Social Connectivity in America:

Changes in Adult Friendship Network Size from 2002 to 2007[1]

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Abstract

There is some panic in the United States about a possible decline in social connectivity. We use two American national surveys to analyze how changes in the number of friends are related to changes in Internet use. We find that friendships continue to be abundant among adult Americans between the ages of 25 to 74 and to have grown from 2002 to 2007. This trend is similar among Internet non-users, light users, moderate users, and heavy users – and across communication contexts: offline, virtual only, and migrating from online to offline. Heavy users are particularly active, having the most friends both on- and off-line. Intracohort change consistently outweighs cohort replacement in overall growth in friendship.

Social Connectivity in America: Changes in Adult Friendship Network Size from 2002 to 2007

Americans are in a panic that social connectivity has drastically declined in the United States. Even as most Americans increasingly use the Internet to connect with others, the media, the public, and even some scholars blame it for pulling Americans away from friends, neighbors and civic involvement. Although some limited evidence has fueled this tizzy, it has mostly been a media panic as scholars have repeatedly shown that the Internet and social relationships are intertwined. Yet, the Internet – and Americans' use of it—is changing rapidly in the first decade of the 21st century. We believe that our research sheds light on how social connectivity is changing with it. We use evidence from two American national surveys of adults to consider:

Has the number of friends changed in this decade?

Is the extent of Internet use associated with the extent of these friendships?

The Recurrent Panic about Social Isolation in America

Has Social Connectivity Declined? A Perennial Question

Panic about the decline of social connectivity is an old story. Different commentators have offered different reasons, ranging from industrialization, capitalism, socialism, urbanization, bureaucratization to feminism (see reviews in Chua, Madej, & Wellman, 2009; Wellman, 2001b). Some have blamed technology, especially since the invention and diffusion of trains, cars, telephones, radios and televisions (e.g., Berger, 1979; Cowan, 1999; Fischer, 1982; Marvin, 1988; Marx, 1964; Wellman & Leighton, 1979). For example, Putnam (2000) looked back nostalgically from the 1990s to the 1960s and argued that Americans were "bowling alone," as television watching was keeping people from community involvement. Likewise, in the 1960s, Stein (1960) and Nisbet (1962) looked back at the 1930s and mourned the decline of

social connectivity. Yet in the 1930s, Wirth (1938) looked back to pre-urban America and worried about the loss of social connectivity in transitory urban life.

More recently, McPherson, Smith-Lovin and Brashears (2006) used the U.S. General Social Survey data to warn, yet again, about the loss of social connectivity, as they showed that the average number of people with whom adult Americans discussed "important matters" decreased 28% in two decades: from 2.9 in 1985 to 2.1 in 2004. In addition, they reported that Americans' close confidants shifted away from friends and neighbors towards close kin and spouses, and that the percentage of the sample who reported having a friend as their confidant had decreased from 73% to 51%.

Although the authors were cautious in reporting a significant downward change (c.f., Fischer, 2009; McPherson, Smith-Lovin, & Brashears, 2009), release of their findings nonetheless led to the return of yet another media panic over the quality of people's personal and communal life. Within days of the article's appearance, a *Washington Post* columnist asserted: "By some reckoning, social isolation is as big a risk factor for premature death as smoking," and blamed it on the Internet (Mallaby, 2006).

Despite these contentions, there has been continuing survey and ethnographic evidence of the abundance of supportive ties with friends and neighbors (e.g., Fischer, 1982; Gans, 1962, 1967; Wellman, 1979; see review in Wellman, 2001b). In this vein, Spencer and Pahl's British study (2006) argues against the pessimistic view of a society made of isolated, self-absorbed individuals. The authors conclude that friendship still functions as social glue of contemporary Western societies through various forms of "personal communities" that are often invisible and unconscious to many.

What has the Internet done to Social Connectivity?

In the past decade, the Internet has become the hot topic in the debate about social isolation and connectivity in America. It started in 1998 when Kraut and colleagues asserted an "Internet paradox," claiming a decline in social involvement and an increase in loneliness and depression among a group of Internet newbies. When *The New York Times* made this front page news (Harmon, 1998), the media panic was on. Nie and associates (e.g., Nie & Hillygus, 2002) also used the time diaries of Internet users to support the disconnection claim. Yet both studies looked only at newbies coming to grips with computers.

The 2006 McPherson, Smith-Lovin and Brashears article rekindled the media panic. Several pundits accused Internet use of producing a closed generation of social isolates who are only comfortable in front of computer screens (e.g., Cornish, 2006; Fountain, 2006; Vedantam, 2006). In his World Communications Day message, Pope Benedict XVI (2009) recognized the power and value of the Internet for spreading information, but warned that people need to get away from their computers and meet people in-person. British media commentator Sigman (2009) went further, arguing that because individuals were staying indoors while online they were not encountering a wide range of people in person, and that this lack of diverse contact could compromise immune function, increasing morbidity and mortality.

Although these negative assertions were widely publicized, there is abundant, consistent and systematic evidence showing a *positive* association between Internet use and contact with friends. To their credit, Kraut and associates (2002) later retracted their original contention of social isolation as onetime newbies became more comfortable with computer use and more engaged in the rapidly evolving Internet. Concomitantly, a variety of studies – from U.S. national surveys to in-depth case studies – have shown that the addition of the Internet and mobile phone communication to traditional face-to-face and phone contact means that there is more overall

communication between friends and relatives now than before the coming of the Internet. This appears to be because computer-mediated communication has become cheaper, quicker and much more efficient than visiting, telephoning, or writing letters the old fashioned pen-to-paper way (Boase, Horrigan, Wellman, & Rainie, 2006; Chen, Boase, & Wellman, 2002; Collins & Wellman, 2009; Katz & Rice, 2002; Quan-Haase & Wellman, 2002; Stern, 2008). Studies have shown:

(a) For most Americans, the time they spend with friends since they started using the Internet has, at a minimum, remained the same: some report an increase; only a few report a decrease (Center for the Digital Future, 2008; Katz & Aspden, 1997).

(b) The more people use the Internet, the more social contact they have with their friends (Cole & Robinson, 2002; Howard, Rainie, & Jones, 2002; Kraut, et al., 2002; Quan-Haase, et al., 2002; Shklovski, Kiesler, & Kraut, 2006; Shklovski, Kraut, & Rainie, 2004).

(c) Rather than replacing in-person and telephone connectivity, the Internet adds to it by developing and maintaining ties between meetings, both local and long-distance (Baym, Zhang, & Lin, 2004; Boase, et al., 2006; Carrasco, Hogan, Wellman, & Miller, 2008; Cummings, Lee, & Kraut, 2006; Hampton & Wellman, 2003; Mok, Wellman, & Carrasco, 2009; Quan-Haase, et al., 2002; Shklovski, Kraut, & Cummings, 2008).

(d) The Internet provides opportunities for forming and developing new friendships which usually continue in-person and by telephone (Bargh & McKenna, 2004; Di Gennaro & Dutton, 2007; Parks & Floyd, 1996; Rice, Sheperd, Dutton, & Katz, 2007).

(e) Internet users may have more friends than non-users. For example, a 2004 Pew survey about Americans' socially-close ties with friends and relatives showed that Internet users had a median of 37 in their networks as compared with 30 for the non-users, and the number of

Americans relying on the Internet for major life decisions had increased by one-third since 2002 (Boase, et al., 2006).

How have Internet Use and Friendship Changed in this Decade?

The saying, "an Internet year is like a dog year," highlights the fast pace of Internet development. For example, in 2000, 67% of Americans had Internet access, but only 16% were broadband users. By 2008, 80% of Americans were Internet users, while 69% were broadband users (Center for the Digital Future, 2009). Broadband has brought more than speed. It has allowed people to leave their computers on all day instead of intermittently dialing up – affording the opportunity for spontaneous communication. It has fostered the development of Web 2.0, where people can communicate collaboratively via the Internet, and the explosive growth of social networking sites such as MySpace and Facebook (Jones & Fox, 2009). These changes in the Internet may have affected friendship. Perhaps for the worse: they may be giving more reason to stay online and avoid contact with friends. Perhaps for the better: they may be providing more ways to contact existing friends, make new friends, and strengthen ties.

Building on Existing Studies

We build on the aforementioned studies on the Internet, friendship, and social connectivity in five ways:

First, assertions about the decline of friendship and social connectivity have either been free of data (exhibiting a Colbertian "truthiness"), looked only at extremely close ties, looked at earlier Internet eras, or focused on atypical newbies. By contrast, we study a large sample of adult Internet users and a much broader set of social ties.

Second, with rare exceptions, most of these studies are based on data from cross-sectional surveys that interviewed participants at only one time. Therefore, researchers have not been able to detect changes over time in friendship networks and relate that to changes in Internet use or to

other factors. In this study, we compare 2002 and 2007, a time span when Internet use expanded and diversified.

Third, few studies focus on the size of social networks. Even when they do, friends are often bundled together with other types of interpersonal relationships such as kin. We focus specifically on changes in the size of friendship networks, as friendship is more likely to be sensitive to social changes.

Fourth, most studies have simply compared all Internet users with non-users. Yet, Internet use has expanded to the great majority of American adults. Hence, we make comparisons based on the extent of Internet use, and we do not assume a linear association between Internet use and the number of friends.

Fifth, we assess the extent to which changes in the number of friends are due to changes within the cohorts or to population turnover.

To address these matters, we pose the following research questions:

RQ1: Are there *differences* in friendship network size among the groups of Internet non-users, light users, moderate users, and heavy users in 2002 and 2007?

RQ2: Are there *changes* in friendship network size *over time* overall and within the groups of Internet non-users, light users, moderate users, and heavy users respectively?

RQ3: Are the changes in friendship network size over time *different* across the groups of Internet non-users, light users, moderate users, and heavy users?

RQ4: How much of the overtime changes in the number of friends can be *attributed to* intracohort change and how much to cohort replacement?

Methods

The Data

Since 2000, the Center for the Digital Future (http://www.digitalcenter.org/) at the Annenberg School for Communication, University of Southern California has led the World Internet Project, working with 26 international partners to study social involvement with the Internet. Its flagship project in the U.S. is an annual survey of over 2,000 households. The original sample and the replacement samples in subsequent years use a national random digit dial (RDD) telephone sample using an equal probability selection method. The final sample for each year derives from both the ongoing panel and a new RDD replacement sample. Starting in 2007, the survey respondents were first contacted via telephone using the same protocol as in previous years, but Internet users were given the option to complete the study either by telephone or an identical web survey. As no record is available as to which method was used for specific interviews, we could not compare the two means of acquiring information.

For the purpose of our analysis, we selected datasets from 2002 and 2007 when identical friendship network questions were asked. We restricted our samples to be the unweighted RDD subsets from adult respondents between the ages of 25 to 74. We excluded respondents aged 12 to 24 and 75 or older because the structures and practices of teen friendships could be drastically different from adults and other age groups in the sample were disproportionately too large or too small compared to the population. The respondents in our samples were somewhat more likely to be women, older, and better educated than what the 2000 U.S. Census shows for this age range (Table 1). Therefore, these three key sociodemographic variables (gender, age and education) were used as control variables in data analysis whenever possible. Because we analyzed separate RDD samples in 2002 and 2007, it is unlikely that our samples contain the same individuals. Hence, our goal is not to make causal inferences, but rather to look at changes in the number of friends over time.

> Table 1 about here <

Key Variables

***Independent Variables*:** According to the Center for the Digital Future (2009), on average, Internet users spent 1.6 hours per day in 2002 and 2.2 hours per day in 2007. To enrich our examination about the association between Internet use and number of friends, we divided our respondents into four groups: non-users, light users, moderate users, and heavy users, rather than a simple binary categorization. "Light users" reported spending an average of one hour or less per day on the Internet; "moderate users" reported spending an average of one to three hours per day on the Internet; and "heavy users" reported spending an average of more than three hours per day on the Internet (Table 1). Not surprisingly, the percentage of Internet non-users declined by one-third between 2002 and 2007, from 35% to 23%, while the percentage of heavy users more than doubled, from 10% to 21%.

Dependent Variables: To address our research questions, we focus on three questions about how the size of three types of friendship is each associated with Internet use:

Offline Friendship: "How many friends outside of your household do you have that you see or speak to at least once a week?"

Virtual Friendship: "How many on-line friends do you have whom you have never met in person?"

Migratory Friendship: "How many friends, whom you originally met on-line, have you since met in person?"

We apply outlier controls to the size of all three types of friendships. For offline friendship network size, the maximum value is 76, as implemented in the original survey. For both virtual and migratory friendship network size, the maximum value is set as (Mean + 3SD).

We are aware that the use of the word "friend" expanded between 2002 and 2007 as MySpace grew popular. Yet Facebook had not yet proliferated, and MySpace was mostly for

teens and young adults then, rather than those aged 25-74 whom we have studied. Despite the reputation of MySpace for housing vast numbers of "friends," Thelwall's (2008) analysis of 20,000 MySpace user profiles found they contained only limited numbers (2-9) of close friends.

Analytical Procedures

We use four types of statistical analysis to answer our research questions about changes in adult friendship network size in America. First, we use multiple classification analysis (MCA) for group comparisons within each survey year. This allows us to detect non-linear relationships and present adjusted means that control for sociodemographic differences between groups (Andrews, Morgan, Sonquist, & Klem, 1973). Percentage changes in adjusted means from 2002 to 2007 are also calculated to examine the differences for each group over time.

Second, we use independent sample *t*-tests to examine differences in friendship network size between 2002 and 2007. This enables us to reveal the magnitude of changes over time at the group level and combined.

Third, to compare overtime changes across groups, we follow the changing-effect model (Firebaugh, 1997, 2008) by running a series of multiple regressions and investigating the significance of interaction effects of individual groups and survey year. For example, if the change in offline friendship network size among non-users from 2002 to 2007 is drastically different from the change among heavy users, we would expect to see a significant interaction effect there. On the other hand, if the slopes of individual groups are parallel and the interaction effects are not significant, that means the changes are consistent across groups.

Fourth, we used a linear decomposition method developed by Firebaugh (1997, 2008) to partition total change in friendship network size between 2002 and 2007 due to intracohort change and to cohort replacement. By intracohort change, we mean aggregated individual change within each age cohort. By cohort replacement, we mean the change in composition of the cohort

as a result of population turnover: the entry in 2007 of those too young to be in the sample in 2002 and the omission in 2007 of people who were eligible in 2002 but were over 74 in 2007 – with possible consequences for differences in Internet use and the number of friends.

This linear decomposition method requires only three continuous variables: two independent variables – survey year and birth cohort – and a dependent variable. In our case, the survey year is either 2002 or 2007; birth cohort, defined as the respondent's birth year and calculated by survey year minus age, ranges from the oldest cohort born in 1928 to the youngest born in 1982; and the dependent variable is friendship network size. The dependent variable y is regressed on survey year x_1 and birth cohort x_2. With the first survey year and the oldest cohort recoded as zero, the standardized regression coefficient β_1 represents the average within-cohort change per year, and β_2 represents the average cross-cohort change. To calculate the contribution of intracohort change, β_1 is weighted by the number of years between two surveys. To calculate the contribution of cohort replacement, β_2 is weighted by the difference between the means of birth years between two surveys. The total change in dependent variable as predicted by the linear decomposition method is the sum of the contributions of both intracohort change and cohort replacement.

Results

Descriptive Results

Offline Friendships: While McPherson, Smith-Lovin and Brashears (2006) found that 23% of American adults did not have anyone available to discuss important matters, our less restrictive survey question shows that only 5% of American adults did not have any friends whom they saw or spoke with at least weekly in 2002 and 2007 (Table 2).

> Table 2 about here <

While the average mean size of friendships has grown, the median size of friendships (a) stayed about the same between 2002 and 2007, and (b) is about the same for different levels of Internet use (and non-use) in both years (Table 2). The median number of friends is either 5 or 6 (except for heavy users in 2002, when it is 7). In all comparisons, the average (mean) is substantial higher than the median. This means that the upper tails of the distributions are consistently larger: what statisticians call a positive skew (Figure 1).

> Figure 1 box plots about here <

What is going on? The average number of friends contacted face-to-face and by phone was substantial early in the decade and continued to be substantial. Rather than the number of friendships declining, they increased on average between 2002 and 2007, and increased the most for heavy Internet users. But the positive skew indicates a complex pattern. The discrepancy between the mean and the median shows that a substantial minority of Americans have had weekly contact with a sizeable number of friends, this large number grew larger in the five-year period of 2002 to 2007, and it grew especially larger for Internet users.

Virtual Friendships: Since the dawn of Internet time, scholars have wondered about people having a second life online in "cyberspace", independent of the people they deal with in-person, supplemented by the telephone (Gibson, 1984; Turkle, 1984, 1995). Yet, despite the lure of the Internet, our analyses show that only over one-fifth of all Internet users report having one or more virtual friends existing only online. Higher levels of Internet use are associated with a higher number of virtual friends. When people do have virtual friends, they tend to have quite a few: there is a positive skew of the means from the medians that is similar to that observed in the changes over time in offline friendships (Table 3; Figure 2).

> Table 3 about here <

Migratory friendships: Just as many friendships expand their contact from offline encounters to include online contact, some relationships that begin online expand to include face-to-face encounters. For example, Kendall (2002) showed such contacts among the members of a men's chat group and Bastani (2000) showed how members of an Arab women's support group in America often traveled to meet their online "sisters." Our analyses suggest that such migratory friendships are even less common than having virtual friends. But when people do have such migratory friends, they often have more than one such a friend. Heavy users are the most apt to have more migratory friends (Table 3).

Group Comparisons

We used MCA for group comparisons in 2002 and 2007. In both years, there is a non-linear relationship between Internet use and the size of offline friendship network. After controlling for sociodemographic variations between groups, the adjusted mean is highest among light users (10.4), followed by heavy users (9.5) moderate users (8.8) and non-users (8.7) in 2002. In 2007, the adjusted mean is highest among heavy users (13.1), followed by light users (12.3), moderate users (10.9), with non-users behind (9.1). The percentage changes between two survey years indicate that heavy users have the largest increase (38%), then moderate users (24%), light users (18%), and the smallest among non-users (4.6%; Figure 2). However, almost none of the user groups are significantly different from the non-user group. The only exception is that heavy users have many more offline friends than non-users in 2007 (Table 4). To double check these findings, additional MCA analyses were carried out to rotate the reference group. They do not show any significant differences between the three user groups in either 2002 or 2007.

> Figure 2 and Table 4 about here <

The same analytical procedure was also applied to virtual and migratory friendships. Results of MCA analyses rotating reference groups suggest that in both survey years: heavy users consistently have more virtual friends and migratory friends than light and moderate users (Table 5). Among other group comparisons, only moderate users have significantly more virtual friends than light users in 2002.

> Table 5 about here <

Change Over Time

Independent sample *t*-tests show that, overall, the mean number of friends increased significantly from 2002 to 2007. This increase is significant for all three types of friendships: offline, virtual, and migratory, but increases within each group are not statistically significant (Table 6).

> Table 6 about here <

Overtime Change across Groups

Growth in the number of offline friendships occurs among both non-users and users with all levels of Internet use. Multiple regressions do not show significant interaction effects, suggesting that the change in the number of offline friends between 2002 and 2007 among light users, moderate users, and heavy users do not differ significantly from the trend among non-users. When sociodemographic factors are included as covariates, the results remain essentially the same (Table 7). Additional regression analyses rotating the reference groups also do not show significant interaction effects for either offline, virtual and migratory friendships

> Table 7 about here <

Partitioning Change

Linear decomposition analyses indicate that intracohort change consistently outweighs the contribution of cohort replacement in overall changes in the mean number of friends – for all

three types of friendships (Table 8). For offline friendships, the survey year coefficient is positive, indicating an increase on average in the number of offline friends within cohorts per year. However, the birth cohort coefficient is negative, suggesting a decrease on average in the number of offline friends across cohorts and younger cohorts have fewer friends.

The situation is slightly different for the more Internet-oriented virtual and migratory friendships, where the entry/exit of younger/older users also accounts for some of the overall increase in the number of online friends. For virtual friendships, both the survey year coefficient and birth cohort coefficient are positive, indicating an increase on average in the number of virtual friends within cohorts per year as well as across cohorts. The total contribution of aggregated individual change accounts for 81% of the total change, and the cohort replacement accounts for 19% of the total change. A similar pattern appears for migratory friendships. The total contribution of aggregated individual change accounts for 82% of the total change, and the cohort replacement accounts for 18% of the total change.

> Table 8 about here <

Discussion

Summary of Main Findings

Friendship is alive and well – and living offline, online, and sometimes in-between.

1. Friendship is still abundant. In both 2002 and 2007, American adults on average have about 10 friends they meet or speak with at least weekly with a few additional virtual friends and migratory friends. Despite the scholarly cautions and media panics, our data suggest that almost everyone has social ties that they contact on a regular basis. People's friendship network sizes vary, depending on their Internet (non-)use. In general, Internet users do not have fewer offline friends than non-users, as the media panic-ers had feared. In fact, after controlling for sociodemographic differences, the adjusted means of user groups tend to be higher than the non-

user group, and heavy users even have significantly more offline friends than non-users in 2007 – with a percentage change of 38% versus 4.6%.

Meeting new friends online is not yet prevalent. Only 22% of Internet users report having virtual friends, and only 15% report having friends who migrated from online to offline contact. But when people do have friendships online, they usually have quite a few. Heavy Internet users are particularly active, having substantially more virtual and migratory friends in both survey years.

2. Friendships grew, 2002-2007. We believe that we are the first to use comparable datasets at different time periods to study changes in the number of adult friendships in association with Internet use. Our analyses show that the average (mean) number of friends consistently and substantially increased between 2002 and 2007 in all three communication contexts (offline, virtual, and migratory). This general trend of growth in friendship is statistically significant. Although the number of friends *within* each group also shows a consistent increase for all three types of friendship, none of those are statistically significant. Moreover, our data reveals a positive skew of means from medians over time, indicating a strong growth for those with more than the median number of friends, thus creating the mean-median discrepancy in the distributions even after outlier control.

***3. The trend is similar in all groups*.** Contradictory to what many have assumed, not only does the number of friends increase for all groups (non-, light, moderate, and heavy users) in five years, the upward trends across groups are not significantly different from each other. In other words, the growth in offline friendship for non-users is not faster or slower than any of the user groups. Likewise, the growth in online friendship for heavy, moderate or light users are not substantially different.

4. Intracohort change outweighs cohort replacement in overall growth in friendship. We believe that we are the first to use linear decomposition method to tease out aggregated individual change from the overall social change in the context of friendship communication. The consistent findings of intracohort change outweighing cohort replacement rule out a cohort effect as a dominant source of change in adult American friendship network size. It is not so much that heavier Internet users are becoming adults and having more friendships; it is more that there is an overall increase in both Internet use and friendship.

Changing Friendships: Changing Technologies, Social Structures, and Norms

Our analysis of changes in the number of adult American friendships suggests an overall expansion of social connectivity. The rising tide of the Internet raises many boats, for the Internet is pre-eminently a social medium. We discuss here three possible and interrelated explanations.

Changing Technologies: One of the greatest challenges of Internet research has to do with the moving target of rapid change (Lievrouw & Livingstone, 2002). In untangling the Internet paradox, Kraut and colleagues attributed the diminishing of initial negative social impact partly to newbies dealing with changing technologies (Kraut, et al., 1998). The Internet has dramatically proliferated in the number of users and applications, transforming from the early organization- and military-centered functions to the widespread use of social media services (e.g., boyd & Ellison, 2007; DiMaggio, et al., 2001; Donath, 2007; Jones & Fox, 2009). We believe that the growing number of friends in America is linked, in part, to the proliferation, popularity and penetration of social media, increasingly diversified Internet users, and ubiquitous mobile connections. These technological tools and features afford ample opportunities for fostering pre-existing ties and developing new ones (e.g., Bargh & McKenna, 2004; Boase &

Wellman, 2006; Herring, 2004; Rainie & Wellman, 2010; Walther, 2006; Wellman, Quan-Haase, Boase, Chen, Hampton, & Diaz de Isla, 2003).

Changing Social Structures: Social structure is shifting from people functioning in encompassing, densely-knit, bounded local groups in the traditional mass society to maneuvering in fragmented, sparsely-knit, permeable, and specialized networks in post-modern society or *network society* (Castells, 1996/2000; van Dijk, 2006; Wellman, 2001a). A particularly relevant concept here is *networked individualism*: the transformation of interpersonal social structures from door-to-door, place-to-place to person-to-person and, even more specialized, role-to-role relations (Wellman, 2001a, 2002; see also *network individualization,* van Dijk, 2006, 2008). This shift of emphasis on individual freedom and responsibility means that people can no longer rely on others to exchange messages on their behalf: personal computers and personal Internet accounts, together with mobile phones, hold greater importance for social connectivity than ever before, with many people interacting almost continuously. Although the individualized networking trend started before the Internet (Wellman, 2001a), "the developing personalization, portability, and ubiquitous connectivity of the Internet are facilitating more individual connectivity" (Wellman, 2004, p. 29).

Changing Norms: Does heavy Internet use cause more friendship, or does more friendship cause more Internet use? We suspect it is a reciprocal feedback process: Those with more friends use the Internet more to keep in contact; those with heavy Internet use develop more friendship. When early users found friends through the Internet more than a decade ago, it seemed novel, unusual and perhaps a bit risky (Katz & Apsden, 1997). But having hundreds of "friends" on one's Facebook profile has become so commonplace that the word may have expanded in meaning (Ellison, Steinfield, & Lampe, 2007; Tong, et al., 2008). Moreover, Internet use has become normalized, with more people spending more time engaging in various

activities via the Internet everyday and the boundaries between on- and off-line becoming ever blurring.

We believe that the nature of friendship networks will continue to evolve alongside with the Internet, the transformation of social structure, and the cultural norms around these increasingly mediated communication practices. As the Internet is being incorporated into people's everyday life and is becoming an indispensable aspect of their social spheres for many, we suggest that what appears as socially isolating from the view of traditional group-based analysis, can be fully social in the context of a *network* society (van Dijk, 2008). It is not that people are all becoming intimate strangers in the Internet era; it is that people's social connectivity is quantitatively – and probably qualitative – *different* than before. Changing social connectivity is, after all, neither a dystopian loss nor a utopian gain, but an intricate, multi-faceted, fundamental social transformation (Wellman, 2001a, 2001b).

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Table 1. ***Sample Characteristics***

Study Year	**2002**	**2007**
Sample Size	501	677
Gender		
% Male	41	45
% Female	59	55
Age		
% 25-34	20	13
% 35-44	22	17
% 45-54	26	23
% 55-64	18	28
% 65-74	15	20
Education		
% Less than High School	12	3
% High School Diploma	25	25
% Some College	29	20
% 4-Year College or Beyond	34	52
Internet Use		
% Non-Users	35	23
% Light Users	35	27
% Moderate Users	21	30
% Heavy Users	10	21

Note. Total percentages may not add up to 100% due to rounding errors.

Table 2. ***Number of Offline Friends in 2002 and 2007 by Internet Use***

	2002				2007			
	M	***Median***	***SD***	**% with 1+ Friends**	***M***	***Median***	***SD***	**% with 1+ Friends**
Non-Users	9.5	5	13.29	92.4	10.2	5	14.89	96.8
Light Users	9.9	6	11.85	94.8	12.3	6	15.17	96.1
Moderate Users	8.5	6	10.91	98.0	10.5	5	13.68	96.5
Heavy Users	9.0	7	8.86	98.0	12.4	6	17.56	95.3
Overall	9.4	6	11.91	94.9	11.3	5	15.23	95.3

Table 3. ***Number of Online Friends in 2002 and 2007 by Internet Use***

	Among all Internet users						Among Internet users with 1+ such friends							
	2002			2007			2002				2007			
	M	*SD*	% with 1+ friends	*M*	*SD*	% with 1+ friends	*M*	*Media n*	*SD*	n	*M*	*Median*	*SD*	n
Virtual														
Light Users	0.8	3.02	12	1.3	8.76	13	6.8	5	5.88	21	10.2	3	22.78	22
Moderate Users	2.1	4.77	28	2.8	9.65	24	7.3	5	6.59	29	11.5	5	17.03	45
Heavy Users	4.1	6.90	45	8.7	2.64	35	9.0	5	7.92	22	24.8	6	40.02	46
Overall	1.7	4.51	22	3.9	16.04	23	7.7	5	6.80	72	16.7	5	30.02	113
Migratory														
Light Users	0.4	1.60	10	0.5	1.93	10	4.5	4	2.88	17	4.6	3	4.39	17
Moderate Users	0.8	2.10	21	1.4	4.00	23	3.7	2	3.25	22	5.9	3	6.62	43
Heavy Users	1.6	3.40	22	2.2	5.32	31	7.4	10	3.15	11	7.1	4	7.59	40
Overall	0.7	2.16	15	1.3	3.92	20	4.7	4	3.37	50	6.2	4	6.72	100

Table 4. ***Number of Offline Friends in 2002 and 2007 Adjusted by MCA, by Internet Use***

	Non-Users		*Light Users*				*Moderate Users*				*Heavy Users*			
Year	**Mean**	**Adj. Mean**	**Mean**	**Diff.**	**Adj. Mean**	**Adj. Diff.**	**Mean**	**Diff.**	**Adj. Mean**	**Adj. Diff.**	**Mean**	**Diff.**	**Adj. Mean**	**Adj. Diff.**
2002	9.5	8.7	9.9	0.4(n.s.)	10.4	1.7(n.s.)	8.5	-1.0(n.s.)	8.8	0.1(n.s.)	9.0	-0.5(n.s.)	9.5	0.8(n.s.)
2007	10.2	9.1	12.3	2.1(n.s.)	12.3	3.2(n.s.)	10.5	0.3(n.s.)	10.9	1.8(n.s.)	12.4	2.2(n.s.)	13.1	4.0*

Note. MCA controlled for age, gender, and education. *$p < .05$.

Table 5. ***Number of Online Friends in 2002 and 2007 Adjusted by MCA, by Internet Use***

	Heavy Users		***Moderate Users***				***Light Users***			
Year	**Mean**	**Adj. Mean**	**Mean**	**Diff.**	**Adj. Mean**	**Adj. Diff.**	**Mean**	**Diff.**	**Adj. Mean**	**Adj. Diff.**
Virtual										
2002	4.0	4.0	2.1	1.9*	2.1	1.9*	0.8	3.2***	0.9	3.1***
2007	8.7	8.1	2.8	5.9***	2.7	5.4**	1.3	7.4***	1.9	6.1**
Migratory										
2002	1.6	1.6	0.8	0.8*	0.8	0.8*	0.4	1.2**	0.5	1.1**
2007	2.2	2.1	1.4	0.8*	1.4	0.7*	0.5	1.7**	0.6	1.5**

Note. MCA controlled for age, gender, and education. *$p < .05$. **$p < .01$. ***$p < .001$.

Table 6. ***Independent Sample t-Tests on Friendship Network Size in 2002 and 2007***

	2002 Mean	2007 Mean	*t*	df	*p*
Offline					
All Respondents	9.4	11.3	-2.30	1088	.022*
Non-Users	9.5	10.2	-0.44	317	.661
Light Users	9.9	12.3	-1.57	322	.118
Moderate Users	8.5	10.5	-1.35	272	.177
Heavy Users	9.0	12.4	-1.66	174	.100
Virtual					
All Internet Users	1.7	3.9	-2.82	596	.005**
Light Users	0.8	1.3	-0.69	338	.489
Moderate Users	2.1	2.8	-0.72	288	.472
Heavy Users	4.0	8.7	-1.87	178	.063
Migratory					
All Internet Users	0.7	1.3	-2.50	789	.013*
Light Users	0.4	0.5	-0.08	341	.934
Moderate Users	0.8	1.4	-1.62	291	.107
Heavy Users	1.6	2.2	-0.70	178	.483

Note. *$p < .05$. **$p < .01$.

Table 7. ***Changing Effects of Internet Use on the Number of Offline Friends, 2002-2007***

Independent Variables	B	*p*	B	*p*
Intercept	9.50**	.002	6.70*	.015
Main effects				
Dummy Light User Group	0.40	.787	1.86	.231
Dummy Moderate User Group	-1.05	.544	0.51	.780
Dummy Heavy User Group	-0.48	.830	1.33	.565
Survey Year (2007 = 1)	0.69	.656	0.46	.769
Interaction effect				
Dummy Light User Group x Survey Year	1.70	.437	1.19	.583
Dummy Moderate User Group x Survey Year	1.34	.565	0.90	.697
Dummy Heavy User Group x Survey Year	2.63	.347	2.21	.426
Covariates				
Age			0.13***	.000
Gender (female = 1)			-1.75*	.040
Education			-0.54	.260

Note. N = 1,093 *$p < .05$. **$p < .01$. ***$p < .001$.

Table 8. ***Results of Linear Decomposition of Friendship Network Size from 2002 to 2007***

	β_1	Intracohort Change		β_2	Cohort Replacement		Total change
Offline friendship network size	0.07*	0.36	134%	-0.113***	-0.091	-34%	0.27
Virtual friendship network size	0.09*	0.43	81%	0.125***	0.101	19%	0.53
Migratory friendship network size	0.08*	0.41	82%	0.107**	0.086	18%	0.49

Note. *$p < .05$. ** $p < .01$. *** $p < .001$.

Figure 1. ***Box Plots of the Number of Offline Friendships by User Groups, 2002 and 2007***

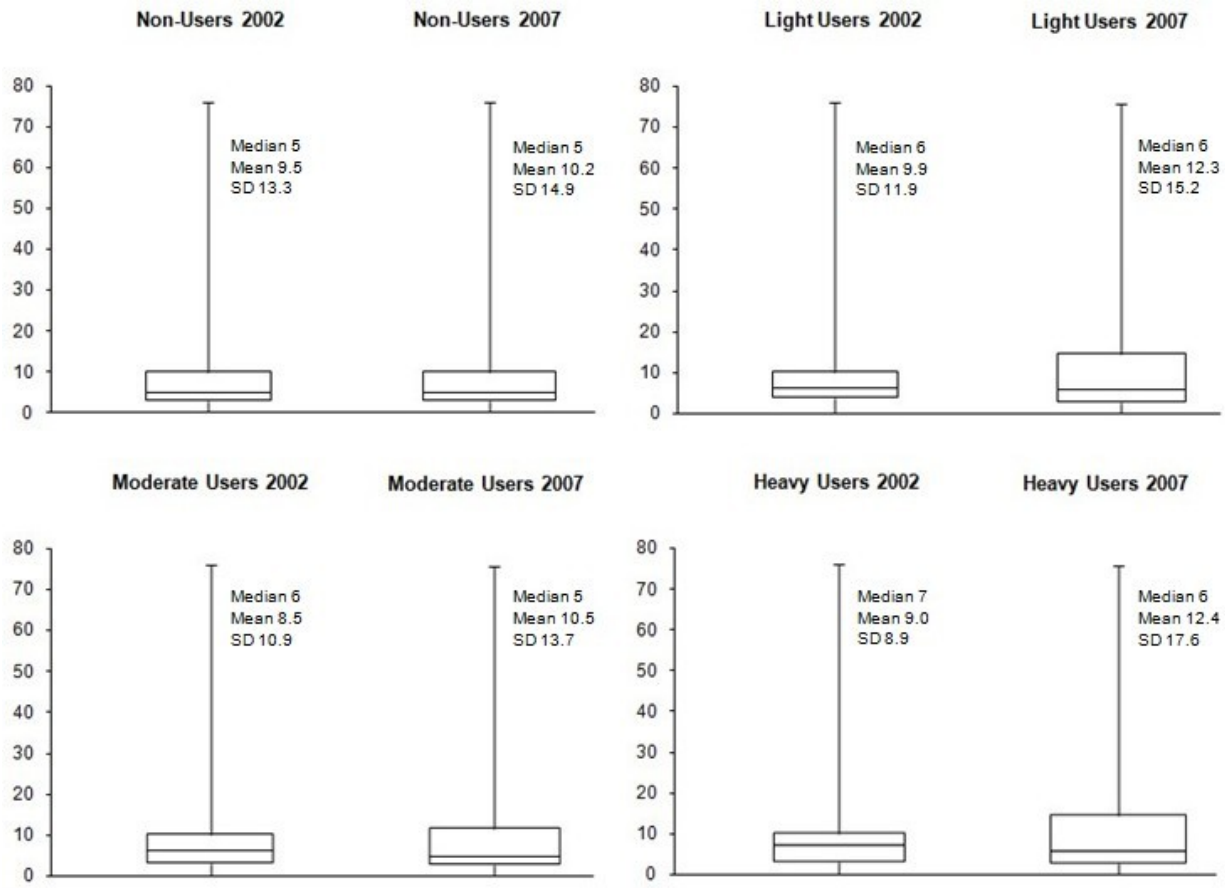

Figure 2. ***Change in Number of Offline Friends from 2002 to 2007***