Digital technology use, in general and for health purposes, by older Singaporeans

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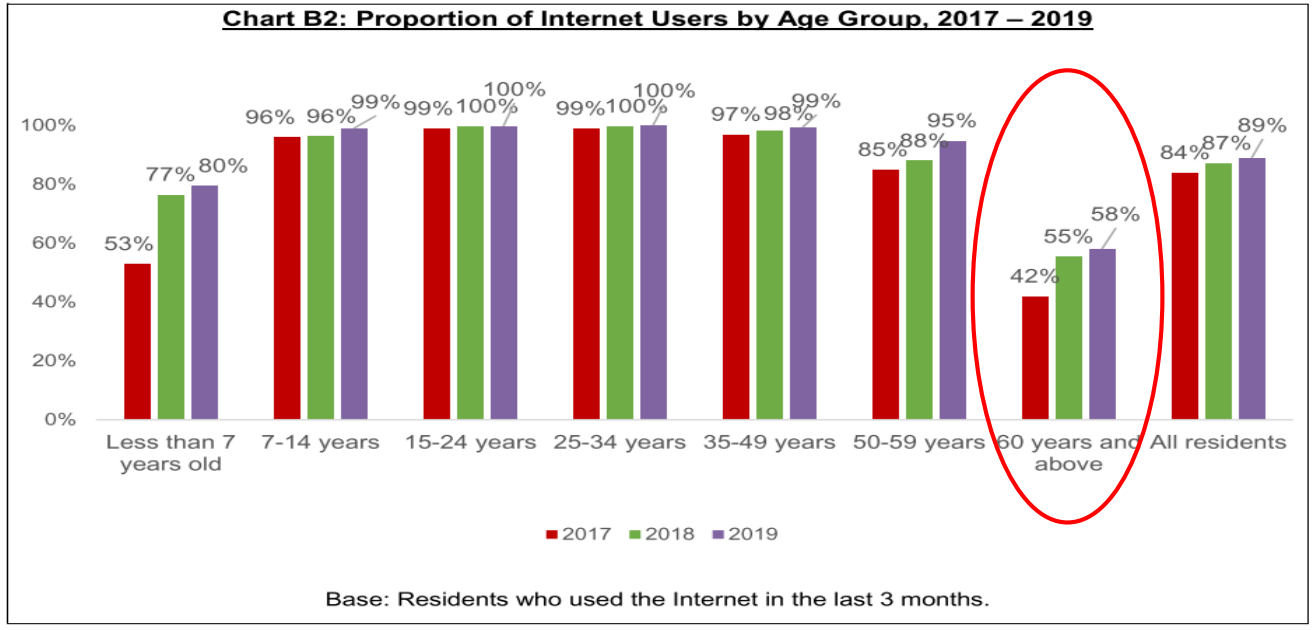
Background

- The United Nations theme of '**Digital Equity for All Ages**' for this year's International Day of Older Persons is timely

- **Digital Divide by age**

✓ Older adults have lower internet use compared to younger people

✓ In Singapore – Infocomm media Development Authority (IMDA) data shows that only a little over half of older adults use the internet



Infocomm Media Development Authority (Singapore 2019)

Background

SMART Nation initiatives in Singapore

- **Smart economy** – online banking, online shopping, government digital services
- **HealthHub portal** –access to medical records, health news and tips
- **Healthy 365 app** – use of wearable technology and healthcare mobile apps for promotion of active lifestyle
- **Telehealth / Smart Health** - video consultations with healthcare professionals
- **Robotics and assistive technology** for seniors and mobility solutions for those with disabilities

Lack of digital literacy - there is a possibility of widening of the digital divide with the oldest old adults being left behind

Digital technology and Ageing in place

- Digital technology has been found to enable and support ageing in place by focusing on accessible communication, emergency assistance, physical and mental well-being
- It can help alleviate social isolation and loneliness, improve social connectedness and boost self-confidence among older adults
- It can reduce caregiving burdens and support healthcare systems

Ollevier, A. et al. (2020, Nov 23). How can technology support ageing in place in healthy older adults? A systematic review. Public Health Rev, 41(1), 26. https://doi.org/10.1186/s40985-020-00143-4
Chen YR, Schulz PJ. The effect of information communication technology interventions on reducing social isolation in the elderly: a systematic review. J Med Internet Res. 2016;18(1):e18.

Background

What are the factors associated with the use of digital technology among older adults?

- Age, education and income are consistent factors in the literature
- Other factors are gender, race/ethnicity, urban/rural residence, chronic conditions, health status, functional limitations and social networks
- Perceived need, ease of use, interest and relevance influence the adoption and acceptance of technology among older adults
- Lack of training and support, design and interface issues, affordability were tied to lower rates of technology use among older adults

Gell, N. M. et al. (2015, Jun). Patterns of technology use among older adults with and without disabilities. Gerontologist, 55(3), 412-421. https://doi.org/10.1093/geront/gnt166
Hunsaker, A., & Hargittai, E. (2018). A review of Internet use among older adults. New Media & Society, 20(10), 3937-3954. https://doi.org/10.1177/1461444818787348

Rationale and Aims

Rationale

- Data on the prevalence of and factors associated with digital technology use and health-related digital technology use among older adults in Singapore is limited

Aims of the study

- To determine the prevalence of digital technology use and health-related digital technology use among older adults in Singapore
- To identify the individual-level factors associated with digital technology use and health-related digital technology use among older adults

Methods

Data source

- THE SIGNS Study – II, conducted on older adults aged 62 years and above (n=2887) in 2019

Definition of outcomes

Digital technology use (yes/no)

Use of any device (smartphone / laptop / desktop computer / tablet / smartwatch) either everyday or on most days of the week.

Health-related digital technology use (yes/no)

Use of internet and/or any app for seeking information on one's health or help with management of a health condition in the past one month.

Conceptual framework for correlates

- Andersen's behavioural model of health service use - to help us guide the selection of covariates and interpret the results of the study
- According to this model, the use of digital technology is determined by older adults' **predispositions** to use services, the resources that **enable** or serve as barriers to use and their **need** or direct cause of service use

Conceptual framework for correlates

Andersen's Behavioural Model of Health Service Utilization

Predisposing factors

Age
Gender
Ethnicity

Enabling factors

Education
Employment
Living arrangement
Housing type
Personal mastery
Social networks

Need factors

Chronic disease
Physical function limitations
Physical activity
Visual impairment
Depressive symptomatology

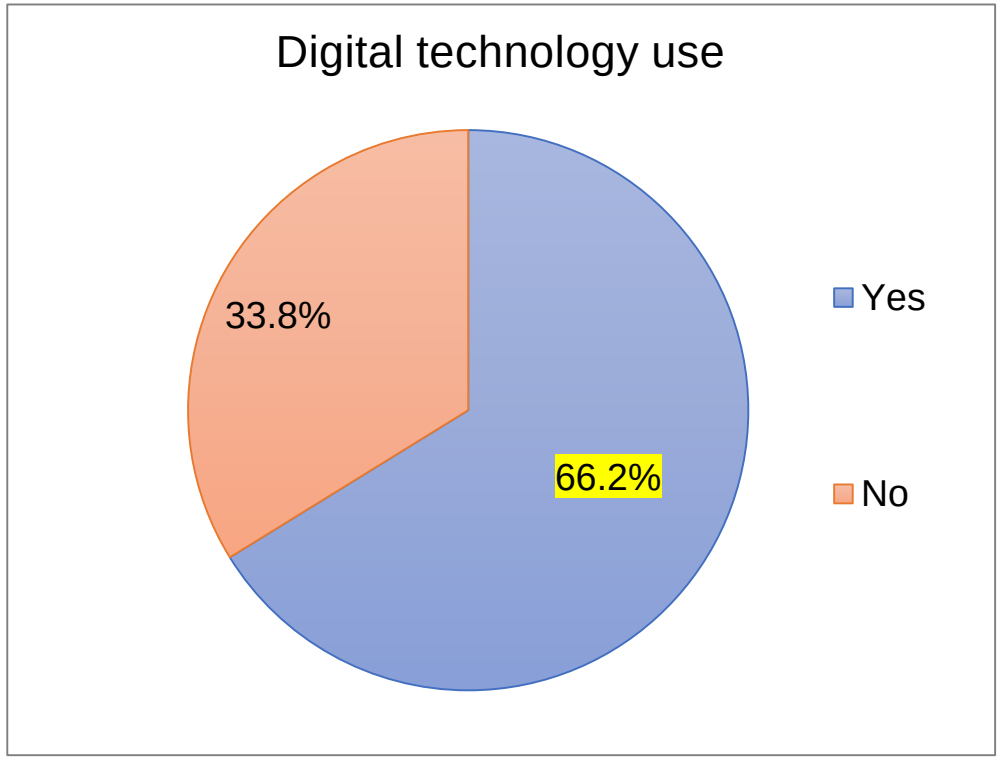
Methods

Statistical analysis

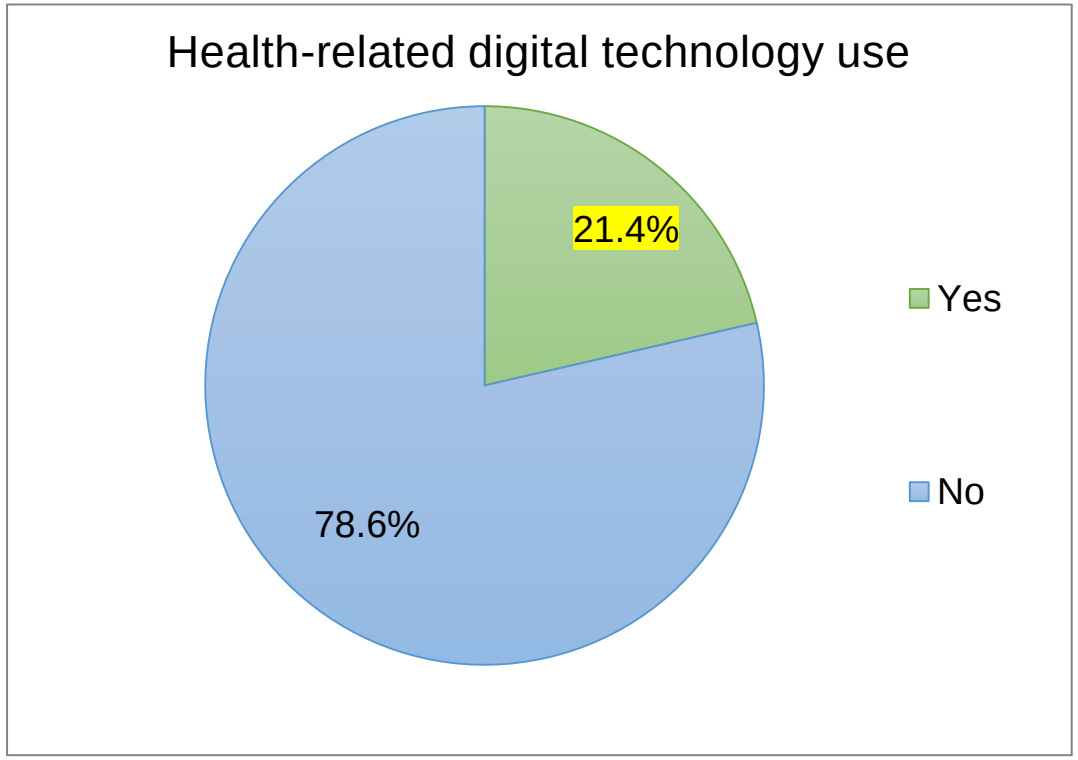
- The analytic sample size for digital technology use - **2887 respondents**
- Health-related digital technology use was analyzed only for those respondents who used digital technology (**1848 respondents**)
- Multiple imputation for missing data (education, physical activity, personal mastery, depressive symptomatology, social networks and BMI)
- Prevalence estimates were defined using non-imputed data
- Multivariable logistic regression models using multiply imputed data for both outcomes
- All results were weighted using attrition adjusted survey sampling weights

Results

Prevalence of digital technology use (n=2887)

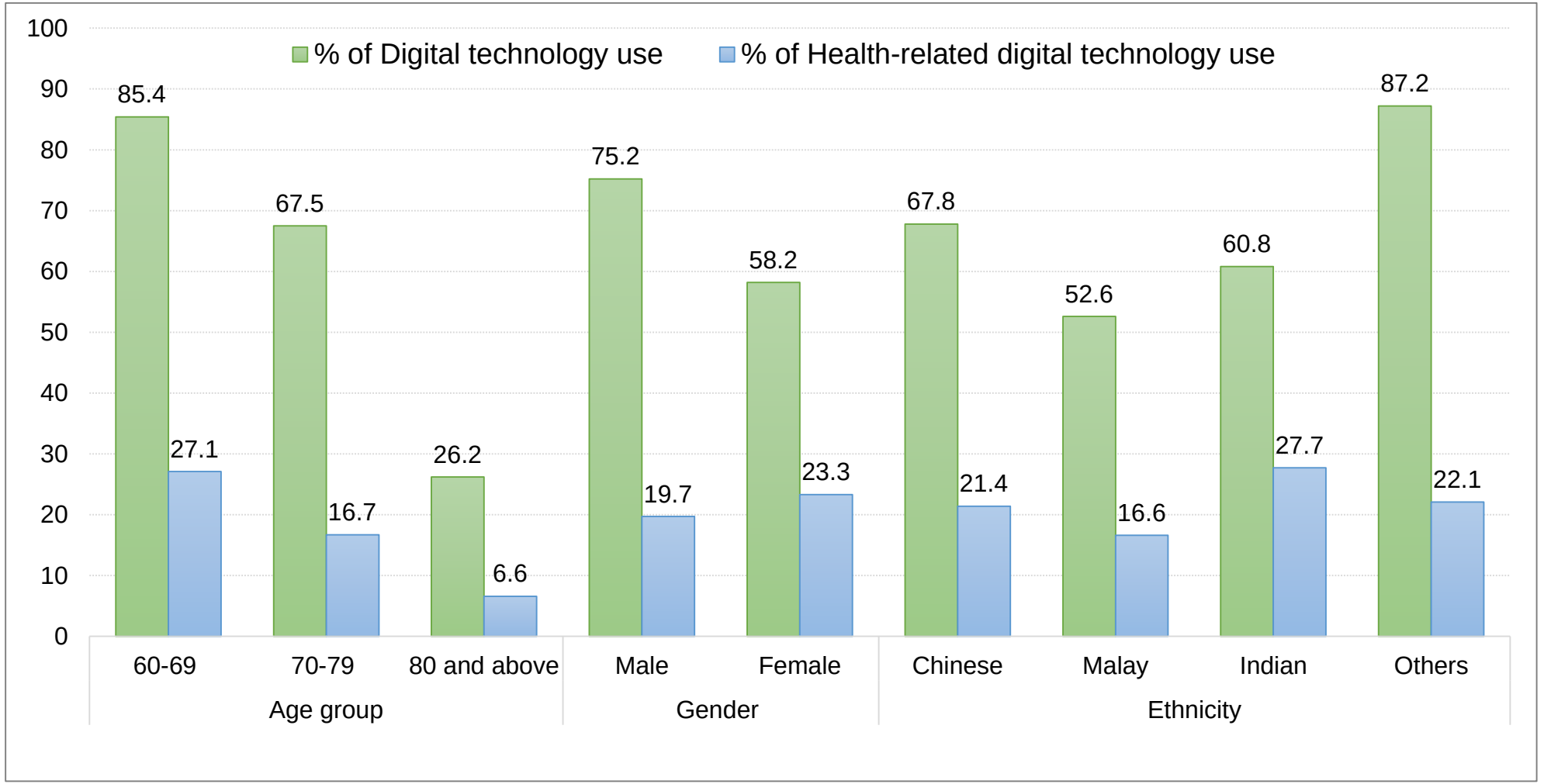


Prevalence of health-related digital technology use among digital technology users (n=1848)



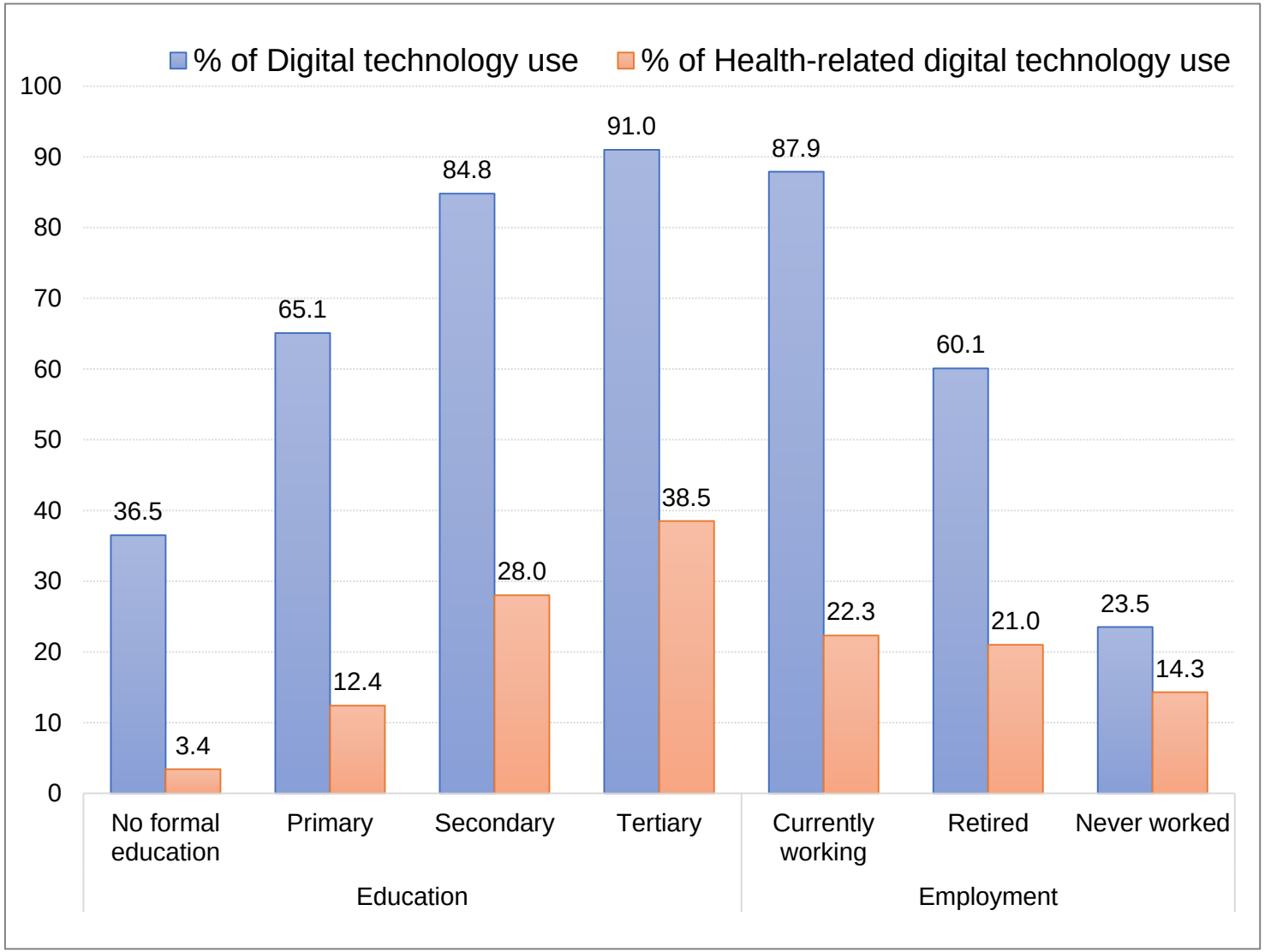
Results

Distribution of digital technology (DT) use and health-related DT use by **predisposing** factors



Results

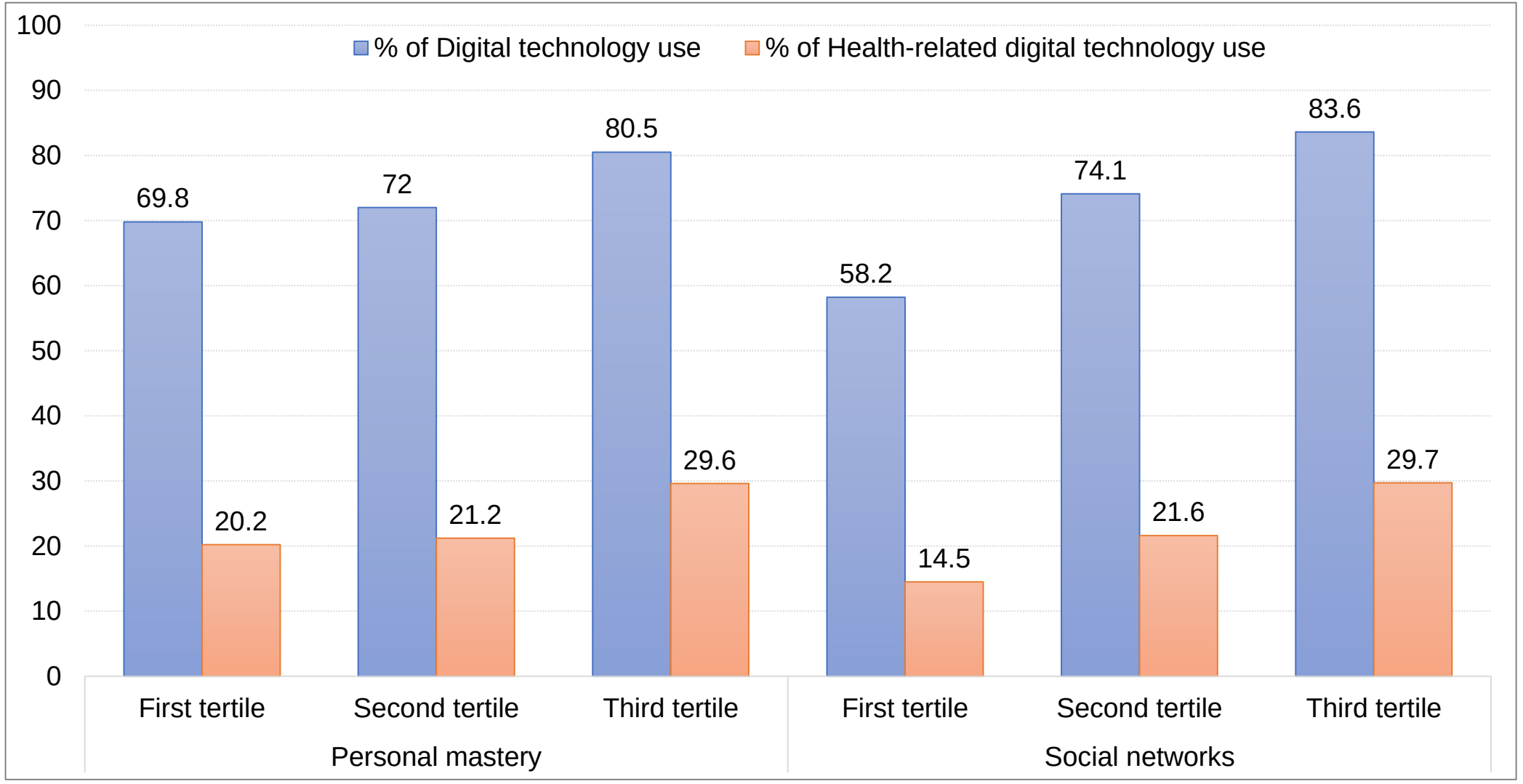
Distribution of digital technology use (DT) use and health-related DT use by **enabling** factors



Enabling factors	% of DT use	% of Health related DT use
Living arrangement		
Living alone	69.1%	18.6%
With spouse, no child	75.9%	21.1%
With child, no spouse	38.5%	15.5%
With child and spouse	75.0%	24.5%
With others only	61.1%	18.2%
Housing type		
1-2 room HDB	64.3%	9.1%
3 room HDB	57.5%	15.9%
4-5 room HDB	68.1%	23.4%
Private housing	78.3%	29.0%

Results

Distribution of digital technology use (DT) use and health-related DT use by **enabling** factors



Results

Distribution of digital technology use (DT) use and health-related DT use by **need** factors

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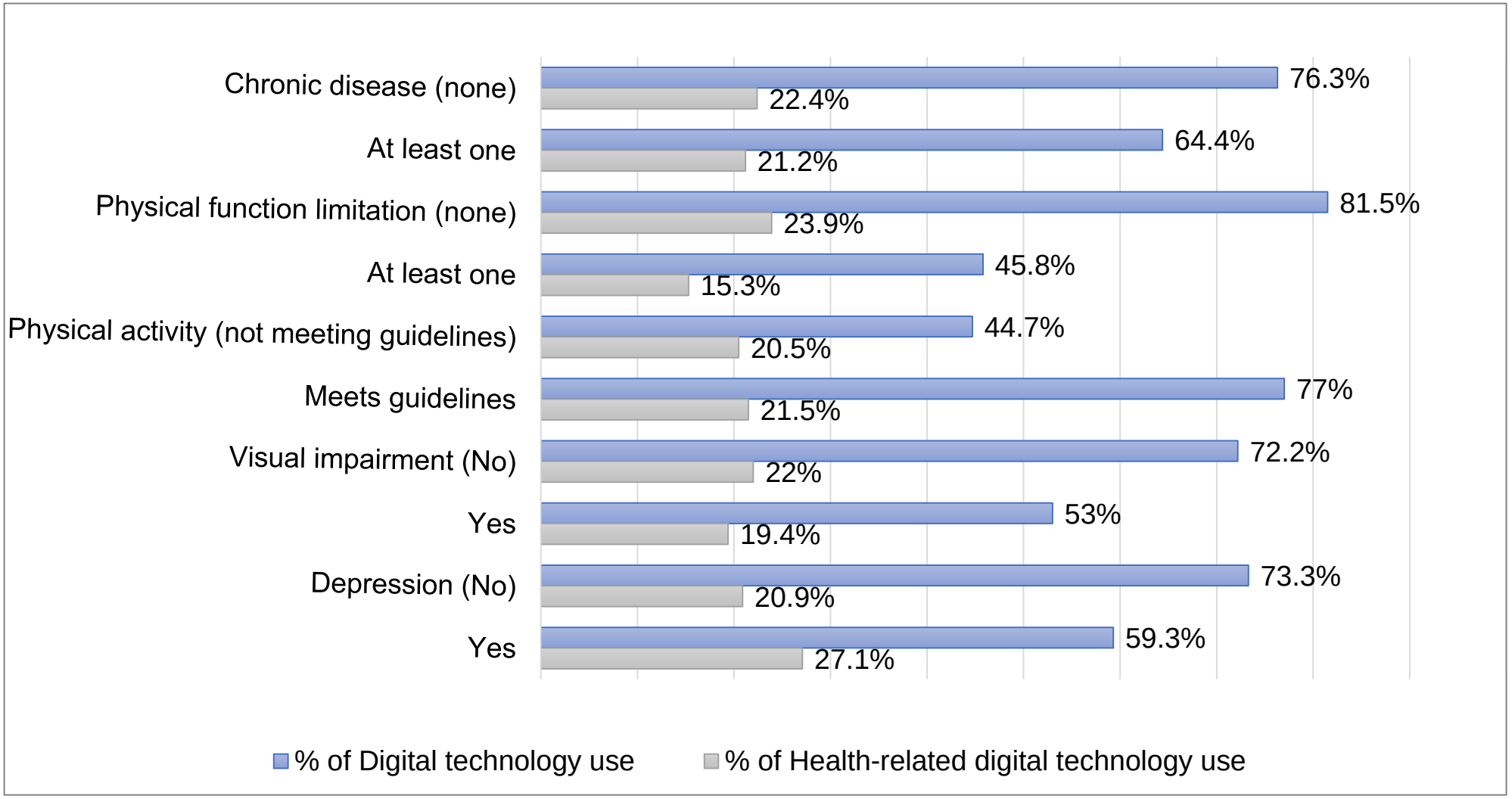

Results

Digital device use among older adults – overall and by age groups and gender.

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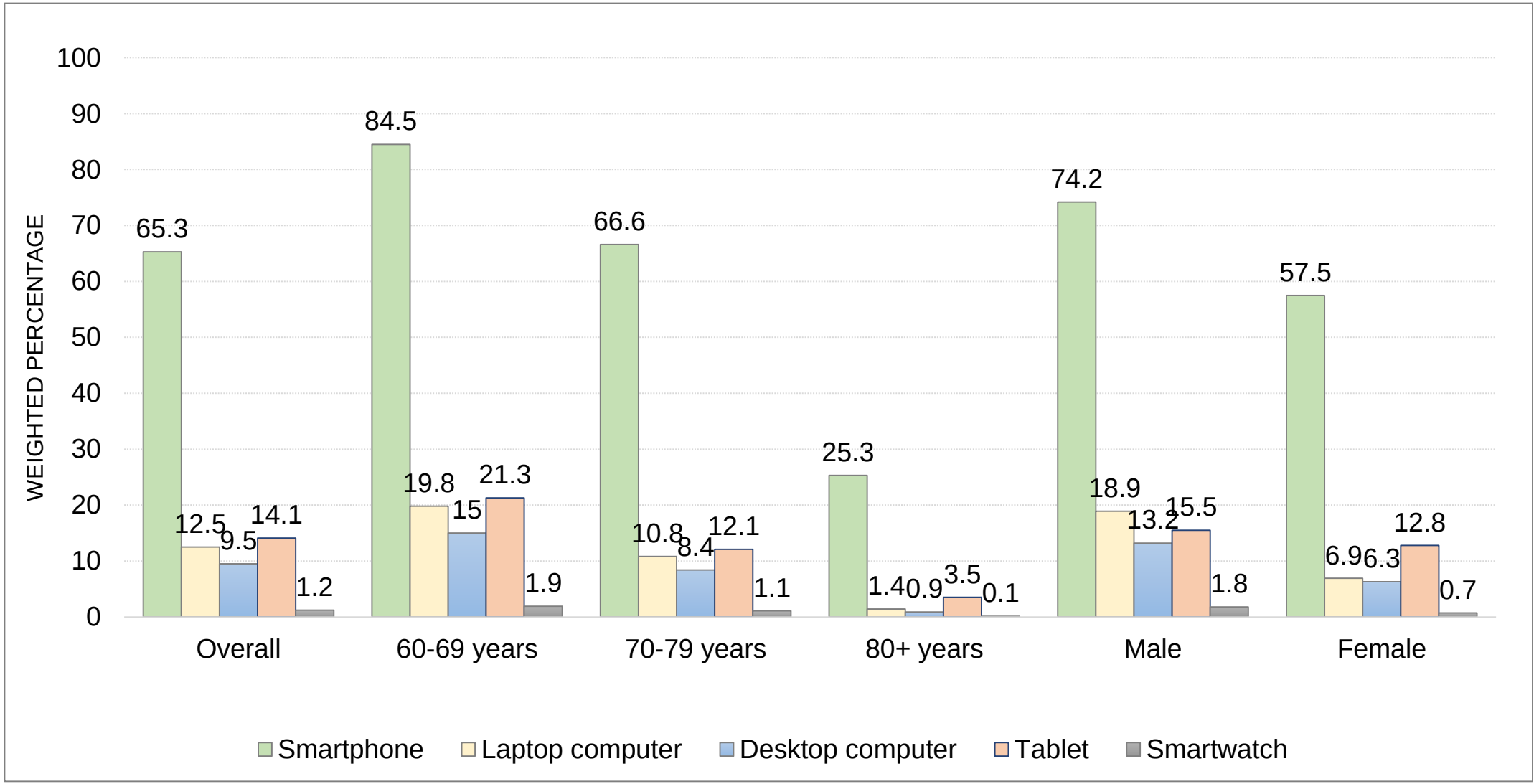

Factors associated with digital technology use

Predisposing factors	Adjusted OR (95% CI)	
Age in years (ref: 60-69)		
70-79	0.51 (0.40-0.66)	↓
80 and above	0.19 (0.14-0.26)	↓
Ethnicity (ref: Chinese)		
Malay	0.51 (0.37-0.69)	↓
Indian	0.57 (0.40-0.82)	↓

Need factors	Adjusted OR (95% CI)	
Physical function limitation	0.80 (0.75-0.86)	↓
Physical activity (ref: not meeting guidelines)		
Meets guidelines	2.01 (1.59-2.54)	↑
Visual impairment (ref: No)		
Yes	0.76 (0.60-0.95)	↓

Enabling factors	Adjusted OR (95% CI)	
Education (ref: no formal education)		
Primary	1.76 (1.34-2.30)	↑
Secondary	4.35 (3.21-5.91)	↑
Tertiary	5.97 (3.80-9.38)	↑
Employment (ref: working)		
Retired	0.45 (0.34-0.58)	↓
Never worked	0.24 (0.15-0.38)	↓
Housing type (ref: 3 room HDB)		
4-5 room HDB	1.43 (1.11-1.84)	↑
Private housing	2.33 (1.42-3.80)	↑
Social networks (ref: 1st tertile)		
2nd tertile	1.77 (1.36-2.29)	↑
3rd tertile	2.27 (1.70-3.04)	↑

Factors associated with health-related digital technology use

Predisposing factors	Adjusted OR (95% CI)	
Age in years (ref: 60-69)		
70-79	0.60 (0.45-0.80)	↓
80 and above	0.25 (0.14-0.45)	↓
Gender (ref: Male)		
Female	1.57 (1.19-2.08)	↑
Ethnicity (ref: Chinese)		
Malay	0.60 (0.40-0.91)	↓

Enabling factors	Adjusted OR (95% CI)	
Education (ref: no formal education)		
Primary	3.73 (1.75-7.96)	↑
Secondary	9.97 (4.79-20.7)	↑
Tertiary	16.7 (7.77-36.0)	↑
Social networks (ref: 1st tertile)		
2nd tertile	1.40 (1.01-1.94)	↑
3rd tertile	1.91 (1.38-2.65)	↑

Need factors	Adjusted OR (95% CI)	
Physical function limitation	0.85 (0.75-0.96)	↓
Depressive symptomatology (ref: not clinically relevant)		
Clinically relevant	2.28 (1.46-3.56)	↑

Results

Significant factors associated with digital technology use and health-related digital technology use

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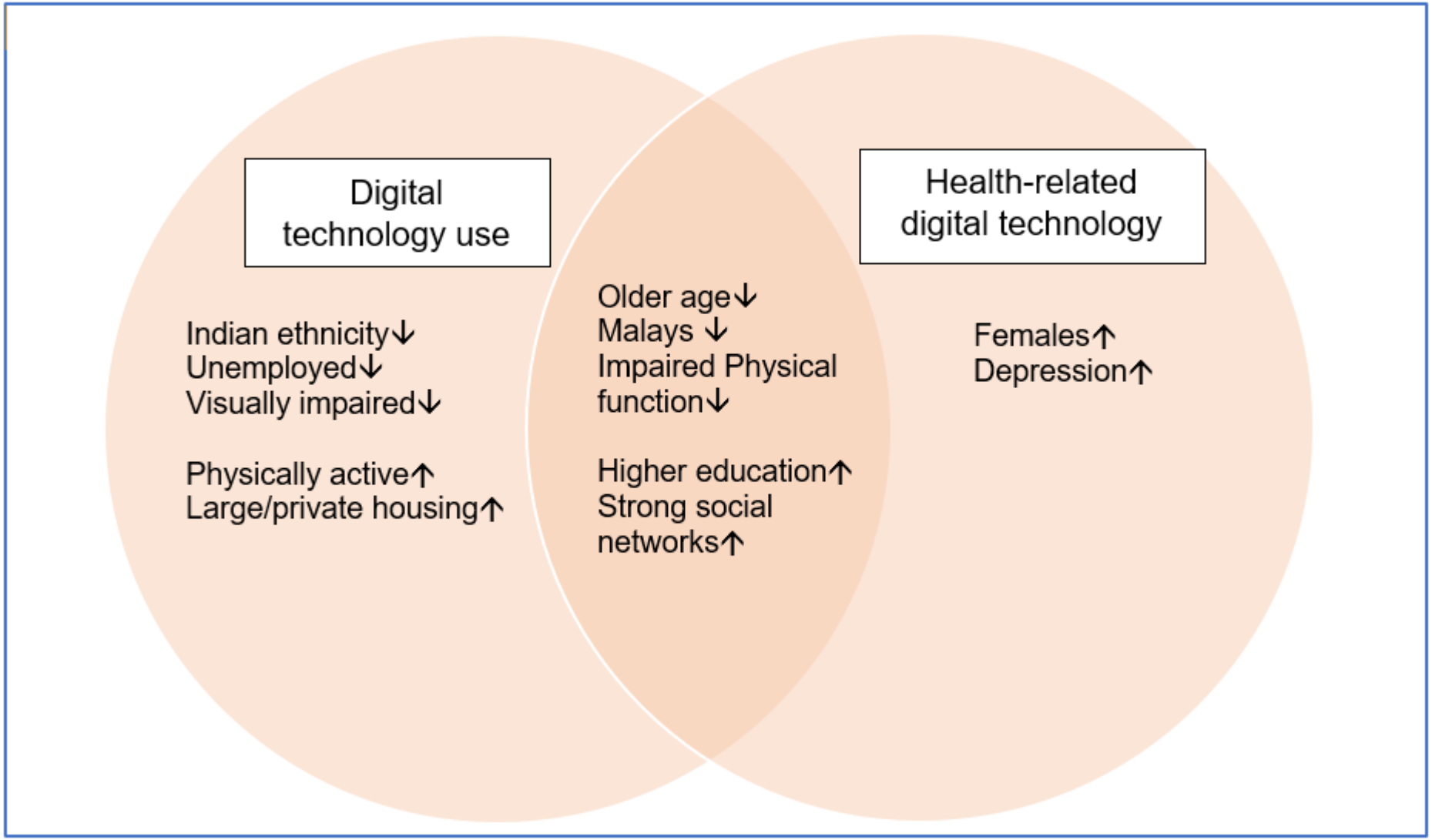
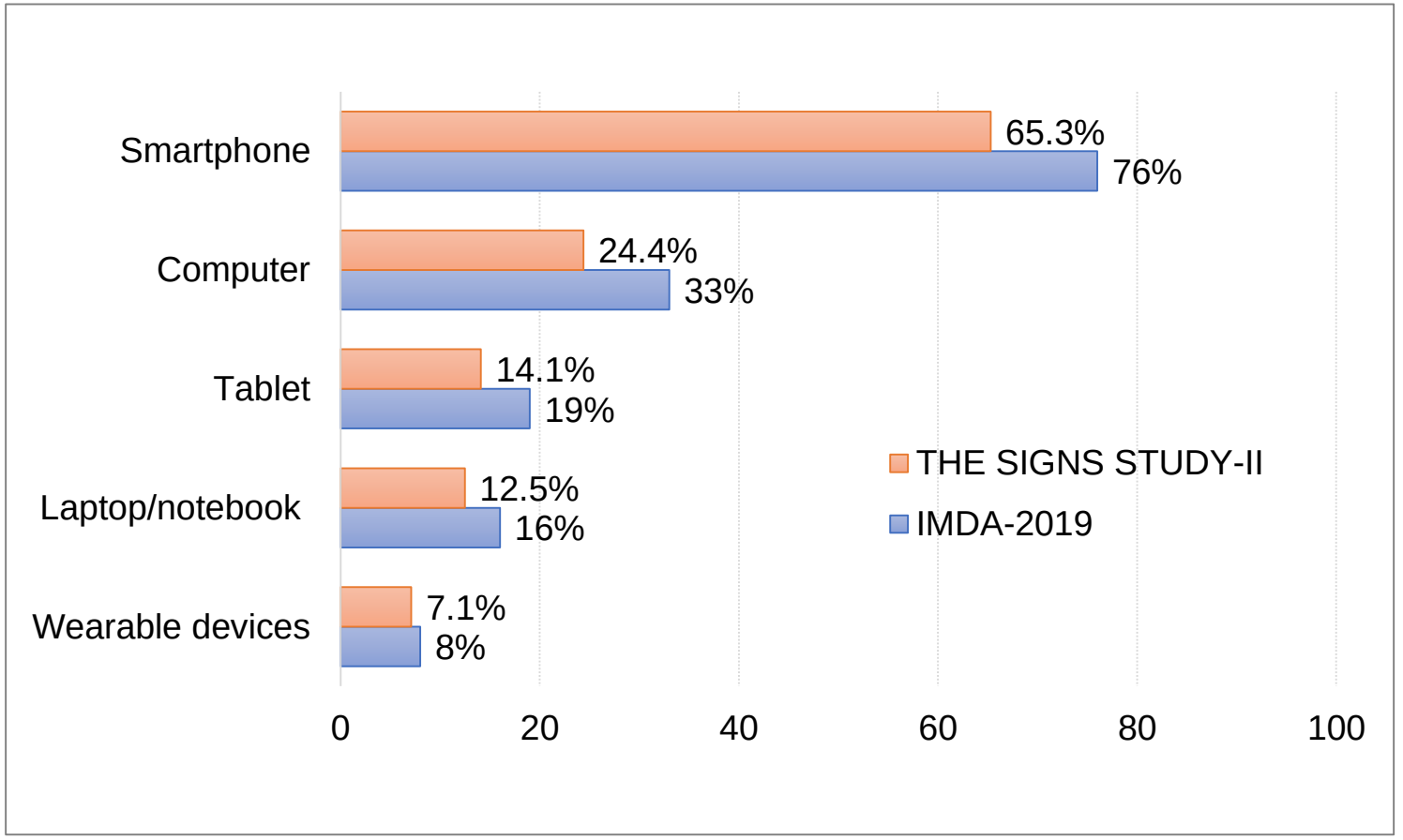


Summary of the findings

- Overall prevalence of digital technology use for older adults aged 62 years and older was 66.2%
- The prevalence of health-related digital technology was 21.4% among the digital technology users
- The significant correlates for digital technology use included predisposing factors (age, Malay and Indian ethnicity), enabling factors (education, employment, housing type and social networks) and need factors (physical function limitations, vision impairment and physical activity)
- Likewise, the significant correlates for health-related digital technology use included predisposing factors (age, female gender and Malays), enabling factors (education, physical function limitations and social networks) and need factors (depression)

Discussion

Comparisons between THE SIGNS Study-II and IMDA 2019 - distribution of device use among older adults



Infocomm Media Development Authority (Singapore 2019). Annual Survey on Infocomm Usage by Households and Individuals Report 2019.

Discussion

Based on the Andersen's model, the following **predisposing factors** were significant

- Use of digital technology and health-related digital technology use declined with increasing age

Low, S. T. H. et al. (2021). Attitudes and Perceptions Toward Healthcare Technology Adoption Among Older Adults in Singapore: A Qualitative Study. Front Public Health, 9, 588590. https://doi.org/10.3389/fpubh.2021.588590
Hunsaker, A., & Hargittai, E. (2018). A review of Internet use among older adults. New Media & Society, 20(10), 3937-3954. https://doi.org/10.1177/1461444818787348

- Malays were less likely users of digital technology for both general and health-related purposes

Ang, S. et al. (2021, Jul 13). Health-Related Difficulty in Internet Use Among Older Adults: Correlates and Mediation of Its Association With Quality of Life Through Social Support Networks. Gerontologist, 61(5), 693-702. https://doi.org/10.1093/geront/gnaa096

- Even though was no gender gap between males and females regarding digital technology use, females used it more for health-related purposes

Mahajan, S. et al. (2021, Jan). Trends and Predictors of Use of Digital Health Technology in the United States. Am J Med, 134(1), 129-134. https://doi.org/10.1016/j.amjmed.2020.06.033

Discussion

Enabling factors

- Education, employment and housing type were significantly associated with digital technology use and contribute to the ‘persistent digital divide’ seen among older adults

Yoon, H. et al. (2021, May). Trends in Internet Use Among Older Adults in the United States, 2011-2016. J Appl Gerontol, 40(5), 466-470. https://doi.org/10.1177/0733464820908427
Hong, Y. A., & Cho, J. (2017, Sep 1). Has the Digital Health Divide Widened? Trends of Health-Related Internet Use Among Older Adults From 2003 to 2011. J Gerontol B Psychol Sci Soc Sci, 72(5), 856-863. https://doi.org/10.1093/geronb/gbw100

- Older adults with more extensive social networks were more likely to use digital technology for general and health related purposes

Yu, R. P. et al. (2015). The relationships that matter: social network site use and social wellbeing among older adults in the United States of America. Ageing and Society, 36(9), 1826-1852. https://doi.org/10.1017/s0144686x15000677

Need factors

- Older adults with physical function limitations and visual impairment were less likely to use digital technology whereas those who were physically active were active technology users.

Levine, D. M.et al. (2016, Aug 2). Trends in Seniors' Use of Digital Health Technology in the United States, 2011-2014. Jama, 316(5), 538-540. https://doi.org/10.1001/jama.2016.9124

Discussion

Limitations

- The data are self-reported and may be subject to social desirability and recall bias during the face to face interviews
- No inferences about causal relationships is possible due to cross-sectional study design
- Did not include questions on other dimensions of digital technology use such as type of technology for specific activities, past experience of internet skills, reasons for non-use, proxy use and autonomy of use by older adults

Increasing the uptake of digital technology among older adults - what's going on in Singapore?

- IMDA launched the Seniors Go Digital initiative in May 2020 – helping with digital literacy and IT awareness
- Silver Infocomm Initiative – in 2007 with Silver Infocomm Wellness Ambassadors (SIWA) help seniors with digital skills
- SkillsFuture credit – for digital literacy training courses (part of lifelong learning)
- Mobile access for seniors scheme - for affordability
- SG digital community hubs at CCs - one on one guidance by SG digital ambassadors
- Increasing online content in Malay, Tamil, Hokkien, Cantonese
- For visual impairment -Voice output software enabling screen reading (text to speech technology) and optical character recognition (OCR)

Discussion

Future Research

- Interventional studies which incorporate digital literacy skills to investigate culturally appropriate and age-specific solutions among the diverse groups of older adults is warranted
- Longitudinal studies would be useful to examine the changes in social inequalities over time and its relationship with the type of digital technology use
- Studies on the use of online content and their associations with psychological and physical health conditions among older adults may be helpful

Conclusion

- Two-in-three older adults aged 62 years and older use digital technology in Singapore
- One-in-five of these older adults who use digital technology, use it for health-related purposes
- Subgroups among older people identified in this study with low usage of digital technology for general and health purposes merit closer attention to bridge the digital divide

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thank you

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https://www.duke-nus.edu.sg/care/

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