Navigating the Digital Chasm: Digital Inequity and the Determinants among Racialized Seniors in Calgary, Alberta.

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1. Introduction

The idea of digital equity has gained traction in recent policy debates and has become a priority concern for smart cities across the world. According to the National Digital Inclusion Alliance (2025), Digital Equity is defined as "a condition in which all individuals and communities have the information technology capacity needed for full participation in our society, democracy, and economy. Digital Equity is necessary for civic and cultural participation, employment, lifelong learning, and access to essential services."

While this notion became a dominant agenda in urban planning (L. Robinson et al., 2020), recent studies highlight that, even in the post-pandemic period of intensified digitalization, persistent barriers remain—including limited access to internet and devices, as well as digital literacy challenges and low adoption of digital technologies (P. Robinson & Johnson, 2021; Y. Zheng & Walsham, 2021). In this context, limited digital literacy not only restricts individuals' ability to navigate technology but also contributes directly to reduced adoption. Additionally, concerns such as lack of trust, perceived irrelevance, and usability issues further hinder adoption beyond literacy barriers.

Previous research showed us that digital inequity is not solely shaped by the digital divide; it is also heavily impacted by pre-existing systemic and structural inequities, (Y. Zheng & Walsham, 2021) often resulting from socio-economic marginalization. While many studies address single variables impacting digital equity, there are limited studies on the impact of intersectionality. Findings in a poll from Philadelphia indicated that senior Black, Hispanic, or foreign-born persons are more likely to have low digital skills/literacy and that lower literacy among older adults might also be connected with education and race (Philadelphia, n.d.). With Calgary's population being 33.3% landed immigrants and with more individuals choosing to age in place (Statistics Canada, 2021 -Profile Table), we felt it was important to conduct a more careful analysis of the multi-dimensionality of digital inequity. Marginalized communities continue to be confronted with increasing socio-spatial inequities, uneven development of public infrastructure, affordable housing, and public services (Meij et al., 2020), this analysis will help us better understand how different systemic injustices interact with the existing digital divide (Potocky, 2021) felt by racialized members of the community.

2. Overall Goal

This study was conducted by the University of Calgary in collaboration with The City of Calgary (The City) with the condition of Digital Equity in mind. The intent is to use the findings to continue to take actionable and impactful steps required to meet the goals outlined in the Digital Equity Strategy. To

do this, the study examined the pattern, extent, and determinants of digital inequity specific to racialized and immigrant seniors. This group was selected for the study as they make up the cross section of two rapidly growing populations within Calgary. This examination will enable The City to better understand the intersecting disadvantages and systemic inequities that can increase vulnerability to digital inequity (Foong et al., 2022; Quan-Haase et al., 2021; P. Robinson & Johnson, 2021). The finding of this study will provide deeper insights into how digital inequity has impacted participants social interactions, economic participation, and mental well-being. This knowledge will guide policy and intervention strategies.

3. Specific Objectives

1. Determine the degree to which the digital divide affects racialized immigrant seniors in Calgary.
2. Understand the barriers racialized/immigrant seniors encounter when accessing existing digital services and digital supports available in Calgary.

4. Methodology

A community-engaged research (Selker & Wilkins, 2017) approach was adopted, involving knowledge users, in this case, the City of Calgary, throughout the research process with equal decision-making capacity. The research question and project planning were co-designed by The City and the research team, ensuring alignment with The City's priorities and a focus on actionable findings. Together, the team determined the methods outlined below to effectively achieve the research objectives. A detailed description of these methods is provided in Appendix I.

4.1 Survey of racialized/immigrant seniors: Surveys were conducted with a multilingual research team in nine different languages to reach racialized/immigrant seniors (aged 65 and older) from diverse ethnic communities in Calgary, including South Asian, Southeast Asian, East Asian, Middle Eastern and Western Asian, Northern and Eastern African, Southern and Central American, and Eastern European (Statistics Canada, 2016). To maximize outreach, community-based organizations were engaged to share study information with their members and initial survey participants were invited to introduce other participants. Each participant received a $10 gift card as an honorarium for their time and contributions.

4.2 Variables description: Data was collected on a wide range of socio-demographic variables, including age, gender, country of origin, duration and status of residency in Canada, employment status, household income, and education level. The survey then explored participants' awareness of and access to digital

inclusion initiatives, technology usage patterns and purpose, and challenges when using technology. A digital technology acceptance measurement tool to use to assess participants' perceptions, attitudes, and experiences related to digital inclusion. All of which provided a comprehensive understanding of the contextual and systemic factors affecting digital inclusion and the impact of digital inequity among racialized seniors.

4.3 Gender-based analysis plus: Gender data were gathered during the survey, and the relationships between these variables and the outcome measures were examined.

4.4 Ethics Approval and Research Data Security: This study was approved by the Conjoint Health Research Ethics Board (CHREB) at the University of Calgary. Respondent information was handled with strict confidentiality, and no personal identifiers were collected. Publications and reports derived from this study present aggregate data only.

5. Findings

394 Calgarians were surveyed in nine languages: Arabic, Tagalog, Bengali, English, Hindi, Korean, Spanish, Simplified Chinese, and Urdu. The largest population group was from Southeast Asia, making up 50% of respondents. A detailed origin chart can be found in Appendix II, Figure 10.

Socio-demographic profile of the respondents

Participants ranged from 65 to 100 years old, with the majority (57%) being between 70 and 80 years of age. Most participants were female (66%). Educational backgrounds were mixed, with 56% holding a diploma or higher despite this, income distribution indicated socioeconomic disparities, with 56% earning below $45,000 annually and 19% reporting no income. Almost all (94%) participants were Canadian citizens or permanent residents, with 64% reporting being residents of Canada for over 20 years. Employment status revealed that 76% of participants were retired. For a full breakdown of the demographic profile of the study population, see Appendix II Table 1.

Digital Inclusion Initiatives

The digital inclusion initiative aims to evaluate service awareness and understand the preferences of respondents regarding digital services. These insights are crucial for identifying gaps and prioritizing areas for improvement in digital access, literacy, and affordability. The results, below, reflect both the

current level of awareness about available services and the specific categories of services deemed important by the participants.

Service awareness

The distribution shown in Figure 1 highlights that the majority, 62%, of respondents are aware of the services available to them. However, 38% of the population remains unaware of available services, underscoring the importance of outreach and education to improve awareness among the population.

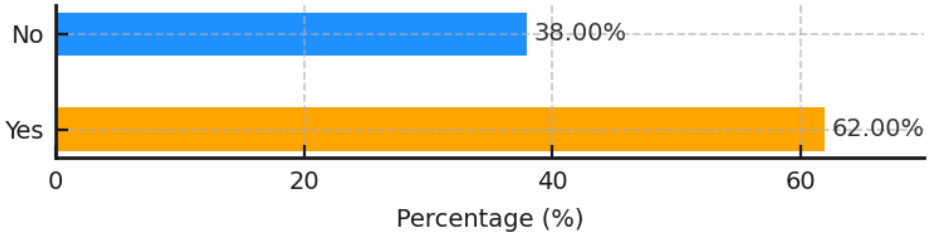

Figure 1: Service awareness among seniors

Service needs

Figure 2 summarizes the services respondents most frequently identified as necessary to overcome barriers to digital engagement. About 25% of the participants reported a need for general online navigation & use. Affordability of devices and technology—including device provision/acquisition and access to affordable technology—was noted by roughly 15%, slightly above digital literacy support (foundational computer skills, technology support, and online safety) at about 13%. Accessibility of services, platforms, and information—such as platform assistance, translation, and information seeking—accounted for around 11% of responses. Smaller proportions of participants identified education/skills training (training/workshops, advanced digital skills) at about 9%, and social service supports (health/wellness resources, finance/government services) at roughly 6%. However, around 21% of the seniors reported no need or were unsure when asked about their preferred services. Overall, these results reveal a diverse range of barriers and underscore the need for varied supports to promote digital inclusion.

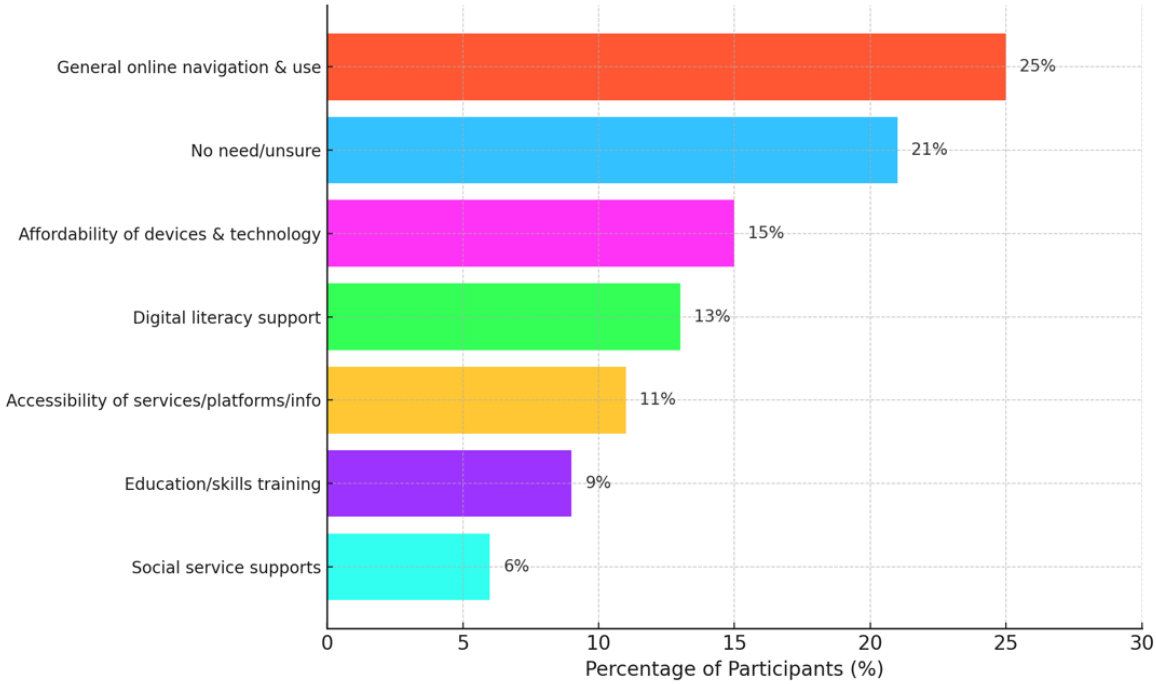

Figure 2: Preferred services

Purpose of technology usage (multiple response)

Participants were able to select multiple options when asked how they are using technology. The categorized results found entertainment as the most common use, with 70% of respondents. This was followed closely by communication and connection at 68%. Other significant areas include education at 55%, accessing social, health, or government services at 52%, and financial services at 49%. See Figure 3 below for full results.

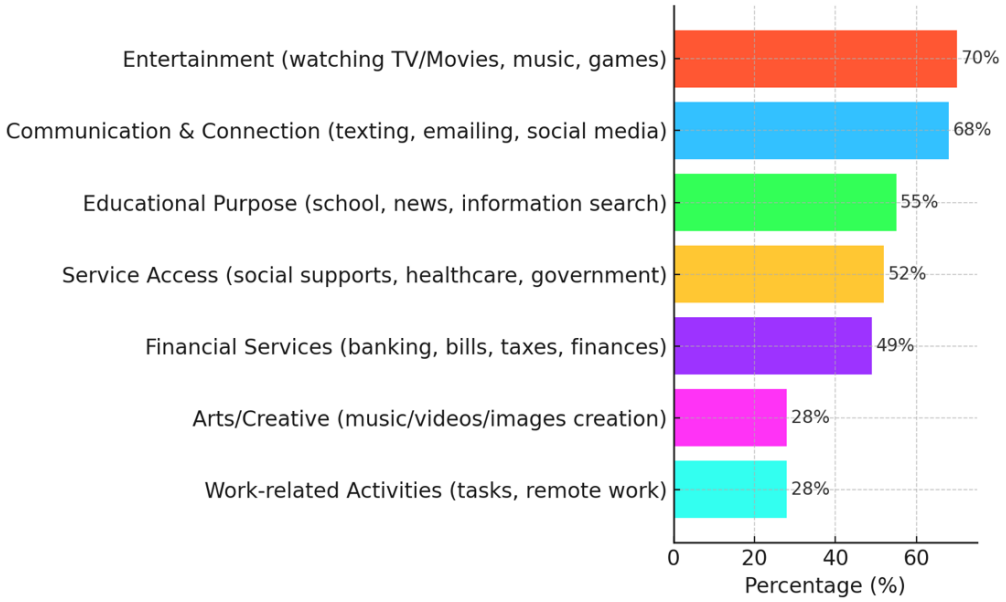

Figure 3: How technology is being used

Barriers faced by respondents

When asked about barriers to using technology, 22% of participants reported experiencing at least one barrier, with 66% of participants reported experiencing two or more barriers. Only 12% of participants reported experiencing no barriers. These findings highlight the widespread nature of technological difficulties, emphasizing the need for targeted interventions to support those encountering multiple obstacles.

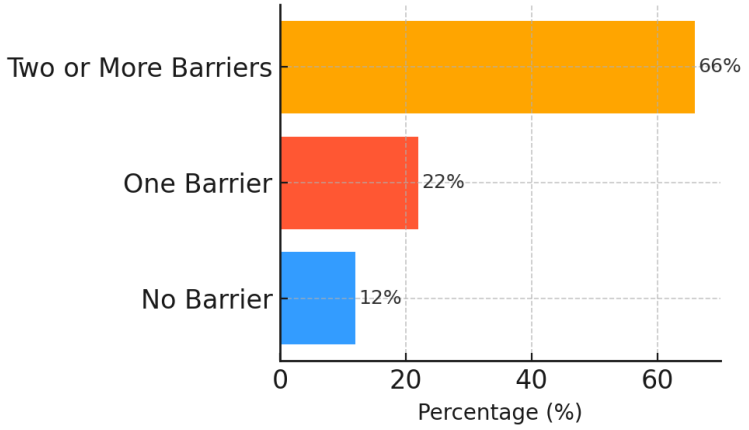

Figure 4: Number of barriers to use

The barriers respondents reported are summarized in the bar chart below. Digital literacy and accessibility were the most frequently reported challenges. 55% of participants report difficulties related to digital skills, knowledge, privacy concerns, or feeling overwhelmed by the amount of information. Similarly, 55% report accessibility challenges, including language challenges and limited access to digital devices. 52% indicate awareness-related issues, such as not being aware of available services. 51% state affordability, including the cost of devices and reliable internet. Lastly, cultural understanding barriers were noted by 25% of participants.

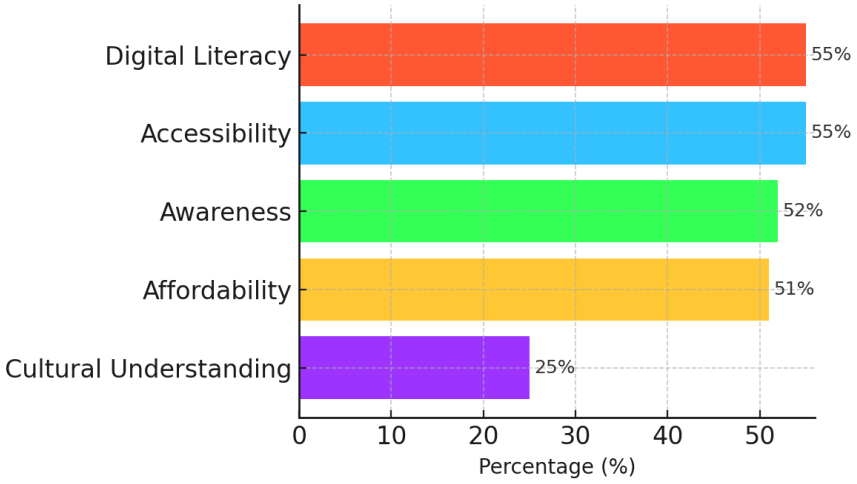

Figure 5: Barrier Type

Correlations Between Barriers and Demographics

Table 1: Relationship between barriers and demographic variables

Variable	Group	No Barrier (%)	One Barrier (%)	Two or More (%)
Years in Canada	< 20 years (n = 143)	10	22	68
	≥ 20 years (n = 249)	12	22	66
Gender	Male (n = 134)	18	19	63
	Female (n = 260)	8	24	68
Education	Up to High School (n = 174)	7	21	72
	Diploma or More (n = 208)	14	23	63

Table 1 shows how the number of technology-related barriers varies by gender, education level, and years lived in Canada. We looked at whether gender, education, or time spent living in Canada made a difference in the number of barriers people faced when using technology. The results showed that gender mattered— women reported barriers more often than men. Education also played a role, with people who had less formal education tending to face multiple barriers, though this difference was not as strong. On the other hand, how long someone had lived in Canada didn't seem to make a difference. These findings suggest that women and those with lower levels of education may need more support to overcome challenges related to using technology.

Impact of removing technology barriers (multiple response)

When asked what would change if their barriers were removed, most respondents reported that their social life would be more active. 62% of respondents stated that technology enables them to stay connected with friends and family. Improved access to healthcare services (57%), increased independence (53%), and improved access to social services (51%), such as immigration applications and Service Canada, were also highly reported benefits. Respondents also felt technology was a useful tool for managing finances, education, increasing work performance, and finding job opportunities. These findings echo what we heard in our broader public engagement in 2022 and underscore the crucial role of digital accessibility in improving various aspects of daily life, social engagement, and professional growth.

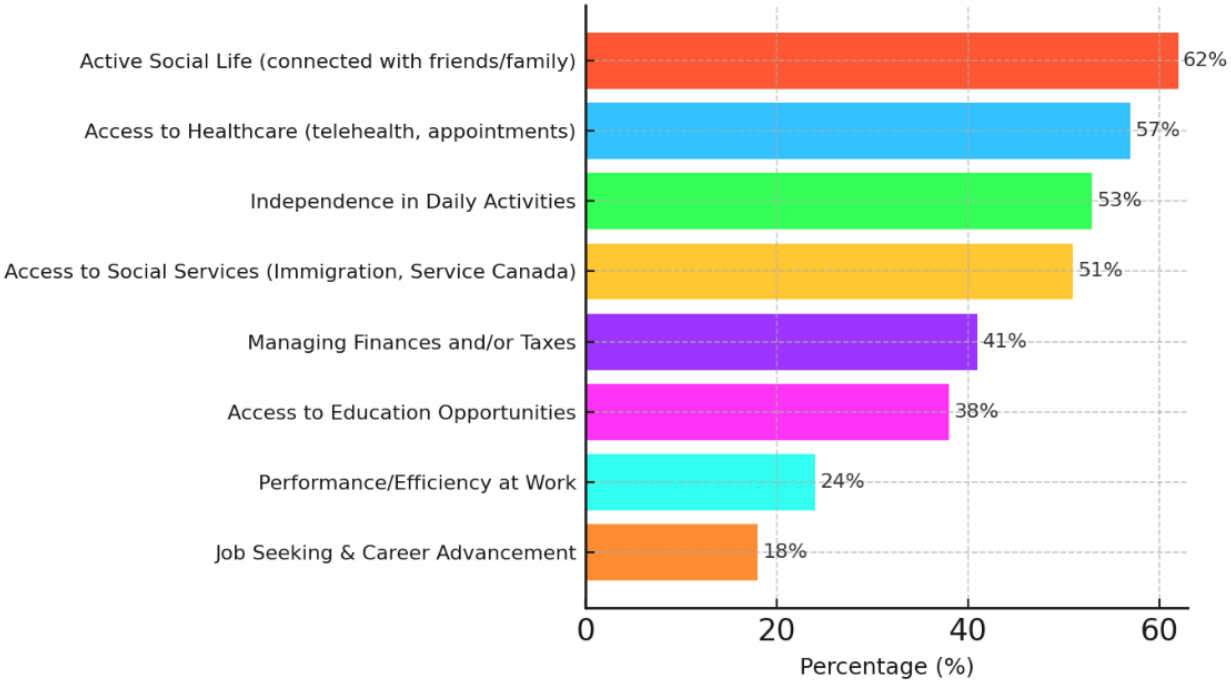

Figure 4: Impact if barriers are removed

Digital Technology Acceptance

The following three key dimensions were used to evaluate participants' perceptions of technology:

1. Attitudinal beliefs, which assess overall views on technology's value
2. Control beliefs, measuring confidence in using technology based on skills and resources
3. Gerontechnology anxiety focuses on emotional responses such as fear or apprehension regarding technology use.

Together, these dimensions offer valuable insights into the factors that influence how individuals engage with and accept technology in their daily lives.

Attitudinal Beliefs

The results of the attitudinal beliefs (AB) scale demonstrate consistently positive perceptions toward technology. Figure 7 summarizes participants' responses to three attitudinal belief scale items regarding technology use in daily activities. Most respondents expressed positive attitudes, with the majority agreeing or strongly agreeing that technology enhances effectiveness in daily activities (77%), is useful in daily activities (83%), and 83% of participants liked the idea of using technology. A small proportion of respondents remained neutral or disagreed with these statements, indicating a generally favorable outlook toward technology use in daily life.

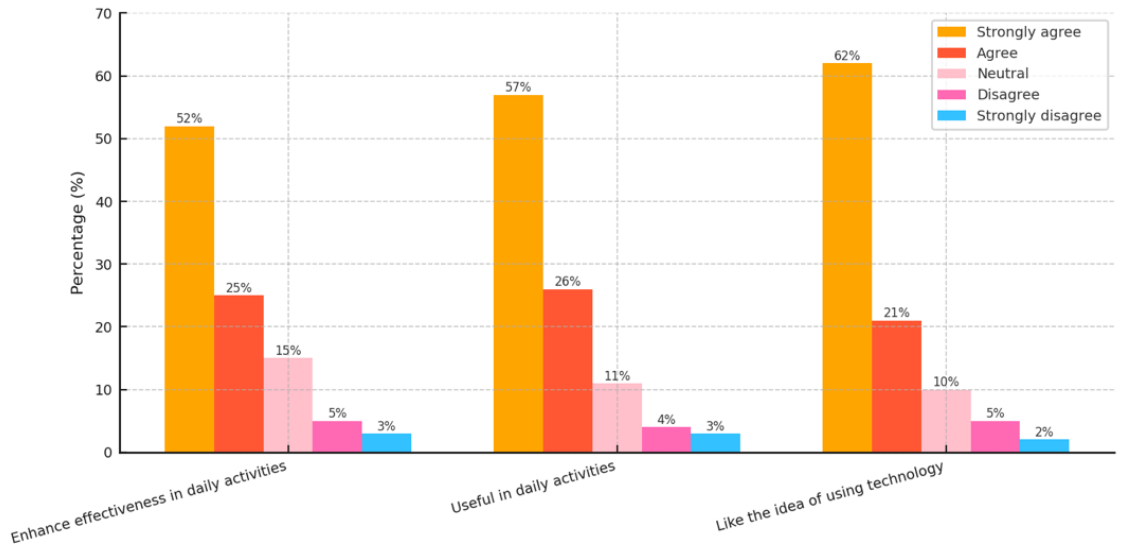

Figure 5: Attitudinal beliefs about technology

Socio-Demographic Differences in Attitudinal Beliefs

This section explores the influence of socio-demographic factors on attitudinal beliefs about technology, focusing on gender, educational attainment, and years of residency in Canada. Understanding these variations provides valuable insights into how different groups perceive the effectiveness, usefulness, and appeal of technology. By examining these factors, the analysis identifies trends and disparities in attitudes, highlighting the role of socio-demographic characteristics in shaping technology acceptance. These insights are crucial for tailoring interventions to promote equitable digital engagement across diverse populations.

Table 2 presents gender-based comparisons of attitudinal beliefs regarding technology use. Overall, both genders displayed positive attitudes toward technology with only minor gender variations.

Table 2: Gender difference in attitudinal beliefs

	Attitudinal belief scale items					
	Using technology would enhance effectiveness in daily activities.		**Technology is useful in daily activities**		**You like the idea of using technology.**	
Response	M (%)	F (%)	M (%)	F (%)	M (%)	F (%)
Strongly Agree	51	53	56	57	66	59
Agree	28	24	28	25	20	22
Neutral	13	16	9	12	9	11
Disagree	5	5	4	3	2	6
Strongly Disagree	2	3	3	3	3	2

M= male and F= female

Table 3 presents attitudinal beliefs toward technology based on respondents' educational background, with participants categorized as having "Up to High School" or "Diploma and Over". Overall, individuals with a diploma or higher consistently showed stronger positive attitudes toward technology. Individuals with a diploma or higher show a roughly 20% increase in strongly agree across all categories compared to those with up to high school education. This indicates that higher education creates more positive attitudes toward technology.

Table 3: Attitudinal beliefs by education

	Attitudinal belief scale items					
	Using technology would enhance effectiveness in daily activities.		Technology is useful in daily activities		You like the idea of using technology.	
Response	Up to HS (%)	PS (%)	Up to HS (%)	PS (%)	Up to HS (%)	PS (%)
Strongly Agree	41	61	45	65	49	72
Agree	26	25	30	23	29	15
Neutral	23	8	16	7	12	10
Disagree	8	3	5	3	8	2
Strongly Disagree	2	3	3	2	3	1

Up to HS= Up to high school; PS= Diploma and over

Table 4 shows attitudinal beliefs toward technology based on years of living in Canada. Overall, attitudes toward technology are similarly positive regardless of the length of residence in Canada. A notable difference was 4% variation when responding to liking the idea of using technology; those who lived in Canada for fewer than 20 years expressed slightly higher strong agreement (64%) compared to those who lived for over 20 years (60%). Overall, the differences based on years of residence were minor, highlighting broadly consistent positive attitudes toward technology across both groups.

Table 4: Attitudinal beliefs by years of living in Canada

	Attitudinal belief scale items					
	Using technology would enhance effectiveness in daily activities.		Technology is useful in daily activities		You like the idea of using technology.	
Response	< 20 (%)	20+ (%)	< 20 (%)	20+ (%)	< 20 (%)	20+ (%)
Strongly Agree	50	53	56	57	64	60
Agree	26	25	27	25	21	21

Neutral	14	15	11	11	9	11
Disagree	6	4	2	4	4	5
Strongly Disagree	3	2	4	2	3	2

<20= below 20 years; 20+= over 20 years

Control Beliefs

The Control Beliefs (CB) scale captures participants' self-assessed ability and external conditions influencing their technology use, measured across four key domains: skillfulness, support-based usage, financial limitations, and accessibility. A total of 68% of participants reported feeling skillful with technology, while 11% expressed a lack of skill, and 21% remained neutral. Confidence increased to 77% agreement when considering the ability to use technology with assistance, where 8% disagreed. Affordability may impact use, with only 65% reporting that their financial status did not limit their technology use, and 14% expressed disagreement, suggesting challenges among a subset of participants. Technology accessibility received the lowest endorsement, with only 55% perceiving it as accessible, and 19% disagreeing. These findings suggest that although many participants feel capable of using technology, external barriers such as financial limitations and accessibility remain significant constraints.

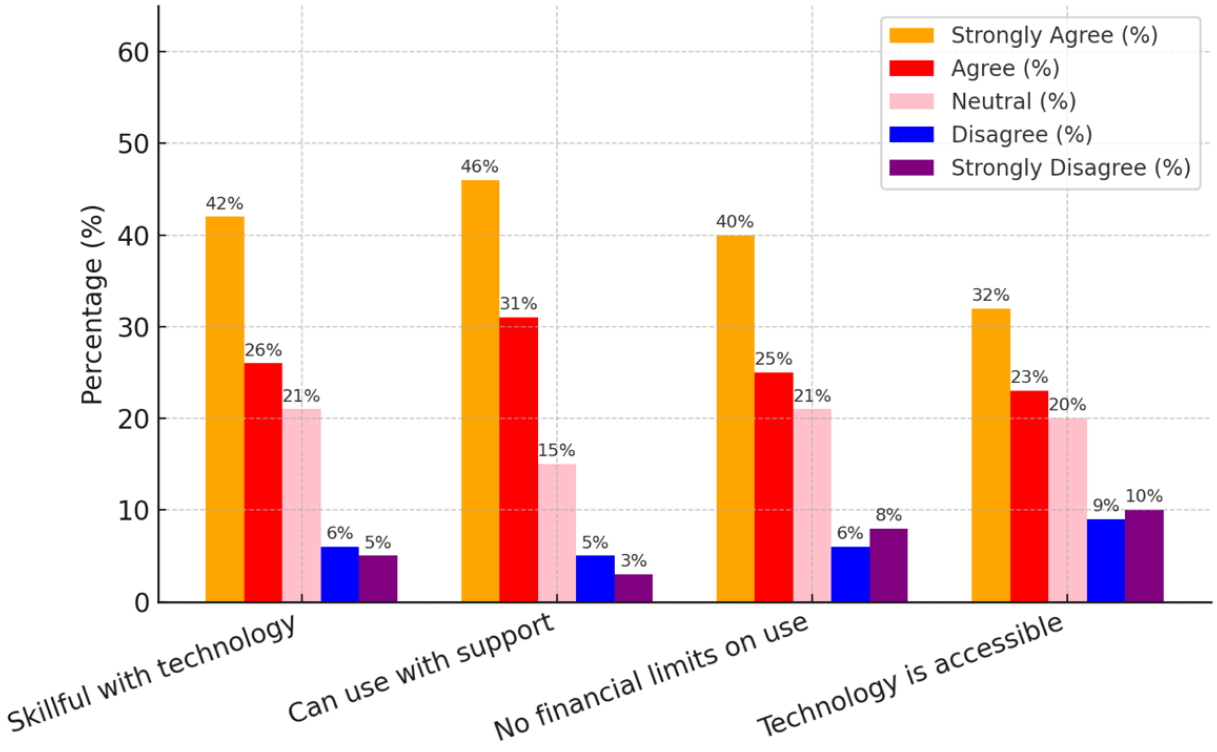

Figure 6: Control belief about technology

Socio-Demographic Differences in Control Beliefs

This section explores how socio-demographic factors, including gender, level of education, and years of residency in Canada, influence participants' confidence in their ability to use technology effectively, how skilled they feel in their ability to complete tasks with and without support, accessibility, and the impact of financial constraints. These findings provide critical insights into the factors shaping individuals' beliefs in capacity and perceived control over technology use.

Table 5 shows the results of the gender difference analysis in control beliefs related to technology use. Overall, responses from males and females showed relatively similar trends, indicating similar control beliefs towards technology, with minor variations in areas of financial limitations, accessibility, and use of technology with support. However, when asked whether they felt skillful with technology, males had a notably higher percentage of strong agreement (47%) compared to females (40%).

Table 5: Gender difference in control beliefs

	Skillful w/ tech		Can use with support		No financial limit		Tech is accessible	
Response	M (%)	F (%)	M (%)	F (%)	M (%)	F (%)	M (%)	F (%)
Strongly Agree	47	40	45	46	38	41	40	36
Agree	28	25	35	29	27	24	21	25
Neutral	17	22	15	16	18	23	18	20
Disagree	3	8	2	6	4	7	8	10
Strongly Disagree	5	5	3	4	13	6	13	9

M= male and F= female

Table 6 summarizes control beliefs regarding technology use by educational level. Overall, individuals with diploma-level education or higher consistently reported stronger positive control beliefs compared to those with education up to high school. A notably higher percentage of respondents with higher education (52%) strongly agreed they were skillful with technology, compared to those educated up to high school (30%). Similarly, the belief in being able to use technology with support was stronger among respondents with higher education (54%) than among those with lower education (36%). The perception of having no financial limits on technology use also showed a marked difference, with more participants holding diplomas or higher (49%) strongly agreeing compared to the lower-educated group (29%). Finally, regarding technology accessibility, the higher-educated group (47%) again showed notably higher strong agreement compared to participants educated up to high school (26%). Overall, these results suggest that educational attainment significantly influences positive control beliefs toward technology use.

Table 6: Control beliefs by education

	Skillful w/ tech		Can use with support		No financial limit		Tech is accessible	
Response	Up to HS (%)	PS (%)	Up to HS (%)	PS (%)	Up to HS (%)	PS (%)	Up to HS (%)	PS (%)
Strongly Agree	30	52	36	54	29	49	26	47
Agree	26	26	29	32	24	26	24	22
Neutral	28	15	23	9	29	15	28	13
Disagree	7	5	7	3	9	3	12	8
Strongly Disagree	9	1	5	2	10	6	11	10

Up to HS= Up to high school; PS= Diploma and over

Table 7 presents the final analysis on how respondents' control beliefs about technology vary based on their length of residence in Canada. Only slight variations were observed between the two groups. What was interesting is that participants who lived in Canada for less than 20 years showed slightly higher strong agreement regarding being skillful with technology (44%) compared to those residing for over 20 years (41%). However, in contrast, a slightly higher proportion of those living in Canada for over 20 years strongly agreed that they can use technology with support (47%) compared to those with shorter residence (43%). Overall, while differences based on length of residence were minor, respondents living in Canada for over 20 years reported slightly stronger control beliefs in some areas compared to those residing for shorter durations.

Table 7: Control beliefs by years of living in Canada

	Skillful w/ tech		Can use with support		No financial limit		Tech is accessible	
Response	> 20 (%)	20+ (%)	> 20 (%)	20+ (%)	> 20 (%)	20+ (%)	> 20 (%)	20+ (%)
Strongly Agree	44	41	43	47	37	41	35	39
Agree	24	27	33	30	25	25	21	25
Neutral	19	22	15	16	18	23	20	20
Disagree	8	5	6	4	7	6	10	9
Strongly Disagree	5	5	4	3	13	5	15	8

>20= below 20 years; 20+ = over 20 years

Correlation between control beliefs statements and barriers to using technology

We examined how individuals' beliefs about their ability to use technology relate to the barriers they experience. The findings show that those who reported having no financial limitations and easy access to

technology were less likely to face barriers. In contrast, there was little or no relationship between experiencing barriers and feeling skillful with technology or being able to use it with support. Additionally, positive relationships were observed among all the control belief statements, suggesting that people who feel confident, have access, and have no financial concerns tend to hold all these beliefs together. Overall, financial resources and accessibility appear to play a more significant role in reducing technology-related barriers than personal skill or supportive use.

Gerontechnology Anxiety

The Gerontechnology Anxiety (GA) scale evaluates older adults' emotional responses to technology, focusing on apprehension and fear (see Figure 9). The GA scale results indicate that a significant proportion of respondents experience apprehension or hesitation due to fear of using technology. 53% of respondents indicated they experience apprehension, and 58% indicated they are hesitant due to fear of technology, which suggests that anxiety toward technology remains a concern among elderly racialized members of the community, which may limit their willingness to adopt digital tools.

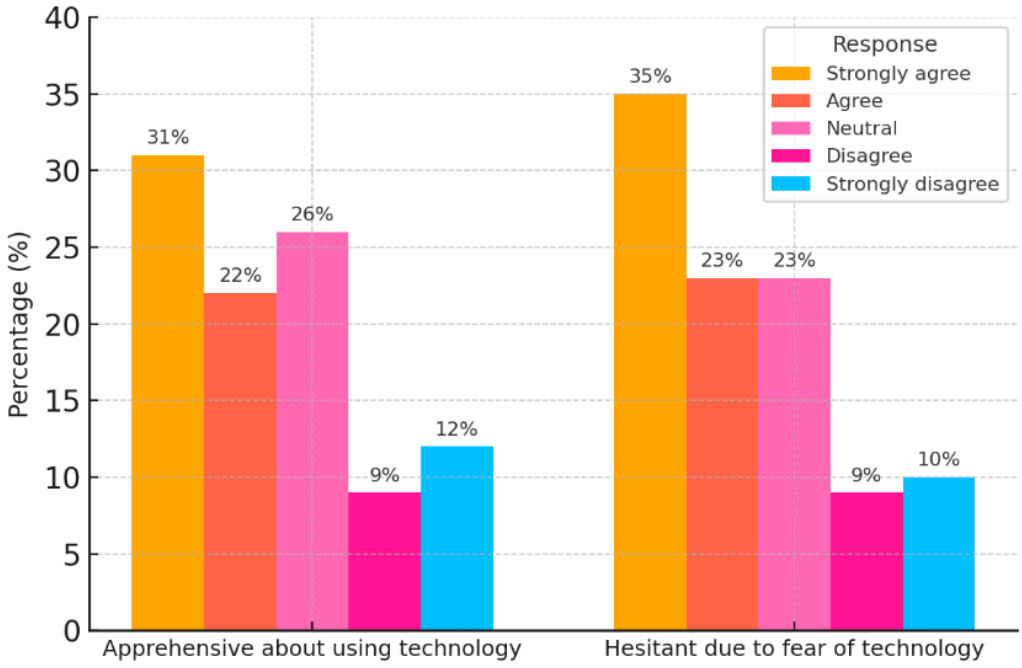

Figure 7: Gerontechology anxiety among respondents

Socio-Demographic Differences in Gerontechnology Anxiety

This section explores how socio-demographic factors such as gender, education level, and years living in Canada influence gerontechnology anxiety (GA). Examining these factors provides insights into how different groups experience apprehension and fear toward technology. Understanding these variations is

essential for designing targeted strategies to reduce anxiety and promote equitable and inclusive digital engagement.

The analysis examining whether respondents' GA varied by gender had few differences overall (see Table 8). Most notably, females showed a higher percentage of strong agreement regarding hesitation due to fear of technology (38%) compared to males (28%). This suggests that while apprehension levels were similar overall, females reported somewhat stronger fears associated with technology use.

Table 8: Gender difference in GA

	Apprehensive about using technology		Hesitant due to fear of technology	
Response	M (%)	F(%)	M(%)	F(%)
Strongly Agree	30	32	28	38
Agree	23	21	28	21
Neutral	27	26	20	24
Disagree	5	10	9	9
Strongly Disagree	14	11	15	8

M= male and F= female

Table 9 shows GA toward technology based on educational level. Participants with higher education (Diploma and over) reported slightly higher apprehension about using technology (57%) compared to those with education up to high school (50%). However, respondents with lower educational levels expressed stronger agreement (36%) when asked about hesitation due to fear of technology than those with diploma-level education or higher (34%). This suggests that although higher-educated individuals felt somewhat more general apprehension, lower-educated participants expressed slightly greater fear-based hesitation toward technology.

Table 9: GA by education

	Apprehensive about using technology		Hesitant due to fear of technology	
Response	Up to HS (%)	PS (%)	Up to HS (%)	PS (%)
Strongly Agree	29	34	36	34
Agree	21	23	22	26
Neutral	31	23	25	20
Disagree	10	6	9	9
Strongly Disagree	9	14	8	13

Up to HS = Up to high school; PS = Diploma and over

It is intriguing that individuals with higher education exhibit greater anxiety related to gerontology. In response, we conducted additional analyses focusing specifically on respondents with higher education who reported experiencing anxiety. We explored how these individuals perceive their own technological skills, their sense of accessibility to technology, and their need for support when using technology. We also examined whether affordability was reported as a barrier among this group, aiming to better understand the underlying factors contributing to their anxiety—for instance, distinguishing between genuine technological skill limitations and issues like lack of secure and affordable internet access.

Table 10 provides a comparative analysis of educated individuals with and without GA (apprehension or fear using technology) regarding their perceptions of technological competence, accessibility, required support, and financial limitations. Overall, these results reveal a surprising trend: educated individuals experiencing GA consistently reported greater technological confidence, accessibility, and fewer financial barriers compared to their counterparts without anxiety. These findings suggest that factors beyond perceived skills, accessibility, financial affordability, or dependency on support may underlie GA, warranting further investigation into psychological and contextual influences.

Table 10: Comparative analysis of technology-related perceptions among educated individuals with and without GA

Variable	**Skillful using technology**		**Technology is accessible**		**Use tech with support**		**Finances don't limit tech use**	
	No (%)	**Yes (%)**	**No (%)**	**Yes (%)**	**No (%)**	**Yes (%)**	**No (%)**	**Yes (%)**
Educated people without GA	27	73	43	57	27	73	25	75
Educated people with GA	19	81	24	76	6	94	26	74

The final analysis examined whether respondents' GA varied based on their years of living in Canada (Table 11). Overall, anxiety levels toward technology were somewhat similar across both groups, with only minor variations. Specifically, respondents residing for over 20 years reported slightly higher strong agreement (37%) regarding hesitation due to fear of technology compared to those living fewer than 20 years (31%). Thus, while anxiety was generally consistent across groups, longer residence in Canada was associated with a somewhat greater fear-based hesitation toward technology.

Table 11: GA by years of living in Canada

	Apprehensive about using technology		Hesitant due to fear of technology	
Response	> 20 (%)	20+ (%)	> 20 (%)	20+ (%)
Strongly Agree	31	31	31	37
Agree	21	22	23	23
Neutral	22	29	22	23
Disagree	8	9	12	7
Strongly Disagree	17	9	12	9

> 20 = below 20 years; 20+ = over 20 years

Barriers Contributing to Apprehension and Fear of Technology Use

This section explores how different self-reported barriers shape participants' levels of apprehension and fear toward using technology. Several interrelated factors emerged as particularly influential. Limited device access and high device costs restrict opportunities for practice. Similarly, the absence of readily available technical support—whether from family members, peers, or institutional resources further amplifies the apprehension or fear.

Infrastructure-related barriers, such as unreliable or costly internet connections, exacerbate these feelings thus potentially discouraging regular use and eroding confidence. Participants also highlighted gaps in digital skills, ranging from difficulty navigating basic interfaces to more advanced concerns such as online security and privacy. Finally, some participants reported experiencing information overload, where the sheer volume of digital content and rapid pace of technological change left them feeling overwhelmed, anxious, or even resistant to further engagement.

Together, these barriers are more than practical obstacles; they contribute to emotional and psychological responses such as heightened apprehension, avoidance behaviors, and fear of failure. Understanding these dynamics offers valuable insights for designing strategies that move beyond access alone, toward targeted digital inclusion initiatives. By directly addressing the roots of apprehension and fear, interventions can more effectively empower individuals to engage with technology with confidence.

6. Discussion

This study offers detailed insights into the digital inclusion landscape among racialized and immigrant seniors, highlighting significant associations between socio-demographic characteristics, technology acceptance, anxiety, and health-related outcomes. By exploring the interplay between demographic factors such as gender, education, income, and duration of residency, this research underscores critical barriers and facilitators impacting digital equity. The findings also provide a nuanced understanding of how psychological elements, including gerontechnology anxiety, intersect with practical barriers, influencing technology adoption and utilization among older immigrant populations. Addressing these multifaceted factors is essential to developing targeted interventions aimed at enhancing digital inclusion, thus improving overall quality of life and social participation among seniors.

The socio-demographic profile shows a predominant female representation and diverse educational backgrounds, reflecting typical patterns observed among senior populations in immigrant communities. Notably, most participants reported lower annual incomes, emphasizing socio-economic vulnerability which potentially impacts digital equity. The results also demonstrate Southeast Asian seniors forming the largest cohort, reflecting immigration trends within Calgary. The significant lack of awareness about digital services among approximately one-third of respondents underscores an essential gap, reinforcing the need for targeted outreach and educational programs (R. Zheng et al., 2015). This gap could contribute substantially to disparities in technology adoption and utilization.

The respondents prioritized the services "General Online Navigation & Usage" and "Foundational Computer Skills," highlighting an essential demand for basic digital literacy interventions. Conversely, minimal interest in "Online Safety & Security" suggests either low awareness or prioritization, pointing to a need for greater education on digital risks (Aly, 2024).

Technology use was predominantly for entertainment and social connections, reinforcing findings from previous studies indicating seniors' inclination towards digital platforms for enhancing social ties and leisure activities (Charness & Boot, 2009). However, critical challenges included skills, language barriers, financial limitations, and infrastructural constraints. Notably, nearly two-thirds experienced multiple barriers, significantly hampering digital engagement and reinforcing the multidimensional nature of digital exclusion. Further analysis showed a statistically significant association between gender and the number of barriers, with women reporting one or more barriers more

often than men. Education level was also marginally associated with the number of barriers, as those with up to a high school education reported multiple barriers more frequently than those with higher education. Duration of residency in Canada did not show a significant relationship. These findings suggest that women and less-educated seniors may require more targeted support to overcome digital challenges.

Female respondents consistently exhibited more positive attitudes toward technology's potential benefits but simultaneously reported higher levels of anxiety, aligning with prior research emphasizing nuanced gender differences (Schumacher & Morahan-Martin, 2001). Higher educational attainment correlated strongly with greater perceived competence and fewer practical barriers, suggesting education as a critical determinant in digital self-efficacy and resource accessibility.

Overall, participants demonstrated positive attitudes toward technology, yet many also described heightened anxiety related to its use—a pattern that persisted irrespective of years lived in Canada. These findings align with existing research suggesting that, while technology fosters cultural exchange, innovation, and global communication, this same process can contribute to the erosion of cultural identity, which may in turn heighten anxieties around digital engagement due to increased awareness of diverse online information and associated risks (Alsaleh, 2024).

The analysis highlights substantial gerontechnology anxiety among participants, particularly females and those with higher levels of education. Females consistently reported higher levels of apprehension and fear related to technology use, underscoring significant gender-based emotional barriers. Interestingly, highly educated respondents experiencing anxiety demonstrated greater self-reported technological competence and fewer practical barriers, suggesting that their anxiety may stem more from psychological or contextual factors rather than from skill deficiencies or accessibility issues. These results support the notion that gerontechnology anxiety among older adults can be multifaceted, influenced by psychological factors, including fear of mistakes, privacy concerns, or negative experiences with technology rather than solely practical limitations. Statistical analyses further deepen this understanding. Participants who lacked device access or faced high device costs exhibited significantly higher levels of both apprehension and fear. Additionally, barriers related to inadequate support and being overwhelmed by information also significantly heightened fear and apprehension scores. Digital skill limitations were also associated with greater fear, though not apprehension. These findings emphasize that practical and informational barriers, rather than cultural or knowledge-based

factors, are more strongly linked to psychological distress in technology use. Such findings emphasize the necessity for interventions targeting psychological support and confidence-building alongside traditional skill-based training (Charness & Boot, 2009).

The study underscores the complexity of digital inclusion among racialized and immigrant seniors, revealing intertwined socio-demographic, psychological, and practical factors influencing digital equity. In light of the findings, interventions must not only address skill-building and infrastructure access but also prioritize gender-responsive and education-level-targeted strategies. Effective interventions must be multifaceted, addressing basic skills training, anxiety management, financial support, infrastructure improvements, and targeted outreach. Culturally sensitive, gender-responsive programs can significantly enhance digital inclusion outcomes, thus improving seniors' overall well-being and social integration.

7. References

Alsaleh, A. (2024). The impact of technological advancement on culture and society. *Scientific Reports*, *14*(1), 32140.

Aly, H. (2024). *Enhancing Digital Privacy Education for Older Adults*. 137–139.

Charness, N., & Boot, W. R. (2009). Aging and information technology use: Potential and barriers. *Current Directions in Psychological Science*, *18*(5), 253–258.

Foong, H. F., Lim, S. Y., Rokhani, F. Z., Bagat, M. F., Abdullah, S. F. Z., Hamid, T. A., & Ahmad, S. A. (2022). For Better or for Worse? A Scoping Review of the Relationship between Internet Use and Mental Health in Older Adults during the COVID-19 Pandemic. *International Journal of Environmental Research and Public Health*, *19*(6), 3658.

Hankivsky, O., & Mussell, L. (2018). Gender-based analysis plus in Canada: Problems and possibilities of integrating intersectionality. *Canadian Public Policy*, *44*(4), 303–316.

Meij, E., Haartsen, T., & Meijering, L. (2020). 'Everywhere they are trying to hide poverty. I hate it!': Spatial practices of the urban poor in Calgary, Canada. *Geoforum*, *117*(May), 206–215. https://doi.org/10.1016/j.geoforum.2020.10.002

National Digital Inclusion Alliance. (2025, June 14). *Definitions—National Digital Inclusion Alliance*. https://www.digitalinclusion.org/definitions/

Ono, H., & Zavodny, M. (2007). Digital inequality: A five country comparison using microdata. *Social Science Research*, *36*(3), 1135–1155. https://doi.org/10.1016/j.ssresearch.2006.09.001

Parker, C., Scott, S., & Geddes, A. (2019). *Snowball Sampling*.

Philadelphia, C. (n.d.). *A DIGITAL EQUITY PLAN FOR THE CITY OF PHILADELPHIA* (January, Ed.; pp. 1–37).

Potocky, M. (2021). The Role of Digital Skills in Refugee Integration: A State-of-the-Art Review. *The International Journal of Information, Diversity, & Inclusion (IJIDI)*, *5*(5).

Quan-Haase, A., Wellman, B., & Zhang, R. (2021). Digital inequality among older adults: How East Yorkers in Toronto navigate digital media. In *Handbook of Digital Inequality* (pp. 194–208). Edward Elgar Publishing.

Resta, P., Laferrière, T., McLaughlin, R., & Kouraogo, A. (2018). *Issues and Challenges Related to Digital Equity: An Overview*. 987–1004. https://doi.org/10.1007/978-3-319-71054-9_67

Robinson, L., Chen, W., Schulz, J., & Khilnani, A. (2018). Digital Inequality Across Major Life Realms. *American Behavioral Scientist*, *62*(9), 1159–1166. https://doi.org/10.1177/0002764218773800

Robinson, L., Schulz, J., Dodel, M., Correa, T., Villanueva-Mansilla, E., Leal, S., Magallanes-Blanco, C., Rodriguez-Medina, L., Dunn, H. S., Levine, L., McMahon, R., & Khilnani, A. (2020). Digital inclusion across the Americas and the caribbean. *Social Inclusion*, *8*(2), 244–259. https://doi.org/10.17645/si.v8i2.2632

Robinson, P., & Johnson, P. A. (2021). Pandemic-driven technology adoption: Public decision makers need to tread cautiously. *International Journal of E-Planning Research*, *10*(2), 59–65. https://doi.org/10.4018/IJEPR.20210401.oa5

Schumacher, P., & Morahan-Martin, J. (2001). Gender, Internet and computer attitudes and experiences. *Computers in Human Behavior*, *17*(1), 95–110.

Selker, H. P., & Wilkins, C. H. (2017). From community engagement, to community-engaged research, to broadly engaged team science. *Journal of Clinical and Translational Science*, *1*(1), 5–6.

Statistics Canada. (2016). *Census Profile, 2016 Census—Calgary [Census metropolitan area], Alberta and Alberta [Province]*. https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/prof/details/page.cfm?Lang=E&Geo1=CMACA&Code1=825&Geo2=PR&Code2=48&SearchText=calgary&SearchType=Begins&SearchPR=01&B1=Immigration and citizenship&TABID=1&type=1

Zheng, R., Spears, J., Luptak, M., & Wilby, F. (2015). Understanding older adults' perceptions of Internet use: An exploratory factor analysis. *Educational Gerontology*, *41*(7), 504–518.

Zheng, Y., & Walsham, G. (2021). Inequality of what? An intersectional approach to digital inequality under Covid-19. *Information and Organization*, *31*(1), 100341. https://doi.org/10.1016/j.infoandorg.2021.100341

Appendix I: Methods Expanded

A community-engaged research (Selker & Wilkins, 2017) approach was adopted, involving knowledge users, in this case, the City of Calgary, throughout the research process with equal decision-making capacity. The research question and project planning were co-designed by The City and the research team, ensuring alignment with The City's priorities and a focus on actionable findings. Together, the team determined the methods outlined below to effectively achieve the research objectives.

Survey of racialized/immigrant seniors: A surveys were conducted with racialized/immigrant seniors (aged 65 and older) from diverse ethnic communities in Calgary, including South Asian, Southeast Asian, East Asian, Middle Eastern and Western Asian, Northern and Eastern African, Southern and Central American, and Eastern European communities.(Statistics Canada, 2016) Having multilingual research team members facilitating survey completion provided additional support to overcome target population's potential communication and physical (e.g., vision/hearing limitation) barriers. The survey was prepared in total of nine languages including Arabic, Tagalog, Bengali, English, Hindi, Korean, Spanish, Simplified Chinese, and Urdu. To maximize outreach, community-based organizations were engaged to share study information with their members. Apart from disseminating the survey invite widely, using the snowball sampling approach,(Parker et al., 2019) we invited initial survey participants to introduce other participants. This comprehensive strategy ensured diverse representation and active engagement from the targeted communities. Each participant received a $10 gift card as an honorarium for their time and contributions.

Variables description: This study collected data on a wide range of socio-demographic variables to provide a comprehensive understanding of digital inequities among racialized seniors. These variables included age, gender (Man, Woman, Non-binary, Prefer not to say), country of origin, and duration of residency in Canada (ranging from less than 20 to over 20 years). Participants were also asked about their residency status (Citizen/Permanent Resident, Refugee/Refugee Claimant, Other), employment status (Employed part-time/full-time, Retired, Seeking jobs, Never employed), household income (No income to Over $150,000), and education level (up to School to Diploma/Graduate degree). The survey further explored participants' awareness of and access to digital inclusion initiatives, asking whether they were familiar with programs supporting digital literacy and access, and their preferences for specific support types. Additionally, participants were asked to report their technology usage patterns, identifying purposes such as education, work, accessing services, financial management, communication, entertainment, and creative arts, as well as challenges faced, including language barriers, device access

and costs, internet affordability, digital skills, and lack of support or awareness of available resources. These variables provided a foundational understanding of the contextual and systemic factors affecting digital inclusion among racialized seniors. The survey also utilized a digital technology acceptance measurement tool for seniors to assess participants' perceptions, attitudes, and experiences related to digital inclusion. The tool was constituted of four scales: Attitudinal Belief, Control Belief, Gerontechnology Anxiety, and Health Condition scales. These scales provided detailed quantitative data to analyze the impacts of digital inequities on racialized seniors.

Gender-based analysis plus: The inclusion and reporting of gender in social research are critical to interpreting results as well as crucial for any community initiative's implementation success as diverse groups of women, men and non-binary people may experience policies, programs and initiatives in different ways.(Hankivsky & Mussell, 2018) Gender data were gathered during the survey, and the relationships between these variables and the outcome measures were examined. The findings indicated that racialized/immigrant women experienced additional barriers and more pronounced consequences of digital inequity due to the intersections of multiple identities. This highlights the compounded challenges faced by these groups in accessing and utilizing digital services.

Ethics Approval and Research Data Security: This study was approved by the Conjoint Health Research Ethics Board (CHREB) at the University of Calgary. Respondent information was handled with strict confidentiality, and no personal identifiers were collected. All data files were securely backed up and protected with password encryption to prevent unauthorized access. Publications and reports derived from this study presents aggregate data only, ensuring that no individual-level identifiers are included, maintaining the anonymity of all participants.

Appendix II: Findings Data Expanded

Table 1: Socio-demographic characteristics

Variable	Categories	Frequency (N=394)	Percent (%)
Age	65-70 years	121	31
	70-80 years	224	57
	81-90 years	46	12
	91-100 years	3	1
	Min/Max	65/100	
Gender	Male	134	34
	Female	260	66
Education	Up to High School	174	44
	Diploma/Over	208	56
Income	No income	74	19
	Less than $45,000	211	56
	$45,000 - $75,000	34	9
	$75,000 - $105,000	19	5
	$105,000 - $150,000	8	2
	Over $150,000	2	1
	Prefer not to say	32	8
Years in Canada	Below 20 years	143	36
	Over 20 years	249	64
Residency Status	Citizen/Permanent Resident	365	94
	Refugee/Refugee Claimant	5	1
	Other	19	5
Employment Status	Employed, part-time	25	6
	Employed, full-time	13	3
	Retired	297	76
	Seeking jobs	7	2
	Never employed	49	13

Global origin of the respondents

The bar chart displays the percentage distribution of individuals based on their country of origin, with Southeast Asians forming the largest group at 50%, followed by South Asians at 20% and Central and South Americans at 13%. Middle Eastern and Western Asians account for 11%, while East Asians represent 4%. The smallest proportions are Eastern Europeans at 1% and Africans at 1%. The trend shows a strong dominance of Southeast Asians, while African and Eastern European representation is minimal.

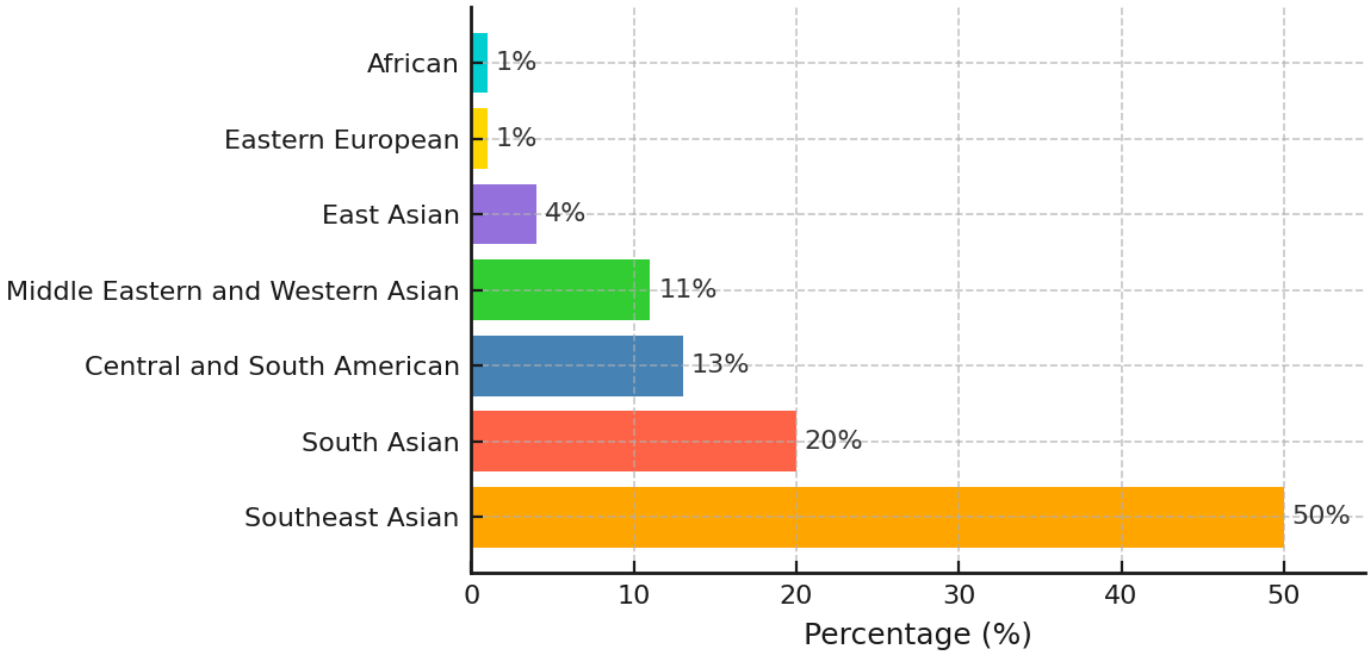

Figure 8: Global origin of the respondents

Appendix III: Findings Data Expanded

Health conditions

The Health Conditions (HC) scale assesses respondents' perceptions of their overall health, cognitive ability, and satisfaction with personal relationships, social support, and quality of life (see Figure 1 below). Among the assessed items, the highest levels of agreement were observed for satisfaction with family and friends' support (59% strongly agreed) and satisfaction with quality of life (56% strongly agreed), indicating strong positive perceptions in these areas. Similarly, satisfaction with personal relationships was high, with 57% strongly agreeing. However, responses regarding health conditions were more concerning, as 35% strongly agreed and 42% agreed that their health was poor, suggesting widespread health challenges among respondents. Cognitive ability, assessed through the ability to concentrate, had a relatively balanced response pattern, with 35% strongly agreeing and 37% agreeing. Overall, the findings suggest that while respondents report high satisfaction in social and emotional well-being, many experience significant health concerns.

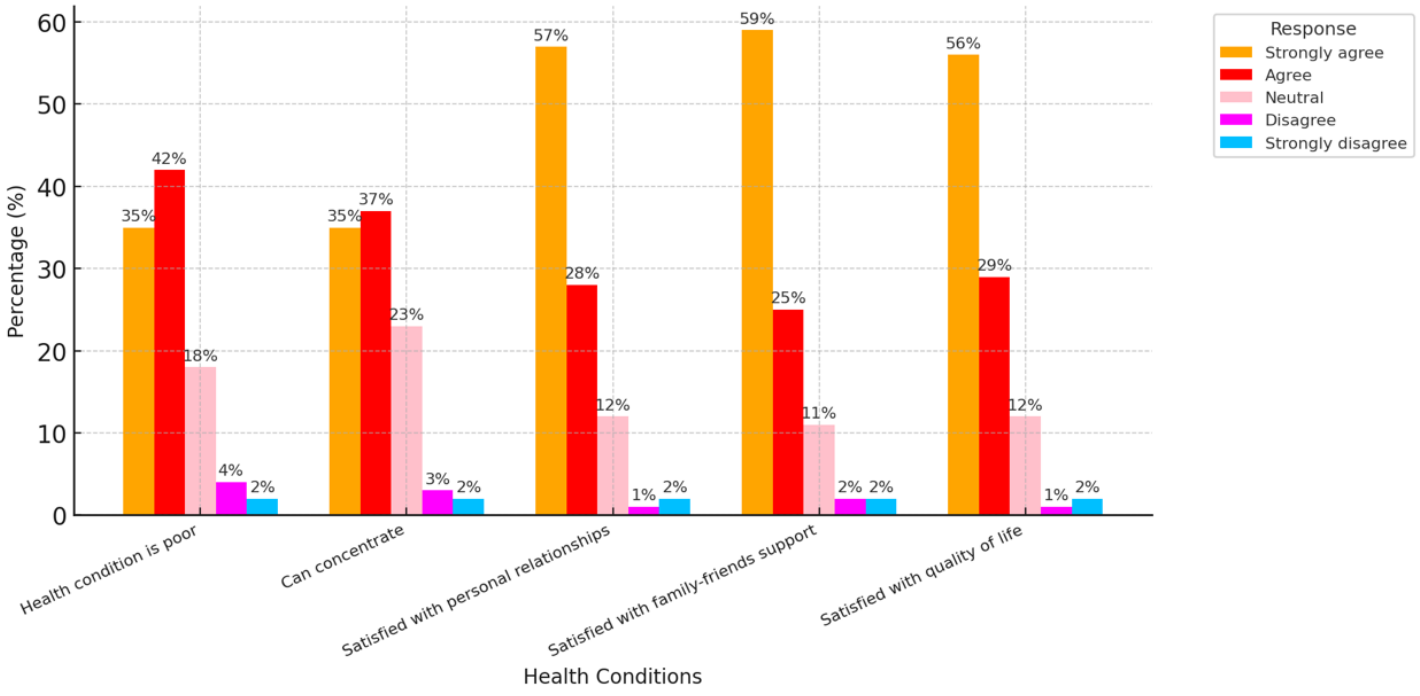

Figure 1: Health conditions of the respondents

Socio-Demographic Differences in Health Conditions

This section explores the impact of gender, educational attainment, and years of residency in Canada on perceptions of health conditions, focusing on general health, ability to concentrate, personal relationships, social support, and overall quality of life. The analysis highlights variations in well-being across different demographic groups, providing insights into how these factors shape individuals' experiences and satisfaction. These findings are essential for guiding interventions aimed at promoting equitable health and well-being across diverse populations.

Firstly, Table 1 below summarizes gender differences related to self-reported health conditions. Overall, both genders reported generally similar perceptions, with slight variations noted. Females expressed somewhat higher strong agreement that their health condition was poor (37%) compared to males (31%). However, females also reported stronger agreement regarding their ability to concentrate (38%) compared to males (29%). Satisfaction with personal relationships was similarly high among males (60%) and females (55%), while satisfaction with family-friends support was slightly higher among females (60%) compared to males (58%). Both males (55%) and females (57%) showed similarly high satisfaction with their quality of life. Overall, the data indicate minor gender differences, with females slightly more inclined to report poorer health but also greater concentration abilities and comparable satisfaction levels in social support and quality of life.

Table 1: Gender Difference in Health Condition

	Health condition is poor		**Can concentrate**		**Satisfied with personal relationships**		**Satisfied with family-friends support**		**Satisfied with the quality of life**	
Response	M (%)	F (%)	M (%)	F (%)	M (%)	F (%)	M (%)	F (%)	M (%)	F (%)
Strongly Agree	31	37	29.01	38	60	55	58	60	55	57
Agree	48	38	44	34	26	29	28	24	33	26
Neutral	15	20	24	22	11	12	12	11	10	13
Disagree	5	3	2	4	2	2	1	3	0	2
Strongly Disagree	2	3	2	2	2	2	2	2	2	2

M= male and F= female

Secondly, this report examined whether respondents' health conditions varied based on their education level. Table 2 below summarizes self-reported health conditions and quality of life by educational attainment. Overall, notable differences were observed between educational groups, with higher-educated respondents (Diploma and over) generally reporting stronger agreement across most of

the items. Participants with diploma-level education or higher were more inclined to strongly agree that their health condition was poor (40%) compared to respondents educated up to high school (28%). However, they also showed higher strong agreement in their ability to concentrate (43% vs. 24%) and expressed greater satisfaction with personal relationships (68% vs. 43%), family-friends support (64% vs. 53%), and overall quality of life (65% vs. 45%). Thus, higher education was generally associated with better perceived quality of life and greater ability to concentrate, despite a paradoxically higher self-report of poor health condition.

Table 2: Health Condition by Education

	Health condition is poor		**Can concentrate**		**Satisfied with personal relationships**		**Satisfied with family-friends support**		**Satisfied with the quality of life**	
Response	Up to HS (%)	PS (%)	Up to HS (%)	PS (%)	Up to HS (%)	PS (%)	Up to HS (%)	PS (%)	Up to HS (%)	PS (%)
Strongly Agree	28	40	24	44	43	68	53	64	45	65
Agree	37	45	41	34	33	23	22	28	30	27
Neutral	27	11	27	19	19	6	19	6	21	5
Disagree	5	2	5	1	2	1	5	0	2	1
Strongly Disagree	3	2	2	2	3	2	2	2	2	1

Up to HS = Up to high school; PS = Diploma and over

Finally, this report examined whether respondents' health conditions varied based on their years of living in Canada. Table 3 below presents self-reported health conditions based on years of living in Canada. Overall, minor differences emerged between the two groups, with participants living in Canada fewer than 20 years generally reporting slightly more favorable perceptions. Respondents living over 20 years showed marginally higher strong agreement that their health condition was poor (35%) compared to those with shorter residence (33%). Both groups expressed similar strong agreement regarding their ability to concentrate, with slightly higher agreement among longer-term residents (36%) versus shorter-term residents (33%). However, respondents residing fewer than 20 years reported notably higher satisfaction with personal relationships (64% vs. 53%), family-friends support (70% vs. 53%), and overall quality of life (62% vs. 53%). Thus, while health condition perceptions were comparable, shorter-term residents reported greater satisfaction in social support and quality of life..

Table 3: Health conditions by years of living in Canada

	Health condition is poor		Can concentrate		Satisfied with personal relationships		Satisfied with family-friends support		Satisfied with the quality of life	
Response	> 20 (%)	20+ (%)	> 20 (%)	20+ (%)	> 20 (%)	20+ (%)	> 20 (%)	20+ (%)	> 20 (%)	20+ (%)
Strongly Agree	33	35.	33	36	64	53	70	53	62	53
Agree	44	40	38	37	24	30	18	30	27	30
Neutral	15	20	26	21	9	13	9	13	9	14
Disagree	5	3	1	4	1	2	2	2	1	2
Strongly Disagree	3	2	2	2	3	2	1	2	1	2

> 20 = below 20 years; 20+ = over 20 years

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