

Access to Media and Inequality Reduction: A Quantitative Study of the Digital Divide among Pakistani Youth

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ABSTRACT

Aim of the study: Study examine associations between digital media access and perceived inequality reduction across social inclusion, empowerment and agency, access to opportunities, and awareness of rights and social justice among Pakistani youth.

Methodology: Using cross-sectional survey data was collected from 287 participants aged 19–30 years from urban and rural areas. Analyses included descriptive statistics, Cronbach's alpha, Pearson and Spearman correlations, and demographic-adjusted ordinary least-squares regression with conventional standard errors and Student-t confidence intervals. Independent-samples Welch t-tests and classical one-way ANOVA examined exploratory demographic differences. Holm correction addressed multiple comparisons within the specified test families.

Findings: The pooled media-access–inequality reduction correlation was .947, compared with .241 within rural respondents. After demographic adjustment, positive associations were observed for overall perceived inequality reduction ($B = 0.214$, 95% CI [0.130, 0.298]), empowerment and agency ($B = 0.731$), and access to opportunities ($B = 0.344$), with Holm-adjusted $p < .001$ for each. Social inclusion ($B = -0.162$, adjusted $p = .080$) and rights awareness ($B = -0.057$, adjusted $p = .432$) had negative point estimates, but neither association was significant after correction. Gender comparisons showed nominal differences on five scales. Age-group ANOVA was assumption-limited because the oldest group had zero variance.

Conclusion Access to digital media had varying relations with outcome dimensions. The negative estimates for social inclusion and rights knowledge did not constitute enough evidence for inverse relations after correcting for multiple tests. Significant location-linked response patterns and repeated records highly constrain inference.

Keywords: Digital divide; Pakistani youth; Digital media access; Perceived inequality reduction; Empowerment; Social inclusion.

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1. INTRODUCTION

As the world is transforming digitally day by day and we are witnessing new technologies and inventions almost daily. The internet and information communication technologies have become essential requirement for living. Those communities which are not very advanced in handling digital technologies lag in advancement and development in this modernized digital world (Safdar & Fatima, 2024; Safdar, 2021; Rhema & Miliszewska, 2014). In today's world, it is essential to have access to internet and digital devices with better experience of handling it. The lack of access, usage and skills of internet and ICTs creates stratification and inequalities among people that further lead towards digital divide (Shabir et al., 2015; Emmison & Frow, 1998). Digital divide is becoming one of the most critical issues faced by people in this era across the globe. The growing disparity in access to and usage of technologies between "information rich" and the "information poor" has led to the emergence of the digital divide (Soomro, 2015). Worldwide, Youth have become key players in this digital revolution, who actively utilizing platforms such as Facebook, Twitter, Instagram, Tik Tok and so on to access information, express their views and for showing supporting various issues and causes (Safdar & Abbasi, 2020; Shabir et al., 2014; Shabir et al., 2014a ; Bennett, 2012). In Pakistan, where youth make up a great portion of the population, digital media presents a valuable opportunity to close the gaps in traditional form of civic participation (Sultan et al., 2024). However, despite having this growth, challenges like the digital divide, low levels of digital literacy and the widespread presence of misinformation continue to limit the potential of digital media in promoting meaningful civic engagement (Sultan et al., 2024). Several studies suggests that digital media motivates and empowers youth to engage with topics like social issues, education, gender equality, environmental concepts, organizing campaigns and participating in discussions (Safdar et al., 2018; Safdar, 2021; Loader et al., 2014). But in the country like Pakistan, where we can see the division of urban and rural areas. Most of the young people of Pakistan living in rural areas still face challenges including lack of internet and access to digital devices and information technology. They are unable to connect with the other people across the globe, that also restricts them to showcase their abilities and skills that leads towards the digital divide (inequality). This study aims to explore that how great access to media increase the reduction of inequality and empowers youth of Pakistan to take participate in the discussion around the globe. Study also focused on how media access influences factors like social inclusion, empowerment/agency, access to opportunities and awareness of rights and social justice. A quantitative research design was employed to conduct this study by collecting data from 287 respondents, youth of Pakistan aged 19-30 years. This study aims to provide quantified insights into how media access reduced the factor of inequality.

Digital inequality then is not simply a matter of someone being a digital user or not. It also relates to the way that access to resources, skills, and social circumstances influence the value gained from digital engagement (Helsper, 2021; Robinson et al., 2015; van Dijk, 2020). This difference matters here, because the access scores and perceived benefits of respondents reflect different dimensions of digital engagement.

Material access involves the variety and usability of devices as well as the resources needed to sustain connectivity (van Deursen & van Dijk, 2019). Access differs from online behavior, the varying aims and paths of use will be maintained between users connected to the internet (van Deursen & van Dijk, 2014). The questionnaire developed in this study assessed the self-reported online access and daily routine rather than the entire spectrum of conditions.

Claiming young age as a marker of high digital competence does not account for variation in online skills and online activities among young adults (Hargittai, 2010; Hargittai & Hinnant, 2008). Past research on Internet use and task-based studies also demonstrate how Internet users do not necessarily have comparable skills when it comes to search tasks (Hargittai, 2002). So in a youth-oriented analysis, the examination within a specified age group would be necessary.

1.2 Problem Statement

In today's world, access to media and information and communication technologies (ICTs) has become one of the most essential requirements for every sector including education, economic, social inclusion, empowerment and social advancements. For Pakistani youth, digital access is a critical factor in enabling meaningful participation in society. But there is significant digital divide in Pakistan that affects youth disproportionately and also deepening the existing social inequalities. Although urban areas of Pakistan have seen advancement in digital infrastructure there is a large number of young people in rural areas that continue to face barriers and different challenges like poor access to internet, lack of digital devices, high cost of devices, limited digital literacy etc. These disparities have serious consequences for equality in education, employment and civic life. Students who do not have stable internet and digital devices face many challenges to continue learning remotely. Moreover, digital access provides opportunities for freelance work, job searching and many other opportunities that are inaccessible to marginalized youth. There are several existing researches that focused on the concept of digital divide but they often remain urban focused and do not fully consider the needs of marginalized groups. This study seeks to fill the gap by using quantitative research design to examine how media access affects youth across different social and economic backgrounds and how it increases the inequality reduction. This study focuses on how access to digital tools and media influences factors like social inclusion, empowerment/agency, access to opportunities and awareness of rights and social justice.

The problem is also social and institutional. Research connects Internet use with existing patterns of inequality, community, participation, and economic life (DiMaggio et al., 2001). Accounts of meaningful inclusion caution against equating the provision of equipment with participation in valued social practices (Selwyn, 2004; Warschauer, 2003). Accordingly, the study treats access as a potentially enabling condition rather than an automatic route to equality.

1.3 Significance of the Study

This research is very significant with understanding the extent of contribution of media access and use in bridging the social gaps among Pakistani youth. As Pakistan is going through a transformational digital phase, it helps to understand how digital technology is impacting the learning, earning, and social inclusion of the nation. The study has a very relevant focus on young population between 15-29 years, which is very reflective for national policy planning. This study makes an attempt to aggregate the data, to understand how those living in rural areas are being alienated and as a result being left out of digital technology devices and access that results into digital divide and because of this inequality. It will support for more inclusive ICT policies and digital literacy interventions where every segment of youth is able to catch the bus on Pakistan's journey towards inclusive and sustainable socio-economic development.

The relevance of the analysis in the study context lies in distinguishing reported connectivity from actual perceptions of inclusion and opportunity. The corresponding-fields perspective connects digital exclusion to resources and participation in specific domains of social life (Helsper, 2012), while work on digital layering highlights the unequal conversion of digital engagement into valued outcomes (Ragnedda, 2017). These perspectives support assessing several outcome dimensions separately.

1.4 Study Gap

Existing research already documents digital inequality in Pakistan, including faculty access, student learning, and entrepreneurial technology adoption. The contribution sought here is narrower: to examine how reported digital media access is associated with four perceived outcome dimensions in one urban–rural youth sample. The study does not claim to measure every mechanism of the digital divide or objectively observed reductions in inequality.

Systematic reviews distinguish the determinants of access, skills, use, and outcomes and identify a need for clearer links between these stages (Lythreathis et al., 2022; Scheerder et al., 2017; Vassilakopoulou &

Hustad, 2023). The present study addresses this distinction through separate outcome scores, while recognizing that its cross-sectional and self-reported measures limit the conclusions that can be drawn.

2. LITERATURE REVIEW

Barra et al. (2024) conducted research on “Digital divide, gender gap, and entrepreneurial orientation: How to foster technology adoption among Pakistani higher education students?”. Aim of the study was to understand the digital divide, gender and entrepreneurial mindset are connected, that based on how Pakistani university students see it. Quantitative Research design was utilized to conduct the study. Findings were analyzed by using structural Equation Modeling (SEM) and Multiple Group Analysis (MGA) that reveals that student’s views on their technological abilities and digital skills influence their willingness to use ICT for entrepreneurial purposes. Study also intent to adopt technology positively that shapes entrepreneurial orientation and also highlights the role of gender and digital access.

Iftikhar et al. (2023) conducted research on “Analyzing Digital Divide Among University Students of Pakistan”. Aim of the study was to explore the obstacles university students of Pakistan face during online education, specifically focused on digital divide. Quantitative research design was utilized to conduct this study by the use Heckman’s Treatment Effect Model to analyze how digital divide affect student’s academic activities or performance. Study found that online education worsened the existing digital divide between students, which also includes some factors that contributes to this divide like, lack of gadgets, access to internet, low family income, location and field of study. Study concluded that the current system is more suitable for theoretical subjects than numerical or technical disciplines in country like Pakistan.

Khan et al. (2024) conducted research on “The Digital Divide In Pakistan: Access To Technology And Its Socio-Economic Implications”. Aim of the study was to explores the digital divide in Pakistan, focusing on disparities in access to technology, internet and digital literacy between urban and rural population. Secondary data and policy analysis was used to examine digital access, infrastructure and government and non-government initiatives. Study found that the urban areas of Pakistan have great access to digital tools and connectivity, whereas the rural areas of Pakistan face major challenges such as poor infrastructure, low digital literacy and affordability issues. Study concluded that closing the digital divide in Pakistan can be done through collaborative multi-stakeholder approaches and also involving government bodies, public sector actors and civil society.

Another study titled: “Unveiling the Digital Capital: A Quantitative Study among University Students in Islamabad” by Haq and Mahmood (2023) seeks to understand the digital capital of university in Islamabad. Study examines the student’s access, skills and attitudes towards the internet, ICT and digital devices. Quantitative Research Design was utilized to conduct this study by employing cross-sectional survey through 397 students in Islamabad. Findings of the study were that most of the students belonged to high income families with great access to digital devices, ICT and internet. They have strong digital skills and utilized digital tools for productive and positive activities. Study concluded that majority of students in Islamabad were well-equipped with digital capital, that also contributes to social and economic development.

Shair et al. (2022) conducted research on Digital Divide in Pakistan: Barriers to ICT Usage Among the Individuals of Pakistan. Aim of the study was to examine those factors that have influence on individual’s capabilities to use ICT (Information and Communication Technology) in Pakistan and also to identify key determinants that contributes to digital divide. Quantitative Research design was utilized to conduct this study, Logit Model was applied to examine the relationship between ICT usage and various factors like socio economic, demographic and regional. Findings of the study were that there is significant digital divide among individuals in Pakistan, and the factors that influence ICT usage includes, access to technology, income, region, ICT infrastructure and other demographic factors. Study concluded that bridging the digital divide in Pakistan requires addressing both infrastructural and socio-economic barriers.

Sultan et al. (2024) conducted research on title: “Exploring the Impact of Digital Media on Youth’s Social Awareness and Engagement in Pakistan: A Qualitative Study”. Aim of the study was to explore that how digital media influences the civic engagement and social awareness among youth of Pakistan. Basically, study seeks to understand youth’s experiences, motivations and obstacles, they face by utilizing the digital platforms or devices for the social causes. The main goal of this study is to provide meaningful insights to inform policy decisions, educational strategies and development of the digital platforms to enhance the participation of youth of Pakistan in addressing social issues. Qualitative Research design was utilized to conduct data from the youth of Pakistan, aged between 18-30 years that were from different socio-economic, geographical and educational backgrounds. Data was collected by using purposive sampling technique and by conducting semi-structures interviews for in-depth personal insights and also by focus groups discussions to explore different group dynamics by means of online zoom call with their consent. Results were analyzed by using NVivo Software by means of thematic analysis, by using the approaches of transcription, coding sheets, and interpretation. Findings of the study were that digital media plays a vital and significant role in enhancing the awareness level of youth of Pakistan about the local and global social issues like climate change, gender inequality and many more. Online platforms like Facebook, twitter, TikTok, Instagram and many other allow youth to express their opinions, engage in activism and discussion about issues around the globe and also allow them to arranged events and campaigns to provide others meaningful insights as well. Study also finds some barrier to engagement including misinformation, fake news, limited digital literacy and many others. Study concluded that digital media acts as both enabler and barrier to civic engagement of youth, it empowers young people to participate in social issue and foster community building but its potential is constrained by some factors like technological, social and cultural limitations.

A broader skills perspective helps explain why access and beneficial outcomes need not move together. A systematic review distinguishes digital skills from wider capabilities needed for work and participation (van Laar et al., 2017). Research on the outcomes of Internet engagement also examines how benefits may extend across personal, social, cultural, and economic domains (van Deursen & Helsper, 2018). These findings motivate separate assessment of perceived empowerment, opportunities, inclusion, and awareness rather than assuming that one overall score describes every domain equally well.

Pakistani evidence supports need for separation of access dimensions. A survey of university faculty highlights variation in physical access, motivation, skills, and use (Soomro et al., 2020). Analysis of national household surveys also links ICT-use ability to demographic, socioeconomic, regional, and infrastructure variables (Shair et al., 2022). These populations and variables are different from our adolescent sample; these findings call for contextualization but not for quantification of the relationships documented in this paper.

Participation in education is a good example of how access must be contextualized. Pandemic research depicts bidirectional effects between digital inequality and social vulnerability (Beaunoyer et al., 2020), whereas online education reveals technological and socioeconomic barriers to maintaining education (Adedoyin & Soykan, 2023). Family circumstances and online education literature also highlight the importance of access-related resources (Gu, 2021). These works lend credibility to analyses of perceived opportunity where the awareness of an opportunity is not interpreted as an educational or employment outcome.

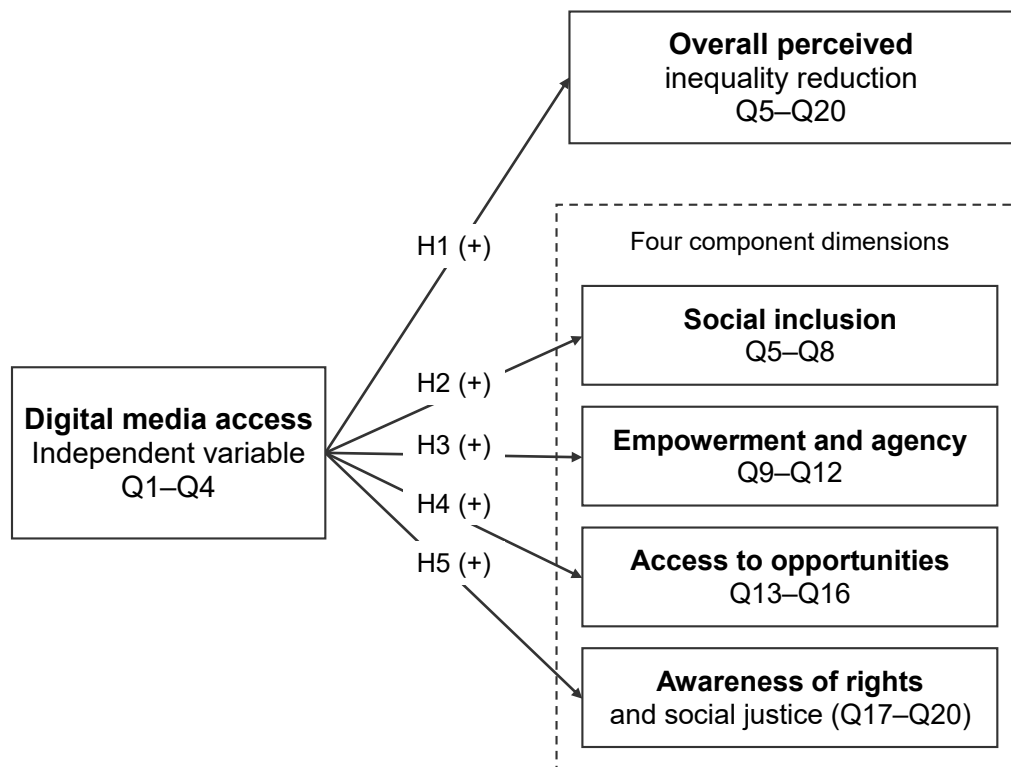
Social inclusion and civic engagement both are outcomes. Ellison et al. identified Facebook use (among college students) as being related to different forms of social capital, and Gil de Ziga et al. researched associations between information-based social-media use and social capital, civic participation, and political participation (Ellison et al., 2007) (Gil de Ziga et al., 2012). Still, claiming all social-media activity is about social inclusion would be unwarranted; the use, context, and outcome measured are all still relevant.

Meta-analyses offer some indication for a benign engagement hypothesis. Meta-analysis of social-media usage and participation tend to show positive relations while remaining silent on causality (Boulianne, 2015). Meta-analyses focusing on young people analyse variation in the relation among different types of engagement and different digital-media measures (Boulianne & Theocharis, 2020). Alongside research on the variation among young people's access and online opportunities (Livingstone & Helsper, 2007), this evidence suggests an association-based model rather than a statement of 'empowerment'.

2.1 Theoretical Framework

The theoretical basis is provided by The Uses and Gratifications Theory, which treats audiences as active consumers who choose to use texts to satisfy needs for information, social interaction, expression, and so on (Blumler & Katz, 1974; Katz et al., 1973). Subsequent literature explicates how this perspective might relate to interactive and emerging media (Ruggiero, 2000; Sundar & Limperos, 2013). Access when talking about this conceptualization offers the opportunity for use; not all motives or gratifications can be directly queried. So, the theory informs the expected relationships but does not establish that access necessarily reduces inequality.

Figure 1: *Conceptual model of the proposed study hypotheses*



Note. H1 concerns the overall inequality reduction score; H2–H5 concern its four component dimensions. The plus signs indicate the hypothesized positive associations, not observed results. The four dimensions are components of the overall score, not mediators. The model is based on the study's stated hypotheses.

The study hypothesizes that increased access to digital media can bring an increase in perceived inequality reduction for Pakistani youth aged 19-30. The independent variable here is access to digital media and the dependent variable is perceived inequality reduction. Inequality reduction is being measured using four widely accepted, interrelated dimensions that collectively capture inequality reduction (social inclusion, empowerment, and agency, access to opportunity and awareness of rights and

social justice). The study shall so look at the association between these variables collectively as well as separately.

This model expands upon the Uses and Gratifications Model discussed earlier. Its focus on the motivated nature of media use is a reason for why we might expect young people to use digital media to satisfy needs related to information, social interaction, self-expression, and participation. In this study, access is assumed to support certain acts. The basic reasoning here is that those who are connected to digital media more often will have greater chances to access information, interact with others, and participate in activities outside of the immediate context. But, having access in and of itself does not ensure that such opportunities will benefit all youth equally.

2.1.1 Digital Media Access

Digital media access indicates how often respondents report they are able to access and use digital media in their daily life. It is assessed using four questionnaire items that ask about regular internet access via a personal device, ease of use of social media, access to an internet-enabled smartphone and regular usage of digital media in daily life. These four items reflect perceived availability and regular usage and do not directly ask about how well respondents are connected to digital media or the cost of access or their digital media skills.

2.1.2 Dimensions of Perceived Inequality Reduction

Social inclusion reflects young people's feeling of belonging, links to various social groups, how well their views are made visible and their feeling of less social distance. The model hypothesizes that more digital media access results in increased perceived inclusion as digital media can widen communication beyond face-to face networks. Empowerment and agency relate to feelings of confidence in voicing an opinion, speaking about a topic of personal importance, speaking to a social problem, or communicating a community concern. We hypothesize that increasing access is directly related to increased opportunities for voice and participation, which are connected to an increased sense of personal voice and agency.

The empowerment construct must be interpreted in context. Psychological empowerment separates process from product and recognizes intrapersonal, interactional, and behavioral components (Zimmerman, 1995). The four empowerment items mostly address perceived voice and capacity and do not and cannot address all facets of that more global construct.

Opportunities & Exposure education training scholarships jobs events, skill-building, and programs and materials outside the community. Increases in media use are hypothesized to relate to an increase in perceived access to opportunities. Perceived opportunity to build skills or receive education and training is conceptually distinct from actual increases in educational attainment, employment, or income.

Awareness of rights and social justice knowledge of human rights, groups of people marginalized, social justice, national, and global inequalities. The conceptual setup hypothesizes that digital media, being easier to access, will generate more opportunities to come across and discuss this sort of information, creating a positive relationship with the respondents' reported awareness.

2.1.3 Structure and Scope of the Proposed Relationships

The four dimensions are used as sub-components of the overarching measure of inequality reduction, not as mediators of media access on a separately-measured outcome. Access to digital media defined by Q1-Q4; social inclusion defined by Q5-Q8; empowerment and agency defined by Q9-Q12; access to opportunities defined by Q13-Q16; awareness of rights and social justice defined by Q17-Q20. The overall dependent-variable score combines Q5-Q20. It indicates greater perceived benefits in these areas, rather than support for the idea that structural inequalities have in fact been reduced.

Gender, age group and urban/rural location speak to the setting in which access and benefits are observed. They are to be thought of separately in comparisons of demographic groups; they are not a single psychological scale. The current model does not assume moderation by location or age group of the

linkages presented here unless tested as an interaction. The model is purely correlational because of its cross-sectional nature.

2.1.4 Study Hypotheses

H1: Digital media access is positively associated with overall perceived inequality reduction among Pakistani youth.

H2: Digital media access is positively associated with perceived social inclusion among Pakistani youth.

H3: Digital media access is positively associated with perceived empowerment and agency among Pakistani youth.

H4: Digital media access is positively associated with perceived access to educational, skill-development, and economic opportunities among Pakistani youth.

H5: Digital media access is positively associated with awareness of rights and social justice among Pakistani youth.

3. METHODOLOGY

3.1 Research Design

Quantitative Research design is employed to conduct this study to examine access of media and inequality reduction among youth of Pakistan. Quantitative Research is the type of research in which numerical data is structured and statistically analyzed (Meissel & Brown, 2023). Cross- Sectional Survey Design is utilized for the collection of data, that is used from a large scale at a single point in time that enables statistical analysis of relationships between variables (Creswell, 2009).

3.2 Research Sample and Sampling Technique

The target population for this study is youth of Pakistan aged 19- 30 years. The study tends to collect data from the target public; sample of 287 respondents was collected during the period of two months that belongs to urban and rural areas of Pakistan. Participants are chosen from universities, colleges and vocational training centers across multiple regions. A Stratified Random Sampling technique was utilized to ensure the representation across Gender, Geographic location and Socioeconomic Status.

3.3 Data Collection

For the data collection, structured and self-administered questionnaire (by using Likert Scale) was designed to assess the perceived social inclusion, empowerment, access to educational and economic opportunities and awareness of social justice and human rights. Survey was distributed paper- based surveys in colleges, centers and universities.

3.4 Data Analysis

The cross-sectional sample included 287 respondents. Data in SPSS (.sav) file was examined with descriptive and inferential data analysis procedures. The script describes the scale-scores rules, model syntax, confidence-interval formulae, and multiple-test corrections as explained below. All files were reviewed for allowable response-values, missing values, duplicate patterns of responses, and consistency of individual composite scores with their component items. No responses to items were missing. All files were kept on file because there can be nothing "invalid" about identical responses; no imputation or automatic deletion of duplicate cases was performed.

Survey quality studies suggest comparison between indicators is preferable to use a single indicator as an absolute indication of invalid responding (Curran, 2016; Meade & Craig, 2012). The sample file does not contain response-time data, or listed attention-check questions. This screening procedure then notes, which responses and response-patterns need to be checked, rather than conclusively determine them to be invalid.

Access to digital media was scored as means for Q1Q4. Social inclusion, empowerment, and agency, access to opportunities, and awareness of rights and social justice were scored as means for Q5Q8, Q9Q12, Q13Q16, and Q17Q20 respectively. Perceived reduction of inequality was scored as the means for Q5Q20. The original 15 response scale was retained for all scales. Demographic frequencies and percentages describe the sample and sample scales' distributions (means, sample standard deviations, medians, and interquartile ranges). Cronbach's alpha tested internal consistency but does not test construct validity.

All questions are worded positively, scores for extent of agreement are 1-5, (Strongly disagree- Strongly agree); the score ranges for the items quoted were 2-4. The instrument provided did not include any Reverse scored items. Scores are, that means, directly related to access to or benefit derived from the service, the higher the scores the more access or benefit. A negative regression coefficient/correlation coefficient does not constitute, in itself, the evidence of a scoring error. Negative confidence limits may also apply to positive questionnaire scores.

Cronbach's alpha is a measure of a dimension of the consistency of scores across items (Cronbach, 1951). Its size is a function of the item set and reliability alone cannot be regarded as sufficient evidence that a measure is unidimensional or valid (Sijtsma, 2009; Tavakol & Dennick, 2011). So, the reliability table is contextualized within the response-pattern audit to determine measurement validity.

Pearson correlations represented the linear relations among digital media access and the outcomes. Spearman correlations, with mean ranks for ties, offered a rank-based comparison. Pearson and Spearman coefficients were reported descriptively; neither served as a substitute for the adjusted hypothesis tests.

Five ordinary least-squares multiple regressions examined H1–H5. Each model included media access and indicator variables for gender, age group, and urban or rural residence. Reference categories were male, age 19–30 years, and urban residence. The combined demographic sum was excluded. The model was $Y = b_0 + b_1(\text{media access}) + b_2(\text{female}) + b_3(\text{age 19–24}) + b_4(\text{age 25–30}) + b_5(\text{rural}) + \text{error}$. B denotes the unstandardized media-access coefficient per one-point difference in its item-mean score.

Conventional regression standard errors were computed from the estimated residual variance and the inverse predictor cross-product matrix. Two-sided coefficient tests from the pooled models were conducted using Student's t distribution with 281 residual degrees of freedom. Pointwise 95% confidence intervals used the corresponding t critical value. Model R², adj. R², and the increase in R² attributable to the inclusion of media access (relative to the model with demographics alone) were computed. Holm's step-down correction (stats models developers, n.d.) was used to adjust the five media-access p-values as one family at a familywise significance level of .05. Confidence intervals were not adjusted for multiple comparisons. Inferences assume observations are independent, the conditional mean is correct, and residual variance is constant; violations of these assumptions may render conventional standard errors and p-values untrustworthy.

The adjustment for multiple testing was based on the sequential rejection principle outlined in Holm (Holm, 1979). It controls the familywise false-positive error for the tests specified in this paper. It does not correct for inaccurate recordkeeping or selection bias or regressions assumptions.

Exploratory independent-samples comparisons used two-sided Welch t tests with Welch Satterthwaite degrees of freedom and Student-t confidence intervals for the mean differences of: (i) the six gender comparisons and (ii) the six location comparisons (SciPy community, n.d.-b). Holm correction was applied independently for the six gender comparisons and independently for the six location comparisons. Age-group comparisons used classical one-way ANOVA, nominal F-test p-values, and sample eta-squared estimates, with Holm correction applied independently for the six scales (SciPy community, n.d.-a). Because the oldest age group had zero variance in age, the assumptions underlying a classical ANOVA could not be confirmed; these were reported as assumption-limited exploratory comparisons.

The unequal-variance two-group test is based on Welch's version (Welch, 1947). The unequal-variance and equal-variance comparisons are extended to several-group mean testing (Welch, 1951). The classical age-group ANOVA is presented with the limitations, because the zero variance for the oldest group means the inverse-variance version of the test cannot be used. Eta-squared is presented as a descriptive measure of the between-group variation (see Lakens 2013 for why effect sizes should be reported apart from test statistics) (Lakens, 2013).

Rural-only regressions were in the same way corrected for gender and for the observed age categories; conventional Student-t intervals based on 159 residual degrees of freedom were not multiplicity-adjusted. Urban-only correlations and slopes were not available as all scores in the urban subgroup on this item was constant. This subgroup analysis was a sensitivity analysis, not an analysis on a verified cleaned data set. Matrix rank, media-access variance inflation factor, leverage, and Cook's distances were examined descriptively; no data points were removed based on these.

The nine tables present demographics, descriptive scale statistics, reliability, pooled correlations, adjusted regression, descriptive urban–rural differences, rural-only sensitivity, independent-samples t tests, and age-group ANOVA, respectively. Sampling weights and institutional cluster identifiers were unavailable. The repeated response patterns, identical urban answers, and absence of overlapping access-score ranges between locations substantially limit all inferential interpretations. Reported p-values and intervals are nominal, conditional on model and sampling assumptions, and do not establish causal effects or population-representative differences.

3.5 Ethical Considerations

This study was as per local practice and applicable guidelines and regulations of the university. The study was carried out in keeping with declaration of Helsinki. All study participants were briefed about the objectives of the study, research activities, potential benefits, and risks before the initiation of the study and were assured of the anonymity, and confidentiality of all information that was obtained from them. The participation was voluntary and could be stopped at the discretion of the study participant without having to provide a reason and study participants were assured of the confidentiality of all the information obtained from them and to ensure the anonymity of data in the report.

3.6 Informed Consent

Informed consent before the test, participants signed a written informed consent. Participants were given adequate information about the aim of the study, test procedures, potential risks and benefits of the test, data confidentiality and right to refuse or withdraw from the study at any time without giving any reasons. Participants had enough time to ask questions and to seek any needed clarifications.

4 RESULTS

Table 1: *Demographic characteristics of respondents*

Characteristic	Category	Frequency (n)	Percentage (%)
Gender	Male	115	40.1
	Female	172	59.9
Age group	19–24 years	238	82.9
	25–30 years	49	17.0
Geographical location	Urban	124	43.2
	Rural	163	56.8
Total sample	All respondents	287	100.0

Note. N = 287. Percentages use the full sample as the denominator; small discrepancies in totals reflect rounding. No demographic responses were missing.

Table 1 express the most respondents were female (59.9%), aged 19–24 years (82.9%), and from rural areas (56.8%).

4.1 Data Screening

The data file had 287 complete cases and 30 numeric variables. There were no missing item values, and all seven stored composite scores were equal to the sums of their constituent variables. All records remained; no imputation or auto-removal of duplicates was performed.

One large response-pattern limitation was found. All urban participants chose 4 (Agree) on all 20 items; no one in rural areas did so. Out of the full set of cases, only 18 20-item patterns occurred. For the 30 variables stored, 22 different rows were seen beyond 265 duplicate runs of those same rows. Item categories in these patterns were 2, 3, and 4; categories 1 and 5 were not used. The cause of these cannot be assumed, but it should be checked that the patterns are not due to erroneous entry of the questionnaire before drawing inferences.

Table 2: *Descriptive statistics for digital media access and the outcomes*

Scale	Mean	SD	Median	25th–75th percentile
Digital media access	3.186	0.744	3.000	2.500–4.000
Inequality reduction	3.176	0.740	2.875	2.438–4.000
Social inclusion	3.225	0.732	3.000	2.500–4.000
Empowerment / agency	3.211	0.744	3.000	2.500–4.000
Access to opportunities	3.186	0.763	3.000	2.500–4.000
Rights and social justice awareness	3.083	0.845	2.750	2.250–4.000

Note. N = 287 for every scale. Scores are item means on the original 1–5 response metric. The final column is the interquartile interval. SD denotes the sample standard deviation.

Table 2 presents the Mean scores ranged from 3.083 for rights and social justice awareness to 3.225 for social inclusion. Digital media access had a mean of 3.186 (SD = 0.744), and overall perceived inequality reduction had a mean of 3.176 (SD = 0.740). These are self-reported perceptions; they do not establish changes in structural inequality.

4.2 Reliability Analysis

Table 3: *Internal consistency of the study scales*

Variable / scale	Items	No. of items	Cronbach's alpha
Digital media access	Q1–Q4	4	0.953
Social inclusion	Q5–Q8	4	0.912
Empowerment / agency	Q9–Q12	4	0.967
Access to opportunities	Q13–Q16	4	0.955
Awareness of rights and social justice	Q17–Q20	4	0.972
Inequality reduction (overall)	Q5–Q20	16	0.984

Note. N = 287 for every scale. Cronbach's alpha was calculated from the original item scores; alpha is unchanged by expressing an item-sum composite as an item mean. The overall inequality reduction scale combines Q5–Q20. Demographic categories are not multi-item scales and do not receive alpha coefficients.

Table 3 indicate Alpha values were .953 (digital media access), .912 (social inclusion), .967 (empowerment and agency), .955 (opportunities), and .972 (rights and social justice). The overall 16-item inequality reduction index had alpha = .984. These values describe internal consistency of this file. The identical urban answers to four items and repeated response patterns could also help explain these very high coefficients, which could not establish construct validity or the four dimensions' separability.

4.3 Bivariate Associations

Table 4: *Correlations between digital media access and each outcome*

Outcome	Pearson r	Spearman rho
Overall inequality reduction	0.947	0.844
Social inclusion	0.868	0.770
Empowerment / agency	0.944	0.915
Access to opportunities	0.917	0.850
Rights and social justice awareness	0.903	0.802

Note. N = 287. Pearson and Spearman coefficients are unadjusted descriptive associations. Spearman coefficients use average ranks for ties. Table 5 reports the five adjusted hypothesis tests; the correlations do not constitute independent confirmation of those tests.

Table 4 demonstrate All pooled associations were positive: the pooled Pearson correlations ranged from .868 to .947 and the Spearman coefficients from .770 to .915. The pooled Pearson correlation was .947. These pooled coefficients pooled together the variation within locations, but also the large differences between urban and rural responses, and should not be used as independent confirmation of the adjusted relationships.

4.4 Inferential Analysis of the Hypotheses

Each hypothesis predicts a positive association with digital media access. A hypothesis is described as provisionally supported only when the adjusted media-access coefficient is positive and its Holm-adjusted two-sided p-value is below .05. H1–H5 form one correction family. Decisions are based on these adjusted regression tests, not the pooled correlations or demographic comparisons. All findings remain exploratory and conditional on model assumptions and the unresolved response-pattern limitations.

Table 5: *Demographic adjusted associations with digital media access*

Hypothesis	B	SE	95% CI	Holm p	Adjusted R ²	Decision
H1 Overall inequality reduction	0.214	0.043	[0.130, 0.298]	< .001	0.960	supported
H2 Social inclusion	−0.162	0.078	[−0.316, −0.007]	0.080	0.861	Not supported
H3 Empowerment / agency	0.731	0.064	[0.605, 0.858]	< .001	0.910	supported
H4 Access to opportunities	0.344	0.074	[0.197, 0.490]	< .001	0.885	supported
H5 Rights and social justice awareness	−0.057	0.072	[−0.198, 0.085]	0.432	0.913	Not supported

Note. N = 287. Models adjust for gender, age group, and urban–rural residence. B is the unstandardized media-access coefficient; SE is the conventional standard error. Pointwise 95% intervals use Student’s t distribution with 281 residual degrees of freedom. The t statistics are reported in the H1–H5 paragraphs. Holm p corrects the five two-sided media-access tests; intervals are not multiplicity-adjusted. Provisionally supported requires B > 0 and adjusted p < .05. Adjusted R² describes the entire model, not the independent contribution of media access. All decisions remain exploratory and conditional on the model and source-data assumptions.

The adjusted results were provisionally consistent with H1, H3, and H4, while H2 and H5 were not supported. Support for the overall composite in H1 does not imply that all four component dimensions were supported. Table 7 assesses the sensitivity of the pattern within rural respondents. The geographic and age comparisons in Tables 6, 8, and 9 describe demographic differences and cannot substitute for testing the media-access associations specified in H1–H5.

The overall-outcome model had R² = .961 and adjusted R² = .960. Adding media access to the demographic-only model increased R² by .0035, or approximately 0.35 percentage points. The corresponding increments were .0021 for social inclusion, .0408 for empowerment and agency, .0086 for

access to opportunities, and .0002 for rights and social justice awareness. These values distinguish the additional association with media access from the much larger fit associated with the demographic structure of the supplied records. The media-access VIF was 13.08, indicating substantial overlap with the demographic predictors. Maximum leverage was .066 and maximum Cook's distances ranged from .015 to .041 across the models. These diagnostics cannot establish the validity or independence of the records.

4.5 Exploratory Urban and Rural Differences

Table 6: *Urban and rural scale differences*

Scale	Urban mean (SD)	Rural mean (SD)	Mean difference
Digital media access	4.000 (0.000)	2.567 (0.290)	1.433
Overall inequality reduction	4.000 (0.000)	2.549 (0.226)	1.451
Social inclusion	4.000 (0.000)	2.635 (0.368)	1.365
Empowerment / agency	4.000 (0.000)	2.610 (0.372)	1.390
Access to opportunities	4.000 (0.000)	2.566 (0.366)	1.434
Rights and social justice awareness	4.000 (0.000)	2.385 (0.356)	1.615

Note. Urban n = 124; rural n = 163. Difference = urban minus rural mean score, without adjustment for other demographics. This table is descriptive. Independent-samples Welch t tests, mean-difference confidence intervals, and Holm-adjusted p-values appear in Table 8. Identical urban answers substantially limit substantive interpretation.

Table 6 illustrate the urban means were 4.000 with zero within-group standard deviation for every scale. Rural means ranged from 2.385 for awareness to 2.635 for social inclusion. Urban-minus-rural mean differences ranged from 1.365 to 1.615 points. These descriptive differences reflect the supplied response pattern; they do not establish population-level geographical disparities or effects of residence.

4.6 Sensitivity Analysis Within Rural Respondents

Table 7: *Rural-only correlations and adjusted associations*

Hypothesis	Pearson r	Adjusted B	SE	95% CI
H1 Overall inequality reduction	0.241	0.247	0.053	[0.142, 0.352]
H2 Social inclusion	-0.151	-0.127	0.109	[-0.344, 0.089]
H3 Empowerment / agency	0.532	0.791	0.085	[0.623, 0.958]
H4 Access to opportunities	0.245	0.385	0.101	[0.186, 0.584]
H5 Rights and social justice awareness	-0.040	-0.061	0.094	[-0.247, 0.125]

Note. Rural n = 163. Regression coefficients adjust for gender and the observed age categories (15–19 and 20–24 years). SE is the conventional standard error; pointwise 95% intervals use Student's t distribution with 159 residual degrees of freedom and are not corrected for multiple comparisons. Urban-only coefficients are undefined because scores are constant. This is a subgroup sensitivity check, not a verified cleaned-data analysis. Negative coefficients and correlations denote inverse point estimates. The social-inclusion and rights-awareness regression intervals cross zero and do not establish inverse associations.

Table 7 explain within rural respondents, the overall Pearson correlation was .241, compared with .947 in the pooled sample. The rural correlations for social inclusion ($r = -.151$) and rights awareness ($r = -.040$) were inverse in direction; the latter was close to zero. Empowerment ($r = .532$) and opportunities ($r = .245$) were positively correlated with media access. These descriptive coefficients do not by themselves establish statistical significance or causation. Conventional adjusted rural models likewise produced negative point estimates for social inclusion ($B = -0.127$, 95% CI $[-0.344, 0.089]$) and rights awareness ($B = -0.061$, CI $[-0.247, 0.125]$), but both intervals included zero. They therefore do not establish inverse conditional associations. Adjusted rural coefficients were positive for the overall outcome ($B = 0.247$, CI $[0.142, 0.352]$), empowerment ($B = 0.791$, CI $[0.623, 0.958]$), and opportunities ($B = 0.385$, CI $[0.186, 0.584]$). These subgroup intervals were not multiplicity-adjusted and remain dependent on conventional regression assumptions.

Urban media-access mean scores were uniformly 4.00, whereas rural scores ranged from 2.00 to 3.00. The groups therefore had no overlapping access-score range. The pooled association combines location differences with within-group relationships, and the common adjusted slope is informed by rural access variation under an additive-model assumption. This prevents a credible estimate of an urban-specific access relationship and restricts comparisons at equivalent access levels. The reduction from the pooled overall correlation of .947 to the rural correlation of .241 demonstrates substantial sensitivity to the location-linked response pattern.

4.7 Independent Samples *T* Tests

Table 8: *Welch independent samples t tests by gender and location*

Comparison and scale	Group 1 mean (SD)	Group 2 mean (SD)	t (df)	Difference [95% CI]	Holm p
Gender: Digital media access	3.330 (0.695)	3.090 (0.761)	2.762 (259.10)	0.240 [0.069, 0.412]	0.012
Gender: Overall inequality reduction	3.338 (0.680)	3.068 (0.760)	3.149 (262.11)	0.270 [0.101, 0.440]	0.007
Gender: Social inclusion	3.326 (0.692)	3.157 (0.752)	1.960 (257.95)	0.169 [−0.001, 0.339]	0.051
Gender: Empowerment / agency	3.391 (0.627)	3.090 (0.792)	3.583 (276.98)	0.301 [0.136, 0.467]	0.002
Gender: Access to opportunities	3.350 (0.690)	3.076 (0.792)	3.111 (265.79)	0.274 [0.101, 0.448]	0.007
Gender: Rights and social justice awareness	3.285 (0.760)	2.948 (0.874)	3.466 (265.99)	0.337 [0.146, 0.529]	0.003
Location: Digital media access	4.000 (0.000)	2.567 (0.290)	63.046 (162.00)	1.433 [1.388, 1.477]	< .001
Location: Overall inequality reduction	4.000 (0.000)	2.549 (0.226)	82.096 (162.00)	1.451 [1.416, 1.486]	< .001
Location: Social inclusion	4.000 (0.000)	2.635 (0.368)	47.393 (162.00)	1.365 [1.308, 1.422]	< .001
Location: Empowerment / agency	4.000 (0.000)	2.610 (0.372)	47.723 (162.00)	1.390 [1.332, 1.447]	< .001
Location: Access to opportunities	4.000 (0.000)	2.566 (0.366)	49.992 (162.00)	1.434 [1.377, 1.491]	< .001
Location: Rights and social justice awareness	4.000 (0.000)	2.385 (0.356)	57.920 (162.00)	1.615 [1.560, 1.670]	< .001

Note. Gender: group 1 = male (n = 115), group 2 = female (n = 172). Location: group 1 = urban (n = 124), group 2 = rural (n = 163). Difference = group 1 minus group 2 on the item-mean metric. Tests are two-sided Welch *t* tests with Welch–Satterthwaite degrees of freedom and pointwise Student-*t* intervals. Holm correction is applied separately within each six-scale comparison family. Confidence intervals are not multiplicity-adjusted. Tests are unadjusted for other demographics and do not replace the adjusted H1–H5 models. Independence and appropriate sampling assumptions remain unverified. A negative lower confidence limit is valid when an interval spans zero; it must not be changed to its absolute value.

Table 8 highlights the Male respondents had higher observed mean scores than female respondents on all six scales. After Holm correction within the gender family, nominal *p*-values were below .05 for media access (*p* = .012), overall perceived inequality reduction (*p* = .007), empowerment (*p* = .002), opportunities (*p* = .007), and rights awareness (*p* = .003). Social inclusion did not meet that criterion (*p* = .051). Its estimated male-minus-female difference was positive (0.169 points), while its pointwise interval [−0.001, 0.339] crossed zero. The small negative lower confidence limit indicates uncertainty around the difference, not a negative questionnaire score or evidence that female respondents had a higher observed

mean. These exploratory comparisons do not control for location and should not be interpreted as effects of gender.

For location, all six nominal Holm-adjusted p-values were below .001. Because every urban respondent scored 4.000 on every scale, the urban sample variances were zero and the Welch degrees of freedom reduced to 162, the rural group's $n - 1$. These very large t statistics describe the same complete group separation already reported in Table 6. They provide no independent validation of the records, and their numerical significance should not be interpreted as reliable population-level evidence without source verification.

4.8 One Way Analysis of Variance by Age Group

Table 9: Classical one way ANOVA across the three age groups

Scale	19–24 mean (SD)	25–30 mean (SD)	F(2, 284)	Nominal Holm p	Eta ²
Digital media access	3.085 (0.716)	4.000 (0.000)	25.207	< .001	0.151
Overall inequality reduction	3.044 (0.726)	4.000 (0.000)	30.060	< .001	0.175
Social inclusion	3.103 (0.727)	4.000 (0.000)	26.120	< .001	0.155
Empowerment / agency	3.086 (0.739)	4.000 (0.000)	26.336	< .001	0.156
Access to opportunities	3.056 (0.757)	4.000 (0.000)	27.015	< .001	0.160
Rights and social justice awareness	2.932 (0.835)	4.000 (0.000)	29.277	< .001	0.171

Note. Age-group sample sizes are 17, 238, and 32, respectively. Classical one-way ANOVA uses between-group $df = 2$ and within-group $df = 284$. $F = (\text{between-group sum of squares} / 2) / (\text{within-group sum of squares} / 284)$. $\text{Eta}^2 = \text{between-group sum of squares} / \text{total sum of squares}$ and is a descriptive sample effect-size estimate. The six classical F-test p-values are Holm-adjusted as a separate exploratory family. They are labelled nominal because equal-variance and sampling assumptions are not supported by the supplied response structure. The 25–29 group has zero variance on every scale, so the usual inverse-variance-weighted Welch ANOVA is undefined. No Welch ANOVA results were substituted or invented.

Table 9 shows the classical ANOVA statistics ranged from $F(2, 284) = 25.207$ for media access to $F(2, 284) = 30.060$ for overall perceived inequality reduction. All nominal Holm-adjusted p-values were below .001, with sample eta-squared estimates ranging from .151 to .175. These nominal tests do not justify a dependable claim of age-related differences: all 32 respondents aged 25–29 were urban and scored 4.000 on every scale, while the other age groups included both urban and rural respondents. The age-group comparisons therefore combine age composition, residence, and the identical-answer pattern. The omnibus tests also do not identify which individual pairs of age groups differ; no confirmatory post-hoc pairwise claims are made.

5. DISCUSSION

The interpretation is in line with the modified hypotheses decisions: H1, H3, and H4 appeared to be preliminarily supported while H2 and H5 were not supported following Holm correction. That's why, the discussion makes a distinction between the positive relationships with the overall composite, empowerment, and opportunities with the lack of corrected support for the proposed positive relationships with social inclusion and rights awareness. The demographic t tests and ANOVA work as context and do not in themselves imply support of the five media-access hypotheses.

The supplemental t tests and the age-group ANOVA are ad hoc demographic comparisons. Their raw p-values do not address how locations and repeat response styles affect scores. In particular, the oldest age group is composed of all urban respondents who give the same answers, making it impossible to distinguish effects of age from location with these unadjusted tests. Such findings need replication in the raw data and in non-saturated data sets with more within-group variation before substantial demographic inferences can be made.

The nine-table format separates the description of the samples, the scale measures, the unadjusted associations, the adjusted hypothesis tests, and the sensitivity analysis. The urbanrural comparisons show large differences in the supplied file, but their inferential reading rests on the untested independence and exchangeability assumptions. Zero urban variation and perfect separation of access scores highlight the importance of record verification more than the tiny numerical p-values.

What do these results imply? The first point is a distinction between the direction of a point estimate and the strength of evidence for an association (for individual point estimates, this is discussed here). While, for example, pooled unadjusted correlations were positive for all outcomes, demographic-adjusted correlations for rights awareness and social inclusion were negative. These two statements are not inconsistent, yet; pooled correlations model across locations, mixing the variation in means across locations with within-location variation, while demographic-adjusted regression coefficients model within-location variation conditional on demographic indicators included in the controls vector. As the location-score range for each location did not overlap, the adjusted estimates for each location were under specified a very particular model, and neither negative coefficient was statistically significant after Holm correction. There is because of this insufficient corrected evidence for either a positive or an inverse association for these two outcomes.

The attribution to empowerment aligns with the conceptual argument that opportunities to voice opinions and engage in digital exchanges might be accompanied by a greater perceived voice. Also, the opportunity scale relates to information, and perceived access to education, training, jobs, and programmes. These are about self-report capacity and awareness of opportunity. They do not determine actual gains in work income education, or civic participation, and the proposed mediation mechanisms of the Uses and Gratifications system were not empirically tested.

The structure of the demographic groups and response patterns is key to understanding the results. All urban participants responded identically to each question, there was no overlap between urban and rural access scores, and many entries were the same. As a result, much of the fit in the combined model is driven by differences between these groups. The small increase in overall R from media access after adjusting for demographics gives more insight into its added statistical value than the pooled correlation alone. The rural-only findings further indicate that the pooled association does not reflect the strength of the relationship within the rural group.

Standard regression coefficients and standard errors have an assumed model specification, independent observations, and fixed residual error variance. The uniform urban response and multiple data for the same respondents cast doubt on the nominal interval estimates and p-values. Adjustment for multiple comparisons is available for the multiple tests but not for the data errors, respondent independence or confounding. Since the analysis and research hypotheses were changed after initial analysis, results are exploratory. The original questionnaires, coding, and data entry records should be checked before the results can be used to support policy prescriptions.

The difference between the pooled and within-rural associations is per the larger narrative that digital inequality must be contextualized within existing social inequalities (Helsper, 2021; Robinson et al., 2015). It does not mean that location is responsible for the association. Overlapping access scores and uniform urban responses exclude the possibility of a comparable-group interpretation that the headline pooled correlation would imply.

The positive adjusted associations with perceived empowerment and opportunity can be considered considering studies relating specific activities online with social capital and civic engagement (Boulianne & Theocharis, 2020; Ellison et al., 2007; Gil de Ziga et al., 2012). The negative but nonsignificant corrected estimates for social inclusion and rights knowledge demonstrate the case for not assuming benefits of access are universal, without implying negative effects of digital media. For both access and use, distinctions between targeted usage and outcomes achieved remain warranted (Scheerder et al., 2017;

van Deursen & Helsper, 2018), but the outside studies offer interpretive history not validation of these entries.

The repeated-answer pattern is in particular problematic because detection methods for insufficient-effort answers are contingent upon the indicators at hand and the context in which they are used (Curran, 2016; Meade & Craig, 2012). Since the reasons for identical responses can be more than one, the safest action at this point is source verification instead of implicating an editor without support or using a deletion rule. Having high alpha scores alone does not address this concern and does not equate validity of the underlying data or constructs (Sijtsma, 2009; Tavakol & Dennick, 2011).

6. CONCLUSION

This exploratory reanalysis identified provisional positive adjusted associations between media access and overall perceived reduction in inequality, empowerment, and agency, and access to opportunities. Adjusted point estimates for social inclusion and rights awareness were negative, but neither reached the .05 threshold after Holm correction. As a result, the study does not establish either a positive or inverse association for these two dimensions. Negative rural estimates were also uncertain, as their confidence intervals included zero. The strong pooled overall correlation was particularly higher than the within-rural association, and all inferential results remain dependent on unverified model and sampling assumptions.

The evidence is heavily constrained by the uniformity of the urban response pattern, repeated records, and no overlap of access scores at the level of the location. The study does not prove that access to digital media was responsible for the inequality reductions; validation of the original records and more diverse samples, validated measures and designs that establish temporal order are required.

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Conflict of Interest

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