





The Text4HealthyAging Program: An Evidence-Based Text Messaging Innovation to Support Healthy Urban Aging in Canada and Australia

Gerontology & Geriatric Medicine
Volume 8: 1–7
© The Author(s) 2022
Article reuse guidelines:
sagepub.com/journals-permissions
DOI: 10.1177/23337214221081378
journals.sagepub.com/home/ggm


Ejemai Eboime¹ , Arto Ohinmaa², Benjamin Rusak^{3,4}, Keri-Leigh Cassidy³, Jason Morrison³ , Patrick McGrath^{3,5}, Rudolf Uher³, Sandra Meier³, Marie-Josée Fleury⁶, Srividya N. Iyer⁶, Soham Rej⁶, Frances Batchelor⁷, Pazit Levinger⁷, Christa Dang⁷, Malcolm Hopwood⁸, Francis N. L. Acquah⁹, Janet Dzator¹⁰, Gail Tomblin Murphy¹¹, Jordan Warford¹¹, Lori Wozney¹¹, Isabelle Vedel¹², Jacqueline Gahagan¹³, Olga Theou^{14,15}, Prosper Koto¹¹, Tara Sampalli¹¹, Susan Kirkland^{14,16}, Nicholas Watters¹⁷, and Vincent I. O. Agyapong³ 

Abstract

Age-friendly cities are crucial to achieve the WHO goal of healthy aging. Such cities promote opportunities for health, participation, and security, thus enhancing quality of life as people age. Older people commonly experience psychosocial challenges such as anxiety, depression, substance abuse, loss of autonomy, grief, fear, and loneliness. Australian and Canadian cities continue to seek innovation to improve healthy urban aging and create more age-friendly environments for older adults. There is increasing evidence on the effectiveness and feasibility of mobile technology in health promotion and closing psychological treatment gaps. Older adults have been demonstrated to engage frequently with mobile devices, particularly text messaging. In this article, we conceptualize the Text4HealthyAging, an evidence-based text messaging innovation to support healthy urban aging in Canadian and Australian cities.

¹Department of Psychiatry, Faculty of Medicine and Dentistry, University of Alberta, Edmonton, AB, Canada

²School of Public Health, College of Health Sciences, University of Alberta, Edmonton, AB, Canada

³Department of Psychiatry, Faculty of Medicine, Dalhousie University, Halifax, NS, Canada

⁴Department of Psychology & Neuroscience, Faculty of Science, Dalhousie University, Halifax, NS, Canada

⁵WK Health Centre, Halifax, NS, Canada

⁶Department of Psychiatry, McGill University, Montreal, QC, Canada

⁷National Ageing Research Institute, Parkville, VIC, Australia

⁸Department of Psychiatry, University of Melbourne, Parkville, VIC, Australia

⁹Positive Wellness Recovery Centre, VIC, Australia

¹⁰Newcastle Business School, University of Newcastle, Australia

¹¹Mental Health and Addictions, Nova Scotia Health Authority, Halifax, NS, Canada

¹²Department of Family Medicine, McGill University, Montreal, QC, Canada

¹³Mount Saint Vincent University, Halifax, NS, Canada

¹⁴Geriatric Medicine Research, Nova Scotia Health Authority, Halifax, NS, Canada

¹⁵School of Physiotherapy, Dalhousie University, Halifax, NS, Canada

¹⁶Department of Community Health & Epidemiology, Dalhousie University, Halifax, NS, Canada

¹⁷Mental Health Commission of Canada, Ottawa, ON, Canada

Corresponding Author:

Vincent I. O. Agyapong, Department of Psychiatry, Faculty of Medicine, Dalhousie University, 1545 Henry Street, 8th Floor Abbie J. Lane Memorial Building QEII Health Sciences Cen, Halifax, NS B3H 4R2, Canada.

Email: agyapong@ualberta.ca



Creative Commons CC BY: This article is distributed under the terms of the Creative Commons Attribution 4.0 License (<https://creativecommons.org/licenses/by/4.0/>) which permits any use, reproduction and distribution of the work without further permission provided the original work is attributed as specified on the SAGE and Open Access pages (<https://us.sagepub.com/en-us/nam/open-access-at-sage>).

Keywords

aging, community, mental health, public health/public policy

Manuscript received: November 26, 2021; **final revision received:** January 6, 2022; **accepted:** February 1, 2022.

Introduction

The population is aging in both Canada and Australia. As of 2016, approximately 15% of Canadians and Australians were aged 65 years and above. This figure is projected to reach about 20–22% by 2036 (Australian Bureau of Statistics, 2019; Shooshtari et al., 2020). According to the Organization for Economic Co-operation and Development (OECD) in 2015, 43% of the older population resides in cities (OECD, 2015). As modern cities rapidly evolve infrastructurally and socially, there is a need to incorporate healthy urban aging into routine services and city development. The World Health Organization (WHO) defines healthy aging as “the process of developing and maintaining the functional ability that enables wellbeing in older age” (Rudnicka et al., 2020).

Age-friendly cities (AFCs) are crucial to achieve the WHO goal of healthy aging. Such cities promote opportunities for health, participation, and security, thus enhancing quality of life as people age (Jeste et al., 2016; Plouffe & Kalache, 2010). Some studies show that older adults living in urban environments tend to experience more psychological distress than those residing in rural communities (Alcaniz et al., 2020; Michel, 2020; Wu et al., 2017). Perceived socioeconomic difficulties (such as the absence of family relationship and family care as well as loss of social support among) among urban dwelling seniors have been attributed to this outcome. Further, cities and densely populated areas tend to be associated with noise, agitation, as well as other social and environmental stressors (Alcaniz et al., 2020; Michel, 2020). Common psychological issues affecting older people may include, but are not limited to, anxiety, depression, and substance abuse. Common social and emotional issues may involve loss of autonomy, grief, fear, loneliness, financial constraints, and lack of social networks (Abraham Cottagiri et al., 2021; Roe et al., 2020; Werth et al., 2002). A complex relationship exists between psychosocial distress and cognitive and physical health that is important to address given the increasing prevalence of multi-morbidity in older age (Sakib et al., 2019).

The ongoing COVID-19 pandemic compounds mental stress and health-related problems as well as existing physical, financial, and social barriers to accessing health care. Studies reveal that the pandemic has intensified post-traumatic stress injuries, anxiety, depression, suicidal ideation, and sleep disorders among residents of municipalities in Australia and Canada (Agyapong et al., 2021a, 2021b; Brydon et al., 2021; Dawel et al., 2020; Lawal et al., 2021; Nkire et al., 2021; Osiogo et al., 2021; Sapara et al., 2021; Shalaby, Adu, et al., 2021; Pachana et al., 2020). Psychosocial support is needed to

motivate older people to adhere to medical and psychological prescriptions, as well as physical activities (Levinger et al., 2021). Thus, enhancing supportive environments wherever they live is essential for healthy aging. Older people in Canada and Australia increasingly describe experiencing social isolation. About 30% of the older population are at risk of becoming socially isolated (Barbosa Neves et al., 2019; Sipowicz et al., 2021). In addition to those living at home, 2.6% and 6% of Canadians and Australians aged 65+ reside in residential aged care facilities, respectively (Dyer & Tilden, 2021; Statistics Canada, 2018), the majority of which are located in urban settings (Colman, 2021; Hanlon & Halseth, 2005; Williams & Kulig, 2012). There is evidence that living in a long-term care facility can contribute to feelings of loneliness and social isolation, as well as sedentary living (Barbosa Neves et al., 2019; Parry et al., 2019). Social isolation in older people, irrespective of where they reside, increases all-cause mortality by 50% (Holt-Lunstad et al., 2010).

Staying socially connected, increasing physical activity, healthy eating, taking steps to minimize their risks for falls and other healthy behavioral and environmental adjustments can help older adults live longer and healthier lives (Jeste et al., 2016; Parry et al., 2019).

In many urban settings, older adults experience challenges with accessing health services, recreational facilities, social, and religious gatherings (Sato et al., 2019). Socio-ecological models indicate that physical activity among older adults is influenced by individual as well as environmental characteristics and the interactions between them (Hallal et al., 2012; Van Cauwenberg et al., 2018).

Efforts to achieve age-friendly cities will benefit from innovative intervention packages that mitigate the effects of physical, psychosocial challenges and multiple morbidities, and promote healthy aging among seniors. There is a growing interest in the use of mobile health (mHealth) technologies to create healthy psychosocial environments for older adults within their communities. The application of mHealth to support healthy aging is now a priority area for policy development in many jurisdictions, including Canada and Australia (Matthew-Maich et al., 2016). This concept paper proposes how a supportive text messaging innovation for older people can bridge this gap.

The Text4HealthyAging Program

The Text4HealthyAging program is an adaptable, evidence-based, supportive messaging innovation, designed to promote healthy aging among people aged 65+ in Canadian and

Australian cities. With the help of mental health therapists, psychologists and people with lived experiences, our not-for-profit partner, the Global Psychological eHealth Foundation (GPEF), developed a bank of supportive text messages that are based on principles of cognitive behavioral therapy. Over 500 messages have been developed which include general supportive messages aimed at motivation, health promotion, and providing health resources through embedded links to websites, pictures or videos, emergency numbers, and education about COVID-19 vaccines and pandemic control measures. Supportive text messages have also been adapted to address people's various mental health diagnosis and follow the earlier development of versions that support other population groups such as young people (MoreGoodDays), veterans and first responders (Text4PTSI and Text4Well-being), as well as people experiencing the COVID-19 pandemic (Text4Hope), adult anxiety and depression (Text4-Mood), and natural disasters (FMMSstrong), among others. (Please see: <https://www.resiliencenhope.org/>). These messages are designed to promote healthy aging as well as provide supportive treatment for psychosocial disorders. However, all subscribers receive the general supportive messages, people with specific needs are able to subscribe to receive messages tailored to specific diagnosis such as post-traumatic stress disorder, frailty, or sociocultural environment (e.g., language and gender-related messages). An example of these supportive messages is:

- *My life during retirement will not be immune from difficulties, but I know I will have peace even during difficult times. I will overcome the storms by connecting with friends and family and staying positive.*

Building on the evidence of efficacy, effectiveness, cost-effectiveness, and acceptability of these supportive text messaging programs when utilized to bridge the psychological treatment gap for mental health patients, as well as promote healthy living across various population groups, we conceptualized an adaptation of this intervention service for the aging population in Canadian and Australian cities. The text4HealthyAging will be adapted to meet the diverse, evolving needs of older people. For example, the messages will provide psychological and educational support for seniors who have diabetes, arthritis, cognitive impairment, depression, anxiety, as well as provide general health promotion and useful resources (such as describing what action to take or who to contact when faced with common challenges in their city of residence). The messages will also provide links to information on neighborhood features and community programs for older adults.

The existing messages will be adapted (and new targeted messages developed) by a team of mental health professionals, geriatric specialists, dietitians, physiotherapists and exercise scientists, social workers, representatives of older people, and gender experts, and experts from municipal public health.

There will be opportunities for adaptations to fit cultural contexts (e.g., First Nations/indigenous populations in Canada and Australia), different gender identities, occupational exposures/experiences (e.g., veterans), the bereaved, multiple language needs, etc. Currently, existing messages have been translated into French, Arabic, Punjabi, and Mandarin.

Delivery Platform

The GPEF has also developed a platform to deliver these text messages across the globe. Please see: <https://www.resiliencenhope.org/programs>. About 10% of subscribers to our Text4Hope program (Agyapong et al., 2021), a population-based intervention providing support to Albertans during the COVID-19 pandemic, are aged 60 years and above. This figure closely mirrors the seniors population of Alberta (11%)(Statistics Canada, 2016). Like other age categories, seniors found the Text4Hope program relevant, and felt the program made them feel connected to the health system despite the constraints of the pandemic(Shalaby, Vuong, et al., 2021). Building on this, the Text4HealthyAging presents an opportunity to promote general wellbeing (physical, psychological, and social) and provide a supportive environment for older people, particularly during the COVID-19 pandemic, and aligned with the goals of AFCs.

Sex and Gender-Based Considerations

Given the evidence that gender sensitivity is important to promote acceptability and satisfaction with supportive text messaging programs (Shalaby, Vuong, et al., 2021), both sex and gender-based considerations will be incorporated throughout program design, implementation, and evaluation of the Text4HealthyAging. The bank of supportive text messages to be used in the intervention will be reviewed by our sex and gender expert group, to ensure that content of the messages include intersecting sex and gender-based considerations and are appropriate for the target population at each site. We will use the 2021 Canadian Institutes of Health Research's Sex and Gender-Based Analysis Plus (SGBA+) analytic framework to evaluate the impact of the interventions in relation to sex and gender specific indicators. Specifically, we will ask participants to rate a random selection of supportive text messages to determine the influence of sex and gender in their rankings. This will help to further develop the text message bank for specific diverse sexes and genders.

Is There Scientific Evidence in Support of the Efficacy and Effectiveness of Supportive Text Messaging Programs?

There is evidence that supportive text messaging can significantly improve the psychosocial well-being of both healthy individuals and people with health conditions. Supportive text messaging can be remotely delivered, is

scalable, economically reliable, convenient, and there is growing evidence of applicability in mental health (Adu et al., 2021; Agyapong et al., 2021; Hall et al., 2015; Shalaby et al., 2021). In three randomized controlled trials conducted in Ireland and Canada (Agyapong et al., 2017; O'reilly et al., 2019), people with Major Depressive Disorder (MDD) who received twice-daily supportive text messages had significantly greater reductions in their depression symptom scores than people who received the usual treatment. In one of these trials, the mean difference in change of Beck Depression Inventory (BDI)-II scores, between the intervention and the control group, was -7.9 (95% CI -13.06 to -2.76 , Cohen's $d = 0.85$) in favor of the intervention group after 3 months (O'Reilly et al., 2019). Further, 83% of subscribers to the Text4Mood program implemented in Alberta reported that the daily messages contributed to improving their overall mental wellbeing (Agyapong et al., 2016).

An evaluation of the Text4Hope program also showed that participants who had received daily supportive text messages for only 6 weeks had significantly ($p < .005$) lower prevalence rates in the 2 weeks preceding data collection for (a) moderate/high stress (78.8% vs. 88.0%), (b) likely Generalized Anxiety Disorder (GAD) (31.4% vs. 46.5%), (c) likely MDD (36.8% vs. 52.1%), and (d) suicidal ideation/thoughts of self-harm (16.9% vs. 26.6%), compared to new subscribers who were yet to receive any daily supportive text messages (Agyapong et al., 2021). There was also demonstrable 23% reduction in the mean anxiety symptom scores for Text4Hope subscribers after 3 months (Agyapong, Shalaby, et al., 2021). We anticipate similar outcomes with the Text4HealthyAging program as well.

Is it Feasible to Implement Supportive Text Messaging Programs for Older Adults?

Supportive text messaging for the urban older adults is feasible to implement in Canada and Australia. Text messaging is available on most cell phones, and does not require software or mobile application downloads, external equipment, fixed lines, or other hardware to function. Mobile phone penetration, as share of population, in Australia and Canada is between 80 and 90% (Government of Canada, 2018). Over 60% and 85% of older people own basic mobile phones in Canada and Australia respectively (Granwal, 2021; Jacobson et al., 2017; Oliveira, 2014; Statista Research Department, 2015). Generally, it is estimated that 99% of received mobile text messages are opened, and 90% of all text messages are read within 3 minutes of receipt (Johnson, 2013). Contrary to the stereotype that older adults do not frequently engage with technology, data suggest that, compared to smartphone apps, there is no significant difference in the use of basic text messaging across age groups in Canada (Statista Research Department, 2021). In another study, 94% of seniors engage with text messages weekly,

sending and receiving an average of 32 messages per month (Mosio, 2021).

Will Supportive Text Messaging Program be Acceptable to Urban Dwelling Older Adults?

Several studies have reported high user satisfaction of the supportive text message interventions. An evaluation of the Text4Mood and Text4Hope programs found that 80% and 88% of participants, respectively, agreed that asynchronous supportive text messages should be provided during follow-up care, while only about 50% and 70% of participants, respectively, agreed to the use of video conferencing consultations (Agyapong et al., 2013, 2016; Shalaby, Adu, et al., 2021). Related to the plan to use Text4HealthyAging to combat isolation and loneliness among seniors and create health cities, 86% of Text4Hope subscribers reported they felt connected to a support system because of receiving the daily supportive messages (Shalaby et al., 2021; Sipowicz et al., 2021). Inferring from this supporting evidence, we anticipate comparable results among the older adult population in our study sites when the Text4HealthyAging is deployed.

Conclusion

Canadian and Australian cities continue to seek out approaches to evolve more into AFCs, the use of technology is also being explored. However, there is the general assumption that technology-based interventions may not be very acceptable or feasible to implement among the older adult population, there is sufficient empirical evidence that the older adults are engaging more with technology. The Text4HealthyAging is a feasible solution to improve urban aging as it utilizes basic text messaging services which, as demonstrated by research, is well utilized by older adults in these countries. It is our anticipation that this innovation will be sustainably incorporated to improve the health of this population in Canada and Australia.

Declaration of Conflicting Interests

The author(s) declared the following potential conflicts of interest with respect to the research, authorship, and/or publication of this article: VIOA and EE are board members of the GPEF, a not-for-profit organization involved with the design of Text4HealthyAging program. All other authors declare no conflicting interests.

Funding

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

ORCID iDs

Ejemai Eboreime  <https://orcid.org/0000-0001-8277-2570>

Jason Morrison  <https://orcid.org/0000-0003-2871-0330>

Vincent I. O. Agyapong  <https://orcid.org/0000-0002-2743-0372>

References

- Abraham Cottagiri, S., Villeneuve, P. J., Raina, P., Griffith, I. E., Rainham, D., Dales, R., Peters, C. E., Ross, N. A., & Crouse, D. I. (2021). Increased urban greenness associated with improved mental health among middle-aged and older adults of the Canadian Longitudinal Study on Aging (CLSA). *Environmental Research*, *206*, 112587. <https://doi.org/10.1016/j.envres.2021.112587>
- Adu, M. K., Shalaby, R., Eboreime, E., Sapara, A., Nkire, N., Chawla, R., Chima, C., Achor, M., Osiogo, F., Chue, P., Greenshaw, A. J., & Agyapong, V. I. (2021). Text messaging versus email messaging to support patients with major depressive disorder: Protocol for a randomized hybrid type II effectiveness-implementation trial. *JMIR Research Protocol*, *10*(10), e29495. <https://doi.org/10.2196/29495>
- Agyapong, V. I. O., Milnes, J., Mcloughlin, D. M., & Farren, C. K. (2013). Perception of patients with alcohol use disorder and comorbid depression about the usefulness of supportive text messages. *Technology and Health Care*, *21*(1), 31-39. <https://doi.org/10.3233/THC-120707>
- Agyapong, V. I., Mrklas, K., Juhás, M., Omeje, J., Ohinmaa, A., Dursun, S. M., & Greenshaw, A. J. (2016). Cross-sectional survey evaluating Text4Mood: mobile health program to reduce psychological treatment gap in mental healthcare in Alberta through daily supportive text messages. *BMC Psychiatry*, *16*(1), 378. <https://doi.org/10.1186/s12888-016-1104-2>
- Agyapong, V. I. O., Juhás, M., Ohinmaa, A., Omeje, J., Mrklas, K., Suen, V. Y. M., Dursun, S. M., & Greenshaw, A. J. (2017). Randomized controlled pilot trial of supportive text messages for patients with depression. *BMC Psychiatry*, *17*(1), 286. <https://doi.org/10.1186/s12888-017-1448-2>
- Agyapong, V. I. O., Hrabok, M., Shalaby, R., Vuong, W., Noble, J. M., Gusnowski, A., Mrklas, K., Li, D., Urichuck, L., Sna-terse, M., Surood, S., Cao, B., Li, X.-M., Greiner, R., & Greenshaw, A. J. (2021a). Text4Hope: Receiving Daily Supportive Text Messages for 3 Months During the COVID-19 Pandemic Reduces Stress, Anxiety, and Depression. *Disaster Medicine and Public Health Preparedness*, 1–5. <https://doi.org/10.1017/dmp.2021.27>
- Agyapong, V. I. O., Shalaby, R., Hrabok, M., Vuong, W., Noble, J. M., Gusnowski, A., Mrklas, K., Li, D., Sna-terse, M., Surood, S., Cao, B., Li, X. M., Greiner, R., & Greenshaw, A. J. (2021b). Mental health outreach via supportive text messages during the COVID-19 pandemic: Improved mental health and reduced suicidal ideation after six weeks in subscribers of Text4Hope compared to a control population. *International Journal of Environmental Research and Public Health*, *18*(4), 2154. <https://doi.org/10.3390/ijerph18042157>
- Alcañiz, M., Riera-Prunera, M. C., & Solé-Auró, A. (2020). When i retire, I'll move out of the city": Mental well-being of the elderly in rural vs. urban settings. *International Journal of Environmental Research and Public Health*, *17*(7), 2442. <https://doi.org/10.3390/ijerph17072442>
- Australian Bureau Of Statistics. (2019). *Australian demographic statistics-2019. 19th December 2021*. Australian Bureau of Statistics.
- Barbosa Neves, B., Sanders, A., & Kokanović, R. (2019). It's the worst bloody feeling in the world": Experiences of loneliness and social isolation among older people living in care homes. *Journal of Aging Studies*, *49*, 74–84. <https://doi.org/10.1016/j.jaging.2019.100785>
- Brydon, A., Bhar, S., Doyle, C., Batchelor, F., Lovelock, H., Almond, H., Mitchell, L., Nedeljkovic, M., Savvas, S., & Wuthrich, V. (2021). National survey on the impact of COVID-19 on the mental health of Australian residential aged care residents and staff. *Clinical Gerontology*, *45*(1), 58–70. <https://doi.org/10.1080/07317115.2021.1985671>
- Colman, C. (2021). Aged care in rural Australia. *Australian Journal of Rural Health*, *29*(3), 483–484. <https://doi.org/10.1111/ajr.12770>
- Dawel, A., Shou, Y., Smithson, M., Cherbuin, N., Banfield, M., Calear, A. L., Farrer, L. M., Gray, D., Gulliver, A., Housen, T., McCallum, S. M., Morse, A. R., Murray, K., Newman, E., Rodney Harris, R. M., & Batterham, P. J. (2020). The effect of COVID-19 on mental health and wellbeing in a representative sample of Australian adults. *Frontiers in Psychiatry*, *11*, 579985. <https://doi.org/10.3389/fpsy.2020.579985>
- Dyer, S. M., & Tilden, D. (2021). Is Australia over-reliant on residential aged care to support our older population? *The Medical Journal of Australia*, *215*(1), 46–e1. <https://doi.org/10.5694/mja2.51129>
- Gouvernement Of Canada. (2018). Commission, C. R.-T. A. T. In *Communications monitoring report 2018*. (Ed.), Gouvernement Of Canada.
- Granwal, L. (2021). *Smartphone ownership in Australia as of July 2019, by age*. Statista.
- Hallal, P. C., Andersen, L. B., Bull, F. C., Guthold, R., Haskell, W., Ekelund, U., & Lancet physical activity series working, G. (2012). Global physical activity levels: Surveillance progress, pitfalls, and prospects. *Lancet*, *380*(9838), 247–257. [https://doi.org/10.1016/s0140-6736\(12\)60646-1](https://doi.org/10.1016/s0140-6736(12)60646-1)
- Hall, A. K., Cole-Lewis, H., & Bernhardt, J. M. (2015). Mobile text messaging for health: A systematic review of reviews. *Annual Review of Public Health*, *36*, 393–415. <https://doi.org/10.1146/annurev-publhealth-031914-122855>
- Hanlon, N., & Halseth, G. (2005). The greying of resource communities in northern British Columbia: Implications for health care delivery in already-underserved communities. *Canadian Geographer-Geographe Canadien*, *49*(1), 1–24. <https://doi.org/10.1111/j.0008-3658.2005.00077.x>
- Holt-Lunstad, J., Smith, T. B., & Layton, J. B. (2010). Social relationships and mortality risk: A meta-analytic review. *Plos Medicine*, *7*, e1000316. <https://doi.org/10.1371/journal.pmed.1000316>
- Jacobson, J., Lin, C. Z., & McEwen, R. (2017). Aging with technology: Seniors and mobile connections. *Canadian Journal of Communication*, *42*(2), 331–357. <https://doi.org/10.22230/cjc.2017v42n2a3221>
- Jeste, D. V., Blazer, D. G. 2nd., Buckwalter, K. C., Cassidy, K. K., Fishman, L., Gwyther, L. P., Levin, S. M., Phillipson, C., Rao, R. R., Schmeding, E., Vega, W. A., Avanzino, J. A., Glorioso,

- D. K., & Feather, J. (2016). Age-friendly communities initiative: Public health approach to promoting successful aging. *The American Journal of Geriatric Psychiatry: Official Journal of the American Association for Geriatric Psychiatry*, 24(12), 1158–1170. <https://doi.org/10.1016/j.jagp.2016.07.021>
- Johnson, D. (2013). *SMS open rates exceed 99%*. Tatango.
- Lawal, M. A., Shalaby, R., Chima, C., Vuong, W., Hrabok, M., Gusnowski, A., Surood, S., Greenshaw, A. J., & Agyapong, V. I. O. (2021). COVID-19 pandemic: Stress, anxiety, and depression levels highest amongst indigenous peoples in Alberta. *Behavioral Science (Basel)*, 11(9), 115. <https://doi.org/10.3390/bs11090115>
- Levinger, P., Cerin, E., Milner, C., & Hill, K. D. (2021). Older people and nature: The benefits of outdoors, parks and nature in light of COVID-19 and beyond- where to from here? *International Journal of Environmental Health Research*, 1–8. <https://doi.org/10.1080/09603123.2021.1879739>
- Matthew-Maich, N., Harris, L., Ploeg, J., Markle-Reid, M., Valaitis, R., Ibrahim, S., Gafni, A., & Isaacs, S. (2016). Designing, implementing, and evaluating mobile health technologies for managing chronic conditions in older adults: A scoping review. *JMIR Mhealth Uhealth*, 4(2), e29. <https://doi.org/10.2196/mhealth.5127>
- Michel, J. P. (2020). Editorial: Urbanization and ageing health outcomes. *The Journal of Nutrition, Health & Aging*, 24(5), 463–465. <https://doi.org/10.1007/s12603-020-1360-1>
- Mosio. (2021). *Text messaging, older demographics and clinical research [online]*. Seattle. <https://www.mosio.com/text-messaging-older-demographics-and-clinical-research/>
- Nkire, N., Nwachukwu, I., Shalaby, R., Hrabok, M., Vuong, W., Gusnowski, A., Surood, S., Greenshaw, A. J., & Agyapong, V. I. O. (2021). COVID-19 pandemic: Influence of relationship status on stress, anxiety, and depression in Canada. *Irish Journal of Psychological Medicine*, 1–12. <https://doi.org/10.1017/ipm.2021.1>
- OECD (2015). *Ageing in cities*. OECD Publishing.
- Oliveira, M. (2014). *Most Canadian seniors have mobile phones, but not 'smart' ones: Poll*. CTV News.
- O'reilly, H., Hagerty, A., O'donnell, S., Farrell, A., Hartnett, D., Murphy, E., Kehoe, E., Agyapong, V., Mcloughlin, D. M., & Farren, C. (2019). Alcohol use disorder and comorbid depression: A randomized controlled trial investigating the effectiveness of supportive text messages in aiding recovery. *Alcohol and Alcoholism*, 54(5), 551–558. <https://doi.org/10.1093/alcalc/agz060>
- Osiogo, F., Shalaby, R., Adegboyega, S., Hrabok, M., Gusnowski, A., Vuong, W., Surood, S., Greenshaw, A. J., & Agyapong, V. I. O. (2021). COVID-19 pandemic: Demographic and clinical correlates of disturbed sleep among 6,041 Canadians. *International Journal of Psychiatry in Clinical Practice*, 25(2), 164–171. <https://doi.org/10.1080/13651501.2021.1881127>
- Pachana, N. A., Beattie, E., Byrne, G. J., & Brodaty, H. (2020). COVID-19 and psychogeriatrics: The view from Australia. *International Psychogeriatrics*, 32(10), 1135–1141. <https://doi.org/10.1017/S1041610220000885>
- Parry, S., Chow, M., Batchelor, F., & Fary, R. E. (2019). Physical activity and sedentary behaviour in a residential aged care facility. *Australasian Journal on Ageing*, 38(1), E12–E18. <https://doi.org/10.1111/ajag.12589>
- Plouffe, L., & Kalache, A. (2010). Towards global age-friendly cities: Determining urban features that promote active aging. *Journal of Urban Health: Bulletin of the New York Academy of Medicine*, 87(5), 733–739. <https://doi.org/10.1007/s11524-010-9466-0>
- Roe, J., Mondschein, A., Neale, C., Barnes, L., Boukhechba, M., & Lopez, S. (2020). The urban built environment, walking and mental health outcomes among older adults: A pilot study. *Frontiers in Public Health*, 8, 575946. <https://doi.org/10.3389/fpubh.2020.575946>
- Rudnicka, E., Napierala, P., Podfigurna, A., Meczekalski, B., Smolarczyk, R., & Grymowicz, M. (2020). The world Health Organization (WHO) approach to healthy ageing. *Maturitas*, 139, 6–11. <https://doi.org/10.1016/j.maturitas.2020.05.018>
- Sakib, M. N., Shoostari, S., St John, P., & Menec, V. (2019). The prevalence of multimorbidity and associations with lifestyle factors among middle-aged Canadians: An analysis of Canadian longitudinal study on aging data. *BMC Public Health*, 19(1), 243. <https://doi.org/10.1186/s12889-019-6567-x>
- Sapara, A., Shalaby, R., Osiogo, F., Hrabok, M., Gusnowski, A., Vuong, W., Surood, S., Urchuk, L., Greenshaw, A. J., & Agyapong, V. I. O. (2021). COVID-19 pandemic: Demographic and clinical correlates of passive death wish and thoughts of self-harm among Canadians. *Journal of Mental Health*, 30(2), 170–178. <https://doi.org/10.1080/09638237.2021.1875417>
- Sato, M., Inoue, Y., Du, J., & Funk, D. C. (2019). Access to parks and recreational facilities, physical activity, and health care costs for older adults: Evidence from US counties. *Journal of Leisure Research*, 50(3), 220–238. <https://doi.org/10.1080/00222216.2019.1583048>
- Shalaby, R., Adu, M. K., Andreychuk, T., Eboime, E., Gusnowski, A., Vuong, W., Surood, S., Greenshaw, A. J., & Agyapong, V. I. O. (2021a). Prevalence, demographic, and clinical correlates of likely PTSD in subscribers of Text4Hope during the COVID-19 pandemic. *International Journal of Environmental Research and Public Health*, 18(12), 6227. <https://doi.org/10.3390/ijerph18126227>
- Shalaby, R., Vuong, W., Hrabok, M., Gusnowski, A., Mrklas, K., Li, D., Snaterse, M., Surood, S., Cao, B., Li, X. M., Greiner, R., Greenshaw, A. J., & Agyapong, V. I. O. (2021b). Gender differences in satisfaction with a text messaging program (Text4Hope) and anticipated receptivity to technology-based health support during the COVID-19 pandemic: Cross-sectional survey study. *JMIR Mhealth Uhealth*, 9(4), e24184. <https://doi.org/10.2196/24184>
- Shoostari, S., Menec, V., Swift, A., & Tate, R. (2020). Exploring ethno-cultural variations in how older Canadians define healthy aging: The Canadian Longitudinal Study on Aging (CLSA). *Journal of Aging Studies*, 52, 100834. <https://doi.org/10.1016/j.jaging.2020.100834>

- Sipowicz, K., Podlecka, M., Mokros, L., & Pietras, T. (2021). Lonely in the city-sociodemographic status and somatic morbidities as predictors of loneliness and depression among seniors-preliminary results. *International Journal of Environmental Research Public Health*, 18(14), 7213. <https://doi.org/10.3390/ijerph18147213>
- Statista Research Department. (2015). *Personal and business mobile phone ownership in Canada 2014, by age group*. Statista.
- Statista Research Department. (2021). *Canada: Smartphone user messaging service preference 2017, by age group*. Statista.
- Statistics Canada. (2016). *Census profile, 2016 census*. Statistics Canada.
- Statistics Canada. (2018). *Living arrangements of seniors*.
- Van Cauwenberg, J., Nathan, A., Barnett, A., Barnett, D. W., Cerin, E., CEPA, & GRP, O. A. W. (2018). Relationships between Neighbourhood physical environmental attributes and older adults' leisure-time physical activity: A systematic review and meta-analysis. *Sports Medicine*, 48(7), 1635–1660. <https://doi.org/10.1007/s40279-018-0917-1>
- Werth, J. L., Jr., Gordon, J. R., & Johnson, R. R., Jr. (2002). Psychosocial issues near the end of life. *Aging & Mental Health*, 6(4), 402–412. <https://doi.org/10.1080/1360786021000007027>
- Williams, A., & Kulig, J. (2012). Health and place in rural Canada. In J. Kulig, & A. Williams (Eds.), *Health in rural Canada*. UBC Press.
- Wu, Y. T., Prina, A. M., Jones, A., Barnes, L. E., Matthews, F. E., Brayne, C., & Mrc, C. (2017). Micro-scale environment and mental health in later life: Results from the cognitive function and ageing study II (CFAS II). *Journal of Affective Disorders*, 218, 359–364. <https://doi.org/10.1016/j.jad.2017.05.001>