

Measuring the Gender Gap on the Internet¹

Bruce Bimber, *University of California, Santa Barbara*

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Objective. This paper evaluates differences in men's and women's presence on the Internet, testing for the presence of gender-specific causes for different rates of Internet use. *Methods.* The paper presents new survey data collected by the author in 1996, 1998, and 1999 showing trends in Internet use, and presents regression models of Internet access and use. *Results.* Two statistically significant gender gaps exist on the Internet: in access and in use. The access gap is not the product of gender-specific factors, but is explained by socioeconomic and other differences between men and women. The use gap is the result of both socioeconomics and some combination of underlying gender-specific phenomena. *Conclusions.* Around one-half of the "digital divide" between men and women on the Internet is fundamentally gender related. Several possible causes may explain this phenomenon.

The Internet has a reputation in some quarters for being biased toward the interests and styles of men. Speculative reasons for this reputation abound, including gender inequality in the professions and industries producing the technologies of the Internet, the commercial success of male-oriented pornography on the Internet, and even on-line sexual harassment that echoes behavior in male-dominated workplaces.

Survey data from a variety of sources are consistent with these anecdotal impressions. Virtually all surveys that have reported demographic data about Internet users in the U.S. show a central fact: *Somewhat fewer women than men use the Internet, and the gap appears larger where more intensive Internet use is concerned.* Figures from the A. C. Nielsen CommerceNet consortium are

typical for 1999. These show that among U.S. and Canadian users, 53% are men and 47%, women; among on-line shoppers, 62% are male and 38%, female; and among people who report having used the Internet in the last twenty-four hours for any purpose, 68% are male and 32%, female (CommerceNet, 1999). In the realm of political activity, the National Election Studies (NES) data show that visitors to campaign sites on the Web during the 1998 election season were 60% male and 40% female (NES, 1998).

One plausible explanation of this gender gap is that differences exist between men and women in socioeconomic status (SES). Education, income, and job status are associated with Internet use, so more men than women show up in the ranks of Internet users. On the other hand, a good deal has been written about gender and technology from the perspective of culture and identity studies, and much of this work suggests the Internet may have "gendered" attributes that favor men in some way, despite the growth of women's Web sites, chat rooms, and other resources. To the extent that such claims are true, gender-specific phenomena may contribute to the gender gap on the Internet.

Despite the burgeoning theoretical literature about technology, these possibilities have not been empirically tested in any detail. This paper explores that problem, addressing the following questions: What are the characteristics of the gap between men's and women's presence on the Internet, and to what extent is the gap gender-specific rather than the result of socioeconomic inequality?

To answer these questions, the paper presents the results of survey research conducted between 1996 and 1999. The surveys show that two gaps exist, one in access to the Internet, and one in use of the Internet among those men and women with access. The paper shows how the access gap is entirely the product of socioeconomic differences between men and women, while the use gap is the product of both socioeconomic differences and some combination of underlying, gender-specific effects.

Theory

The fact that surveys have found differences between men and women in Internet use is not in itself surprising. Many media exhibit patterns of use that differ between men and women. For instance, women watch more total hours of television than do men, but fewer hours of regular television news (Stanley and Niemi, 1998). Compared with men, women are less intensive consumers of news from many sources, especially newspapers and newsmagazines, yet are more

likely than men to watch a television news special or documentary (Bennett and Bennett, 1989; Stanley and Niemi, 1998). In the case of print media, about 45% of men and 40% of women report reading a newspaper daily, a modest but statistically significant gap (National Opinion Research Center, 1996). The audiences for talk radio and also for MTV are both 60% male and 40% female (Davis and Owen, 1998). In the realm of political communication, men are more likely than women to contact government officials in writing, by a gap of around 8% (Verba, Schlozman, and Brady, 1995).

The effects of socioeconomic differences between men and women are relevant to many of these media phenomena, but are especially important for gender patterns and the Internet, because Internet access and use are strongly correlated with SES. Figures from the 1998 National Election Studies, for instance, show that 70% of Americans with a college degree had access to the Internet that year, but just 20% of those with a high school diploma or less education had access (NES, 1998). Other forms of media, except for newspapers, typically do not exhibit such a strong, positive relationship with SES. Television watching, for instance, is actually negatively correlated (Stanley and Niemi, 1998).

Because gender inequalities persist in the US across education, income, and employment status, men's and women's presence on the Internet is surely influenced by SES to a larger degree than is the case for television or radio. About 74% of adult men not in school are employed, for example, compared with 53% of women (NES, 1998). Educational differences are much smaller, but contribute to the gap in SES: 27% of men and 23% of women over 25 years of age have college degrees (Census Bureau, 1999). These facts suggest that some or perhaps even all of the gender gap that has been reported on the Internet is simply an artifact of socioeconomic differences between men and women.

Alternatively, gender-specific phenomena may indeed be at work on the Internet. The general theory that the Internet is somehow "gendered" encompasses many possibilities. For instance, the Internet may appeal differentially to men and women because of stereotypes signaling that computer technology is more appropriately male than female (Janssen Reinen and Plomp, 1997; Fletcher-Flinn and Suddendorf, 1996; Sutton, 1991.) Some theorists argue that male values have been institutionalized in the technology through its creators, embedding a cultural association with masculine identity in the technology itself (Wajcman, 1991, 1995; Gill and Grint, 1995; Kramarae, 1988; Faulkner and Arnold, 1985; Cockburn, 1985). In the terminology of Green, Owen, and Pain (1993), the technology may be "gendered by design." A weaker variant of this

claim is that content on-line tends to favor male interests and styles, independently of any intrinsic properties of the underlying technology.

Another possible explanation of the Internet as "gendered" points to sex differences in cognition and communication. Sex differences have been shown in a number of areas potentially relevant to Internet use: in the structure of friendship, in social aggressiveness, and in expressiveness (Canary and Dindia, 1998); in speech patterns (Smythe and Meyer, 1994; Mulac et al., 1988); and in certain areas of cognition (MacIntyre, 1997; Feingold, 1996; Halpern, 1996). Some studies on computer use by children have reported sex differences in aptitude or skill (for reviews, see Shashaani, 1997; Sutton, 1991). Survey research has also suggested that men are more likely to enjoy searching for information of personal interest outside the requirements of work, and to feel more positive about Internet use in general (Ford and Miller, 1996). These various causal possibilities support the general hypothesis that the Internet has gender-relevant properties that are not simply artifacts of SES.

Method and Results

To evaluate SES and gender on-line, I rely on data sets collected in 1996, 1998, and 1999 through nationwide, random-digit-dial telephone surveys conducted through the Omnibus Survey Program at the University of Maryland's Survey Research Center. Each round of the survey returned a little over one thousand responses from adults around the U.S., for a combined N of 3032. The response rates were 65%, 55%, and 57%, respectively, for the three survey years. Poststratification weighting on sex, education, age, race, and region is employed, as is design-effect weighting that accounts for varying numbers of phone lines and adults in each household.

A good starting point for the analysis is Internet access, I measured access from any of the three major locations for entry—home, work, or school. Not surprisingly, the data show that both men and women have been gaining access to the Internet at a steady pace. Between 1996 and 1999, the fractions of men and women with access to the Internet have doubled, from about 25%-30% in 1996 to about 50%-60% in 1999. The data do show a gender difference. About 60% of men and 50% of women had access in 1999. In 1996 and 1998, the gap was about 5% and was not statistically significant, so the ten-point gap in 1999 represents an increase, and this gap reaches statistical significance (chi-square = 10.4, $p = .00$).

The picture can be developed further by considering how often men and women with access to the Internet actually use it. To measure use, I asked just those respondents who reported having access about their frequency of use on a 5-point scale, from daily to never. I find that gender patterns in Internet use vary substantially across different frequencies or levels of use. Setting aside the small and equal proportion of men and women who have Internet access but never use it, three distinct patterns are evident in the data, associated with frequent use, moderate use, and infrequent use.

I define frequent use of the Internet as simply daily use. While this definition does not capture differences between people who spend many hours per day on-line and those might take only minutes to send and receive a few electronic-mail messages, this definition appears to delimit an important boundary in gender patterns for the period 1996 to 1999. The data show that women are substantially less likely than men to be frequent users, and the gap between them reveals no sign of narrowing over the period measured in my surveys. In 1996, for instance, about 10% of women who had access to the Internet were frequent users, compared with about 17% of men. In 1999, 25% of women and 38% of men with access were frequent users. These gaps are statistically significant across the study period. There appears to be more to the matter of men's and women's unequal presence on-line than simply differential access.

At the other end of the spectrum from daily users are infrequent users, which I define as respondents with access to the Internet who use it *less than once per week*. In 1996, women were much more likely than men to be infrequent users, by a difference of 70% to 45%, but by 1999 the gap had closed. About 30% of both men and women with access were infrequent users.

The fact that by 1999 men were better represented than women among frequent users but equally represented among infrequent users suggests that women must outnumber men at some intermediate level of Internet use. The data show that this is precisely the case. I define moderate users as those using the Internet *less than once per day but at least once per week*. Women outnumber men in this intermediate category 40% to 28%, a statistically significant gap (chi-square = 9.5, $p = .00$) about the same size as the gap in frequent use, but in the opposite direction.

In 1996, men outnumbered women both as frequent users and as moderate users. In 1999, this was no longer the case; a shift in women's behavior occurred on-line, and this shift was concentrated at the ranks of moderate use. A number of surveys measuring gender presence on-line have reported an influx of women

over the last two years (Mediamark, 1999; CommerceNet, 1999). Either women going on-line recently are tending to be among the moderate users, or women on-line for several years have changed their habits, or both.

So, two statistically significant gaps of modest size exist on the Internet. The gap in access is about 10%, while the gap in use is around 12%-13%. To differentiate between SES and gender itself as contributors to these effects, I use logistic regression analysis of the 1999 data. I estimate models for Internet access, frequent use, and moderate use, because the bivariate trend data described above suggest that these are the most promising dependent variables for understanding gender. Included as independent variables in these models are standard measures of education and income, and a dichotomous variable for employment status that measures whether the respondent is employed full-time. Along with variables for age, race, and ethnicity, I also include a measure for marital status and for whether the respondent reports being a housekeeper.

The results of the models are presented in Table 1, The model for access to the Internet shows that education and income are predictive of access, as is age in the negative direction. Not surprisingly, housekeepers are less likely than nonhousekeepers to have Internet access. Marital status has a small effect, with marriage positively associated with access. Gender has a very weak, nonsignificant effect. When these other factors are accounted for, then, gender itself does not account for any of the difference between men's and women's access. Removing the variable for housekeeper status increases somewhat the coefficient for gender, but it remains statistically nonsignificant. With respect to access to the Internet, the hypothesis of gender-specific effects is not supported.

Table I
Logistic Regression Analysis of 1999 Internet Access and Use

	Access		Frequent Use		Moderate Use	
	B (std)	<i>p</i>	B (std)	<i>p</i>	B (std)	<i>p</i>
Education	0.29	0.00	0.11	0.02	0.08	0.11
Age	-0.27	0.00	0.06	0.28	-0.09	0.07
Income	0.26	0.00	0.06	0.28	-0.09	0.07
Sex	-0.02	0.61	-0.10	0.01	0.11	0.01
Latino	0.01	0.81	-0.12	0.05	0.02	0.64
Race	[n/a]	0.82	[n/a]	0.06	[n/a]	0.44

Black	-0.05	0.53	-0.07	0.53	-0.09	0.39
Asian or Other	-0.06	0.54	-0.25	0.06	0.16	0.21
Employed	-0.06	0.08	0.13	0.01	0.02	0.68
Married	0.07	0.05	0.01	0.82	-0.05	0.29
Housekeeper	-0.13	0.001	0.08	0.12	-0.003	0.96
Constant	-1.00	0.14	-1.29	0.11	-0.83	0.26
<i>N</i>	802	[n/a]	466	[n/a]	466	[n/a]
Model chi-square	251	.00	39	.00	19	.04

Notes: Coefficients are standardized.

The models for frequent use and moderate use are different. In the frequent use equation, education is again predictive, and so are race, ethnicity, and employment status. Whites are more likely than others to be frequent users, and Latinos less likely than non-Latinos. Here, age is not significant. Housekeeper status is also not predictive, interestingly enough. It comes as no surprise that being employed full-time is associated with frequent use. The survey questionnaire did not differentiate among employment classifications, but it is possible to examine whether, in the aggregate, men's jobs are different than women's with respect to frequent Internet use. I ran the model separately for men and women, and found that being employed fulltime is strongly associated with frequent Internet use for men, but has no relationship for women. On the whole, men's jobs appear to contribute to frequent Internet use, while women's do not.

Most important here, gender exerts a comparatively strong effect on frequent use. Women are indeed less likely than men to use the Internet frequently, when other factors such as employment rates and education are taken into account. The gender effect is even more striking in the model for moderate use, because sex is the only predictor of moderate Internet use to reach statistical significance. For patterns of Internet use, then, both socioeconomic and underlying gender mechanisms contribute to the gap.

It is possible to interpret the relative contribution of gender, because the standardized coefficients in the logit models scale the change in the dependent variables that is accounted for by change in each independent variable, measured in units of standard deviations. The standard deviation of the sex variable is .5, and of frequent use is .38. Since the standardized sex coefficient is -.11, being

female as opposed to male—where these are coded 0 and 1—therefore decreases the probability of Internet use by about 8%, independent of the effects of other variables. The results are similar for moderate use. Of the overall 13% gap between men and women as frequent users of the Internet, over half is produced by gender-related mechanisms, and the rest by other factors such as education and employment status.

Discussion

This analysis has shown that a gap in access to the Internet exists between men and women, but this gap is the product of socioeconomic and other factors, not gender itself. In the long run, it seems likely that this gap will narrow of its own accord, because educational and income differences between men and women are slowly shrinking. In this connection it is interesting to observe that slightly more women than men now complete college, positioning themselves better for participation in the information revolution (Census Bureau, 1999). Also, as the Internet itself expands and access becomes less expensive and less skill-intensive, socioeconomic status is growing less strongly correlated with Internet access.

On the other hand, gender effects in Internet use do exist. For some reason or combination of reasons that are gender specific, and that have yet to be explained, women are less intensive Internet users than men. The various accounts available from the literature on gender and technology suggest a wide range of promising, but challenging, avenues for further exploration. The reasons that women are less intensive Internet users may involve stereotyping, inherently "gendered" technology embodying male values, content that favors men, sex differences in cognition or communication, or other factors—in addition to socioeconomics. These effects are undoubtedly interactive, and will not be easily disentangled. Underlying differences in communication styles, for instance, may contribute to stereotypes about the Internet, which in turn affect the production and marketing

Web content and services, which might then reinforce stereotypes. There is good reason to expect that some of the factors contributing to the current gender gap may change over time, especially the effects of content and stereotypes, and so the gender gap in use may well narrow as a result. So far, though, the Internet is revealing gender differences that are at least as substantial, if not more so, as those involving other media.

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¹ Direct all correspondence to Bruce Bimber, Department of Political Science, University of California, Santa Barbara, CA 93106 (tel: 805-893-3860; e-mail: bimber@polsci.ucsb.edu). For purposes of replication, the data are available from the author. This work was supported by grants from the National Science Foundation and the Regents of the University of California.