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The power divide: Mobile communication in Los Angeles' Skid Row

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Abstract

This study explores mobile phone use among people experiencing homelessness in downtown Los Angeles. It explores usage patterns and connectivity challenges, and how these affect access to social services as well as opportunities for information seeking, skills building, and social capital formation. To characterize the unreliable conditions under which this population uses mobile phones, we introduce the concept of *access instability* to capture not simply the obstacles to technology access imposed by poverty but more broadly those stemming from a combination of poverty, housing insecurity, and discrimination. The study is primarily based on a survey among adults experiencing homelessness (or at risk of) conducted over a span of 5 months, complemented by findings from a participatory research intervention carried out in collaboration with a local advocacy organization. Among the key findings is that reliable access to electrical power represents a fundamental yet understudied barrier to mobile use among marginalized populations, including (but not limited to) those experiencing homelessness. Lacking a safe and reliable place to charge their devices, the unstably housed must activate coping strategies that limit digital engagement and constrain use. Overall, access instability disrupts the expectation of constant

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reachability that underpins modern economic and social relations. Ultimately, this narrows pathways out of homelessness by limiting the ability to gain or sustain employment, to connect with healthcare providers and other vital resources, and to maintain networks of personal support.

Keywords
communication policy, digital inequality, homelessness, Los Angeles, mixed methods

Introduction

The unstably housed are resource deprived and socially marginalized along several dimensions. However, researchers have consistently found high levels of engagement with mobile communication devices among homeless populations (Eyrich-Garg, 2011; Reitzes et al., 2016; Rice & Barman-Adhikari, 2014). These results are consistent with survey findings for the general population showing that, over time, gaps in mobile phone adoption between different segments of the US population have been closing (Pew Research, 2019). Digital-divide scholarship has evolved accordingly, turning attention from inequalities in physical access (the so-called "first-level" digital divide) to differences in ICT skills and motivations, in patterns of online engagement, and in potential outcomes for education, employment, health and other key determinants of individual wellbeing (Livingstone & Helsper, 2007; Scheerder et al., 2017).

Nonetheless, several recent studies suggest that survey-based estimates of the first-level digital divide may be underestimating the challenges to technology access faced by the urban poor (e.g., Gonzales, 2016; Marler, 2019; Robinson et al., 2015). These studies postulate that technology access is best conceptualized as a dynamic gradation of opportunities that extends beyond device ownership or service subscription captured at a single point in time. By calling attention to the fluidity of connectivity circumstances among the urban poor, this body of literature emphasizes the complex interdependencies between digital inequalities and those in education, housing, employment, and other resources. These studies have renewed the debate on the first-level digital divide, particularly in the context of high-income countries, where surveys suggest near-saturation levels of smartphone adoption (Pew Research, 2019). Through these new lenses, technology access becomes a dynamic concept that can be partitioned into several dimensions (such as quality, reliability, and stability), thus yielding a continuum of material circumstances that map onto different opportunities for mobile technology use.

Building upon this literature, this study explores mobile phone access and use among the houseless population in the Los Angeles area known as Skid Row. In particular, we seek to analyze how barriers to mobile use narrow potential pathways out of homelessness by disrupting access to social services as well as

opportunities for information seeking and social capital formation. To characterize the conditions under which this population uses mobile phones, we introduce the concept of *access instability* (echoing the well-known concept of *housing instability* in the homelessness literature). This term captures not simply the obstacles to technology access imposed by poverty, which are well established in the digital inequality literature, but more broadly those stemming from a combination of poverty, housing insecurity, and social discrimination.

Among the key findings of this study is that reliable access to electrical power represents a fundamental yet understudied barrier to mobile technology access among marginalized populations, including (but not limited to) those experiencing homelessness. Lacking a safe and reliable place to charge their devices, the unstably housed must activate coping strategies that limit digital engagement and constrain mobile use. Critically, access instability disrupts the expectation of constant reachability (Ling, 2004) that constitutes the foundation of modern economic and social interactions. Ultimately, this affects the ability of those experiencing homelessness to gain or sustain employment, to connect with healthcare and other vital resources, and to maintain networks of personal support.

The findings are primarily based on a survey among adults experiencing homelessness (or at risk of) conducted in downtown Los Angeles over a span of 5 months during 2018. The interpretation of findings also draws from a participatory research intervention carried out by the research team in collaboration with a grassroots advocacy organization based in Los Angeles' Skid Row. The intervention explored community-driven alternatives to improve Internet access for Skid Row residents. A series of co-design workshops brought together researchers with local residents and community leaders, including many with lived experience of homelessness.

The study makes three main contributions to the digital inequality literature. First, it expands scholarship on the dimensions that characterize disparities in mobile phone access in high-resource contexts. More specifically, the study documents how broader social inequalities combine with group-based discrimination and local policies to create barriers to mobile engagement that go beyond device ownership and service subscription. Second, the study fills a gap in scholarship by examining how digital inequality manifests among displaced populations, at a time when the number of displaced migrants and people experiencing homelessness is growing rapidly in the United States and elsewhere. Third, the study validates the need for a multilayered theoretical perspective on digital inequality that explores how barriers at the material access layer propagate onto disparities in skills, motivations, and ultimately opportunities for mobile use.

Theory and research questions

Homelessness, digital inequality, and urban poverty

With the surge in homelessness in major urban centers in the United States and elsewhere, digital inequality scholars began exploring how housing insecurity

combines with other dimensions of social distress to hinder communication technology use. A key theme in this literature is the examination of differences in adoption and patterns of use between those experiencing homelessness and the general population. Interestingly, a consistent finding is that, at first sight, differences tend to be relatively small. For example, using a sample of adults in permanent support housing in the Los Angeles area, Rhoades, Wenzel, Rice, Winetrobe, and Henwood (2017) find no significant differences in smartphone adoption between this sample and the general US population. A comparison of social media use between homeless young adults and US college students by Guadagno, Muscanell, and Pollio (2013) similarly finds minimal differences in adoption and overall patterns of use. An earlier study conducted in 2011 by Reitzes, Parker, Crimmins, and Ruel (2016) in downtown Atlanta finds somewhat larger differences, which suggests that gaps between the unstably housed and the general population have been gradually closing.

Scholars have also examined how the size and composition of mobile-based social networks impacted the wellbeing of those experiencing homelessness. A consistent finding has been that maintaining ties to family and friends who are not homeless is associated with pro-social behavior and positive health outcomes. The hypothesis is that these connections provide access to information and personal support unavailable through peer, street-based interpersonal networks. For example, using a convenience sample of homeless youth recruited at a drop-in agency in Los Angeles, Rice and Barman-Adhikari (2014) find that having social media connections with geographically distant, non-street peers is positively associated with searching for employment. Other studies suggest that social media use supports engagement with online groups and advocacy organizations that help validate individual identity and provide pro-social support not found in street peers (Eyrich-Garg, 2011; Roberson & Nardi, 2010).

Several studies also probe into the interdependencies between homelessness and urban poverty, and how this affects opportunities for mobile access and patterns of use. One major line of argument is that survey-based estimates of mobile adoption among the urban poor (and those experiencing homelessness in particular) fail to capture the multiple barriers to access faced by these populations in their everyday lives. These barriers include frequently broken or stolen devices, slow connections, unreliable service, and limited data plans (Powell et al., 2010; Reisdorf & Rikard, 2018; Rhinesmith, 2012). Humphry (2014) suggests that owning a mobile phone is not indicative of their affordability but rather of the degree to which the unstably housed depend on mobile access to fulfill essential daily needs.

Leveraging mobile technologies for health

Public health and social work scholars have long acknowledged the opportunities afforded by mobile devices to improve delivery of health and other services to those experiencing homelessness (Eyrich-Garg, 2010; Sala and Mignone, 2014). The literature identifies multiple opportunities, both in terms of improving

treatment of existing conditions as well as in reducing risk factors. For example, Freedman et al. (2006) find that mobile phones can help reduce drug use by homeless individuals undergoing treatment. Rice (2010) finds that having social media connections with non-street peers who practice safe sex is associated with a 90% reduction in risky sexual behavior among homeless youth, while Rice, Kurzban, and Ray (2012) find that those with larger and more heterogeneous social networks present better mental health outcomes compared to peers with smaller, less diverse personal networks.

By contrast, other studies emphasize the challenges for leveraging mobile technologies to improve health outcomes among the urban poor. Gonzales (2016) examines these challenges through the lenses of technology maintenance, showing that the frequent occurrence of cellphone disconnection (due to broken devices or service interruptions) significantly reduces access to health services among low-income HIV+ patients. In a related study, Gonzales (2014) finds that the psychological reassurance that the average mobile user associates with being able to connect with friends and family at all times is significantly weaker among the urban poor due to frequent mobile disconnection.

Access instability

Drawing from the above literature, this study uses the concept of *access instability* to refer to the precariousness that characterizes mobile access and use among the unstably housed. Echoing the concept of housing instability in the homelessness literature, access instability centers on the challenges to maintain mobile connectivity and the frequent interruptions in access, which stem from multiple factors that often occur in combination.

The first factor relates to the use of second-hand, low-quality mobile devices among those experiencing homelessness, often obtained through subsidy programs or bought in secondary markets. These phones tend to be less durable, and less capable of connecting, holding a power charge, or running applications. Second, safely securing a device is difficult for those frequently exposed to theft or property confiscation by law enforcement. When a device is stolen or confiscated, users not only lose the information contained on the device, but also the ability to be reached by others. This is particularly true when replacing a device requires obtaining a new phone number, which is often the case through subsidy programs such as Lifeline (discussed below). This temporary loss of "individual addressability" (Ling, 2012) is yet another source of access instability.

A third dimension of access instability, and one that is for the most part overlooked in the extant literature, relates to the lack of reliable options for recharging mobile devices. As a result, the unstably housed must activate a number of coping strategies to access the power grid, often requiring significant time and travel as well as costs. While low-battery anxiety has been previously studied by social psychologists (e.g., Yildirim & Correia, 2015), such anxiety takes an entirely different meaning for the unstably housed because the ability to charge at an electrical

outlet can never be taken for granted. In other words, while for the average mobile user low-battery anxiety is typically short-lived and easily alleviated, it is a permanent feature of the lived experience with mobile among the unstably housed.

Lack of reliable access to power, and the ingenuous ways in which mobile users cope with it, has been studied before in the digital inequality literature, particularly in the context of low-income countries (e.g., Wyche & Murphy, 2013). In these contexts however, the origin of the problem is the limited development of the power grid in marginalized urban contexts or in rural areas. This stands in sharp contrast to our study setting in downtown Los Angeles, where lack of access to electricity is driven not by infrastructure deficits but rather by discrimination and exclusionary practices that bar people living on the streets from tapping into this infrastructure.

Using access instability as a theoretical starting point, this study addresses the following research questions:

RQ1: What are the key barriers to mobile use and the coping strategies activated by those experiencing homelessness?
RQ2: How does access instability affect the general patterns of mobile phone use in this population?
RQ3: How does access instability affect opportunities for information seeking, access to social services and social capital formation through mobile technologies?

Methods

Fieldwork and sample recruitment

Previous studies have identified numerous challenges to random sampling in survey research with homeless populations, including difficulties with enumeration, the transient nature of the population, and the very fact that homelessness is a fluid problem, with individuals often moving in and out of homelessness in a relatively short time span (Eyrich-Garg & Moss, 2017; Fitzgerald et al., 2001). Following standard practice in homelessness research (e.g., Eyrich-Garg, 2011; Guadgano et al., 2013; Rice & Barman-Adhikari, 2014), this study is based on a convenience sample of individuals recruited through the Los Angeles Public Library. More specifically, respondents were recruited at a monthly event that brings homeless service organizations to the library premises in downtown Los Angeles. These events (called The Source) attract a large traffic of people affected by housing insecurity.

Fieldwork was conducted between May and October of 2018, and respondents received a small monetary compensation for their participation in the survey. The data was collected in person by an interviewer through a tablet pre-loaded with a Qualtrics-based questionnaire. The average duration of the interviews was approximately 25 minutes. Following IRB requirements, participants were informed that

results were anonymized and that no identifying information would be retained. The study was limited to the adult population (18+ years). Minors were thus filtered out after recruitment, yielding a sample of 106 valid responses.

Defining homelessness

For the purpose of this research, we found it necessary to define a scale of homelessness severity. Our working hypothesis is that as people's housing situation becomes increasingly unstable, their ability to access and use mobile phones similarly becomes increasingly unstable. Defining gradations of homelessness is not necessarily straightforward, however. Various government agencies, at the federal and local level, have adopted different definitions that correspond to the programs and services they offer. Further complicating the task is the very meaning of "home": our community partners emphasize that, for people living on the streets, their sidewalk tent, the car they live in or their makeshift shelter is their home, and that they should be more accurately characterized as "houseless" (Winetrobe et al., 2017).

While acknowledging these complexities, we divided our survey respondents into four categories of increasing housing instability. These categories are closely aligned, though not a literal match, with those of public agencies such as the Los Angeles Homeless Services Authority (LAHSA) and the Federal Department of Housing and Urban Development (HUD). They reflect homelessness in the US context, and thus differ from definitions in other contexts, such as the broader ETHOS typology (European Typology on Homelessness and Housing Exclusion). Our four categories are as follows:

1. **At risk of homelessness**—includes respondents who state they are currently housed and have never experienced homelessness. However, because they seek services targeting the unstably housed, we infer they are at risk of homelessness.
2. **One-time homeless**—includes respondents who either state a) they have experienced homelessness once in the past 3 years, for less than 1 year; or b) they are currently homeless for the first time, but for less than 1 year.
3. **Repeatedly homeless**—includes respondents who state they have experienced homelessness between two and four times in the past 3 years.
4. **Chronically homeless**—includes respondents who state they have experienced homelessness more than four times in the past 3 years, or that they have currently been experiencing homelessness for longer than 1 year.

Sample characteristics and limitations

Using a convenience sample naturally raises questions about external validity. In order to strengthen the validity of our findings, we compare our sample to the results of the 2018 Los Angeles Homeless Services Authority (LAHSA) annual homelessness count along a number of sociodemographic dimensions.

Table 1. Characteristics of Study Sample versus 2018 LAHSA Count (City of Los Angeles only).

		Our sample (%)	LAHSA count (%)
Gender			
	Male	65	67
	Female	35	31
Age (years)			
	Minor	–	9
	18–24	5	7
	25–54	61	59
	55–61	14	15
	62+	20	10
Chronically homeless			
	Yes	41	28
	No	59	72
Race/ethnicity			
	Hispanic	29	35
	African American	26	39

Source: Los Angeles Homeless Services Authority and study sample.

The LAHSA annual count is a point-in-time census of the homeless population in Los Angeles County. The 2018 count was conducted in January, and resulted in a total estimate of 31,285 people experiencing homelessness in the city of Los Angeles. In Table 1 we compare our sample to these results along key demographic characteristics.

As shown, our sample generally matches the characteristics of the homeless population in the city of Los Angeles. There are however some differences in the age distribution (partly due to filtering out minors in our sample), in racial composition (our sample having fewer minority individuals), and in the share of chronically homeless (which is partly explained by differences in the definition used, as described in the previous section). Perhaps the most important difference (which is not captured in Table 1) is the fact that, due to our recruitment strategy, our sample is biased toward those willing and able to seek resources and support services at the Los Angeles Public Library, which correlates with those described in the literature as the "functional homeless." This is an important characteristic of our sample that potentially over-estimates some of our findings regarding mobile use among those experiencing homelessness.

The small sample size is an important limitation of this study, as it decreases statistical power and thus the ability to detect significant differences. Despite this limitation, we report the results of association and difference in means tests when appropriate. In some cases, results are statistically significant at lower confidence levels than commonly reported (e.g., at $p < 0.1$ or 90%). In general terms, and in line with other survey-based studies with homeless populations (see review by Sala

& Mignone, 2014), we present our quantitative findings as indicative of patterns that need further validation in studies with larger samples.

Measuring access instability

In order to explore how access instability affects the frequency and patterns of mobile engagement, we construct a measure of access instability based on two variables: mobile ownership and difficulty in charging a mobile device. More specifically, we consider that respondents are struggling with access instability when they either (1) did not own a mobile device at the time of the survey or (2) reported they sometimes or always have difficulty charging their mobile device. Based on this definition, about two-thirds (69%) of our sample falls in the access instability category. While acknowledging that access instability occurs along a continuum of individual experiences, this binary distinction enables a preliminary exploration of how it affects patterns of mobile use among the unstably housed.

Participatory co-design workshops

In addition to the survey, we partnered with a Skid Row grassroots organization, the Los Angeles Community Action Network (LA CAN), to organize a series of co-design workshops aimed at addressing connectivity and information access deficits on Skid Row. The workshops brought together researchers with a dozen members of the Skid Row community—including currently houseless Skid Row residents, people living in shelters and transitional housing, as well as activists working with LA CAN or other organizations.

Over a period of eight weeks during the fall of 2018, we held weekly meetings during which we explored the mobile connectivity barriers participants faced in the daily lives, discussed alternative solutions adopted in similar contexts, and tested a variety of devices and equipment. The practical outcome of this action-research effort was a hybrid solar charging cart that has been regularly deployed at Skid Row community events, each yielding additional insights and refinements for both the object as well as the research and community practices surrounding it. The conversations between researchers and community members that took place throughout the co-design process and the subsequent deployment of the charging cart have provided valuable insights to contextualize and enrichen our survey findings.

Results

Device ownership and access

Those experiencing homelessness in Los Angeles are marginalized within a high-resource urban context. This has several important implications, one of which is the fact that barriers to mobile phone ownership are significantly lower than in other contexts. Figure 1 presents results for adoption of different communication

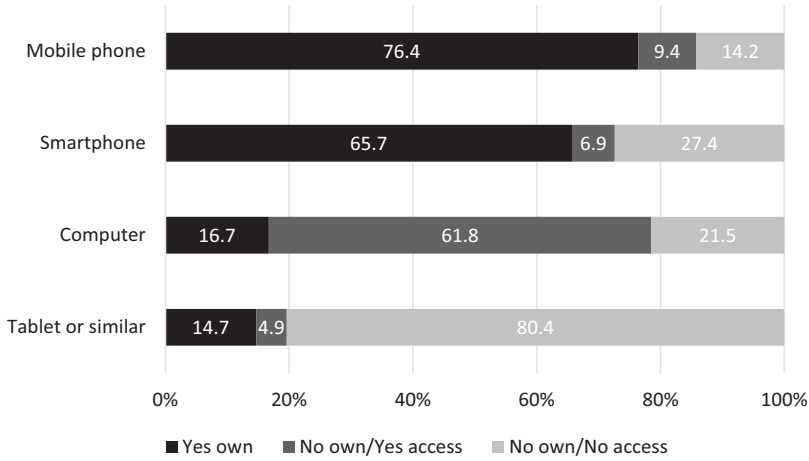

Figure 1. Device ownership and access (%).

devices in our sample. The results differentiate between individual device ownership and device access (e.g., shared PC use at shelter or public library).

As shown, most respondents (76.4%) own a mobile device, with about 66% owning a smartphone with Internet access capabilities. Smartphone penetration is somewhat lower than the estimate for the overall US population, which stood at 77% in 2018 (Pew Research, 2019). However, among low-income Americans (i.e., annual incomes below $30 K) smartphone penetration was estimated at 67%, which means that ownership among the unstably housed in Los Angeles is in line with the comparable overall population.

This result is partly explained by the Lifeline program, a federal program that subsidizes mobile phone service to low-income individuals. The program provides a monetary subsidy to companies that serve customers who qualify on the basis of their income or participation in one of several government assistance programs such as SNAP ("food stamps"), Medicaid, Federal Public Housing Assistance (FPHA), and others. In order to attract customers, service providers (for the most part resellers of the large wireless operators) typically offer a free smartphone device to new subscribers.

With about 1.8 million program recipients and the second highest participation rate in the nation, California is ground zero for the Lifeline program. During our fieldwork in downtown Los Angeles, we observed the permanent presence of Lifeline providers actively recruiting customers among the unstably housed. Workshop participants generally reported negative experiences with the handsets obtained through Lifeline providers, which are typically refurbished, low-end smartphones. A recurring theme is that these devices have low-quality batteries that last only a few hours. While our team did not independently test these claims, these patterns are typical of refurbished and used phones.[1]

The true value of the Lifeline program is the subsidized service. Several of our workshop participants reported obtaining a free Lifeline phone, and subsequently acquiring a new device from a store or as a gift in order to transfer the line to their new device. However, the Lifeline phone is often kept as a backup device, validating the strategy of mobile device accumulation documented by Marler (2019).

A related dimension of access instability is the frequent turnover in mobile phone number, with over half of our sample reporting a change in number in the past six months. This is due to phones being frequently stolen or lost in street sweeps by law enforcement. Thus, while obtaining a new device is relatively straightforward, with every change in mobile number the unstably housed face a significant cost in lost information and contacts.

In contrast to mobile devices, individual ownership of computing devices (16.7%) and tablets (14.7%) was significantly lower than in the overall US population. This is perhaps unsurprising given the permanent threat of theft and confiscation of personal property that those living on the streets experience. As a result, almost by necessity those experiencing homelessness are part of the growing "mobile Internet underclass" (Napoli & Obar, 2014). At the same time, a majority of the respondents (about 62%) report having access to a computing device at a shared-access location. This finding validates a number of studies showing that public libraries and community organizations continue to play a key role in addressing the connectivity needs of marginalized urban populations (Strover, 2019).

Charging devices

Lack of stable housing results in the loss of several attributes of modern life that most urban dwellers (even those struggling with poverty) take for granted. One of them is the ability to recharge a mobile device at home. The average mobile user plugs the device overnight, starting the day with a full battery. By contrast, for those who live on the street a typical day starts with a dead or dying battery. As a result, the day's activities must include stops at various locations (e.g., cafés, parks, and other public locations) with access to a power outlet. Since most locations only allow charging for a limited amount of time and are often congested, hopping between various locations in a single day is not uncommon. At the end of a typical day the battery is drained, and with no place to plug overnight, the cycle starts again the next morning.

Our findings suggest that charging is a key dimension of access instability among those experiencing homelessness. The majority of respondents (about 60%) report that finding a place to charge a mobile device is sometimes or always difficult (Table 2). Further, this barrier rises with the severity of housing instability, with about three quarters of the chronically homeless reporting that charging is often/always difficult. By contrast, among the at-risk population (which by definition are currently housed) only 25% report having trouble finding a place to charge.

Table 2. Homeless Severity and Device-Charging Difficulty (%).

	At risk	First-time homeless	Repeatedly homeless	Chronically homeless	Total
Charging is never difficult	75.0	50.0	31.6	25.9	39.7
Charging is sometimes difficult	12.5	37.5	47.4	33.3	35.9
Charging is often/always difficult	12.5	12.5	21.0	40.8	24.4

$\chi^2 = 10.031$, $p < 0.04$

Internet use

Our results corroborate previous findings regarding high levels of Internet engagement among homeless populations (Eyrich-Garg, 2010; Guadagno et al., 2013; Humphry, 2014). Overall, only 12% of the respondents report not having used the Internet in the past three months, which matches estimates for the general US population (Pew Research, 2019). However, a key difference between the unstably housed and the overall population is frequency of use (Figure 2). As shown, our respondents are less likely to connect daily, and significantly more likely to connect weekly or monthly. Being online less frequently creates several disadvantages, for example when pursuing employment opportunities or seeking social services (Gonzales, 2016).

A key finding from this study is that people experiencing access instability (either because they do not own a device or struggle to charge it) report less frequent online access (Table 3). In particular, the share of daily users drops 11.5 p.p. among those struggling with access instability. This suggests connectivity is more precarious for those experiencing homelessness.

Range of activities

The "ladder of opportunities" framework developed by Livingstone and Helsper (2007) provides a useful theoretical framework to explore the patterns of mobile engagement by those experiencing homelessness. This framework transcends a binary perspective of Internet use/nonuse by connecting activity patterns to key dimensions of individual wellbeing. Empirically, it is based on analyzing the range of online activities, premised on the hypothesis that the broader the range of instrumental technology use, the more likely the positive impact on user wellbeing. We adapt the original scale to construct a measure of mobile engagement for the unstably housed represented by the sum of all instrumental activities reported by respondents. These activities (11 in total) range from seeking online information about health, food, or shelter to searching for jobs and training opportunities.

Overall, users report engaging in an average of 5.2 online activities ($SD = 2.7$). However, users struggling with access instability engage in significantly fewer online activities than those who do not—those with unstable access report an average of 4.3 activities, while others report 5.6 activities ($\Delta = -1.3$, $SE = 0.6$).

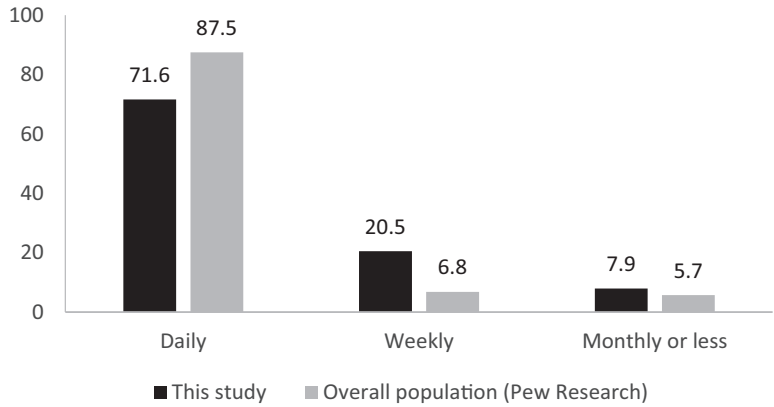

Figure 2. Frequency of Internet use (%).
Note: Sample restricted to Internet users.

Table 3. Access Instability and Frequency of Internet Access (%).

	Access instability = YES	Access instability = NO	Difference	Total
Daily	67.8	79.3	−11.5	71.6
Weekly	20.3	20.7	−0.4	20.4
Monthly	11.9	0	11.9	8.0

$\chi^2 = 3.8019$, $p < 0.1$

A simple difference-in-means test shows that this difference is statistically significant at the $p < 0.05$ level, indicating that access instability limits the ability of those experiencing homelessness to engage in a broader set of online activities, narrowing the potential benefits afforded by mobile technologies.

Information seeking

For the unstably housed, searching for food and shelter is part of everyday life. As shown in Figure 3, Internet access is a critical tool in this daily routine. About 61% of our sample reports seeking information about housing or shelters online, while about 45% reports seeking information about meals and food. Another common use is seeking information about public transit (58%), a highly relevant topic for those often journeying in search for a place to sleep, to get a meal or to recharge a phone. A relatively high share of respondents also report using the Internet to contact case workers (about 40%) or look for legal information or advice (about 39%). The latter finding is particularly significant, and likely reflects the legacy of poverty criminalization and police harassment against the Skid Row homeless population.

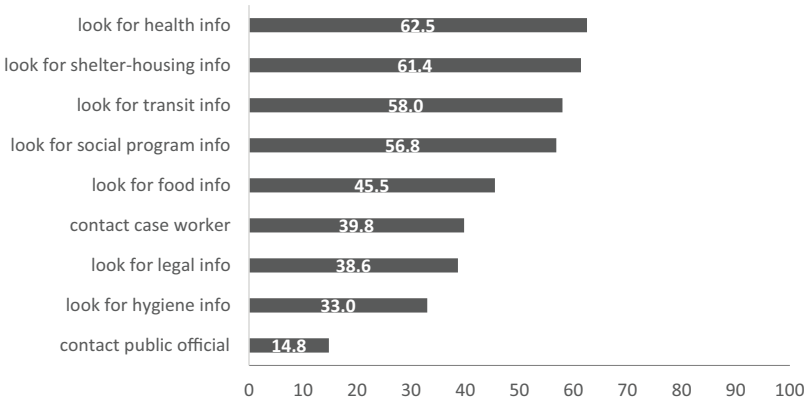

Figure 3. In the past three months, have you used the Internet to. . .? (multiple responses).

At the top of the information-seeking categories is health. This suggests that mobile use functions as a coping mechanism through which the unstably housed respond to increased health risk exposure and higher barriers to health care access. Further, about 40% of our respondents reports online uses related to communication with case workers or appointments with service providers. This likely reflects the growing digitization of social protection programs including California's Section 8 voucher program, a housing subsidy program for low-income individuals which has migrated significant elements of the application and eligibility-verification process online.

Employment

Previous research shows that finding a job is a key pathway out of homelessness (Marr, 2012). Further, a survey conducted by LAHSA revealed that the most common explanation given by homeless adults for lacking shelter is not having employment (Economic Roundtable, 2019). However, the relation between employment and homelessness has evolved in recent years due to stagnant wages, the growth of non-standard employment, and the sheer severity of the housing crisis in Los Angeles County. This combination of factors has resulted in a sharp increase in the number of employed adults that end up homeless. Using LAHSA records for 2016 and 2017, a study has estimated that 22% of the chronically homeless and 39% of the first-time homeless are fully employed (Economic Roundtable, 2019).

Our survey results corroborate these findings. Approximately a third of our sample reports income from a full- or part-time job. Further, a significant share is actively seeking employment, with 56% of respondents reporting they have looked for a job in the past year. Of those actively seeking employment, about

Table 4. Communication Modes with Friends or Relatives by Housing Status, Multiple Answer (%).

	Friends/relatives not homeless	Friends/relatives also homeless	Difference (*t*-test)
Email	21.4	0.0	21.4%***
Social media	40.5	10.3	30.2%**
Interpersonal (in-person)	41.7	86.2	−44.5%*
Phone calls and text	88.1	51.7	36.4%***

*** $p < 0.001$, ** $p < 0.05$, * $p < 0.1$

84% report going online to search for jobs. Among those who found employment, about 77% cite Internet access as a critical resource in searching and applying for work.

Connectivity is critical not just for finding but also for maintaining employment, since many of the available entry-level, low-skill positions are zero-hour contracts with constantly changing schedules. This requires workers to be permanently "on call" to fill the next available shift. Access instability thus negatively affects the ability of those experiencing homelessness to take advantage of employment opportunities in the context of flexible labor contracts that require employees to be reachable at all times. While not directly addressed in this study, the relationship between access instability and precarious employment deserves further scholarly attention.

Building human capital

In addition to seeking employment, many of those experiencing homelessness are also actively searching for education and training opportunities. About 7% of our respondents are enrolled in a degree program, while 14% are enrolled in a certificate program. This validates evidence of a growing population of students struggling with housing insecurity across the United States. Overall, slightly over half of our respondents report having looked for education or training programs in the past year.

In line with patterns among the general US population, our findings suggest that respondents seeking information about education and training opportunities turn to online resources. Of those seeking this type of information, over 90% report using the Internet for this purpose. Further, about half (45%) of those that enrolled in an educational or training program in the past year report going online to take classes or access related educational resources. Unsurprisingly, Internet access is at the center of strategies to build skills among those struggling with housing insecurity.

Table 5. Access Instability and Frequency of Communication with Housed Family/Friends (%).

	Daily	Weekly	Monthly	Yearly	No contact	Total
Access instability = YES	5.5	27.7	27.7	22.4	16.7	100
Access instability = NO	22.5	39.4	22.5	12.7	2.9	100
Full sample	19.1	37.6	23.6	14.6	5.1	100

$\chi^2 = 4.418$, $p < 0.04$

Building social capital

It is a well-established finding that individuals with larger and more diverse social networks benefit from being able to tap into information resources and personal support systems unavailable to those in smaller or more homogeneous networks (Lin, 1999). As noted above, several studies with homeless populations have corroborated these findings. Among those experiencing homelessness, often isolated both physically and socially, mobile phones greatly facilitate connections with those outside their immediate, street-based community.

We begin by comparing the communication patterns activated by those experiencing homelessness when connecting with friends or family depending on their housing status (Table 4). As shown, while communication with those who are also struggling with homelessness mostly relies on face-to-face interactions, communication with non-street friends or relatives is largely based on phone calls, text messaging and to some extent social media. The last column in Table 4 reports difference in means tests, and it reveals that the communication patterns used to reach non-street peers are significantly different from those used to connect with friends or relatives who are also homeless.

Given previous findings about the importance of maintaining ties with non-street peers, we next explore how access instability affects frequency of communication with housed friends and relatives. As shown in Table 5, those struggling with access instability report communicating less often with family and friends who are not homeless. The data reveals a clear pattern of less frequent communication among those struggling with access instability, thus suggesting a statistically significant association ($p < 0.04$) between access instability and opportunities to connect with non-street family/friends.

Finally, we ask respondents for the availability of personal or professional support in the case of a personal crisis or emergency. As noted above, the extant literature shows that mobile phones provide significant psychological reassurance to users, who rely on being able to reach family/friends or relevant professionals in the case of a personal emergency, and that this is particularly valuable for those at increased risk of crime or health crises (Gonzales, 2016). As shown in Table 6, those struggling with access instability are significantly less likely to report having someone to turn to in case of a crisis or a personal emergency. This suggests that, while the average mobile user finds comfort knowing that a loved one or a

Table 6. Access Instability and the Availability of Emergency Support (%).

	Support is not available	Support is available
Access instability = YES	28.3	71.7
Access instability = NO	12.1	87.9
Full sample	23.0	77.0

$\chi^2 = 3.2914$, $p < 0.07$

support professional is only a phone call away, access instability prevents those experiencing homelessness from the reassurance of being able to activate support at times of need.

Discussion and conclusion

This study seeks to contribute to the small but growing literature that investigates the social and technological attributes characterizing mobile access and use by those experiencing homelessness. The study is situated in what is arguably the most appropriate social laboratory to understand these questions: the area of downtown Los Angeles known as Skid Row, which is home to about 5,100 houseless people (LAHSA, 2019). The mixed-methods approach combined results from a survey with findings drawn from a participant research intervention in collaboration with a Skid Row advocacy organization.

Overall, the study reveals the complex and often surprising ways in which those experiencing homelessness are appropriating mobile technologies. While this appropriation closely resembles the patterns observed among the urban poor more generally, the combination of resource deprivation, social stigma, and criminalization faced by those living on the streets raises unique issues that our study set out to uncover. The challenges associated with charging devices while living on the streets characterize the unique barriers to mobile appropriation by the unstably housed. It is, we argue, a key dimension of access instability among this population, one that remains mostly overlooked in the existing literature.

Further, our survey findings suggest an association between charging barriers and the severity of housing instability. This was validated by the participant research intervention, which revealed both the multiple strategies activated by the unstably housed to charge devices as well as the psychological distress associated with the need to seek access to the electricity grid on a daily basis. In other words, while for the average mobile user a dead battery is a short-term inconvenience, for those experiencing homelessness it means not being able to search for where to find shelter or eat the next meal. But perhaps more critically, it also means not being able to follow-up on a job application or missing a call from a social worker, which in the long run truncates potential paths out of homelessness.

Theoretically, our study follows Gonzalez (2014) and several others who argue that discrete measures of mobile access are inadequate to capture the situated

conditions of mobile appropriation among the urban poor. We thus probe for evidence of access instability along a continuum of individual experiences of mobile access and use, some of which can be captured through surveys while others require qualitative research tools. We find that access instability significantly affects the affordances associated with mobile technology for those struggling with homelessness. For example, it reduces frequency of contact with family and peers who are not homeless, which previous studies show is an important contributor to individual wellbeing in this population. From a social capital perspective, access instability makes it harder to create and cultivate networks that alleviate social isolation and help bridge access to non-redundant information.

At the same time, we find high levels of mobile engagement among those experiencing homelessness that create multiple opportunities to improve information access and the delivery of social services. While the potential is almost endless, our findings suggest that access instability is a key contributor to the gap between a priori expectations and posterior outcomes. For example, our survey reveals that the adoption of mobile apps specifically developed by government agencies and nonprofit organizations to address the needs of the houseless is negligible.[2] While this may be partly attributed to lack of awareness and poor communication, it also reflects the strategic choices that mobile users in this population are forced to make as a result of access instability.

Several findings in this study point to low-cost, high-impact initiatives that could significantly reduce access instability among the unstably housed. For example, given that the power infrastructure in the Skid Row area is to a large extent already in place (in lampposts, public squares, transportation stations, and other city-owned assets), the operating cost of providing free device-charging to those experiencing homelessness would be minimal. According to our calculations, for the about 5,000 houseless people living in the Skid Row area to fully charge one device daily, the electricity cost would amount to about $5,500 per year.[3] This represents about 0.00015% of the annual LAHSA budget, the agency that operates the bulwark of homeless services in Los Angeles County.

Our findings also suggest that much can be improved about the federal Lifeline program as it relates to the houseless residents of Skid Row. In particular, incentives for Lifeline providers to distribute higher-quality devices could significantly improve the program's impact. In particular, allowing Lifeline providers to apply part of the subsidy to the purchase of more robust devices equipped with more efficient batteries would significantly alleviate access instability among those experiencing homelessness. Higher-quality devices would also increase incentives for Lifeline recipients to safeguard their mobile phones, thus extending the device-replacement cycle and reducing program administration costs.

Overall, there is no silver bullet to address the homelessness crisis in urban America, and improving mobile access for houseless populations may not seem an obvious priority. However, our findings suggest that small, low-cost changes to existing programs and policies can substantially reduce access instability, which in turn could improve intermediate outcomes (such as social capital formation and

access to health resources) that have been shown in previous studies to increase opportunities for transition out of homelessness.

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Notes

1. An analysis by the U.S. Department of Homeland Security reaches a similar conclusion (DHS, 2017).
2. Examples include FreshEBT, which allows users to check their SNAP balance online, and WIN (What I Need), a mobile app that helps connect to local homelessness resources.
3. Our calculation is as follows: the capacity of the average phone battery is 3000mAh and, at 5 V, requires 15 Wh to charge from 0% to 100%. Doing so every day for 365 days then requires 5.475 kWh (1,000 Wh = 1 kWh). The average price of electricity in CA is about 20 cents per kWh, yielding a total price of $1.095 to charge each device for an entire year. Assuming each of the estimated 5,000 houseless residents of Skid Row charges a single device once a day every day of the year, the total annual costs are $1.095 × 5000 = $5,475.

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