—
Latino	14.2 (286)	15.9 (840)	***
Female	50.5 (1,690)	50.9 (3,349)	—
Immigrant	10.6 (248)	11.0 (624)	—
Homeowner	63.5 (2,021)	59.7 (3,779)	**
Urban	83.5 (2,320)	83.6 (4,729)	—
<b>Education level</b>			
Less than high school	12.9 (219)	11.6 (485)	—
High school	24.5 (626)	20.1 (1,092)	***
Some college	37.0 (900)	37.1 (1,755)	—
College	16.1 (648)	19.5 (1,393)	***
Graduate	9.5 (408)	11.8 (886)	**
Age in years, mean (SD)	44.9 (17.2)	45.4 (17.1)	†
Employed	63.9 (1,684)	59.1 (3,101)	**
<b>Annual household income</b>			
<US\$20,000	35.6 (903)	21.3 (1,221)	***
US\$20,000–34,999	14.7 (423)	16.2 (913)	—
US\$35,000–49,999	17.8 (542)	14.2 (825)	**
US\$50,000–74,999	13.6 (395)	17.6 (965)	**
≥US\$75,000	18.3 (538)	30.7 (1,687)	***
Married	54.6 (1,613)	52.9 (2,901)	*

Source. 2007–2012 Health Information National Trends Survey.

Note. Unless specified otherwise, statistics shown are percentages (and frequencies).<sup>†</sup> $p < .10$ ; \* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$ .

## Results

### Bivariate Results

The first stage of the analysis involved a series of bivariate analyses. The first of these is shown in Table 1, which shows that the descriptives for the analytic sample are not balanced across the survey years. Compared to 2007, for example, the proportion of respondents in 2012 stating that they have paid employment is significantly lower and the proportion of respondents reporting a college-level education or higher is significantly higher. This is expected, given the changes in the economic environment that occurred between these 2 years. Because the descriptives are not balanced, I considered whether results were sensitive to these differences. Toward the end of the results section, I summarize an auxiliary analysis and comment on this situation.

The second bivariate analysis involved examining changes in Internet access from 2007 to 2012 among the groups of interest. Table 2 shows that all of the racial and ethnic groups pertinent to the analysis exhibited significant increases in Internet during this time frame. Latinos' increase in access was less statistically significant than the changes for other groups. Both men and women showed significant increases in Internet access. Focusing on the intersections of gender and race and ethnicity reveals a more nuanced picture of changes in Internet access. The greatest increase in Internet access occurred among Black men. Changes in Internet access among Latino men and women were the least statistically significant. While the change in reports of Internet access among men was the second highest in magnitude, the change is only marginally significant. Meanwhile, changes in Internet access among the other intersections were statistically significant.

**Table 2.** Weighted Bivariate Analysis of Change ( $\Delta$ ) in the Percentage (%) of Respondents Reporting Internet Access from 2007 to 2012.

	% (Frequency) Reporting Internet Access		$\Delta$ in %	Significance of $\Delta$
	2007	2012		
Race/ethnicity				
White	78.6 (1,661)	85.2 (3,195)	6.6	***
Black	58.7 (226)	76.4 (640)	17.7	***
Latino	62.8 (188)	77.0 (584)	14.2	*
Gender				
Male	72.0 (781)	81.9 (1,740)	9.9	***
Female	76.0 (1,294)	83.9 (2,679)	7.9	***
Intersections				
White female	80.5 (1,010)	86.7 (1,869)	6.2	***
White male	76.6 (651)	83.7 (1,326)	7.1	***
Black female	62.6 (162)	76.0 (453)	13.4	**
Black male	53.7 (64)	76.8 (187)	23.1	**
Latino female	64.2 (122)	77.0 (357)	12.8	*
Latino male	61.5 (66)	77.0 (227)	15.5	†

Source. 2007–2012 Health Information National Trends Survey.

† $p < .10$ ; \* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$ .

### Multivariable Results

In the next stage of the analysis, I conducted multivariable analyses to evaluate the four research questions. Specifically, I adjusted the bivariate analyses of Internet access with the controls and also compared changes from 2007 to 2012 across the groups of interest in the research questions.

**Research Question 1:** Table 3 summarizes the analysis investigating the first of these questions, which was whether Blacks and Latina/Latinos have lower Internet access than Whites. The analysis is one of the few to examine Latinos in relation to other racial and ethnic groups. In 2007, Black and Latino respondents were significantly less likely to report having access to the Internet than White respondents, mirroring results obtained from 2008 (Talukdar & Gauri, 2011). Both the Black-White and Latino-White differences narrow in 2012, but notably remained statistically significant. This shows that a racial and ethnic divide in Internet access that favors Whites was still present in 2012.

The last model in Table 3 with the full sample shows that the Black-White difference in 2012 is marginally different from 2007. This indicates that between these 2 years, Blacks have marginally narrowed the access divide, a picture different from a prior time frame (Talukdar & Gauri, 2011). Conversely, the Latino-White difference is statistically equivalent between 2007 and 2012. However, I cautioned earlier that these results may be conservative estimates of the Latino-White difference because respondents were not able to complete a Spanish version of the questionnaire in the mail-mode sample from 2007.

**Research Question 2:** The analysis in Table 3 also allows me to go beyond previous ones (Bucy, 2000; Cotten & Jelenewicz, 2006; Hoffman et al., 2001; Talukdar & Gauri, 2011; Wilson et al., 2003) to uncover novel findings about how Latinos compare to Blacks, the basis of the second research question. Wald tests show that the coefficients for Blacks and Latinos are statistically equivalent to one another. Moreover, the changes in access from

**Table 3.** Comparisons of Weighted Logistic Regression Coefficients and Odds Ratios Predicting Racial/Ethnic Differences in Access to the Internet Between 2007 and 2012.

	2007 (n = 2,801)			2012 (n = 5,611)			Full Sample		
	B	SE	OR	B	SE	OR	B	SE	OR
<b>Race/ethnicity (vs. White)</b>									
Black	-.855**	.270	.425	-.465*	.210	.628	-.927**	.266	.396
Latino	-.726*	.320	.484	-.490*	.221	.613	-.851**	.308	.427
<b>2012 survey (vs. 2007)</b>									
Black × 2012 survey							.346**	.118	1.413
Latino × 2012 survey							.487 <sup>†</sup>	.282	1.628
							.433	.336	1.543
<b>Controls</b>									
Immigrant	-.612	.389	.542	-.350 <sup>†</sup>	.181	.705	-.454*	.211	.635
Homeowner	.434 <sup>†</sup>	.229	1.543	-.178	.283	.837	.061	.160	1.062
Urban	.692**	.215	1.998	.500*	.193	1.649	.565***	.150	1.760
<b>Education level (vs. &lt; high school)</b>									
High school	.535*	.265	1.708	.811**	.229	2.250	.730***	.166	2.075
Some college	1.560***	.209	4.757	1.971***	.217	7.180	1.819***	.151	6.163
College	2.138***	.315	8.484	2.138***	.315	14.651	2.492***	.184	12.091
Graduate	2.526***	.263	12.500	3.395***	.360	29.809	3.054***	.216	21.191
Age (years)	-.056***	.006	.946	-.063***	.007	.939	-.060***	.004	.942
Employed	.030	.200	1.030	.002	.146	1.002	.019	.124	1.019
<b>Annual household income (vs. &lt; \$20,000)</b>									
US\$20,000–34,999	.736**	.238	2.088	.546*	.256	1.726	.587**	.170	1.799
US\$35,000–49,999	.723**	.237	2.061	.870**	.299	2.387	.807***	.203	2.242
US\$50,000–74,999	.803*	.326	2.231	1.227***	.235	3.411	1.070***	.193	2.914
≥US\$75,000	1.109*	.417	3.032	1.675***	.229	5.331	1.471***	.245	4.353
Married	.226	.189	1.254	.476**	.142	1.610	.373**	.110	1.453

Note. SE = standard error; OR = odds ratio.

Source. 2007–2012 Health Information National Trends Survey.

<sup>†</sup>p < .10; \*p < .05; \*\*p < .01; \*\*\*p < .001.

2007 to 2012 (i.e., the interaction between race/ethnicity and survey year) are statistically equivalent to one another. Thus, not only is Internet access comparable between Blacks and Latinos, but the gains among this group from 2007 to 2012 are also comparable.

**Research Question 3:** The third research question was about the gender divide in access. Collapsing across gender in Table 4, women were significantly more likely to report having Internet access, both in 2007 and 2012. The gender difference decreased in statistical significance in 2012, but the last model in Table 3 shows that this change in the gender divide was not statistically significant. In other words, women were significantly more likely than men to report having access in 2007 and this gap did not change much in 2012. Both of these findings are consistent with an assessment of the gender divide from 2002 to 2008 (Talukdar & Gauri, 2011).

**Research Question 4:** A more nuanced picture emerges from examining the intersection of gender and race, the next research question I investigate with the multivariable analysis. Table 5 summarizes the analysis that considers the intersection of gender and race and ethnicity, across the 2 survey years. The first column of the table shows that in 2007, there are no significant two-way interactions between gender and race. In 2012, however, one two-way interaction appears. The second column shows that the probability of reporting Internet access in 2012 differed for Black men and women. To determine if the patterns of significance for

**Table 4.** Comparisons of Weighted Logistic Regression Coefficients and Odds Ratios Predicting Gender Differences in Access to the Internet by Survey Year.

	2007 (n = 2,801)			2012 (n = 5,611)			Full Sample		
	B	SE	OR	B	SE	OR	B	SE	OR
Female (vs. male)	.510**	.165	1.665	.428*	.151	1.405	.580**	.166	1.786
2012 survey (vs. 2007)							.580**	.172	1.786
Female × 2012 survey							-.185	.201	.831
<b>Controls</b>									
Immigrant	-.864*	.375	.421	-.548**	.179	.578	-.662**	.200	.516
Homeowner	.508*	.236	1.663	-.116	.268	.890	.126	.153	1.134
Urban	.526*	.231	1.692	.420*	.189	1.522	.450**	.153	1.568
<b>Education level (vs. &lt; high school)</b>									
High school	.590*	.262	1.804	.875***	.226	2.399	.781***	.162	2.184
Some college	1.662***	.007	5.271	2.018***	.211	7.520	1.887***	.152	6.597
College	2.259***	.325	9.573	2.754***	.224	15.710	2.582***	.177	13.227
Graduate	2.713***	.259	15.076	3.509***	.358	33.428	3.202***	.217	24.580
Age (years)	-.053***	.006	.948	-.062***	.006	.940	-.058***	.004	.944
Employed	.066	.214	1.068	.037	.146	1.038	.059	.132	1.061
<b>Annual household income (vs. &lt; US\$20,000)</b>									
US\$20,000–34,999	.823**	.229	2.276	.598*	.254	1.819	.660***	.164	1.936
US\$35,000–49,999	.826**	.231	2.285	.929**	.290	2.531	.898***	.197	2.455
US\$50,000–74,999	.968**	.310	2.633	1.312***	.244	3.715	1.184***	.192	3.268
≥US\$75,000	1.197**	.409	3.310	1.783***	.236	5.947	1.558***	.250	4.750
Married	.280	.190	1.324	.476**	.138	1.609	.398**	.111	1.489

Source. 2007–2012 Health Information National Trends Survey.

† $p < .10$ ; \* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$ .

the coefficients predicting Internet access differ significantly between the 2 survey years, I turn to the final analytic step.

The last column of Table 5 shows that there are significant three-way interactions between race and ethnicity, gender, and survey year, indicating the importance of investigating the intersection of gender and race when examining trends in Internet access. This analysis yields novel findings and illustrates a more complex picture of changes in Internet access. I summarize the predicted probabilities from this last model in Figure 1 to aid in interpretation of these findings that dig deeper into the fourth research question.

Consistent with the prior analyses, the figure shows that the probability of having Internet access increased across all groups between 2007 and 2012. Women and Whites have the greatest probability of reporting Internet access. The changes in access over time, however, differ by gender and race and ethnicity. No significant changes in the gender divide in Internet access among Whites are observed. Between 2007 and 2012, Black men experienced a significant increase in Internet access, making them the newest Internet users. This is a notable change, given that Black men were the least likely to report Internet access in 2007 and that the gender divide among Blacks was the largest during this time as well. The change in Internet access between 2007 and 2012 for Black men is marginally greater than the change in access among Black women during the same time period. The figure and the coefficients in Table 5 suggest that in 2012, there is no longer a gender divide in Internet access among Blacks. Finally, the change in the probability that Latinas have access during this time period appears to be greater than that for Latino men, but this is not a statistically significant change. As a result, the gender divide among Latinos in Internet access is

**Table 5.** Comparisons of Logistic Regression Coefficients and Odds Ratios Predicting the Intersection of Racial/Ethnic and Gender Differences in Access to the Internet by Survey Year.

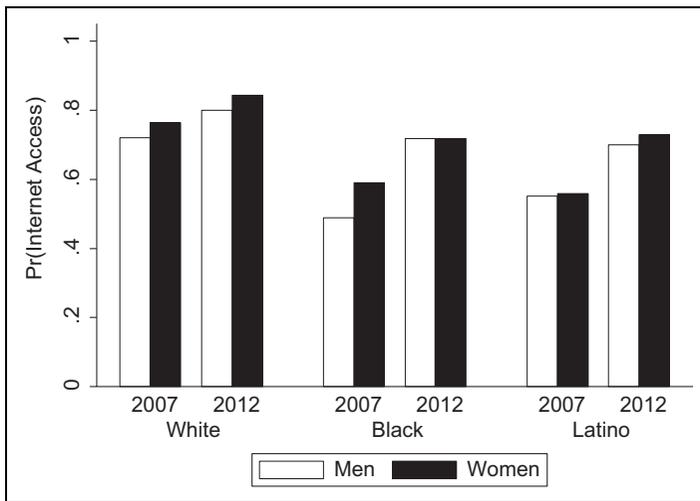
	2007 (n = 2,801)			2012 (n = 5,611)			Full Sample (n = 8,412)		
	B	SE	OR	B	SE	OR	B	SE	OR
<b>Race/ethnicity (vs. White)</b>									
Black	-.951*	.383	.386	-.013	.348	.987	-1.029*	.393	.357
Latino	-.410	.457	.664	-.344	.324	.709	-.553	.454	.575
Female (vs. male)	.643**	.190	1.903	.670**	.188	1.955	.720**	.197	2.054
Black × female	.093	.355	1.098	-.914*	.390	.401	.073	.367	1.076
Latino × female	-.658	.492	.518	-.383	.374	.682	-.654	.515	.520
Black × 2012 survey							1.005*	.450	2.731
Latino × 2012 survey							.278	.510	1.320
Female × 2012 survey							-.106	.245	.899
Black × female × 2012 survey							-.902 <sup>†</sup>	.512	.406
Latino × female × 2012 survey							.310	.591	1.363
2012 survey (vs. 2007)							.403*	.175	1.496
<b>Controls</b>									
Immigrant	-.638	.403	.528	-.335 <sup>†</sup>	.188	.715	-.458*	.216	.632
Homeowner	.432 <sup>†</sup>	.232	1.541	-.186	.279	.831	.050	.159	1.052
Urban	.672**	.215	1.959	.479*	.191	1.614	.545**	.148	1.725
<b>Education level (vs. &lt; high school)</b>									
High school	.524 <sup>†</sup>	.267	1.689	.794**	.230	2.212	.717***	.167	2.049
Some college	1.546***	.207	4.690	1.959***	.217	7.091	1.807***	.152	6.090
College	2.160***	.316	8.670	2.694***	.233	14.796	2.507***	.178	12.274
Graduate	2.566***	.262	13.020	3.421***	.360	30.609	3.091***	.218	21.999
Age (years)	-.057***	.006	.945	-.065***	.006	.937	-.061***	.004	.941
Employed	.068	.219	1.071	.041	.150	1.041	.061	.134	1.063
<b>Annual household income (vs. &lt; US\$20,000)</b>									
US\$20,000–34,999	.788**	.238	2.199	.603*	.259	1.827	.640***	.171	1.897
US\$35,000–49,999	.796**	.251	2.217	.928**	.300	2.530	.875***	.207	2.399
US\$50,000–74,999	.925**	.336	2.522	1.303***	.250	3.679	1.161***	.200	3.192
≥\$75,000	1.168**	.422	3.215	1.756***	.238	5.787	1.539***	.252	4.662
Married	.247	.186	1.280	.487**	.143	1.628	.394**	.112	1.482

Note. SE = standard error; OR = odds ratio.

Source. 2007–2012 Health Information National Trends Survey. <sup>†</sup> $p < .10$ ; \* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$ .

absent in 2007 and 2012. Taken together, these findings indicate that the gender divide that favors women only appears among Whites, something other research has yet to show.

Finally, given that the bivariate analysis from Table 1 showed that the characteristics of the sample differed significantly by survey year, I conducted an auxiliary analysis (not shown, but available upon request). I estimated the propensity (Rosenbaum & Rubin, 1984; Rubin, 1997) to be in a given survey year, based on sample characteristics. I split the distribution of these propensity scores into five quintiles and assigned respondents an indicator variable based on their membership in a quintile. I then examined whether the propensity to be in a given survey year changed the multivariable results summarized earlier appreciably. The analysis showed that the patterns of significance documented in the multivariate results are equivalent once I adjust estimates for this propensity. If anything, trends in the coefficients suggested that adjusting for the propensity to be in a given survey year makes the changes in Internet access (from 2007 to 2012) and the group differences in these changes to increase in significance. Given that such analyses



**Figure 1.** Predicted probability of reporting internet access adjusted for controls, by survey year, race/ethnicity, and gender.

cannot completely adjust for propensity to be in a given group, this merely hints at what would have occurred had the characteristics been balanced across survey years. As such, the multivariable results are likely conservative estimates of the true patterns in Internet access by gender and race and ethnicity.

## Discussion

Given the narrowing gap in Internet access, it is indeed crucial to ask research questions about usage because the answers are relevant for the majority of the population. This should not be mistaken, however, for a legitimate reason to neglect to ask the most basic question of who has access. Based on a review of the literature, I identified four research questions and examined these in the analyses of the two recent iterations of the HINTS. I find that Blacks and Latinos still report lower Internet access than Whites (RQ1) and that Latinos' access to the Internet is generally comparable to Blacks (RQ2). I also find that the gender divide in Internet access now favors women over men (RQ3). Further, the analyses of the intersections between gender and race and ethnicity showed that in 2012, the gender divide only appeared among Whites and that Black men are the newest Internet users (RQ4).

Prior research has examined two of these research questions. Findings addressing RQ1 add to a deep literature documenting a racial and ethnic divide in Internet access across a number of years (e.g., Katz & Rice, 2002; National Telecommunications and Information Administration, 1995; Talukdar & Gauri, 2011). That this divide continues to exist in the recent data I analyzed speaks to its persistence, while also bringing Latinos into the discussion. Of note, the comparison of the racial and ethnic differences from 2008 to 2012 suggested that the racial divide is stabilizing. This initially appears encouraging, especially since the Black–White difference in access increased from 2002 to 2007 (Talukdar & Gauri, 2011). Before reaching the conclusion, however, it is important to point out that this research from the earlier time frame measured Internet access *at home*, whereas the measure I use is more general and does not distinguish where access occurs. The measure I use captures the fact that access for disadvantaged populations—including racial and ethnic minorities—is commonly provided through public facilities, such as public libraries (Dombrowski, Hayes, Mazmanian, & Volda, 2014; Jaeger & Fleischmann, 2007; Smith

& Eschenfelder, 2013). Consequently, it seems likely that access—by whatever means—is still determined by race and ethnicity. Whether this racial divide over time is narrowing or stabilizing may depend on how access is defined, with broader measures of access likely capturing community efforts to narrow the divide.

Research has also examined RQ3, regarding the gender divide, previously. Consistent with the study that analyzed patterns in Internet access at home (Talukdar & Gauri, 2011), I find that women report greater access than men and that this divide remained stable across the survey years I examined. Unlike race and ethnicity, gender is unrelated to where individuals access the Internet (e.g., Wilson et al., 2003). Together with other research using U.S. data from the early part of the 21st century (Ono & Zavodny, 2003, 2007), this suggests that the divide reversed in favor of women around 2001 and has remained stable through 2012.

The other two research questions, which were about comparing Latinos to Blacks (RQ2) and gender differences by race and ethnicity (RQ4), have not been examined systematically in previous studies. Accordingly, the findings in these two cases uncover novel patterns. Prior research has been limited in the data available (Bucy, 2000; Cotten & Jelenewicz, 2006; Hoffman et al., 2001; Talukdar & Gauri, 2011; Wilson et al., 2003), constraining the ability to investigate these two research questions. At first glance, it appeared that Latinos resembled Blacks in access. However, disaggregating data by gender and race demonstrated that Black men exhibited patterns that contrasted sharply from others, making them the newest Internet users. Continuing to monitor these trends with large-scale data will be necessary for future research.

Given the push to offer an increasing number of services on the Internet, these patterns have broader implications. For example, policies have been enacted to computerize medical records and encourage patients to engage with their health information over secure web servers (Blumenthal, 2010). Lack of Internet access, however, is still a barrier for some patients (Goel et al., 2011). To the degree that patient engagement with their personal health information is paramount for improving health care delivery (e.g., see Delbanco et al., 2012), tracking who has Internet access will be important for assessing the potential of these health information technologies for addressing health and health care inequities. In another realm, e-government is a policy movement toward making government-related services and information available on the Internet, with the expectations that it improve quality of services and also democracy (e.g., see Organisation for Economic Co-Operation and Development, 2003). However, the movement has fallen short from expectations, and some are blaming the digital divide (both first and second level) as a culprit (e.g., Edmiston, 2003; Helbig, Gil-García, & Ferro, 2009). Finally, the demography of online banking—an increasingly important means to organize personal finances—is poorly understood (for a review, see Hanafizadeh, Keating, & Khedmatgozar, 2014). The current research can draw attention to important demographic subgroups that should be investigated.

To be sure, after achieving universal access, we will still need to address potential usage gaps. Research has documented potential factors that may eliminate second-level digital divides. For example, in a study among university students where Internet access is institutionalized, little usage gaps were apparent (Cotten & Jelenewicz, 2006). At the same time, other research finds that leveling access does not guarantee that usage divides will erode (Goldfarb & Prince, 2008; Sims, 2013). The relationship between access and usage is complicated, necessitating that we continue to complement usage studies with those on access.

A number of avenues for future research exist. The findings illuminate important intersection rarely examined in the literature on the digital divide, but still leave much that needs to be learned. Besides the intersection of gender and race, future research may examine how these two intersect with class. Previous research on the digital divide documents that class is a primary driver of the divide in access. Within this research, education level is commonly used as an indicator (e.g., Ono and Zavodny, 2007; Talukdar & Gauri, 2011; Wei & Hindman, 2011). In addition, because of

small sample sizes, I could not examine other racial and ethnic groups. A recent report shows that Asian American's Internet access is comparable to Whites (National Telecommunications and Information Administration, 2013). Future research may examine gender patterns among other racial and ethnic groups. I also could not examine more deeply other features of "race" beyond just the simplified categorization available in the survey. Features such as skin color (Bonilla-Silva, 2004) are an additional axis by which racial and ethnic groups stratify. It would be illuminating to know whether the impact of such features bleed into the digital divide.

Some avenues of future research are necessary to address additional limitations of this research. The cross-sectional nature of these data limits the ability to understand why divides are disappearing or remaining, which is useful for informing policy design. The fact that Black men experienced the largest increase in Internet access, for example, may be due to the high unemployment rates among this subgroup during the time period examined (Kuehn, 2013). The Internet is increasingly being used to match employers with employees (Beard, Ford, Saba, & Seals, 2012; Fountain, 2005). It may be that the high rates of unemployment among Black men may be motivating them to gain Internet access to search for employment, but I cannot determine with certainty using these cross-sectional data. A similar problem limits the ability to understand why women report more Internet access than men. Other research finds that a country's gender gap in Internet access is strongly related to its broader patterns of gender inequality, such as the gap in wages between men and women (Ono & Zavodny, 2007). Consequently, merging in data that track changes in indicators of gender inequality may be informative.

Finally, the measures available in the HINTS survey years used do not allow me to deepen our understanding of how individuals are accessing the Internet, and how this may explain the observed patterns. A recent U.S. survey found that a greater proportion of Blacks and Latinos reported owning a smartphone than Whites (Smith, 2013), suggesting that perhaps smartphone adoption patterns may explain trends. Unfortunately, items asking how respondents accessed the Internet (e.g., via broadband connection, smartphone, and dial-up) were introduced in 2012 and are not available for 2007. Furthermore, neither survey year allows me to distinguish between public and private Internet access. Prior research suggested that Blacks are more likely to be familiar with public facilities that offer Internet access than Whites (Wilson et al., 2003). This information is essential to determine the efficacy of public facilities in narrowing gaps in Internet access.

## Conclusion

The increasing penetration of the Internet into daily lives has given rise to a research area dedicated to documenting trends in Internet access and use. As gaps in Internet access have narrowed, much of this research has focused on use and not access. However, I contend that a number of questions remain unanswered regarding who has Internet access. My analysis of recent data on U.S. adults reveals that women and Whites are the groups most likely to have Internet access. Black men were the least likely to report Internet access in 2007, but experienced the greatest increase in Internet access during 2007 to 2012. The changing nature and persistence of first-level digital divides have implications for a society increasingly relying on the Internet, which initiatives aimed at deploying educators for non- and new users of the Internet should consider (e.g., Dombrowski et al., 2014; Jaeger & Fleischmann, 2007; Smith & Eschenfelder, 2013). Taken together, this research underscores the need to bear in mind that we must not take for granted the most basic question of who has Internet access, even in the United States.

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