 Research Article

The effects of urbanization and social media use on individuals' perceived social isolation

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ABSTRACT

Social networks have become an integral part of modern life, with billions of people around the world using platforms such as Facebook, Instagram, and Twitter to connect with others and share information and content. However, there is growing concern that social networks can also contribute to social isolation, particularly for individuals who substitute online for offline in person interactions. This study aims to investigate the relationship between the use of social networks and perceived social isolation and how this relationship varies by demographic and level of urbanization. The results showed that, on average, an individual's sense of social isolation due to social networks increased for each additional hour spent on social networks and decreased for individuals with a high school education, some college education, and living in a suburban area. In particular, the model suggests that people living in suburban areas attribute lower levels of social isolation to the use of social media compared to those living in urban areas.

Keywords: social media, social isolation, urbanism, social networks

INTRODUCTION

Social networks have become an increasingly significant part of modern society. This is due to the billions of people around the world using plat- forms like Facebook, Instagram, and Twitter to connect with others and share information and content. Although social networks can facilitate the maintenance of interpersonal relationships and support social cohesion (Ellison et al., 2007; Valkenburg et al., 2006), there is growing concern that they can also contribute to feelings of isolation, particularly for people who substitute online for offline human interactions (Kross et al., 2013; Valenzuela et al., 2009).

In addition to its impact on interpersonal connectivity, the use of social networks may also have an effect on mental health and well-being. Some research has found that the use of social media can have negative impacts on mental health and well-being, including increased feelings of loneliness and a sense of isolation (Madge et al., 2009; Shavazi & Homayoon, 2014). Other studies have identified a positive relationship between social media use and mental health, particularly for individuals who use it for peer support and connection (Burke et al., 2010).

The relationship between social media use and social isolation is com- plex and multifaceted and can vary by demographic factors such as age, sex, and education level. The purpose of this study is to investigate the relationship between the use of social media and perceived social isolation and how this relationship varies by demographic and level of urbanization. Understanding the impact of social networks on social isolation is critical to developing strategies to promote a sense of connection and well-being in the digital age. Specifically, by understanding the collection of people who feel most socially impacted by technology use, intervention strategies can be employed to connect social technology use with physical connection to bridge the 'bowling alone' problem as stipulated by Paxton (1999) and Putnam (2000).

Consequently, the study is interested in testing the following hypotheses:

H1. The more time an individual spends on social media, the more they attribute their social isolation due to social media.

H2. An individual's age affects how they view social media as a contributing factor to their social isolation.

H3. The local environment (level of urbanism) affects how an individual views social media as contributing to their social isolation.

By investigating the perception of individual social media impacts, the study lays the foundations for an intervention for physical connection or other forms of tactile social action. In doing so, the study aims to provide a baseline for potential actions to enable and foster community development in a way that is most likely to be receptive to the audiences most in need.

BACKGROUND

There is a growing body of research on the ways in which social networks intersect with and influence offline behavior. This literature focuses both on the tangible impacts of social media use and the implications for the structure and content facilities that come with the nature of networks that are built and maintained on platforms. Consequently, these studies are subdivided into

(1) the impact of social media use on offline connections,

(2) the impact of social media on opinions and health, and

(3) the impact of usage on shaping behavior.

Online & Offline Impacts

The rapid growth of social networks has fundamentally shifted the dynamics of human interaction. A central discussion in this domain is related to the dichotomy between social connections on-line and offline.

Ellison et al. (2007) posited that social media platforms, particularly Facebook, can significantly boost social capital, particularly bridging social capital. In a similar vein, Valkenburg et al. (2006) found that online communication could improve the quality of friendships, potentially due to the disinhibition effect, where individuals feel more comfortable expressing themselves online than offline. Hybrid spaces, as described by Horan (2022), are the confluence of online and offline spaces, where online interactions facilitate and complement real-world connections.

In contrast, there are concerns about the potential detriment of excessive online interactions. Kross et al. (2013) observed that high levels of Facebook use correlate negatively with overall life satisfaction, possibly due to unfavorable social comparisons. Valenzuela et al. (2009) also noted that while social networks can increase social trust and participation, they can simultaneously erode close relationships if used as a replacement for face-to-face interactions.

Recent neurological studies have begun to explore the dopamine-driven feedback loops associated with social media usage. These loops can foster a kind of addictive behavior, making users prioritize virtual interactions over real-world ones, leading to feelings of isolation (Yang, 2023). The use of social technologies also has an impact on senses of security awareness and perceived quality of life (AlSobeh et al., 2023). The broader repercussions of this behavioral trend pose challenges not only at the individual level but also at the societal level, as communities grapple with the balance between online and offline engagements.

Opinions & Health

The role of social networks as a channel for information dissemination and opinion shaping is well documented. Loader and Mercea (2011) highlighted how social networks, particularly Twitter, have emerged as influential players in political discourse, fostering real-time debates and shaping narratives. Newman (2011) also emphasized the potential for social networks to democratize, reducing barriers to information dissemination and enabling grassroots mobilization.

McLuhan's (1994) famous axiom, "the medium is the message," becomes particularly salient in the digital age. The structures and advantages of online platforms profoundly influence the content and nature of communications (McLuhan, 1994). However, the vast reach and accessibility of information online also come

with pitfalls. In particular, the potential for echo chambers, where individuals are isolated from diverse perspectives, leading to increased polarization and misinformation, is of significant concern (Bennett & Segerberg, 2011). Although the echo chamber hypothesis has its detractors (Bruns, 2017), the existence of the phenomenon and its implications remain hotly debated topics (Bruns, 2019).

The mental health implications of social media use have also attracted significant attention. Burke et al. (2010) found that passive consumption of information (e.g., scrolling without interacting) on platforms such as Facebook could correlate with feelings of envy and social isolation. However, Pellegrino et al. (2022) posited that the act of sharing and receiving feedback could engender feelings of happiness and belonging. The dichotomy in the findings underscores the complexity of the effects of social media on mental well-being, with the nature and purpose of use playing a central role.

Behavioral Influence

The algorithmic underpinnings of social media platforms have come under increasing scrutiny. While these algorithms, driven by artificial intelligence, personalize user experiences, they also influence the content users see, potentially reinforcing existing beliefs and biases (Ohme, 2021). There is growing evidence that algorithms inadvertently promote extremist content or perpetuate misinformation (MacLeod, 2019). Moreover, these algorithms can be exploited maliciously, as bots and automated accounts manipulate discourse and even political behavior (Swart, 2021).

Guess et al. (2023) pointed to the power of social networks in shaping political behavior, emphasizing the roles of exposure and social validation (Guess et al., 2023). In essence, users are more likely to be influenced by information or narratives that they perceive as widely accepted or endorsed by their peers.

Given these profound implications, there is an urgent need for more granular research to decipher the nuances of algorithmic influence and devise strategies to counteract potential harms.

METHODS

Participants

The study sample consisted of 1000 participants recruited through Amazon Mechanical Turk (MTurk). Participants were required to be at least 18 years old and have a US-based MTurk account, as well as an active Facebook account. Mechanical Turk (MTurk) is an Amazon-developed online plat- form that allows businesses and individuals to outsource tasks to a global, on-demand workforce. It has become increasingly popular as a tool for researchers in the social sciences. This is because it allows for the quick and relatively inexpensive collection of data from a large and diverse sample of individuals (Buhrmester et al., 2011).

One of the main advantages of MTurk for social science research is its ability to reach a diverse and geographically dispersed sample of participants. Researchers can easily target specific demographics or countries and reach a large number of participants in a relatively short amount of time (Buhrmester et al., 2011). Additionally, MTurk allows researchers to specify the qualifications and payment for each task, which can be useful to ensure that only participants with the necessary skills and motivation complete the tasks (Paolacci et al., 2010). However, there are also several challenges and limitations to using MTurk for social science research. One concern is the potential for participant attrition, as MTurk workers may not be as invested in research as traditional participants (Goodman et al., 2013). Additionally, there is the potential for participant fraud or misbehavior, as MTurk workers may not always be truthful about their qualifications or may not complete tasks to the required standard (Paolacci et al., 2010). To mitigate these issues, researchers have suggested using multiple methods of data collection, carefully screening and training participants, and taking steps to ensure the validity and reliability of the data collected (Goodman et al., 2013).

Despite these challenges, MTurk has been used in a variety of social science research studies, including studies on decision making, social influence, and personality. For example, researchers have used MTurk to study how individuals make decisions under uncertainty (Busemeyer, 1985), how social influence affects consumer behavior (Dellarocas et al., 2007), and how personality traits relate to decision making and risk taking (Kim & Hodgins, 2017).
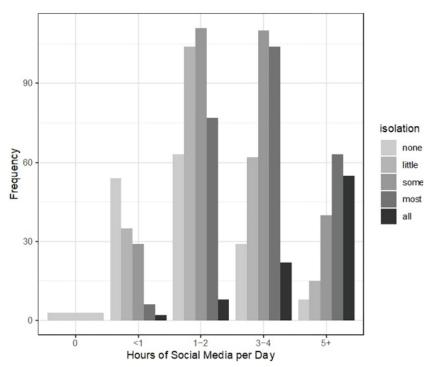
Figure 1. Perceived isolation from social media use (Source: Author's own elaboration)

This survey was implemented using MTurk with a few considerations in mind. First, it implemented filters to screen out non-valid answers. Second, demographic questions were added to ensure that a diversity of the sample was found in the responses. Lastly, it implemented a screening question to ensure that all respondents were active social media users.

Procedure

The survey questionnaire was designed in HTML and administered online. Participants were informed about the purpose of the study and asked to provide informed consent before beginning the survey. The questionnaire took approximately two minutes to complete, and the respondents were compensated for their time. Data were collected over the course of 24 hours and results were tabulated to csv and transposed for analysis in R. The raw data are available on Zenodo at the following URL: https://zenodo.org/records/10562836.

Measures

The survey questionnaire included a variety of measures to assess the use of social networks, social connectedness, social support, and social isolation. Demographic questions included age, gender, level of education, and the urbanity of their location.

Data Analysis

Data were analyzed using the R statistical software. Descriptive statistics were calculated for all variables, including means, standard deviations, and frequencies. Significance tests and OLS models were performed to examine the relationships between social media use, social connectivity, social support, and social isolation, as well as how these relationships varied by demographic factors.

RESULTS

Figure 1 shows that as an individual increases his use of social networks to more than four hours a day, he tends to contribute more of his feelings of social isolation to his use of social networks than other factors. For lighter social media users, the majority of their self-identified social isolation is derived from other sources.
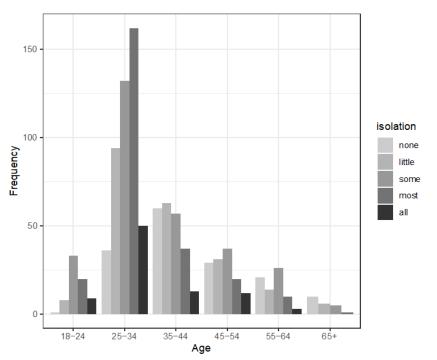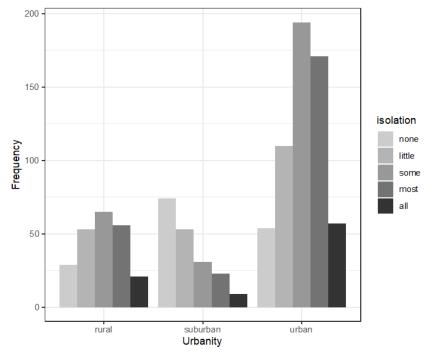
Figure 2. Impact of age on perceived social isolation from social media use (Source: Author's own elaboration)

Figure 3. Impact of urbanism on perceived social isolation from social media use (Source: Author's own elaboration)

This would be consistent with the idea that there is a boundary threshold upon which the use of social networks takes over other factors that might contribute to feelings of social isolation.

Figure 2 shows that the majority of the respondents not only cluster around the 25-34 range, but also that when viewed by age, the impact of social media use on feelings of social isolation changes significantly between age groups. While the 25-34 age group reports a significant amount of their social isolation due to social media, the distribution tends to drop in higher age brackets. Due to their low use of social networks, the highest age bracket over 65 reports relatively low levels of social isolation.

Table 1. Linear regression model predicting perceived social isolation

	Dependent variable: Social isolation	
	(1)	(2)
Hours on social media	0.300*** (0.024)	
Graduate degree	0.102 (0.067)	0.062 (0.073)
High school	-0.945*** (0.156)	-0.972*** (0.169)
Some college	-0.629*** (0.118)	-0.093 (0.136)
Age		
25-34	0.044 (0.127)	-0.093 (0.136)
35-44	-0.339** (0.148)	-0.658*** (0.147)
45-54	-0.242 (0.148)	-0.493*** (0.159)
55-64	-0.332** (0.168)	-0.633*** (0.179)
65+	-0.685*** (0.246)	-1.026*** (0.263)
Suburban	-0.458*** (0.099)	-0.588*** (0.106)
Urban (city)	0.044 (0.078)	0.081 (0.084)
Constant	1.216*** (0.165)	2.367*** (0.149)
Observations	1,000	1,000
R^2	0.329	0.220
Adjusted R^2	0.322	0.212
Residual standard error	0.986 (df=988)	1.063 (df=989)
F-statistics	44.068*** (df=11; 988)	27.820*** (df=10; 989)

Note. *p<0.10; **p<0.05; & ***p<0.01

Figure 3 shows that levels of urbanism affect the way people view social media use, which affects their social isolation. For individuals living in rural and urban environments, the assignment of social media use's impact follows relatively normal distributions. For people in suburban environments, that distribution is much more skewed. Individuals tend to attribute less of their social isolation to the use of social networks.

Expanding on these findings, a linear regression model is presented that dives deeper into these independent variables. The results of this model are presented in **Table 1**.

A linear regression model was fitted to a survey data set to investigate the relationship between an individual's sense of social isolation due to social networks and various demographic factors (hours, education, age, and urbanity). The model included an intercept term and 11 coefficients for each of the predictor variables. A second model was built to exclude hours on social media as a predictor of social isolation. The residuals of the model ranged from -2.417 to 3.028, with a median of -0.017. The coefficients for the predictor variables showed that, on average, an individual's sense of social isolation due to social networks increased by 0.300 for each additional hour spent on social networks and decreased by 0.945, 0.629, and 0.458 for individuals with a high school education, some college education, and living in a suburban area, respectively. An individual's sense of social isolation due to social networks also tended to decrease with age, with the exception of individuals aged 25-34 and 55-64, who showed no significant difference in isolation compared to the reference group.

The model had a residual standard error of 0.986 and an R-squared value of 0.329, indicating that the model explains approximately 32.9% of the variance in the number of isolated individuals. The F statistic of 44.06 and a p-value of <0.001 indicate that the model is significant. However, the adjusted R-squared value of 0.3222 suggests that some of the predictor variables may not contribute significantly to the model. In the second model, the variable 'hours on social media' is removed, leading to a much lower R-squared value, suggesting that the variable is significantly impactful on how an individual views social isolation as a result of their social media use.

Consequently, these results present evidence to support (**H1**) that an increase in the use of social networks results in an increasing attribution of an individual's attribution of social isolation due to social networks. There is also evidence to indicate (**H2**) that an individual's age affects the assignment of social isolation by social networks. Generally, as an individual gets older, the level of attribution of social isolation due to the use of social media decreases over time. Lastly, there is evidence to support the effect of urbanism. Suburbanism has a negative effect on an individual's perception of social isolation due to the use of social networks. Or, in other words, if an individual lives in the suburbs, they are less likely to view social media as the highest contributing factor to social isolation.

DISCUSSION

Based on the results of these models, it appears that an individual's attribution of social isolation to social networks is significantly associated with hours of social media use, education level, age, and urbanity.

In terms of hours of social media use, the model suggests that as hours of social media use increase, interpersonal isolation also increases. This is consistent with the literature that suggests that social media use may have negative impacts on a person's connectedness and social capital. This is especially true for individuals who substitute online for offline interpersonal interactions (Kross et al., 2013; Valenzuela et al., 2009). It is imperative to note that this association can be influenced by other factors such as individual differences in the use of social media and the quality of online interactions. The model also suggests that higher levels of education are associated with lower levels of social isolation. This may be due to the fact that people with higher levels of education may have more opportunities for interpersonal connections and support outside of social networks.

In terms of age, the model suggests that older age is associated with higher levels of social isolation. This is consistent with the literature that suggests that older adults may be more vulnerable to social isolation due to factors such as retirement, loss of interpersonal connections, and declining physical and mental health (Cornwell & Waite, 2009). Social media may not play a significant role in the level of social isolation, in general; therefore, the attribution of social media may not be as high as other factors.

Finally, the model suggests that urbanity is associated with social isolation. In particular, the model suggests that people living in suburban areas attribute lower levels of social isolation to social networks compared to those living in urban areas. This may be due to differences in the availability of support networks and access to cultural activities in different areas.

It is critical to note that these associations are based on the results of a linear regression model. They may be influenced by other factors not included in the model. More research is needed to better understand the mechanisms through which these factors intersect and influence social isolation.

Comparison With Previous Studies

Our findings resonate with the existing literature in several domains. The positive correlation between hours of social media use and interpersonal isolation aligns with the research on the possible detriments of extensive online interactions. The work of Kross et al. (2013) and Valenzuela et al. (2009) underscores this dynamic, suggesting that a heavy reliance on online platforms might erode genuine social connections.

The observation of education is intriguing and finds support in socio- logical research. Higher educational attainment has long been associated with an expansive and diverse social network that allows individuals to form more meaningful offline interactions (Granovetter, 1973). Our results reaffirm this, suggesting that a solid educational background might offer some insulation against the isolative effects of social networks.

Our findings on age-based variations in social isolation align with the broader narrative on aging and social dynamics. Older people often face multiple challenges, from health-related issues to the dissolution of long-standing social bonds, which can compound feelings of isolation Cornwell and Waite, 2009. However, it should be noted that while our study emphasizes the role of social networks, the broader landscape of factors that influence social isolation in older age groups remains multifaceted.

Potential Weaknesses

Although our study offers valuable information, it is essential to acknowledge its limitations. While our model identifies associations, it does not necessarily pinpoint causation. For example, it is possible that people feeling isolated may turn to social networks for comfort, rather than use of social networks leading to isolation. The demographic makeup of our sample could skew the results. For example, if the sample overrepresents a certain age group or educational background, it might influence the observed associations. There might be lurking variables not considered in our model that could influence the observed relationships. For example, the nature and quality of online interactions, the specific platforms used, and individual personality traits could all modulate the effects of the use of social media on perceived isolation. The study is largely based on the self-assessments of the respondents, which can introduce biases. Objective measures or

corroborating sources might offer more nuanced insights. Our observations on urbanity and social isolation, while insightful, might not be generalized in different countries or cultural contexts. Urban environments vary widely in their social dynamics in different regions.

Additionally, the study does not try at addressing causation but demonstrates how the relationship between variables may allow for the intervention in addresses in the phenomena in question. Future studies could incorporate longitudinal work to address the causative element in the research question. Additionally, it can incorporate a sample that may be more representative of the national and global populations in question.

Considering these limitations, more research is warranted to dive deeper into the intricate interplay of the factors highlighted in our study. Despite these limitations, the results present several conclusions that highlight how social networks can be understood. By implementing a large sample size, this study aims to combat some of those biases and limitations by drawing on a larger population to gain more generalizable results. Although it is critical to consider these limitations when interpreting the study results, the findings show unique vectors to understand a potential generalization of behavior because of the use of social media.

Future Research

While this study may present significant conclusions regarding the use of social media and its relationship with perceived social isolation, future work may examine the impact of social media use longitudinally, querying the same population regarding the impact of their social media use over time. Additionally future work can address the issue by examining data from several sources in addition to Mechanical Turk. For example, the surveys can be drawn from several online and offline sources from a range of individuals, rather than a sampled population of Mechanical Turk users.

BROADER IMPLICATIONS

Re-Evaluating Digital Social Landscape

The findings of our study shed light on the evolving nature of the digital social landscape. With the proliferation of social media platforms, there is a pressing need to understand not just the immediate effects, but also the broader societal implications of such pervasive technology. The observed relationship between social media use and feelings of isolation underscores a paradox: platforms designed to connect individuals can inadvertently perpetuate feelings of disconnection.

Our digital age, characterized by instantaneous communication and global networks, raises the question: Does increased connectivity necessarily translate to meaningful connection? The nature of interactions on these platforms, often fleeting and superficial, might not provide the same emotional sustenance as face-to-face interactions (Turkle, 2011). Our findings resonate with this sentiment, suggesting that while social networks bridge geographical divides, they may not always bridge emotional ones.

Education as a Buffer

The inverse relationship between educational attainment and feelings of isolation is a significant revelation. Education has traditionally been viewed as a means of personal advancement, but our study emphasizes its role as a social tool. Higher educational levels might equip individuals with critical thinking skills, allowing them to navigate the digital world more effectively and discern the quality of online interactions (Youniss et al., 2002). Furthermore, educational institutions often foster robust offline networks, providing a buffer against the isolative effects of digital overreliance.

Age & Digital Vulnerability

The increased vulnerability of older people to feelings of isolation in the digital age is a pressing concern. As digital natives, younger generations may be better equipped to navigate the complexities of online interactions. However, older generations, who transition to the digital world, may face challenges in adapting to its nuances (Bixter et al., 2019). This digital vulnerability, compounded by factors such as retirement or declining health, underscores the need for targeted interventions. Digital literacy programs for older people,

focusing not just on the technical aspects but also on the emotional and social dimensions of online interactions, could be invaluable.

Urbanity & Changing Nature of Communities

The urban-suburban divide in the attributions of social isolation is reflective of larger social shifts. Urban environments, characterized by their hustle and anonymity, may offer numerous interactions, but fewer connections. The digital realm, in this context, can either exacerbate this sense of isolation or provide solace, depending on individual usage patterns. Suburban environments, with their closer-knit communities, might offer a safety net against digitally-induced isolation. This raises pertinent questions about urban planning and community building in the digital age. How can urban spaces be designed to foster genuine community, ensuring that people are not lost in the crowd?

Digital Policy & Intervention

The broader implications of our findings extend to the realm of policy- making. As digital platforms play increasingly central roles in our lives, robust digital policies are needed. These could range from promoting digital literacy to regulating the design of social media platforms to foster genuine connections. Mental health interventions could incorporate modules on healthy digital consumption, allowing individuals to navigate the online world without compromising their well-being.

CONCLUSIONS

In conclusion, our study, set against the backdrop of the digital revolution, offers profound insights into the intricacies of human connection in the 21st century. While the tools of interaction have evolved, the fundamental human need for genuine connection remains unchanged. It is imperative for society, from policy makers to educators to urban planners, to recognize and address the challenges and opportunities presented by this digital paradigm shift. As we are on the cusp of further technological advancements, from augmented reality to artificial intelligence, understanding the human element becomes even more crucial. Our study serves as a steppingstone, emphasizing the need for a holistic understanding of the impact of the digital realm on the very fabric of human society.

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