Social Networks and Health Service Demand: Evidence from the U.S. and China

G. Nathan Dong*

Columbia University

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ABSTRACT

Amid increasing interest in how social relationships play an important role in health and health behavior, it remains unclear whether social interaction benefits health literacy and in turn affects individuals' healthcare consumption. More specifically, this article proposes a research hypothesis to address the question: Do individuals who are strongly tied to other individuals within the social networks become more health conscious or literate and hence use more health services? This paper extends prior research on social support, health literacy and healthcare utilization to investigate the relation between social interaction and health service demand. Using the Health Tracking Household Survey of the U.S., the paper provides cross-sectional evidence that people who actively helped their friends and relatives look for health information from a variety of sources including other friends in their social connections made more visits to hospitals, ERs, and doctor clinics. It also finds that people of younger age, male gender, having higher income, being married, white race, having longer working hours, owning a business, having more years of education, and having no insurance coverage tend to avoid seeking health services. The causal inference is drawn from a quasi-experimental design using the China Health and Nutrition Survey when social interaction was exogenously intensified in China when digital cellular phone service was first introduced to some but not all Chinese provinces.

Keywords: Social networks, health literacy, health service demand, healthcare utilization
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* Dept. of Health Policy & Management, Columbia University. 600 W 168th Street, New York, NY 10032. Tel: 212-342-0490. E-mail: gd2243@columbia.edu. We thank participants of the Health Literacy Research Conference (Institute of Medicine), Social Science & Medicine Conference on Equity, Governance and Social Impact (Singapore), Workshop on Networks in Trade and Finance (CIRANO) for comments. No potential conflict of interest relevant to this article was reported.

"What we eat, how we respond to stress, whether or not we smoke cigarettes, how much exercise we get, and the quality of our relationships and social support can be as powerful as drugs and surgery…. Often, even better."

--- Testimony before Senate Health Committee (2009), Dr. Dean Ornish, founder and president of Preventative Medicine Research Institute and professor of medicine at UC San Francisco

I. INTRODUCTION

While prior literature has examined the impact of social networks in the context of business trade (Rauch 2001), education (Sacerdote 2001), finance (Ljungqvist, Marston, and Wilhelm 2009), health (Smith and Christakis 2008), labor market (Montgomery 1991), management (Tsai and Ghoshal 1998), public policy (Aizer and Currie 2004), social decisions (Akerlof 1997), and sociology (Morgan and Sorensen 1999 and Cattell 2001), the study of how social networks affect the demand of healthcare service is new.[1] Social interactions can influence healthcare usage in different ways. A consumer's social connections can provide information on the institutional details of the health care system. These connections can reduce the search costs of locating an appropriate health care provider. Health information provided by a consumer's friends and relatives may alter the demand for services by affecting the perceived efficacy or desirability of the available services. This paper is to take a step further to study how a consumer demands health care services when she is socially active: whether an individual who helped her friends and relatives look for health information from a variety of sources including other friends in her social connections made more visits to healthcare providers. We believe this measure of social networks (rather than a simple measure of number of friends) reflects the "active" aspect of social connections. We use a sample of randomly selected households that answered survey questions about their social activities and healthcare utilization to assess the economic, demographic and personal factors that determine the healthcare consumption.

Social support, health literacy, and healthcare service utilization have attracted considerable attention amongst academics, politicians and the media recently. In part, this has reflected a desire to understand the economic and social factors behind health literacy that how consumers obtain, process, and understand health information, health service consumption behavior (Selden, Zorn, Ratzan, and Parker 2000 and Lee, Zrozullah, and Cho 2004), and the overall market failure in the healthcare sector due to imperfect information between informed

[1] Andersen (1995) is among the earliest theoretical studies to understand the potential connections between social networks and healthcare utilization.

healthcare providers and uninformed or less informed patients (Arrow 1963, Hurley 2000 and Kenkel 1990).[2] However, there is also a growing recognition of a considerable shift in decision-making power away from healthcare providers to consumers along with the movement in healthcare delivery and payment system toward managed care. In addition, recent economic recession and patient frustrations with healthcare service likely play a role in motivating consumers to more actively manage their healthcare demand. Given that the prior research only study the impact of social networks on health, health literacy, and health behavior, this article seeks to present a contribution by focusing on the relation between social networks and health service demand, and what other variables besides social networks determine a consumer's utilization of health services and what kind of health service. Such an update in the literature is critical to understanding how contributing factors of health service demand have changed over the past decade. We provide new evidence on quantitatively understanding how different aspects of personal characteristics, time and geographic locations influence individual decisions to use health service.

Several unique features of the data facilitate the current study. First, the survey includes important information on social activities and health service usage patterns, which enables us to study the link between social support and healthcare utilization. The survey also has detailed information on household demographics, such as age, race, gender, and number of family members. We can therefore distinguish how social networks and demographic background separately contribute to health service consumption. In addition, detailed labor market information, such as income, employment status, and entrepreneurial opportunities, provides additional controls on earning capacity and expectation of future income, which may influence the tendency to seek healthcare services. The findings reported in this paper can help policy makers to increase the effectiveness of public policies that aims at increasing utilization of healthcare[3] or businesses and entrepreneurs to target the underutilized groups or regions for health services by advertising on internet social media, local newspapers, or community groups.[4]

The remainder of the paper is organized as follows. Section II reviews the relevant prior research on social support, networks, health literacy, and health service utilization. Section III

[2] See also Cotton and Gupta (2004), Dwyer and Liu (2013), Roberts (1988), Rooks, Wiltshire, Elder, BeLue, and Gary (2012), and Suarez, Ramirez, Villarreal, Marti, McAlister, Talavera, Trapido, and Perez-Stable (2000).

[3] Newacheck, Hughes, and Stoddard (1996) provide empirical evidence that having a regular doctor visits increases access to primary care. Brashers, Goldsmith, and Heish (2002) discuss the importance of information management in coping with illness and illness-related uncertainty.

[4] Bernhardt (2006) discusses how commercial marketing can effectively reach the public and improve health.

presents the sample data, measurement choice, and empirical method. Section IV evaluates the results. Section V discusses the causality concern and proposes alternative specifications to address the endogeneity issue. Section VI concludes.

II. RELATED LITERATURE

Despite the abundance of papers on social networks, health and health behavior, prior literature investigating the relationship of social support, health literacy and healthcare demand is scarce, and little research has been done into the determinants of individuals' healthcare utilization. One thread of the literature studies the consequences of health literacy on health status and health service utilization: Baker, Parker, Williams, Clark, and Nurss (1997), Baker, Parker, Williams, and Clark (1998), Williams, Baker, Parker, Nurss (1998), and Parker, Baker, Williams, and Nurss (1995). These studies reveal no relation between health literacy and health care demand (regular source of care or physician visits), but significant relation between health literacy and hospitalization. However, the relationship varied by the research site and was statistically significant only among patients in one hospital. Weiss, Blanchard, McGee, Hart, Warren, Burgoon, and Smith (1994), Friedland (1998), and Scott, Gazmararian, Williams, and Baker (2002) provide inconsistent results on the relation between health literacy and health service utilization.

This paper is also closely related to another thread of literature on the consequences of social networks on health literacy. Individuals are social actors, residing in social environments that contain various degrees of support and resources. These studies attempt to understand the extent how low health literacy may affect individuals' health adversely. For example, when people encounter problems stemming from their health literacy deficiency, do they rely on social networks or resources for support (Kirsch, Jungeblat, Jenkins, and Kolstad 1993)?

The concept of social support or sharing resources by a network of individuals and social groups (Lepore, Evans, and Schneider, 1991), is far from new to researchers. People seek and receive assistance from other people as defined as the coping behavior (Antonucci, 2001, Cohen, Teresi, and Holmes, 1985, Krause, 1997, Ren, Skinner, Lee, and Kazis, 1999, Sherman, 2003, Turner and Lloyd, 1999). Literature on the direct impacts of social networks on health service demand is relatively new,[5] and partly derived from the literature of social networks and help-seeking in healthcare contexts. Although Tijhuis, Peters, and Foets (1990) do not find strong evidence that a

[5] See Antonucci, Ajrouch, and Janevic (2003), House, Landis, and Umberson (1988), Lin, Dean, and Ensel (1986), Penninx, Van Tilburg, Deeg, Kriegsman, Boeke, and Van Eijk (1997), and Unger, Johnson, and Marks (1997).

person's number of close friends will actually affect her willingness to seek help, Sherbourne (1988) suggest that some characteristics of social networks (number of connections) affect the likelihood of seeking professional help: individuals with more close friends are less likely to seek help from professional services. Mechanic (1982) and Ben-Sira (1984) show that people with more social support rely on their social network for support while those without strong social ties visit the doctor. Using a sample of Australian adolescents with psychological distress, Rickwood and Braithwaite (1994) report the association of availability of social support and help-seeking behavior. The more recent work of Deri (2005) examines the immigrants who use the Canadian health care system for the first time to provide evidence that consumers' behavior of using health care service is affected by the behavior of others around them, and the induced health service demand reflects consumers' initial contact with the health care system. However, it remains unclear to what extent these findings can be generalized to broader consumption decisions of health services (hospital admissions, emergency cares, and consultation with doctors), broader definition of illness (rather than mental illness), and broader populations who are not immigrants and do not have universal health care. We hypothesize that consumers who are strongly tied to other individuals become more health conscious or literate by learning from the process of helping their friends and relatives look for health information; as a consequence, they become more sensitive and knowledgeable about their own health problems and hence demand more healthcare services.[6] It is precisely this point, which has heretofore not been investigated, that we wish to address in this paper.

III. DATA AND METHODOLOGY

Analyzing the relation between social support and health service demand requires collecting data on individual social connections, demographic information, and healthcare service utilization. We use the Health Tracking Household Survey 2007 and 2010 which is a successor of the Community Tracking Study Household Survey. This US household-representative, cross-sectional survey of civilian and non-institutionalized individuals contains information on health insurance coverage, access to care, perceptions of care delivery and quality of care, use of health services, health status, consumer engagement, use of health care information, and demographic information. The survey was conducted by the Center for Studying Health System Changes via random-digit dialing

[6] Hendryx, Ahern, Lovrich and McCurdy (2002) provide some empirical evidence that people living in metropolitan areas report fewer problem accessing health care; however, a person living in a metropolitan area doesn't necessarily means she is strongly attached to other people in the social networks. It only suggests that local cities offers more convenient services than their countryside counterparts.

telephone surveys. We obtain the survey data and documentation from the Health and Medical Care Archives.[7]

To determine the extent to which social ties are influencing health service demand, we need to construct a variable that describes the strength of consumers' social interaction and support from their friends and relatives. The quantity characteristic of this variable should capture the fact that the more socially active they were with friends and relatives, the more civically involved they were, the greater their overall sense of connectiveness (Collins and Wellman 2010), the better health literacy or being more health conscious, and potentially the more utilization of healthcare services. The Section E (Quality of Care and Risk Behaviors) of the survey asks six questions: During the past 12 months, did you look for or get information about a health concern for another adult, such as a friend or family member, from: 1) the internet, 2) other friends or relatives, 3) TV or radio, 4) newspaper, books or magazines, 5) someone else other than doctor, health care professional, or health care organization, and 6) alternative sources. Based on the answers to these six survey questions, we create six dummy variables. There are five main dependent variables: ACIWEB, ACIFRN, ACITV, ACIHRDCY, ACIOTHR, and ACIALT. ACIWEB is a dummy variable with value one for an individual who looked for or got health information for her friends or family members from the internet and zero otherwise. ACIFRN is a dummy variable with value one for getting health information for her friends or family members from other friends or relatives and zero otherwise. ACITV is a dummy variable with value one for getting health information for her friends or family members from TV or radio and zero otherwise. ACIHRDCY is a dummy variable with value one for getting health information for her friends or family members from newspaper, books or magazines and zero otherwise. ACIOTHR is a dummy variable with value one for getting health information for her friends or family members from someone else other than doctor, health care professional, or health care organization and zero otherwise. ACIALT is a dummy variable with value one for getting health information for her friends or family members from alternative sources and zero otherwise.

The variable of interest in this article is SOCIALNET which is the sum of the aforementioned dummy variables. To control for household characteristics, we include other covariates like family income, family size, marriage status, ethnicity, age, gender, education, insurance coverage, geographic location, and whether owing a business. Specifically, the EDUCATION variable is calculated on a survey question in the Section A (Demographics and

[7] http://www.icpsr.umich.edu/HMCA

screening) of the survey which asks all persons 18 or older, or under 18 and are either the head of the household or spouse of the head of the household: What is the highest grade or year of school completed? The INSURANCE dummy variable is set to one if the family is covered by employment-sponsored, private purchased or military insurance, Medicare, Medicaid, or other public coverage and zero if not insured. Because family income might not be a perfect measure of household wealth and the survey didn't ask a specific question about wealth, we also consider whether the person owns a business or farm and the number of hours he worked per week at main job. It must be recognized that the data availability of household asset ownership and banking relation is limited (for example, data in terms of mortgage payment, bank account, or access to credit) and this inevitably restricts the variables that can be incorporated within the model. Finally, we break down the household locations to Northeast, Mideast, South and West, and whether living in a large metropolitan area with 200k population.[8]

To measure the health service demand, we construct the dependent variable as the number of visits to health service providers in the past 12 months. It is the sum of the following four different measures of healthcare visits provided by the survey: HSPSTYN (number of stays in any hospital overnight or longer), TOTERX (number of emergency room visits resulting in an admission to the hospital), DRVISNX (number of visits to see a doctor), and MPVISNX (number of visits to see a nurse practitioner or physician assistant). The detailed definition of each dependent and independent variable can be found in Table I.

[Insert Table I Here]

This paper focuses upon analyzing the determinants of healthcare demand by testing empirical models that relates health service utilization to social networks, income, employment, demographic information, and geographic locations. We pooled the two survey results from the Health Tracking Household Survey in 2007 and 2010 to perform cross-sectional analyses. We apply multivariate OLS, IV and median regressions to assess the relationship between health service utilization and social networks.

In the first set of analysis, we use OLS regression, and the dependent variable is the total number of visits to healthcare providers. The main predictor variables are social networks, income, marriage status, ethnicity, age, gender, insurance coverage, and working hours. Other model

[8] Based on 1992 MSA/PMSA boundaries and population.

covariates include family size, education, geographic location, whether living in a metropolitan area, and whether owing a business. We use two dependent variables to proxy for an individual's social networks. The first dependent variable is SOCIALNET which is the sum of six dummy variables ACIWEB, ACIFRND, ACITV, ACIHRDCY, ACIOTHR, and ACIALT. The second dependent variable is HELPFRIEND which equals to ACIFRND, a dummy variable with value one for getting health information for her friends or family members from other friends or relatives and zero otherwise.

It should be noted that an individual in the survey can choose to visit hospitals, ERs, and doctors at the same time. To avoid the double-counting problem in health service utilization, we estimate associations between different kinds of visits to health service providers and predictor variables in the second set of regressions. The dependent variables in this case are the number of visits to: 1) hospitals, 2) ERs, and 3) doctors. Similar to the first set of regressions, our variables of interest are SOCIALNET and HELPFRIEND.

As far as the explanatory variables are concerned, the economic approach to access healthcare implies that wealth is a major determinant of health service utilization. The main measure of wealth in this paper is income. On the one hand, wealth may be positively related to health service demand as better financial strength makes medical payments (out-of-pocket and co-pay) more sustainable; on the other hand, higher incomes along with better employment or entrepreneurial opportunities might also discourage time-consuming visits to healthcare providers, thereby having a negative impact on health service demand. A second potentially important factor is occupational status. The main measure of occupational status of an individual in this study is the number of hours that she works in a week. An individual with a full-time job might be expected to avoid unnecessary healthcare services, whereas an unemployed individual would have plenty of time to see doctor.

In addition, location information such as whether living in a large metropolitan area and one of the four US regions is included in the regression analysis. The empirical models incorporated variables representing demographic factors suggested by prior research: age, gender, ethnicity, family size, and education. In particular, age appears to be potentially of major significance on the basis of previous empirical evidence. Risk-taking activity might affect the use of healthcare services. The main variable of risk preference is whether an individual owns a business or a farm. Owning a business or a farm can be a good proxy for measuring the level of entrepreneurial activity of a household. It should be noted that the impact of education on

financing decision makings can be mixed. On one hand, a better educated individual might be less likely to see doctor due to better health literacy. On the other hand, she might be more likely to have health problem due to stress.

IV. RESULTS

The summary statistics for all variables are shown in Table II. The survey respondents claimed to visit healthcare providers on average 5 times with a minimum of zero and a minimum of 49 times each year. In addition, a majority of the visits were to doctors (4 times), followed by the visits to emergency rooms (0.4 times) and hospitals (0.2 times). Roughly 57% of the individuals in the sample helped their friends and relatively seek health information from a variety of sources including her other friends (24%), the Internet, TV, radio, newspaper, books, magazines, someone else other than doctor, health care professional or health care organization, and alternative sources. Although people only worked 17 hours per week, much less than a full-time job, 88% of them have health insurance coverage from either private or public insurers. These people are 44 years old on average, 73% of them are white, and 69% are married with an average family size of 2.6 members. More interestingly, 71% of the survey respondents are living in a metropolitan area, have 13.6 years of education, and almost 10% of them own a business.

[Insert Table II Here]

The Pearson's correlations are reported in Table III. An examination of the correlation matrix indicates that correlations between independent variables are generally smaller than 0.4. This low correlation among the covariates helps prevent the problem of multicollinearity that causes high standard errors and low significance levels when both variables are included in the same regression. Further diagnostics indicate no obvious evidence of serious multicollinearity among the covariates.

[Insert Table III Here]

Table IV provides the results of the coefficient estimates for the associations between health service demand and social networks using OLS regression. The variable of interest is an individual's demand for healthcare service which is measured by the number of visits that an

individual made to hospitals, ERs, and doctors. The dependent variable in specifications (1) to (4) is an individual's social networks (SOCIALNET) which is measured by whether she helped her friends and relatives seek health information from a variety of sources including from her other friends. As a robustness check, we use the dummy variable (HELPFRIEND) that is set to one if an individual helped seek health information only from her friends as the dependent variable in specifications (5) and (6).

[Insert Table IV Here]

In specifications (1) to (4), the variable of social networks (SOCIALNET) has significant positive coefficients, suggesting that individuals with more social connections or support consume more healthcare services, all else equal. We also observe that people having higher income, being married, of white ethnicity/race, having longer working hours, owning a business, having more years of education tend to avoid seeking health services, whereas those of older age, female gender, and having insurance coverage tend to use more health services. The significant effect of gender is not really surprising. It has been well documented in the social science literature that women are more likely to be affected by social interactions (Walen and Lachman 2000). Doyle (1983) suggests that women are more comfortable seeking help than men, and women are consequently more likely than men to be positively affected by social support.

It should be recognized that helping friends and relatives seek health information might not be a good proxy for an individual's social support. To address this concern, we construct a new dependent variable HELPFRIEND that specifically measures whether she helped look for health information for her friends from other friends, and re-do the OLS regressions. The coefficient estimates reported in specifications (5) and (6) are still positive that is consistent with the previous findings. More interestingly, the overall utilization of healthcare services is lower in 2010 than in 2007.

Whereas the above findings using total numbers of visits to healthcare providers were suggestive, they do not provide further information regarding what exact health service was used. Hence we run multivariate analysis for the number of visits to hospitals, ERs, and doctors separately. The coefficient estimates of these OLS regressions are given in Table V.

[Insert Table V Here]

The results are similar to the ones reported in Table IV except that gender becomes an insignificant predicting factor for healthcare utilization in four out of six specifications. In addition, we conduct median (50% quantile) regression to address the possible problem of outliers in our sample. The coefficient estimates reported in Table VII suggest that our previous results using OLS regressions hold in this median regression except that the coefficient estimates of income become insufficient in all specifications.

[Insert Table VI Here]

Overall, our cross-sectional evidence suggest a statistically significant association (and causality evidence from the IV regressions) between social networks and health service demand controlling for individual characteristics (income, ethnicity, marriage, age, gender, etc.), time (year of survey), and geographic locations (living in metropolitan areas and US regions).

V. ROBUSTNESS

It should be noted that the economic interpretation of statistical significance in correlations between social networks and health service demand deserves caution because the empirical results reported in the previous section could be driven by endogeneity concerns. Specifically, there might be significant omitted variable(s) correlated with individuals' social connections and their behavior of using healthcare providers driving our results spuriously. One possible omitted variable is the social skills: people who are good at or simply enjoy personal relationships might be more likely to be health conscious; hence using more health services. The important role of interpersonal communication as a source for communicating about illness, prevention and treatment to the consumers is well established in Brashers, Goldsmith, and Heish (2002) and Kreps and Thornton (1992), and Dutta-Bergman (2004).

To address the issues of endogeneity and omitted variable bias, we could use instrumental-variable (IV) estimation by identifying a set of measures (the instruments) that directly explain an individual's health service demand (the dependent variable) but only indirectly affect her social interactions (the independent variable) with other individuals. However ensuring the instruments not have a direct effect on the dependent variable is very difficult, and this makes an good instrumental variable hard to find. Alternatively we can use a quasi-experimental design to

estimate the impacts of a natural disaster, a government policy or an exogenous business event on health service demand. The idea is that there is a major unexpected change that affects social ties in the community. An example of such a quasi-experiment might be a new technology that brings people closer to each other. For example, China introduced GSM cellular phone service to several provinces in 1995 and GPRS cellular phone service, an upgrade over the basic features of GSM, in 2002. Prior research in communication, media and sociology has revealed the effects of cellular phone use on social connectedness (Geser 2005, Katriel 1999, and Wei and Lo 2006). Based on these studies we can infer that an immediate consequence of the construction of GSM/GPRS networks and the popularity of cellular phones in China was an overall tightening of social connections among residents in these provinces. Still, it would be difficult to attribute the change in health service demand in these provinces to the introduction of GSM/GPRS cellular phone service. This actually implies the satisfaction of the exclusion restrictions, meaning that an individual's demand for health care is not caused by this newly introduced communication technology directly, but rather by increased social connections with other individuals. Thus, we can treat the introduction and popularity of GSM/GPRS cellular phone service as a quasi-experiment and treat the change in social network intensity as exogenous.

In this paper we use a Difference-in-Difference (DiD) regression to exploit this quasi-experiment. The key assumption of this DiD regression is that the introduction and popularity of this new cellular phone service only affected the tightness of social networks of the residents in these provinces but not to the residents in other provinces that did not establish GSM/GPRS networks at that time. The provinces that introduced the GSM/GPRS networks is considered a "treatment" group and the provinces that did not introduce the networks is considered a "control" group. The observations for the control group are used to control for variations in the dependent variable that affect both the treatment and control groups.

Specifically, we consider the introduction of GSM network to three Chinese provinces in 1995 and GPRS network in 2002 as exogenous shocks, and employ a matched-sample DiD regression. Three Chinese provinces with the introduction of digital cellular service are defined as the treatment group, and three Chinese provinces without the introduction of new digital cellular phone networks are defined as the control group. The dummy variable CELLPHONE is set to one for the treatment group and zero otherwise. The dummy variable POST is set to one if the year is after the introduction of GSM/GPRS networks, and zero otherwise. A third dummy variable POST×CELLPHONE is the cross-product of the previous two dummy variables. The dependent

variable is the number of visits to medical service providers. We collect individual health care demand data from the China Health and Nutrition Survey (CHNS) in 1993, 1997, 2000 and 2004, and match individuals by identifying the severity of their injuries and their gender, age, income and whether they are living in urban or rural area. The results of DiD regressions are reported in Table VII.

[Insert Table VII Here]

Specification (1) in the table uses a Probit regression and Specification (2) uses a Logit regression. In both specifications, the residents in the provinces with the new GSM/GRPS cellular phone services demand less health care on average; however as the positive coefficient for the interaction term (POST×CELLPHONE) suggests, the demand for health care services increases dramatically after the introduction of this new communication technology in these provinces. This causal evidence confirms our previous findings that social networks play an important role in health care demand.

VI. CONCLUSION

Despite a large body of papers on social networks, health and health behavior, prior literature investigating the relationship between social support, health literacy and healthcare utilization is scarce, and little research has been done into the determinants of individuals' health service demand. This paper is to take a step further to study whether individuals who actively helped their friends and relatives look for health information from a variety of sources including other friends in their social connections used more health care services. We believe this measure of social networks (rather than a simple measure of number of friends) reflects the "active" aspect of social connections.

Using both panel data in the U.S. and longitudinal data in China, this paper provides strong cross-sectional and causal evidence that people who are socially "active" became more health-conscious or literate and hence use more health care services. The analysis using the U.S. dataset also finds that people of younger (age effect), male (gender effect), having higher income (wealth effect), being married (family effect), of white race (ethnicity effect), having longer working hours (time-availability effect), owning a business (risk-taking effect), having more years of education (literacy effect), and having no insurance coverage (disincentive effect) tend to avoid

seeking health services. The quasi-experimental study employing the Chinese dataset identifies an exogenous change in social connection intensity and provides strong causal evidence.

Social networks, health literacy, and healthcare service utilization have attracted considerable attention amongst academics, politicians and the media recently. In part, this has reflected a desire to understand the economic and social factors behind health literacy that how consumers obtain, process, and understand health information, health service consumption behavior, and the overall market failure in the healthcare sector due to imperfect information between informed healthcare providers and uninformed or less informed patients. However, there is also a growing recognition of a considerable shift in decision-making power away from healthcare providers to consumers along with the movement in healthcare delivery and payment system toward managed care. In addition, recent economic recession and patient frustrations with healthcare service likely play a role in motivating consumers to more actively manage their healthcare demand. Given that the prior research only study the impact of social networks on health, health literacy, and health behavior, this article seeks to present a contribution by focusing on the relation between social networks and health service demand, and what other variables besides social networks determine a consumer's utilization of health services and what kind of health service. Such an update in the literature is critical to understanding how contributing factors of health service demand have changed over the past decade. We provide new evidence on quantitatively understanding how different aspects of personal characteristics, time and geographic locations influence individual decisions to use health service.

These findings can help policy makers to increase the effectiveness of public policies that aims at increasing utilization of healthcare or businesses and entrepreneurs to target the underutilized groups or regions for health services by advertising on internet social media, local newspapers, or community groups.

REFERENCE

Aizer, Anna and Janet Currie, 2004, Networks or Neighborhoods? Correlations in The Use of Publicly-funded Maternity Care in California, *Journal of Public Economics* 88, 2573–2585.

Akerlof, George, 1997, Social Distance and Social Decisions, *Econometrica* 65, 1005–1027.

Andersen, Ronald, 1995, Revisiting the Behavioral Model and Access to Medical Care: Does it Matter?, *Journal of Health and Social Behavior* 36, 1–10.

Antonucci, T.C., 2001, Social Relations: An Examination of Social Networks, Social support, and Sense of Control, Handbook of the Psychology of Aging (5th ed., J.E. Birren, Ed.), 427–453, Academic Press, San Diego, CA.

Antonucci, T.C., K.J. Ajrouch, and M.R. Janevic, 2003, The Effect of Social Relations with Children on the Education-health Link in Men and Women Aged 40 and Over, *Social Science & Medicine* 56, 949–960.

Arrow, Kenneth, 1963, Uncertainty and the Welfare Economics of Medical Care, *American Economic Review* 53, 941–973.

Baker, D.W., R.M. Parker, M.V. Williams, W.S. Clark, and J. Nurss, 1997, The Relationship of Patient Reading Ability to Self-reported Health and Use of Health Services, *American Journal of Public Health* 87, 1027–1030.

Baker, D.W., R.M. Parker, M.V. Williams, and W.S. Clark, 1998, Health Literacy and The Risk of Hospital Admission, *Journal of General Internal Medicine* 13, 791–798.

Ben-Sira Z., 1984, Chronic Illness, Stress and Coping, *Social Science & Medicine* 18, 725–736.

Bernhardt, Jay, 2006, Improving Health through Health Marketing, *Preventing Chronic Disease* 3, 1–3.

Brashers, Dale, Daena Goldsmith, and Elaine Heish, 2002, Information Seeking and Avoiding in Health Contexts, *Human Communication Research* 28, 258–271.

Cattell, Vicky, 2001, Poor People, Poor Places, and Poor Health: the Mediating Role of Social Networks and Social Capital, *Social Science & Medicine* 52, 1501–1516.

Cohen, C.I., J. Teresi, and D. Holmes, 1985, Social Networks, Stress and Physical Health: A Longitudinal Study of An Inner-city Elderly Population, *Journal of Gerontology* 40, 478–486.

Collins, Jessica and Barry Wellman, 2010, Small Town in the Internet Society: Chapleau Is No Longer an Island, *American Behavioral Scientist* 53, 1344–1366.

Cotton, Shelia and Sipi Gupta, 2004, Characteristics of Online and Offline Health Information Seekers and Factors that Discriminate between Them, *Social Science and Medicine* 59, 1795–1806.

Deri, Catherine, 2005, Social Networks and Health Service Utilization, *Journal of Health Economics* 24, 1076–1107.

Doyle, James, 1983, The Male Experience, W.C. Brown Co. Publishers, Dubuque, IA.

Dwyer, Debra and Hong Liu, 2013, The Impact of Consumer Health Information on the Demand for Health Services, *Quarterly Review of Economics and Finance* 53, 1–11.

Friedland, R.B., 1998, Understanding Health Literacy: New Estimates of the Costs of Inadequate Health Literacy, National Academy on an Aging Society, Washington DC.

Geser, Hans, 2005, Towards a Sociological Theory of the Mobile Phone, E-Merging Media: Communication and The Media Economy of the Future, Eds. Zerdick, Picot, Schrape, Burgelman and Silverstone, Springer.

Hendryx, Michael, Mellissa Ahern, Nicholas Lovrich, and Arthur McCurdy, 2002, Access to Health Care and Community Social Capital, *Health Services Research* 37, 85–101.

House, J.S., K.R. Landis, and D. Umberson, 1988, Social Relationships and Health, *Science* 241, 540–545.

Hurley, Jeremiah 2000, An Overview of The Normative Economics of The Health Sector, *Handbook of Health Economics* 1 (Anthony Culyer and Joseph Newhouse, Eds), Part A, 55–118.

Katriel, Tamar, 1999, Rethinking the Terms of Social Interaction, *Research on Language and Social Interaction* 32, 95–101.

Kenkel, Don, 1990, Consumer Health Information and the Demand for Medical Care, *Review of Economics and Statistics* 72, 587–595.

Kirsch, I.S., A. Jungeblat, L. Jenkins, and A. Kolstad, 1993, Adult Literacy in America: A First Look at The Results of The National Adult Literacy Survey, National Center for Educational Statistics, US Department of Education, Washington, DC.

Krause, N., 1997, Anticipated Support, Received Support, and Economic Stress among Older Adults, *Journal of Gerontology: Series B* 52, 284–293.

Kreps, G.L. and B.C. Thornton, 1992, Health Communication: Theory and Practice, Waveland Press, Prospect Heights, IL.

Lee S.Y., A.M. Arozullah, and Y.I. Cho, 2004, Health Literacy, Social Support, and Health: A Research Agenda, *Social Science & Medicine* 58, 1309–1321.

Lepore, S.J., G.W. Evans, and M.L. Schneider, 1991, Dynamic Role of Social Support in The Links between Chronic Stress and Psychological Distress, *Journal of Personality and Social Psychology*, 61, 899–909.

Ljungqvist, Alexander, Felicia Marston, and William Wilhelm, 2009, Scaling the Hierarchy: How and Why Investment Banks Compete for Syndicate Co-management Appointments, *Review of Financial Studies* 22, 3977–4007.

Lin, N., A. Dean, and W.M. Ensel, 1986, Social Support, Life Events, and Depression, Academic Press, Orlando, FL.

Mechanic, D., 1982, The Epidemiology of Illness Behavior and Its Relationship to Physical and Psychological Distress, *Symptoms, Illness Behavior, and Help-Seeking* (Mechanic, Ed.), 1–24, Rutgers University Press, New Brunswick, NJ.

Mohan J. Dutta-Bergman, 2004, Primary Sources of Health Information: Comparisons in The Domain of Health Attitudes, Health Cognitions, and Health Behaviors, *Health Communication* 16, 273-288

Montgomery, James, 1991, Social Networks and Labor-Market Outcomes: Toward an Economic Analysis, *American Economic Review* 81, 1408–1418.

Morgan, Stephen and Aage Sorensen, 1999, Parental Networks, Social Closure, and Mathematics Learning: A Test of Coleman's Social Capital Explanation of School Effects, *American Sociological Review* 64, 661–681.

Newacheck, Paul, Dana Hughes, and Jeffrey Stoddard, 1996, Children's Access to Primary Care: Differences by Race, Income, and Insurance Status, *Pediatrics* 97, 26–32.

Parker, R.M., D.W. Baker, M.V. Williams, J.R. Nurss, 1995, The Test of Functional Health Literacy in Adults: A New Instrument for Measuring Patients' Literacy Skills, *Journal of General Internal Medicine* 10, 537–541.

Penninx, B.W.J.H., T. Van Tilburg, D.J.H. Deeg, D.M.W. Kriegsman, A.J.P. Boeke, and J.T.M. Van Eijk, 1997, Direct and Buffer Effects of Social Support and Personal Coping Resources in Individuals with Arthritis, *Social Science & Medicine* 44, 393–402.

Rauch, James, 2001, Business and Social Networks in International Trade, *Journal of Economic Literature* 39, 1177–1203.

Ren, X.S., K. Skinner, A. Lee, and L. Kazis, 1999, Social Support, Social Selection and Self-assessed Health Status: Results from The Veterans Health Study in The United States, *Social Science & Medicine* 48, 1721–1734.

Rickwood, D.J. and V.A. Braithwaite, 1994, Social-psychological Factors Affecting Help-seeking For Emotional Problems, *Social Science & Medicine* 39, 563–572.

Roberts, Susan, 1988, Social Support and Help Seeking: Review of Literature, *Advances in Nursing Science* 10, 1–11.

Rooks, Ronica, Jacqueline Wiltshire, Keith Elder, Rhonda BeLue, and Gary, 2012, Health Information Seeking and Use Outside of the Medical Encounter: Is It Associated with Race and Ethnicity?, *Social Science & Medicine* 74, 176–184.

Sacerdote, Bruce, 2001, Peer Effects with Random Assignment: Results for Dartmouth Roommates, *Quarterly Journal of Economics* 116, 681–704.

Scott, T., J.A. Gazmararian, M.V. Williams, and D.W. Baker, 2002, Health Literacy and Preventive Health Care Use among Medicare Enrollees in a Managed Care Organization, *Medical Care* 40, 395–404.

Selden, C.R., M. Zorn, S.C. Ratzan, and R.M. Parker, 2000, National Library of Medicine Current Bibliographies in Medicine: Health Literacy, NLM Pub. No. CBM 2000-1, National Institutes of Health, U.S. Department of Health and Human Services, Bethesda, MD.

Sherbourne, C.D., 1988, The Role of Social Support and Life Stress in Use of Mental Health Services, *Social Science & Medicine* 27, 1393-1400.

Sherman, A.M., 2003, Social Relations and Depressive Symptoms in Older Adults with Knee Osteoarthritis, *Social Science & Medicine* 56, 247–257.

Smith, Kristen and Nicholas Christakis, 2008, Social Networks and Health, *Annual Review of Sociology* 34, 405–429.

Suarez, Lucina, Amelie Ramirez, Roberto Villarreal, Jose Marti, Alfred McAlister, Gregory Talavera, Edward Trapido, and Eliseo Perez-Stable, 2000, Social Networks and Cancer Screening in Four U.S. Hispanic Groups, *American Journal of Preventive Medicine* 19, 47–52.

Tijhuis, M.A.R., L. Peters and M. Foets, 1990, An Orientation toward Help-seeking for Emotional Problems, *Social Science & Medicine* 31, 989–995.

Tsai, Wenpin and Sumantra Ghoshal, 1998, Social Capital and Value Creation: The Role of Intrafirm Networks, *Academy of Management Journal* 41, 464–476.

Turner, R.J. and D.A. Lloyd, 1999, The Stress Process and The Social Distribution of Depression, *Journal of Health & Social Behavior* 40, 374–404.

Unger, J.B., C.A. Johnson, and G. Marks, 1997, Functional Decline in The Elderly: Evidence for Direct and Stress-buffering Protective Effects of Social Interactions and Physical Activity, *Annals of Behavioral Medicine* 19, 152–160.

Walen, Heather and Margie Lachman, 2000, Social Support and Strain from Partner, Family, and Friends: Costs and Benefits for Men and Women in Adulthood, *Journal of Social and Personal Relationships* 17, 5–30.

Wei, Ran and Ven-Hwei Lo, Staying Connected While on the Move: Cell Phone Use and Social Connectedness, *New Media and Society* 8, 53–72.

Weiss, B.D., J.S. Blanchard, D.L. McGee, G. Hart, B. Warren, M. Burgoon, and K.J. Smith, 1994, Illiteracy among Medicaid Recipients and Its Relationship to Health Care Costs, *Journal of Health Care for the Poor and Underserved* 5, 99–111.

Williams, M.V., D.W. Baker, R.M. Parker, and J.R. Nurss, 1998, Relationship of Functional Health Literacy to Patient's Knowledge of Their Chronic Disease: A Study of Patients with Hypertension and Diabetes, *Archives of Internal Medicine* 158, 166–172.

Table I. Variable definitions

Variable Name	Type	Definition
VISITS	Scale	Total number of visits to hospitals, ERs, doctors and other health professionals.
HVISITS	Scale	Number of visits to hospitals.
ERVISITS	Scale	Number of visits to ERs.
DRVISITS	Scale	Number of visits to doctors.
SOCIALNET	Scale	Social networks is measured by the sum of six dummy variables that are set to one if the household get health information for his friends and relatives from internet, friends, TV/radio, books, and other sources.
HELPFRIEND	Dummy	1 for getting health information for his friends from other friends.
INCOME	Scale	Log income of family's total income from all sources, before taxes and other deductions.
WHITE	Dummy	1 for white, and 0 for other ethnic groups.
MARRIED	Dummy	1 for married family and 0 otherwise.
AGE	Scale	Age of the head of the household.
SEX	Dummy	1 for male head of household and 2 for female.
INSURANCE	Dummy	1 if covered by employment-sponsored, private purchased or military insurance, Medicare, Medicaid, or other public coverage, and 0 if not insured.
WORKHOURS	Scale	Number of hours per week worked at main job.
FAMILYSIZE	Scale	Total number of persons within each family.
METRO	Dummy	1 if a household living in a large metropolitan area with 200k population based on 1992 MSA/PMSA boundaries and population, and 0 if living in small metropolitan or rural areas with less than 200k population.
EDUCATION	Scale	The number of years of education completed.
OWNBUSINESS	Dummy	1 if the household has a business or farm, and 0 otherwise.
MIDEAST	Dummy	1 if living in US Mideast region, and 0 if living in Northeast, South or West.
SOUTH	Dummy	1 if living in US south region, and 0 if living in Northeast, Mideast or South.
WEST	Dummy	1 if living in US west region, and 0 if living in Northeast, Midwest or South.
YEAR2010	Dummy	1 for 2010 survey, and 0 for 2007 survey.

Table II. Summary statistics

Variable	Mean	Standard Deviation	Min	Max
VISITS	4.95	5.41	0	49
HVISITS	0.17	0.69	0	20
ERVISITS	0.39	0.89	0	5
DRVISITS	3.96	4.44	0	20
SOCIALNET	0.57	0.99	0	5
HELPFRIEND	0.24	0.43	0	1
INCOME	9.11	3.64	0	11.9
WHITE	0.73	0.44	1	1
MARRIED	0.69	0.46	0	1
AGE	44.1	21.7	0	91
SEX	1.54	0.49	1	2
INSURANCE	0.88	0.32	0	1
WORKHOURS	17.2	20.9	6	65
FAMILYSIZE	2.61	1.37	0	8
METRO	0.71	0.45	0	1
EDUCATION	13.6	2.68	0	19
OWNBUSINESS	0.11	0.31	0	1

Table III. Correlation matrix

	VISITS	HVISITS	ERVISITS	DRVISITS	SOCIALNET	HELPFRIEND	INCOME	WHITE	MARRIED	AGE	SEX	INSURANCE	WORKHOURS	FAMILYSIZE	METRO	EDUCATION
HVISITS	0.458															
ERVISITS	0.467	0.440														
DRVISITS	0.951	0.282	0.265													
SOCIALNET	0.042	-0.012	-0.003	0.043												
HELPFRIEND	0.039	0.000	0.012	0.035	0.790											
INCOME	0.006	-0.005	-0.023	0.009	-0.025	-0.018										
WHITE	0.003	-0.022	-0.091	0.023	-0.008	-0.007	0.042									
MARRIED	-0.059	-0.054	-0.126	-0.033	0.068	0.037	0.070	0.163								
AGE	0.142	0.083	-0.015	0.153	-0.058	-0.057	0.083	0.170	0.008							
SEX	0.119	0.023	0.039	0.118	0.101	0.082	0.015	-0.028	-0.109	0.009						
INSURANCE	0.175	0.045	-0.008	0.191	0.024	0.009	0.034	0.181	0.131	0.240	0.033					
WORKHOURS	-0.183	-0.120	-0.133	-0.159	0.070	0.040	-0.011	0.048	0.125	-0.266	-0.171	0.038				
FAMILYSIZE	-0.094	-0.057	-0.075	-0.082	0.076	0.061	0.029	0.008	0.546	-0.348	-0.025	0.027	0.175			
METRO	0.004	-0.009	-0.025	0.022	0.053	0.035	-0.079	-0.138	-0.025	-0.035	0.002	0.021	0.012	0.014		
EDUCATION	-0.034	-0.062	-0.138	-0.004	0.188	0.106	-0.067	0.184	0.144	-0.006	-0.018	0.198	0.233	0.088	0.103	
OWNBUSINESS	-0.058	-0.032	-0.057	-0.051	0.041	0.026	-0.044	0.093	0.095	0.037	-0.103	0.001	0.161	0.057	-0.065	0.117

Table IV. OLS regressions

The dependent variable is the number of visits to hospitals, ERs, doctors and other health professionals. The independent variables include social networks, help-friends, family income, being white, marriage, age, sex, having insurance coverage, working hours per week, family size, living in large metropolitan area, education, and whether owning a business. The variable of social networks is the sum of six dummy variables that are set to one if the household get health information for his friends and relatives from internet, friends, TV/radio, books, and other sources. The variable of help-friends is a dummy variable that is set to one if the household gets health information for his friends and relatives from other friends. All specifications use OLS regressions, and specifications (2), (4) and (6) have region (northeast, mideast, south and west) and year (2007 and 2010) fixed-effects. z-statistics are shown in the parentheses with ***, ** and * indicating its statistical significant level of 1%, 5% and 10% respectively.

Dependent Variable: #Visits to Health Services	(1)	(2)	(3)	(4)	(5)	(6)
SOCIALNET	0.321***	0.329***	0.315***	0.324***		
	(11.07)	(11.29)	(10.30)	(10.55)		
HELPFRIEND					0.619***	0.619***
					(7.950)	(7.953)
INCOME	-0.0103	-0.0105	-0.0103	-0.0102	-0.00770	-0.00744
	(-1.334)	(-1.357)	(-1.198)	(-1.185)	(-0.837)	(-0.807)
WHITE	-0.156**	-0.156**	-0.174**	-0.173**	-0.204**	-0.203**
	(-2.378)	(-2.347)	(-2.318)	(-2.263)	(-2.553)	(-2.494)
MARRIED	-0.701***	-0.698***	-0.415***	-0.406***	-0.364***	-0.354***
	(-11.29)	(-11.20)	(-5.004)	(-4.885)	(-4.155)	(-4.040)
AGE	0.0302***	0.0298***	0.0215***	0.0204***	0.0177***	0.0167***
	(22.82)	(22.41)	(10.33)	(9.771)	(7.967)	(7.544)
SEX	0.709***	0.701***	0.828***	0.814***	0.877***	0.861***
	(12.34)	(12.15)	(12.86)	(12.60)	(12.90)	(12.65)
INSURANCE	2.660***	2.620***	2.920***	2.885***	3.011***	2.985***
	(30.05)	(29.30)	(29.35)	(28.75)	(28.46)	(28.10)
WORKHOURS	-0.0360***	-0.0362***	-0.0359***	-0.0364***	-0.0379***	-0.0382***
	(-26.18)	(-26.21)	(-22.48)	(-22.68)	(-22.24)	(-22.37)
FAMILYSIZE			-0.158***	-0.163***	-0.153***	-0.156***
			(-5.122)	(-5.248)	(-4.608)	(-4.711)
METRO			0.0207	-0.0268	0.0190	-0.0194
			(0.297)	(-0.376)	(0.257)	(-0.259)
EDUCATION			-0.0648***	-0.0645***	-0.0566***	-0.0572***
			(-5.137)	(-5.092)	(-4.259)	(-4.298)
OWNBUSINESS			-0.408***	-0.396***	-0.387***	-0.371***
			(-3.988)	(-3.867)	(-3.587)	(-3.435)
MIDEAST		-0.539***		-0.579***		-0.619***
		(-6.340)		(-6.112)		(-6.184)
SOUTH		-0.187**		-0.206**		-0.219**
		(-2.330)		(-2.295)		(-2.308)
WEST		-0.582***		-0.525***		-0.556***
		(-6.465)		(-5.257)		(-5.269)
YEAR2010		-0.160***		-0.228***		-0.215***
		(-2.828)		(-3.639)		(-3.261)
N	29,432	29,432	29,432	29,432	29,432	29,432
Adj. R-square	0.078	0.079	0.085	0.087	0.083	0.085
F- Test	363.4***	245.7***	230.6***	175.1***	205.2***	157.4***

Table V. OLS regressions with different measures of health service demand

The dependent variable is the number of visits to hospitals, ERs, doctors and other health professionals. The independent variables include social networks, help-friends, family income, being white, marriage, age, sex, having insurance coverage, working hours per week, family size, living in large metropolitan area, education, and whether owning a business. The variable of social networks is the sum of six dummy variables that are set to one if the household get health information for his friends and relatives from internet, friends, TV/radio, books, and other sources. The variable of help-friends is a dummy variable that is set to one if the household gets health information for his friends and relatives from other friends. All specifications use OLS regressions with region (northeast, mideast, south and west) and year (2007 and 2010) fixed-effects, and z-statistics are shown in the parentheses with ***, ** and * indicating its statistical significant level of 1%, 5% and 10% respectively.

Dependent Variable: #Visits to:	Hospitals (1)	ERs (2)	Doctors (3)	Hospitals (4)	ERs (5)	Doctors (6)
SOCIALNET	0.00774*	0.0255***	0.238***			
	(1.897)	(5.037)	(9.394)			
HELPFRIEND				0.0231**	0.0610***	0.428***
				(2.214)	(4.764)	(6.664)
INCOME	-0.00294**	-0.00628***	-0.00465	-0.00279**	-0.00589***	-0.00258
	(-2.564)	(-4.423)	(-0.654)	(-2.264)	(-3.888)	(-0.340)
WHITE	-0.0363***	-0.114***	-0.0230	-0.0368***	-0.122***	-0.0440
	(-3.574)	(-9.082)	(-0.364)	(-3.383)	(-9.149)	(-0.656)
MARRIED	-0.0653***	-0.163***	-0.131*	-0.0612***	-0.157***	-0.102
	(-5.930)	(-11.95)	(-1.916)	(-5.215)	(-10.93)	(-1.406)
AGE	0.00224***	-0.00232***	0.0201***	0.00206***	-0.00266***	0.0173***
	(8.102)	(-6.757)	(11.68)	(6.925)	(-7.279)	(9.471)
SEX	-0.00317	0.000460	0.720***	-0.00559	0.00464	0.762***
	(-0.370)	(0.0433)	(13.52)	(-0.613)	(0.414)	(13.57)
INSURANCE	0.114***	0.131***	2.426***	0.117***	0.133***	2.510***
	(8.560)	(7.926)	(29.32)	(8.217)	(7.628)	(28.65)
WORKHOURS	-0.00317***	-0.00444***	-0.0256***	-0.00326***	-0.00463***	-0.0270***
	(-14.88)	(-16.83)	(-19.36)	(-14.22)	(-16.46)	(-19.19)
FAMILYSIZE	-0.00114	-0.0162***	-0.131***	0.000266	-0.0146***	-0.125***
	(-0.279)	(-3.186)	(-5.122)	(0.0600)	(-2.676)	(-4.574)
METRO	-0.00965	-0.0619***	0.163***	-0.0111	-0.0623***	0.174***
	(-1.021)	(-5.287)	(2.779)	(-1.099)	(-5.044)	(2.811)
EDUCATION	-0.0105***	-0.0327***	-0.0225**	-0.0113***	-0.0338***	-0.0148
	(-6.259)	(-15.67)	(-2.149)	(-6.310)	(-15.42)	(-1.352)
OWNBUSINESS	-0.0233*	-0.0473***	-0.316***	-0.0249*	-0.0449**	-0.293***
	(-1.714)	(-2.808)	(-3.743)	(-1.724)	(-2.529)	(-3.297)
MIDEAST	0.00714	-0.0293*	-0.497***	0.00258	-0.0296*	-0.525***
	(0.568)	(-1.881)	(-6.358)	(0.192)	(-1.797)	(-6.360)
SOUTH	0.00922	-0.0216	-0.183**	0.0114	-0.0240	-0.194**
	(0.775)	(-1.464)	(-2.476)	(0.898)	(-1.539)	(-2.481)
WEST	-0.0228*	-0.0679***	-0.442***	-0.0269*	-0.0723***	-0.460***
	(-1.719)	(-4.134)	(-5.369)	(-1.901)	(-4.167)	(-5.280)
YEAR2010	-0.0284***	-0.0302***	-0.182***	-0.0298***	-0.0293***	-0.177***
	(-3.422)	(-2.938)	(-3.528)	(-3.376)	(-2.698)	(-3.249)
N	29,432	29,432	29,432	29,432	29,432	29,432
Adj. R-square	0.025	0.047	0.084	0.024	0.049	0.082
F- Test	47.2***	91.6***	168.8***	42.1***	87.5***	151.7***

Table VI. Median (50%-quantile) regressions

The dependent variable is the number of visits to hospitals, ERs, doctors and other health professionals. The independent variables include social networks, help-friends, family income, being white, marriage, age, sex, having insurance coverage, working hours per week, family size, living in large metropolitan area, education, and whether owning a business. The variable of social networks is the sum of six dummy variables that are set to one if the household get health information for his friends and relatives from internet, friends, TV/radio, books, and other sources. The variable of help-friends is a dummy variable that is set to one if the household gets health information for his friends and relatives from other friends. All specifications use median (50-percentile) regressions, and specifications (2), (4) and (6) have region (northeast, mideast, south and west) and year (2007 and 2010) fixed-effects. z-statistics are shown in the parentheses with ***, ** and * indicating its statistical significant level of 1%, 5% and 10% respectively.

Dependent Variable: #Visits to Health Services	(1)	(2)	(3)	(4)	(5)	(6)
SOCIALNET	0.201*** (10.08)	0.198*** (9.918)	0.195*** (9.001)	0.212*** (9.263)		
HELPFRIEND					0.455*** (7.917)	0.448*** (7.429)
INCOME	0.00154 (0.292)	0.00569 (1.072)	0.00272 (0.445)	0.00575 (0.896)	0.00669 (0.986)	0.00812 (1.138)
WHITE	-0.0401 (-0.891)	-0.0463 (-1.011)	-0.0792 (-1.483)	-0.0758 (-1.332)	-0.0846 (-1.432)	-0.108* (-1.710)
MARRIED	-0.413*** (-9.671)	-0.391*** (-9.136)	-0.162*** (-2.764)	-0.183*** (-2.973)	-0.106 (-1.643)	-0.119* (-1.753)
AGE	0.0242*** (26.64)	0.0231*** (25.32)	0.0286*** (19.41)	0.0279*** (17.96)	0.0263*** (16.06)	0.0258*** (15.02)
SEX	0.581*** (14.70)	0.591*** (14.90)	0.757*** (16.56)	0.732*** (15.24)	0.780*** (15.54)	0.738*** (14.00)
INSURANCE	2.183*** (35.90)	2.098*** (34.15)	2.119*** (30.01)	2.085*** (27.95)	2.186*** (27.98)	2.171*** (26.41)
WORKHOURS	-0.0234*** (-24.79)	-0.0238*** (-25.15)	-0.0177*** (-15.65)	-0.0183*** (-15.37)	-0.0192*** (-15.27)	-0.0196*** (-14.85)
FAMILYSIZE			-0.145*** (-6.604)	-0.139*** (-6.023)	-0.145*** (-5.931)	-0.145*** (-5.665)
METRO			-0.00412 (-0.0832)	-0.0204 (-0.385)	-0.00987 (-0.181)	-0.0245 (-0.422)
EDUCATION			-0.0304*** (-3.399)	-0.0344*** (-3.647)	-0.0290*** (-2.952)	-0.0345*** (-3.344)
OWNBUSINESS			-0.311*** (-4.289)	-0.301*** (-3.963)	-0.312*** (-3.919)	-0.287*** (-3.431)
MIDEAST		-0.523*** (-8.965)		-0.455*** (-6.460)		-0.512*** (-6.613)
SOUTH		-0.194*** (-3.525)		-0.145** (-2.176)		-0.145** (-1.974)
WEST		-0.619*** (-10.01)		-0.504*** (-6.789)		-0.524*** (-6.412)
YEAR2010		-0.0486 (-1.252)		-0.114** (-2.440)		-0.0931* (-1.826)
N	29,432	29,432	29,432	29,432	29,432	29,432
Wald Test	2214.58***	2264.33***	1969.34***	2022.59***	1366.89***	1413.56***

Table VII. Difference-in-difference regressions of quasi-experimental study

We consider the introduction of GSM network in 1995 and GPRS network in 2002 as exogenous shocks, and employ a matched-sample difference-in-differences (DiD) regression. Three provinces with the introduction of GSM/GPRS cellular phone service are defined as the treatment group, and three provinces without the introduction of new cellular phone networks are defined as the control group. The dummy variable *CELLPHONE* is set to one for the treatment group and zero otherwise. The dummy variable *POST* is set to one if the year is after the introduction of GSM/GPRS, and zero otherwise. A third dummy variable *POST*×*CELLPHONE* is the cross-product of the previous two dummy variables. The dependent variable is the number of visits to medical service providers. We match individuals by identifying the severity of their injuries and their gender, age, income and whether they are living in urban or rural area. The specification (1) uses a Probit regression and (2) uses a Logit regression. Z-statistic is shown in the parenthesis with ***, ** and * indicating its statistical significant level of 1%, 5% and 10% respectively.

Dependent Variable: Visits to Medical Service Providers	(1) Probit	(2) Logit
POST	0.06 (1.02)	0.09 (1.14)
CELLPHONE	-0.21*** (-3.04)	-0.33*** (-2.91)
POST ×CELLPHONE	0.22** (2.38)	0.34** (2.27)
CONSTANT	0.13*** (4.59)	0.34*** (4.47)
N	3,348	3,348
Pseudo R-square	0.05	0.05
LR Chi-square	21.65***	21.65***