

Theorizing the digital divide: Information and communication technology use frameworks among poor women using a telemedicine system [☆]

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Abstract

In this paper, we argue that reconceptualizing the “digital divide” from the perspective of those with the least access requires that the policy concern shift from disparities in access to computers and the Internet toward an examination of how Internet information resources are differentially accessed and used. Drawing on an archive of clinical narrative descriptions documenting training sessions related to eight African American, low-income women involved in a clinical trial of a telemedicine system intervention for monitoring cardiovascular disease risk factors implemented at Temple University; we illustrate the shortcomings of a limited conceptualization of access. Rather, we propose a model that depicts information and communication technology (ICT) access in terms of four interrelated elements: (a) information delivery approaches (how information is shared, disseminated and accessed through the use of e-communication technologies), (b) technology use contexts (what are the specific settings in which technology is accessed), (c) social networks (what is the role of social networks in shaping access to and use of ICTs) and (d) the social policies and institutional mechanisms regulating technology access (specifically targeted to ICT use as well as more generally). This model highlights the embeddedness of ICT use in the geography of people’s daily lives and suggests a number of policy concerns related to how ICTs may mitigate or exacerbate economic and political inequalities in the United States.

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1. Overview

Information and communication technologies (ICTs) are radically changing the way that healthcare in the United States is delivered, with the advancement of telemedicine among the most prevalent changes. Telemedicine involves using ICTs to provide health care to patients in

settings that are geographically discontinuous from the locus of health care institutions. As such, telemedicine can be seen as an inherently geographic technology. In fact, geographers (and others) have suggested that there is an urgent need to analyze critically the effects of telemedicine systems on health care delivery and outcomes (Cutchin, 2002; Crampton, 1999; Andrews and Kitchin, 2005). Many people studying telemedicine primarily focus on its potential benefits (Cutchin, 2002). Yet as Crampton (1999) argues, all technologies have both totalizing and democratizing tendencies. A number of researchers note the transformative effects of ICTs for reorganizing institutionalized health care services and health care provider roles while simultaneously creating new cyberspace

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arrangements that comprise new realms of care (Cutchin, 2002; Halford and Leonard, 2006; Andrews and Kitchin, 2005). Cutchin (2002, p. 12) argues that the “geography of virtualization” raises ethical concerns related to access and connectivity. In particular, Kim (2005) suggests that there are ethical concerns raised by the potential for telemedicine to widen health disparities given that there are also disparities in people’s access to ICTs.

We reflect on these ethical concerns by considering the issue of how society weighs the tensions between the right of people to health care, the costs and benefits of providing care, and people’s right to privacy. Specifically, we argue that this issue can not be adequately addressed without reframing the “digital divide” from the perspective of some of those who not only experience the least access to information and communication technologies, but also experience significant health care disparities – both of which are due to their wider economic, political and social marginalization. The gap between those with the most and those with the least access to information and communication technologies (ICTs) is commonly referred to as the “digital divide.” The digital divide is most associated with other indicators of inequality such as income, gender, race/ethnicity and geographic location. The larger societal concern is that lack of access to the computers and the Internet as well as related information flows will exacerbate other forms of social, economic, and political marginalization.

The conceptualization of the digital divide has expanded from an earlier, more limited focus on differential access to computers and the Internet to a broader understanding of access in terms of infrastructure, usage, and information flows (see van Dijk, 2005; DiMaggio et al., 2001; Hargittai, 2003; Lenhart and Horrigan, 2003; Jackson et al., 2003; De Haan, 2004). However, Servon (2002) notes that policy makers have continued to focus on ICTs in terms of lack of access to infrastructure by concentrating on finding the means to provide individuals and communities with computers and Internet service as well as training in basic computer literacy.

But this research is limited in its ability to produce nuanced policy prescriptions because of a lack of geographic analysis. For example, while scholars have agreed that limiting the concept of access to equate solely with location and quality of ICT infrastructure is insufficient (Hargittai, 2002), the geographic dimensions of ICT and social inequality are largely unexamined (Andrews and Kitchin, 2005). A number of geographers have begun to reconceptualize the digital divide in terms of people’s embeddedness in places as well as by exploring how digital divides are uneven across multiple scales (Crampton, 2003; Warf, 2001). Geographers have also considered the implications of virtual communications for reconfiguring geographies of everyday life (Adams, 1997, 1998; Dodge, 2001; Dodge and Kitchin, 2005a,b; Hillis, 1998). This growing body of work, however, does not focus specifically on how people challenge and alter their strategies with respect to their own purposes for using ICTs. In order to

get at these geographic issues, a different scale of analysis is needed. Gilbert and Masucci (2004, 2006) have shown that examining individual perspectives of poor women who are navigating institutions to gain educational, economic, and health services needed for survival gives insight about their self-efficacy with respect to using geographic information specifically and ICTs more generally. This work underscores the need to differentiate among groups of poor women, whose frameworks are inextricably intertwined with their highly localized circumstances and social contexts (Gilbert and Masucci, 2006, p. 758).

In this paper, we intend to explore the spatiality of the digital divide from the perspective of low-income racialized minority women living in inner cities – many of whom are elderly. This is a group that is typically characterized as being the most negatively impacted by the digital divide (NTIA, 2002). Specifically, we want to understand these women’s frameworks for ICT use – that is how their daily experiences, interests, and knowledge shape how they do or would like to use ICTs and the related information flows. Our focus on their use of a telemedicine system reflects the societal trend for many poor, racialized women to encounter ICTs as a part of their negotiation of education, health and social services as well as for elderly women to first encounter ICTs in the context of changing modalities of the delivery of health care (Kreps, 2005).

We will draw on an archive of clinical narrative descriptions documenting training sessions related to eight women (ages 37–71) involved in a clinical trial of a telemedicine system intervention for monitoring cardiovascular disease risk factors implemented at Temple University in 2004 (for further discussion see Masucci et al., 2006; Kashem et al., 2006). The archive of clinical narratives comprises part of the study record for a digital divide sub-study connected with a larger clinical investigation related to the use of an Internet Telemedicine System that monitors risk factors for patients with cardiovascular disease. The objective of the sub-study was to assess the effectiveness of an ICT training process to provide a foundation in basic computer skills and training in the use of the telemedicine system for users with little prior ICT experience. We will examine perspectives related to ICTs found in narrative descriptions of a small cohort of trainees consisting of the poorest and least experienced users in the sub-study to examine the digital divide beyond the facets of access to computers and the Internet and differential usage. We will draw on the archive of clinical narratives among the women to outline an alternative model building on geographical conceptualizations of the digital divide that depicts ICT access in terms of the interconnections among four elements: (a) information delivery approaches (how information is shared, disseminated and accessed through the use of e-communication technologies), (b) technology use contexts (what are the specific settings in which technology is accessed), (c) social networks (what is the role of social networks in shaping access to and use of ICTs) and (d) the social policies and institutional mechanisms regulating technology access

(specifically targeted to ICT use as well as more generally). Each of the elements of our reconceptualization of the digital divide is inherently geographical, as we will demonstrate, and points to the importance of understanding the embeddedness of ICTs in daily life. As such, it suggests a number of policy concerns related to how ICTs may mitigate or exacerbate economic and political inequalities in the United States.

2. Current approaches for understanding and overcoming differential access to ICTs

A common point of departure for researchers examining the effects of the digital divide is to cite how disparities in household ownership of computers and use of the Internet were depicted in a series of reports published by the National Telecommunications and Information Administration (NTIA, 1995, 1998, 1999a,b, 2000, 2002, 2004). The series of reports called “Falling through the Net” and “A Nation Online” base assessment of disparities in computer use and ownership and Internet use on household surveys and census data among families and individuals in the United States. These reports galvanized national attention on the problem of the digital divide within the United States. Based on these reports, the term “digital divide” was widely adopted to refer to the great differences in computer and Internet access and use at the household level among families from diverse socio-economic and racial/ethnic backgrounds.

While three reports (1998, 1999a,b, 2000) indicated that there was a growing divide along factors such as race, age, income and education, the more recent reports (2002, 2004) indicate a stabilization and continuation of the digital divide. The studies generally document that low-income and racialized minority households, women and elderly adults have the lowest rate of computer ownership, computer use, and Internet access. But, since the last report forgoes questions dealing with the digital divide in order to describe the diffusion of broadband technology (2004), scholars and policy makers do not agree about whether or not disparities have actually dissipated to the extent that is indicated by the reports. Nonetheless, based on the NTIA report series, we would expect that low-income, elderly, racialized minority women living in North Philadelphia are likely to experience digital divide disparities.

The NTIA series does provide a beginning point for examining disparities in differential access to computers and the Internet faced by low-income, racialized minority populations and women in comparison to that of more affluent white and male populations at home and at work. They do this by linking the assessment of digital divide disparities to computer ownership and, later, the use of computers and the Internet. Yet, the notion of the digital divide is not defined beyond depicting such differences. An expanded understanding of the digital divide would shed light on broader implications of the processes by which disparities unfold. This would include empirical research on

the different means by which individuals – and in the case of this paper, low-income African American women living in North Philadelphia – access computers and the Internet and relate the information obtained to specific decision making processes.

2.1. Policy approaches for overcoming the digital divide

Following the NTIA reports (1998, 1999a,b, 2000), different approaches for addressing the problem of computer infrastructure and Internet access have been popularized. One of the most widely advocated approaches for individuals to overcome infrastructure and access barriers is to draw on resources now available through the country’s system of public libraries. The National Commission on Libraries and Information Science documented that by 2000, 94.5% of all public libraries in the US provided computer and Internet access to patrons (Bertot and McClure, 2000).

Another approach to overcome the lack of access to ICTs involves the donation of old computer equipment by private entities to public schools and community organizations that serve low-income families. In some cases, non-governmental organizations complement these donations by refurbishing the donated equipment and providing software, technical support, and coordination services to public schools and community organizations that need to either start up or upgrade computer and Internet facilities.

A third approach, which is advocated in NTIA’s (1999) reports, is to enhance existing infrastructure for accessing the Internet by supporting non-profit and community organizational settings through partnerships with larger institutions. Such programs as Teaming for Technology and NTIA’s Technology Opportunities Program are just two examples of the dedication of resources to learn how the enhancement of community ICT resources can address the intertwining of ICT access and the capacity of community organizations to meet specialized needs of constituents.

A fourth approach is the trend to embed the use of ICTs with the delivery of services and to provide training and to enhance infrastructure in association with the altered service delivery approach. The increasing use of Internet-based communication systems for managing health conditions, accessing educational records, requesting municipal services, and engaging in civic discourse often involve educational training and enhancing ICT infrastructure at community centers and within households.

These approaches focus on the creation of mechanisms that provide facilities, equipment, technical assistance, and educational training to individuals and communities negatively impacted by the digital divide. Researchers who believe that the differentials in access to the Internet and computers is declining and will continue to decline due to market forces, suggest that these public policies will not remain necessary over time (for a review and critique see Kvasny and Keil, 2006). A recent study of two digital

divide initiatives in Georgia found that providing computers, Internet access and basic computer education was necessary but not sufficient to ameliorate the digital inequalities experienced by poor people in urban areas because of the manner in which digital inequalities were intertwined with other structural inequalities including lack of access to decent schools and poverty (Kvasny and Keil, 2006).

2.2. State of research

There is a growing body of research that would help to explain the findings in Georgia. This research seeks to reconceptualize the digital divide beyond access to computers and the Internet. Rather, this research seeks to understand differences in access in terms of usage, skill levels, and benefits of use. Furthermore, the research seeks to understand how access is embedded in and reinforces broader social, economic, and political inequalities (For reviews of this literature see DiMaggio et al., 2001; Kvasny and Keil, 2006; Lenhart and Horrigan, 2003). DiMaggio et al. (2001) provide a comprehensive review of the literature on the social implications of the Internet. These authors suggest that a research agenda addressing the impact of the Internet must include an understanding of its effects on inequality as well as the relationship between behavioral, institutional and social contexts. Other studies propose that digital divide inequalities are intertwined with inequalities in other areas, such as civic engagement and political participation, health care, and education (Axelson and Hardy, 1999; Bimber, 2000; Cavanaugh, 2000; Fox, 2001; Guillén and Suárez, 2001; Schmid, 1996; Schneider, 1996; Skinner, 1997; Tambini, 1999; Tate et al., 2001; van Dijk, 2005; Warschauer, 2003). For example, Robinson et al. (2003, p. 18) found that educational attainment was the key determinant in explaining ICT use patterns at home and at work. They found that higher educational levels were associated with more use related to work, education, and political and social engagement; alternatively those with higher educational levels used ICTs the least for entertainment and non-work purposes. This work suggests the necessity of moving beyond a notion of the digital divide that is conceptualized in terms of access to infrastructure. For example, such considerations as the cost of software and hardware and the level of awareness about the potential role that computer technology can play in the routines and needs of people's daily life are cited as significant barriers that minorities, women, and the elderly face (Shiver, 1995).

Warschauer (2003), Mark et al. (1997) and Merrifield et al. (1997) have shown that technological literacy is improved by performing specific tasks and through participation in technology learning activities. Using the case of individuals from different cultural backgrounds seeking to gain English language literacy, Merrifield et al. (1997) underscore the significance of participating in educational programs for breaking social and economic isolation. Fur-

thermore, they point to the significance of both social networks and institutional support systems as bridges to gain ICT knowledge as a pathway to technology access.

Mark et al. (1997) suggest that the environment in which individuals access the Internet is as important as the various types of social networks drawn upon to support people's initial interest in the Internet. Katz and Aspden (1997) and Conte (1999) found that the majority of Internet users were first introduced through social networks and those who did not use the Internet were also less likely to belong to social networks. Nevertheless, Mark et al. (1997) show that low-income minorities were least likely to use social networks and were more likely to use the library despite a large body of research that demonstrates the importance of social networks for poor people and racialized minorities in a range of areas including for social and emotional support, financial support, employment, child care, and health care (e.g., Benin and Keith, 1995; Hogan et al., 1990; Jayakody et al., 1993; Wiles, 2003, 2005; Johnson and Roseman, 1990; Jewel, 1988; Oliver, 1988a,b).

Furthermore, Paul and Stegbauer (2005, p. 1) point to the paucity of digital divide research that examines the effects of socio-economic status, education and gender among the elderly, concluding that "informal peer learning and group support is crucial for dissemination of the use of the Internet among the elderly". Keil (2005) finds that the use of the Internet among the elderly will be an increasingly important component of their ability to access health services. At a time when the number of elderly is rapidly increasing, the digital divide implications for accessing health information has been the focus of a series of pilot studies sponsored by the National Cancer Institute (Kreps, 2005). Kreps finds that libraries will become increasingly relied upon in the complex formula of overcoming health disparities through ameliorating digital divide barriers for accessing health information. Kreps points again to the importance of informal social and family relationships for creating a context for assessing information needs and accessing information using ever changing ICT resources.

This research presents an enormous advance over conceptualizations of the digital divide that focus on access in terms of computers and the Internet. As Kvasny and Keil (2006) argue, these broader conceptualizations of the digital divide help to explain why providing free access to computers and the Internet as well as basic training were not enough to overcome digital inequalities in their study. Furthermore, they argue that from a public policy perspective, digital divide initiatives must supplement basic training with more advanced learning opportunities in a variety of formats. Designers of these educational opportunities should "enter into dialogue with the people to construct alternative representations of working-class subjects and uses of ICT, not to win them over with training programmes that reinforce the status quo" (Kvasny and Keil, 2006, p. 49).

We argue, however, that these explanations and policy recommendations are limited precisely because they fail to conceptualize accessibility from a geographic as well as sociological perspective.

2.3. Critical geography research on the digital divide

Geographers have considered implications of virtual communications for reconfiguring geographies of everyday life (Adams, 1997, 1998; Dodge, 2001; Dodge and Kitchin, 2005a,b; Hillis, 1998). This research is extremely useful because it suggests the embeddedness of ICTs in everyday life as well as providing a broader analysis of how power relations experienced in particular places deeply affect individual ICT use and adoption. The result has been that many policy concerns have been central in the critical geography discourse. These have included: (a) the impact of widespread uses of ICTs on individual privacy (Dodge and Kitchin, 2005a,b; Pickles, 1997), (b) community information and individual empowerment (Curry, 1997; Streibel, 1998) and (c) economic organizational and development impacts (Aoyama and Sheppard, 2003; Symons, 1997). Critical geographers have also shown how virtual communications can affect uses and connectivity of spaces as well as altering the meanings of places for different people (Curry, 1997). And, there has been strong interest in how spaces are monitored, along with a consideration of the public space and individual privacy effects of these activities (Curry, 1997; Dodge and Kitchin, 2005a,b; Pickles, 1997).

In terms of reconceptualizing the digital divide, the usefulness of critical geographic inquiries has been to highlight that the power relations associated with developing and implementing ICT systems profoundly regulate the empowerment of individuals and marginalized groups. Geographers also have been at the forefront of trying to understand what accessibility means in a new information society.¹ Yet the geography of the digital divide is still relatively unexplored (Crampton, 2003).

Researchers that have begun to reconceptualize the digital divide from a geographical perspective argue that access to the Internet and computers must be understood in relation to wider political, economic and social inequalities which are spatially as well as socially constituted (Crampton, 2003; Warf, 2001; Wilson, 2000). For example, researchers have documented that access to the Internet and computers is geographically uneven from the international to intra-urban scale as well as varying by race, class, and gender (Crampton, 2003; Warf, 2001).

Crampton (2003, p. 142, italics in the original) argues that the digital divide is better understood as “unequal access to *knowledge in the information society*... There are at least three senses of knowledge: *to know with* (access

to tools), *to know what* (access to information), and *to know how* (how to use these tools)... the *geography* of the digital divide addresses how the relationship between this knowledge and space is uneven across multiple scales.” We would add that these different forms of knowledge are embedded in particular places.

Hanson (2000) begins to conceptualize how knowledge is embedded in particular places. She argues that traditional measures of access ignore the ways in which people are embedded in place-based social networks that shape the nature and extent of the information that people receive. In fact, feminist geographers have demonstrated that place-based social networks are important for women’s access to information such as employment, child care and housing (Hanson and Pratt, 1995; Peake, 1997; Gilbert, 1998). Hanson (2000, p. 273) asks: “In thinking about accessibility in an information age, how might IT intersect with these often place-based and place-biased information networks? How might IT be used to intervene strategically to increase the access of those who currently lack it?”

This research suggests that the digital divide might be better understood in terms of: (a) the specific places in which people gain access to computers, the Internet and training; (b) the manner in which people may rely on place-based and non-place-based social networks; and (c) how specific social policies and institutions may shape their view of the importance of information recourses in addition to the ways in which they may obtain access to computers and Internet resources. Yet, there have been few studies that examine the digital divide from the perspective of those most impacted. Therefore, our work focuses on gaining an improved understanding of how marginalized groups: (a) perceive the importance of ICTs for mitigating their circumstances, (b) strategize to access and use ICTs and (c) benefit or falter from the impact of ICTs on their daily lives (Gilbert and Masucci, 2004, 2005, 2006). This work demonstrates that poor women’s ICT frameworks are highly varied depending on their particular interests, experiences, and social and geographic location. We turn now to examine the ICT frameworks of low-income, racialized minority, and elderly women in relation to health care to illustrate how this reconceptualization of the digital divide might lead to more useful policy.

3. ICT use frameworks among poor women using an Internet telemedicine

A clinical study of the use of a telemedicine system to monitor risk factors for cardiovascular disease (CVD) was implemented by the Temple Telemedicine Research Center at Temple University from 2004 to 2007 (Masucci et al., 2006; Kashem et al., 2006). The study examined the use of an Internet Patient–Physician communication system for patients to self-manage risk factors for cardiovascular disease (CVD). Since the use of the Internet for telemedicine applications is increasing despite the

¹ For an excellent collection that reexamines accessibility in relation to place, cyberspace and new information and communication technologies see Janelle and Hodge (2000).

frequency with which systems are underutilized (Paul et al., 1999), one concern related to the CVD risk factors study was how the challenge of digital divide disparities among patients might affect the use of the system. The study's strategy for addressing this problem was to create an easy-to-use interface for patients to send self-monitored data (including blood pressure, weight, number of cigarettes smoked, and steps walked) to the study database.

The first phase of the study specifically addressed how digital divide barriers might impact the use of the system during an extended clinical investigation. This digital divide sub-study aimed at determining if the telemedicine system was easy enough for Internet neophytes to use after a short orientation to the system. This involved 44 patients who were representative of groups impacted by the digital divide – poor, elderly, inner-city and rural residents. Two cohort groups were included in the digital divide sub-study – a north Philadelphia based group, 96% of whom were African American and a group from rural, Central Pennsylvania, all of whom were white. Patients in both groups were trained to use the telemedicine system following training protocol and ICT skill assessment designed specifically to assess the likelihood of system use from a remote location. Barriers to using ICTs were mitigated by providing basic computer training and assessing patient self-efficacy issues related to acquiring skills needed to use the Internet system developed for the study.

The major outcome of the digital divide study was that the vast majority of patients were able to learn how to use the telemedicine system through participation in a two hour training session, despite having little or no ICT access or experience (Masucci et al., 2006). The study also showed that successful performance of 14 basic computer, Internet, and telemedicine system use skills during the training session was the strongest predictor of successful use of the telemedicine system.

3.1. Examination of clinical archives from the digital divide sub-study

We will examine clinical archives from the digital divide sub-study to examine the geographic implications of the ICT use frameworks among a small cohort of the poorest women patients in the study. We turn particularly to a descriptive analysis of the trainer comments related to addressing the needs of those most representative of the digital divide perspective. We will show the range of discussions, observations and perspectives from this cohort as a means of drawing inferences related to the theoretical argument we have presented.

There are recent precedents for using qualitative methods generally and clinical narratives as a specific data source for examining patient perspectives related to health care and their broader context for receiving care (Charon, 2001; Feudtner, 1998; Hripcsak et al., 2003). Feudtner in particular points to the need to foster approaches for eliciting patients to describe experiences and life stories as an

essential part of linking evidence based medicine with the circumstances of specific individuals to improve overall understanding of their individual health care needs. Narrative archives can include written notes of care providers, health educators, or clinical researchers related to treatments, questions encountered during interactions with patients, observations related to patients, and patient comments and concerns. Such documentation is integrated in patient health records as a component of implementing the standard of care.

Trainers involved in the digital divide sub-study were required to record notes in relationship to their interactions with patients from the study. The notes are part of the official archive of the study, providing important documentation related to the required reporting of adverse health events of any clinical study in order to meet the internal review board standards. The trainers involved in the sub-study were provided instruction on how to implement a uniform educational experience among the patients by the study investigators. They were also given instruction on how to describe the training activities along with noting any concerns related to patients during the training. Since the focus of the sub-study was to assess how digital divide barriers might intersect with the frameworks users have for engaging ICTs more generally, trainers were specifically instructed on how to note their observations, patient comments and patient–trainer discussions related to the following factors: (a) information about prior employment and ICTs, (b) information about patient concerns related to information privacy, (c) patient ICT interests and experiences that might not relate to the health context of the training, (d) patient perspectives on the value of the use of the telemedicine system, and (e) information related to ICT and other educational opportunities. In addition, trainers were asked to note references to specific places, place-based strategies for using ICTs, reliance on local community resources and involvement with family and friends related to the use of ICTs. The narrative records completed by trainers consist of short reports ranging from 200 to 700 words in length, giving an overview of their observations related to the implementation of the training protocol and patient perspectives related to the use of the Internet telemedicine system.

The training reports provide insights about the benefits and challenges study participants had when using the telemedicine system. We will focus on the training experiences of the cohort of interest with respect to the intersection of digital divide concerns and using ICTs for managing health; this group consists of the eight poorest women living in the inner city of Philadelphia who participated in the digital divide sub-study. Table 1 shows the demographic characteristics and telemedicine system use data for the cohort. They are African American residents of North Philadelphia, an area of the city characterized by extreme economic distress; their reported ages range from 37 to 71. None of the women earns more than \$15,000 per year, each has either an 11th or 12th grade education, and most

Table 1
Summary data for digital divide sub-study cohort of interest living in Philadelphia

Pseudonym	Age	Education	Employment status	Average cumulative training score	Successful transmission of data using telemedicine system/number of days between training and submission	Prior experience using computers (PE)	Home access to computers (HA)	Prior Internet experience	Self reported comfort level using computers
Linda	69	High School Graduate	Unemployed	2.63	No	No PE	No	No	Very uncomfortable
Patricia	66	High School Graduate	Unemployed (former custodian, welder)	5	Yes (35 days)	Less than five total hours PE	Yes	No	Uncomfortable
Joyce	62	Completed 11th Grade	Unemployed	4.85	Yes (14 days)	6–10 total hours PE	Yes	No	Very comfortable
Barbara	37	Completed 11th Grade	Employed	4.46	Yes (22 days)	Less than five total hours PE	Yes	No	Very Comfortable
Rhonda	71	Bachelor of Science	Not Employed, retired	5	Yes (1 day)	Weekly PE	Yes	No	Uncomfortable
Gloria	49	High School Graduate	Unemployed, public assistance, former nurse	4.83	Yes (27 days)	PE several times per year	Yes	No	Uncomfortable
Monica	Did not provide	Some college, High School Graduate	Employed	5	Yes (2 days)	Less than five total hours PE	Yes	No	Comfortable
Carla	Did not provide	High School Graduate	Employed	5	Yes (Not available)	Daily use PE	Yes	Yes	Very uncomfortable

All women earn less than \$15,000; all are African American; health data omitted from table; all were consented through IRB Process to participate in the sub-study. Summary demographic and outcomes data for the entire sub-study can be found in Masucci et al. (2006).

are unemployed. Despite these characteristics, these women scored on average 4.6 out of 5 across all 14 basic computer skills and all but one of the women successfully transmitted information using the telemedicine system. This outcome is consistent with the general findings of the digital divide sub-study.

We used a web-interactive content analysis tool called Text Analysis Portal for Research (TAPoR) to identify the main themes found across the training reports using key word tracking tools embedded within the portal. We grouped key words with similar meanings, and used frequency counts to construct an analysis of major topics. They included comments of patients and observations of trainers related to: (a) training implementation experiences, perspectives and outcomes, (b) prior and developing ICT skills of patients trained, (c) the use and value of the Internet telemedicine system, (d) health concerns, (e) work, employment, and financial concerns, (e) family and place connections related to ICTs, and (f) key word searches conducted using the Internet during the training sessions (see Table 2).

We will focus on examining three aspects of this thematic sort of narrative content. First, we consider the

nuance found in the ranges of narrative content related to the interconnections between prior ICT experience, access to ICT infrastructure, development of basic computer skills during the training sessions and the underlying value of using the Internet telemedicine system among the cohort of interest. Second, we consider the degree to which place is embedded as a concept within the discussions around the extent of ICT experiences among the members of patient social networks comprised primarily of extended family members and friends. Finally, we will examine the narratives to consider the ways in which economic circumstances and connections with institutions for accessing needed services are related to the women's training experiences.

We suggest that the ICT frameworks of this cohort demonstrate that our alternative model of the digital divide allows us to provide a more nuanced analysis of nature, extent, and causes of digital inequalities than does the more traditional model which examines differences in access to computers and Internet as well as usage. Building on geographical conceptualizations of the digital divide, our model examines the digital divide as the interconnections among four elements: (a) the information delivery

Table 2

Content themes from archived reports of training experiences among the cohort of interest

ICT Skills 58 entries	Training 43 entries	Family–place 30 entries	Telemedicine 27 entries	Health 11 entries	Employment–income 9 entries	Keyword searches (8 entries)
Specific types of skills: basic computer skills, mouse navigation, point and drag skills, data entry	Training attention span	Concern for inherited family health problems	Successful patient use of the telemedicine system	Family health histories	Occupational histories related to ICT skills (typing, data entry)	Careerlink
Prior experiences through which skills were gained: data entry, classes taken, typing, informal instruction	Benefits of training stated by patients	Involvement in raising children and grandchildren	Using the system to self-monitor health and communicate with physicians	Family connections for managing health concerns	Lack of occupational history related to ICT use (nursing, welding, custodian)	Weather
How to access information on the Internet	Ease of training	Ongoing CVD health concerns related to pregnancy	Relationships between the Internet and the telemedicine system	Impacts of system use on health management from home and work	Reliance on family members for financial support	Mayo clinic
Explanations related to experiences obtaining skills	Training success	Intergenerational home residences as context for ICT access and training support	Relationship between self-care and use of the system	Using the Internet to find out more information about health conditions	Reliance on public assistance	Diabetes
Access to ICTs needed to obtain skills and support: using family computers, taking computer classes, owning computers, using computers of family members, access to ICTs through courses taken	Training implementation: system updates, sequence, elements, balance of time among elements, success in transmission of health information, clarification of training procedures	Trainings conducted with family members, participation in the study by friends	Telemedicine system design: ease of use, technical problems with the system, privacy concerns related to patient information, patient–provider communications and health feedback		Obtaining computer access through services of homeless shelter	Email
Challenges using computers in the past	Connections among training experiences	Family mitigation of access to ICTs in the home	Instructions related to the use of the system		Using the Internet to find career information	Blood pressure
Desire to own and use ICTs	Patient enjoyment of training	Shared use of ICTs among family members in the home	Follow up activities related to the use of the system			Recipes for plus sized women
	Training barriers	Shared family resources in the home	Benefits of the system			

approaches; (b) technology use contexts; (c) social networks; and (d) the social policies and institutional mechanisms regulating technology access and use. Using our model to analyze the women's experiences of ICTs, we find that the geographic nature of their experiences lies in the highly localized context of ICT resources and the use of place-based social networks by most of the women to provide information and resources related to ICTs. The localized context of ICT resources, the nature and extent of social networks, and the kinds of information and resources embedded in the social networks are shaped by the extreme geographic and racial segregation experienced by all of the women in the study. Ultimately, it is the result of the geography of poverty, racial segregation, and service delivery that combined with the limited mobility of the women due to health limitations, lack of access to transportation, and/or multiple responsibilities such as children or elderly care, that makes the use of the telemedicine system potentially beneficial in helping to overcome the complex travel logistics associated with navigating multiple services in order to increase health care access, delivery and outcomes.

3.2. *Information delivery approach*

One aspect of the digital divide is the difference associated with how information is shared, disseminated and accessed through the use of e-communication technologies. Elements of e-communications include: (a) using electronic mail; (b) sending text messages from one cell phone to another; (c) collaborating using software that enables Internet conference activities; (d) using electronic listservs and bulletin boards and (e) using group software that enables Internet access to common source documents (i.e. Blackboard).

When we consider the prevalence of e-communications as part of the delivery of information, two issues emerge that emphasize the disparities associated with the digital divide, especially the ways in which poor women interact with and are affected by ICTs. First, in order to participate in e-communication tasks, it is necessary to have hardware, such as a computer or other electronic communication device, and relevant software that permits a particular form of communication activity. Second, it is necessary to have access to a service provider in order to participate in the communication possibilities associated with the hardware and software configurations. Both issues have strong geographic implications. First, the location of a computer that is accessed matters in terms of the negotiation of time and distance in the daily lives of individuals. Second, the degree of access is strongly influenced by the quality of Internet service provided and capacity of hardware. Slower, older computers that rely on a phone modem connection have the effect of reducing connectivity to Internet information resources as compared with newer, faster computers using dsl or cable connections to the Internet. As real world services, such as accessing health care, move to integrate the

use of ICTs in their delivery models, differences in the available ICT infrastructure can affect the geography of service access as well as the outcomes achieved.

In response to the sub-study enrollment questions, seven of the eight women reported using computers in their homes prior to the study (see Table 1). However, none of the women had Internet access at home or prior experience in using e-mail, and only one reported any prior experience using the Internet. Comments shared during the training session illustrate that access and experience were difficult for the women to assess. And, the narratives show that economic circumstances strongly affected their likelihood of having Internet service at home. For example, Barbara indicated that she had used a computer in a class provided at a homeless shelter. She stated that she wanted to get a computer at home but she could not afford it. Barbara received computer training from a service provider of emergency housing. Yet once she was no longer homeless, she was not able to attain a computer at home. Another woman, Linda, was unemployed and had to share a pair of glasses with her brother throughout the training. Again, Linda's experience deepens the meaning of accessibility. She is gaining access to health care through the telemedicine study, but not the glasses that would enable her to use the system (or her prescriptions for that matter). Rhonda had a computer at home, but not an Internet connection. She was taking a free computer class, but could not afford to pay for an Internet course. Patricia, owns a computer that she purchased on a payment plan through her former job as a custodian. Joyce has a computer in her bedroom, although no Internet connection and little experience. There is little question that lack of money is a barrier to gaining access to computers, the Internet, and training. Yet, as these women indicate, the experience of poverty is limiting access in more profound ways. Women who had used computers at home prior to participation in the sub-study did not necessarily own the computers they used. And, nearly all seem to have gained experience first through their own jobs, with seven of the women reporting that their prior computer use experience consisted solely of word-processing. Among the challenges that are faced in the realm of information delivery is to understand the means by which individuals have access to computers and the Internet, paying particular attention to identifying and overcoming ICT use barriers. In addition to more common approaches to improve infrastructure including providing low cost or free computers, Internet access, and/or training, such innovations as creating "user friendly" software applications, Internet sites, and information formats may have more wide reaching effects of democratizing information itself. Furthermore, tying computer and Internet access as well as training to broader social services, may help overcome the more profound barriers people experience due to poverty.

Another challenge faced in overcoming digital divide barriers is to consider what purpose individuals have for using ICTs and to examine how people interact when they

use all kinds of ICT resources, including the Internet. Many of the women expressed an interest in using the Internet to attain health information (see Table 2). Monica conducted a Google keyword search on “blood pressure” in order to obtain information about her condition. Monica complained that her physician does not give her enough information. Barbara, a mother of a school-aged child, was particularly interested in using the Internet to get information about diabetes. Her own mother and sister had died of diabetes at the ages of 45 and 35, respectively, and she was concerned about arriving at the same age benchmark with a similar health condition. She viewed Internet skills as having the potential to strengthen her odds at obtaining information that could improve her health outlook. Barbara conducted a Google keyword search on diabetes and “women plus recipes”. Rhonda was concerned that her ability to use and gain benefit from the system depended upon her ability to afford an Internet connection at home.

Examining information delivery provides an important underpinning for understanding that each facet of e-communication is impacted by place-based social circumstances, knowledge of how to use computers, and knowledge of information schemas to relate optimally relate with Internet information resources. This perspective is useful to examine the relationship between ICT knowledge and ICT access and use, as these can be shaped by the place-context in which the ICT infrastructure is to be accessed and used. In overcoming the digital divide, it is important to have access to computers and the Internet, but it is much more important to have knowledge of how to use computers and how to access the Internet. Furthermore, we need to address the barriers to access to ICTs experienced by poor people beyond simply a lack of access to money. Poverty impacts people’s access in more insidious ways such as ill health, lack of housing, and lack of basic literacy.

3.3. *Technology use contexts*

Knowledge of how to use computers and how to access the Internet is one way of describing technological literacy. Moreover, gaining technological literacy is an interactive process, experienced in specific settings, whether at home, work, public libraries, or in Computer Technology Centers (CTCs). We suggest that framing what the digital divide means from the perspective of poor people involves depicting their perspectives on the context within which computers are made available and Internet access is provided.

Even when women had computers at home, it was not necessarily possible for them to use the computer (see Table 2). Monica has a computer at home and indicated that she “loves computers,” but only had about five hours prior computer experience. She explained that the computer was used by her children thereby indicating that she prioritized her children’s access more than her own. A number of the women indicated that they preferred to submit their data at the lab so that they could get help from

an assistant. Others preferred the local library. Rhonda indicated that she planned to use the Internet at the CTC where she was taking her free computer class. Underlying these preferences is the availability of, and knowledge about, place-based ICT resources.

By understanding what constitutes an appropriate setting for gaining technology literacies, we can better conceptualize the barriers that exist. For example, if an individual prefers to gain access to the Internet in settings that provide technical assistance rather than at home, merely owning a computer does not constitute overcoming the digital divide. For such an individual, having access to technical and educational support would be an important element in redressing other disparities around using computers and accessing information through the Internet.

We suggest that paying close attention to how poor women assess the highly localized and place-based context in which they may use computers and gain access to the Internet is an essential element of gaining technology literacy. We also suggest that technology literacy is the underpinning for overcoming digital divide barriers. Further, we suggest that gaining technology literacy provides a basis for the self-efficacy skills needed to assess the benefits of particular technology use settings in relationship to specific computer and Internet access needs.

3.4. *Social networks*

Research has shown that relying on place-based social networks is an important strategy used by low-income, racialized minority women to access resources. But, the types of networks used and the location of networks have important consequences on poor women’s decision-making on issues such as the well-being of their families (Gilbert, 1998; Peake, 1997). Lenhart and Horrigan (2003) point out that more research is needed to differentiate the access and use dynamics of the least engaged in using ICTs. They illustrate that ICT use is dramatically shaped by place-based networks among these individuals, with particular importance placed on household access characteristics. In poorer households, where ICT access may involve older computers and dial-up service provision, not surprisingly, use of the Internet is infrequent. In higher income households, many “net-evaders” who do not prefer to use the Internet maintain access when needed through the proxy use of other household members. They also point out that “net-dropouts” are often low income, minority users who have lost access to the Internet due to the inability to pay for service provision at home or the loss of an aging computer. These users maintain access to information through friends and family, and they are the most likely to rely on free library or community center access (Lenhart and Horrigan, 2003).

The women in the digital divide sub-study whose training experiences we have examined all demonstrated a relationship between place-based social networks and how they access and use computers and Internet resources (see Table

2). Three of the women participated in the study with male relatives who lived in North Philadelphia; in two instances within the same training session. In both cases where the women trained with their brothers, the men had more computer skills (however, that did not translate into better compliance with system use on the part of male study participants). Barbara's brother helped the trainer to explain basic computer skills and the telemedicine system to her. Barbara also indicated that she would rely on her brother for assistance in submitting data at the library. Barbara is an example of the importance of place-based social networks in gaining computer skills and knowledge about place-based resources.

Social networks were sometimes constraining as well as enabling – often simultaneously (see Table 2). For example, Joyce lives with her daughter who is a computer programmer. Joyce described using her daughter's computer to play Solitaire and use Internet sites. She said that her daughter had banned her from using the home computer and the Internet because of her excessive gaming and gambling losses at casino sites. She also described having shopped at several online department stores in the past, but explained that her daughter had cut up her credit cards due to her excessive online spending. Interestingly, the trainer observed that she learned how to use the site quickly and with little difficulty. Her prior experience seems to have provided a basis for acquiring skills. Yet despite her prior experience, Joyce was hesitant initially to engage in the training session until she encountered a friend from her neighborhood in the reception area who helped her decide to complete the training.

The place-based social networks of low-income, racialized minority women will play a role in how they access ICT and how they use Internet resources. Furthermore, these place-based social networks will help to determine what information women receive related to ICTs including place-based resources. We suggest that how they relate this information to decision-making should be accounted for in our efforts to understand digital divide barriers. Furthermore, we also suggest the need to ask if ICT access ultimately alters the kinds of social networks women use.

3.5. Social policy and institutional mechanisms regulating technology access

These women's access to health care is embedded within the inequalities of the health care system in the United States (Kreps, 2005). There are two issues that we would like to highlight. First, a number of women were concerned about the potential lack of privacy resulting from using the telemedicine system (see Table 2). Gloria gives a glimpse into her complicated decision-making related to access to ICTS and healthcare. Gloria was receiving welfare benefits of \$30.00 a month and was in the process of trying to claim unemployment benefits. She states that she agreed to be in the study because she needs the money. She would not consider other types of clinical trials because some are too

invasive. Since this clinical trial had the benefit of computer training, she decided to participate.

Barbara demonstrates another example of the trade off between potential loss of privacy and desire to gain access to health care. The trainer, Barbara and her brother logged into the physician accessible database to which patients submit data using the telemedicine system as a means of explaining how the system works. Both thought the study was a good idea; however, they noticed immediately that their social security numbers had been recorded in the database. They expressed concern that someone could obtain their personal information and use it improperly. The trainer explained that this information was not supposed to be in the database and would be removed immediately. Despite these concerns, Barbara's deep concern for her health described above led her to transmit data to the telemedicine system.

The second issue that became apparent was that these women were evaluating the potential benefit of the telemedicine system from a disadvantaged position vis-a-vis the health care system. Monica said that her physician does not give her information on her condition. She said that the telemedicine system would be useless if she does not receive feedback from the physician. She wants to receive more than a thank you message on the login screen. She wants to receive detailed information from a physician on how to take care of herself in association with use of the telemedicine system. She does not know if the telemedicine system is beneficial. She was unsure if she would submit information everyday. This raises the question as to how the telemedicine system is perpetuating unequal access to health care. It is important to note, however, that given the current health care system, it is unlikely that she will receive improved face-to-face access.

This is just one example of how institutions and institutional mechanisms can alter the geographies of daily life. For these women, the issue of privacy and accessing information are closely related to their navigation of a number of interrelated services and institutions. Their decisions to use ICTs balance factors that require careful consideration of their geographically situated experiences. The adjustments they make are carefully considered; and closely connected to the changes in how institutions integrate ICTs.

3.6. Summary

Despite the limited prior experience in using computers and the Internet among these eight women, most of the women were able to learn quickly how to use the telemedicine system for managing health information. They reveal a great deal of sophistication related to the role of information in managing their conditions and the actual purpose of the system from multiple perspectives (physician, patient, general health management). Several of the women had computers at home but chose to use computers in other local settings to transmit data in order to take advantage of assistance in specific settings such as a local library or

community technology center. And several explained their own computer use experiences in direct terms of their place-based family networks.

Through interacting with these women, we argue that by combining technology literacy training with self-monitoring their health, many of the barriers related to ICT use for poor women were overcome. We conclude that the women were able to benefit in multiple ways at least in the short-term. First, they were able to use ICTs to communicate with health care providers on a frequent basis and eliminate the need, expense, and time required for face-to-face communication. Second, they gained confidence in terms of being able to assess how ICTs might relate to their individual circumstances. And finally, they were able to gain experience in using ICTs that provided a basis for shared interactions with family, friends and community members in different contexts. Their narratives of ICT use draw attention to the need to examine the digital divide in a more nuanced way than the traditional model would suggest. In particular, we highlight the geographic nature of women's complex strategies to access ICTs including the highly localized context of ICT resources and the use of place-based social networks by most of the women to provide information and resources related to ICTs. These strategies are created within the broader context of highly racially segregated and geographically isolated neighborhoods on the one hand, and each woman's relative mobility due to factors such as health, poverty, multiple responsibilities, and transportation availability.

ICTs are emerging to play a significant role in mitigating the access poor women have to health care for themselves and their children. While the Department of Health and Human Services (DHHS) is supporting research to identify how women's healthcare can be improved through integrating information resources into clinical health care provision, it acknowledges that there continues to be a health gap between minorities and whites that may limit the effectiveness of such measures in addressing the needs of poor women. Therefore, the use of health care information to assess what the digital divide means for poor women in terms of their access to technology, the information they receive, and their decision-making outcomes addresses a major public policy issue.

4. Conclusions

In conclusion, we argue that our reconceptualization of the digital divide from the perspective of some of the most marginalized people in our society shifts the policy thrust from simply overcoming delivery barriers to understanding what strategies may work to help empower poor people through the use of ICTs in daily life. It requires us to understand the embeddedness of people in place-based communities and social networks as well as the unevenness of ICT resources and information across space. It is impor-

tant that public policy invests in strategies that will improve access to computers and the Internet such as investing in community technology centers, donating computers to community organizations, providing training programs for supporting workforce development and creating publicly accessible information resources. There is no question that we need to enhance substantially the ICT resources available in poor communities.

However, these approaches have not fundamentally altered the landscape of empowerment among marginalized groups nor have they democratized information resources. We suggest that by learning what strategies are being employed successfully by marginalized populations, both at the individual and collective scales, we can gain a better understanding of how ICTs can be a part of improving quality of life. Our observations show that among the strategies used by the women to overcome digital divide barriers were: sharing computers with place-based social networks, particularly family members, accessing educational programs at local community centers and libraries, and coupling ICT training with engagement of needed services. These experiences provided enough ICT background for nearly all of the women to master the use of the telemedicine system in the digital divide sub-study. This demonstrates that a reconceptualized policy framework for addressing ICT approaches that reflects the perspectives of marginalized populations might link investments in community information needs to the specific challenges faced. For the women in the digital divide sub-study, it is clear that health information needs should be central to policy-making efforts. A number of policy concerns need to be addressed in order to ensure that poor people are not marginalized further by linking community information needs to specific challenges such as health care. First, we need a broader discussion of who has the right to decide what information should be made available in the public domain. Clearly, the implications for privacy are far reaching for everyone. Yet, poor people are monitored extensively through their participation in the social welfare system; and their privacy concerns could be greatly exacerbated as health care delivery is increasingly integrated with the use of ICTs.

Second, a re-evaluation of public policies related to the intertwining of technological and basic literacies as prerequisites to accessing health, education, jobs and decision making processes. The use of ICTs has the potential to exacerbate inequalities in the United States so we need to think carefully about how we embed ICT use in public policy.

Thirdly, an examination of the costs and benefits of improving information accessibility towards the goals of decreasing health gaps for racialized minority populations and women in the United States. Clearly providing infrastructure is not enough, however costly. But finding better ways to empower marginalized people in relation to their health is likely to have long-term benefits to society in terms of decreased medical costs.

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