



**University of
Zurich**^{UZH}

**Zurich Open Repository and
Archive**

University of Zurich
University Library
Strickhofstrasse 39
CH-8057 Zurich
www.zora.uzh.ch

Year: 2018

A review of Internet use among older adults

Hunsaker, Amanda ; Hargittai, Eszter

Abstract: As the world population ages and older adults comprise a growing proportion of current and potential Internet users, understanding the state of Internet use among older adults as well as the ways their use has evolved may clarify how best to support digital media use within this population. This article synthesizes the quantitative literature on Internet use among older adults, including trends in access, skills, and types of use, while exploring social inequalities in relation to each domain. We also review work on the relationship between health and Internet use, particularly relevant for older adults. We close with specific recommendations for future work, including a call for studies better representing the diversity of older adulthood and greater standardization of question design.

DOI: <https://doi.org/10.1177/1461444818787348>

Posted at the Zurich Open Repository and Archive, University of Zurich

ZORA URL: <https://doi.org/10.5167/uzh-168013>

Journal Article

Published Version

Originally published at:

Hunsaker, Amanda; Hargittai, Eszter (2018). A review of Internet use among older adults. *New Media Society*, 20(10):3937-3954.

DOI: <https://doi.org/10.1177/1461444818787348>



A review of Internet use among older adults

new media & society

2018, Vol. 20(10) 3937–3954

© The Author(s) 2018

Article reuse guidelines:

sagepub.com/journals-permissions

DOI: 10.1177/1461444818787348

journals.sagepub.com/home/nms

**Amanda Hunsaker
and Eszter Hargittai** 

University of Zurich, Switzerland

Abstract

As the world population ages and older adults comprise a growing proportion of current and potential Internet users, understanding the state of Internet use among older adults as well as the ways their use has evolved may clarify how best to support digital media use within this population. This article synthesizes the quantitative literature on Internet use among older adults, including trends in access, skills, and types of use, while exploring social inequalities in relation to each domain. We also review work on the relationship between health and Internet use, particularly relevant for older adults. We close with specific recommendations for future work, including a call for studies better representing the diversity of older adulthood and greater standardization of question design.

Keywords

Digital inequality, digital divide, Internet skills, Internet use, older adults, surveys

Introduction

As the global population ages and life spans increase (United Nations, 2017), older adults comprise a growing component of both current and potential Internet users. Although increasing life spans mean many individuals spend a significant portion of life as an older adult, recent work points to outdated social constructs regarding aging that blind technology markets to the potential for older adults as worthy and relevant consumers (Coughlin, 2017). In addition, while the majority of older adults feel technology makes a positive impact on society, almost three-quarters of older adults lack confidence in their ability to use devices to complete online tasks (Anderson and Perrin, 2017). These juxtapositions play out in the continued global disparity between the numbers of

Corresponding author:

Eszter Hargittai, University of Zurich, Andreasstrasse 15, Zürich 8050, Switzerland.

Email: pubs@webuse.org

older adults who go online when compared with adults overall and younger age groups (Anderson and Perrin, 2017; Center for the Digital Future, 2016). Understanding older adults' Internet uses and skills, including an overview of how their measurement has changed over time, is significant both for having a more comprehensive view of Internet use in society and for knowing what type of support digital media can realistically provide for this population.

This review examines the state of research on Internet use among older adults including how social inequalities have both evolved and remain in relation to who goes online and what they do once connected. We review articles presenting quantitative survey findings primarily from studies using large, population-representative data sets. To identify articles, we searched in Google Scholar for "older adults," "aging," "aged," "older people," "elderly," and "seniors." We paired this search with "Internet," "web," "online," or "digital," and "use," "usage," or "skills." The search terms "survey" and "quantitative" were included to identify articles reporting on survey research. These terms were also paired with "health," "well-being," "depression," and "social support" when identifying articles exploring these specific factors. Table 1 summarizes some basic information about the studies that focus on social inequality and/or look at health outcomes.

To start with, we consider how older adult samples are typically derived for Internet use studies since these have implications for findings. Next, we examine trends in the prevalence of Internet use and the sociodemographics related to being online. Internet skills, or know-how in using digital media, follows, including a look at the effectiveness of training programs on enhancing these skills. We then discuss how older adults differ in their use of the Internet, especially in the realms of social media use and health. We then specifically consider how Internet use may relate to health and well-being. Following these discussions, we examine measurement design, including changes over time and differentiation in question asking. We close with a discussion of future methodological approaches for this critical area of research.

A methodological preamble to reviewing studies of Internet use among older adults

While considerable scholarship has focused on older adults' Internet uses, studies differ in how they define and bound their populations, posing some challenges for comparability. Most importantly, studies vary in how they group age categories, as well as in what starting age connotes older adulthood. The older adult age group may start at 45 years (e.g. Czaja et al., 2013), 51 years (e.g. Cotten et al., 2012, 2014; Silver, 2014), 60 years (e.g. Lam and Lam, 2009), or 65 years (e.g. Gell et al., 2015; Friemel, 2016; Quan-Haase et al., 2017). When researchers rely on secondary analyses of existing data—something that characterizes a sizable portion of noninterventionist studies in this domain—the age criteria of the initial data-collection effort determines the age bounds. Among studies reporting on primary data collection, previously used inclusion criteria are set by notions related to age of retirement (Virokannas et al., 2000) or age cutoffs used by the World Health Organization (2015). Others do not indicate a rationale other than noting that the sample was limited to older adults (Czaja et al., 2013; Selwyn et al., 2003). Morris and Brading (2007) argue for a lower age floor (i.e. 55 years), as it allows for more specified

Table 1. Summary of prominent quantitative studies on Internet use among older adults.

	Age	Primary or secondary data source	Cross-sectional, longitudinal, or panel	Bivariate or multivariate analyses	Digital inequality measures
Access					
Friemel, 2016	65+	Secondary	Cross-sectional	Multivariate	Access
Gell et al., 2015	65+	Secondary	Cross-sectional	Multivariate	Access, Task-related Internet use, Health-related Internet use
Gilleard and Higgs, 2008	50+	Secondary	Cross-sectional	Multivariate	Access
König et al., 2018	50+	Secondary	Cross-sectional	Multivariate	Access
Selwyn et al., 2003	60+	Primary	Cross-sectional	Bivariate	Access
Silver, 2014	51+	Secondary	Cross-sectional	Multivariate	Access
Lam and Lam, 2009	60+	Secondary	Cross-sectional	Multivariate	Access
Yu et al., 2016a	51+	Secondary	Cross-sectional	Multivariate	Access, Social network site adoption
Greysen et al., 2014	65+	Secondary	Cross-sectional	Multivariate	Access
Freese et al., 2006	~65	Secondary	Panel	Multivariate	Access
Hamer and Stamatakis, 2014	50+	Secondary	Cross-sectional, panel	Multivariate	Access
Internet skills					
Czaja et al., 2013	45+	Primary	Cross-sectional	Multivariate	Internet skills
Hargittai and Dobransky, 2017	55+	Secondary	Cross-sectional	Multivariate	Internet skills
Hargittai et al., 2018	60+	Primary	Cross-sectional	Multivariate	Internet skills
Xie, 2011	56–91	Primary	Cross-sectional	Multivariate	Internet skills

(Continued)

Table 1. (Continued)

	Age	Primary or secondary data source	Cross-sectional, longitudinal, or panel	Bivariate or multivariate analyses	Digital inequality measures
<i>Types of use</i>					
Anderson and Perrin, 2017	65+	Primary	Cross-sectional	Bivariate	Access, Social network site adoption
Choi and DiNitto, 2013	65+	Secondary	Cross-sectional	Multivariate	Access, Health-related Internet use
Hong and Cho, 2016	55+	Secondary	Longitudinal	Multivariate	Health-related Internet use
Levine et al., 2016	65+	Secondary	Cross-sectional	Multivariate	Health-related Internet use
Levine et al., 2017	65+	Secondary	Panel	Multivariate	Health-related Internet use
<i>Health and well-being implications</i>					
Cotten et al., 2014	51+	Secondary	Panel	Multivariate	Access
Cotten et al., 2012	51+	Secondary	Cross-sectional	Multivariate	Access
Heo et al., 2015	65+	Secondary	Cross-sectional	Multivariate	Frequency of Internet use
D'Orsi et al., 2014	50+	Secondary	Panel	Multivariate	Access
Seifert et al., 2017	65+	Primary	Cross-sectional	Multivariate	Access
Van Deursen and Helsper, 2015	65+	Primary	Cross-sectional	Multivariate	Types of use
Yu et al., 2016b	51+	Secondary	Cross-sectional	Multivariate	Social network site adoption

age comparisons within study samples. Even less defined in the literature, age ceiling may simply correspond to the oldest participant in the study being conducted, although sometimes the age range is bounded (e.g. Eurostat, 2016; Iyer and Eastman, 2006; Manafò and Wong, 2012). For example, Eurostat (2016) uses an age ceiling of 74 years when reporting age group comparisons.

Another challenge of studies on Internet uses among older adults is how participants are recruited. Cotten (2017), in reviewing how technology use may influence the quality of life in aging, highlighted that studies may limit inclusion criteria to individuals living at home, excluding older adults living in residential facilities (e.g. nursing homes, assisted living facilities, memory care units) who may also be of older age. For example, Pew Research Center surveys on Internet use limit their sampling frames to community-dwelling older adults (Anderson and Perrin, 2017), as does the English Longitudinal Study of Ageing (D'Orsi et al., 2014) and the Health and Retirement Study protocol (Cotten et al., 2012, 2014; Hogeboom et al., 2010; Silver, 2014). One exception is a Swiss survey of older adults living in a residential care facility that compared Internet use of their sample to older adults living at home (Seifert et al., 2017). Limiting samples this way is potentially problematic as community-dwelling older adults likely experience fewer physical and cognitive impairments than those living in facilities, biasing the samples toward those with better physical and/or mental capacities. Therefore, apart from the above-mentioned Swiss study (Seifert et al., 2017), much work is likely excluding the most disadvantaged among older adults from whether and how such groups use the Internet. This means that reports of access rates and usage are likely overestimating actual rates were all older adults to be taken into consideration. Overall, the variations and limitations in the study design discussed above add considerable complexity to the study of Internet use among older adults. It is important to keep these limitations in mind when reviewing the literature on older adults' online experiences or lack thereof.

Rates of Internet use among older adults

Internet use among older adults has steadily increased over time. In the United States, just 12% of older adults aged 65 and above were using the Internet in 2000, growing to 22% in 2004, 38% in 2008, 53% in 2012, and 67% in 2016 (Anderson and Perrin, 2017; Fox, 2004; Zickuhr and Madden, 2012). While this shows a considerable increase over time, in comparison to the general adult population, older adults still lag behind; 90% of all US adults (aged 18 and above) were online in 2016 (Anderson and Perrin, 2017). Studies from other countries also report increased percentages of Internet users, and similar lags among older adults in comparison with other age groups (Center for the Digital Future, 2016; Dutton and Blank, 2013; Friemel, 2016; Galperin, 2017). A 2015 summary of worldwide Internet use in 19 countries spanning six continents reported a general trend of lower use among older than younger adults (Center for the Digital Future, 2016).

Simply looking at the overall numbers for older adults obscures strong discrepancies in Internet experiences within that group. While 82% of the young-old (aged 65–69) in the United States are Internet users, the rate is 75% for 70–74-year-olds, 60% for 75–79-year olds, and 44% for the oldest-old (age 80+; Anderson and Perrin, 2017). Among

studies conducting within-group age comparisons of older adults, a linear relationship is apparent, with Internet use dropping as age increases (Gell et al., 2015; Hargittai and Dobransky, 2017; König et al., 2018). Friemel (2016) even noted an exponential drop in the frequency of going online after age 70 among Swiss older adults, indicating a definite “grey digital divide” (Millward, 2003; Morris and Brading, 2007).

Along with the above stark differences, the notion of a generational divide has been supported by using age cohorts to examine Internet use, finding that older adults born during or after World War II were more likely to participate in online activities in comparison to even older age groups (Gilleard and Higgs, 2008). Generational effects were also noted by Hargittai and Dobransky (2017), where the oldest-old (80–97) were the least likely to be online. The authors attributed this finding to these older adults having completed their working careers before the Internet’s mass diffusion. Computer use prior to retirement has also been noted as a significant predictor of Internet access in old age, another indicator that cohort effects may play a role in whether people are connected in later life (Friemel, 2016).

Who is online among older adults?

Inequalities in demographics and socioeconomic status relate to who uses the Internet in the general population, a finding that also holds for older adult samples. Among large, older adult, population-representative samples, a higher level of education is consistently linked to being an Internet user (Gell et al., 2015; Gilleard and Higgs, 2008; König et al., 2018; Lelkes, 2012; Silver, 2014). Older adults with a college degree are far more likely to go online at 92% than those with some college experience, but no degree (76%), and those with at most a high-school education (49%; Anderson and Perrin, 2017). The same findings hold for correlations between income and being online. In the United States, almost all older adults with high and middle incomes (>\$50,000/year) are Internet users (94% and 90%, respectively, Anderson and Perrin, 2017). Percentages drop dramatically to 67% and 46% for older adults with lower middle and lower incomes. Other studies have found similar relationships between socioeconomic status and Internet use in old age (König et al., 2018; Silver, 2014; Yu, et al., 2016a).

While the above socioeconomic variables reveal clear social disparities in becoming an Internet user, differences by gender are less clear-cut, with newer studies less likely to find divergences. One recent paper reported no relationship between gender and being online for older adults when controlling for other sociodemographic factors (Friemel, 2016). Other work reporting on older adult samples found that more men go online than women (König et al., 2018; Selwyn et al., 2003; Van Deursen and Helsper, 2015), even when controlling for age (Gell et al., 2015). In contrast, an analysis of the US Health and Retirement Study found that women were more likely to access the Internet than their male counterparts, although the gap decreased with age (Yu et al., 2016a). Other recent work corroborates the finding that the young-old may not be experiencing the gender disparity documented among more mature older adults (König et al., 2018). Examining the reasons for differences in getting online related to gender among older adults, Chu (2010) reported a significantly higher rate of self-confidence related to being an Internet user for men than for women, while comfort with communication via the Internet was

the same. These discrepancies in findings suggest that a more nuanced look at the relationship between gender and Internet access among older adults is needed, particularly with a consideration of how age moderates this relationship.

Health factors may also play a role in determining who goes online. Reduced functional status or disability may impede getting online (Gell et al., 2015; Greysen et al., 2014). Across old-age groups, better self-reported health status predicted who accessed the Internet in a secondary analysis of data from 17 European countries (König et al., 2018). Cognitive functioning is especially relevant for Internet use among older adults, since impairments are most likely to appear in later life, impeding daily activities and social interactions. Activities that are increasingly becoming popular to do online, such as bill paying, making reservations, shopping, and communicating with family and friends, may become cumbersome to impossible with cognitive decline. Several studies report that better overall cognition significantly associates with Internet use (Freese et al., 2006; Hamer and Stamatakis, 2014). When examining specific domains of cognition, intact reasoning, memory, and intelligence all relate to better Web navigation skills (Czaja et al., 2013). More work in this area might better elucidate the associations between varying types of online activities and domains of cognition.

Overall, while Internet adoption is clearly growing among older adults, access inequalities by demographic and socioeconomic factors continue to exist and require more attention. More in-depth examinations may tease out underlying beliefs that hold back older adults in their use. For example, older adults were more likely to cite lack of interest in Internet use, rather than cost or access as reasons for Internet non-adoption (Helsper and Reisdorf, 2013), but a lack of awareness—a type of skill—about what the Internet has to offer may explain the lack of interest. Next, then, we turn to discussing differences in Internet skills among older adults, a variable that has been shown to matter when it comes to people's online activities (Hargittai, 2010; Zillien and Hargittai, 2009).

Internet skills

Beyond access, the ability to use the Internet effectively and efficiently is an important part of what people can make of their time spent online (Hargittai, 2002). Internet skills may in fact matter in determining how older adults use the Internet. A recent survey of older adults found that those with greater self-assessed computer and Internet skills reported a greater willingness to adopt a new technology (Berkowsky et al., 2018). Among older adults, the young-old are more likely to have better Internet skills and do more things online than more mature older adults (Hargittai et al., 2018; Hargittai and Dobransky, 2017). Societal inequalities follow into this second-level digital divide. Among older adults, better Internet skills, including general and social media skills, were associated with higher levels of education and higher income (Hargittai et al., 2018; Hargittai and Dobransky, 2017). Further examination of how income relates to Internet skills found that greater autonomy of use, or freedom to access the Internet of one's own volition, influences this relationship (Hargittai et al., 2018).

Some work has tested the effectiveness of training programs for older adults focusing on the development of Internet skills. In an online health literacy intervention, older adults were randomized into collaborative or individual learning conditions and received

training on accessing health information from the US-based NIH SeniorHealth.gov Website (Xie, 2011). From pre- to post-intervention, Internet skills significantly improved regardless of the learning condition. A randomized controlled trial testing the effectiveness of a training program for older adults in navigating the Website Medicare.gov found that those in the training arm performed tasks with greater accuracy and efficiency than those who received no skills training (Czaja et al., 2013). Overall, further examinations of how social inequalities play out for this area are clearly needed, as is an understanding of how older adults might be supported in improving their Internet skills.

Differentiated online activities

What older adults do on the Internet has evolved over time just as the kinds of activities available online have also changed. In 2003, the most common online activities such as use of email and information seeking among older adults (aged 65 and above) had similar or slightly lower percentages in comparison to adults below the age of 65 (Fox, 2004). By 2009, when more defined age cohorts were used in analyses (55–63 years, 64–72 years, and 73+ years), emailing, general online searching, product research, and health information seeking still ranked high for all older adults, and had even increased (Jones and Fox, 2009). When comparing older adult age cohorts, however, frequencies were the lowest across the board for older age groups, while the youngest old matched, or was closing in on, general adult population percentages (Jones and Fox, 2009).

Given the increasing diffusion of social media, studies started to focus on their adoption in particular. Based on Pew Research Center data analysis, use of social network sites among those 65 and older grew from 13% in 2009 to 33% in 2011 (Zickuhr and Madden, 2012) with over 40% using social media in 2018 (Smith and Anderson, 2018). Clear differences by age cohort among older adults exist. The young-old have a higher prevalence of social media use than the oldest-old (e.g. 47% for ages 65–69 vs 17% for ages 80 and above; Anderson and Perrin, 2017). Even with these age cohort differences, one study reports that the oldest-old are more motivated to use the Internet more for social connectivity than information seeking (Sims et al., 2016).

Demographic and social inequalities also play a role in who among older adults use social media, although studies show varying findings. A Pew Research Center report notes that social media use is more prevalent among older adults who are younger, and have higher education and higher income (Anderson and Perrin, 2017). Other work finds that among older adults, younger age, being female, employment, and being married significantly increase the odds of using social media, while race, education, income, and health status do not (Yu et al., 2016a). Additional work corroborates the finding that older women are more likely to use social network sites than men (Van Deursen and Helsper, 2015).

Given the importance of health matters for older adults, a number of studies examine inequalities in health-related online information-seeking activities concerning demographic and social factors (Choi and DiNitto, 2013; Hong and Cho, 2016). Other work examines the relationship between varied measures of health and online health-related Internet use (Levine et al., 2017). Older age negatively associates with Internet use for health reasons (Hong and Cho, 2016; Levine et al., 2016) presumably not because of less

relevance for this population, rather, lower levels of use. Accessing health information online related to higher levels of education and higher income (Flynn et al., 2006; Choi and DiNitto, 2013; Hong and Cho, 2016; Levine et al., 2016). Being Black related to a lessened likelihood of health-related Internet use, while varied findings exist for Latinos (Choi and DiNitto, 2013; Levine et al., 2016). In relation to gender and online health-information seeking, older women were in fact closing in on men, in terms of disparity (Hong and Cho, 2016, Supplemental Tables). Varying signals of a decline in health seem to influence how older adults use the Internet for health reasons (Levine et al., 2017). While declines in physical ability, moving to a nursing home, and dementia diagnosis all associate with reduced health-related Internet use, other measures, including newly diagnosed depression, decline in overall health status, hospitalization, and the diagnosis of a new health condition did not have an association (Levine et al., 2017). The type of health decline may therefore matter to use of the Internet for health. Does such use make a difference for actual health outcomes? We review the related literature next.

Implications of Internet use for health and well-being

Knowing who uses the Internet and how is important, because such uses have potential implications for important life outcomes such as health and wellness. Here, we first look at studies examining health, including physical and mental health, in relation to Internet use, and then explore psychosocial outcomes such as well-being and social support.

Few studies report on physical health outcomes in relation to Internet use, and those that do focus on function and health behavior. Internet use relates to better self-reported health and a lessened risk of developing a functional impairment (D'Orsi et al., 2014; Yu et al., 2016a). Regular Internet use may also relate to health behaviors. A study of older adult cancer survivors reported that those with consistent Internet use over 8 years were more likely to report cancer screening participation in year 8 (Xavier et al., 2013).

The relationship between Internet use and mental health and well-being is promising. Cross-sectional and longitudinal work report significant, inverse relationships between Internet use and depression (Cotten et al., 2012, 2014; Hamer and Stamatakis, 2014). In cross-sectional analysis of US older adults aged above 50, Internet use reduced the likelihood of being classified as having depression by 20–28% (Cotten et al., 2012). A longitudinal analysis using the same sample reported that Internet use reduced the probability of depression among older adults by one-third (Cotten et al., 2014). Other work has corroborated the cross-sectional relationship between Internet use and depression, but found no longitudinal association (Hamer and Stamatakis, 2014). Promising findings are also reported for measures of psychological well-being and Internet use. Cross-sectional work reports associations between Internet use and greater social support, decreased loneliness, better life satisfaction, better psychological well-being, and better overall mental health (Heo et al., 2015; Lam and Lam, 2009; Seifert et al., 2017). Social media adoption in particular relates to improved well-being. Older adults who use online social network sites reported higher perceived support from friends and greater social connectedness (Yu et al., 2016b).

Intervention studies examining varying protocols that promote Internet use and skills among older adults create the bulk of work on the effect of Internet use on mental health and well-being (Forsman et al., 2017). A systematic review examining the effectiveness

of technological interventions in improving mental health and well-being among older adults included 16 studies with Internet use as a primary component of the intervention protocol (Forsman et al., 2017). The review identified six studies with high rigor in design, of which three reported improvements in depression (Laganá and García, 2013), life satisfaction (Shapira et al., 2007), and perceived social support (Torp et al., 2008) following participation in Internet use and skill-building interventions, and in comparison with control group assignment. One intervention study not included in the above review tested a training and follow-up coaching protocol for email and Internet use, and reported greater reductions in loneliness compared with control participants (Fokkema and Knipscheer, 2007). Forsman et al. (2017) note some caveats to keep in mind regarding the intervention studies they reviewed. Across studies, participants did not always begin with psychological symptoms or reports of low well-being. This in turn may have lowered the likelihood of finding a positive effect on mental health outcomes.

Measuring psychosocial outcomes that are Internet or computer-related may be a promising alternative to more generalized mental health measures. Chu et al. (2009) conducted a randomized controlled design testing a protocol intended to build skills for online health-information seeking among older adults. Participants in the intervention reported reduced computer anxiety, greater computer confidence, and greater computer self-efficacy. Overall, the above results point to further areas for investigation of the relationship between health outcomes from Internet use among older adults. Greater specificity of the mental health or well-being measure may actually reveal better outcomes that are more likely to show impact.

Challenges of studying older adults' Internet uses

In addition to challenges outlined at the beginning of the article stemming from different types of age cutoffs and population inclusion, studying older adults' Internet uses also runs into methodological issues concerning measurement instruments. Changes in technology, the expansion of the Internet, and the Internet as an increasing and changing mode of social interaction all influence the content of survey questions on Internet use. Question design among Internet use studies for older adults significantly varies, both over time within the same study, and across protocols. No standardized measures are typically employed. Studies conducting secondary analyses may be limited by the availability of Internet-related questions included in the initial survey, where in most cases Internet use is not the primary focus. Measures may only broach access with few or no follow-up questions related to years of use, frequency of use, context of use, Internet skills, and types of usage. A single dichotomous question may be the only variable describing Internet access, which cannot capture essential nuances like quality of connection (dialup vs broadband), autonomy of use (number and types of locations of access), or mobile access. When studies do ask about Internet use, they may conflate many different online activities. For example, the Health and Retirement Study collapses the activities: "receiving e-mail ... making purchases, searching for information, or making travel reservations" (Institute for Social Research, University of Michigan, 2016), preventing a more in-depth exploration of Internet use, with the substantial number of covariates that are included in the data.

Globally, other longitudinal studies of aging that are also publicly available data sets have used a similar approach, adding one to two questions regarding Internet access and use at varying data collection waves, and with varied wording and response categories (European Research Infrastructure Consortium, 2012; Institute for Fiscal Studies, 2014; World Health Organization, 2007). Inclusion of variables allows for comparisons of Internet use and access to a wealth of aging-focused covariates, as well as cross-country comparisons, but no great depth of examination regarding Internet use (Christelis et al., 2012; Hong et al., 2017; Romano et al., 2014). Some change is occurring within older-adult-focused panel studies. For example, The English Longitudinal Study of Ageing, added questions about frequency, location, and type of Internet use in 2012–2013 (Institute for Fiscal Studies, 2014), although we identified no secondary analyses studies that explore these recently added variables.

Several public longitudinal data sets do include a greater range of Internet-related questions, with content amended over survey waves. The National Health and Aging Trends Study incorporates measures of frequency and types of Internet use (Kasper and Freedman, 2017). Most Internet-use-related secondary analyses using these data report cross-sectional findings (Choi and DiNitto, 2013; Elliot et al., 2014; Gell et al., 2015; Kim et al., 2016; Lee et al., 2017), with few reporting longitudinal results (Levine et al., 2017). A supplemental survey of a subsample of Health and Retirement Study (HRS) participants who report regular Internet use also explores being online in greater depth over six waves of data collection, although questions were added and deleted with each iteration, making longitudinal comparisons difficult (Institute for Social Research, University of Michigan, 2016). Begun in 2003, questions initially covered location and frequency of use, email use, and Internet use for travel and shopping. An expansion in 2013 added questions on Internet use for finance, use of social network sites, health information seeking, news, hobbies, and Internet security. To date, only cross-sectional analyses are reported, combining results from the primary HRS data set and the supplemental survey (Levy et al., 2015; Yu et al., 2016a).

How survey questions have changed over time may be more noticeable in studies with primary data collection, where there is greater opportunity to employ specific questions to explore details about the types of Internet use. Survey questions have evolved as the types of online activities that are available and popular have changed. One early study asked older adults about a range of activities, including online searching, financial management, downloading media, and participating in educational courses (Selwyn et al., 2003: 573). Czaja et al. (2006) captured the increasing diversity of Internet activities using the following categories to derive a breadth of Internet use variable: “communication, news and weather, information gathering (legal information), community resources, health, travel, leisure/entertainment, and shopping” (p.339). Questions regarding the use of social network sites among older adults began to appear later (Leist, 2013; Nef et al., 2013). Mapping trends in the varying ways people use the Internet becomes all the more thorny when no standardized approach is applied to categorizing and describing domains of use. Whether there are online activities that may pertain more to older adults, and might be more prevalent, or growing in prevalence, also warrants attention.

Overall, these limitations impede comparability across studies, making interpretations of results a difficult process. Qualifying, and accurately specifying, the question

origins of reported results becomes all the more critical. In the following section, in addition to recommendations for recruitment design, we present some further ideas for addressing the above issues of measurement.

Directions for future research

Future research on older adults and Internet use may benefit from a more inclusive recruitment design, further work in specific domains of Internet use, and, as discussed above, more standardized measurement approaches. First, a justification of the age cutoff applied to primary data collection may better clarify the focus of study and allow for greater inclusion of aging adults. While age 65 has been commonly applied as a cutoff as it signals the age of retirement and eligibility for aging-related social entitlements, using a lower age floor, as suggested by Morris and Brading (2007), might better capture the differentiation in findings across older adults, and better pinpoint disparity. We see the beginnings of a pattern of disparity when comparing the young-old with the oldest-old in Internet use and skills (Hargittai and Dobransky, 2017). It is important to know whether this disparity continues or changes as younger generations age and technology continues to evolve. In addition to a lower age floor, recruitment protocols should include individuals living in supportive care settings, as we see that differing and greater disparities might occur for these older adults (Seifert et al., 2017).

When turning to the domains of Internet use measured, Internet skills in particular clearly require greater attention, as they appear to be a key indicator when examining social inequalities and online activity (Hargittai and Dobransky, 2017; Hargittai et al., 2018). Better elucidation of how Internet skills relate to specific types of Internet use is also critical. Social media use and health-related use both stand out as primary ways that older adults incorporate the Internet into their lives (Hong and Cho, 2016; Yu et al., 2016b). Yet we know of no large-scale studies, for example, of older adults' Internet uses as related to health outcomes that take Internet skills into consideration. Emerging work on older adults' proxy Internet use, that is, non-users asking others to use the Internet for them, has particular bearing for older adults who may be especially limited in direct access and needed skills (Dolničar et al., 2018; Selwyn et al., 2016). Smartphone-based Internet use also merits further work as social inequalities persist among older adults in both smartphone ownership and use (Anderson and Perrin, 2017; Petrovčič et al., 2018).

Intervention studies that incorporate online training skills, even those with primary aims of improving other outcomes, should include Internet skills as pre and post measures. Although social inequalities in relation to Internet access are well documented, greater examination of changes in social inequalities over time may reveal addressable patterns. Social inequalities related to the ways of using the Internet might also benefit from longitudinal examination. Most analyses in this area, albeit with population-representative, longitudinal data sets (Kasper and Freedman, 2017; National Cancer Institute, 2017), have been cross-sectional.

Measurements of Internet use remain largely unstandardized; even when examining access, differing temporal approaches and definitions of use complicate and even hinder cross-study comparisons. Although the Health and Retirement Study acts as a model for longitudinal studies of aging around the globe and cross-sample comparisons are available,

questions regarding Internet access and use across these studies differ in wording. Moving toward the standardization of both questions and response options will allow for more comparable results. Examples do exist where studies replicate question sets (Tennant et al., 2015). Looking to existing measures at the point of study design is worthwhile; even in cases where new ways to use the Internet are being examined, existing question stems and response options may be applied.

Finally, the relationship between health and well-being, and Internet use warrants more attention, with longitudinal analysis. Aging is a heterogeneous experience, and does not necessarily equate with a corresponding state of impairment (Dannefer, 2003). Older adults may be in the later stages of life with perfect health, or in the earliest stages of aging and experiencing several chronic health conditions. Further incorporations of measures of health and well-being might better elucidate these underlying factors as even potentially addressable causes of disparity in online access and use (Cotten et al., 2014; Levine et al., 2017; Seifert et al., 2017). Health status as an antecedent to health-related Internet use (Levine et al., 2017), as well as depression as an outcome of being online (Cotten et al., 2014), have both undergone initial explorations. Further work examining both of these areas, in addition to whether physical health might benefit specifically from health-related Internet use, could also lead to better targeted intervention work in this area.

Conclusion

A clear disparity exists among older adults when making age group comparisons; the young-old are more likely to access and use the Internet as well as have better Internet skills than their more mature counterparts. Higher income and higher education, primary social inequality indicators among adults in general, also distinguish Internet access, use, and skills in older adulthood. Gender differences are not as clear-cut, however. The gender gap reported for the oldest-old in relation to Internet access does not appear to replicate itself among the younger cohorts. Results are inconclusive regarding gender in relation to Internet uses and skills. Studies do report a generally positive impact of Internet use on health and well-being although a general bias toward publishing significant results, whether positive or negative, may limit reporting on findings in this area. We recommend the use of more inclusive recruitment designs that use a lower age floor and include older adults living in supportive care. This area is ripe for new research that explores specific domains of Internet use, tests and applies standardized measurement approaches, and brings more focus to the role of health and well-being as antecedents and outcomes of being online. While increasing research has focused on exploring the Internet uses of older adults, much work remains for a better understanding of how the Internet may be influencing—whether in positive or negative ways—older adults' lives.


Acknowledgements

The authors are grateful to the anonymous reviewers for their valuable suggestions. They also thank the members of the Internet Use and Society division at IKMZ of the University of Zurich for helpful input.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

ORCID iD

Eszter Hargittai  <https://orcid.org/0000-0003-4199-4868>

References

- Anderson M and Perrin A (2017) Tech adoption climbs among older adults. *Pew Research Center: Internet, Science & Technology*. Available at: <http://www.pewinternet.org/2017/05/17/tech-adoption-climbs-among-older-adults/> (accessed 28 August 2017).
- Berkowsky RW, Sharit J and Czaja SJ (2018) Factors predicting decisions about technology adoption among older adults. *Innovation in Aging* 1(3): 1–12.
- Center for the Digital Future (2016) *The World Internet Project: International Report*. 6th ed. USC Annenberg School. Available at: <http://www.digitalcenter.org/wp-content/uploads/2013/06/2015-World-Internet-Report.pdf> (accessed 4 September 2017).
- Choi NG and DiNitto DM (2013) Internet use among older adults: association with health needs, psychological capital, and social capital. *Journal of Medical Internet Research* 15(5): e97.
- Christelis D, Georgarakos D and Haliassos M (2012) Differences in portfolios across countries: economic environment versus household characteristics. *The Review of Economics and Statistics* 95(1): 220–236.
- Chu A, Huber J, Mastel-Smith B, et al. (2009) “Partnering with seniors for better health”: computer use and Internet health information retrieval among older adults in a low socioeconomic community. *Journal of the Medical Library Association* 97(1): 12–20.
- Chu RJ (2010) How family support and Internet self-efficacy influence the effects of e-learning among higher aged adults—analyses of gender and age differences. *Computers & Education* 55(1): 255–264.
- Cotten SR, Ford G, Ford S, et al. (2012) Internet use and depression among older adults. *Computers in Human Behavior* 28(2): 496–499.
- Cotten SR, Ford G, Ford S, et al. (2014) Internet use and depression among retired older adults in the United States: a longitudinal analysis. *The Journals of Gerontology: Series B* 69(5): 763–771.
- Cotten SR (2017) Examining the roles of technology in aging and quality of life. *The Journals of Gerontology: Series B* 72(5): 823–826.
- Coughlin JF (2017) *The Longevity Economy: Unlocking the World’s Fastest-Growing, Most Misunderstood Market*. New York: PublicAffairs.
- Czaja SJ, Charness N, Fisk AD, et al. (2006) Factors predicting the use of technology: findings from the center for research and education on aging and technology enhancement (CREATE). *Psychology and Aging* 21(2): 333–352.
- Czaja SJ, Sharit J, Lee CC, et al. (2013) Factors influencing use of an e-health website in a community sample of older adults. *Journal of the American Medical Informatics Association* 20(2): 277–284.
- Dannefer D (2003) Cumulative advantage/disadvantage and the life course: cross-fertilizing age and social science theory. *The Journals of Gerontology: Series B* 58(6): S327–S337.
- Dolničar V, Grošelj D, Hrast MF, et al. (2018) The role of social support networks in proxy Internet use from the intergenerational solidarity perspective. *Telematics and Informatics* 35(2): 305–317.

- D'Orsi E, Xavier AJ, Steptoe A, et al. (2014) Socioeconomic and lifestyle factors related to instrumental activity of daily living dynamics: results from the English longitudinal study of ageing. *Journal of the American Geriatrics Society* 62(9): 1630–1639.
- Dutton WH and Blank G (2013) *Cultures of the Internet: The Internet in Britain*. Oxford: Oxford Internet Institute, University of Oxford.
- Elliot AJ, Mooney CJ, Douthit KZ, et al. (2014) Predictors of older adults' technology use and its relationship to depressive symptoms and well-being. *The Journals of Gerontology: Series B* 69(5): 667–677.
- European Research Infrastructure Consortium (2012) The survey of health, ageing and retirement in Europe, Main Questionnaire Wave 4, English. Available at: http://www.share-project.org/fileadmin/pdf_questionnaire_wave_4/SHARE_generic_wave4_main_questionnaire.pdf (accessed 16 November 2017).
- Eurostat (2016) Internet access and use statistics—households and individuals. Available at: http://ec.europa.eu/eurostat/statistics-explained/index.php/Archive:Internet_access_and_use_statistics_-_households_and_individuals_-_2016_edition
- Flynn KE, Smith MA and Freese J (2006) When do older adults turn to the Internet for health information? Findings from the Wisconsin longitudinal study. *Journal of General Internal Medicine* 21(12): 1295–1301.
- Fokkema T and Knipscheer K (2007) Escape loneliness by going digital: a quantitative and qualitative evaluation of a Dutch experiment in using ECT to overcome loneliness among older adults. *Aging & Mental Health* 11(5): 496–504.
- Forsman AK, Nordmyr J, Matosevic T, et al. (2017) Promoting mental wellbeing among older people: technology-based interventions. *Health Promotion International*: 1–13.
- Fox S (2004) *Older Americans and the Internet*. Washington, DC: Pew Internet & American Life Project. Available at: <http://www.pewinternet.org/2004/03/28/older-americans-and-the-internet/>
- Freese J, Rivas S and Hargittai E (2006) Cognitive ability and Internet use among older adults. *Poetics (Journal of Empirical Research on Culture, the Media and the Arts)* 34(4): 236–249.
- Friemel TN (2016) The digital divide has grown old: determinants of a digital divide among seniors. *New Media & Society* 18(2): 313–331.
- Galperin H (2017) Why are half of Latin Americans not online? A four-country study of reasons for Internet non-adoption. *International Journal of Communication* 11: 3332–3354.
- Gell NM, Rosenberg DE, Demiris G, et al. (2015) Patterns of technology use among older adults with and without disabilities. *The Gerontologist* 55(3): 412–421.
- Gilleard C and Higgs P (2008) Internet use and the digital divide in the English longitudinal study of ageing. *European Journal of Ageing* 5(3): 233.
- Greysen SR, Chin Garcia C, Sudore RL, et al. (2014) Functional impairment and Internet use among older adults: implications for meaningful use of patient portals. *JAMA Internal Medicine* 174(7): 1188–1190.
- Hamer M and Stamatakis E (2014) Prospective study of sedentary behavior, risk of depression, and cognitive impairment. *Medicine and Science in Sports and Exercise* 46(4): 718–723.
- Hargittai E (2002) Second-level digital divide: differences in people's online skills. *First Monday* 7(4).
- Hargittai E (2010) 'Digital na(t)ives? Variation in Internet skills and uses among members of the "Net generation."' *Sociological Inquiry* 80(1): 92–113.
- Hargittai E and Dobransky K (2017) Old dogs, new clicks: digital inequality in skills and uses among older adults. *Canadian Journal of Communication* 42(2): 195–212.
- Hargittai E and Piper AM, Morris MR (2018) From Internet access to Internet skills: digital inequality among older adults. *Universal Access in the Information Society*. Epub ahead of print 3 May. DOI: 10.1007/s10209-018-0617-5.

- Helsper EJ and Reisdorf BC (2013) A quantitative examination of explanations for reasons for Internet nonuse. *Cyberpsychology, Behavior and Social Networking* 16(2): 94–99.
- Heo J, Chun S, Lee S, et al. (2015) Internet use and well-being in older adults. *Cyberpsychology, Behavior and Social Networking* 18(5): 268–272.
- Hogeboom DL, McDermott RJ, Perrin KM, et al. (2010) Internet use and social networking among middle aged and older adults. *Educational Gerontology* 36(2): 93–111.
- Hong YA and Cho J (2016) Has the digital health divide widened? Trends of health-related Internet use among older adults from 2003 to 2011. *The Journals of Gerontology: Series B* 72(5): 856–863.
- Hong YA, Zhou Z, Fang Y, et al. (2017) The digital divide and health disparities in China: evidence from a national survey and policy implications. *Journal of Medical Internet Research* 19(9): e317.
- Institute for Fiscal Studies (2014) English longitudinal study of ageing, Wave Six Interview Questionnaire – 2012 to 2013. Available at: https://www.elsa-project.ac.uk/uploads/elsa/docs_w6/main_questionnaire.pdf
- Institute for Social Research, University of Michigan (2016) Health and Retirement Study Questionnaires. Available at: <https://hrs.isr.umich.edu/documentation/questionnaires> (accessed 11 October 2017).
- Iyer R and Eastman JK (2006) The elderly and their attitudes toward the Internet: the impact on Internet use, purchase, and comparison shopping. *Journal of Marketing Theory and Practice* 14(1): 57–67.
- Jones S and Fox S (2009) *Generations Online in 2009*. Washington, DC: Pew Internet & American Life Project. Available at: <http://www.pewinternet.org/2009/01/28/generations-online-in-2009/>
- Kasper JD and Freedman VA (2017) *National Health and Aging Trends Study User Guide: Rounds 1–6 Final Release* (User Guide). Baltimore, MD: Johns Hopkins University School of Public Health.
- Kim J and Lee HY, Christensen MC, et al. (2016) Technology access and use, and their associations with social engagement among older adults: do women and men differ? *The Journals of Gerontology: Series B* 72(5): 836–845.
- König R, Seifert A and Doh M (2018) Internet use among older Europeans: an analysis based on SHARE data. *Universal Access in the Information Society* 17(3): 621–633.
- Laganá L and García JJ (2013) The mental health impact of computer and Internet training on a multi-ethnic sample of community-dwelling older adults: results of a pilot randomised controlled trial. *International Journal of Biomedical Science* 9(3): 135–147.
- Lam L and Lam M (2009) The use of information technology and mental health among older caregivers in Australia. *Aging & Mental Health* 13(4): 557–562.
- Lee HY, Kim J and Sharratt M (2017) Technology use and its association with health and depressive symptoms in older cancer survivors. *Quality of Life Research* 27: 467–477.
- Leist AK (2013) Social media use of older adults: a mini-review. *Gerontology* 59(4): 378–384.
- Leikes O (2012) Happier and less isolated: Internet use in old age. *Journal of Poverty and Social Justice* 21(1): 33–46.
- Levine DM, Lipsitz SR and Linder JA (2016) Trends in seniors' use of digital health technology in the United States, 2011–2014. *JAMA* 316(5): 538–540.
- Levine DM, Lipsitz SR and Linder JA (2017) Changes in everyday and digital health technology use among seniors in declining health. *The Journals of Gerontology: Series A* 73: 552–559.
- Levy H, Janke AT and Langa KM (2015) Health literacy and the digital divide among older Americans. *Journal of General Internal Medicine* 30(3): 284–289.
- Manafò E and Wong S (2012) Assessing the eHealth literacy skills of older adults: a preliminary study. *Journal of Consumer Health on the Internet* 16(4): 369–381.

- Millward P (2003) The “grey digital divide”: perception, exclusion and barriers of access to the Internet for older people. *First Monday* 8(7). Available at: <http://journals.uic.edu/ojs/index.php/fm/article/view/1066> (accessed 4 September 2017).
- Morris A and Brading H (2007) E-literacy and the grey digital divide: a review with recommendations. *Journal of Information Literacy* 1(3): 13–28.
- National Cancer Institute (2017) Health information national trends survey. Available at: <https://hints.cancer.gov/default.aspx> (accessed 15 December 2017).
- Nef T, Ganea RL, Müri RM, et al. (2013) Social networking sites and older users—a systematic review. *International Psychogeriatrics* 25(7): 1041–1053.
- Petrovčič A, Slavec A and Dolničar V (2018) The ten shades of silver: segmentation of older adults in the mobile phone market. *International Journal of Human–Computer Interaction* 34(9): 845–860.
- Quan-Haase A, Mo GY and Wellman B (2017) Connected seniors: how older adults in East York exchange social support online and offline. *Information, Communication & Society* 20(7): 967–983.
- Romano MF, Sardella MV, Alboni F, et al. (2014) Is the digital divide an obstacle to e-health? An analysis of the situation in Europe and in Italy. *Telemedicine and e-Health* 21(1): 24–35.
- Seifert A, Doh M and Wahl H-W (2017) They also do it: Internet use by older adults living in residential care facilities. *Educational Gerontology* 43(9): 451–461.
- Selwyn N, Gorard S, Furlong J, et al. (2003) Older adults’ use of information and communications technology in everyday life. *Ageing & Society* 23(5): 561–582.
- Selwyn N, Johnson N, Selena N, et al. (2016) Going online on behalf of others: an Investigation of ‘proxy’ Internet consumers. Available at: <https://accan.org.au/index.php> (accessed 3 May 2018).
- Shapira N, Barak A and Gal I (2007) Promoting older adults’ well-being through Internet training and use. *Ageing & Mental Health* 11(5): 477–484.
- Silver MP (2014) Socio-economic status over the lifecourse and Internet use in older adulthood. *Ageing and Society* 34(6): 1019–1034.
- Sims T, Reed AE and Carr DC (2016) Information and communication technology use is related to higher well-being among the oldest-old. *The Journals of Gerontology: Series B* 72: 761–770.
- Smith A and Anderson M (2018) *Social Media Use in 2018*. Washington, DC: Pew Research Center.
- Tennant B, Stellefson M, Dodd V, et al. (2015) eHealth literacy and Web 2.0 health information seeking behaviors among baby boomers and older adults. *Journal of Medical Internet Research* 17(3): e70.
- Torp S, Hanson E, Hauge S, et al. (2008) A pilot study of how information and communication technology may contribute to health promotion among elderly spousal carers in Norway. *Health & Social Care in the Community* 16(1): 75–85.
- United Nations (2017) *World Population Prospects: The 2017 Revision, Key Findings and Advance Tables* (ESA/P/WP/248). New York: Department of Economic and Social Affairs, Population Division.
- Van Deursen AJAM and Helsper EJ (2015) A nuanced understanding of Internet use and non-use among the elderly. *European Journal of Communication* 30(2): 171–187.
- Virokannas H, Rahkonen M, Luoma I, et al. (2000) The 60-year-old female worker as user of new technology. *International Journal of Industrial Ergonomics* 25(5): 491–495.
- World Health Organization (2007) Study on global ageing and adult health, wave 1, Household Questionnaire. Available at: http://www.who.int/healthinfo/systems/GenericHHQ_NoKish.pdf?ua=1 (accessed 17 November 2017).
- World Health Organization (2015) World report on ageing and health. Available at: <http://www.who.int/ageing/events/world-report-2015-launch/en/> (accessed 31 January 2018).

- Xavier AJ, D'Orsi E, Wardle J, et al. (2013) Internet use and cancer-preventive behaviors in older adults: findings from a longitudinal cohort study. *Cancer Epidemiology, biomarkers and prevention* 22(11): 2066–2074.
- Xie B (2011) Effects of an eHealth literacy intervention for older adults. *Journal of Medical Internet Research* 13(4): e90.
- Yu RP, Ellison NB, McCammon RJ, et al. (2016a) Mapping the two levels of digital divide: Internet access and social network site adoption among older adults in the USA. *Information, Communication & Society* 19(10): 1445–1464.
- Yu RP, McCammon RJ, Ellison NB, et al. (2016b) The relationships that matter: social network site use and social wellbeing among older adults in the United States of America. *Ageing & Society* 36(9): 1826–1852.
- Zickuhr K and Madden M (2012) Older adults and Internet use. *Pew Research Center*. Available at: <http://www.pewinternet.org/2012/06/06/older-adults-and-internet-use/>
- Zillien N and Hargittai E (2009) Digital distinction: status-specific Internet usage. *Social Science Quarterly* 90(2): 274–291.

Author biographies

Amanda Hunsaker is a postdoctoral scholar at the Institute of Communication and Media Research of the University of Zurich. She completed her doctorate at the University of Pittsburgh School of Social Work. She conducts research on older adults and health with a focus on cognition.

Eszter Hargittai is a professor and chair of Internet Use and Society at the Institute of Communication and Media Research of the University of Zurich. Her research looks at differences in people's Internet uses with a particular focus on how varying levels of Internet skills relate to what people do online.