UNCOVERING THE COMPLEXITY OF FOOD/NUTRITION, PHYSICAL ACTIVITY AND MENTAL HEALTH AMONG ARAB IMMIGRANTS/REFUGEES IN ONTARIO, CANADA: THE CAN-HEAL STUDY

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Lay Abstract

This research explored the food, leisure time physical activity, and mental health (MH) experiences among Arab immigrants/refugees (AIR) in Ontario, Canada. The goal is to investigate pathways to promote the MH and well-being of the AIR community. The CAN-HEAL (Canadian Arab Nutrition, Health Education and Active Living) project was done in collaboration with the AIR community and used three different tools (interviews, photography, and a survey) to gain a better understanding of the community's needs. In the survey of 60 AIR participants, we found high rates of poor mental well-being (55%), physical inactivity (87%), and poor reliable access to healthy and affordable food that meets one's cultural preferences (65%). Eighty-seven percent of first-generation immigrant participants reported unfavorable changes in MH after immigration because of unfair opportunities, and poor living conditions and unjust systems. Interactions between different individual characteristics (e.g., gender, income, religion, immigration status) increased the unfavourable changes in MH, played a big role in how food and physical activity affected AIR's MH, and led to unfair gaps in health and opportunities within the AIR community. The relationship between food, physical activity and MH among AIR is complex. For example, food quality, traditional foods and favourite physical activities play a large role in the feelings and well-being of AIR. As part of this project, a thoughtful plan has been produced with members of the AIR community in Ontario to allow their voices to be heard, to advocate for fair opportunities and treatment, and to promote their health and well-being.

Abstract

This doctoral dissertation explores the complex food/nutrition, leisure physical activity (LPA) and mental health (MH) needs in Arab immigrants/refugees (AIR) in Ontario, Canada. The main goal is to improve the MH and well-being of AIR. The CAN-HEAL (Canadian Arab Nutrition, Health Education and Active Living) project used a collaborative community-based participatory research and integrated knowledge translation approach, and triangulated data from three different methods (qualitative interviews, Photovoice, and a questionnaire survey) to enhance study rigour.

A primary finding of this research is that food/nutrition, LPA, and MH needs in AIR are multi-layered and vary considerably according to intersectional experiences, cross-cultural pressures, living conditions and racism. The research found an alarming prevalence of poor mental well-being (55%), food insecurity (65%) and low LPA levels (87%) in AIR participants (n=60). Among first-generation immigrant participants, 87% reported negative changes in MH since immigration. These negative changes are not straightforward; they are complex and dynamic, and mainly related to structural barriers, poor living conditions, and system failures to accommodate the distinct cultural needs of the AIR community. Intersections among different socio-demographic factors (e.g., gender, length of residency, income, parenthood, religion, immigration status), amplified the negative changes in MH, and played a considerable role in how nutrition, food security and LPA impacted AIR's MH, exacerbating inequities within the AIR community. This research shows that the relationships among food/nutrition, LPA and MH among AIR are multi-faceted, and that there are various psycho-socio-cultural pathways and processes through which diet quality, cultural foods and LPA can contribute to shaping AIR's MH.

As part of this research, an upstream-downstream-based socio-political and community-level action plan was co-developed to thoroughly address the complex needs among AIR and to work towards health equity for this marginalized population. Collaboration between health and non-health sectors is required to effectively implement this action plan.

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List of Abbreviations

AIR: Arab immigrants and refugees

CBPR: community-based participatory research

HIE: healthy immigrant effect

IKT: integrated knowledge translation

LPA: leisure physical activity

MH: mental health

PA: physical activity

SDoH: social determinants of health

YSIE: years since immigration effect

Declaration of Academic Achievement

This thesis includes three original research papers (chapters 3, 4 and 5), two of which have been published and the third has been submitted for peer review as outlined below. The research questions, objectives, and relationships between the three research papers are presented in Chapters 1 and 6.

The published research papers are:

Chapter 3:

Elshahat S., Moffat T., Iqbal B.K, Newbold K.B, Gagnon O., Alkhawaldeh H., Morshed M., Madani K., Gehani M., Zhu T., Garabedian L., Belahlou B., Curtay S.A.H, Zhu I.H., Chan C., Duzenli D., Rajapaksege N., Shafiq B., & Zaidi A. (2024). 'I thought we would be nourished here': the complexity of nutrition/food and its relationship to mental health among Arab immigrants/refugees in Canada: the CAN-HEAL study. *Appetite*, 1:195:107226. DOI: 10.1016/j.appet.2020.104753.

Chapter 5:

Elshahat S., Moffat T., Iqbal B.K, Newbold K.B,, Morshed M., Gagnon O., Alkhawaldeh H., Madani K., Gehani M., Zhu T., Garabedian L., Jafri Y., Kanaa N., Mohamed A., Nadeem N., Oghli Z.S., Zabian S., Shah A., Samhat A., Khaira S., Jelal H., Kaloti J., Varadarajan S., Xu Y., & Laing M. (2024). 'I thought we would be cherished and safe here': understanding the multi-faceted nature of mental health among Arab immigrants/refugees in Ontario, Canada- the CAN-HEAL study. *Social Psychiatry and Psychiatric Epidemiology*. DOI: 10.1007/s00127-024-02668-4.

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CHAPTER ONE: INTRODUCTION

Food/nutrition and physical activity (PA) have the potential to shape individuals' mental health (MH) and well-being (Cadenhead et al., 2020; Chekroud et al., 2018). The relationship between food/nutrition, PA and MH can be critical and is worth a thorough investigation among Arab immigrants and refugees (AIR) whose numbers have been rapidly increasing in the West. AIR, like all newcomers, are at high risk for MH issues, but they often experience numerous distinct stressors, such as the post-September/11 rise in anti-Arabism and anti-Muslim hate (Abdulahad et al., 2014; Padela & Heisler, 2010). AIR also often embody unique socio-cultural attributes that may foster adaptive mechanisms and resilience (Rayes et al., 2021). The promotion and support of nutritious, culturally acceptable foods and engagement in culturally relevant leisure PA (LPA) present promising avenues for improving AIR's MH and well-being by enhancing a positive ethnic identity and reducing social exclusion.

Research shows that AIR have distinct food/nutrition, LPA and MH needs and face various socio-cultural and structural barriers to food security, equitable LPA, and MH (Amer & Hovey, 2012; Eldoumi & Gates, 2019; Vatanparast et al., 2020). Examples include limited accessibility to culturally appropriate foods that meet AIR food preferences and religious proscriptions (e.g., *halal* for Muslims), lack of availability of culturally appropriate LPA services, and perceived lack of safety due to the media's demonization of Arabs and the rise in hate crimes (Elshahat & Moffat, 2020). Despite the complex needs and issues AIR face around food/nutrition, LPA and MH, there is a research gap in this area, due to the challenge of doing research with AIR that is culturally sensitive, avoids stigma around MH, and reduces the fear of speaking out, which can be difficult for marginalized people (Elshahat & Moffat, 2022). This community-engaged project called CAN-HEAL (Canadian Arab Nutrition, Health Education and Active Living) addresses these research gaps among AIR in Ontario, Canada, following culturally sensitive best practices.

To understand the complexity of the issues that AIR experience around food/nutrition, LPA, and MH, it is important to discuss the relationship between these topics as well as the distinct cultural norms and core values of the Arab culture that often shape the way AIR behave and interact with their surrounding environment, including food system, leisure facilities and health/social care systems. As such, this chapter introduces three original research articles (i.e., chapters 3, 4 and 5) encompassed as part of this dissertation by reviewing the literature on food/nutrition, PA and MH in general populations and global immigrants, including AIR. This chapter also introduces the Arab culture, norms, values, history, marginalization, and the oppression that Arabs face in Western countries. Next, relevant theoretical and conceptual frameworks that were used in previous dietary, PA, and MH research of immigrants are discussed and integrated. The goal is to best inform our understandings of these areas and the complex issues AIR face, as well as to produce better-informed research that is designed to meet a given set of aims/objectives. Then, the dissertation's aim, objectives and research questions are outlined. Finally, summaries of chapters 3, 4, 5 and 6 are presented to illustrate how they complement one another towards addressing the aim and objectives of this research.

1. Background

It has been posited that food/nutrition and physical activity (PA) have the potential to influence one's mental health (MH) and well-being (Cadenhead et al., 2020; Chekroud et al., 2018). Over the past few years, there has been a growing interest in the field of nutritional psychiatry that studies the relationship between nutrition and MH, mainly through a biomedical lens (Firth et al., 2020; Fresán et al., 2018; Grajek et al., 2022; Suárez-López et al., 2023; Tewari et al., 2022). The consumption of fruits/vegetables and the Mediterranean diet has been significantly associated with low psychological distress and depression scores in randomized-controlled trial and survey studies in Australian and Canadian populations (Davison et al., 2020; Kingsbury et al., 2015; Parletta et al., 2019). Different experimental

and survey studies found that sugar-dense foods were associated with high distress and negative MH in the general population in the UK and the US (Freije et al., 2021; Knüppel et al., 2017; Wallis & Hetherington, 2008; Wallis & Hetherington, 2004). Evidence from social science research, moreover, underscores the social impacts of food deprivation/shortage and thoroughly addresses the complex relationship between food (in)security and MH (Babaei et al., 2020; Ciciurkaite & Brown, 2022; Fang et al., 2021; Jessiman-Perreault & McIntyre, 2017; Weaver et al., 2021). Food security is defined as the consistent access to affordable food that is nutritious and meets one's cultural preferences/restrictions and dietary needs (FAO, 2017). Food insecurity, on the other hand, is a dynamic and multi-faceted experience that encompasses worrying about food accessibility, compromising quantity and/or quality of consumed food and in more severe cases involuntarily cutting meals and hunger/starvation (Lane et al., 2019). Hadley and Crooks (2012) report different psycho-social pathways through which food insecurity may impact one's MH and well-being. These include negative changes in dietary behaviours, low medication compliance for people with disabilities potentially given financial insecurity (i.e., purchasing food or housing instead of medication), socially stigmatized coping strategies as well as feelings of shame, helplessness, and isolation.

In addition to dietary practices and nutrition, PA has increasingly been studied as an important lifestyle factor that is related to one's health and well-being. There is growing interest in the field of exercise psychiatry which addresses the relationship between PA and MH, mainly from a biomedical/kinesiological perspective (Belvederi Murri et al., 2019; Craft & Perna, 2004; Hu et al., 2020; Mahindru et al., 2023; Xie et al., 2021). Regular participation in adequate PA (i.e., 150 min or more of moderate-intensity PA or 75 min or more of vigorous-intensity PA or an equivalent combination of both) has been found to promote positive MH and well-being (Bull et al., 2020). A cross-sectional study of 1.2 million adults revealed that participants who participated in sufficient PA had significantly better MH outcomes than those who did not adequately exercise (Chekroud et al., 2018). Moreover, Wolever et al.

(2012) found a substantial reduction in psychological distress following yoga exercise in a three-arm randomized controlled trial of 239 adults that were randomized into one of three groups (yoga, mindfulness and no intervention). An aerobic training program was also found to increase dispositional mindfulness (i.e., a form of self-awareness and protective factor of both mental and physical health) in adult men over the course of 12 weeks, compared to a relaxation program which yielded no improvement (Mothes et al., 2014). Research also suggests that MH status may affect one's PA participation. A systematic review of longitudinal studies reported that depression may be a significant predictor for low PA (Roshanaei-Moghaddam et al., 2009). Emerging evidence, however, underlines the psychosocial impacts of PA participation and holistically addresses the complex relationship between PA and MH (Davis et al., 2021; Di Bartolomeo & Papa, 2017; Eime et al., 2013; Stevens et al., 2021; Wu et al., 2023). Kandola et al. (2019) reported different psychosocial pathways through which PA can promote MH and well-being. These include enhancing social support (supportive actions/assistance brought by social relationships), improving self-efficacy (situation-specific self-confidence in one's ability to fulfill a certain task), and self-esteem (self-worth and self-image, which encompasses a combination of behavioural, cognitive, and affective mechanisms). A cross-sectional study in China also found that exercise was associated with positive MH among participants during the COVID-19 pandemic through various pathways: hope, "pathways thinking" (i.e., developing and identifying possible routes to achieve a goal), and agency thinking (i.e., ability to fulfill one's potential and goals) (Yao et al., 2022).

The relationship between food/nutrition and PA and MH among immigrants is understudied and is worth a thorough investigation given that immigrants' dietary practices, PA patterns and MH can be impacted by various socio-economic, cultural, and structural factors, such as financial pressures, language barriers and lack of availability of culturally relevant resources (Dombou et al., 2022; Elshahat, Moffat, Gagnon, et al., 2023; Hartley et al., 2017). Over the past three decades, the number of international immigrants worldwide has increased by approximately 84% (IOM, 2022). The number of Arab immigrants and

refugees (AIR) has been rapidly rising in the West, due to political oppression/persecution, civil conflicts, occupation, and wars in the Middle East (Kira et al., 2013; Kira, Alawneh, et al., 2014; Kira, Amer, et al., 2014). Given the economic instability in the Arab world, many AIR opt to immigrate to other nations driven by the desire to seek better opportunities (e.g., education and employment) (Fargues, 2017). In Canada and the US, AIR account for about 2% and 1.1% of the entire populations respectively (Statistics Canada, 2022c; Stephan, 2021). From 2015 to 2023, it is estimated that over 450,000 AIR moved to Canada (Government of Canada, 2023c, 2023d).

AIR, like all newcomers, are at high risk for MH issues, but they experience distinct stressors (e.g., post-September/11 increase in anti-Arab abuse, discrimination and racial profiling) and embody unique social/cultural attributes and values that may foster adaptive mechanisms and resilience (Abdulahad et al., 2014; Padela & Heisler, 2010; Rayes et al., 2021). Some of the distinct attributes and core Arab cultural values include collectivism, generosity, honour, respect, and religion, though it is worth noting that these are relational and relative rather than absolute and often shaped by historical and social processes (Harb, 2016; Obeidat et al., 2012). For many Arabs, family is often held to be more important than self and represents the main social unit in Arab communities (Federation of American Scientists, 2006). Honour and shame are vital components of most Arabs' identity, with family's reputation reflecting on the entire family. In the case of adversities such as earthquakes and war, many Arabs feel collective responsibility, hurting for those experiencing hardships from their community and trying to take actions to assist (British Red Cross, 2024). Moreover, many Muslim Arabs embody the narration by Prophet Muhammad (peace be upon him) '*The parable of the believers in their affection, mercy, and compassion for each other is that of a body. When any limb aches, the whole body reacts with sleeplessness and fever*', holding themselves accountable for supporting and uplifting their community during times of difficulty (Islam et al., 2023; Parrott, 2020).

The value of the social aspect in the Arab culture also extends to food and culinary traditions, which are usually important to most Arabs' identity and well-being. For example, for many Arabs, mealtimes are usually a communal experience where family members eat together, often from a shared dish and using right hands (Ensign, 2021). Moreover, Arabs around the world celebrate many social occasions that center around unique culinary traditions and practices that are an integral part of their collectivistic culture. For example, during the holy month of *Ramadan* (the month when Muslims are required to fast from dawn to dusk), Muslim Arabs often break their fast with dates (traditionally eaten with Arabic coffee served from a classic Arabian coffee pot, which is an elegant and ornate vessel known as the '*dallah*'). During this time, community members distribute/donate dates to other fasting Muslims on streets, on transportation vehicles and/or in mosques as advised by Prophet Muhammad (peace be upon him) (Abu-Farha, 2018; Kadi, 2015). During *Eid Al-Adha* (Feast of Sacrifice which honours the willingness of Prophet Abraham (peace be upon him) to sacrifice his son to obey God's command), Muslim Arabs often offer sacrifices of an animal (e.g., cow, goat) and share the meat with family, relatives/friends, and those in need, celebrating the occasion by cooking/eating traditional meat-based dishes, such as *Fatteh (*a Middle Eastern dish consisting of layers of poached meat, rice, toasted flatbread, nuts and garlicky yogurt) (Bochi, 2023). Many Christian Arabs also often celebrate Christmas by cooking and eating various traditional meat-based meals, such as *kubbeh* (a bulgur- and meat-based balls encasing minced lamb) and stuffed grape leaves (Kassis, 2022).

In the context of PA, the collectivistic nature of the Arab culture also plays a considerable role in many PA/sports types, which are key to many Arabs' sense of identity and well-being. For example, camel racing is a popular Middle Eastern sport that is performed in groups and is associated with various social practices and customs, including its execution on distinctively designed fields under the supervision of expert community committees (Khalaf, 1999). The sport is an essential pillar of many Arabs' identity and presents a source of inspiration for poetry and signing, which resulted in it being inscribed by UNESCO

(2020) on the Representative List of the Intangible Cultural Heritage of Humanity. Soccer has also been far more than just a sport to most Arabs; it is a fundamental part of many Arabs' daily lives and a tool to express socio-cultural and political identities (Busse & Wildangel, 2023). For instance, preeminent soccer clubs in Algeria, Morocco and Tunisia played a substantial role in national liberation movements by helping preserve Arabs' identity against colonization and presenting social/cultural advancement in people's struggles for independence (Busse & Wildangel, 2023). Furthermore, Qatar's hosting of the FIFA World Cup tournament in 2022 was suggested to help preserve national identity and challenge/defy stereotyping of Arabs by the West that often views them as exotic, inferior, and uncivilized (Griffin, 2019; Omer, 2023). Moreover, *Dabke* is a traditional Arabic folk dance that centers around community/family bonding and combines circle and line dancing, popularly performed in weddings and other social occasions (Sellman, 2021). *Dabke* has been particularly significant for Palestinians who engage in the dance wearing traditional clothing as a way to preserve their identity across the globe and to resist the eradication of their culture since the displacements of 1948 and 1967 and under occupation (Al-Dajani, 2013; Mahmoud et al., 2005).

Promoting nutritious traditional foods that meet AIR's cultural preferences and providing culturally relevant PA opportunities may present a promising means to improve the MH and well-being of AIR by enhancing a positive ethnic identity, facilitating their adaptation to their host nations, and reducing their experiences of social exclusion.

2. Mental Health and Well-being

Mental ill-health is a public health and social justice issue that affects about 13% of the global population (WHO, 2022). In 2019, the number of disability-adjusted life years (i.e., a measure of disease burden manifested through the total number of years lost as a result of disability or early death) attributable to mental illness was estimated to be 125.3 million (Ferrari et al., 2022). In Canada and the US, mental ill-

health affects over 20% of the total population (CDC, 2023; Centre for Addiction and Mental Health, 2021). Consequences involve health and social inequities, decreased quality of life, and escalated economic burden. Annual healthcare costs associated with mental ill-health have been estimated to be around $80 and $280 billion in Canada and the US, respectively (Canadian Mental Health Association, 2021; The White House, 2022).

Immigrants are at high risk of MH challenges, given this population's exposure to various stressors throughout their migration trajectory (Kamimura et al., 2020; Wolf et al., 2017). Indeed, leaving one's country of origin and the transition into another nation with different/unfamiliar cultural norms/values and systems can expose immigrants to numerous societal stressors (Elshahat et al., 2022). Examples include, but are not limited to, family separation, social isolation, un- or underemployment, loss of social status, financial hardships, language barriers, racism, and documentation status issues (Ahmad et al., 2020). Furthermore, many refugees suffer additional unique stressors which may place their MH at higher risk than immigrants (Daynes, 2016). Examples of these distinct stressors include, but are not limited to, exposure to political violence, torture, war trauma, severe deprivation of basic human needs, lack of resources in camps and/or transit countries, limited mobility, and visa insecurity (Khoury & Hakim-Larson, 2020). A previous scoping review revealed that MH challenges may be especially critical for AIR owing to various distinct societal stressors (e.g., post-September/11 rise in anti-Arabism and anti-Muslim hate) (Elshahat & Moffat, 2022). A cross-sectional survey found that AIR in the US experienced significantly higher depression scores than African Americans (Jamil et al., 2008). Half of Iraqi refugee participants (n= 366) in another American survey study reported symptoms of depression and psychological distress (Taylor et al., 2014).

The high prevalence of MH challenges among AIR has been linked to the historical racism, stereotyping, demonization, and dehumanization of Arabs in the West, which were exacerbated after September/11

(Jamal & Naber, 2011; Razack, 2022). A survey study found that Arab Americans reported significantly higher anxiety and depression scores after the September/11 attack than before it (Amer & Hovey, 2012). For decades, the Western media has biasedly and unethically painted a picture that discriminatorily portrays Arabs and Muslims as terrorists, uncivilized and inferior, which resulted in more complicated discrimination against AIR in different contexts (e.g., education, job market, workplace, healthcare, housing), aggravating exclusion and exacerbating MH problems (Upal, 2023). A survey of 1,005 Canadian adults found that Arabs were twice as likely to be viewed by Canadians as oppressive towards women (48%), fanatic (21%), and violent (15%), relative to East Asians or Europeans (Canadians for Justice and Peace in the Middle East, 2021). A review study of 17 American newspapers compared 256,963 articles addressing four religions over three decades and found significantly more negative representations of Muslims/Islam compared to Hindus, Jews and Catholics (80, 52, 49 and 45%, respectively) (Bleich & Veen, 2022b). Another review of 528,444 newspaper articles from the US, Canada, the UK, and Australia found that the proportions of negative portrayals of Muslims in these countries were alarming (80, 79, 79 and 77%, respectively) (Bleich & Veen, 2022a). The practices of discrimination and othering of Arabs and Muslims are not limited to media; they have extended to institutional and political levels. Arabs have been harassed on university campuses, Muslim charities' assets have been frozen, mosques have been defaced, and police and security racial profiling of Arabs/Muslims occurs frequently at airports and on streets (Samari, 2016). Examples of discriminatory policies include authoritarian practices after the passage of the US Patriot Act, and the Muslim Ban enacted in 2017 by the previous American President (Donald Trump) that placed strict restrictions on travel to the US against citizens of seven nations, including six Arab countries (Iraq, Libya, Somalia, Sudan, Syria, and Yemen) (Musabji & Abraham, 2016).

Discriminatory practices against Arab groups have also been noted in Canada. For example, discrimination against Syrian Muslims was reported in the context of resettlement and permission to enter

the country (Levitz, 2015). Quebec's Bill 21 that prohibits state employees in Quebec from wearing religious symbols, such as *hijab* (head scarf worn by Muslim women) for Muslims, kippah for Jews and the turban for Sikh, is another example of Canadian discriminatory policies (Canadian Civil Liberties Association, n.d.). In 2021, a Muslim elementary school teacher in Quebec was removed from her job for wearing *hijab,* which triggered a flare of anger and disappointment in the community against this discriminatory bill (Quenneville, 2021).

These discriminatory policies and practices have collectively fueled dreadful hate against Arabs and Muslims in the West and have been associated with an alarming rise in hate crimes/incidents in this population (Samari, 2016). From 2020 to 2021, hate crimes against Arabs and Muslims in the US increased by 48% and 38% respectively, though it is worth pointing out that these numbers likely do not reflect the actual picture of hate crimes due to underreporting by victims who often fear reporting to law enforcement agencies (Melnitsky, 2023). The situation has been much worse in Canada, where more Muslims have been murdered in anti-Muslim hate crimes relative to any other G-7 country (National Council of Canadian Muslims, 2022). In Canada, Muslims are the most targeted population, with anti-Muslim hate crimes increasing by 71% from 2020 to 2021 (Statistics Canada, 2023). Examples of recent high-profile anti-Muslim hate crimes in Canada documented by media include the Quebec City Mosque shooting in January 2017 and the murder of an entire Muslim family during their regular walk in London, Ontario in June 2021 (Zine, 2021a, 2021b). Emerging research reveals that encountering anti-Muslim hate crimes/incidents (either directly or indirectly through, for example, listening to victims' experiences or watching the news) is significantly associated with negative MH (Ahmed & Islam, 2023; Furqan et al., 2022; Kennedy-Turner et al., 2023).

Another major stressor that AIR face is the cross-cultural pressures and differences between the Arab and Western cultures and values. The Arab culture is relatively conservative and emphasizes privacy, with

religion playing a significant role in many Arabs' lives (Federation of American Scientists, 2006). It also often centers around collectivism, emphasizing community and family over self. The transition to the West where publicity is relatively normalized and individualism and secularism are dominant often exposes AIR to significant stress emanating from attempts to adapt, while maintaining one's ethnic identity (Elshahat & Moffat, 2022; Folmer et al., 2014). Ethnic identity can be defined as the sense of belonging and psychological attachment to an ethnic group that shares the same sociocultural characteristics, beliefs, experiences, and heritage of an individual (Trimble & Dickson, 2005). Maintaining positive ethnic identity has been found to protect the MH and well-being of immigrants, including AIR (Elshahat & Moffat, 2022; Urzua et al., 2021). MH is associated with a pervasive stigma and is considered a taboo subject in many cultures (e.g., Arab culture, East- and South-Asian cultures), which is relatively different from the emerging normalization of MH by many Westerners (Elshahat & Moffat, 2021; Karasz et al., 2019; Kleinman, 2012; Yin et al., 2020). While MH stigma is prevalent in many ethnic minority cultures, the issue is not a one-size-fits-all; different ethnic groups often embody distinct values and may express MH symptoms differently (Kirmayer et al., 2011). For AIR, privacy and trust concerns are often common barriers to seeking MH support (Khatib et al., 2023). Some of the common terminologies used by Arabs to express MH challenges include '*khulug dayee'*, '*medaye'* and *'nafseya ta'bana'*: the direct English translation of each term is 'narrow endurance', 'feeling narrowed', and 'soul is tired', respectively (Vink et al., 2022). Lack of awareness and understanding of the cultural values and MH needs/taboos of AIR can expose this population to stressful situations (e.g., miscommunication with healthcare providers, feeling offended) that may threaten this population's MH and well-being (Kleinman, 2012).

Despite the unique MH needs and stressors AIR face, a recent scoping review found a research gap in this area (Elshahat & Moffat, 2021). The review notes that previous AIR-MH studies lacked cultural sensitivity/safety (i.e., honouring and incorporating core cultural values of an ethnic group into any

project/program/service designed to support this particular group) and were researcher-oriented, with no or minimal engagement of the community. Engaging AIR in research design and achieving cultural sensitivity and safety is especially critical for stigmatized topics like MH to fully understand AIR's priorities, collect reliable data, explore potential MH-promoting opportunities and inform effective, culturally appropriate interventions.

3. Food/Nutrition and Mental Health

Substandard nutrition is a significant public health problem that is associated with numerous physical and MH issues and inequities. In the West, the US has the highest diet-related mortality and disability-adjusted life-years rates of about 3982 and 170 per 100,000 populations, respectively (Afshin et al., 2019). This is followed by Canada where diet-related mortality and disability-adjusted life-years rates are 2625 and 127 per 100,000 populations, respectively (Afshin et al., 2019). The relationship between food/nutrition and MH has been documented and extensively researched in previous studies of the general populations (Adan et al., 2019; Firth et al., 2020; Grajek et al., 2022). The food/nutrition-MH relationship, however, is still understudied among immigrants whose dietary intake, food security and MH can be affected by different intersecting socio-economic, cultural, and structural factors, such as poverty, systemic discrimination, cultural proscriptions and food system barriers (Elshahat, Moffat, Gagnon, et al., 2023; Zangiabadi et al., 2024).

Eighteen percent of the Canadian population suffer from household food insecurity (Li et al., 2022). The problem is about six-fold more prevalent among marginalized communities, including immigrants/refugees, due to job insecurity, high food cost, racism, and loss of food identity (Moffat et al., 2017; Vanderkooy, 2016). For example, a lack of Black ethnic grocery stores triggered distress among African immigrants in Canada who linked this to systemic racism (Beagan & Chapman, 2012). Immigrants in the US, especially those with low-income, reported that they have been anxious about

going out and accessing food provider locations and services since the COVID-19 pandemic and the murder of George Floyd, which they perceive to have resulted in accumulated stress (Hearst et al., 2021). Furthermore, immigrants in the US reported receiving discriminatory treatment in food assistance programs, which was associated with feelings of loneliness, fear of seeking food aid from others when needed, thereby exacerbating their food insecurity and stress (Carney, 2015). The role of gender in food security (i.e., women holding more responsibility for procurement, preparation and intrahousehold allocation of food) may also aggravate food insecurity among immigrant women, resulting in nutrition and MH inequities. Some qualitative studies reveal that immigrant women make numerous sacrifices and compromises (e.g., cutting/skipping meals and/or consuming poor-quality foods) to nutritiously feed their families/children, negatively affecting their MH and well-being (Ahmad et al., 2004; Carney, 2014; Carney & Krause, 2020). Immigrant women in a qualitative study by Carney (2015) reported that they often risk themselves (e.g. driving without a license) to procure affordable, nutritious foods to healthfully feed their families, which increases their psychological distress. Furthermore, Carney (2010, 2017) found that immigrant women in the US performed low-wage labor to care for their household food security, which was associated with negative MH. To fulfill their motherhood duties of feeding their children, immigrant women in Carney's studies (2010, 2017) also reported that they had to walk for miles to survey prices at grocery stores to procure affordable food, which was associated with anxiety. Immigrant mothers in the US also reported that they experienced accumulated debt and related distress due to borrowing money repeatedly to fulfill their responsibilities of feeding their children (Carney, 2014). The 2022 Canadian Community Health Survey (CCHS) found that single mothers were among the most vulnerable groups, with food insecurity rate reaching 48%, owing to various intersecting factors, such as debts, lack of assets and unemployment (Statistics Canada, 2022b).

Research also showed that many immigrants carry unique beliefs and have distinct needs regarding food safety and preference that if not met, may affect their food security and MH negatively. For example,

multi-ethnic immigrants in Canada, the UK, and the US perceived fresh/unfrozen produce as essential for cooking traditional, healthy foods that boost their mood (Amos & Lordly, 2014; Beagan & Chapman, 2012; Turkoglu et al., 2020; Vue et al., 2010). Lack of fresh fruits/vegetables and fish in the UK was reported to present a major barrier to nutritional and mental well-being among Polish immigrants who used to consume fresh produce in Poland (Brown & Paszkiewicz, 2017). Similarly, multi-ethnic immigrants, including AIR, reported concerns and worry about lack of fresh produce in Canada due to a common belief that canned/frozen foods are harmful/unsafe to consume and lack nutritional value (Ahmad et al., 2004; Moffat et al., 2017).

In addition to the above-mentioned stressors that immigrants face, AIR have additional unique dietary needs that if not effectively met, may place their food security and MH at higher risk than other immigrant groups. AIR embody certain cultural and religious dietary proscriptions and culinary practices that are fundamental to their ethnic identity and MH (Elshahat & Moffat, 2020; Gillette, 2016). For example, practicing Muslim AIR can only consume food that is identified as *halal* (i.e., permissible to consume according to Islamic law), and thereby need to ensure the *halalness* of any food items (not containing non-halal meat, pork, or alcohol products, which are prohibited for Muslims) before consumption. In order for meat to be *halal*, the animal should meet certain conditions during breeding and slaughtering (Bonne & Verbeke, 2008; Qureshi et al., 2012).

The 2022 Canadian Community Health Survey (CCHS) noted that AIR experience a substantially higher prevalence of food insecurity (27%) compared to the white population (15%) and many other racialized groups, e.g., South Asian (21%), Latino (20%) and Chinese (18%) (Li et al., 2022). High prices for foods that meet AIR's cultural and religious proscriptions and preferences can exacerbate food insecurity and place this population's MH at risk (Elshahat & Moffat, 2020). Different studies of immigrants, including AIR, found that limited availability and/or high-priced *halal* foods in Australia and Canada represented a

source of psychological stress to participants (Amos & Lordly, 2014; Moffat et al., 2017). Furthermore, lack of transparent *halal* labeling was another source of anxiety and distress to Muslim immigrants who reported having to check the religious acceptability of any food item before purchase (Kavian et al., 2020). For Muslims, consuming *halal* food is suggested to promote spiritual well-being and MH (Alzeer et al., 2017). Heidari et al. (2023) reported various pathways through which *halal* food can improve consumers' MH. These include enhancing connection to God and His creation, promoting calmness, inner peace and tranquility, and building discipline and self-control by following God's orders.

There has been growing evidence on the role of cultural/traditional foods in promoting immigrants' MH and well-being (Kilanowski, 2010; Rizvi et al., 2021; Turkoglu et al., 2020; Weaver et al., 2014; Wright et al., 2021). Cultural foods can act as a social lubricant to help reduce post-immigration-related loneliness by bringing immigrant families/friends together and providing an opportunity to establish social networks in the destination country (Brown & Paszkiewicz, 2017; Rabikowska, 2010). Traditional food consumption was reported to help African immigrants in Canada counter racism and enhance a positive cultural/racial identity by facilitating connection and meal-sharing opportunities among community members (Beagan & Chapman, 2012). Immigrants in the US and the UK also reported that consuming cultural foods provided a sense of calmness, relieved their home sickness and reminded them of happy memories in their countries of origin, which was associated with positive MH (Brown & Paszkiewicz, 2017; Vue et al., 2010). Qualitative studies reveal that dining out in ethnic restaurants enhance immigrants' MH and well-being by promoting a feeling of 'being at homeland' (Kavian et al., 2020; Lassetter, 2010). Cultural food accessibility also helps to foster a positive ethnic identity and promote feelings of being 'at home' among Syrian refugees in São Paulo, Brazil (Porreca et al., 2019; Scagliusi et al., 2018).

Recent research about AIR living in Canada demonstrates that AIR have distinct dietary needs and face various socio-cultural issues around food security, such as lack of accessibility to culturally acceptable foods (Al-Kharabsheh et al., 2020; Chevrier et al., 2023; Vatanparast et al., 2020). Nevertheless, a recent scoping review found that there is still a paucity of research about diet and food security amongst AIR, with no studies closely exploring the food/nutrition-MH relationship (Elshahat & Moffat, 2020). This scoping review also noted the need for more mindful community-engagement and cultural sensitivity/safety in dietary research of AIR, which is crucial for gaining an in-depth understanding of this community's needs, collecting reliable data, exploring potential opportunities for promoting food security and designing effective community-informed interventions.

4. Physical Activity and Mental Health

Physical inactivity is a significant global public health issue and the fourth key risk factor for multiple non-communicable diseases, including MH issues (Park et al., 2020). Globally, around 3.2 million deaths and 13.4 million disability-adjusted life-years have been attributable to physical inactivity annually (WHO, 2023). In Canada and the US, the healthcare and societal costs of physical inactivity have been estimated to exceed $28.5 billion annually (Ding et al., 2016). Adequate PA participation (weekly participation in ≥150 min of moderate-intensity activity or ≥75 min of vigorous-intensity activity or an equivalent combination of both) directly contributes to reaching goal three of the UN Sustainable Development Goals (healthy lives and well-being for all) by helping prevent and manage non-communicable diseases, including mental-ill health (UN, 2015). Nonetheless, only 47% and 50% of the American and Canadian populations, respectively, participate in sufficient PA (CDC, 2022; Statistics Canada, 2021). These reported low PA prevalences highlight the need for more health promotion work to raise the profile of optimal health and well-being.

The terms ‘physical activity’ and ‘exercise’ have been used interchangeably in the literature, though they refer to different concepts (Ceria-Ulep, Tse, et al., 2011). PA may broadly be conceptualized as any skeletal muscle-related bodily movements that result in energy expenditure and are expressed in metabolic equivalents (i.e., a physiological concept used to express intensity and energy expenditure associated with PA engagement) (Caspersen et al., 1985). PA occurs across life domains: domestic, leisure, occupational and travel. Exercise, on the other hand, is a subcategory of PA, specifically leisure physical activity (LPA); it usually refers to planned/structured and repetitious activity that is purposefully practised to improve health and well-being (Ceria-Ulep, Tse, et al., 2011). Sport is a subcategory of exercise and may be practised individually and/or as part of a team, and usually incorporates competition and entertainment (Malm et al., 2019). A lack of consistency in the definitions of these concepts and the interchangeable use of them is evident in previous research, particularly qualitive studies, and has been criticized as PA and exercise may be perceived differently among individuals from different cultural backgrounds (Elshahat, Moffat, Morshed, et al., 2023; Hartley et al., 2017). For example, Arab and Filipino migrants perceived their day-to-day chore activities (e.g., cleaning windows, hand-washing of laundry) as exercise (Ceria-Ulep, Serafica, et al., 2011; Devlin et al., 2012), as opposed to Asian migrants who did not consider chores as exercise (Caperchione et al., 2011). These differences in perceptions underscore the need for consistent conceptualization of PA and exercise to best understand immigrants’ needs. Additionally, categorization and research on different domain-specific PA, which are often associated with different MH benefits, is needed. For example, structured LPA appeared to improve immigrants’ MH by enhancing social cohesion and self-agency (Elshahat, Moffat, Morshed, et al., 2023).

Immigrants/refugees are at higher risk for physical inactivity than the general population due to different socio-economic, cultural, environmental, and structural factors that may impede their PA and MH (Kobrosly, 2019; Mude & Mwanri, 2016; Södergren et al., 2010; Tremblay et al., 2006). Examples of these factors include poverty, language barriers, cultural beliefs, systemic discrimination, difference in

climate between country of origin and destination country. Moreover, gender discrimination is predominant in many cultures, which may contribute to gender inequities in PA and MH (Elshahat, Moffat, Morshed, et al., 2023). Qualitative studies show that various gendered-social influences and cultural norms were associated with low PA participation and negative MH among immigrant women. For example, Middle Eastern and Asian immigrant women embodied gendered cultural beliefs that females should not engage in any exercise activities during menstruation, which was related to negative MH among these women (Hashimoto-Govindasamy & Rose, 2011; Im & Choe, 2001, 2004). Multi-ethnic immigrant women also experience stigma around participation in male-dominated sports (e.g. boxing, hockey), which was associated with women's feelings of discrimination/exclusion and depression symptoms (Caperchione et al., 2011; Haith-Cooper et al., 2018). On the other hand, women-only sports clubs/programs in Europe were reported to provide a judgemental free space for ethno-culturally diverse immigrant women, facilitating their participation in male dominated sports, and enhancing a feeling of equity that improved their MH (Verreault, 2017; Walseth, 2008).

In addition to the above-mentioned factors and stressors that immigrants experience, AIR have additional unique socio-cultural needs that if not mindfully met, may hinder their PA participation, and place their MH at higher risk than other immigrant groups. Many AIR embody specific cultural and religious proscriptions that forbid them from wearing tight/short clothes in public and exercising in mixed-gender facilities (Elshahat & Newbold, 2021). Lack of availability of culturally appropriate clothing, facilities and programs that accommodate AIR's cultural needs was reported to impede this population's PA and well-being (Benn & Pfister, 2013; Dagkas & Benn, 2006; Eldoumi & Gates, 2019). Culturally-safe, gender-segregated exercise interventions, on the other hand, enhanced PA engagement among Sudanese refugee women in Australia and helped foster their social inclusion, which was associated with positive MH and well-being (Hashimoto-Govindasamy & Rose, 2011).

There has been growing evidence for the role of culturally-familiar PA and ethnic sports in promoting immigrants' MH and well-being (Kim et al., 2016; Mao et al., 2020). For example, engagement in *Taekwondo* (Korean self-defence sport that comprises many kicks and punches techniques) empowered Korean immigrants in the US to preserve their identity, which was related to reduced psychological distress (Kim et al., 2012). Likewise, participation in Chinese sports (e.g., *Tai Chi, Kung Fu, Qi Gong*) was associated with positive MH and well-being among Chinese immigrants in Canada (Taylor et al., 2008; Tong et al., 2019). A three-month *Tai Chi* sport program was significantly related to social cohesiveness and reduced distress symptoms in Chinese immigrants in the US (Taylor-Piliae et al., 2006). Moreover, cultural dance interventions were found to help multi-ethnic immigrants maintain a sense of belonging and feel connected to their cultural heritage/roots and thereby minimize anxiety and depression symptoms (Verreault, 2017). Similarly, participation in *Dabke* (a traditional Arabic folk dance) was found to promote the MH and well-being of Palestinian-Syrian refugees in Europe by re-establishing their identity, promoting feelings of peace and connection to homeland and overcoming war-related trauma (Ziadeh, 2020).

Preliminary research found that AIR in Canada face unique psycho-socio-cultural barriers (e.g., fear of post-9/11 rise in harassment and lack of culturally appropriate resources) that impede their PA participation and place their MH at risk (Elshahat & Newbold, 2021). Providing culturally-relevant PA opportunities may present a promising avenue for promoting AIR's MH by enhancing adaptation and reducing social exclusion (Sjögren Forss et al., 2020). Despite the distinct barriers AIR experience around PA, there is a research gap in this area, due to social exclusion and fear of being prejudged/misunderstood. A recent AIR-focused scoping review of 75 studies found that Canada is far behind Australia, Europe, and the US, in AIR-PA research, with only 5% of studies performed in Canada, none of which closely explored the PA-MH relationship (Elshahat & Newbold, 2021). These studies employed researcher-oriented methodological designs that do not mindfully engage marginalized

communities as partners and overlook cultural sensitivity/safety. Ensuring cultural sensitivity and safety in PA-MH research can be critical for AIR to facilitate cultural understanding, enhance data reliability, explore potential opportunities for PA and MH promotion and inform effective, culturally-appropriate interventions (Elshahat & Moffat, 2021).

5. Theoretical and Conceptual Frameworks

5.1. The Healthy Immigrant Effect and Resilience

In immigrant health research, there has been a growing interest in the 'healthy immigrant effect' (HIE) theory, which posits that immigrants enjoy better health outcomes compared to non-immigrant populations in the host country (Newbold, 2006). Most of the HIE research that suggests the presence of health advantage in immigrants mainly studied mortality and physical health outcomes/indicators, such as cardiovascular diseases, diabetes, and total cholesterol, with limited attention given to MH (Aldridge et al., 2018; Ng & Zhang, 2020; Vang et al., 2017; Vang & Ng, 2023). A recent systematic review on HIE-MH found inconsistent evidence about the MH advantage amongst immigrants relative to non-immigrant individuals (Elshahat et al., 2022). Whilst some studies reported significantly better MH in immigrants than non-immigrant comparators (Ali, 2002; Budhwani et al., 2015; Stafford et al., 2010), others showed either significantly poorer MH (Boen & Hummer, 2019; Casillas et al., 2012; Silveira et al., 2002) or non-significant differences (Choi et al., 2016; King et al., 2019). These inconsistent findings were also reported in HIE-physical health reviews and may partly be related to inconsistency in the definition of

immigrant and comparator/reference groups (Osypuk et al., 2015; Vang et al., 2017). Whilst some studies defined immigrants as foreign-born individuals (i.e., first-generation immigrants) (Hamilton, 2015; Kwak, 2016), others provided a broader definition, including foreign-born individuals and their descendants (i.e., second- and third-generation immigrants) (Lee, 2019; Van Geel & Vedder, 2010). Regarding comparison

group, definitions in previous studies substantially varied among second- and third-generation immigrants, non-immigrants or a combination of both (Bousmah et al., 2019; Helgesson et al., 2019; Kwak, 2016). The inconsistent findings across HIE studies may also in part be explained by the lack of clarity regarding whether the sample of immigrant group included or excluded refugees (Elshahat et al., 2022). Compared to voluntary migrants, refugees are more likely to suffer from various distinct stressors (e.g., political persecution/violence, few material resources, war trauma, uprooting and suboptimal hygiene in refugee camps/transit countries) that can negatively impact their health and well-being (Daynes, 2016).

The health advantage noted in some HIE studies has been explained by 'the immigrant selection hypothesis' that proposes that receiving countries positively select healthy immigrants by applying strict immigration policies, such as the points-based systems in Canada and Australia that favor and screen for those with optimal health and socio-economic status (Ramraj et al., 2015; Vang et al., 2017). This perspective, nonetheless, fails to take into account the situation of refugees and undocumented immigrants, which often does not comprise a positive selection. Previous HIE studies have also proposed that the suggested health advantage in immigrants could be attributed to the concept of resilience (Oh et al., 2015; Wu et al., 2010). In the psychological sense, resilience is far more than the absence of psychopathology; it is a dynamic process that entails people's capacity for continuous adaptation and transformation to effectively cope with adversities and stressors (Ciaramella et al., 2022; Mendenhall & Kim, 2021; Ungar, 2013). A broader definition of resilience involves multifaceted, interconnected community assets and protective factors/pathways/processes that enable individuals to adapt and take control of their health and well-being, despite societal stressors (Olcese et al., 2024; Panter-Brick, 2014; Windle, 2011).

In the past few years, the concept of resilience has been heavily criticized (and rightly so), with calls for a more culturally safe and sensitive, context-oriented, white supremacy-free conceptualization, particularly in the context of racialized groups and in light of oppression, racism and the 'othering' that these groups suffer (Bottrell, 2009; Sims-Schouten & Gilbert, 2022; Theron, 2015; Michael Ungar, 2011; Van Breda, 2018). Sims-Schouten and Gilbert (2022) have reported that the concept of resilience has widely been applied to ethnic minorities in ways that are biased, dehumanizing, flawed and stigmatizing, where these marginalized groups are often accused of not having right capacities/competencies and defined as in need of adaptation/resilience, whilst their experiences of oppression and structural discrimination/racism (e.g., racial profiling in schools, healthcare, job applications, policy enforcement) are erased and swept under the rug. It has been argued that the current conceptualizations of resilience should be reconceptualized/redefined for ethnic groups, taking into account multilayered and interactive impacts of personal, institutional, political and socio-cultural factors that may influence one's behaviour, MH and wellbeing (Van Breda, 2018). This can be particularly critical in settings dominated by oppressive white viewpoints/voices that determine what 'positive emotions and traits' and 'coping processes' entail and in societies where the voices of racialized communities are censored, under-represented and silenced (Sims-Schouten & Gilbert, 2022; Theron, 2015).

The focus on adaptation/transformation in the conceptualization of resilience can only result in the increase in absenting, 'othering', under-representation, and blaming ethnic community members for not coping in oppressive environments, and as such exacerbate racism, dehumanization, and discriminatory practices (Hicks, 2015). Instead, a focus on agency, structure, and community-engagement (i.e.., engaging *with* community, instead of *about/on* the community, through for example research and programing) is fundamental to gain in-depth insight into what resilience entails by actively listening/understanding each community member's unique experiences of adversities, coping behaviours/mechanisms and outcomes.

Without this, there is solely the alarming risk of ‘absenting’, dehumanization, ‘othering’, and more seriously, unethically labelling/viewing affected communities and individuals as ‘different’, ‘resistant’ and a threat (Sims-Schouten & Gilbert, 2022). For example, a black mother participant in a British study (Sims-Schouten & Gilbert, 2022) reported that her child had been taunted and called the N-word in class, which led her to get very angry at school. Instead of addressing the issue that made this mother traumatized/upset, the school viewed her behaviour in response to racism (i.e., anger) as 'different’ and ‘threatening’, and so oppressively threatened her that they would call the police to arrest her. Framing behaviours and responses to racism as ‘different’ and ‘threatening’ largely focuses on a moralistic, reductionist and isolated notion of the affected person, who is blamed for their behaviour, instead of considering broad social structures and oppressive systems (Bottrell, 2009). This has been described as biased and exclusionary, leading to one-sided judgements and views that locate the issues in the affected person and their community and ignoring the details of the entire context (Sims-Schouten & Gilbert, 2022). This highlights the need to reconceptualize and redefine resilience.

Many scholars argue that ‘difference’ and resistance are important forms/strategies of resilience among racialized groups and that they should be acknowledged and recognized, especially in light of the trauma related to racism (Bottrell, 2007; Hart et al., 2016; Sims-Schouten & Gilbert, 2022). Sims-Schouten and Gilbert (2022) delineated that for many historically racialized/oppressed communities, resilience can mean ‘resistance’, i.e., resisting unjust treatment and racism, and fighting for dignity, justice, freedom and maintenance of one’s culture/identity. Likewise, other scholars suggest that resistance to adversity is much more appropriate than resilience (Bottrell, 2009; Van Breda, 2018). Bottrell (2007) describes resistance as critiques, behaviours and practices that express opposition to oppressive regimes, rules, and systems in certain contexts as a result of long-lived experience of marginalization and trauma. Resistance has been a coping mechanism among many politically oppressed communities. For example, people of

South Africa adopted resistance as a liberation movement and as a way to show opposition to the apartheid state (Switzer & Adhikari, 2001). Resistance has continued in post-apartheid South Africa, where protests have been used to resist poor living conditions which helped affected people survive and remain resilient (Mottiar, 2019). Likewise, many studies found that Palestinians use *Sumud* (concept that is interwoven with ideas of resilience and steadfastness) and resistance as a source of resilience and a coping mechanism to survive/thrive in their homeland despite hardship and violent occupation practices (Gould, 2014; Makkawi, 2012; Marie et al., 2017; Nguyen-Gillham et al., 2008). In a qualitative study by van Teeffelen et al. (2005), Palestinian artists crafted different drawings to illustrate the concept of *Sumud.* One participant drew an old olive tree with profound roots, with branches that are flexible and strong in facing adverse events, such as strong winds. The tree symbolizes the authentic thousands-of-years history and peace, the roots symbolize steadfastness on the Holy land, and the branches symbolize Palestinians' resilience, whereas the wind is a symbol of occupation (van Teeffelen et al., 2005). Faith, identity, religion and spirituality have also been reported to be sources of resilience among Palestinians in occupied Palestinian territories and in AIR in the US after September/11 (Abu, 2004; Beitin & Allen, 2005; Marie et al., 2017). Furthermore, Muslim participants in a study by Abu (2004) reported that the Islamic religion was a source of resilience. Indeed, Islamic spiritual care has been growingly used by many Muslim care providers to support the MH and well-being of Muslims (Baig & Isgandarova, 2023; Isgandarova, 2005, 2011, 2012, 2014). The life story of prophet Mohamed (PBUH) has acted as a role model of resilience and inspired many Muslims to follow his teachings (Considine, 2020).

5.2. Years Since Immigration Effect, Acculturation & Cumulative Stress Theories and Social Suffering

An interrelated phenomenon to the HIE theory is the "years since immigration effect" (YSIE) that posits that the initial health advantage among immigrants starts to decline with increased length of residency in the host country (McDonald & Kennedy, 2004). Within immigrant health research, there has been little

attention given to the YSIE theory. A recent systematic review of 58 studies found that only 45% of HIE-MH studies examined the YSIE, and these mainly used quantitative cross-sectional or secondary analysis design, highlighting a gap in qualitative research, which is crucial to obtain an in-depth understanding of immigrants' perceptions and MH experiences after immigration (Elshahat et al., 2022). The systematic review found consistent, convincing evidence for a decrease in the MH of immigrants over years in the host country, which supports the YSIE theory (Elshahat et al., 2022). The noted decline in immigrants' health with increased length of residency has been linked to unhealthy acculturation into Western lifestyle (e.g., hiding one's ethnic identity and adopting unhealthy/risky behaviors, including over-reliance on poor-nutrient, convenience foods, smoking, and sedentary lifestyle, etc.) (Lu et al., 2017). A healthy process of acculturation is conceptualized as healthful/mindful integration into the society of the host country, while preserving one's cultural roots/values with minimal pressures from the mainstream society to completely fit in (Elshahat & Moffat, 2021; Salant & Lauderdale, 2003). The acculturation concept has broadly been used in immigrant MH research, but acculturation-focused MH studies arrived at inconsistent results. Some studies found a positive relationship between acculturation and MH of immigrants (Barrett et al., 2002; Cho et al., 2003), whereas others noted negative associations (Bratter & Eschbach, 2005; Buddington, 2002). On the other hand, other studies did not find any relationship between acculturation and MH (Castillo et al., 2004; Franzini & Fernandez-Esquer, 2004). These inconsistent findings may in part be explained by acculturation measurement issues. Across immigrant-MH studies acculturation has mainly been measured through scales that focus on three prime proxy indicators: language proficiency, length of stay in destination country and nativity (Salant & Lauderdale, 2003). This approach to measuring acculturation has been criticized, given that acculturation is a complex, dynamic and multi-faceted process that is associated with a variety of strategies that can considerably vary according to socio-economic, cultural and structural factors and parameters, such as

each individual's material conditions, cultural context, history and social capital (Lopez-Class et al., 2011).

Another potential explanation for the observed decline in immigrant health with increased length of residency pertains to the accumulative exposure to numerous stressors in the destination country at different levels: individual (e.g., language barriers or financial pressures), socio-cultural (e.g., low social support), and structural (e.g., systemic discrimination, racism, health/social systems barriers) (Lau et al., 2013). Central to the stress theory is the assumption that there is a negative connection between stress and human health (Weber, 2011). Providing a deeper understanding of the detrimental impacts of stress, the cumulative stress theory suggests that human exposure to different stressors cumulatively adds up to cause a dysregulation of physiological mediators, resulting in various physical and MH impairments (Tuggle et al., 2018). Indeed, immigrants face numerous repeated migration stressors that can build up gradually over years, eventually giving rise to the noted decline in their health with increased length of residency (Bhatnagar, 2014). Following migration, individual stressors, such as language barriers, may be navigated by harnessing the available key resources by immigrants in the destination country. However, many societal and organizational stressors that are historically and structurally embedded within society may be harder to address (as they require radical social reformation), which is often related to continuous trauma, social suffering and poor MH among the affected immigrant communities (Scott-Jones & Kamara, 2020).

Perception of discrimination may prominently factor in racialized/ethnic minorities' life experiences, as recurrent exposure to and fear of racism-related incidents often triggers repeated stress responses and subsequent decline in health and well-being (Elshahat et al., 2022). For example, historical oppressive policing practices (e.g. stop and frisk) and arrest history were related to negative MH in African Americans (Anglin et al., 2014). Forced movement of Indigenous Peoples and stealing their children to

forcibly/unethically send them to Residential Schools and erase their native culture have been associated with intergenerational trauma in this marginalized population in Canada (Smye et al., 2023). The continued dehumanization/demonization of Arabs by Western governments and media and history of cruel occupation of Arab lands and torturing their inhabitants to death (e.g., the American invasion/occupation of Iraq, the British occupation of Egypt, Palestine, Gulf region, Somalia, Sudan and Yemen, the Italian occupation of Libya, the French occupation of Algeria, Lebanon, Syria, Morocco and Tunisia, and the Spanish occupation of Morocco), have been associated with collective and intergenerational trauma in the Arab community (Hamadeh et al., 2023; Hosny et al., 2023). For example, Algeria has been named '*blad Al-milyun shaheed*,' (the million-martyr country), where the French military killed about one million Algerians and deliberately tortured inhabitants, committing numerous crimes against humanity, such as systematic stripping of people, burying elderly people alive, hanging by the feet/hands, using electric shock and water torture, and violently depriving women of their virginity (an important part of women's identity before marriage in Algerian society) by committing rape, including cruel rape by beer bottles (Bensmaia & Gage, 2014; El Atti, 2033; Kooistra, 2022). Likewise, different case studies showed numerous crimes and human rights violations committed by the US occupation forces against innocent Iraqi people, including gang raping of children after invading their families' homes, arresting the elderly, women and people with disabilities as terror tactics, and torturing naked detainees with electricity through their genital organs (Khawaja, 2012). One Iraqi refugee survivor who fled from Iraq seeking refuge in Sweden reported that the scars of persecution and violence, where he was deprived of food, stripped naked multiple times and taunted by dogs, have been negatively impacting his physical and MH to date (Masri, 2023). The bloody history of these occupations resulted in historical and intergenerational traumas for members of the Arab community.

Societal failures to provide accessible, culturally-sensitive/safe health and social care services in Western countries has been linked to worsened MH outcomes among racialized immigrants, due to prejudice, lack of cultural understanding of unique historical traumas, and miscommunication (Whitley, 2014). Indeed, ensuring culturally sensitive/safe services that effectively meet the social, cultural, and linguistic needs of historically disadvantaged ethnic minorities and diverse immigrants is a cornerstone of an equitable, healthy and prosperous society. This may be particularly critical for MH services due to different cultural beliefs and stigma associated with MH issues that can be quite pervasive in many cultures (Chimoriya et al., 2023; Shu et al., 2022). There has been a growing increase in medicalization of MH, which is often fueled by the pharmaceutical industry's interest in the development of vast diagnostic classifications and markets for 'selling sickness' (Kleinman, 2012). The Diagnostic and Statistical Manual of Mental Disorders (DSM) approach has been criticized for expanding MH diagnostic classifications by adding further conditions that redefine and label more people as mentally ill that need medical treatment while ignoring people's lived adverse/traumatizing experiences and social suffering (Boysen & Ebersole, 2014; Kleinman, 2012). The concept of 'social suffering' was introduced by Kleinman (2012) to argue that suffering can be a human reaction and product of the continued exposure to a set of interrelated political, socio-economic, and institutional influences and powers that need to be effectively addressed instead of medicalizing people's feelings and labeling the affected people as mentally ill. For example, in their MH study with Indigenous people in Canada, Smye et al. (2023) proposed that MH services delivery should be mindfully developed with awareness, and responsiveness to the effects of the historical structural violence and related social suffering on affected individuals' lived experiences and realities. This can be achieved by adopting relational practice and policies, i.e., an approach to healthcare practice that recognizes the social context as a potent force which shapes both marginalized communities' health and the way care should be provided (Lamph et al., 2023).

5.3. Social Determinants of Health, Intersectionality and Inequities

Over the past decades, there has been a growing interest in the 'social determinants of health' (SDoH) as a conceptual framework to tackle health and social inequities. The SDoH framework posits that individuals' health is impacted/shaped by the conditions and environment in which they were born, live(d), work(ed) and age(d), including individual, economic, demographic, socio-cultural and political contexts (Marmot & Wilkinson, 2005; Raphael, 2016). For example, poverty and poor living conditions have been linked to increased social deprivation (e.g., food and water insecurity, homelessness, inadequate healthcare), psychological distress, and negative health outcomes (Marmot & Wilkinson, 2005). Poverty has also been related to malnutrition, 'hidden hunger' (i.e., micronutrient deficiencies that occur as a result of consuming low-nutrient diet) and many communicable and non-communicable diseases, such as diabetes and mental-ill health (Siddiqui et al., 2020; Weffort & Lamounier, 2023). Low socio-economic status has also widely been linked to low PA levels and poor health outcomes (Rawal et al., 2020). Basky (2020) reports that individuals living in low-income and less walkable neighborhoods are more likely to develop chronic health problems, such as diabetes, relative to those residing in more walkable high-income areas. Poor working conditions (e.g., inflexible work schedules, physically dangerous environment, lack of sick leave, late shifts) have also been associated with poor physical and MH (Hämmig, 2017). The 2021 US National Health Interview Survey found more serious psychological distress levels among working participants who faced difficulty changing their work schedule and who had no paid sick leave compared to those who had a relatively more flexible schedule and paid sick leave options (Mykyta, 2023). A 5,877-employee study in Switzerland noted that lack of supervisor support was significantly associated with poor physical and MH outcomes (Hämmig, 2017). Conversely, a qualitative study of 39 employees in the UK found that compassionate supervisors helped protect employees' MH by, for example, going above and beyond to shield them from poor policies/leadership from elsewhere in the institution (Nielsen & Yarker, 2023).

Although the above issues can impact the health and well-being of any population, immigrants are often at higher risk due to experiencing various additional complex/unique stressors. For example, Latino immigrants reported barriers to equitable employment in the US where they often are sorted into low-wage/low-quality jobs, suffer from poor working conditions and have higher job fatality rates than many other immigrant groups (Salinas & Salinas, 2022). These issues are much worse for undocumented migrants who involuntarily accept these risky conditions due to fearing deportation or losing their employment, which places their health at higher risk than their documented migrant counterparts.

For many immigrants, particularly those from racialized groups, different socio-demographic characteristics (e.g., age, gender, religion) often intersect with one another and with other external stressors (e.g., systemic discrimination), resulting in multiple inequities and vulnerabilities. Intersectionality is a concept that acknowledges the various axes of marginalization, including different facets of one's social and political identities and how these can intersect/interact, giving rise to different modes of discrimination, oppression and inequities (Crenshaw, 2006; Weldon, 2008). The concept has been widely used to uncover the dynamics of possessing multiple marginalized identities, including the invisibility of people with many intersecting marginalized identities. The 'intersectional invisibility' hypothesis suggests that people with various marginalized identities often struggle to be acknowledged, heard, and represented compared to other groups (Al'Uqdah et al., 2019). The invisibility suffered by marginalized racialized groups may be explained by the concept of centeredness, which suggests that Western society is male-centered, White-centered, and Christian-centered (Crenshaw, 2006). White-centeredness, and Christian- centeredness may contribute to the marginalization of people of colour and non-Christians. Al'Uqdah et al. (2019) found that African Muslims in the US faced complex inequities and MH challenges that are aggravated by their intersectional identity as African *and* Muslim. Similarity, Muslim Arab immigrants in the US reported various MH issues and inequities exacerbated by their intersectional identity as Arab *and* Muslim (Hassouneh & Kulwicki, 2007). A broader anthropological

approach to intersectionality emphasizes culture, connection and belonging and how systems failures to meet cultural needs of different ethnic groups can intersect with other socio-demographic characteristics, giving rise to multiple inequities (Degnen & Tyler, 2017). For example, lack of availability of affordable nutritious, culturally appropriate foods and PA services intersect with low socio-economic status and the Arab identity among AIR in Western countries, resulting in complex food security issues, low activity levels and multiple nutrition and PA inequities (Elshahat & Moffat, 2020; Elshahat & Newbold, 2021). Cultural exclusion and social injustice often fuel nutrition and other health inequities across populations and thereby negatively impact people's health and nutritional well-being (Nisbett, 2019; Nisbett et al., 2022; Thayer et al., 2022). Addressing socio-cultural and political determinants of health and nutrition is an essential step and the most sustainable way to achieve nutrition and health equity for all populations.

5.4. Nutrition Transition and Dietary Acculturation

There has been a growing number of studies that address the concept of 'nutrition transition', which refers to the alarming shift in people's dietary intake from healthy, high-nutrient foods to a fat/sugar-dense and poor-nutrient diet (Popkin, 2015; Popkin & Gordon-Larsen, 2004; Popkin et al., 2012). Nutrition transition is thought to be a product of many interrelated socio-economic, and structural factors, such as poverty, high-priced healthy foods, the widespread advertisement of convenience fast foods, and unhealthy food environments (Popkin, 2015). This transition has been linked to many physical illnesses, such as diabetes and atherosclerosis, as well as neurological and MH problems (Liang et al., 2023). Many immigrants, and particularly those who lived in urban areas before migration, likely experienced the detrimental impact of nutrition transition in their countries of origin (Garduno, 2015). Moving to Western nations may move immigrants further along in this transition, placing them at higher risk for poor nutrition, and dietary-related health problems than the broader population. For example, Himmelgreen et al. (2014) notes that Mexican migrants to the US experience negative impacts of the nutrition transition in

both their homeland and the destination country. This is consistent with conclusions reported in a review of dietary practices among AIR in Western countries (Elshahat & Moffat, 2020).

Within immigrant dietary research, the concept of dietary acculturation has widely been used and broadly refers to the process of adaptation and integration into the host country and its food environment and system (Berry, 1997). A more inclusive definition of the concept involves the environment/system and resources that help immigrants integrate into their new home as active members, while preserving their cultural food values and practices with minimal stress and pressure from the mainstream society to fully fit in (i.e., to entirely adopt its culinary practices and eating habits that may be culturally inappropriate to specific immigrant groups) (Elshahat & Moffat, 2020). The dietary acculturation concept has mainly been used in nutrition studies of Asian and Latino immigrants, and to lesser extent among AIR. Overall, and regardless of the studied immigrant group, findings from dietary acculturation research are inconsistent. While some studies noted positive changes in dietary intake of accultured immigrants (e.g., higher intake of fruits/vegetables) (Eldoumi & Gates, 2017; Khan et al., 2016), others found that acculturation was related to negative changes (e.g., increase in convenience food consumption and/or reduced fruits/vegetables intake) (Aljaroudi et al., 2019; Neuhouser et al., 2004). These conflicting findings have been attributed to dietary acculturation measurements issues, where studies have mainly relied on broad proxy measures (e.g., length of residency, and language proficiency) (Elshahat & Moffat, 2020). This approach has been criticized as it overlooks other important context-based factors, (e.g., socio-economic status, cultural beliefs and proscriptions, family size and support), which often interact, giving rise to differences in dietary acculturation processes and strategies. A more holistic approach/framework that considers the complexity of different immigrants' characteristics, and psychological, socio-cultural, and structural influences and their relationship to health and nutritional well-being is needed (Elshahat,

Moffat, Gagnon, et al., 2023). An example of such approach is the bio-psycho-socio-cultural framework which is discussed in the following section.

5.5. Bio-psycho-socio-cultural Framework

Despite the unique psycho-sociocultural issues faced by immigrants in the context of food (in)security, nutrition and PA participation, most immigrant health research uses a biomedical perspective, ignoring the substantial impact of systems failure and culture on shaping immigrants' food security and nutritional status and PA engagement (Elshahat, Moffat, Gagnon, et al., 2023; Elshahat, Moffat, Morshed, et al., 2023). There is a need for a holistic framework that acknowledges that nutrition is far beyond nutritional and caloric values of food and that PA comprises more than bodily movements and energy expenditure, and considers, for example, contexts and different interrelated socio-cultural, psychological, and biological factors and their impact on one's dietary intake, PA levels, health, and well-being. An integrated bio-psycho-socio-cultural framework provides a promising opportunity to explore the complexity of food/nutrition and PA needs as they relate to communities' health by coalescing the complex, dynamic and multi-layered interplays between human biological facets, the broader physical and socio-cultural environment as well as economic and political structures (Nunes, 2012). Two recent scoping reviews found that a holistic bio-psycho-socio-cultural perspective can be particularly beneficial in providing in-depth insights into the complex food/nutrition and PA needs of immigrants, given this population's embodiment of unique cultural beliefs and exposure to numerous stressors that may place their health at higher risk than the broader population (Elshahat, Moffat, Gagnon, et al., 2023; Elshahat, Moffat, Morshed, et al., 2023).

6. Aim, Objectives and Research Questions

The CAN-HEAL community-engaged research aims to intensively research food/nutrition, LPA, and MH needs among AIR in Ontario, Canada, as well as co-develop a culturally appropriate action plan to improve AIR's nutritional status, LPA participation, MH, and well-being. This is achieved through three original studies, which are presented in chapters 3, 4 and 5. Summaries of these chapters/studies are outlined in the next section. These studies seek to answer the following broad research questions: 1) *What are the complex food/nutrition, leisure physical activity and mental health experiences and needs among Arab immigrants/refugees in Ontario, Canada?, and 2) Can improved access to culturally appropriate foods and leisure physical activity opportunities promote the mental health and well-being of this population, and if so, how?* The three following general key objectives were explored in this dissertation to address this research question:

1. To gain in-depth understanding of experiences, perceptions and factors that impact AIR's dietary intake, food security status, LPA participation and MH.
2. To examine the complex relationship between food/nutrition, LPA, and MH among AIR.
3. To co-propose a culturally appropriate action plan to improve AIR's food security, nutritional status, LPA participation, MH and well-being.

7. Thesis Chapter Outlines and Summary of Research Studies

This dissertation comprises six chapters, following the McMaster University "sandwich thesis" recommended format. Chapter 2 addresses the project methods including location/setting, community partnership techniques, data collection methods, recruitment and sampling strategies, ethics, methodological frameworks, cultural safety/sensitivity principles, my positionality as a researcher, as well as challenges versus enablers of this project. Chapters 3, 4, and 5 present three standalone articles that have been structured and submitted for publication in scholarly journals, two of which have been

published (Elshahat, Moffat, Iqbal, Newbold, Gagnon, et al., 2024; Elshahat, Moffat, Iqbal, Newbold, Morshed, et al., 2024). All the three studies were part of the larger CAN-HEAL study that adopted a collaborative, community-based participatory research and integrated knowledge translation approach that follows cultural sensitivity best practices to build partnership with the community. This approach aided the collection of reliable data that reflect the actual dietary, LPA and MH experiences and needs of the Arab community. Data in these three studies were collected from 60 AIR adult participants using three different methods (qualitative interviews, Photovoice methodology and survey questionnaire) to address the study's aim. Chapter 6 comprises an overview of the overall research aim and objectives and how these were effectively addressed, before discussing the main findings of the research, and outlining the advocacy and knowledge translation efforts exerted to support the mental well-being of the AIR community. Chapter 6 also outlines the research strengths and limitations, the thesis's contribution to the literature, the conclusion and future directions/opportunities. Overviews of the three standalone articles (chapters 3, 4 and 5) are presented below.

7.1. Chapter 3 (Study 1): 'I thought we would be nourished here': the complexity of nutrition/food and its relationship to mental health among Arab immigrants/refugees in Canada: the CAN-HEAL study. Article published in Appetite in January 2024.

This chapter examines food/nutrition needs as they relate to MH among AIR in Ontario, Canada. Previous research has found that AIR in Canada face various socio-cultural stressors and barriers to food security and nutritious eating, such as limited accessibility of culturally acceptable foods that meet AIR cultural proscriptions and preferences. This paper provides an in-depth exploration of the complexity of these issues among AIR living in Ontario as well as their food/nutrition needs as they pertain to their MH and well-being. The research was guided by an *integrated* bio-psycho-socio-cultural framework to thoroughly uncover the complexity of food/nutrition needs as they relate to the MH challenges and needs of AIR. Participants in this research experienced an alarming prevalence of food insecurity (65%) and reported

various barriers to nutritious eating which was associated with negative MH. Food quality/safety presented a substantial concern and source of anxiety for AIR; expired/rotten food products, food mislabeling, and the widespread presence of genetically/chemically modified foods were associated with negative MH. Intersections among different socio-demographic characteristics (e.g., gender, religion, income) played a considerable role in how nutrition, food security, and dietary intake impacted AIR's MH and caused substantial inequities. This research found that the food/nutrition-MH relationship in AIR is multi-faceted, with various psycho-socio-cultural pathways/processes appearing to shape AIR's MH. A socio-political and community-level action plan that requires intersectoral collaboration between health and non-health sectors has been co-proposed as part of this research to achieve nutrition and health equity for AIR.

7.2. Chapter 4 (Study 2): 'I deserve the right to exercise': the complexity of leisure physical activity needs and its relationship to mental health among Arab immigrants/refugees in Ontario, Canada: the CAN-HEAL study. Paper submitted to Discover Social Science and Health.

This chapter explores the leisure physical activity (LPA) needs as they relate to MH among AIR in Ontario, Canada. Previous research found that AIR in Canada face various socio-cultural stressors and barriers to LPA participation, such as lack of availability of culturally appropriate services that meet AIR cultural proscriptions. This paper provides an in-depth exploration of the complexity of these issues and AIR's LPA needs as they pertain to their MH and well-being. The research was guided by an *integrated* bio-psycho-socio-cultural framework in order to thoroughly uncover the complexity of LPA needs as they relate to MH of AIR. Participants in this research reported an alarming level of inactivity (86.7%), and linked that to various economic, environmental, and psycho-socio-cultural barriers that hindered their LPA participation, which was associated with negative MH. Intersections between different socio-demographic characteristics (e.g., age, gender, income) caused substantial LPA and MH inequities within the AIR community. Older adults and low-income participants reported *significantly* lower LPA levels

than younger generations and those with higher income. This research found that the LPA-MH relationship in AIR is multi-faceted, with various psycho-socio-cultural pathways/processes appearing to shape AIR's MH. A socio-political and community-level action plan that requires intersectoral collaboration between health and non-health sectors has been co-designed as part of this research to achieve LPA and MH equity for AIR.

7.3. Chapter 5 (Study 3): 'I thought we would be cherished and safe here': understanding the multi-faceted nature of mental health among Arab immigrants/refugees in Ontario, Canada- the CAN-HEAL study. Paper published in Social Psychiatry and Psychiatric Epidemiology in April 2024.

This chapter examines MH needs among AIR in Ontario, Canada. AIR are at high risk for MH challenges owing to various unique stressors, such as post-September/11 increase in racism and demonization. This paper provides an in-depth exploration of the complexity of MH experiences, stressors and needs among AIR. The research was guided by an integrated 'social determinants of health' framework and the 'years since immigration effect' theory. The term "mental health" was deemed offensive for participants aged >30 years, who proposed other culturally appropriate words including "well-being" and "emotional state". Participants in this research reported an alarming prevalence of poor mental well-being (55%). Of first-generation immigrant participants, 86.8% reported negative changes in MH since migration. The negative changes reported in this research are not straightforward; they are complex and dynamic, and mainly relate to micro/macro-aggression, cross-cultural pressures, dissatisfaction with the health and social care system, and poor living conditions. Intersections between different socio-demographic factors (e.g., gender, length of residency, income, religion) amplified the negative changes in MH and exacerbated inequities. This research underscores the need for culturally sensitive/safe healthcare and structural/policy reformation to tackle MH inequities in AIR.

CHAPTER TWO: METHODS

1. Introduction

To gain in-depth understanding of the health needs and priorities of Arab immigrants and refugees (AIR), it is imperative to genuinely engage the community in the research process and employ culturally sensitive/safe approaches, methods and knowledge translation techniques that consider and honour AIR's cultural values and norms. This is particularly critical when doing research with marginalized communities and on stigmatized and sensitive topics, such as mental health (MH) and food insecurity. Despite the importance of engaging the community, previous AIR research has mostly adopted a researcher-dominated approach (i.e., lack of engagement of AIR) (Elshahat & Moffat, 2022; Elshahat & Newbold, 2021). The CAN-HEAL (Canadian Arab, Nutrition, Health Education and Active Living) project addressed this gap by engaging the AIR community in Ontario, Canada, and incorporating their core cultural values and perspectives throughout the research and knowledge translation processes. This research was conducted online through the Zoom platform (due to the COVID-19 pandemic restrictions) and deployed a multi-methodological approach that triangulates the findings from three different methods (Photovoice, qualitative interviews and a questionnaire survey) to enhance the robustness of the results.

This chapter starts by addressing the project location and setting and includes a discussion of the use of online/virtual platforms in qualitative research. Next, I provide a detailed description of the employed methodological frameworks and principles including the levels and techniques of the established community partnership. This is followed by an overview of sampling strategies, participant recruitment techniques used in this study, and ethics. I then describe each of the three methods (qualitative interviews, Photovoice and a questionnaire survey) employed for data collection as well as data analysis techniques, and discuss the multi-methodological approach deployed, including its strengths and challenges. I also address the cultural safety/sensitivity principles adopted in this project as well as my experience and

positionality as an Arab researcher within this research. The chapter concludes with outlining challenges and enablers of this project.

2. Study Location and Setting

This research was performed in Ontario – home to approximately 50% of AIR in Canada (Government of Canada, 2023c, 2023d). Given that food and health/social care systems vary among Canadian provinces, I decided to narrow the scope of the research to one province to facilitate data analysis and knowledge translation. The three studies incorporated within this dissertation were performed through the Zoom platform due to COVID-19 pandemic restrictions. A description and overview of Ontario demographics as well as a discussion of the use of online/virtual platforms in qualitative research are provided below.

2.1. Description and Overview of Ontario Demographics

Ontario is geographically the second largest province (after Québec) and the most populous one in Canada (Government of Ontario, 2012, 2023b). It covers over 1 million square kilometers and is home to over one-third of Canada's entire population. Over 15.5 million individuals are estimated to live in Ontario (Government of Ontario, 2012, 2023b). The province constitutes two main regions of considerably different character: Northern Ontario and Southern Ontario (Government of Ontario, 2012). Northern Ontario covers about 88% of the total area of the province; however, it constitutes only around 6% of the province's population, largely due to its harsh climate (i.e., very cold winters and hot summers) and focus/reliance on specific economic activities (e.g., agriculture, forestry, and mining) that have not supported large populations. Conversely, Southern Ontario covers only around 12% of the entire area of the province yet constitutes the majority of the province's population (about 94%). This high population density in the Southern Ontario region is largely attributable to the presence of most of Ontario's cities, companies, institutions, manufacturing sector and major roads (Government of Ontario, 2012). Southern Ontario is also

home to Canada's capital (Ottawa) and the largest city of Canada (Toronto). Ottawa comprises the majority of the Canadian government departments and agencies, whereas Toronto is home to Canada's financial sector (e.g., prime Canadian banks and Toronto Stock Exchange) (Government of Ontario, 2012).

From mid-2022 to mid-2023, Ontario received 42.5% of all newcomers to Canada, the majority of whom settled in Southern Ontario (Government of Ontario, 2023b). The region is one of the top destinations for newcomers (including AIR), particularly the Greater Toronto Area (GTA) for many reasons. These include – but are not limited to – a diverse and multicultural population and the presence of many educational institutions and corporations, which provide various employment opportunities (Destination Ontario, 2024). Most AIR prefer to live in Southern Ontario, particularly in Ottawa and the GTA, due to the presence of major cultural stores and worship places in these areas. For example, most of the branches of Adonis (a popular Middle Eastern supermarket) and Paramount Fine Foods (a popular Middle Eastern restaurant chain) in Ontario are located in the GTA area and Ottawa (Adonis, n.d.; Toronto Union, n.d.). As well, the Islamic Society of North America (ISNA) Canada, a non-profit organization that provides many programs/services to support the Muslim community, is located in Toronto and Mississauga (ISNA Canada, n.d.).

2.2.The Use of Online/Video-conferencing Platforms in Qualitative Research

Online techniques have widely been used for some years in quantitative questionnaire survey research for many reasons, including cost-effectiveness, feasibility and effectiveness in collecting large amount of data from research participants from a wide range of demographics in a short period of time (Regmi et al., 2017; Tiersma et al., 2022). Compared to quantitative research, the use of remote/virtual methods in qualitative research has received limited attention and discussion in the literature (Tiersma et al., 2022). However, this trend has rapidly changed over the past few years, where remote/virtual methods started to garner growing attention in the qualitative research community, particularly during and after the COVID-19 pandemic that

caused disruption for qualitative researchers and in-person data collection plans (Keen et al., 2022). Over the past three years, many scholars have discussed the long-term methodological implications of the pandemic-related adaptation in qualitative interview research (i.e., the transition from face-to-face to virtual platforms) (Dubé et al., 2023; Keen et al., 2022). They argue that digitalization of traditional interview methods can be beneficial for both researchers and participants (e.g., overcoming mobility and travel challenges) and so the conversation should shift from 'coping with' remote qualitative research during times of crisis towards embracing it as an efficient and valuable approach for methodological innovation (Dubé et al., 2023; Keen et al., 2022).

Before the COVID-19 pandemic, the qualitative methodological literature on remote methods primarily focused on their limitations, mainly difficulty establishing rapport, poor engagement, technical difficulties, and exclusion of participants with low access to technology (Chen & Neo, 2019). However, adaptations to qualitative methods during the COVID-19 pandemic have paved the way for useful adjustments/updates to improve virtual methods' effectiveness, flexibility, and utility. For example, the use of online methods to conduct focus groups has witnessed a shift from online messaging platforms and virtual chat functions to video-conferencing technology (e.g., Zoom, Skype) to enhance engagement and make use of body language (Brown et al., 2021; Greenspan et al., 2021). Similarly, there has been an emerging interest in the use of synchronous video-conferencing platforms in qualitative interviews, where many researchers have used platforms, such as Webex by Cisco and Zoom, for interviewing participants and data collection (Archibald et al., 2019; Gray et al., 2020; Labinjo et al., 2021). Archibald et al. (2019) found various benefits from using the Zoom platform for conducting interviews (i.e., cost- and time-effectiveness, good rapport and user-friendliness), which outweighed its limitations related to technical difficulties. Participants in Archibald's et al. (2019) study also rated Zoom-based interviews above traditional face-to-face interviewing.

In the context of the CAN-HEAL project, the use of the virtual Zoom platform demonstrated effectiveness and feasibility in the conduct of both qualitative interviews and Photovoice sessions, with benefits outweighing challenges and limitations. For example, this online model helped engage/include members of hard-to-reach groups (e.g., males, people with disabilities, those living remote areas) and to allow their voices to be heard in the research. Moreover, this model reduced research costs and facilitated the inclusion of a wider range of demographics from across Ontario by saving significant cost and time of travelling. Although this online model was associated with some limitations and challenges (mainly related to technical difficulties and access to technology), these were overcome by adopting some techniques that were deemed effective. For example, the challenge of lack of unfamiliarity with technology was overcome by a prior training on the use of the Zoom platform. Furthermore, support from community representatives was available to those who might encounter issues with internet access to reduce barriers.

3. Methodological Frameworks and Principles

3.1. The Ottawa Charter for Health Promotion Principles

The Ottawa Charter for Health Promotion provides a concrete framework for research, policy and practice for promoting populations' health (WHO, 2012). It addresses and stresses the impact of the social determinants of health on people's health and well-being. The Charter identifies five prime strategies that are fundamental for health promotion: producing healthy public policy, establishing supportive environments, developing personal skills, strengthening community actions, and reorienting health services (Nutbeam et al., 2021). Additionally, it emphasizes three key actions: advocate (for health and social equity), enable (by empowering communities to take actions to improve their health and well-being), and mediate (through collaboration between the communities, and health and non-health sectors). According to the Charter, these actions and strategies should be collectively addressed and approached in a structured manner. This approach is particularly critical for promoting the health and well-being of marginalized

communities, including immigrants and refugees, by guiding the design of effective tailored interventions, programs, and policies.

The World Health Organization (WHO) has provided technical guidance on adapting the Ottawa Charter's strategies to promote the health of immigrants and refugees (WHO, 2018). This includes engaging immigrant/refugee communities by prioritizing community-based approaches that mobilize community assets and resources and empower immigrants/refugees to speak up about their needs. The WHO's technical guidance also emphasizes the importance of improving the quality of physical and social environments where immigrants/refugees live, investing in linguistically-sensitive health education initiatives, and adopting culturally sensitive/safe approaches to health and social care that are responsive to the unique needs of the immigrant and refugee communities (WHO, 2018). The CAN-HEAL project adhered to these principles by employing a collaborative community-based participatory research (CBPR) and integrated knowledge translation (IKT) approach that followed cultural sensitivity/safety best practices and invested in numerous culturally and linguistically sensitive advocacy and health promotion initiatives as discussed below.

3.2.Community-based Participatory Research

Community-based participatory research (CBPR) has garnered a growing interest among researchers, community organizations, public health professionals and practitioners to effectively address health and social inequities in marginalized populations worldwide (Anderson et al., 2018; Tremblay et al., 2018). CBPR is identified as action research, which was initially developed by social scientist, Kurt Lewin, to utilize research to promote social justice through social change and reformation (Lewin, 1946). According to Lewin (1946), when practicing CBPR, community members should be genuinely involved in all of the stages of the research process, including determining the issues that need to be addressed, developing a plan and taking action to push for social change. Friere (2000) also used a similar approach and

emphasized that the oppressed should be given the opportunity to examine their own oppression experiences through CBPR to bring about social change. Friere argued that marginalized community members should be engaged in research as subjects (*not* objects) by ensuring their full reflective participation in the act of their liberation, which can be achieved by genuinely engaging them throughout the research process. CBPR is a collaborative approach that involves an equitable partnership between researchers and the community and recognizes each party's unique strengths/experiences throughout the entire research process to achieve a common, agreed-upon goal (Faridi et al., 2007). Participants in CBPR are active contributors in generating knowledge about their lived experiences and issues that matter most to them. Community empowerment is an integral component of CBPR. Over the past few decades, there has been an increase in the development and use of participatory research tools whose goals go beyond data collection to promote self-awareness and empower the community to push for social change (Catalani & Minkler, 2010). An example of a participatory tool is "Photovoice" which empowers participants by enabling them to produce photographic evidence of issues that impact their lives to raise awareness and enact policy/systemic change to advance social justice (Liebenberg, 2018). The CBPR approach emphasizes cultural sensitivity/safety at every research stage by incorporating the community's core values and accommodating participants' needs (Ahmed & Palermo, 2010). The participant/community-centered characteristics of CBPR make it an ideal approach for addressing the complex health and social needs of marginalized communities, including immigrants and refugees.

3.3. Integrated Knowledge Translation

Integrated knowledge translation (IKT) is an emerging approach to research framed on a paradigm shift from researcher-driven to equitable, partnership-based research that engages the community and knowledge users (i.e., those expected to benefit from and use the research findings, such as practitioners, policy-makers and stakeholders) throughout the research process with the aim of addressing real-life problems and generating applicable evidence and solutions (Boland et al., 2020; Kothari et al., 2017).

Initially advanced by the Canadian Health Services Research Foundation and then by the Canadian Institutes of Health Research, IKT has widely been promoted to produce applicable knowledge that enhances patient/person-centeredness within health and social care systems and effectively addresses communities' complex health needs/issues (CIHR, 2019; Denis & Lomas, 2003). IKT deploys principles that are similar to those of CBPR by emphasizing the value of equitable partnerships and collaboration between researchers and community/knowledge users throughout the research process, with the aim of co-producing knowledge that is a product of combining both parties' expertise (Jull & Giles, 2017; Nguyen et al., 2020). The main difference, nonetheless, between both approaches is that IKT is application-oriented especially within the context of health system improvement, whereas CBPR is social justice-centered with the aim of addressing health and social inequities by producing social transformation. Although IKT is a relatively new research approach compared to CBPR, researchers have been striving to define/set principles to structure and inform the implementation of IKT-based research (Powell et al., 2013). Understandings and usage of IKT continue to crystalize as decision-makers, policy analysts, and researchers together with community stakeholders look for novel approaches to produce knowledge that is applicable to improving health and social care systems (Boland et al., 2020).

3.4. An Amalgamated CBPR-IKT Approach and the Current Project

Thus far, previous studies that employed a collaborative research technique have mainly focused on an individual approach (either CBPR or IKT) (Jull & Giles, 2017; Nguyen et al., 2020). In this dissertation, I argue that integrating both approaches is not only beneficial but also important for effectively addressing complex health issues that are socially stigmatized (e.g., mental health) among marginalized populations. This is particularly fundamental for immigrants/refugees from racialized groups who are often disproportionally disadvantaged by the social determinants of health and suffer from social exclusion, fear of governmental authorities, cross-cultural pressures and their embodiment of various distinct cultural

beliefs and values that, if not effectively appreciated in health/social care settings, can considerably impact their health service utilization (Elshahat et al., 2022). Integrating CBPR and IKT provides a unique opportunity for combining the strengths of both approaches, that is, advocating for social reformation to address social determinants of health and ensuring cultural sensitivity/safety throughout the research process using CBPR, and co-producing applicable knowledge to inform effective, tailored interventions and best practices for culturally sensitive/safe health and social care delivery through IKT. This will ultimately serve to improve the community's health and well-being.

The CAN-HEAL project integrated both CBPR and IKT approaches to intensively and thoroughly address the food/nutrition, leisure physical activity (LPA) and mental health (MH) needs of Arab immigrants/refugees (AIR) in Ontario, Canada. Central to the integrated CBPR-IKT approach used in this project are three pillars: 1) Establishment of an efficient multi-level partnership with the community and knowledge users; 2) Adherence to principles of cultural sensitivity/safety (e.g., language appropriateness and respect); and 3) Commitment to social justice and application. CAN-HEAL's commitment to social justice has been informed by the fact that health, including MH, is socially determined, and that social injustice kills people on a grand scale (Raphael, 2016). This commitment has been affirmed and demonstrated through exerting enormous efforts to conduct community-led initiatives that raise awareness about the unique needs and systemically rooted issues that the AIR community faces, to induce empowerment and advocate for social justice/change. The project's commitment to application is guided by its goal of informing the development of culturally sensitive/safe health and social care systems that honour the unique and complex health needs of the AIR community. This commitment to application has been affirmed and shown through constantly fostering mutual dialogue with practitioners and service providers (e.g., via holding virtual health-focused panels, workshops) throughout the research process with the aim of co-exploring ways to use the research and its findings to improve health and social care delivery and practice. More information about the advocacy and application-related efforts and initiatives conducted as

part of the CAN-HEAL project is provided in chapter six (Discussion and Conclusion) as part of this dissertation.

4. Community Partnership

A multi-level partnership was established with the community and knowledge users in Ontario, Canada over the timeframe 2019-2021. This involved partnerships with AIR community leaders/representatives, community organizations, clinics, community-based businesses, and students/youth as discussed below under three separate sub-sections. These efforts resulted in the establishment of a diverse advisory/working group that collaborated on the project and shared a common goal of empowering AIR and other ethnic minorities across Canada to take action to improve their health and well-being. All partnering knowledge users worked using resources within the community and followed principles of empowerment, trust/respect, and reciprocity (i.e., mutual exchange of knowledge).

4.1. Community Leaders and Representatives

Partnerships were formed with 25 AIR community leaders/representatives (68% females, 56% young adults aged 18-25) who have experience in health, wellness, activism and/or social justice, from across Ontario. They were first consulted about the study topic and design to assure that they align with the AIR community's needs. Partnering community leaders/representatives then helped in the initial development of the research tools and materials, the recruitment of participants, the interpretation of findings, advocacy, and knowledge mobilization efforts. Frequent consultations/discussions were held with the community leaders/representatives as needed throughout the study via virtual communication tools (e.g., the Zoom platform, emails).

4.2. Community Organizations, Clinics, and Community-based Businesses

Partnerships were formed with 107 Canadian community organizations (providing wellness/MH, physical activity and/or food services), health clinics and community-based businesses. The depth of partnership participation in the project varied according to each organization's available resources. Overall, community-based organizations collaborated mainly on participant recruitment, knowledge mobilization and advocacy efforts, with some virtual consultations and meetings about the study design and applicability of the findings. Health clinics and community-based businesses supported knowledge mobilization initiatives and advocacy efforts.

4.3.Students/Youth

A team of students/youth with various backgrounds from across Canada was formed. This team has been an integral part of the project, collaborating not only on all aspects upheld by the community leaders/representatives but also on research execution (e.g., note-taking during interviews, facilitation, translation), after receiving appropriate training. Over the last two decades, there has been an increase in youth engagement models that call for involving youth as partners in health promotion research with the aim of enhancing the validity and robustness of findings, while contributing to the professional development of youth by equipping them with various skills and experience necessary for their growth as effective future leaders (Hawke et al., 2020). The TYPE Pyramid Model proposes that efficient/authentic youth engagement goes beyond understanding the research and the issues at hand to shared control and decision-making (Wong et al., 2010). This model was adapted by the McCain Centre (a hub at the Center of Addiction and Mental health, which focuses on clinical research, community partnerships and youth engagement) to incorporate four integral principles to increase authenticity of youth partnerships: 1) flexibility regarding roles and milestones, 2) mentorship to youth, 3) reciprocal learning between

researchers and partnering youth, and 4) authentic, shared decision-making (CAMH, n.d.; Heffernan et al., 2017).

The CAN-HEAL project adopted an adapted version of the McCain Centre's model by integrating two additional principles that further reinforce youth engagement: 1) granting titles and leadership to youth volunteers, and 2) engaging youth in celebration. Giving self-reflective titles to community volunteers has been associated with reduced emotional exhaustion, and improved passion and performance (Grant et al., 2013). Indeed, assigning titles and clear roles to youth throughout their engagement in research and knowledge translation can motivate them, while cultivating a sense of responsibility towards the project. The CAN-HEAL student representative team constituted seven prime committees working separately, but collaboratively towards the goals of the project. Each student was given title(s) (e.g., design and visualization lead), aligning with their assigned committees' objectives; they worked closely with the researcher (SE) towards fulfilling the project goals. There is growing evidence for the role that achievement celebration plays in enhancing joy in work and promoting team-building in organizations and work environments (Farr, 2003; Powers et al., 2018). Given the magnitude of the CAN-HEAL project (i.e., integrating both CBPR and IKT approaches) and the need to motivate the youth team, frequent celebrations of accomplishments and milestones were essential to foster motivation/pride, ease transitions and acknowledge efforts. Celebrations varied among awards ceremonies, multi-cultural parties, and game events with prizes. These efforts collectively resulted in effective engagement and an organizational climate that promoted success in the desired outputs/outcomes of the project.

5. Participation, Sampling and Recruitment

Sixty socio-demographically diverse AIR were recruited from October 2021 to June 2022, and participated in the study. AIR from any of the 22 Arab countries (Al-Sayyed et al., 2017) who were aged >18 years and lived in Ontario, Canada were eligible to participate. Seventy-three percent of participants

were females, 90% were Muslims, 62% were married, and 50% were aged 31-49 (Fig. 1.1). Fifty percent of the participants were employed, and at least one-third were low-income. Fifty-three percent were voluntary immigrants, 35% were refugees, and 12% were second generation immigrants. Forty-three percent of the participants were recent immigrants/refugees (<5 years since arriving to Canada). Participants were from across 14 Arab countries of origin. Regarding place of residence in Ontario, large-, medium-, and small-sized cities were represented (28%, 35% and 37%) respectively (Fig 1.2). Ninety-eight percent of the participants were from Southern Ontario; the region where most AIR reside in Ontario (Statistics Canada, 2017).

Fig. 2.1. Socio-demographic characteristics of participants (N= 60) in the CAN-HEAL study

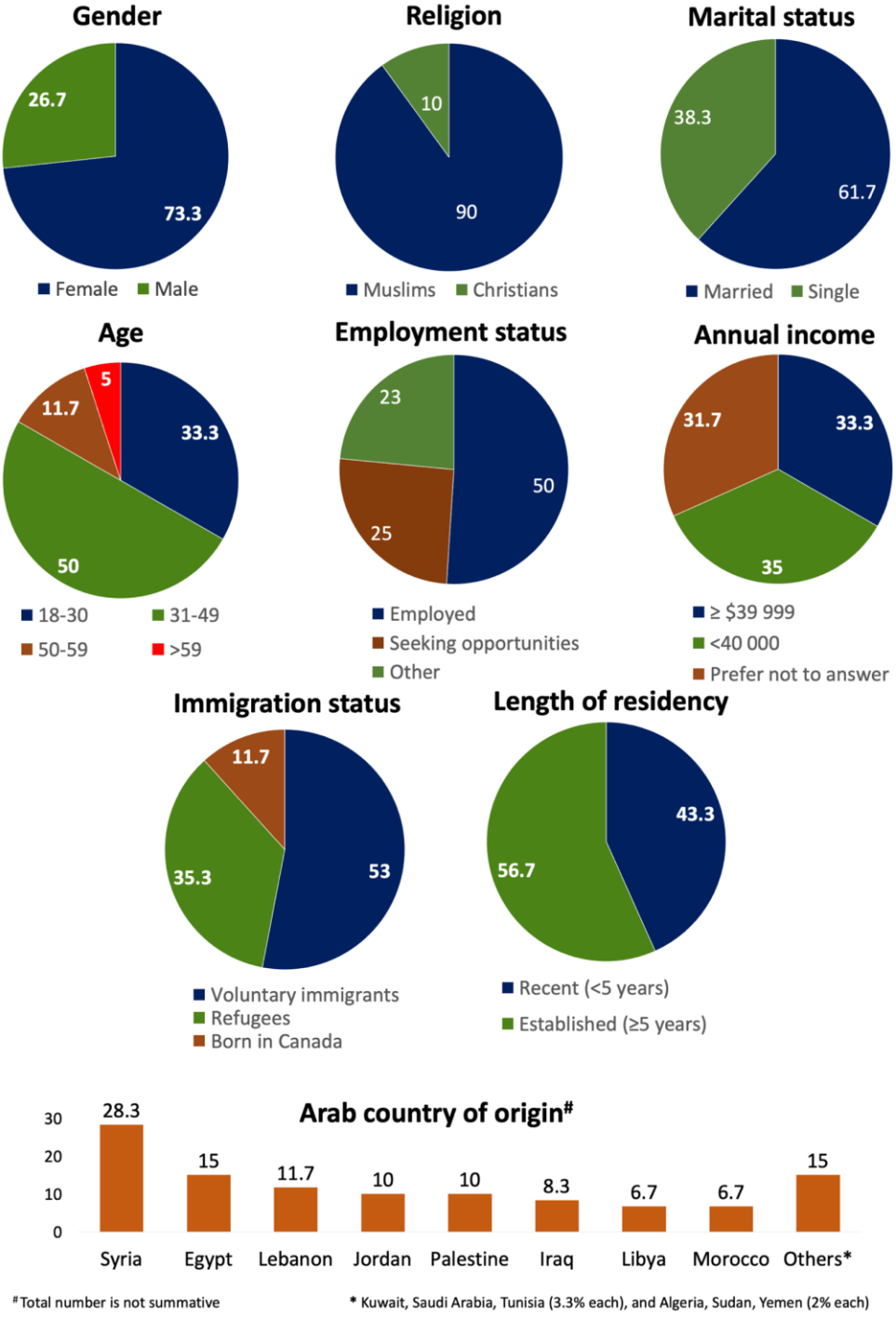
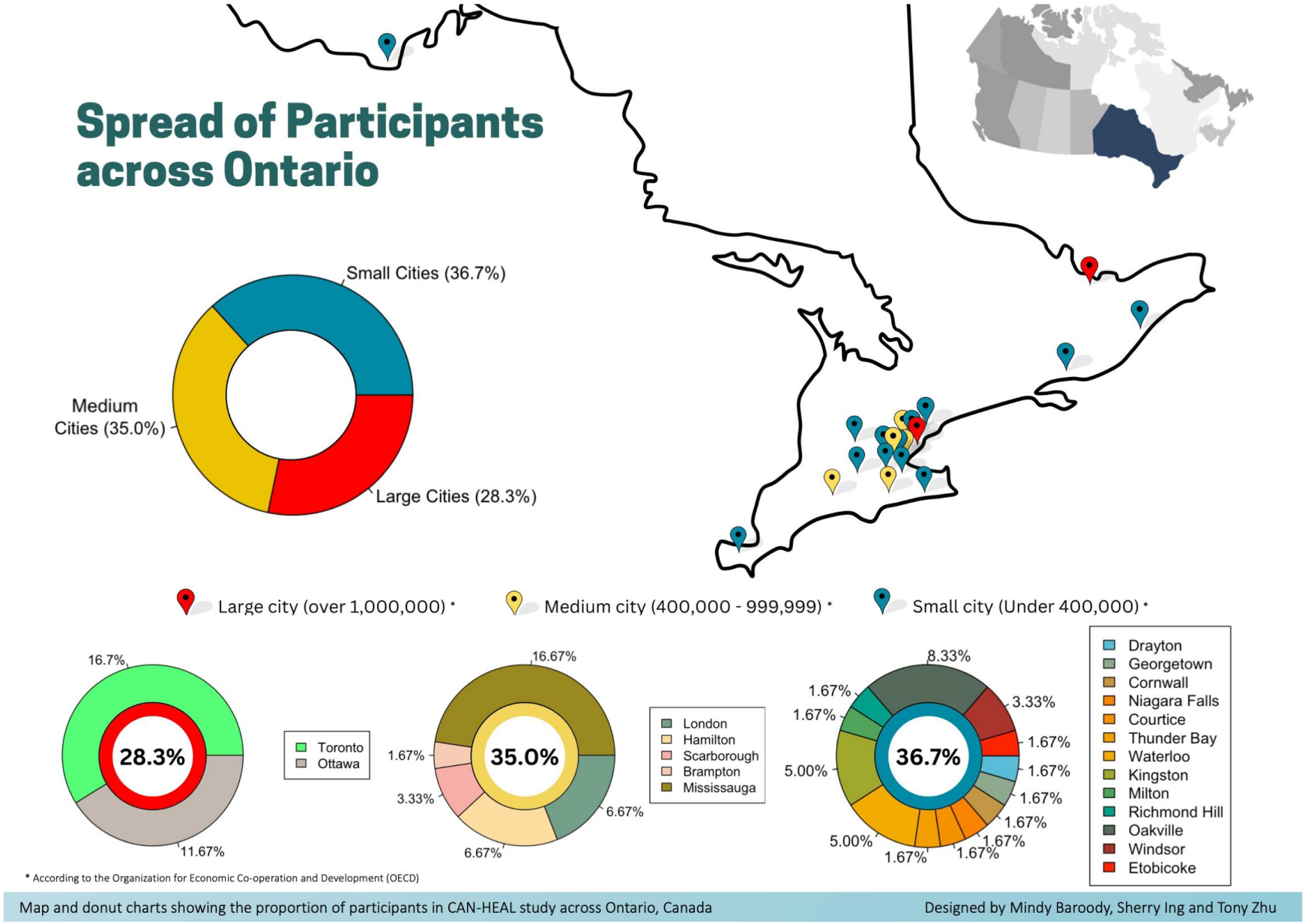


Fig. 2.2. Map showing spread of participants across Ontario



The recruitment was performed using a combination of three sampling techniques: convenience, snowball and purposive. Convenience sampling (also called availability sampling) is a cost- and time-effective non-probability sampling technique that involves collecting data from an easily accessible/available group of people (Simkus, 2023). Examples of convenience sampling are recruitment through advertising a research study on social media and collecting data from accessible and physical locations that are relevant to the goal of the study (e.g., surveying people in a local shopping mall). Snowball sampling (also called network sampling) is also a non-probability sampling approach where individuals involved in the research assist researchers by recruiting potential participants from among their acquaintances/networks (Etikan, Alkassim & Abubakar, 2015). The snowball method is known for its effectiveness in engaging/recruiting hard-to-reach groups. Purposive sampling (also known as selective sampling) is an approach commonly used in qualitative research to maximize the diversity of the recruited sample by looking for and selecting specific groups of individuals with certain traits to provide more context to effectively address the research questions of a particular project (Campbell et al., 2020).

The CAN-HEAL project integrated convenience, snowball, and purposive sampling strategies to utilize the strengths of each strategy, reach a wider demographic of the AIR population and maximize the diversity of the sample. The recruitment process included disseminating physical posters/flyers in community centers and worship places throughout Ontario, advertising the study through social media, and circulating the recruitment posters/flyers among community leaders/representatives' networks. Many participants deemed the research important so they proactively mentioned that they would spread the word about the project among their networks and encourage them to participate in the research. To enhance diversity in the recruited sample, the recruitment posters/flyers were purposively spread among specific hard-to-reach socio-demographic groups, mainly males and residents of small-sized cities in Ontario. The posters were produced in Arabic, English and French to enhance accessibility and promote

inclusivity by ensuring that individuals with limited English proficiency had equitable access and opportunity to participate.

Interested AIR individuals filled out an online eligibility screening form, which was circulated alongside the posters/flyers (Appendix A & B). The purpose of this form was to confirm eligibility, ensure socio-demographic diversity in the final recruited sample by asking questions about background (e.g., age, gender, Arab country of origin, city of residence in Ontario, immigration status), and identify potential participant preferences and needs for participation (e.g., preferred language and time for interview and Photovoice sessions, preferred method of contact, any requirement for Zoom training). This approach not only helped maximize socio-demographic diversity in the eventual recruited sample, but also provided in-depth insight into the different preferences and needs in terms of participation by potential participants to ensure that proper arrangements were made in advance to accommodate each participant's unique needs and provide a comfortable and welcoming environment. These strategies collectively aided the collection of reliable data and enhanced study's rigour. The participants in this project provided an informed voluntary consent to participate (Appendix C). Ethics clearance of the project was obtained from the McMaster Research Ethics Board.

6. Multi-methodology and Triangulation

This project adopted a multi-method approach by integrating three different methods (qualitative interviews, Photovoice and a questionnaire survey) to allow for triangulation of the findings. A multi-method approach can be defined as the use of more than two data collection methods to address the same research questions within a single research study by triangulating the data/results to form an integrated whole (Hunter & Brewer, 2015). The use of a multi-method approach is recommended to enhance: research rigour by aiding triangulation (i.e., combining different data sources and methods to develop an in-depth understanding of specific phenomena); creativity by uncovering novel findings and occurrences that

advance knowledge; and growth by expanding the scope of the project to explore complex aspects and contexts of the issue(s) being studied (Brewer & Hunter, 2006; Esteves & Pastor, 2003). It is also important to note that each method has its own limitations, and so using a multi-method approach can help overcome each method's weaknesses and improve the reliability of the overall findings. The use of a multi-methodological approach, nonetheless, is associated with some challenges (Davis et al., 2011). Combining more than one method in one project is often time-consuming and requires expertise and skills in different methods to answer a pre-formulated research question (Tariq & Woodman, 2013). Furthermore, disseminating findings of multi-method research requires creativity and organization skills to present and summarize/synthesize data in a coherent and engaging way. My previous experience in different qualitative and quantitative methodologies coupled with my supervisor's and supervisory committee's expertise and guidance helped mitigate the above challenges. I have also used innovative knowledge translation strategies to coherently integrate findings and disseminate them in a clear and compelling manner as discussed in chapter six (Discussion and Conclusion) in this dissertation.

Though the CAN-HEAL project conducted a quantitative survey, the project is largely qualitative in nature as this methodology is effective in providing in-depth understandings of the complex and sensitive issues studied in this research (mental health, food (in)security and leisure physical activity) by reducing barriers, and building connection/trust with the AIR community that has been historically excluded and racialized (Gill et al., 2008; Montesanti et al., 2017; Teherani et al., 2015). The addition of a questionnaire survey was to provide some basic descriptive statistics of participants' sociodemographic and experiences regarding mental health (MH), food (in)security and leisure physical activity (LPA) levels. More discussion about the use of a questionnaire survey and qualitative methods in the context of the CAN-HEAL project is provided below.

7. Questionnaire Survey

The 60 recruited participants filled out a questionnaire survey that was co-designed and pilot-tested for cultural-acceptability, feasibility, and validity with a convenience sample of 20 AIR representatives. The survey comprised questions about socio-demographics, food (in)security (adapted from the Canadian household food security survey module (HFSSM)), dietary intake (adapted from the short form food frequency questionnaire (SFFFQ)), LPA participation (adapted from the global physical activity questionnaire), and mental well-being (adapted from the WHO-5 mental well-being questionnaire) (Appendix D). The HFSSM is an 18-item scale that inquires if respondents or their household members experienced food insecurity-related experiences (i.e., worrying that food would run out, not affording to purchase balanced meals, having to cut size of meals, suffering from hunger) in the previous year (Statistics Canada, 2022a). Food security status is identified by checking the number of affirmative responses to the statements about food insecurity experiences: food secure (0), marginally food insecure (1), moderately food insecure (2 to 5), severely food insecure (6 or more). The SFFFQ asks participants about frequency of eating different food items in a 'typical' week over the past month (Cleghorn et al., 2016). A score from zero to two is assigned based on the reported frequency. For healthy foods (e.g., fruits/vegetables), the following scoring system applies: zero for never or less than once weekly, one for once weekly, 2-3 per week, or 4-6 per week, and two for 1-2 daily, 3-4 daily, or 5+ daily. For unhealthy foods (e.g., processed meat, sweets), an inverse scoring method applies (e.g., two for never or less than once per week). Higher cumulative scores suggest better diet quality.

The global physical activity (PA) questionnaire assesses a respondent's level of PA- in metabolic equivalents (MET)- across life domains (i.e., work, travel, and leisure) in a typical week (WHO, 2021). For LPA, the questionnaire asks respondents about frequency and time they spent in participation in vigorous-intensity leisure/recreational activities (i.e., activities during which participant cannot say more

than a few words without gasping for breath, such as running) and moderate-intensity leisure/recreational activities (i.e., activities during which participant can comfortably talk but not sing, such as brisk walking). Total LPA levels are calculated in MET-minutes/week by summing the total MET minutes calculated for vigorous-intensity activity (frequency * time * 8) and moderate-intensity activity (frequency * time * 4). The person would be considered as meeting the recommended guidelines when the total MET minutes per week is ≥600. The WHO-5 questionnaire involves five statements about mental well-being (i.e., feeling cheerful, relaxed, vigorous, fresh, life is filled with things that are of interest) that participants rate on a 0-5 scale (Topp et al., 2015). The score is then multiplied by four for a score between 0 to 100; higher scores indicate better mental well-being. These questionnaires have all been previously validated, though these previous validations were not performed with AIR community in Canada (Cleghorn et al., 2016; El-Hajj & Benhin, 2020; Sember et al., 2020; Topp et al., 2015). The co-development and pilot-testing of the survey used in this study with a convenience sample of 20 AIR representatives helped enhance its cultural-acceptability, feasibility, and validity. Participants were also invited to submit a favourite cultural recipe and its perceived health/well-being benefits. The recipes were used to develop an Arabic community cookbook to support the AIR community and raise awareness about their needs.

Descriptive statistics of participants' responses were produced using Microsoft Excel. Chi-square tests were conducted to compare differences in food insecurity according to different socio-demographic factors (e.g., income, immigration status, length of residency, location). Non-parametric statistical tests were conducted to compare differences in LPA levels and mental well-being according to different socio-demographic factors, given that the data were not normally distributed. Mann-Whitney U tests were conducted to compare two-group differences (e.g., according to gender, income, and length of residency). Three-group differences (e.g., regarding age and location) were compared using Kruskal-Wallis tests, and

post-hoc Dunn's test was done when a significant difference was found. The statistical significance level for all analyses was set at $p < 0.05$.

8. Qualitative Interviews

This research employed qualitative interviews to gain an in-depth understanding of the complex food/nutrition, LPA, and MH needs in the AIR community. Qualitative interviews have been extensively used by social sciences and health researchers to elicit detailed information and get comprehensive understandings of phenomenon at hand (Dunwoodie et al., 2023; Jamshed, 2014; McGrath et al., 2019; Newington et al., 2022). This method has also been of high value to practitioners and public health professionals as it helps to provide thorough and actionable insights that can directly inform the development of effective programs and interventions (Halbesleben, 2011). Qualitative interviews can be categorized into three types: structured, semi-structured and unstructured interviews (Patton, 2002). Structured interviews strictly follow a predetermined set of questions, which limits the researcher's ability to ask follow-up questions and gain a holistic insight into the issues/phenomena at hand (Young et al., 2018). In contrast, unstructured interviews are very fluid, where the researcher comes to the interview with no specific frameworks or questions about the topic being studied (Patton, 2002). A limitation of this approach is that it may yield data with different patterns/structures (Patton, 2002).

Semi-structured interviews combine a pre-developed set of open-ended questions with the opportunity for the researcher to ask follow-up questions as needed to explore certain themes/responses further and gain more in-depth insights into the contextual details about the topic being studied (Jamshed, 2014). For these reasons, many scholars suggest that semi-structured interviews are the most efficient and useful method in qualitative research that helps to provide reliable and comparable data with different research participants (Gill et al., 2008; Jamshed, 2014). Across the literature, it is concurred that a semi-structured interview

guide should be developed in order to perform an efficient interview (Jamshed, 2014; Kallio et al., 2016). Such a guide should ideally include different questions that follow a predetermined theoretical framework and align with the research goals and objectives. Many scholars suggest that pilot-testing of the interview guide is a crucial step to enhance research quality and trustworthiness by promoting reliability and validity (Malmqvist et al., 2019; Shakir & Rahman, 2022). The main goal of the pilot testing is to test the interview guide and its questions for clarity, cultural sensitivity, and relevance for the project's goals as well as to identify and address any potential issues beforehand. This is particularly critical for research on sensitive topics (e.g., mental health) with immigrants and ethnic minorities who often embody cultural beliefs and values that should be respected in the research design (Kim, 2010).

In the CAN-HEAL project, semi-structured interviews were conducted with 50 AIR who were representatively chosen according to age and gender from the initial sample of 60 participants. The length for each interview was 90-120 minutes. Each participant was given the opportunity to take a 10-min break in the middle of the interview. The interviews were guided by an interview question guide that asked participants about 1) experiences, perceptions, and factors that impact their dietary intake, food security, LPA, and MH, 2) how they perceive the relationship between food/nutrition, LPA and their MH, and 3) public policy actions they think are needed to improve their food security, nutritional status, LPA, and MH (Appendix E). The question guide was co-developed with community leaders/representatives who recommended questions that they believed were important to address for the AIR community in Ontario. The interview guide was pilot tested twice with AIR representatives to ensure its feasibility and cultural sensitivity. Interviews with participants were conducted until reaching a data saturation point after which no new data and themes were being found. This was reached at the 41st interview. An additional nine interviews were performed to reach 50 interviews and enhance research robustness and the reliability of the findings (Dworkin, 2012).

All the interviews were performed by the researcher (SE) according to each participant's language choice. Since I am an Arabic/English bilingual immigrant from the Middle East, I was able to conduct interviews in English and Arabic. This aided cultural understanding and mindful communication with participants. Eighty-eight percent of the interviews were conducted in Arabic *and* English, 6% in English, Arabic *and* French, and 6% in Arabic only. Student research assistants (4-5) attended to assist with note taking, facilitation and French-English translation as needed. Each interview started with introductions to build a welcoming environment and establish rapport with the participant. This would be followed by reminding the participant about information regarding the purpose of the project, principles of confidentiality/privacy, and rights (e.g., skip any questions that might be uncomfortable to answer). This approach helped build a comfortable and trustful environment where participants felt welcomed, realized the importance of the project, and got confident in their participation to contribute to the meaningful process of informing positive change to health and social care systems and policies.

9. Photovoice

Photovoice is a participatory, empowering tool that helps marginalized communities produce photographic evidence on the health and social issues they experience to raise awareness and advocate for health and social policy change (Liebenberg, 2018). Photovoice is an emerging methodology that was initially developed in mid 1990s in attempt to move past traditional qualitative research and its linguistic imperialism (Cleland & MacLeod, 2021). It focuses on the complexity of the visual and socio-political contexts and consequences that often are inadequately addressed in other qualitative research types. The term 'Photovoice' underlines the goal and the importance of this methodology- giving voice to those who have been historically marginalized/excluded through photographs, particularly regarding complex contexts that may not be easily expressed via text or speech (McClowry, 2022). Given this method's emphasis on historical concerns regarding social justice for disempowered communities, Photovoice

brings substantial potential to improve marginalized groups' conditions and livelihood (Budig et al., 2018). Guided by principles of empowerment and critical awareness of complex sociopolitics, Photovoice focuses on what participants believe is important to further explore via photo-elicited discussions and reflections (Cleland & MacLeod, 2021). This makes Photovoice an ideal tool to democratize the research process by empowering participants and helping them feel that 'they' bring profound value to the project and can contribute to informing meaningful policy change (Budig et al., 2018).

Photovoice has been employed in research projects that focused on women's health to provide in-depth insight into areas to target for policy change (Colón-Ramos et al., 2017; Spencer et al., 2021; Vaughn et al., 2008). Photovoice research studies have also been conducted with immigrants/refugees, though these have mainly focused on Sub-Saharan African and Latinx groups (Elsey et al., 2018; McMorrow & Saksena, 2017; Merino et al., 2020). There is a gap in Photovoice research with Arab immigrants/refugees (AIR). The CAN-HEAL project addresses this gap by deploying a Photovoice methodology to gain in-depth understandings of the complex food/nutrition, LPA, and MH needs in the AIR community and identify areas for policy change.

In the CAN-HEAL project, twelve Photovoice sessions were carried out over Zoom with 26 AIR who were representatively selected from the initial sample of 60 participants according to age and gender. To meet participants' needs, each Photovoice session was limited to 2-3 AIR to promote in-depth conversation and comfort. The length for each interview was 120-150 minutes. Participants were given the opportunity to take a break (around 10-15- min) in the middle of session. Photograph-taking guidelines were thoroughly explained to each participant before their session. These included inviting each participant to capture 3-5 original digital photographs that do not involve identifiable human features to represent issues related to food (in)security, nutrition, LPA and MH that matter most to them. In every session, participants' photographs were shared via Zoom share screen feature and discussed by asking

each participant to describe the photo, illustrate how it related to their MH, explain why they thought the concern(s) or strength(s) shown in the photo exist and propose solutions to tackle the presented issues. Relevant follow-up questions and prompts were used throughout each session, engaging all participants.

Similar to the interviews, all the Photovoice sessions were conducted in participants' language of preference by the bilingual Arabic/English immigrant researcher (SE), which aided cultural understanding and mindful communication with participants. Ninety-two percent of the Photovoice sessions were performed in English *and* Arabic, and 8% in English, Arabic *and* French. Student research assistants (4-5) attended to assist with note taking, facilitation and French-English translation as needed. Each Photovoice session would start with introductions to build a welcoming environment and establish rapport with participants. This was followed by reminding the participants about information regarding the goal of the project, principles of confidentiality/privacy, and rights (e.g., skip any questions that might be uncomfortable to answer). This approach helped build a positive, relaxed, and trustful environment where participants felt welcomed, realized the importance of the project, and got confident in their participation to contribute to the meaningful process of informing positive policy change to improve the health and well-being of the AIR community.

10. Qualitative Data Analysis

All the audiotaped interviews and Photovoice sessions were orthographically transcribed verbatim by listening to the audio recording and transcribing every word, with noting inflection, pauses, and tones to ensure accuracy and completeness. This was followed by doing translation into English as applicable. Thematic analysis of the data was conducted using NVivo software (Release 1.0) and Microsoft Excel. Within health and social sciences research, thematic analysis has widely been used as an effective qualitative analytic method (Virginia Braun & Clarke, 2006; Thomas & Harden, 2008). Thematic analysis

can be broadly defined as an analytic technique for finding/searching, analyzing, and reporting patterns and themes within qualitative data to illustrate and uncover various complex aspects of the research topic. In addition to its effectiveness in addressing complex research questions, thematic analysis is widely known for its accessibility and flexibility (Dawadi, 2020). It has been suggested as an efficient method for analyzing qualitative data from community-based participatory research, as it allows for socio-cultural and psychological interpretation of data and aids the production of analyses that is suited to guiding policy change and development (Virginia Braun & Clarke, 2006).

The analysis process in this research followed the six-phase framework developed by Braun and Clarke (2006). This starts with building familiarity with the data through careful and intensive reading and re-reading of the whole dataset/verbatim transcripts. This is fundamental for identifying potential information that may be relevant to addressing the research questions. Step two involves producing codes, which are the prime building blocks of what will become themes afterwards. After completing the coding of all the dataset, initial themes are generated by reviewing and analyzing the coded data where different codes may be combined based on shared meanings to form initial themes or sub-themes. Then, a recursive review of the initial themes against the coded data and the whole dataset is conducted to revise themes/sub-themes as needed and finalize a thematic framework that effectively addresses the research questions. This is followed by naming (producing concise, informative, catchy, and memorable names) and defining the themes/sub-themes where each individual theme/sub-theme is expressed according to the whole dataset and the research questions being addressed. The final phase involves producing and finalizing the report, with connecting and ordering the themes in a logical and meaningful way to build a compelling narrative of the data. While the six phases are outlined in a specific sequential order, it is important to note that the thematic analysis is not a linear process; instead, it is recursive and iterative and involves moving back and forth among the phases as needed (Braun & Clarke, 2013). Coding and theme identification/development for all the qualitative data in this research was independently performed by the

researcher (SE) and four student research assistants who were previously trained by SE. Consensus regarding coding and theme development was achieved via regular discussions among researchers. A hybrid analysis approach was employed by integrating both deductive analysis (also known as theory-driven approach where codes are generated mainly according to a pre-determined conceptual framework) and inductive analysis (also known as data-driven approach where codes are mainly produced to reflect the content of the data, without explicitly considering any pre-conceived theoretical/conceptual framework). The main goal was to effectively address pre-formulated research objectives, while revealing any new concepts/phenomena (Fereday & Muir-Cochrane, 2006).

11. Cultural Sensitivity and Safety

The CAN-HEAL project has followed five best practices of cultural sensitivity/safety (i.e., achievement of cultural trust by creating a culturally sensitive/safe space that respects the socio-cultural values of participants and accommodates their needs throughout the research process) to enhance the reliability and truthfulness of participants' responses, promoting the study rigor and the credible/meaningful application of the findings (Im et al., 2004; Pelzang & Hutchinson, 2018). These best practices are cultural relevance, contextuality, respect, language appropriateness, and flexibility.

11.1. Cultural Relevance

The cultural relevance of the CAN-HEAL project was carefully examined prior to conducting it by consulting with partnering Arab community leaders and representatives about the research design/topic to ensure that they aligned with the AIR community's needs/priorities. Furthermore, three separate scoping reviews on MH, diet/nutrition and physical activity practices among AIR were conducted by the researcher (SE) to guide a culturally relevant research proposal (Elshahat & Moffat, 2020, 2021; Elshahat & Newbold, 2021). Input from community partners and leaders along with my insider's knowledge,

enabled us to frame the entire research approach and design around the core Arab cultural values (collectivism, generosity, honour, respect, privacy and religion) (Harb, 2016).

11.2. Contextuality

Researchers' possession of culturally sensitive and mindful knowledge/awareness of structural conditions that shape participants' responses and interpretations of experience-informed stories/situations is fundamental to achieve contextuality for complex phenomena and the derived results, ensuring findings' reliability/validity (Pelzang & Hutchinson, 2018). As an immigrant from the Middle East, my cultural background helped effectively fulfil contextuality by displaying a comprehensive inside knowledge of the systemic barriers and the political history of Arab world that places AIR's MH at risk. Contextuality was further strengthened through consultations/collaborations with partnering AIR community leaders and representatives throughout the course of the project.

11.3. Respect

Throughout the CAN-HEAL study, participants were treated with utmost respect, aligning with the core Arab cultural values. During interviews and Photovoice sessions, participants' input and perspectives were profoundly respected and empathically listened to and appreciated. As per participants' needs and the Arab cultural value of privacy, Photovoice sessions were limited to 2-3 participants with accommodations made for any gender-related requests (i.e., women's preference for women-only session), given the sensitivity of the MH topic. All participants' religious needs were accommodated, such as holding interviews at appropriate times during the Muslim fasting month of *Ramadan* and giving breaks for prayers (Harb, 2016).

11.4. Language Appropriateness

Language appropriateness was effectively fulfilled throughout the CAN-HEAL project by using culturally appropriate language/words for stigmatized topics (e.g., mental health) and conducting the research in each participant's language of request. The survey was available in English, Arabic and French. Furthermore, interviews and Photovoice sessions were performed in each participant's requested language(s) (Arabic, English and/or French) as discussed above.

11.5. Flexibility

Flexibility was maintained throughout the research by meeting participants' preferences for communication methods (e.g., phone, text messages) when addressing their questions about the research. Additionally, flexibility was sustained by accommodating each participant's time preferences for interview and Photovoice session times, taking into consideration the needs of participants with different conditions (e.g., familial responsibility, job conditions). The Zoom platform was preferred by the community for interviews and Photovoice sessions given its convenience and COVID-19 restrictions at the time of the research and arrangements were made to provide training to participants per request.

12. Positionality and Reflexivity

As a Muslim Canadian Arab immigrant woman researcher conducting research in collaboration with the AIR community in Ontario, Canada, it is fundamental to discuss my positionality within this research and reflect on how this might impact this project's implementation and outcomes. This is particularly important, given the relatively collectivistic and conservative nature of the Arab culture and the unique cultural values and norms that affect most Arabs' everyday way of living. Defining positionality is also

crucial, given the long history of dehumanization, and marginalization of the Arab community overall, and the systemic racism this population has suffered for decades.

I am an Arabic/English bilingual Canadian Arab immigrant who has full appreciation and in-depth awareness of the core cultural values adopted by the AIR community. As well, I am fully knowledgeable about the collective stereotyping, struggles, and social suffering experienced by the AIR community. As a visibly Muslim Arab immigrant, I have a first-hand experience of the collective marginalization/stigmatization that the AIR community face in Western countries. For example, I have received harassing and offensive comments and questions about my Arab and Muslim identity in different contexts (e.g., healthcare, public spaces, school) since immigration.

Overall, my cultural background, identity and experiences have played a significant role in implementing a genuine research project, maximizing its impact through the design of many community-informed advocacy and health promotion initiatives. This was achieved by finding a balance between my background/identity/experiences as an Arab immigrant and my role as a researcher and consistently practicing reflexivity by reflecting on my positionality to genuinely connect with my community, while striving to achieve the best research outcomes. Revealing my Arab background/identity at the beginning of this project and throughout the research process was fundamental for building trust with the community and enhancing data reliability. This helped participants realize that I would likely feel/understand them, and so they could share their actual experiences and needs without fear of being judged, which aided the collection of reliable data and enhanced research trustworthiness. Exercising reflexivity, I chose to not to share my specific experiences (e.g., culturally appropriate food accessibility challenges, anti-Muslim hate, discrimination/racism) with the community/participants except in certain situations and as needed to enhance research rigour. For example, during interviews, if participants shared a specific difficult experience that I could relate to, I would inform them of my own similar experience to validate their

feelings, build a sense of connectedness and help them feel included. This helped create a safe space where participants could openly share their experiences and feel empowered to propose actions that they believe would help achieve social justice and promote the health and well-being of the AIR community.

Finally, the practice of engaging four student research assistants in the analysis process – coding and theme identification/development for the qualitative data, and holding regular discussions to reach consensus – helped minimize any likelihood of subjectivity, and thereby, increase research rigour and enhance robustness of the findings.

13. Challenges and Enablers

The implementation of this project was associated with numerous challenges and enablers. These are organized below under four prime categories: 1) online model, 2) partnership, 3) positionality and role, and 4) limited resources.

13.1. Online Model

Despite the various advantages of using an online model to implement this project (e.g., engaging hard-to-reach groups, overcoming travel challenges), this model was associated with different challenges that are important to discuss. These include the need for intensive preparations by the researcher (e.g., learning about the intricacies of the virtual Zoom platform) to be well-prepared for managing any technical issues that might arise during the qualitative interviews and Photovoice sessions. Another challenge was the need to make exhaustive arrangements to ensure participants were prepared and felt confident to participate in the interviews/sessions on Zoom by providing prior training on the platform as needed. As well, there was the challenge of needing to mindfully arrange in advance for support measures to help potential participants who might encounter issues with internet access to reduce barriers to participation.

Finally, although the use of an online model was very helpful in establishing the community partnership across Ontario, it was not an easy task to motivate the team (particularly youth/student) virtually, due to the lack of in-person socialization/social interactions, which required additional and intensive efforts.

A specific enabler that helped overcome some of the challenges above was the assistance from community leaders/representatives and student volunteers to help with the prior arrangements and to provide support to those who might encounter issues with internet access to enhance inclusivity and reduce barriers to engagement in the project. To help motivate the team/student volunteers, the researcher consistently employed virtual community-building fun activities (e.g., games, competitions, fun trivia focused on Arab culture, sharing funny remote work moments), and used personalized communication (as relevant) to help everyone feel valued and special.

13.2. Partnership

The process of establishing a community partnership is not an easy task; it is very time-consuming. In the context of this project, building a multi-level partnership with the community has been a challenging and tedious process that required intensive planning, and efforts to find middle grounds to accommodate everyone's needs (e.g., schedules, meeting times, resource capacity). Regarding student volunteers/youth, it was challenging to make tailored arrangements to accommodate them during exam seasons, motivate them, and provide training (e.g., cultural sensitivity and knowledge translation techniques). Additionally, there was the challenge of attrition, where some students left due to unexpected life events (e.g., moving to another country with a completely different time zone).

Exercising open mindedness and consistently and thoughtfully reminding everyone of the goals we were working towards (i.e., contributing to the development of equitable systems to improve the health and well-being of AIR and other similar marginalized groups) helped in overcoming some of the above-

mentioned challenges. As for student volunteers, celebrating achievements, assigning them titles/designations, and showing genuine care and consistent support have been helpful in enhancing motivation and team morale.

13.3. Positionality and Role

Although my identity and positionality in this research has been helpful in promoting the effectiveness of the whole project and maximizing its impact, I faced different challenges that are important to discuss to show the whole picture, as discussed above. Conducting community-engaged qualitative research with a community to which one belongs is a very demanding responsibility and task, especially when this community has been historically dehumanized/racialized and embodies unique cultural norms. Performing genuine and *culturally sensitive/safe* community-engaged research on sensitive topics like MH and food insecurity entails more than active listening to participants' traumatizing experiences/stories and needs over a prolonged period; it involves supporting the community when needed, especially during times of crises. For example, throughout the course of the project I have received many urgent calls/messages from newcomer community members who required urgent referral to support for *emergency* situations (e.g., facing a hate crime, housing assistance). Furthermore, many community members turned to me to ask for advice/referral for support during times of severe adversities (e.g., the 7.8-magnitude earthquake that hit Syria/Turkey in February 2023, which exacerbated the impacts of the war and aggravated the crisis for countless Syrian families). Collectively, this has been an extremely challenging and emotionally taxing experience, which unfortunately has exposed me to vicarious trauma. This is something that I did not anticipate, was not informed of, and for which I received no prior training. This is a potential serious risk for researchers who conduct community-engaged research on sensitive topics with the community to which they belong.

Observing the challenges I have faced as the lead of this project, many Arab representatives/volunteers would check up on me and send appreciation/empathic messages for conducting this research. Additionally, Arab and Muslim volunteers would assist me with finding and referral to culturally sensitive support services for community members who might face emergency situations. This helped immensely and reflected the true meaning of community-engaged research.

13.4. Limited Resources

Throughout the conduct of this project, limited resources presented a substantial challenge and made the experience of performing this community-engaged research much more challenging. This includes, but is not limited to, limited funding/material resources to support the partnerships (e.g., proper honoraria for community and student volunteers), participants/community members who were in need for urgent support (e.g., severe food insecurity), and the implementation of community-informed health promotion initiatives. Doing this type of research was particularly challenging due to the negative consequences of the COVID-19 pandemic. Examples of these consequences include the massive inflation, lockdown, service shutdown, and job insecurity, which were all exacerbated by this pandemic crisis (Purewal & Smith, 2024).

To mitigate this challenge and crises, I had to find potential community-based businesses to provide support (e.g., providing coupons for culturally appropriate foods/meals to families experiencing severe food insecurity) and collaborate on implementing some much-needed health promotion initiatives. Arab community representatives/volunteers assisted me with this process. Nonetheless, it was still a challenging task that increased the burden on me especially with all the challenges I outlined above.

CHAPTER THREE: 'I THOUGHT WE WOULD BE NOURISHED HERE': THE COMPLEXITY OF NUTRITION/FOOD AND ITS RELATIONSHIP TO MENTAL HEALTH AMONG ARAB IMMIGRANTS/REFUGEES IN CANADA: THE CAN-HEAL STUDY

Title: 'I thought we would be nourished here': the complexity of nutrition/food and its relationship to mental health among Arab immigrants/refugees in Canada: the CAN-HEAL study

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A**bstract**

Nutritional psychiatry suggests that diet quality impacts one's mental health (MH). The relationship between food/nutrition and MH may be particularly salient for immigrants/refugees who often experience high risk for household food insecurity and MH challenges. An innovative collaborative community-based participatory research and integrated knowledge translation approach was adopted to explore food/nutrition needs as they relate to MH among Arab immigrants/refuges (AIR) in Ontario, Canada. The goal was to co-identify areas that require social change and co-produce applicable knowledge for service improvement. The CAN-HEAL study used a multi-methodological approach, employing qualitative interviews, Photovoice and a questionnaire survey. A combination of three sampling approaches (convenience, snowball and purposive) was used to recruit sixty socio-demographically-diverse adult AIR participants. The research was guided by an integrated bio-psycho-socio-cultural framework.

Participants reported various socio-economic and structural barriers to nutritious eating. Food quality/safety was a significant concern and source of anxiety among AIR; food mislabeling, the widespread presence of genetically/chemically modified foods and expired/rotten food products were associated with negative MH. Participants experienced an alarming prevalence of food insecurity (65%), which was associated with negative MH. Intersections among age, gender, religion, socio-economic status, parenthood, disability, and place of residence played a considerable role in how nutrition, food security, and dietary intake impacted AIR's MH and caused substantial disparities within the AIR community. The food/nutrition-MH relationship among AIR is multi-faceted, and various psycho-socio-cultural pathways/processes were found to shape MH. Intersectoral collaboration between health and non-health sectors is needed to implement a co-proposed socio-political and community-level action plan to achieve nutrition and health equity for AIR and other similar marginalized groups.

Keywords: dietary intake, food security, distress, anxiety, inequities, bio-psycho-socio-cultural model

1. Introduction:

1.1. Background

Poor nutrition is a critical public health issue that is associated with physical and mental health (MH) inequities. Across Western countries, Canada shows the second highest (after the US) diet-related mortality and disability-adjusted life-years rates of about 2625 and 127 per 100,000 populations, respectively (Afshin et al., 2019). The association between poor nutrition, household food insecurity and MH has been established, but there is debate about causal pathways and determinants, which vary from one population to another. There has been a growing interest in the nutritional psychiatry field, which focuses on the biochemical relationship between food/nutrition and MH at physiological level (Norwitz & Naidoo, 2021). For example, fruit/vegetable and Mediterranean diet consumption was significantly associated with positive MH among Australian and Canadian adults in different studies (Davison et al., 2020; Parletta et al., 2019). Evidence from social sciences research, however, underscores the social effects of basic needs deprivation and highlights a more complex relationship between food (in)security and MH (Weaver et al., 2021). The food/nutrition-MH relationship is understudied and is worth a thorough investigation among immigrants/refugees whose dietary practices and MH can be impacted by various socio-economic factors and external stressors (Elshahat et al., 2023).

From 2015 to 2022, Canada received over 400,000 Arab immigrants/refugees (AIR) (Government of Canada, 2022, 2023a). AIR, like all newcomers, are at high risk for suboptimal nutrition and MH issues, but they experience distinct stressors such as post-9/11 racism that may negatively impact their food security (Elshahat & Moffat, 2021). Food security is conceptualized as the reliable access to affordable, nutritious food that meets one's dietary needs and cultural proscriptions/preferences (FAO, 2017). Food insecurity is a complex, dynamic and multi-layered experience that ranges from worrying about food affordability to compromising diet quality and/or quantity and involuntarily reducing food intake, leading

to hunger and physiological/psychological disruption (Lane et al., 2019). The problem is alarming in Canada, with over 15% of the population suffering food insecurity (Tarasuk et al., 2021). Food insecurity is about six-fold more prevalent among marginalized communities, including newcomers, due to racism, un- or under-employment, and loss of food identity (Moffat et al., 2017; Vanderkooy, 2016). This can be of concern amongst AIR who embody specific cultural/religious dietary proscriptions and food-related practices that are essential for their ethnic identity and MH. Indeed, the 2021 Canadian survey found that AIR (alongside West Asians) encounter the highest prevalence of food insecurity compared to other racialized groups (Tarasuk et al., 2021). Preliminary research reveals that AIR in Canada encounter different socio-cultural issues around food security, such as cultural food proscriptions (Vatanparast et al., 2020). Nonetheless, according to a recent scoping review, there is a lack of food security and dietary research among AIR, with no studies thoroughly examining the food/nutrition-MH relationship (Elshahat & Moffat, 2020). The scoping review, moreover, found a lack of cultural sensitivity in the conduct of dietary research, which is crucial for collecting reliable data and developing tailored interventions.

This community-engaged research (CAN-HEAL) addresses the gap in food/nutrition-MH research among AIR, following cultural sensitivity best practices. The objectives of this study were to: 1) explore experiences and factors that impact AIR's food security status and dietary intake, 2) investigate the relationship between food/nutrition and MH among AIR, and 3) co-propose a culturally sensitive action plan to improve AIR's food security and nutritional status. The term "culturally sensitive" is often used in the immigrant health literature and refers to appreciating a group's cultural values/norms when designing health promotion interventions/policies to address the unique needs among immigrant groups, and thereby reduce inequities (Elshahat & Moffat, 2021).

1.2. A Holistic Theoretical Framework

The biocultural approach to food/nutrition proposes that human biology is plastic and can undergo psychological/neurophysiological changes in response to extrinsic stressors, such as migration-linked changes in dietary practices and resource insecurities (Wiley, 2020). There is evidence that food and water insecurity may occur individually or concurrently, which often results in syndemics (i.e., aggregation and synergistic interaction of two or more public health issues, which exacerbate the burden of the problem) and complex biological and psychological disruption, and MH challenges (Hadley & Crooks, 2012; Workman et al., 2020). The different pathways through which these operate include perceived unfairness, uncertainty, helplessness, and stigma/shame. Much of this research has been performed in lower-income countries, with less research done with immigrants in higher-income countries (Dou et al., 2022; Elshahat et al., 2023). Well-established support systems (e.g., tailored nutrition programs) in the destination country can help immigrants adapt and healthfully combat stressors. For example, community gardening programs were found to empower immigrants to obtain fresh produce that meet their food needs/preferences and support their well-being (Hartwig & Mason, 2016). Access to cultural foods was noted to help Syrian refugees in São Paulo, Brazil maintain their identity and bring feelings of being "at home" (Scagliusi et al., 2018). Systemic failures/barriers, however, may hinder immigrants from healthful adaptation and negatively impact their MH (Elshahat et al., 2022). For instance, Muslim immigrants in Canada reported the limited availability/accessibility of *halal* foods to be distressful (Moffat, et al. 2017).

Despite the various psycho-sociocultural stressors faced by immigrants in the context of food/nutrition and MH, there is a focus on a biomedical perspective in this area (Elshahat et al., 2023). The CAN-HEAL study utilizes a holistic bio-psycho-socio-cultural framework that integrates the complex, dynamic and multi-layered reciprocity between human biology and broader physical, psychosocial, and cultural environments to comprehensively examine the complexity of food/nutrition and its relationship to MH

among AIR (Nunes, 2012). The aim is to identify areas that require social change and produce applicable knowledge for service improvement, enhancing AIR's nutritional status and MH.

2. Methods

According to the World Health Organization's (2018) Ottawa Charter for Health Promotion, strengthening community action is fundamental for enhancing vulnerable communities' health. Given the vulnerability and culturally-specific needs of AIR, the CAN-HEAL study deployed a collaborative community-based participatory research (CBPR) and integrated knowledge translation (IKT) approach that emphasizes an equitable partnership between community and researchers to reduce barriers, ensure cultural sensitivity and collect reliable data that are meaningful to the goal of producing applicable knowledge for service improvement (Kantamneni, 2019; Kothari et al., 2017). A multi-methodological approach was deployed with conducting qualitative interviews, Photovoice and a survey, and triangulating the findings (Hunter & Brewer, 2015). The study adhered to cultural sensitivity best practices by incorporating the preferences/needs and values of AIR (e.g., interview time flexibility during *Ramadan*, providing the survey in Arabic, using culturally-appropriate words for stigmatized topics, like MH).

2.1. Study Location and Setting

This study was conducted in Ontario – the most populous and second-largest Canadian province. The province is home to approximately 50% of AIR in Canada (Government of Canada, 2022, 2023a). Maintaining the focus on Ontario aided effective data analysis as the food and health/social care systems vary among provinces. The study was implemented through the Zoom platform (due to COVID pandemic restrictions); the effectiveness of online platforms in qualitative research has been documented (Gray et al., 2020).

2.2. Community Partnership

A tri-level community partnership was built with AIR over the period 2019-2021. This started with partnering/consulting with 25 AIR community leaders/representatives from across Ontario (68% females, 56% young adults) about the study topic/scope and design/methods, ensuring that they align with AIR's needs. This was followed by forming partnerships with different community organizations/centers and building a team of students/youth. These efforts resulted in the formation of a diverse advisory working group that helped in the research implementation and shared the same goal of promoting nutritional health and MH among AIR.

2.3. Recruitment

Sixty AIR were recruited from October 2021 to June 2022, using a combination of three sampling approaches: convenience, snowball and purposive (Etikan, Alkassim, & Abubakar, 2015). AIR aged >18 years were eligible. Arabic, English, and French-language recruitment materials were used to recruit AIR. The recruitment process included disseminating physical posters/flyers in different community centers and worship places, advertising the study through social media, and circulating the recruitment message among community leaders/representatives' networks. To maximize diversity in the recruited sample the recruitment message was purposively spread among certain hard-to-reach socio-demographic groups, mainly males and residents of small-sized cities. An informed, voluntary consent was obtained from each participant. Ethics clearance of the study was obtained from the McMaster Research Ethics Board.

2.4. Questionnaire Survey

The 60 recruited participants completed a questionnaire survey that was co-developed and pilot-tested for feasibility/validity and cultural-acceptability with a convenience sample of 20 AIR. The survey included questions about socio-demographics, food (in)security (adapted from the Canadian household food

security survey (HFSSM)), dietary intake (adapted from the short form food frequency questionnaire (SFFFQ)), and mental well-being (adapted from the WHO-5 mental well-being questionnaire). The HFSSM is an 18-item scale that asks respondents if they/their household members experienced food insecurity-related conditions (i.e., worry about food running out, not affording balanced meals, having to cut size of meals, suffering hunger) in the past year (Statistics Canada, 2022). Food security status is determined by the number of affirmative responses to the statements about food insecurity experiences: food secure (0), marginally food insecure (1), moderately food insecure (2 to 5), severely food insecure (6 or more). The SFFFQ asks respondents about frequency of eating different foods/drinks during a 'typical' week in the last month (Cleghorn et al., 2016). A score from zero to two is given according to the reported frequency. For healthy foods (e.g., fruits/vegetables), scoring is as follows: zero for never or less than once weekly, one for once weekly, 2-3 per week, or 4-6 per week, and two for 1-2 daily, 3-4 daily, or 5+ daily. Unhealthy foods (e.g., sweets) are scored inversely (e.g., two for never or less than once weekly). Higher cumulative scores indicate better diet quality. The WHO-5 involves five statements about mental well-being that respondents rate on a 0-5 scale (the score is then multiplied by four for a score between 0 to 100; higher scores connote better mental well-being). (Topp et al., 2015). These questionnaires were previously validated (Cleghorn et al., 2016; El-Hajj & Benhin, 2020; Topp et al., 2015).

Descriptive statistics of participants' responses were produced using Microsoft Excel. Chi-square tests were performed to compare differences in food insecurity according to income, immigration status, length of residency and location. Statistical significance level was set at $p < 0.05$. Participants were also invited to submit a favorite cultural recipe and its perceived health/well-being benefits. The data were used to produce an Arabic community cookbook to support AIR and raise awareness about their needs.

2.5. Qualitative Interviews and Photovoice

Semi-structured interviews (each 90-120 minutes) were performed with 50 AIR who were representatively drawn according to age and gender from the initial sample of 60 participants. The interviews were guided by a question guide that asked participants about factors that impact their food security and dietary intake, how they perceive the relationship between food/nutrition and their MH, and public policy actions they think are needed to improve their nutritional status. The question guide was co-developed with community representatives who recommended questions they thought were important to address for the AIR community in Ontario. Interviews were conducted until data saturation- point after which no new information/themes are found. This was achieved at the 41st interview, with an additional nine interviews conducted to reach 50 to enhance study rigor (Dworkin, 2012).

This study also employed Photovoice – a participatory, empowering tool that helps vulnerable communities create photographic evidence to raise awareness and inform culturally-sensitive interventions (Liebenberg, 2018). Twelve sessions were conducted with 26 AIR, with these individuals representatively drawn according to age and gender from the initial sample of 60 participants. In accordance with participants' needs, each session was limited to 2-3 AIR to enhance in-depth conversation and comfort. Photograph-taking guidelines were explained to each participant before their session. These included inviting each participant to take 3-5 original digital photographs that do not include identifiable human features and symbolize food (in)security and nutrition-related issues that matter most to them/their MH. In each session, participants' photographs were discussed by asking each participant to describe the photo, explain how it related to their MH, and suggest solutions to address the presented issues.

All interviews and Photovoice sessions were conducted by the first author (an Arabic/English bilingual researcher with a Middle Eastern background), according to each participant's language request. This helped facilitate cultural understanding and communication with participants. Ninety percent of

interviews/sessions were conducted in Arabic *and* English, 6% in English, Arabic *and* French, and 4% in Arabic only. Student research assistants (4-5) attended for note taking, facilitation and French-English translation if needed. From the audiotaped interviews/sessions, verbatim transcripts were produced (and translated into English if applicable). Thematic analysis was done using NVivo software (Release 1.0) and Microsoft Excel. The analysis followed the six-stage framework by Braun and Clarke (2006), which starts with establishing familiarity with the data, before producing codes and generating initial themes. This was followed by reviewing/refining the themes and naming/defining them before producing the report. Coding/theme identification for all of the qualitative data was independently carried out by five researchers. Consensus regarding coding was reached via regular discussions among researchers. A hybrid coding approach (inductive and deductive) was deployed to address the pre-formulated study objectives, while revealing any new concepts/phenomena (Fereday & Muir-Cochrane, 2006).

3. Results

3.1. Descriptive Characteristics of Participants

Seventy-three percent of participants were females, 50% were aged 31-49, 90% were Muslims and 62% were married (Table 3.1). At least one-third of the participants were low-income, according to the 2023 Canadian low-income cut off (Government of Canada, 2023b). Fifty-three percent of the participants were voluntary immigrants, 35% were refugees/asylum seekers and 12% were second generation immigrants. Forty-three percent were recent immigrants/refugees (<5 years since moving to Canada). Fourteen Arab countries were reflected in the sample. Regarding location in Ontario, large-, medium-, and small-sized cities were represented (28%, 35% and 37%) respectively. Sixty-five percent of participants were deemed food insecure (13% severe, 32% moderate and 20% marginal) and 58% reported poor diet quality. Fifty-five percent of participants reported poor mental well-being.

Table 3.1. Socio-demographic characteristics of participants

Variable	Frequency (N= 60)
Age	
18-30	20 (33.3%)
31-49	30 (50%)
50-59	7 (11.7%)
>59	3 (5%)
Gender	
Female	44 (73.3%)
Male	16 (26.7%)
Religion	
Muslim	54 (90%)
Christian	6 (10%)
Immigration status	
Voluntary immigrant	32 (53.3%)
Refugee/asylum seeker	21 (35%)
Born in Canada	7 (11.7%)
Length of residency in Canada	
< 5 years	26 (43.3%)
≥5 years	34 (56.7)
Place of residence in Ontario	
Small-sized city	22 (36.7%)
Medium-sized city	21 (35%)
Large-sized city	17 (28.3%)
Marital status	
Married	37 (61.7%)
Single	23 (38.3%)
Employment status	
Employed	30 (50%)
Seeking opportunities	15 (25%)
Retired	1 (2%)
Other	14 (23%)
Yearly household income	
Less than $20 000	8 (13.3%)
$20 000 - $39 999	12 (20%)
$40 000 - $79 999	16 (26.7%)
$80 000+	5 (8.3%)
Prefer not to answer	19 (31.7%)
Arab country of origin [a]	
Syria	17 (28.3%)
Egypt	9 (15%)
Lebanon	7 (11.7%)
Jordan	6 (10%)
Palestine	6 (10%)
Iraq	5 (8.3%)

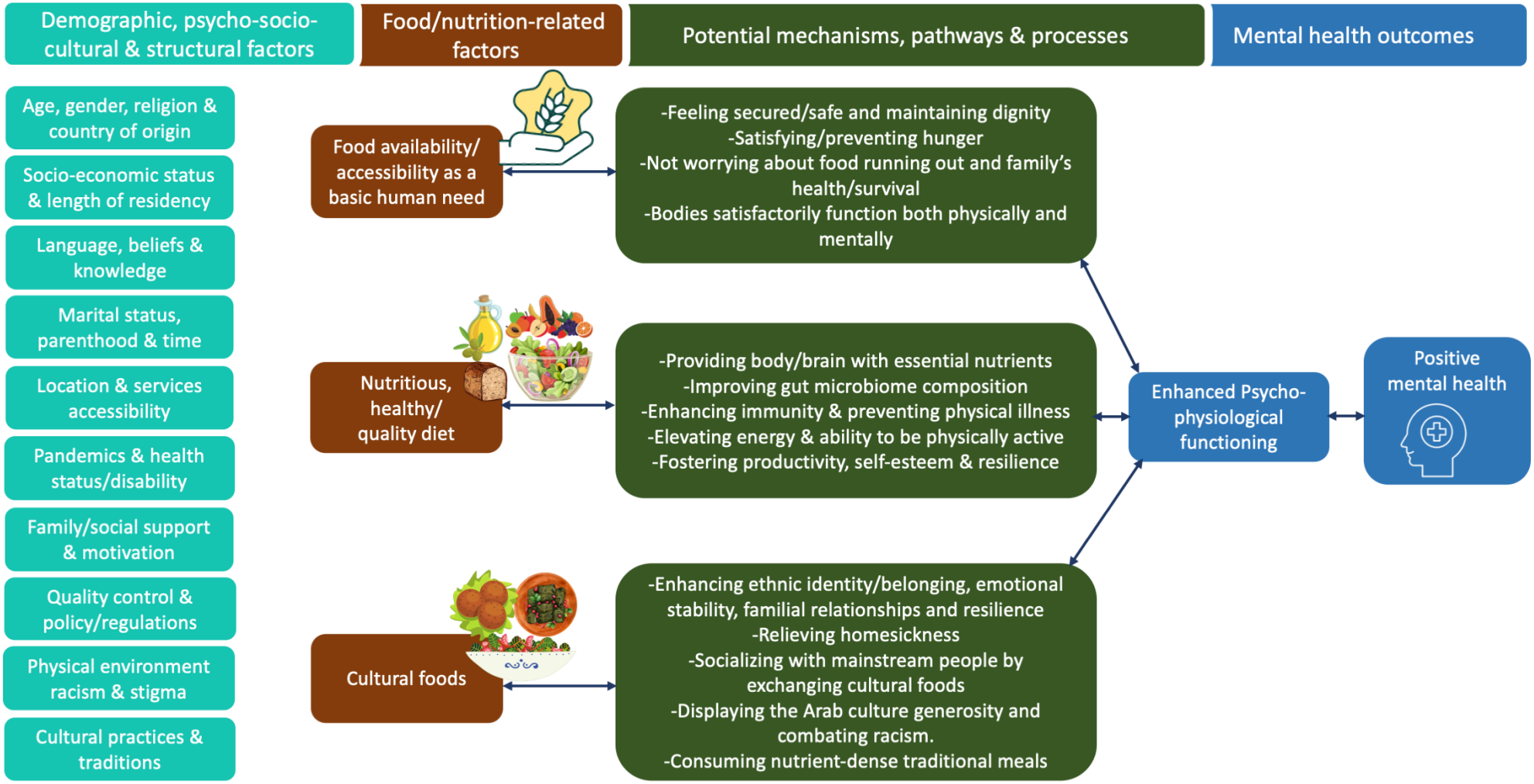
Libya	4 (6.7%)
Morocco	4 (6.7%)
Others [b]	9 (15%)

[a] Total number is not summative. [b] Kuwait, Saudi Arabia, Tunisia (3.3% each), and Algeria, Sudan, Yemen (2% each).

3.2. Nutrition/Food and MH Themes

Data from the different methods were triangulated and supported each other. Five major themes were generated: 1) anxiety around food policy/regulations, 2) nutrition and food inequities, 3) cultural food insecurity, 4) food/nutrition and cultural cuisine and MH, and 5) actions for equitable nutrition. Employing the preliminary model proposed by Elshahat et al. (2023), a bio-psycho-socio-cultural-guided conceptual model was created to present the complexity of food/nutrition and its relationship to MH (Fig. 3.1).

Fig. 3.1. A bio-psycho-socio-cultural-guided conceptual model presenting the complex food/nutrition-mental health relationship



3.2.1. Anxiety around Food Policy/Regulations

All participants expressed concerns about food price regulations. This included an alarming increase in essential food costs (e.g., fruits/vegetables, beans) and its impact on their households' nutritional status (Table 3.2, subtheme 1a, and Fig. 3.2a). A healthy-unhealthy food cost discrepancy was reported by participants who were worried about the associated health implications, particularly when not affording high-priced healthy options.

The frequent presence of expired food items or rotten produce on grocery stores' shelves was a major concern that caused worry and lack of trust in the Canadian food system (Table 3.2, subtheme 1b and Fig. 3.2b). Expired food (e.g., cans) in foodbanks was associated with distress among AIR due to worry about family's health and perceived feeling that they were not cared about, though they appreciated foodbanks' efforts to support. Participants expressed strong concerns around food industry regulations in Canada. A common issue was the lack of accuracy of nutrition labels, particularly on imported food items. One participant related his diabetic wife's *unexpected* increase in blood sugar to the imported packaged food that they consumed (Table 3.2, subtheme 1c). Participants were also anxious about nutritional content of packaged Canadian products. One mother of a toddler (< 2 years) captured/shared a photo of nutrient facts of a puree product that includes 7g sugar per 5 tablespoons, expressing shock and strong concerns about the amount of sugar (Fig. 3.2c). The participant explained that toddlers should not consume any sugar as per dietary recommendations for children (i.e., zero added sugar for < 2 years, and <25g for ≥ 2 years). Participants expressed concerns about the widespread marketing of energy/sugar-dense foods and lack of restrictions on what can be advertised to children (Fig. 3.2d).

Genetically- and chemically modified foods presented a considerable source of distress to AIR (Table 3.2, subtheme 1d). Two participants captured photos of apples covered with wax-like substances/chemicals, expressing concerns/worry about consuming these foods (Fig. 3.2e). One mother stated that she feels

compelled to peel apples (though, before immigration, she used to consume them with skin to benefit from its nutrients/fiber), as she does not feel safe eating/feeding her children chemically modified apples. The same participant added that this whole situation is stressful; for example, she explained that beyond compromising one's diet, peeled apples turn unappealing brown, which presents a barrier to apple consumption at school for her children. Another participant also shared a photo of cucumber and watermelon which she perceived to be substantially larger than what her family used to consume in their country of origin (Fig. 3.2f). One participant also expressed concerns around the size of poultry saying '*Every chicken, whether it is a turkey or chicken it's very big. I don't know how it reach this size...That makes me afraid from what they give the chicken and how they feed it*..'. Participants were collectively worried about the health impacts of consuming and feeding these foods to their families. Some participants even reported that they were diagnosed with physical health issues (e.g., vertigo, yeast overgrowth in small intestines) because of the consumption of genetically/chemically modified foods. Overall, participants expressed the need for affordable non-genetically/chemically modified foods; defined by AIR as organic or natural with *no* chemicals/hormones/additives. To obtain the foods they felt safe consuming, some participants reported doing community/home gardening and/or asking families in their homeland to ship food items to them (Table 3.2, subtheme 1e and Fig. 3.2g).

Table 3.2. Illustrative quotes for qualitative data themes

Theme	Sub-theme	Illustrative quotes
1. Anxiety around food policy/ regulations	**1a.** Food prices	- "Food prices are going up crazy." - "Sometimes you are obliged to eat more carbs just to feel full and not pay too much for groceries. The prices, especially the healthy, like, the vegetables and fruits is much expensive".
	1b. Expired food items	- "Something shocking… that at [name of large grocery store], I used to find expired items... It was expired maybe six months ago." - "With all respect to food banks, when I used those services in the past, I realized it was heartbreaking when I see expired items…I would not even eat rather than getting an expired item."
	1c. Nutrition labelling and advertising	- "We noticed that some food that it's coming from overseas, they put it I think here in Canada, they have to put the carbs and things like that on any food. It looks they are not calculated right.." - "The advertisement doesn't help at all... they advertise more of unhealthy eating... They advertise the kid's meal and then they get a toy with it but it's not healthy.."
	1d. Genetically/ chemically modified food	- "I don't know what they put, what they give for the cucumber to have this size…we don't know what kind of food we eat.".
	1e. Gardening & shipping natural foods from homeland	- "If you don't grow it, you don't know what you are getting. You are having a little heaven in your garden as it's something that you can trust…it's pure, no chemical on it." -"It is olive oil was pressed from my grandfather's yard in Lebanon…that's fresh olive oil, pure. We get it shipped all the way from Lebanon."
2.Nutrition and food inequities	**2a**. Low-income issues	- "When I don't have a lot of money, investing in food is expensive. So, if I have $50…it can be easily spent on some few items in fruits and vegetables, but I'll just take some pasta maybe and some other, carbohydrates, it doesn't make me feel good. I know that it's very limited money and I have to get at least the basic stuff for my child milk, eggs,…it affects my mental health, my mood."
	2b. Pregnancy needs	- "If I don't have the budget, how am I supposed to provide my baby of these nutrients? When you tell a pregnant woman that you have to eat this and this and this, you have to make it affordable for her."
	2c. Religion and culture	- "I've tried to look for the ingredients and try to see if it is 100% Halal… It's sort of this stress and anxiety." - "If I didn't get my special halal food, I feel sad because I think it's my right to get what I need as, for example, as a vegetarian, you can, found everything in every store, or a person who have some allergy. But if I didn't found my halal food in all the stores, I feel like I'm a minority and nobody thinks about us."
	2d. Disability	- "I prefer, fish, especially, organic or natural. For meat, I prefer organic halal because of my religion… and because not organic contains hormones and the, hormones, disturb my body.. I don't have to worry about the allergic reaction".

	2e. Low-population cities	- "If I went down to Montreal and I want to make a trip to Adonis or Al-Bakar or a third place. I'd waste time just travelling between them. The busyness, the traffic of Montreal. And it's the same thing in Ottawa."
3.Cultural food insecurity	**3a.** Availability issues	- **"**There's nothing here. We don't have Arabic supermarket…There's no Halal here. If I like having grilled meat. There is no halal barbecue restaurants. I want shawarma, I have to go down to Montreal or.. up to Ottawa."
	3b. Halal-non-halal price discrepancy	- "I always buy halal food and it's more expensive than the, regular, chicken, for example, multiply by three or four regular price and I cannot buy the other chicken.. I feel it's not fair."
	3c. Foodbank issues	- "Foodbanks should be aware of cultural food.. I know the people in food bank, they want to help, but they don't know. So, this cultural competency piece is lacking here."
	3d. Lack of halal labelling and ingredient transparency	- "It's a tragedy..when we are at the shop, and we are sitting there reading everything kids selected. I start, teaching them...they just picking on the basket. When you say no, there is gelatin… they start crying and lying on floor." - **"**If I look at the information…they don't give a lot of ingredients... it's just one of the things that have been impacting my mental wellbeing since I came to Canada."
	3e. Cross-contamination	- "I saw in [well-known cafe], one of the workers was making a sandwich with the same gloves they grabbed the bacon. Then I saw them making another sandwich. And they just didn't change like the gloves. They were working on the same surface, and they use the same grill. This is one of my concerns."
	3f. Lack of awareness	- "Sometimes at my work they bring food for lunch…I ask him if it is halal? If it is not halal, I won't eat.. He told me OK... He tells me, I brought you a halal see. I told him what is halal? And he says, pork..." - "I used to work in a restaurant. Workers who work there are not Muslim. Many times, they ask me, do you drink alcohol? I'm going to ..drink wine. But I can't drink this, because I am Muslim. I need to explain for them what's halal and haram for being like a Muslim so they don't ask a Muslim about these types of things and some red lines that they cannot exceed."
4.Food/nutrition/ and cultural cuisine and MH	**4a**. Food availability/ accessibility and hunger	- "Food availability is giving the security for a person.. I'm secure, I have food. Feeling safe..you have the food that you can feed yourself, feed your family." - "If I don't eat for a long time, I get dizzy, I'm not as energetic… If for example, a problem comes up during the day, I'm already thinking about how hungry I am and how I need to eat. It just really adds a lot of stress." - "When you go to the store at the beginning of the COVID and you go when the shelf were empty. At that time, I got nervous, to be honest. So definitely effecting on your mental health, because it got you worried."
	4b. Food quality	- "I started to be conscious of how junk, poor quality food made me feel afterwards. I would feel very drained, I have no energy, and down mentally. Obviously if you're eating healthier, your brain and body function a lot better, you are going to have more energy.." - "There is a relation between the good bacteria in the gut and the wellbeing and the mental health.. that is the reason most of the times that people who eat junk food they don't feel happy.." - "Food can be an addiction. If you're facing challenges, you use food to ease emotional burdens"

	4c. Cultural foods	- "We are not crazy just about to eat this specific food. No, this attaches to your roots. And, so, you are being yourself. And when you get to know yourself, you are a stable person. You are more efficient person that can help others."
5.Actions for equitable nutrition	**5a**. Food affordability	- "The government should have more regulations and control the price." - "We need more support to women, and especially during pregnancy it's much needed, like, discounts, coupon."
	5b. Awareness & nutrition education	- "I hope we can have access to the nutrition doctors to give us more options, like for Arabic or Muslim style because if you go for nutrition, he will give you the Canadian style of diet and it's not working with us." - "If you can do it [a reliable resource] in simple English so everyone can understand, because sometimes you keep reading just one page, but all of it is terminology. You don't know, should I eat it, or I shouldn't?"
	5c. Surveillance & quality control	- "In terms of vegetables and fruits there has to be surveillance. They're letting in anything. It has to be under surveillance so we can know what we're eating." - "I wish at the federal levels, and the provincial level, to take these decisions to make our food really healthier, to prohibit the use of pesticides, and the herbicides,.. Also, to have much more transparency regarding the GMO.."
	5d. Halal and cultural foods	- "If pressure is put on the factories that produce the halal product, just ensure that the prices are reasonable." - "The government has to support small businesses which are making Arabic food, so they can make it." - "Any fast-food restaurants…We have a big community of Muslim... So, they should consider halal menu."

[a] Age and gender of participants are not included to maintain privacy.

Fig. 3.2. Photos shared by Photovoice participants

a: Food items in grocery cart. Symbolize concerns about the increase in food price

b: Rotten tangerine on shelf in grocery store. Symbolize concerns about food quality/safety

c: Nutrient facts of toddler puree. Symbolizes concerns about the amount of sugar

d: Cookies. Symbolizes concerns about marketing of sugar-dense foods/sweets

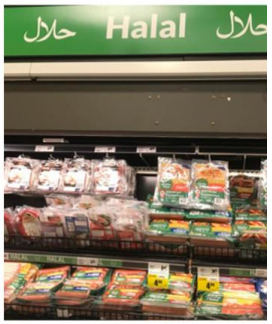
e: Apples. Symbolize concerns about substances/chemicals used to cover fruits to increase their shelf life

f: Large cucumber and watermelon. Symbolize concerns around genetically modified foods

g: Growing natural/organic grapes in backyard of one participant's house

h: Coffee. Symbolizes concerns about lack of ingredient transparency (*halalness*)

i: Okra, tamarind syrup, pomegranate sauce and mixed herbs. Symbolize lack of accessibility of healthy cultural foods



j: Limited halal section in grocery store. Symbolizes frustration with lack of accessibility of halal meat

k: Candies. Symbolizes stress about absence of halal labeling

l: Parsley in jar (left). Toys in the jar (right). This full photo symbolizes "you are what you eat"

m: Different homemade, nutritious, cultural meals. The photos symbolize the healthfulness of cultural foods and their significance in enhancing ethnic identity, family bonding and mental health

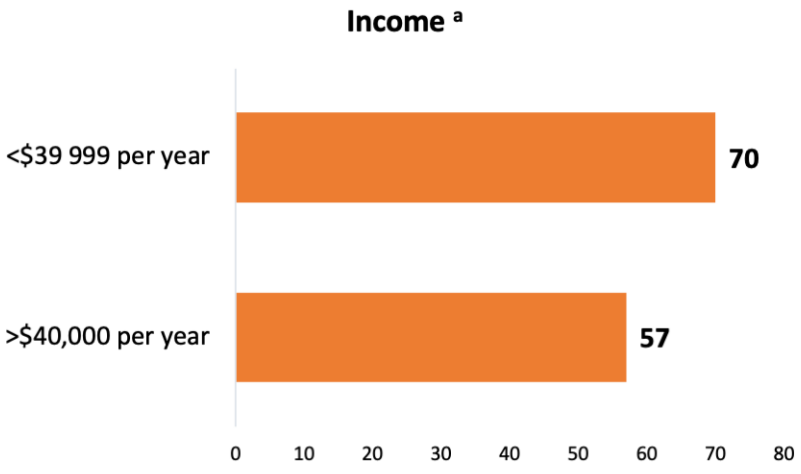
3.2.2. Nutrition and Food Inequities

Considerable nutrition disparities were noted within the AIR community. Low-income participants, and particularly recent immigrants/refugees, reported facing various challenges in meeting their dietary needs (Table 3.2, subtheme 2a). The survey results also showed higher food insecurity rates among participants with annual income of <$39.999 (70%) than those of a higher income (57%) (Fig. 3.3). Although not statistically significantly different, food insecurity rates were higher among refugees and those with shorter length of residency than those who voluntarily immigrated and those with longer residency (81% and 69% *vs.* 59% and 62%, respectively). Participants explained that they could not afford nutritious foods and reported concerns around the stigma associated with seeking food assistance. One participant stated '*Some people they don't like to go [to food bank.] It's a stigmatized, like, people get stigmatized if they go to food bank*'. These issues were most common among mothers, particularly single mothers, who reported having to cut their meals or consume poor-nutrient foods often to feed their children. Pregnant and breast-feeding women additionally reported difficulties meeting their nutrition needs (Table 3.2, subtheme 2b).

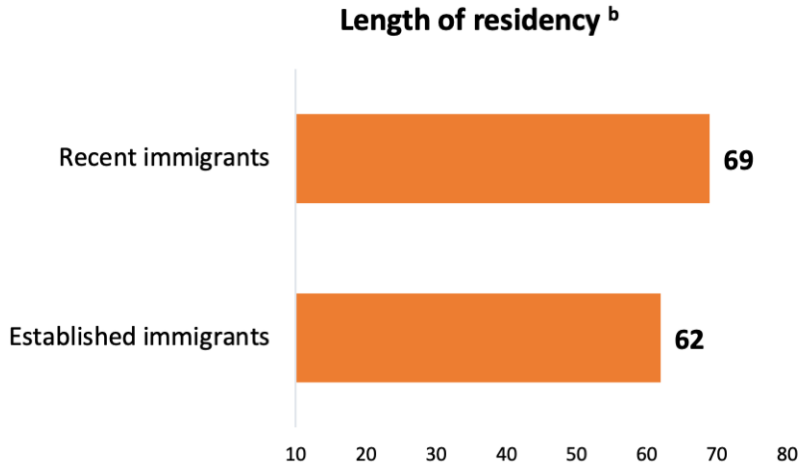
AIR from specific Arab countries (e.g., Tunisia) appeared to experience more difficulties finding nutritious cultural foods from their regions in Ontario, compared to other groups (e.g., Syrian, Lebanese). Muslim AIR faced additional stress around either accessing *halal* meat (i.e., permissible to consume according to Islamic law) or ensuring the *halalness* of food items (not containing non-halal meat, pork, or alcohol products, which are prohibited for Muslims) (Table 3.2, subtheme 2c and Fig. 3.2h). One participant said '*If I didn't get my special halal food, I feel sad because I think it's my right to get what I need*.'. The issue was particularly concerning among AIR with disabilities associated with dietary restrictions; they faced significant barriers to obtaining nutritious, healthy foods that meet their religious *and* disability-related dietary restrictions (Table 3.2, subtheme 2d). AIR residing in very small cities (with

population of <50,000) which lack cultural foods reported being substantially affected by the above factors, given their need to travel long distances to secure nutritious, culturally appropriate foods (Table 3.2, subtheme 2e). The survey results showed that participants from large-sized cities (Toronto & Ottawa) experienced higher food insecurity than those from medium- and small-sized cities (76% vs. 57 and 64%, respectively) (Fig. 3.3). Participants explained that living expenses, particularly housing rental costs in large Canadian cities, are very high, which swallows most of their income, leaving little for food.

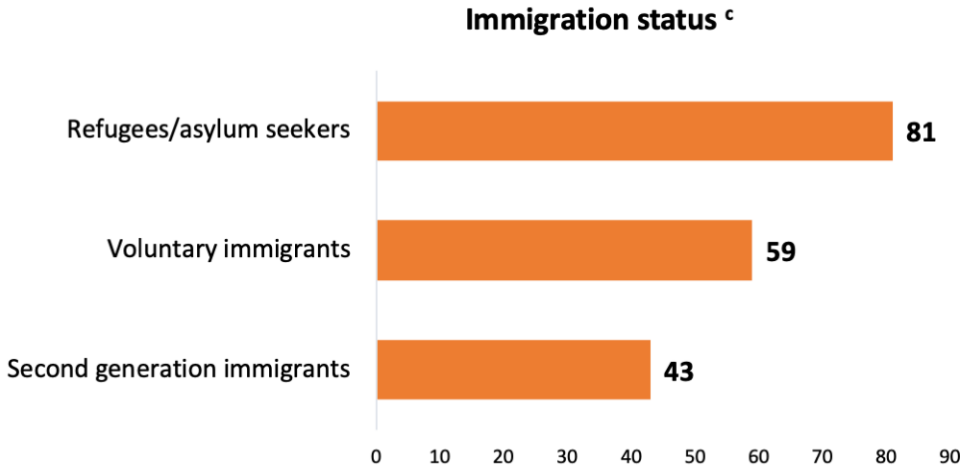
Fig. 3.3. Sub-group differences in food insecurity status



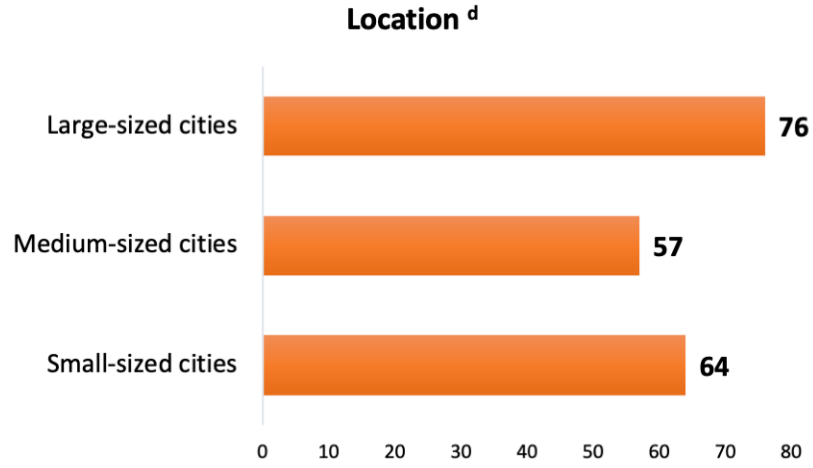
[a] No statistically significant difference: X^2 (1, N=41) = 0.7, p= .39



[b] No statistically significant difference: X^2 (1, N=60) = 0.4, p=.55



[c] No statistically significant difference: X^2 (2, N=60) = 4.3, p= .12



[d] No statistically significant difference: X^2 (2, N=60) =1.6, p= .46

3.2.3. Cultural Food Insecurity

Participants reported challenges in maintaining a state of cultural food security (stable/easy access to nutritious, cultural foods that meet one's dietary needs/preferences). Muslims additionally faced significant barriers to accessing *halal* food, with the lack of access negatively impacting their MH. Participants reported either limited availability/variety or complete unavailability of cultural/*halal* food in grocery stores and public spaces (Table 3.2, subtheme 3a and Fig. 3.2i). One participant captured a photo of the *halal* section in a Canadian grocery store, expressing frustration with the limited availability/variety of halal products (e.g., no red meats), relative to non-halal (Fig. 3.2j). The price of *halal* meat was reported to be significantly higher than the non-halal (e.g., double/triple). This difference was associated with negative MH, stemming from feelings of unfairness and social exclusion (Table 3.2, subtheme 3b). One participant elaborated on this issue saying '*The price is really high. When you see the flyers in supermarkets, and you see there is discounts on meat and it's not halal you feel like you are excluded… Like if, you didn't count.*'. Low-income AIR added that foodbanks often provide culturally unfamiliar/unacceptable foods that they could not use (Table 3.2, subtheme 3c).

Lack of *halal* labelling on food products was a considerable issue reported by Muslim AIR as causing them high distress and anxiety during shopping (Table 3.2, subtheme 3d). This was particularly concerning for parents accompanying kids as the latter often put pressure on them by requesting non-halal products (Fig. 3.2k). A lack of ingredient transparency (i.e., *halalness*) in restaurants'/vendors' menus was also a common stressor reported by Muslim AIR. Participants were concerned about cross-contamination of non-permissible products (e.g., pork) with *halal* ingredients due to using the same utensils for food handling in restaurants/vendors (Table 3.2, subtheme 3e). Finally, 88% of participants noted a lack of awareness (among the public) about what *halal* means and/or importance of cultural foods,

which often resulted in (un)intentional bullying/harassment and MH-threatening incidents in various contexts, including schools, workplace, and restaurants (Table 3.2, subtheme 3f).

3.2.4. Food/Nutrition and Cultural Cuisine and MH

Participants identified food as an integral part of their MH and well-being. They reported that the availability/accessibility of food as a basic human need is crucial for making them feel secure and satiated and for preventing hunger, thereby enabling their bodies to satisfactorily function physically and mentally (Table 3.2, subtheme 4a). Some participants referred to the empty grocery stores' shelves during the COVID-19 pandemic and how this caused them severe distress and anxiety.

The quality of food was a substantial MH determinant reported by participants. They identified nutritious/healthy foods as vital for their MH through different pathways, including providing the body/brain with essential nutrients, improving gut microbiome composition and immunity, preventing physical illnesses, as well as enhancing energy, productivity, self-esteem, resilience, and ability to be physically active (Table 3.2, subtheme 4b). One participant captured a creative photo of two parts (part one shows parsley in a jar, representing diet, and part two displays action figures in the same jar, representing consumers) to elaborate on the role food quality plays on one's well-being by stating '*you are what you eat*', underscoring the health implications of food quality (Fig. 3.2l). Participants also reported that their MH status impacted eating behaviors. Psychological stress was often associated with cooking/consuming unhealthy meals and seeking emotional security from energy-sugar/dense foods.

Traditional foods/cuisine play a significant role in enhancing AIR's MH (Table 3.2, subtheme 4c). Reported pathways included enhancing a positive ethnic identity/belonging, emotional stability, and resilience, strengthening familial relationships, relieving home sickness, facilitating networking opportunities with mainstream people by exchanging/introducing cultural foods, displaying the Arab

culture of generosity, and combating racism. One participant elaborated on the importance of traditional cuisine saying '*I smell my mother in this meal. Tell kids your grandmother used to make this dish. When we're here in the West, unfortunately we miss out on the family relationships. These foods try to compensate, help with the feeling of security, strengthening identity*.'. Finally, participants reported that cultural foods are often healthy/nutrient-dense, which contributes to positive MH. Different participants shared photos of varied homemade, nutritious, traditional meals, which involve vegetables, healthy fat (i.e., olive oil), complex carbohydrates and protein, to demonstrate the healthfulness of cultural foods and their significance in enhancing their families' ethnic identity, bonding and MH (Fig. 3.2m).

The bio-psycho-socio-cultural model helped display the complexity of food/nutrition and its relationship to AIR's MH by integrating different factors, pathways/processes, and outcomes (Fig. 3.1). The model shows various demographic, psycho-socio-cultural and structural factors that were reported by AIR as influencing their dietary intake and food security status. It also presents various pathways/mechanisms via which food availability/accessibility, diet quality and cultural foods shaped AIR's MH as reported/perceived by the participants. The model connotes a possible bidirectional/reciprocal food/nutrition-MH relationship.

3.2.5. Actions for Equitable Nutrition

Participants made different recommendations/requests for food policy change. These included introducing stricter regulations that ensure essential food affordability, regularly providing grocery gift cards to low-income families and mothers/mothers-to-be, subsidizing the price of healthy foods, supporting the opening of more ethnic grocery stores, running more community food programs, and providing government support to food banks to provide more high-quality culturally appropriate foods (Table 3.2, subtheme 5a). Another proposed action is to conduct ethnic and *halal* food campaigns/events that raise awareness about these foods and their importance for AIR's MH. To promote healthy eating, participants

proposed imposing more taxes on unhealthy foods and restrictions on advertising them to children. They also expressed the need for culturally/linguistically sensitive nutrition education resources and services, cultural-competency training for care providers, and more representation/diversity in the dietetics profession (Table 3.2, subtheme 5b).

Participants requested that stricter regulations be put in place to limit the use of chemicals and genetic engineering in agriculture/farming and ensure the safety/accuracy of nutrition labels on imported items (Table 3.2, subtheme 5c). They highlighted the need for transparent labelling on produce regarding any chemical substances used in production. Inspection reinforcement in food provider locations was emphasized by participants as a crucial measure to ensure food safety (e.g., decrease rotten, expired foods).

Muslim AIR additionally requested that the government support the halal meat industry (e.g., halal certification) to address the halal-nonhalal cost gap and enhance accessibility in grocery stores (Table 3.2, subtheme 5d). They also emphasized the need for mandating halal (*or* vegan) labelling on all grocery food products. Regarding restaurants, participants requested stricter regulations for ingredient transparency by incorporating halal icon/symbol on menus as relevant for a more inclusive society.

4. Discussion

The CAN-HEAL study explored food/nutrition needs as they relate to MH among AIR in Ontario, Canada. The study found that AIR face different structural barriers that hinder their ability to eat healthfully, which was associated with negative MH. Food quality/safety was a major concern and source of anxiety among AIR. A novel finding is the reported frequent presence of expired and rotten foods in food provider locations, and the associated negative MH. A recent study showed that Canadians relied on the “best before” date as an indicator of food safety, with about 70% opposing the date elimination to

reduce food waste (Charlebois et al., 2022). Governments/authorities are urged to consider the MH implications of food policies, which can be particularly concerning for ethnic minorities, including AIR, and adopt tailored preventative measures (e.g., more food handling/safety awareness campaigns) to help prevent anxiety about food safety. The widespread availability of genetically/chemically modified foods without transparent labelling was a considerable stressor for AIR who perceived these foods as unsafe to eat. Before immigration, many AIR were used to eating fresh, non-chemically modified foods, which they perceive to be "pure/contaminant-free" and normal-sized. The transition to Canada, where genetically/chemically modified foods are widespread, has been reported in several AIR studies about food insecurity in North America, and is associated with feelings of unsafety about these foods, fear, worry, and dread of the unknown. (Elshahat & Moffat, 2020).

Another important finding from this study is that although AIR collectively share common concerns about food/nutrition in Canada, nutrition inequities vary by sociodemographic factors, family roles, and geographical location. For example, our research showed that participants from large-sized cities experienced higher food insecurity than those from smaller cities, which was attributed to challenges in balancing rent and food or other costs. Similar findings were reported for Syrian refugees in Quebec, Canada (Chevrier et al., 2023). AIR mothers, particularly single parents, reported that they frequently reduced their own nutritional well-being to adequately feed their children. This has been previously reported in studies of mothers living in food insecure households in the US (Olson, 2005) but not specifically among AIR. The disparities revealed in our study underscore the need for subgroup-focused nutrition services/programs to promote nutrition equity for AIR.

This study found an alarming prevalence of household food insecurity (65%) among AIR participants, which is more than double what was reported for Arabs in the Canadian Community Health Survey (CCHS) (28%) (Tarasuk et al., 2021). This substantial difference may in part be explained by the non-

inclusion of refugees or non-English speakers in the CCHS, and by the community-engaged nature of our research, including the genuine consideration of cultural sensitivity (e.g., providing the questionnaires in Arabic), which aided trust-building with the community, and thereby collecting relatively reliable data. The CAN-HEAL study also uncovered widespread cultural food insecurity among AIR. The concept of cultural food insecurity was first introduced by Power (2008) to describe the unique needs of Indigenous people in the Canadian North and later used by Moffat, et al. (2017) to extend understanding of food insecurity among immigrants. Participants in this study reported substantial barriers to accessing culturally appropriate foods that meet their dietary needs/proscriptions and preferences which were associated with negative MH. Limited availability of cultural foods was also reported as a major stressor among other ethnic minorities in Canada (Beagan & Chapman, 2012). Our study showed that Muslim AIR experienced numerous challenges around *halal* food accessibility (e.g., lack of *halal* labelling, high-priced *halal* meat), which were associated with negative MH. Similar findings have been reported for other Muslim immigrants in Canada (Vallianatos & Raine, 2015). Another unique finding is reports of bullying/harassment towards Muslim AIR regarding their *halal* diet needs. From 2020-2021, Canada witnessed a 71% increase in reported Islamophobic hate crimes, excluding day-to-day, often-unreported anti-Muslim incidents, such as those in our study (Canada, 2021). This highlights the need for more Muslim/*halal* awareness campaigns and measures to eliminate these incidents.

The current study revealed that the food/nutrition-MH relationship among AIR is multi-faceted. Food availability/accessibility, as a basic human need for survival, was associated with AIR's MH as reported by participants. This is corroborated by Tarasuk et al.'s (2018) study which found that severe household food insecurity was significantly associated with MH services utilization among the general population in Ontario. Diet quality was associated with MH among AIR. Similar findings have been found among older Canadian adults (Davison et al., 2020). Although the MH impacts of food (in)security and diet quality are well-documented and apply to any population, the relationship between food (in)security/diet quality and

MH among AIR is concerning given the complex and unique challenges this population faces (e.g., Anti-Arabism, Islamophobia), which may lead to adverse synergistic effects and complicated MH issues. Participants in this study reported cultural foods to be helpful in protecting their MH through different psycho-socio-cultural pathways, such as enhancing ethnic identity, belonging and resilience. Similarly, access to cultural foods was found to aid Syrian refugees preserve their identity and cultivate feelings of being "at home" in São Paulo, Brazil (Porreca et al., 2019; Scagliusi et al., 2018). In the destination country, immigrants often face different identity-related challenges, due to cross-cultural differences and loss of familiarity, which may place their MH at risk (Furnham, 2019). Cultural foods can be helpful in affecting immigrants' emotions by fostering a sense of belonging, thereby promoting healthful adaptation and enhancing MH (Locher et al., 2005).

Overall, the bio-psycho-socio-cultural model helped illustrate/conceptualize the complexity of food/nutrition as it relates to AIR's MH by integrating various factors and pathways/processes, through which food/nutrition was found to shape AIR's MH. The model highlights the need for holistic, culturally competent nutrition interventions/policies to address the complex dietary needs among AIR and promote their MH.

Finally, different political and community-level actions to enhance nutrition equity were proposed in this study. Examples include supporting ethnic grocery stores, running more community food programs, conducting cultural and *halal* food awareness campaigns, providing culturally sensitive nutrition education resources, and limiting the use of chemicals/genetic engineering in agriculture. The proposed actions highlight the need for intersectoral collaboration, particularly for addressing the complex systemic issues. As a community-engaged study, immediate actions were taken to address some of the feasible (at the research project level) community's needs, such as running community-led cultural awareness campaigns and developing/distributing a culturally sensitive nutrition education cookbook.

5. Strengths and Limitations

This study integrated CBPR and IKT approaches to identify areas for social reformation and create applicable knowledge for service improvement. Cultural sensitivity was maintained throughout the research, which helped enhance the validity of the findings. This study was done on Zoom, which could be associated with some connection/technical difficulties. However, these limitations were outweighed by various advantages, including time- and cost-effectiveness and feasibility of recruiting hard-to-reach participants from wider geographical areas.

Our study adopted a multi-methodological approach and triangulated the findings to increase rigor. Another strength is the application of a holistic bio-psychosocial-cultural framework to the study's results to develop a conceptual model that presents the complex food/nutrition-MH relationship. This study involved socio-demographically diverse AIR, which helped reveal disparities. However, sub-groups were not equally represented, which may have resulted in unequal representation of experiences. The findings of this Ontario-focused study may not be generalizable to other locations where policies differ. While the survey sample size was small, the results overall are eye-opening and provide a valuable insight into food/nutrition inequities in the AIR community. Although causality between food/eating practices and MH could not be inferred given the study design, the findings shed light on the complex relationship between food/nutrition and MH among AIR, which can inform culturally sensitive programs. All data in this study were self-reported, which may be associated with social desirability or recall bias; however, this was mitigated by triangulating different methods.

6. Conclusions

The CAN-HEAL study showed that AIR face various structural barriers that hinder healthy eating and negatively impact MH. Food quality/safety was a major concern among AIR. Sociodemographic variables

and complex vulnerabilities result in several inequities that play a substantial role in how nutrition, food security, and dietary intake are experienced and can impact AIR's MH. Participants experienced an alarming prevalence of food insecurity, which was associated with negative MH. Overall, the food/nutrition-MH relationship among AIR is complex and multi-faceted, and various psycho-socio-cultural pathways/processes were found to shape AIR's MH. Proposed actions highlight the need for intersectoral collaboration between health and non-health sectors to achieve nutrition equity for AIR.

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CHAPTER FOUR: 'I DESERVE THE RIGHT TO EXERCISE': THE COMPLEXITY OF LEISURE PHYSICAL ACTIVITY NEEDS AND ITS RELATIONSHIP TO MENTAL HEALTH AMONG ARAB IMMIGRANTS/REFUGEES IN ONTARIO, CANADA: THE CAN-HEAL STUDY

Title: 'I deserve the right to exercise': the complexity of leisure physical activity needs and its relationship to mental health among Arab immigrants/refugees in Ontario, Canada: the CAN-HEAL study

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Abstract

Background and objectives: The emerging evidence in exercise psychiatry suggests that leisure physical activity (LPA) impacts one's mental health (MH) positively. The suggested MH benefits of LPA may present a promising avenue to promote the MH of immigrants/refugees, who often face various stressors that may impede their MH. This study aimed to examine LPA needs as they pertain to MH among Arab immigrants/refugees (AIR) in Ontario, Canada.

Methods: The CAN-HEAL study adopted a collaborative community-based participatory research and integrated knowledge translation technique. Three methods were triangulated: qualitative interviews, photovoice and a questionnaire survey. A combination of three sampling strategies (convenience, purposive and snowball) was utilized to recruit 60 socio-demographically diverse AIR participants (aged > 18 years). The study was informed by an integrated bio-psycho-socio-cultural framework.

Results: Participants were knowledgeable about recommendations and MH benefits of LPA. Nonetheless, 86.7% reported *not* engaging in sufficient regular LPA, due to different structural, and psycho-socio-cultural barriers. Intersections between age, gender, socio-economic status, length of residency, and immigration status were associated with substantial LPA disparities and negative MH within the AIR community. Older adults and low-income participants reported *significantly* lower LPA levels than younger generations and those with higher income. The LPA-MH relationship among AIR is multi-faceted, with various LPA-related bio-psycho-socio-cultural pathways/mechanisms influencing AIR's MH.

Conclusion: LPA needs among AIR are multi-faceted. Intersectoral collaboration is required to implement a co-proposed community- and political-level action plan to address LPA disparities and achieve healthy equity for AIR and other similar vulnerable groups.

Keywords: physical activity, distress, depression, community-based participatory research, bio-psycho-socio-cultural model, photovoice

1. Introduction:

1.1. Background

Physical inactivity is an alarming global public health issue that is linked to physical and mental health (MH) disparities [1]. In Canada, only 50% of the adult population participate in adequate physical activity (PA) (i.e., ≥150 minutes of moderate-to-vigorous intensity activity per week) [2]. Immigrants are about two times less likely to be physically active than the broader population owing to different socio-cultural and ecological factors, such as language barriers and difference in climate between homeland and host country [3,4]. There is growing evidence that adequate regular PA participation tends to act as a protective factor against mental ill-health [5]. The PA-MH relationship can be particularly striking among immigrants whose activity levels and MH can be affected by various distinct stressors, such as racism and cross-culture pressures [6].

From 2015 to 2022, Canada received over 400,000 Arab immigrants/refugees (AIR) [7]. Preliminary research found that AIR in Canada encounter distinct psycho-socio-cultural barriers to PA, particularly in the leisure domain, that result in disproportionally lower attendance at PA programs/classes and higher risk for MH issues among AIR than other immigrant groups [8]. Examples of reported barriers include fear of post-9/11 harassment, gender stereotyping/bias in sports and lack of culturally appropriate resources. Promoting culturally-relevant leisure physical activity (LPA) represents a promising avenue for improving AIR's MH by enhancing resilience and adaptation while reducing social exclusion [9].

Despite the specific issues AIR face around LPA participation, there is a lack of research in this area, due to cultural sensitivity and social exclusion [8]. A recent AIR-specific scoping review of 75 studies reports that Canada is far behind US, Australia and Europe in AIR-PA research, with only 5% of studies

conducted in Canada, none of which examined the PA-MH relationship [8]. These studies used researcher-dominated research designs that do not engage vulnerable communities as co-partners and overlook cultural sensitivity. Achieving cultural sensitivity in PA-MH research among AIR, who embody distinct cultural norms/values and often internalize MH stigma, is crucial for ensuring data reliability and informing effective, culturally-responsive interventions [10].

This community-engaged research study (CAN-HEAL) fills the gap in LPA-MH research amongst AIR, following best practices for cultural sensitivity [11,12]. The study's objectives include: 1) exploring experiences, perceptions and factors that affect AIR's LPA participation, 2) examining the relationship between LPA and MH, and 3) co-proposing a culturally appropriate action plan to promote AIR's LPA participation and MH.

1.2. A Holistic Approach/Framework

Despite the distinct psycho-social and cultural stressors that immigrants face in the context of PA and MH, most scholarship in this area uses a biomedical approach [6]. The CAN-HEAL study employs an integrated bio-psycho-socio-cultural framework to coalesce the multiplex, dynamic interplay between human biology and the broader environment as it pertains to LPA and MH among AIR [13]. The biocultural approach to PA and movement postulates that the human body is plastic and responds in different ways to environmental stressors, including migration-related behavioural and lifestyle changes [14]. Culturally appropriate services in the host country can help immigrants healthfully integrate and maintain positive MH. However, systemic barriers may impede immigrants' healthful adaptation and negatively affect their MH. The goals of this study are to thoroughly examine complexity of LPA and how it relates to AIR's MH and to propose effective, community-informed interventions.

2. Methods

The Health Promotion Ottawa Charter suggests that involving marginalized communities in setting health promotion priorities/agenda is crucial for reducing health inequities [15]. The CAN-HEAL study employed a collaborative approach including community-based participatory research (CBPR) and integrated knowledge translation (IKT) that recognizes an equitable community-researcher partnership to reduce barriers and enhance cultural sensitivity with the aim of co-identifying areas for social reformation and co-creating applicable evidence for service improvement [16–18]. A multi-methodological approach was deployed to enhance study rigour by triangulating three different methods: qualitative interviews, photovoice, and a quantitative survey.

2.1. Study Location

This study was undertaken in Ontario, home to around 50% of AIR in Canada [7,19]. A focus on Ontario minimizes provincial differences in health/social care systems that could complicate data analysis. Due to COVID pandemic restrictions, the Zoom platform was used to conduct interviews and photovoice sessions. The platform's effectiveness/feasibility has been documented in previous studies [20,21].

2.2. Community Partnership

From 2019 to 2021, a three-dimensional community partnership was developed. First, 25 AIR community leaders/representatives were consulted about the research topic/design to ensure its alignment with the community's needs. Second, partnerships were formed with various community centers. Third, a team of youth/students was built. These efforts yielded a diverse advisory/working group that aided the research, while sharing the goal of empowering and promoting AIR's LPA and MH.

2.3. Recruitment and Survey

Sixty AIR were recruited between October 2021-June 2022 by utilizing three sampling approaches: convenience, purposive and snowball [22]. AIR residing in Ontario and aged >18 years were eligible. Physical and electronic recruitment flyers/posters (in English, Arabic and French) were widely disseminated through social media and different community and worship centers. The recruitment message was also circulated among community representatives' networks and was purposively spread among hard-to-reach demographic groups (e.g., males and residents of small-sized cities). These strategies helped attain socio-demographic diversity in the sample. An informed, voluntary consent was obtained from all participants. Ethics clearance was obtained from the McMaster Research Ethics Board.

All participants filled a questionnaire survey that was co-designed and pilot-tested with 20 AIR representatives to ensure feasibility and cultural-appropriateness. The survey constituted questions regarding socio-demographics, LPA participation (adapted from the global PA questionnaire, which assesses respondent's level of PA- in metabolic equivalents- in a typical week [23]), and mental well-being (adapted from the WHO-5 well-being questionnaire, which examines respondents' mental well-being for the previous two weeks on a 0-5 scale; the raw score is multiplied by 4 for a score ranging from 0 to 100, with higher scores indicating better mental well-being) [24]. Descriptive statistics of participants' responses were developed utilizing Microsoft Excel. Non-parametric statistical tests were conducted to compare differences in LPA levels according to different socio-demographic factors. Mann-Whitney U tests were conducted to compare two-group differences according to gender, income, and length of residency. Three-group differences regarding age, immigration status and location were compared using Kruskal-Wallis tests, and post-hoc Dunn's test was done when a significant difference was found. Statistical significance was set at $p < 0.05$.

2.4. Quantitative Interviews and Photovoice

Fifty AIR (representatively drawn based on age and gender from the 60-participant recruited sample) participated in semi-structured 90-120-min interviews. The questions covered experiences, knowledge/perceptions and factors that impact LPA participation, the relationship between LPA and MH, and solutions needed to promote AIR's LPA participation. Data saturation (no new themes emerged) was achieved at the 41st interview. A further nine interviews were held to reach 50 interviews and enhance study robustness [25].

The photovoice participatory method was used to help AIR speak up by creating photographic evidence on their LPA experiences and needs as they relate to MH [26]. Twelve sessions were undertaken with 26 AIR who were representatively drawn based on age and gender from the 60-participant recruited sample. Each session was limited to two/three AIR to enhance participants' comfort and deep conversation. Photo-taking guidelines were illustrated to every participant before their session. These involved inviting each participant to capture 3-4 authentic digital photos that do not include identifiable human features and depict LPA participation as it relates to MH. In each session, photos were discussed with participants, with a focus on how the issues/strengths symbolized in each photo relate to their MH, and solutions needed to promote LPA.

All interviews and sessions were undertaken in each participant's preferred language by the first author who is a bilingual (Arabic/English) researcher with a Middle Eastern background. Each session was attended by four/five research assistants to help in notetaking and English-French translation as needed. Verbatim transcripts were developed, before undergoing translation into English (if applicable). Data underwent a thematic analysis using NVivo software and Microsoft Excel and deploying the framework by Braun and Clarke [27], which includes developing familiarity with the data, generating codes, producing initial themes as well as reviewing/revising the themes and defining/naming them, before

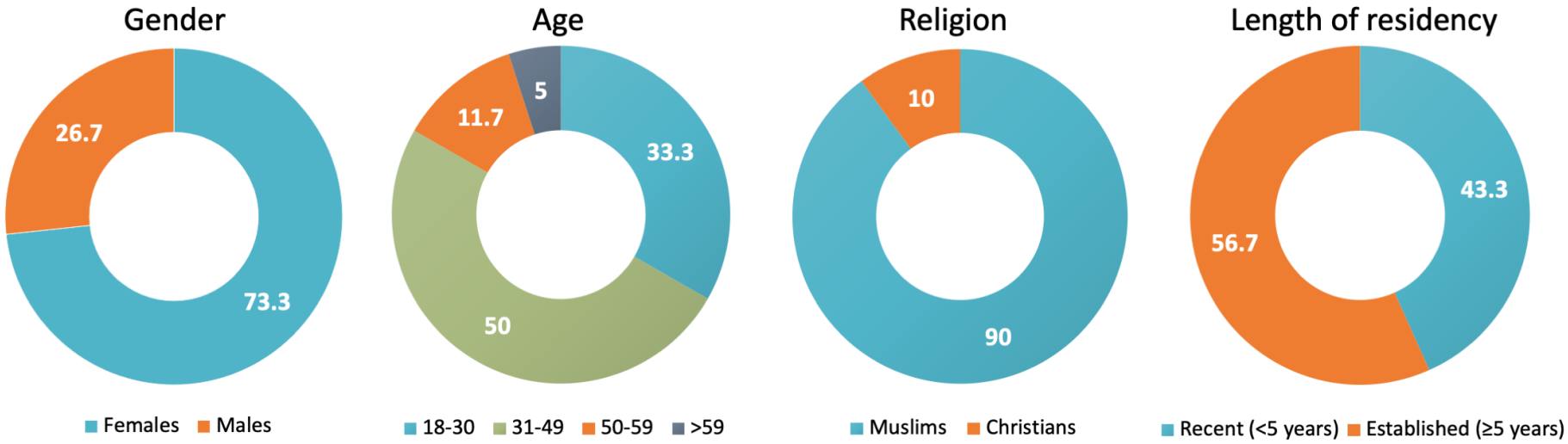
producing the report. A combination of deductive and inductive coding was performed to fulfill the study's objectives and help generate any new phenomena [28].

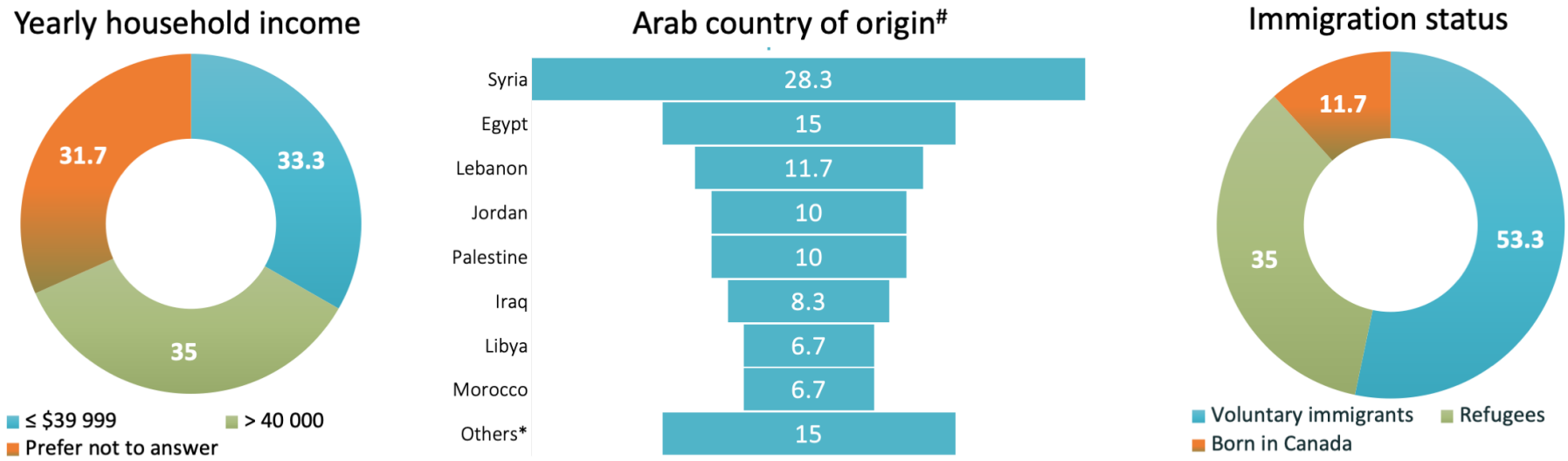
3. Results

3.1. Survey

Sixty participants responded to the survey; 50% were aged 31-49, 73% were females, 62% were married, 90% were Muslims, at least 35% were low-income, and 57% were established immigrants (Fig. 4.1). Fifty-three percent of participants were voluntary immigrants, 35% were refugees and 12% were second-generation immigrants. Respondents were from different-sized cities in Ontario: small (37%), medium (35%) and large (28%). The sample reflected 14 Arab nations. Of the 60 participants, 87% reported *not* meeting ≥150 or ≥75 minutes of moderate or vigorous intensity activity, respectively or combination of both per week, and 55% of participants reported low mental well-being.

Fig. 4.1 Descriptive characteristics of participants





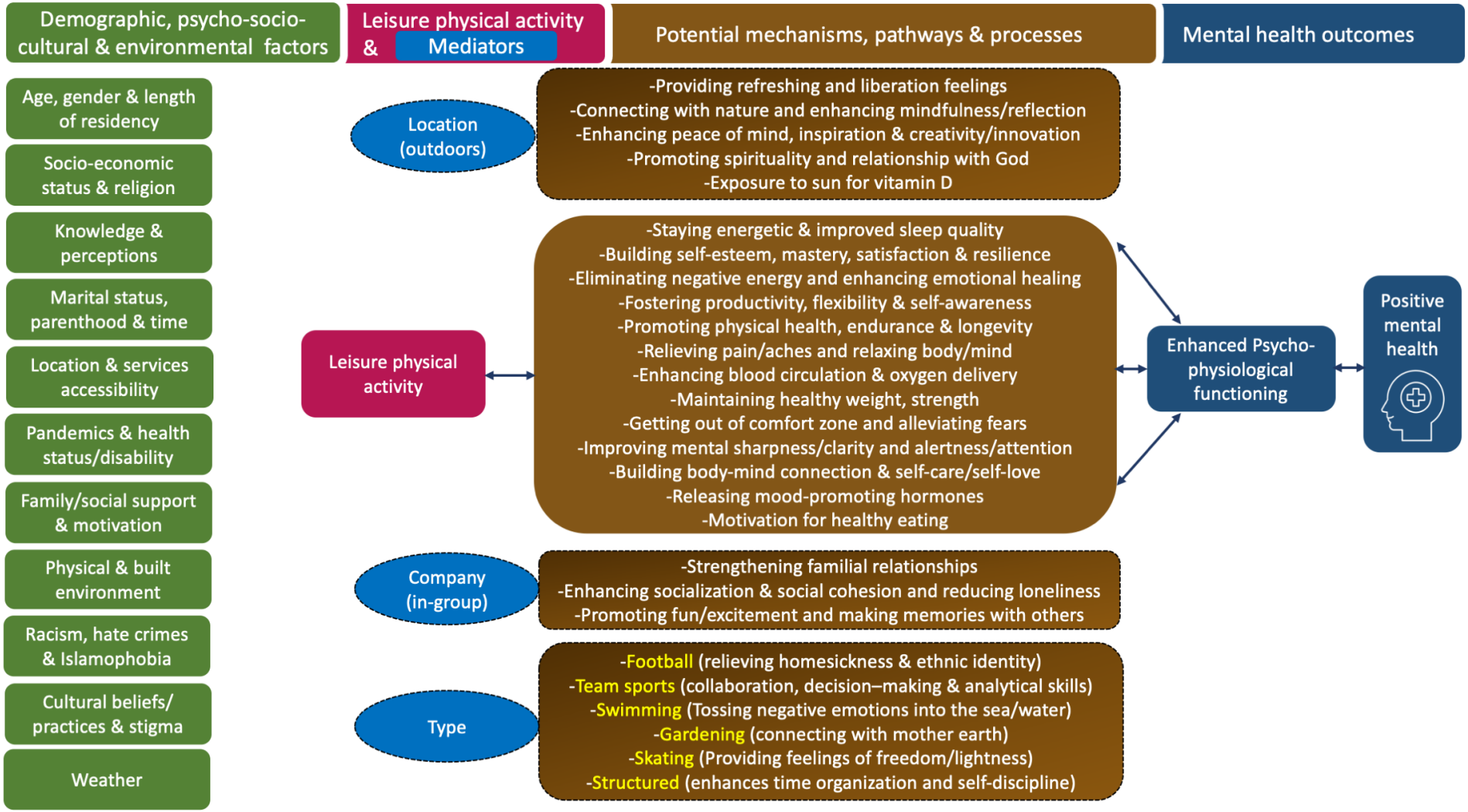
Total number is not summative

* Kuwait, Saudi Arabia, Tunisia (3.3% each), and Algeria, Sudan, Yemen (2% each)

3.2. Triangulation of Results

Data from the different methods confirmed each other. Four prime themes were developed: 1) LPA knowledge, perceptions, and practices/preferences, 2) LPA inequity, 3) LPA and MH, and 4) actions to move towards LPA equity. Applying the preliminary model propounded by Elshahat et al. [6], a bio-psycho-socio-cultural-informed conceptual model was developed to illustrate the multi-dimensional nature of LPA and its relationship to AIR's MH (Fig. 4.2).

Fig. 4.2. A bio-psycho-socio-cultural-guided conceptual model illustrating the complex relationship between leisure physical activity and mental health



3.2.1. LPA Knowledge, Perceptions, and Practices/Preferences

Overall, participants were knowledgeable of recommendations and the importance of LPA for MH and well-being (Table 4.1, subtheme 1a). They perceived LPA as enjoyable body movements that help relieve stress and prevent illnesses. However, low-income participants, particularly working parents, identified LPA as a luxury for which they did not have time. Youth exhibited higher knowledge of exercise principles, including pre-and post-workout nutrition and safety guidelines (e.g., drinking water), than older generations.

The most reported/preferred LPA types were walking/hiking, bicycling, gardening, swimming, football/soccer, basketball, weightlifting and gymnastics. Overall, participants preferred in-group exercising (e.g., with family and friends) and outdoor LPA participation (Table 4.1, subtheme 1b). One participant captured a photo of a trail in the Eglinton Ravine Park in Toronto to present enjoyment of outdoor LPA which provides an opportunity for connecting with nature and recharging (Fig. 4.3a). Winter presented a barrier to outdoor LPA (Fig. 4.3b & c). One participant stated '*Exercise unfortunately just became in the summer, I would go down.. and swim or walk.. When I'm with my wife and kids, especially in the spring or summer or fall, we go about twice or three times a week*'. Ninety-two percent of participants reported becoming sedentary during winter due to lack of culturally appropriate indoor facilities, high-priced gym memberships, unreliable local transportation systems, and/or worry about contracting COVID-19. Some participants (8%) reported exercising at home during winter using their own equipment, such as dumbbells and jump ropes (Fig. 4.3d & e).

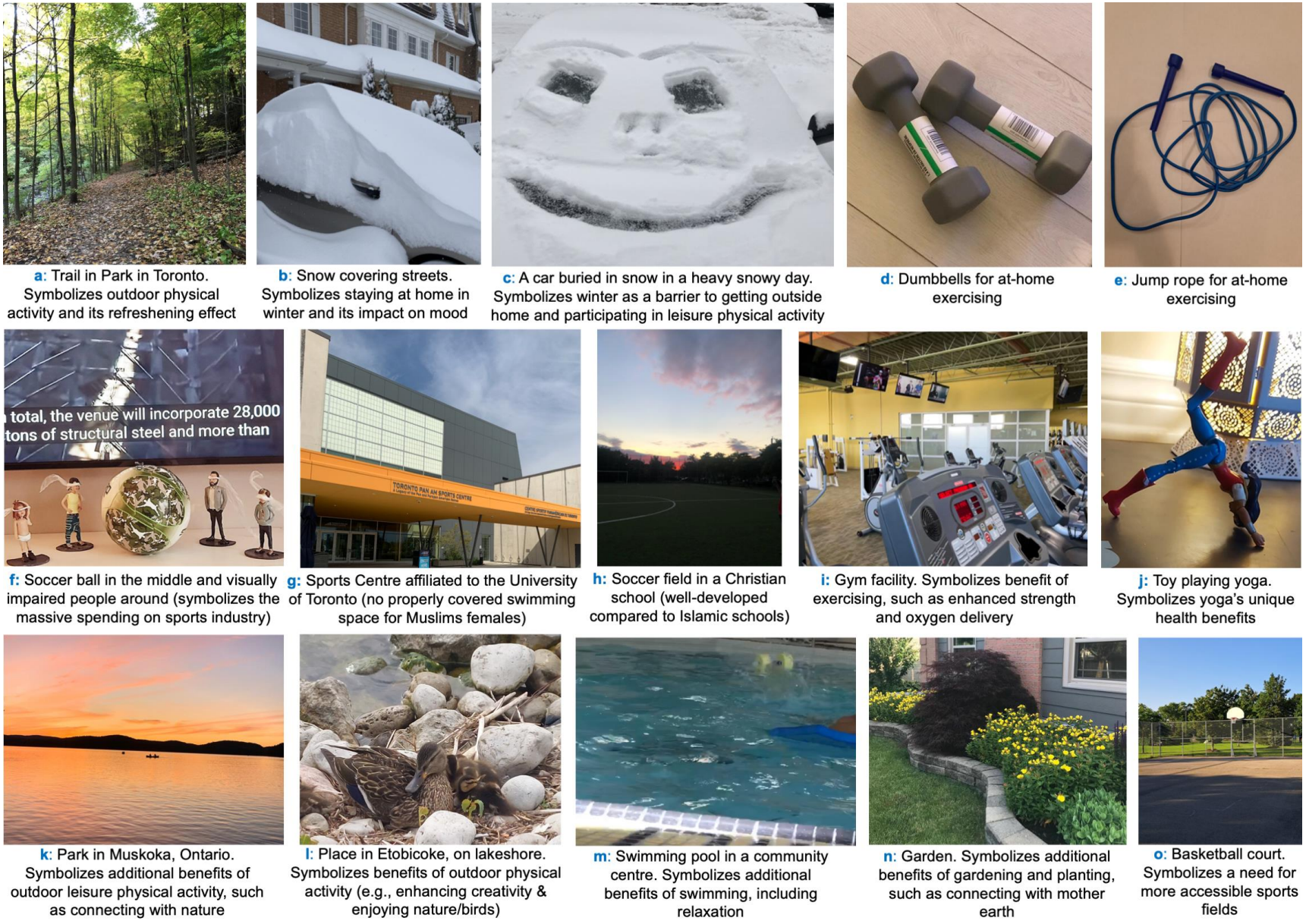
Table 4.1. Illustrative quotes for qualitative data themes

Theme	**Sub-theme**	**Illustrative quotes**
1. LPA knowledge, perceptions, and practices/preferences	**1a.** Knowledge and perceptions	- 'The best time of the day, it is the easiest and the most accessible way to relieve my stress.' - 'Those little smartwatches that keep track of how many steps you take a day. It kind of motivates you to do more and be more active when you see the steps increasing each day through your watch.' - 'Having short exercise sessions, at least three days a week is so significant.' - 'For workout, drinking my water, hitting, like, the goal daily–protein, getting enough protein daily and, nutrition-wise, vegetables are my number one right now.'
	1b. LPA preferences	- 'I just like when the weather is nice outside, I just feel more inclined to go outside and go on a walk or go on a hike or, even a bike ride. I don't like the cold. That would be the biggest barrier.' - 'In the pandemic, we didn't get the chance to go out. So, we decide to move for doing some activity at home. And in summer we get to a park every day, minimum two hours. We make activity sports outside.' - 'I like walking, any physical activity with people, just outside. Lots of fun.'
2. LPA inequity	**2a.** Income	- 'It's expensive. So, you gonna pay for accessing the machines and if you wanna have a class or course, you have to pay additional money, to have personal coach you have to pay additional money.' - 'My son needed it [exercise/sports programs fees] more than me because he has no friends here. He sometimes feels upset. He needs something to feel that he is still alive.'
	2b. Location	- 'Streets were already cracked; all holes, ditches. So, the snow on top of that just made it a much worse. It's very unsafe for everything, even walking was very unsafe. For mothers with strollers, weren't easy, to move from one place to another.'
	2c. Age and gender	- 'I had back injury years ago, and then I was advised with the fitness classes. But you need some instructors and, physical activities trainer or a physiotherapist, and the place and the group, to start with.' - 'I love football. I am not joining a team, and I don't have this possibility to win a match... I always try to just check around because of social concerns… There's a stigma.. as a woman...'
	2d. Religion	- 'Here, I struggle to find a class that it's 100 percent ladies and no camera inside the room. I'm gonna be moving, you gonna be filming me, okay, what are you gonna do with this after? And that's a struggle.' - 'Most Catholic schools are very well-built. It's because they get public funding. But if you look at Islamic schools, if you look at Jewish schools, they don't really get that funding. So, they're unable to put these kinds of good types of fields or enjoyment activities. That's one of the major issues that occur here.'
3. LPA and MH	**3a.** MH benefits	- 'When you do it, you will start to have the more energy, you are more active, relaxed, your organs are working better, more blood is going to your brain. Endorphin will be produced in your body, less pain. You will go in the evening and sleep better.'

		- 'You feel healthy. That's a big thing. And you know that you're going to make it to, if God wants, you're going to make it till you're 60, or your seventies, or even your eighties. You will see your granddaughters and grandson, and makes you feel safe.'
	3b. Reverse relationship	- 'Physical activity depends on like, mental activity. If you're happy, then I go for physical activity. If you're not happy, you're gonna be lazy at home, eating in front of the TV.' - 'You feel I am more comfortable after working out and I think you'll want to do it more, right. If you feel more comfortable what you're doing kind of motivates you to do more and take care of yourself.'
	3c. Outdoor LPA	- 'Outdoor walking makes me, you know, it changed my mood. I feel peace when I walk. I, sometimes I pray while I am walking, you know. It's a very nice time.'
	3d. In-group LPA	- 'I, sometimes in the summer I go for biking with my kids. And, sometimes we are hiking. We can speak with each other… some activities to do together that can affect mental health positively.' - 'Football affects me of course because…it's making me…having fun because I'm doing this sport, I'm so happy and, it's because, it's about group. It helped me to communicate with people.'
	3e. Specific LPA types	- 'I love to garden it's a form of relaxation and, also you get physical activity. Same thing as gardening. You get outside, fresh air, get your hands in the soil, you know. Kind of connect with mother earth.' - 'Swimming is a very easy to do sport. It's refreshing. I feel it's, it takes out lots of emotion, I mean like negative emotions that you have, you can toss it into the sea or water while swimming. This is what I feel towards swimming leisure activity, it takes lots of your negative energy. It will relief you.'
4. Actions to move towards LPA equity	**4a.** Programming and socio-economic status	- 'The government should put in perspective the growing community, like, in Milton. Five years ago, it was a small town and there was one community center. Now it's really becoming bigger…. Community centers are much important for the wellbeing.' - 'The government should give the sports activity for everybody for free, especially for kids, it's related to their health.'
	4b. Muslim women needs	- 'Something that can help it's Muslim friendly activities.. A female only, hours of swimming pool should be something available for all of us. Not only for Muslim, or maybe for just women. And, not only swimming, even at the gym, having hours for woman consecrated for a woman.' - '…the covered clothing, the sport kind of clothes, making it accessible everywhere. You don't have to search like a crazy person for that to be able to do your activities.'
	4c. Youth needs	- 'I would like the government to put more focus on youngsters and youth. Cause we have a lot of power. We have the energy to change things, but we don't have the facilities. For example, in Windsor, we have only two soccer fields that are usually booked all the time... So, if we make more plans regarding soccer fields, basketball fields, any sports, people will get more involved.'

		- ‘A solution like making.. a group on Facebook that says like anyone who wants to play soccer. So, if I don’t have like a full team, so ‘guys I want to go tomorrow playing football from eight to nine. So who want to play with me?’ And, of course, providing fields, because there are not many football fields here.’

Fig. 4.3. Photos shared as part of the Photovoice methodology



a: Trail in Park in Toronto. Symbolizes outdoor physical activity and its refreshening effect

b: Snow covering streets. Symbolizes staying at home in winter and its impact on mood

c: A car buried in snow in a heavy snowy day. Symbolizes winter as a barrier to getting outside home and participating in leisure physical activity

d: Dumbbells for at-home exercising

e: Jump rope for at-home exercising

f: Soccer ball in the middle and visually impaired people around (symbolizes the massive spending on sports industry)

g: Sports Centre affiliated to the University of Toronto (no properly covered swimming space for Muslims females)

h: Soccer field in a Christian school (well-developed compared to Islamic schools)

i: Gym facility. Symbolizes benefit of exercising, such as enhanced strength and oxygen delivery

j: Toy playing yoga. Symbolizes yoga's unique health benefits

k: Park in Muskoka, Ontario. Symbolizes additional benefits of outdoor leisure physical activity, such as connecting with nature

l: Place in Etobicoke, on lakeshore. Symbolizes benefits of outdoor physical activity (e.g., enhancing creativity & enjoying nature/birds)

m: Swimming pool in a community centre. Symbolizes additional benefits of swimming, including relaxation

n: Garden. Symbolizes additional benefits of gardening and planting, such as connecting with mother earth

o: Basketball court. Symbolizes a need for more accessible sports fields

3.2.2. LPA Inequity

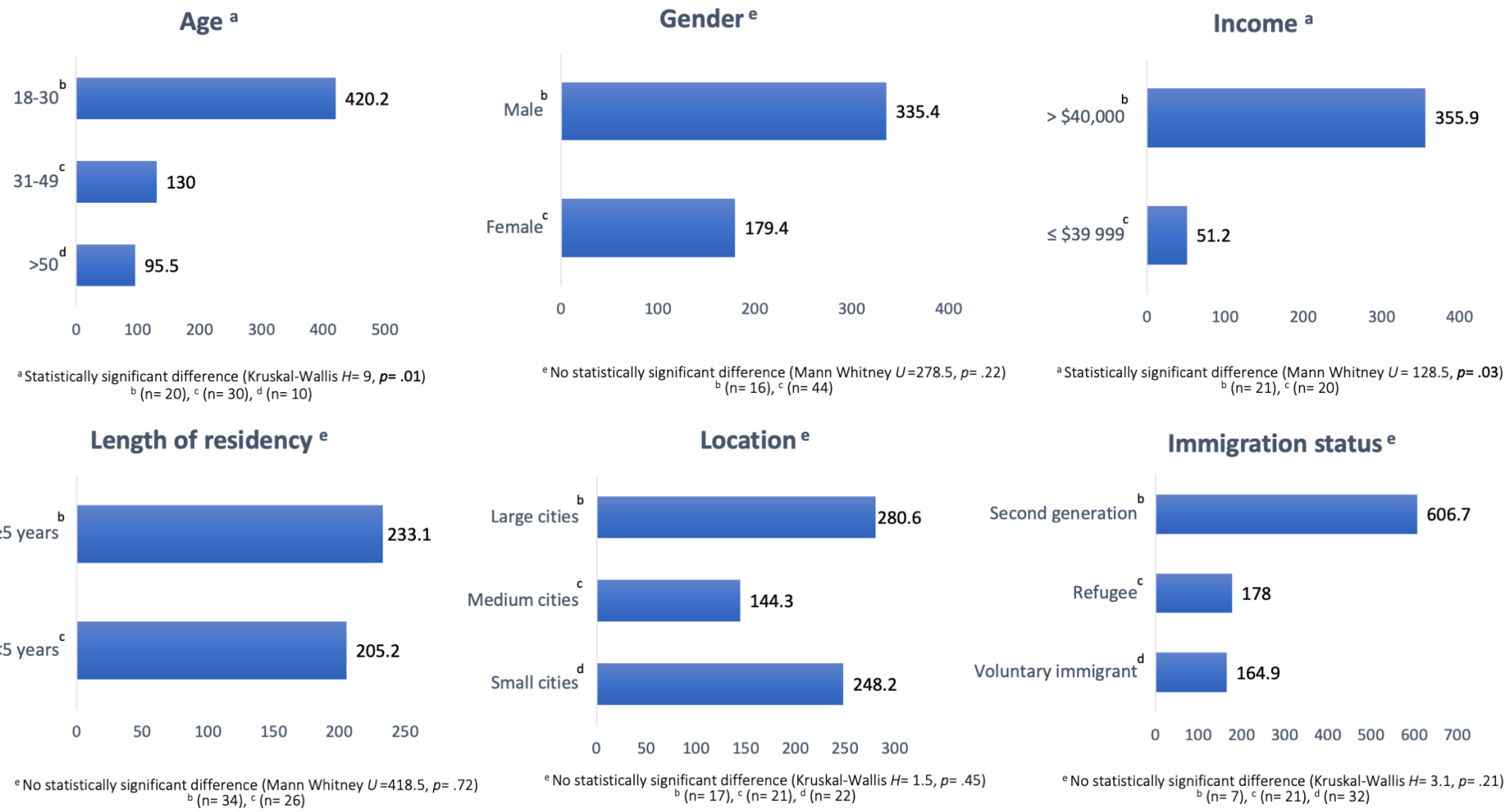
Substantial LPA disparities were found within the AIR community. Low-income participants faced numerous barriers to LPA, including not being able to afford the cost of gym memberships, community/sport centers, and at-home exercise equipment, which was associated with feelings of inequity and negative MH (Table 4.1, subtheme 2a). The survey results also showed significantly lower LPA levels among low-income participants than those with higher income (Mann Whitney U= 128.5, p= .03) (Fig. 4.4). One participant presented a photo of a soccer ball with visually impaired people around it, expressing anger about the massive spending on sports industry (i.e., FIFA), whilst many communities do not have equitable access to exercise/sports facilities (Fig. 4.3f). Parenthood intersected with income, where low-income parents prioritized their children by compromising their own needs to register/pay for their offspring to participate in exercise/sports programs. Participants living in underserved areas faced additional barriers to LPA, including lack of culturally appropriate indoor facilities and poorly established/maintained pedestrian and cyclist infrastructures and sports fields/courts (Table 4.1, subtheme 2b). Participants residing in large cities reported higher levels of LPA than those in medium- and small-sized cities, though the difference was not statistically significant (Fig. 4.4). Participants with less than 5-year length of residency were more likely to lack knowledge about available LPA services/resources, which hindered their LPA engagement. Although not statistically significantly different, levels of LPA were lower among those who immigrated <5 years ago and first-generation AIR compared to those with ≥5-year length of residency and second-generation immigrants (Fig. 4.4).

Older adults, especially those with age-related disabilities (e.g., osteoarthritis), reported challenges in finding exercise opportunities that are tailored to their needs (Table 4.1, subtheme 2c). Older adults also reported significantly lower LPA levels in the survey than younger generations (Kruskal-Wallis H= 9, p= .01). The role of gender was also associated with LPA disparities. Female participants reported stigma,

social pressures and stereotyping as barriers to participation in their preferred LPA, particularly male-dominated sports (e.g., football). The survey results also showed that females were less likely to participate in LPA than males, though the difference was not statistically significant (Fig. 4.4). Mothers of children with special needs also experienced significant challenges finding accessible facilities/services that met their needs.

Muslim AIR reported distinct barriers to LPA, including a lack of availability and affordability of culturally relevant sportswear and facilities that offer women-only spaces/hours and ensure complete privacy of the clients (e.g., no security cameras or male guards) (Table 4.1, subtheme 2d and Fig. 4.3g). Participants reported that even though some high-priced facilities provide women-only hours, they have security cameras, which caused them psychological distress and discomfort. Visibly Muslim women (with *hijab*) additionally suffered discrimination and detrimental impacts of Islamophobia, where they reported fear of hate crimes and harassment as major barriers to LPA (Table 4.1, subtheme 2d). One participant stated '*I have fear from hate crimes. This puts too much pressure on me. Honestly, it makes sometimes I don't like to go far away. Like I stay close by. I'm scared, honestly, because of these attacks, I'm scared*'. This issue was particularly prevalent after the murder of a Muslim family in London, Ontario, where they were murdered during their regular walk in 2021 [29]. Young Muslim males reported an absence of well-maintained sports/soccer fields in Islamic schools, compared to Catholic schools, which presented a barrier to LPA (Fig. 4.3h, Table 4.1, subtheme 2d).

Fig. 4.4. Sub-group differences in leisure physical activity levels in metabolic equivalents



3.2.3. LPA and MH

All participants recognized LPA as beneficial for improving their MH and well-being (Table 4.1, subtheme 3a). They reported different biological processes associated with LPA that they perceived to enhance their MH. These included enhancing blood circulation, oxygen delivery to the brain, mood-promoting and painkiller hormones (e.g., endorphins, dopamine), body organ functioning, mental sharpness, sleep quality and longevity. Other reported MH-promoting benefits of LPA included eliminating negative energy/thoughts and fears, and promoting self-esteem, mastery experiences, self-awareness, body-mind connection, self-care, emotional healing, strength, flexibility, productivity, life satisfaction, adaptation, and resilience (Fig. 4.3i). One participant described the MH impacts of LPA '*It's relieving my stress. I feel like I love myself, I'm giving myself love, care. I take care of myself because it makes me feel good about myself. I feel satisfied. I feel like self-love*'. Another participant captured a photo of a toy doing yoga to symbolize the various health benefits (e.g., promoting mood, reducing back pain) from this exercise (Fig. 4.3j). Participants also recognized LPA as helpful for maintaining a healthy weight and motivating them to eat healthfully. MH status was reported to influence LPA engagement. Participants clarified that being in a positive MH state motivated them to increase their LPA levels, whereas feeling mentally down was associated with a sedentary lifestyle (Table 4.1, subtheme 3b).

Different factors appeared to maximize the MH benefits of LPA. Participants recognized outdoor LPA as associated with additional MH-promoting pathways, including enhancing mindfulness, peace of mind, connection with nature, exposure to sun for vitamin D (to fight depression), spirituality and relationship with God (e.g., verbal praying/remembrance of God), refreshment, and inspiration/creativity (Table 4.1, subtheme 3c, Fig. 4.3k & l). One participant described perceived MH benefits of outdoor LPA '*We used to walk in the park, it is really good to connect with the nature and hear the noises, sounds of nature. That's how I recharge my batteries. This is also a form of meditation because as Muslim, once you you've seen how beautiful it is, you say, "Subhanallah" (Glory to God) because you just glorify the creator of*

the universe'. In-group LPA, particularly with family and friends from the same cultural background, was reported to provide additional MH benefits by enhancing socialization and maximizing fun/excitement (Table 4.1, subtheme 3d). Finally, participants reported additional distinct MH benefits associated with specific LPA types (Table 4.1, subtheme 3e). For example, participants perceived swimming to help them toss their negative emotions/thoughts into water, whereas gardening was reported to aid connection with mother earth (Fig. 4.3m & n). Football/soccer was reported to relieve homesickness and enhance ethnic identity, given its popularity in Arab countries. Team sports and structured LPA were perceived to help in developing various skills (e.g., collaboration, decision-making), which was associated with positive MH.

The bio-psycho-socio-cultural model aided conceptualization of the multi-faceted relationship between LPA and MH by amalgamating different factors/determinants, pathways, processes, and outcomes (Fig. 4.1). This model displays various socio-demographic, environmental, psychological, and cultural factors that were found to influence AIR's LPA participation. Additionally, it shows varied LPA-related processes/pathways that were reported by participants as fundamental in shaping their MH. Three prime mediators were noted to maximize benefits of LPA by facilitating additional distinct MH-promoting pathways/processes: 1) location (outdoors), 2) company (in-group) and 3) LPA type (specific preferred activities). Finally, the model exhibits a bidirectional/reciprocal relationship between LPA and MH as reported by participants.

3.2.4. Actions to Move Towards LPA Equity

Participants made many recommendations regarding actions to be taken by municipalities and the government to ensure LPA equity. They emphasized that they/the Arab community deserve the right for equitable opportunities to exercise. Recommendations included opening more accessible community centers, especially in rural and underserved areas, and conducting programs that consider the community's different needs (e.g., flexible hours to accommodate working parents and formats tailored to

seniors or people with disabilities) (Table 4.1, subtheme 4a). Parents emphasized the need for free LPA programming for children and families to help them stay physically active throughout the year, particularly in winter. Mothers also highlighted the need for increasing monetary assistance for daycare, especially for families with 3+ kids, to help promote mothers' LPA. Increasing minimum wage, limiting work shifts, and officially implementing the four-day work proposal by the Government of Ontario [30] were recommended by participants as helpful strategies to tackle time and financial constraints and promote LPA and MH.

Muslim women expressed an utmost need for LPA facilities that provide women-only hours to facilitate their LPA engagement (Table 4.1, subtheme 4b). They also recommended supporting/encouraging mosques to run women/family-friendly LPA programs. Enhancing affordability of Muslim-friendly sportswear was reported as vital for enhancing Muslims' LPA. Muslim participants also recommended ensuring accessibility of LPA information about available culturally appropriate services.

Providing more well-established sports fields that are affordable/accessible was recognized by all youth as fundamental to enhancing LPA participation (Table 4.1, subtheme 4c, Fig. 4.3o). Participants also recommended the development of online community-based groups to facilitate sports team formation and enhance sports engagement. Finally, participants recommended raising more awareness of the importance of LPA for one's MH to motivate the community to increase LPA participation, and to help facilitate advocacy for implementing the above-outlined recommendations/actions.

4. Discussion

The CAN-HEAL study investigated LPA needs as they pertain to MH among AIR in Ontario, Canada. This research revealed a knowledge-application gap, with AIR reporting low PA levels, despite possessing sound knowledge of recommendations and health benefits. Different socio-economic and

ecological barriers were blamed for this gap, including financial constraints, time pressures, cold/snowy weather and lack of accessible facilities. While similar barriers were noted for the general Canadian population [31–33], the issue can be more critical for AIR due to this population's unique needs and interaction between different barriers [8]. For example, the lack of culturally appropriate facilities was found to interact with winter when outdoor exercising is challenging, which left AIR unable to exercise either indoors or outdoors during this time. This highlights the need for increasing culturally relevant LPA opportunities during the winter season to promote equitable LPA. Our study showed that AIR preferred to participate in in-group LPA over the 'alone' model. This is consistent with findings of a study of multi-ethnic immigrants/refugees by Wieland et al. [34]. Similar to our study, participants in Wieland et al.'s study elaborated that exercising with others helped enhance a sense of community and provide socialization opportunities. Although the socialization benefits associated with LPA may apply to any population, this can be particularly beneficial for immigrants/refugees (including AIR) by mitigating the negative psychological impacts of immigration-related family separation and loneliness [10].

An important finding of the CAN-HEAL study is the complex and intersecting inequities in LPA within the AIR community. Although our research found that AIR generally share common needs regarding LPA participation in Canada, complex vulnerabilities, and intersections between different characteristics/factors (e.g., age, gender, religion, disability, socio-economic status) triggered LPA and MH disparities within the AIR community. Our study found significantly lower LPA levels among older AIR adults compared to younger generations. Similar findings were found for the general Canadian population [2]. Although any older adult may face age-related barriers to LPA, older AIR suffer additional complex challenges that increase their vulnerability, including cultural proscriptions and Anti-Arabism, which place their MH at higher risk than the broader population [8]. Muslim women in our study reported complex barriers to LPA, which was associated with negative MH. Similar findings were reported for Muslims in the UK [35,36]. These intersections underline that LPA needs are not one-size-

fits-all, highlighting the need for tailored LPA programs and policies that consider the varied individual and group needs of AIR.

Our study found a positive, multi-dimensional relationship between LPA and MH among AIR. Similar findings were noted for other multi-ethnic immigrants in North America [37,38]. PA can promote the release of different mood-promoting hormones, such as serotonin, that can improve one's MH [39]. PA is also posited to promote the production of peripheral brain-derived neurotrophic factor which is suggested to enhance neuroplasticity and exert anti-depressant effects [40]. Beyond biological benefits, participants of this study reported various psychosocial pathways/mechanisms, such as enhanced self-esteem, mastery experiences and resilience, as contributing to positive MH when participating in LPA. Our research found that in-group and outdoor LPA was associated with maximized health benefits related to unique psycho-socio-cultural pathways to positive MH among AIR. While some of these benefits (e.g., socialization, enjoying nature) may apply to other populations [41,42], one unique MH-promoting pathway associated with outdoor LPA among AIR in this study was nurturing spirituality and relationship with God by, for example, reciting prayers and remembering God while engaging in LPA. This distinct pathway may in part be explained by the role that religion plays in Arab culture, where it presents an integral part of most Arabs' everyday lives. A systematic review by El-Masri et al. [43] also found that Muslim AIR recognized the role religion plays in their lives and how it encourages PA, referring to the Islamic prayer which includes movements/prostrations.

The bio-psycho-socio-cultural model helped conceptualize the complex, multifaceted LPA-MH relationship by coalescing numerous factors, LPA-related mediators and pathways/mechanisms that are related to MH. The model underscores the need for holistic, culturally appropriate LPA programs/policies to address the complex LPA needs among AIR and promote this population's MH.

Different community- and political-level actions were co-proposed as part of this study to push for equitable LPA opportunities. These actions underscore the necessity of intersectoral collaboration between health and non-health sectors to effectively address the complex, systemic issues (e.g., increase in hate crimes and lack of accessible facilities) and achieve LPA and MH equity. This can be achieved by adopting a Health in All Policies collaborative approach to public policy that systematically takes into consideration the health implications of policies by all government sectors to address health and social inequities within communities [44]. As a collaborative community-engaged study, prompt actions were taken to fulfill some of the recommendations that are feasible at the scale of the research project. These included hosting community-led LPA awareness campaigns and creating/distributing culturally appropriate LPA educational resources.

5. Strengths and Limitations

This study examined LPA needs as they relate to MH among AIR; an under-researched area that is worth a thorough investigation to tackle health and social inequities. Our research adopted a collaborative CBPR and IKT approach to aid co-creation of applicable knowledge that guides the development of effective tailored LPA interventions and equitable policies to address health disparities. An additional strength of this study is the recruitment of diverse participants, which aided in uncovering complex inequities within the AIR community and identifying varied needs regarding LPA and MH. It is worth noting that sub-groups (e.g., age and gender) were not evenly represented, which may have resulted in uneven representation of experiences. An integrated bio-psychosocial-cultural framework was adopted and applied to the study's findings, designing a conceptual model that displays the multi-faceted LPA-MH relationship among AIR. A limitation of this study is that it is focused on Ontario, which may not make the findings generalizable to other regions. The data collected in this study were self-reported, which may have posed the risk for recall or social desirability bias. Nonetheless, the risk was mitigated by

triangulating three different methods, enhancing the study rigour. Cultural sensitivity was maintained throughout the research by honouring the Arab community's social/cultural values and accommodating participants' needs, which helped strengthen the findings' validity and credibility.

6. Conclusions

The CAN-HEAL study revealed a knowledge-application gap; AIR reported a low level of LPA engagement, despite showing sound knowledge of recommendations and health benefits. Different socio-economic and ecological barriers were reported to be the reason for this gap. Intersections between different socio-demographic factors played a substantial role in how LPA was experienced and triggered disparities within the AIR community. The LPA-MH relationship among AIR is multi-dimensional and numerous psycho-socio-cultural pathways/mechanisms were found to influence AIR's MH. Three major mediators were found to maximize the MH benefits of LPA: 1) location (outdoors), 2) company (in-group), and 3) LPA type. Intersectoral collaboration is required to implement actions at community- and political-levels and tackle LPA disparities among AIR, promoting this population's MH.

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CHAPTER FIVE: 'I THOUGHT WE WOULD BE CHERISHED AND SAFE HERE': UNDERSTANDING THE MULTI-FACETED NATURE OF MENTAL HEALTH AMONG ARAB IMMIGRANTS/REFUGEES IN ONTARIO, CANADA- THE CAN-HEAL STUDY

Title: 'I thought we would be cherished and safe here': understanding the multi-faceted nature of mental health among Arab immigrants/refugees in Ontario, Canada- the CAN-HEAL study

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Abstract

Purpose: Mental health (MH) is a critical public health issue. Arab immigrants/refugees (AIR) may be at high risk for MH problems owing to various unique stressors, such as post-September/11 demonization. Despite the growing AIR population in Western countries, there is a lack of AIR-MH research in these nations. The CAN-HEAL study examined MH experiences and needs among AIR in Ontario, Canada.

Methods: This study employed a cooperative community-based participatory research and integrated knowledge translation approach. The study used photovoice, qualitative interviews and a questionnaire survey. Sixty socio-demographically diverse AIR adults partook in this study. The research was informed by the "social determinants of health" framework and the "years since immigration effect" (YSIE) theory.

Results: The term "mental health" was deemed offensive for participants aged >30 years. Participants proposed other culturally-appropriate words including "well-being" and "emotional state". The prevalence of poor mental well-being in the sample was alarming (55%). Of first-generation immigrant participants, 86.8% reported negative changes in MH since migration. The negative changes are not straightforward; they are complex and dynamic, and mainly related to micro/macro-aggression, cross-cultural pressures, dissatisfaction with the health and social care system, and poor living conditions. Intersections between different socio-demographic factors (e.g., gender, length of residency, income, parenthood, religion) amplified the negative changes in MH and exacerbated inequities.

Conclusions: MH needs among AIR are distinct and intersectionality aggravated inequities. Culturally and structurally competent healthcare and structural/policy reformation are required to tackle MH inequities. This can be fulfilled through intersectoral cooperation and including AIR in decision-making.

Keywords: distress, anxiety, immigrants, community-based participatory research, social determinants of health, inequities

1. Introduction:

1.1. Background

Mental health (MH) is one of the most disregarded, yet significant development issues among the 17 Sustainable Development Goals [1]. In the G7 countries, Canada (like the US) has the highest prevalence of MH issues (20%), with estimated societal costs of over $50 billion annually [2]. Immigrants/refugees face various stressors that put their MH at risk, resulting in health disparities [3]. Canada comprises the fifth-largest immigrant population in the West, with Arab immigrants/refugees (AIR) constituting 2% of its population [4, 5]. Mental health can particularly be critical amongst AIR, who face distinctive triggers (e.g., anti-Arabism), besides the daily life stressors experienced by any immigrant [6, 7].

1.2. Theoretical Frameworks

The "Healthy Immigrant Effect" posits that immigrants possess a health advantage over domestic-born which fades over years [8]. The noted decline in immigrants' health is called the "Years Since Immigration Effect" (YSIE). A recent systematic review reported convincing evidence for a decline in immigrants' MH over years, confirming the YSIE phenomenon [9]. In Canada, however, most of this evidence (94%) comes from secondary analysis studies that use data collected through culturally unadapted surveys/tools and treat all immigrants as if they are a one-size-fits-all, overlooking the MH stigma that is pervasive in many cultures. The decline in immigrants' MH has been linked to cumulative exposure to varied societal/structural stressors [10].

The social determinants of health (SDoH) framework proposes that people's health is shaped by the environment they live(d) in, including individual/behavioural, socio-demographic, cultural and political contexts [11, 12]. Immigrants often experience societal/structural stressors and display MH symptoms

differently. For example, AIR's experience of racism is unique owing to negative media representation/stereotyping that portrays Arabs as terrorists [13–15]. Lack of awareness/understanding of the Arab culture's MH taboos can expose AIR to high stress that puts their well-being at risk [16]. Despite the unique MH needs/stressors AIR experience, a recent review found a research gap in this area [17]. The review notes that previous AIR-MH studies are biomedically centered and researcher dominated (i.e., lack engagement of AIR). Engaging AIR in research design and ensuring cultural sensitivity is particularly crucial for stigmatized topics like MH to collect reliable data and inform culturally appropriate interventions.

This community-engaged study (CAN-HEAL) addresses the AIR-MH research gap, employing the SDoH framework and the YSEI theory to: 1) examine experiences, perceptions, and changes in AIR's MH since immigration to Canada, 2) explore MH determinants among AIR, and 3) co-propose a culturally-appropriate action plan to improve AIR's MH.

2. Methods

The CAN-HEAL study employed a cooperative community-based participatory research (CBPR) and integrated knowledge translation (IKT) approach that involves a community-researcher partnership to reduce barriers, and generate applicable knowledge for service improvement [18, 19]. This study deployed a concurrent multi-method approach by integrating qualitative interviews, photovoice, and a survey, and concurrently triangulating the findings to enhance the study's robustness [20]. This approach helps fill knowledge gaps that cannot be addressed through one method alone [21–23]. For example, understanding people's experiences/perceptions about stigmatized health/social issues, like MH, cannot be achieved through a survey alone; integrating qualitative interviews can provide additional in-depth insight. Photovoice can also empower participants to think critically/deeply, and

symbolize/explicate their experiences, maximizing the richness of data/findings [24]. Data from the different methods were integrated through fusion that occurs in a convergent and continuous manner throughout data collection, analysis/interpretation as well as comparison and corroboration of the findings [25]. The study adhered to cultural sensitivity best practices by meeting AIR's needs in alignment with the core values of the Arab culture (collectivism, generosity, honour, respect, and religion) [26]. These included giving break for prayers during interviews, and offering flexibility with interview times, considering participants' different conditions (e.g., work, familial responsibility, any cultural/religious occasions). Ethical clearance was received from the University Research Ethics Board (#5515).

2.1. Study Location

This study was performed in Ontario, home to about 50% of AIR in Canada [4, 5]. The study was undertaken through the Zoom platform (due to COVID-19 pandemic restrictions); the efficacy/viability of Zoom in qualitative studies, including cost- and time-effectiveness, convenience and user-friendliness, has been documented in other research studies [27].

2.2. Community Partnership

A tri-level partnership was established with the community from 2019 to 2021. Twenty-five AIR community leaders/representatives were consulted about the study topic and design to ensure its alignment with the community's needs. Partnerships with different community organizations/centers and clinics were built, while forming a team of students/youth from across Canada. These efforts brought about the establishment of an advisory working group that supported the research execution.

2.3. Recruitment and Survey

Sixty AIR (aged ≥18 years) were recruited between October 2021 and June 2022 and participated in the study. Three sampling techniques (snowball, convenience and purposive) were used to maximize socio-demographic diversity among recruited participants [28]. Posters/flyers were disseminated through social media and community networks, and purposively spread among hard-to-reach socio-demographic groups. All participants provided an informed, voluntary consent and completed a socio-demographic survey with mental well-being questions adapted from the WHO-5 questionnaire, which constitutes rating five statements about mental well-being on a 0-5 scale (the raw score is multiplied by 4 for a score ranging from 0 to 100; higher scores indicate better mental well-being) [29]. The survey was co-developed and pilot-tested for validity and cultural-appropriateness with 20 AIR. Descriptive statistics were produced using Microsoft Excel. Non-parametric Mann-Whitney U tests were done to compare differences in mental well-being according to gender, immigration status, length of residency, and homeland. Statistical significance was set at $p < 0.05$.

2.4. Qualitative Interviews and Photovoice

Semi-structured, 90–120-minute interviews were conducted with 50 AIR (representatively selected from the initial 60-partcipant sample, according to age, gender and participant's availability). Participants were asked about their perceptions/beliefs, experiences, any changes in their MH over time in Canada, factors that impact their MH and solutions needed for MH promotion. Data saturation was reached at the 41st interview; an additional nine interviews were performed to enhance the study's robustness [30].

The study also deployed Photovoice – a participatory tool that helps marginalized communities produce symbolic representations of their health/social issues and speak up [24]. Twelve sessions were performed with 26 AIR that were representatively drawn according to age, gender, and participant's

availability from the 60-participant sample. Each session was limited to 2-3 AIR to promote in-depth conversation. Every participant was invited to take 3-5 original digital photos without identifiable human features, symbolizing issues/things that matter to their MH. During sessions, photos were discussed with a focus on how the depicted issues relate to participants' MH and solutions needed.

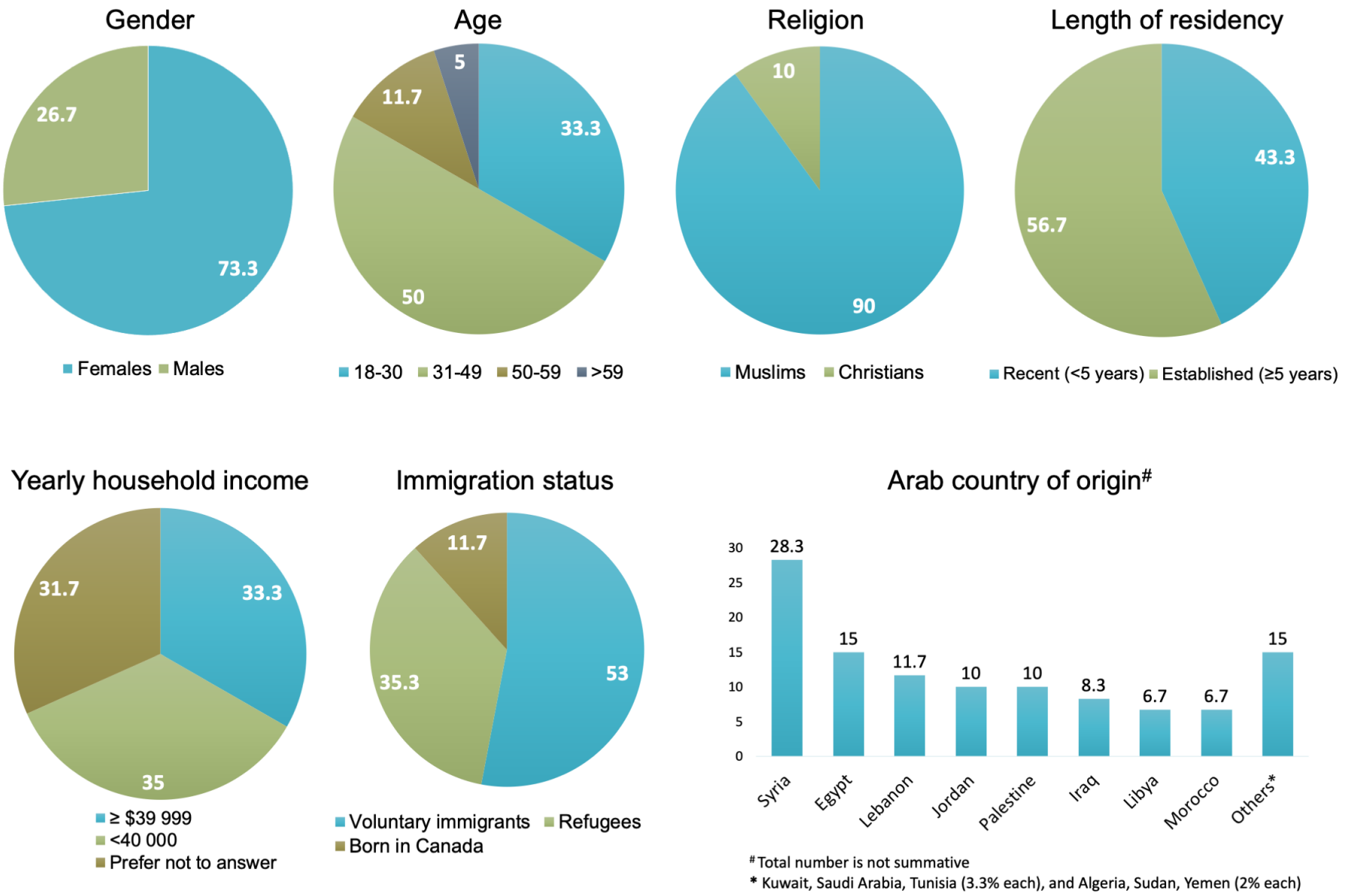
The interviews and photovoice sessions were performed in each participant's requested language by the first author (an Arabic/English bilingual researcher with a Middle Eastern background). Participants provided verbal informed, voluntary consent in their language of choice. Ninety percent of interviews/sessions were performed in English with some Arabic, 6% in English with some Arabic and French, and 4% in Arabic only. Research assistants attended for notetaking and French-English translation (if applicable). Verbatim transcripts were created (and translated to English when applicable). Translation was checked by a bilingual/trilingual research assistant to ensure accuracy. NVivo software and Microsoft Excel were utilized to perform thematic analysis. Deductive and inductive coding was performed to effectively address the study objectives while uncovering any new phenomena/concepts [31].

3. Results

3.1. Descriptive/Frequency Statistics

Seventy-three percent of the 60 participants were female, 50% were aged 31-49, 53% were voluntary immigrants, 35.3% were refugees and 11.7% were second-generation immigrants (Fig. 5.1). Half of the participants were employed, at least 35% were low-income, and 43.3% were recent immigrants. Participants were from 14 different Arab countries, and from different-sized cities in Ontario: large (28.3%), medium (35%) and small (36.7%). Fifty-five percent of participants reported poor mental well-being (mean score of 48.1± 19.6 out of 100).

Fig. 5.1. Socio-demographic characteristics of participants (n= 60)



3.2. Triangulation of Results

Findings from the different methods were consistent with each other in terms of MH experiences, stressors, inequities, and complex needs among AIR. All findings were organized around six major themes: 1) perceptions and experiences, 2) micro- and macroaggression, 3) living conditions and system crisis/failure, 4) cross-cultural gaps, 5) intersectionality and disparities, and 6) actions needed for MH equity. An SDoH-guided conceptual model was produced to illustrate/conceptualize the complex MH issues among AIR.

3.2.1. Perceptions and Experiences

This theme covers AIR's perceptions and experiences of MH. First-generation AIR aged >30 years identified the term "mental health" as culturally inappropriate and offensive (Table 5.1, subtheme 1a). They explained that MH means "sanity" in the Arabic language, and therefore its inverse is "insanity" – a dangerous word, particularly for marginalized populations. Alternative culturally relevant terms proposed by participants to replace the term "mental health" in healthcare settings included mood, feelings, mind/psychological health, emotional state, and well-being (Table 5.1, subtheme 1b). The term "mental health", however, was deemed relatively innocuous by younger adults and second-generation AIR who had already normalized the use of MH in Western populations (Table 5.1, subtheme 1c).

Participants recognized the importance of MH and considered it a priority (Table 5.1, subtheme 1d). They perceived positive MH as inner peace and the ability to enjoy life without suffering uncontrollable burdens. Overall, first-generation immigrants noted turbulence in their MH since moving to Canada and linked that to their expectations not being met regarding equity, acceptance of differences/diversity, and better opportunities (Table 5.1, subtheme 1e). Of first-generation immigrant participants, 86.8% reported negative changes in MH since migration. Fifty-four percent of these identified that they experienced ups

and downs since arrival with periods of worsened episodes mainly triggered by racism/discrimination, and systemic barriers.

Table 5.1. Illustrative quotes for qualitative data themes

Theme	**Sub-theme**	**Illustrative quotes**
1. Perceptions & experiences	**1a.** Cultural-inappropriateness of the MH term	- "For our culture, the 'mental health' word is translated as sanity, you know, and sometimes, when you ask someone an Arabic person, "Do you struggle with your sanity?" It's really, really bad." - "In our countries, if you translate the same way, "mental health", no, it means mental illness, not mental wellbeing. We need to find a proper word for that… it means sanity… It's a conflict of words." - "Mental health means that you are crazy." - "If you ask an Arab person "how is your mental health?" they will be very offended."
	1b. Alternative culturally-relevant terms	- "The emotional state is linked with the feeling, you know, the emotional state, it's more of how the person feels…not his sanity or his like mental health." - "In Arabic, we have 'how are you', 'how do you feel', 'how are you' means everything. I am sad. I am happy. I am, whatever. We have to be very careful, very sensitive with wording with the Arab community as, word by word translation, might be not the proper way to say thing to Arab people."
	1c. Young adults & 2nd generation immigrants normalizing MH	- "Households in the Arab community, like, younger generations sometimes accept this word.. but, you know, parents, or older people, they refuse that." - "Mental health is nothing to be ashamed of.."
	1d. Recognizing the importance of MH	- "It's the head of everything. That's why the mental means mind and mind is above all other organs. So, this is exactly that priority when it comes to the mental wellbeing, so it comes first. If I am mentally healthy, I can take control of the rest of my body, I can take control of my life. So, it means control. I noticed when I don't feel mentally well, I start losing, my strength physically." - "Mental wellbeing is one of the biggest, if not the biggest determinant of your everyday life, it impacts every single aspect of how you live, how you feel when you wake up and throughout the day."
	1e. Changes in MH since immigration	- "Mentally, I am down. Canada is misleading." - "I'm not happy like before, because life here is not easy. I had a lot of problems in my health… because the kind of job that I do, there is no time for anything you have to run, run, run, run... There is no time to live."
2. Micro- and macroaggression	**2a.** Intimidation/threats & bullying	- "I have faced a lot, a lot of people think that because I am wearing a hijab, I'm putting a scarf on my hair, I don't have a brain or I'm not an educated person. I faced a lot of incidents actually" - "We were in… with my kids… a person decided he didn't like me because I was wearing hijab. He started saying bad words to us... There was a dirty place. And he was pointing towards me and towards the dirty place that I belong to that place."

		- "I've been asked very ridiculous questions, like, do you have cancer? Is that why you hide your hair? Or not hide your hair, like, do you not have hair? Are you bald? These questions are not asked in a genuine matter.."
	2b. Misrepresentation and Islamophobic/ xenophobic incidents	- "I saw this thing on [popular streaming service] where it was the hijabi girl was fasting, and guess how she broke her fast in the show. She was in a bar drinking alcohol. That's how they showed her breaking her fast. And I'm like, why? Don't even show it, you're misrepresenting it." - "I was in a …class ... They pulled up videos of different people's cultures, and it was all beautiful for everyone... You know what they showed for Islamic culture? They showed a video of ISIS. Shooting people and saying this is our culture and I'm like, hold up, pause. This is a radical group of like..10,000 people. Islam is a religion of 2 billion people.. It's not related to the religion itself. You shouldn't generalize."
	2c. Discriminatory job market	- "I have experience 18 year in our country as a [medical doctor]. I know it's a complicated issue here, but I can do it, if I get some training. Now Canada spends the money to give me mental health and support in the depression and give me medicine. It can avoid that by give me some job. Give me training for that…use me. I may get out of the house improve my mood and self-esteem. Not give me like antidepressant medicine. They lose many talent people in the newcomer, and make it a mental issue for them from frustration..." - "I got tired, worked hard, put effort, attended university, studied, and got education, because I have a goal to live in a certain way. So, when I come here and you treat me as not having a degree, then this is very frustrating and demotivating and causes many psychological problems." - "My dad changed his name on his resume. My mom changed. My brother changed it. Like, they all changed their names on their resume just so they could get the job."
3. Living conditions and system crisis/failure	**3a**. Inflation and economic issues	- "I will feel much better if the gas price goes down. Everything is going so expensive, so high, and then they are not match the standard of life or the salaries… This is not fair…it's not fair for every Canadian." - "Prices of food are going up crazy, you know, and the income is the same." - "Housing and insurance. Those two, they will take most of your salary, and then you won't have enough money to eat. In Quebec, the insurance of the cars is much, much less than here in Ontario." - "The bank and interest, the mortgage, all the stuff together. The bank is taking our money."
	3b. Tax-service quality discrepancy	- "One of the weakest points in the system of Canada, the healthcare system, it has a lot of negative issues. Huge wait time that you would need to wait for very minor surgeries or treatments." - "PhD students, they have a very little money, it cannot offer for them good life.. The money is not enough for offering ordinary life. The scholarship here is not enough, and this a big problem actually." - "Long-term care housing should be better and more affordable. Insurance should be more affordable. Universities tuition fees should be less, like we struggle.. I have my son, he's struggling to have a job, he is tired." - "We need to think of seniors and older generation and provide them with good services."
4. Cross-cultural gap	**4a.** Culturally-inappropriate remarks	- "Many times, they [colleagues] asked me, oh, you have a girlfriend. No, I don't have a girlfriend because I am Muslim, so I can't have a girlfriend and they kept asking me a lot of times about this." - "This is sexualization of religious symbols. This is insensitive in our religion, in Islam… I'm, I'm really hurt."

	4b. Language, ideologies, and lifestyle	- "I came with zero English.. when I came here, I wasn't able to speak, like, one good sentence, nothing at all." - "My grandma go to that hospital... They asked.. if there's a way to give her a medicine or.. let her die. For us, for Arabs, we know what our parents mean. And, of course Muslims, because..they took care of their parents. So, when a doctor asks some Arab people to give her a medicine or no, that's the worst thing that could happen." - "Here, you have to work more than enjoying life… But sometimes you will need that self-space just to treat yourself. Go out, do something that makes you happy, just to go back on the routine again."
5.Intersectionality and disparities	**5a.** Low-income	- "I was alone. I don't have home. I was in shelter..." - " if I have only $50, it doesn't make me feel good,. I know that it's very limited money.."
	5b. Disabilities	- "I don't have washroom in the first floor and I have struggled to just up and down. I gave them the medical letter and, you know, even before that, even like the doctor wrote a letter and I have every proof that they really need it [accessible housing] need it and it's urgent. And they did nothing… I was depressed…Once she told me you should ask for mental health. No, I'm fine. I told her all I need is a house. I'm not crazy."
	5c. Location	- "… the struggle to get to the place, which is the closest it's Kitchener to me, to go to one of these [ethnic] stores, and get some of the needs of the products that we use to make like middle eastern dish." - "In our community, because we're just a small town, we don't like we don't attend to any events or like we, yeah. I don't know anything about these organizations [community centers]."
	5d. Country of origin	- "Back home [worn-torn country] is the rest of my family, so you're also worried about those who were not able to make it out all the time, so that also negatively impacts your mental wellbeing." - "The reason for rejection my mom's visitor visa that the officer don't believe she will leave Canada, the same thing happened with my father…I asked a paralegal he mention since they holding Syrian passport there is almost no chance…it is Trump's Muslim ban in other word."
	5e. Age and gender	- "So, we need to be secure about our future. Our health go down and money, go down. Everything go down. So, it need to be secure in the future for elder people." - "As a hijabi I'm like always on guard like watching my surroundings if someone seems like they may harm me.. When I take the subway downtown, I always stand as far back from the platform as possible because there have been cases.. where people get like pushed into the tracks just because they're Muslim or wear the hijab."
	5f. Parenthood	- "What can you imagine, what's the parents feeling when they see their kids, their sons or daughters, they just following.. whatever the society and they're following whatever the other side want them to be, right? You cannot raise them the way that- the Islamic way or the way you grow up in back home.."
	5g. Religion	- "At the time of the accident [London attack], I swear, by God..we became afraid, frankly. We became afraid to go to the mall or walk to a supermarket on our own, because they were attacking veiled women and Islam." - "We are one month away from *Eid Al-Adha* (Feast of Sacrifice, celebrated by Muslims) and it is, like, tough to find a place where to find the lamb or- -and it is, like, a real frustration for us." - "I'm Muslim and I don't want to go through the interest…They need to work with bank and for us as Muslim, I don't know what we should do to not deal with interest and do the *haram* (forbidden by Islamic law)."

6. Actions needed for MH equity	**6a.** Fighting racism and Islamophobia	- "I have a certain degree… give me something similar to it, or help me do something, that is relevant to what I studied, and at the same time, it is not as if I did not study anything." - "Systemic actions are also important. Having laws, having acts, and having bills that protect us as hijab-wearing women, instead of having bills that tell you not to wear the hijab as a teacher, and say provinces like Quebec... I'm not sure what her hijab would do to the students..." - "Put serious and continuous steps to protect all communities and diversities in Canada, and it should be done by the government itself. For example, the police diversity in London city police should be considered and not be from one ethic or one race, Canada diversity should be real program in all the government.. or cities." - "Government should educate people about Islam and Muslim and their needs... We should because we have people very loaded with bad information, misleading information.. There should be campaigns…, as in London, Britain, there were drawings on the buses, public transportation, big signs in the streets, simple ads on TV." - "One of the things that I often think about is representation. When I see a Muslim news reporter who's wearing a hijab on TV that makes me feel empowered that makes me feel happy because I can say now like look Muslim women can do a lot of successful things and still wear the hijab, so there's no need to hate them."
	6b. Improving living conditions	- "Why not our province go and learn from Quebec in some points [insurance]…I mean, go and learn from other experience wherever you see a successful experience with the good results." - "There's a rule to make four days working. It will help too much…you will work four days and you have like three days to do activities with your family, I hope they will approve it." - "The budget and the laws for the health should be really considered to hire more health workers, who support the community physically and mentally. Government of Canada and Ontario should provide support for activities in Arabic language to the Arab community to improve their mental well-being." - "Having culturally appropriate health services.. Living in the west like everything healthcare related is defined by the western perspective and not all cultures, especially mental health the way that someone who's not Arab or Muslim will receive help for mental health will not be the same as someone who is from a different culture."

Abbreviations; MH: mental health

3.2.2. Micro- and Macroaggression

This theme addresses AIR's experiences of micro- and macro-aggression as they relate to MH. Microaggression is conceptualized as day-to-day discriminatory actions/incidents (intentional or unintentional) against marginalized groups (e.g., making jokes that mock/degrade Arabs), whereas macroaggression involves large-scale systematic/institutional/structural oppression and racism (e.g., not hiring people due to their race) [32]. Exposure to discrimination and/or harassment/slights was a common stressor reported by participants and related to negative MH. Participants reported that stereotyping/misconceptions about Arabs and Islam, overall, led to various acts of racism towards AIR in different settings (e.g., schools/universities, workplaces) (Table 5.1, subtheme 2a). Examples included intimidation/threats, bullying about cultural/religious clothing and foreign accents, and social pressures to conform to "normal/Canadian/Western" ways of behaving (e.g., pressuring Muslims to drink alcohol). One participant captured an ingenious photo of three toys with masks and a toy with *hijab* (veil) to symbolize the harassment *hijabi* women face in Canadian society that had already normalized masks during the COVID-19 pandemic (Fig. 5.2a). Another participant took a photo of a toy with *hijab* in a jar surrounded by toys with no hijab to signify exclusion/discrimination/harassment *hijabi* women face (Fig. 5.2b). Participants blamed media's demonization of Arabs, lack of government support (e.g., the Ontario provincial government refusing to pass Bill 86, known as "Our London Family Act" to combat Islamophobia in Ontario), and discriminatory laws (e.g., Bill 21 that prohibits state employees in Quebec from wearing religious symbols, including hijab for Muslims and kippah for Jews) for the rise in xenophobic/Islamophobic incidents and crimes (Table 5.1, subtheme 2b) [33].

The discrimination against immigrants within the Canadian job market was associated with negative MH among AIR (Table 5.1, subtheme 2c, Fig. 5.2c). Participants reported prevalent issues of dismissing foreign degrees/experiences, mandating so called "Canadian experience" and *not* hiring/undermining immigrants due to a 'foreign' sounding name or accent, which caused them high distress.

Fig. 5.2. Photos shared as part of the Photovoice methodology

a: Toys with masks (left). Toy with Hijab (right). Symbolizes bullying hijabi women face in society that normalized masks for protection

b: Toy with hijab in jar (middle) surrounded by toys with no hijab. Symbolizes exclusion/harassment hijabi women face in Canada

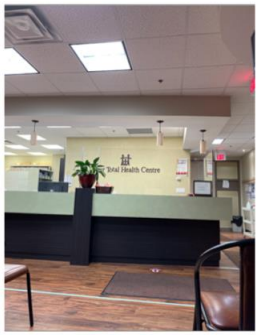
c: Medical equipment (Stethoscope). Symbolizes discriminatory dismissal of immigrants' foreign degrees

d: Empty bag, symbolizing inflation & insurance that leave people financially constrained

e: Newspaper ads for selling houses. Symbolizes the housing crisis in Canada and its impact on people's mental health

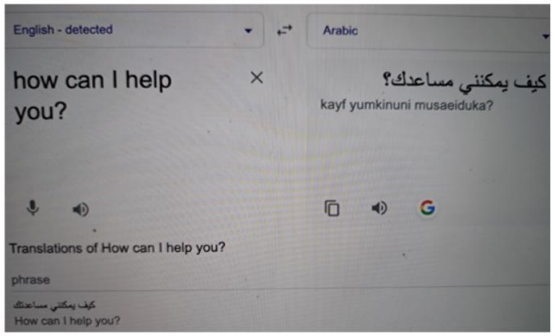
f: ATM, symbolizing interests as swallowing peoples' income

g: Public transit. Symbolizes unreliability of transport system



h: Health center in Toronto, symbolizing the lack of accessible, timely healthcare

i: Seniors in a park, symbolizing a lack of accessible, culturally-sensitive programs for elderly



j: Online Arabic-English translator, symbolizing challenges that immigrants face with communication in English outside home

k: IELTS testing center, symbolizing English language barriers that immigrants face

l: Care packages to the homeless, symbolizing mental-health threatening challenges that the homeless face

m: Hourglass, symbolizing immigrants concerns about the future as seniors

n: Tree Roots for healthy growth. Symbolizes the importance of positive cultural identity for immigrants

o: The London Muslim Mosque. Symbolizes grief for the murder of the Muslim family in London, ON and fear of the rise in hate crimes

p: Lambs. Symbolize struggles Muslims in Canada face to practice their traditions for Eid Al-Adha (Muslims' Holiday of Sacrifice)

3.2.3. Living Conditions and System Crisis/Failure

This theme addresses poor living conditions and system issues in Ontario (i.e., social, financial, healthcare, education, transport) as they pertain to AIR's MH. Participants reported increased living costs with no commensurate increase in income as a major stressor (Table 5.1, subtheme 3a). One participant captured a photo of an empty bag to represent price inflation, which has left people financially constrained and mentally drained (Fig. 5.2d). Participants were particularly anxious about the increasing prices of foods and housing, which they identified as "basic life necessities for health/well-being and stability". They reported a housing crisis and linked that to the increase in homelessness in Canada (Fig. 5.2e). Participants described the high insurance rates in Ontario and high interest rates as swallowing people's income and leaving them financially insecure and mentally unwell (Fig. 5.2f).

A tax-service quality discrepancy was reported. Participants perceived that the quality of available services did not match the imposed taxes, which caused them disappointment and distress (Table 5.1, subtheme 3b). Participants described the transportation systems as unreliable and unaffordable, and the health system as not-timely, ineffective, unsafe, inequitable, culturally/structurally incompetent, unintegrated, and lacking coverage of essential healthcare services (e.g., dental and medications) (Fig. 5.2g &h). University students/trainees also reported a lack of appropriate government financial support during their education/training, which impeded their MH. Older adults delineated a lack of accessible, culturally sensitive long-term care homes and programs, where seniors can connect with peers of similar cultural backgrounds (Fig. 5.2i).

3.2.4. Cross-cultural Gaps

Cross-cultural gaps, defined as the differences in socio-cultural norms between the Arab and Euro-Canadian cultures and lack of appreciation of AIR's cultural needs, were associated with poor MH among AIR. Participants explained that the differences in values between the Arab conservative culture, which

centers around privacy/secrecy, and the modern Canadian/Western culture that normalizes opening up, and publicity, caused them psychological distress. For example, participants reported that they often received culturally inappropriate comments/questions (e.g., dating/sexual relationship) by mainstream people/colleagues, which made them feel offended, excluded and mentally distressed (Table 5.1, subtheme 4a). Furthermore, Muslim participants were anxious, tearful, and stressed about sexualization of religious symbols (e.g., *hijab*) in public in Canada. They explained that hijab is sacred in Islam, where sexual activities are only allowed in private (not in public) and within a marital relationship.

Language barriers were associated with poor MH (Table 5.1, subtheme 4b, Fig. 5.2j & k). Participants reported difficulties in using common terms that imply different meanings in the Arab/Canadian cultures if directly translated, which often result in misinterpretations/wrongful assumptions and psychological stress. The difference in lifestyles between the Arab and Canadian cultures caused distress to AIR. They clarified that the Arab culture is collectivistic, privileging family and community over individuals, which differs from the Canadian culture that values individualism. These differences resulted in stressful incidents that negatively affected AIR's MH. For example, one participant exemplified that healthcare providers asked them if they would like to give their hospitalized grandmother medicine or leave her to die, which goes against the Arab culture. Finally, participants reported that Canadian lifestyle is overall stressful where people "*live to work*" instead of working to live.

3.2.5. Intersectionality and Disparities

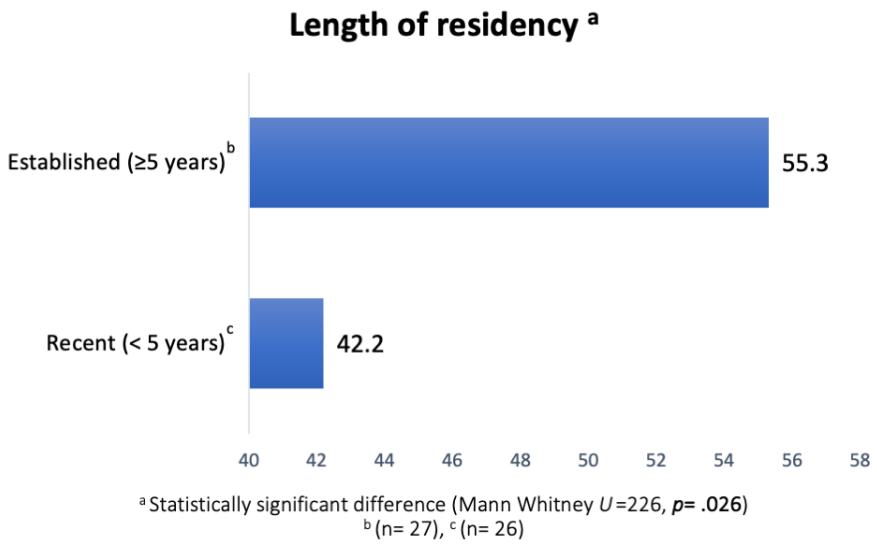
This theme addresses intersectionality and MH disparities within the AIR community. Intersectionality is conceptualized as the interactions between different axes of marginalization and facets of one's socio-cultural identities, giving rise to exclusion and complex inequities [34]. Low-income AIR participants, particularly single mothers, faced unique stressors that impeded their MH. These included running out of food, hunger, and homelessness (Table 5.1, subtheme 5a, Fig. 5.2l). AIR with disabilities experienced

distinct challenges, including lack of accessible housing, services, and culturally acceptable foods that meet their strict dietary restrictions (Table 5.1, subtheme 5b). Participants residing in rural areas faced stressful barriers to accessing culturally appropriate services (Table 5.1, subtheme 5c). This was particularly concerning for recent immigrants/refugees who lacked familiarity with available resources/services and suffered from family separation, which increased their loneliness. The survey results also showed that recent immigrants had significantly lower mental well-being scores than established immigrants (Mann Whitney U= 226, p= .026) (Fig. 5.3). Although not statistically significantly different, mental well-being scores were lower among refugees and participants from war-torn/occupied countries than voluntary immigrants and those from non-war-torn/non-occupied nations. Participants experienced a distinct homeland trauma, worries about their family back home and systematic discrimination in family reunification, where their parents' visas were rejected due to belonging to a war-torn nation as advised by their lawyer/ paralegal (Table 5.1, subtheme 5d). They described this as an undeclared/unofficial, "deceitful Trump-like Muslim ban".

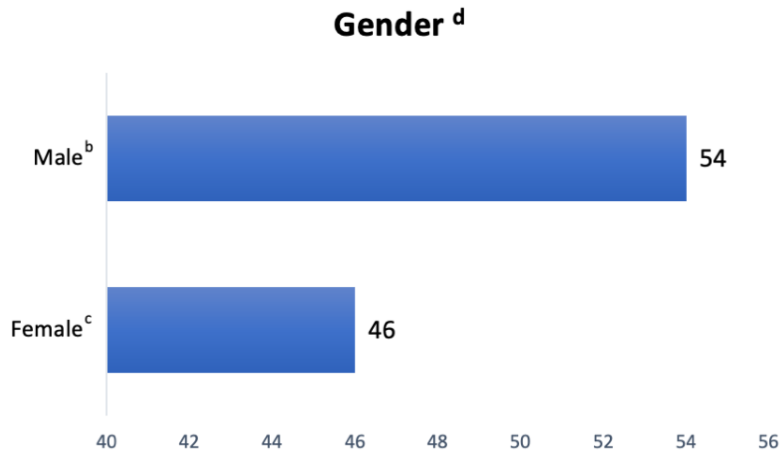
MH experiences and healthcare-seeking behaviors were gendered; for example, mothers reported the fear of their children being taken away from them as a barrier to disclosing any MH symptoms (Table 5.1, subtheme 5e). Females also scored lower for mental well-being in the survey than males (Fig. 5.3). Seniors expressed anxiety/worry about the future and financial security in Canada (Fig. 5.2m). Parent participants were anxious and fearful about their children losing their cultural identity (Table 5.1, subtheme 5f). One participant took a photo of tree roots to symbolize the importance of positive cultural identity (maintaining one's roots) for immigrants' MH (Fig. 5.2n). Cultural identity was a significant issue among Muslim parents who expressed concerns about raising their children in a secular society, especially with a lack of affordable Islamic schools. All Muslim participants reported fear about the safety of their family, especially females with *hijab*, due to the rise in Islamophobic incidents/crimes in Canada (Table 5.1, subtheme 5g). One woman captured a photo of a rally at a Muslim Mosque in London,

Ontario to express devastation/grief for the loss of a Muslim Family whose innocent lives were taken in a hate crime in 2021 (Fig. 5.2o). Muslim AIR reported additional distinct challenges, including a lack of awareness/consideration for their religious occasions in Canadian society which increased their social exclusion (Fig. 5.2p). Another unique stressor is the lack of accommodations for Muslims, whose religion strictly prohibits paying interest/usury, and so they cannot secure housing through bank mortgages.

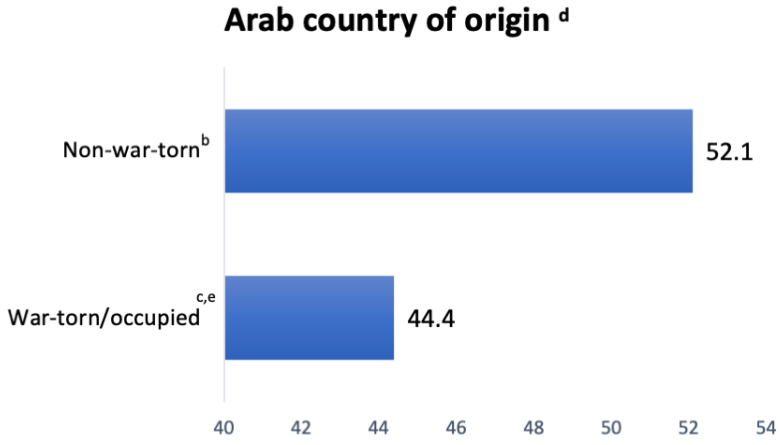
Fig. 5.3. Sub-group differences in mean mental well-being scores (on the 0-100 WHO-5 mental well-being index)



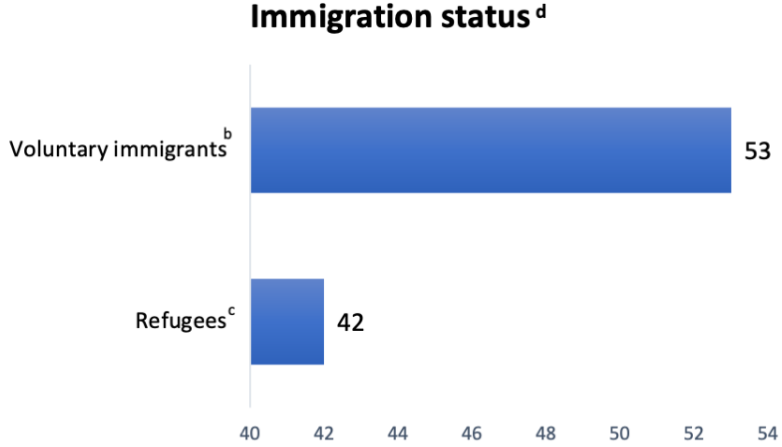
[a] Statistically significant difference (Mann Whitney U =226, p= .026)
[b] (n= 27), [c] (n= 26)



[d] No statistically significant difference (Mann Whitney U =263, p= .138)
[b] (n= 16), [c] (n= 44)



[d] No statistically significant difference (Mann Whitney U =331.5, p= .082)
[b] (n= 29), [c] (n= 31), [e] Iraq, Libya, Palestine, Syria, and Yemen



[d] No statistically significant difference (Mann Whitney U =243, p= .092)
[b] (n= 32), [c] (n= 21)

3.2.6. Actions Needed for MH Equity

This theme addresses participants' recommendations for actions needed to achieve MH equity. Participants stressed the need for addressing discriminatory/inequitable policies, including structural barriers to professional licenses among immigrants, and implementing tailored anti-Islamophobia legislation to eliminate Islamophobic incidents/crimes (Table 5.1, subtheme 6a). Participants also emphasized a need for achieving equitable ethnic/religious representation in the political system, healthcare, government, and media to promote tolerance. Other recommendations included mandating a proper anti-racism/oppression training for employees/staff in all government and non-government institutions and raising awareness about the Arab and Muslim community's needs.

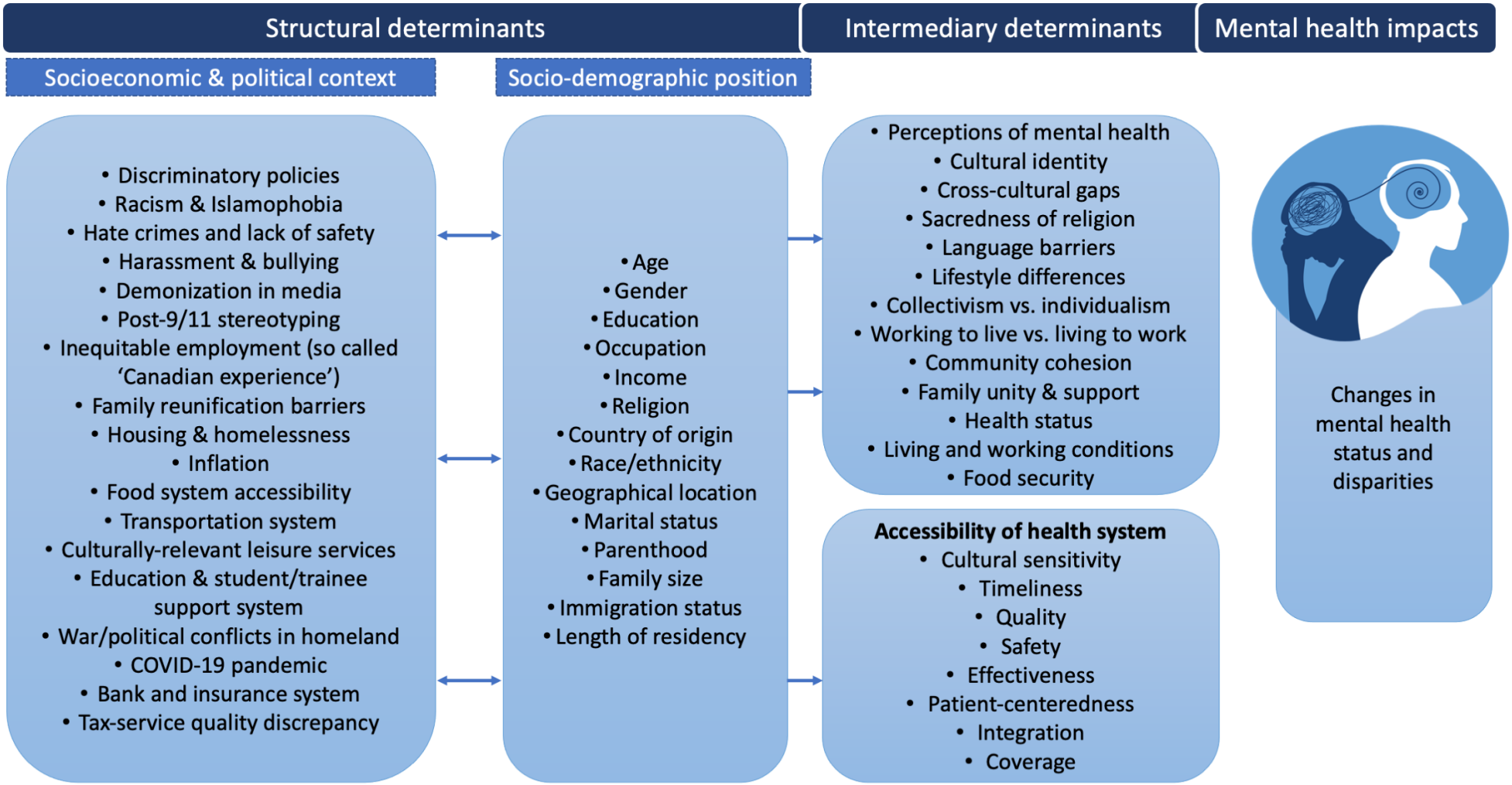
Different recommendations were made to improve living conditions (Table 5.1, subtheme 6b). These included a need for introducing stricter regulations for ensuring the affordability of essential goods/services (e.g., food, telecommunication) and insurance and effectively tackling the housing crisis. Participants also emphasized the need for increasing minimum wage to match the inflation rate, officially applying the four-day work proposal by the Government of Ontario to help individuals spend more leisure time, establishing more community centers and worship places, as well as enhancing quality and accessibility of healthcare, senior services, transportation, and support system to students/trainees. For MH care delivery, participants stressed the need for hiring more AIR professionals and providing training to healthcare providers on the range of social norms and taboos in the Arab culture to enhance cultural and structural competency.

3.2.7. SDoH-guided Conceptual Model

The social determinants of health framework aided the illustration of different factors and complex contexts that shape AIR's MH (Fig. 5.4). The model shows various distinct structural determinants,

including socioeconomic and political contexts and socio-demographic factors that were found to affect AIR's MH in a complex, non-sequential process. The model additionally demonstrates different intermediary determinants, including psychosocial and individual factors, material conditions, and health system accessibility, that were found to exert an impact on AIR's MH individually and collectively, resulting in negative changes in MH and substantial inequities.

Fig. 5.4. Social determinants of health-guided model conceptualizing the complexity of mental health issues



4. Discussion

The CAN-HEAL study explored MH experiences, perceptions, and needs amongst AIR in Ontario, Canada. This research showed that there is a pervasive MH stigma in the Arab community. This is consistent with the findings of previous studies of Arabs in Australia and the Arab world [35, 36]. A novel finding of this study is the stigma around the use of "mental health" term in healthcare settings with AIR who perceived the term to be offensive/culturally inappropriate. Our study revealed an alarming rate of poor mental well-being (55%). The study also found a reported decline in first-generation AIR's MH after immigration. This is consistent with previous studies of YSIE phenomenon, which shows a decline in immigrants' MH since arrival [9]. A novel finding from our qualitative research, however, is that the negative changes in MH are not straightforward; they are complex, dynamic, and multi-faceted, and vary according to intersectional experiences of micro/macro-aggression, cross-cultural pressures, and living conditions. Perceived day-to-day racism and systemic discrimination are also associated with negative MH in previous studies of immigrants/refugees [37, 38]. Our study, nonetheless, showed that AIR additionally face a collective trauma related to the historical stereotyping/stigmatization/demonization of Arabs, which has been exacerbated after the September/11 attacks. Jamal and Naber [14] also reported that Arab Americans have long encountered historically unique forms of racism, orientalism, and othering, which have been intensified after September/11. The discriminatory job market and the mandatory so-called "Canadian experience" were found to be associated with poor MH among AIR in our study. Similar findings were found in previous Canadian immigrant studies [39, 40]. The issue, however, appears to be more prevalent for racialized groups. For example, an employment/income gap was found between racialized and non-racialized groups in Canada, with Arabs and West Asians earning about 15% less income than non-racialized individuals [41].

An eye-opening finding from this study is the intersectionality of MH within AIR. Our research found that participants' socio-demographic characteristics contributed to considerable MH inequities and amplified the negative changes in MH since migration. Gender was found to exacerbate MH inequities. For example, visibly Muslim women suffered distinct stressors (e.g., deep fear due to the rise in Islamophobic hate crimes/incidents), which aggravated MH inequities. Samari et al. [42] also found an association between Islamophobia and poor MH among Muslims in Western countries. Furthermore, AIR mothers feared disclosing MH symptoms due to fear of losing their children. Similar findings were noted in a study of multi-ethnic women in Ontario [43]. Our study found lower mental well-being among refugees than voluntary immigrants. A scoping review on migrant MH reported similar findings [44]. Compared to voluntary immigrants, refugees are more likely to face numerous stressful events throughout their migration journey (e.g., political persecution/violence) that can negatively impact their MH. Our research found that recent immigrants had significantly lower mental well-being scores than established immigrants. This is consistent with the results of the 2020 Canadian survey [45]. These findings can partly be explained by the distinct challenges recent immigrants faced during the COVID-19 pandemic (e.g., inability to navigate essential services due to the lockdown).

Participants in this study reported a wage-living expenses gap, which was associated with psychological distress. The 2022 Canadian survey showed that post-COVID inflation impacted 75% of Canadians' ability to meet day-to-day expenses [46]. One in three Canadians reported money to be the primary cause of anxiety and depression [47]. The issue, however, can be particularly concerning for immigrants, due to lower weekly earnings than non-immigrants [48]. Our study showed dissatisfaction with the quality and effectiveness of Canadian services, particularly the health system, which was associated with distress among AIR. This is consistent with the findings of a study of immigrants in Saskatchewan, Canada [49]. Indeed, the Canadian health system is facing a significant strain and workforce crisis, which has been associated with increased wait time, inefficient care provision, negatively impacting all Canadians [50].

These issues, however, may be particularly concerning for immigrants due to cross-cultural differences, language barriers, and unique racial trauma. In the context of the CAN-HEAL study, a lack of cultural and structural competency in healthcare were major stressors for AIR. Cultural competency is broadly conceptualized as the behavioural, and linguistic skills possessed and exercised by providers when delivering healthcare to people from different cultural backgrounds [51]. Structural competency refers to the knowledge and ability of healthcare providers to appreciate how health issues and symptoms are impacted by structural determinants of health [52]. Indeed, cultural and structural competency in healthcare are essential, particularly for the delivery of MH care to ethnic minorities that embody distinct values and suffer unique race-based stressors (e.g., anti-Blackness for Black people, post September/11 rise in anti-Arabism for AIR) [53].

The SDoH model aided the illustration of complex contexts and varied factors, including intermediary determinants, material conditions, and health system accessibility, that were found to affect AIR's MH in a dynamic, non-sequential manner, resulting in MH inequities (Fig. 5.4). The model underscores the need for equitable policies/systems and individual-centered programs that consider the unique and complex MH needs among AIR.

Various community and policy-level actions were proposed in this study to address MH inequities. These actions underline the requisite for intersectoral collaboration to efficiently tackle the complicated, historically rooted systemic issues and achieve MH equity. The Health in All Policies cooperative technique that thoroughly considers the social and health implications of government policies is recommended to combat inequities [54]. As a synergetic community-engaged project, some actions were taken towards addressing some of the viable needs at the project's scale, such as running community-led awareness campaigns and panels/workshops on various topics (e.g., racism and mental well-being), and developing/distributing culturally appropriate wellness resources. Indeed, these efforts contributed to

improved well-being within the community, as informally reported by many participants and community members, who admitted that this project and the associated support actions have cultivated a feeling of hope that there is light at the end of the tunnel.

5. Strengths and Limitations

This study utilized a collaborative CBPR and IKT approach to produce applicable knowledge. A methodological triangulation was employed by using three methods and integrating their findings through fusion; this helped enhance the study's rigor by maximizing the richness of data as qualitative and quantitative methods are complementary [55]. The SDoH framework and the YSIE theory were used to thoroughly examine complex MH needs among AIR. There was a possibility of selection bias in the sample of participants in interviews since participant's availability to participate was a determinant, alongside age and gender, of participant selection. The risk of bias was mitigated by using three sampling approaches (convenience, purposive, and snowball) to maximize the socio-demographic diversity of the initial 60-partcipant sample from which the participants in interviews were selected. Furthermore, qualitative data saturation was achieved to ensure that the collected data have captured the diversity and depth of the study topic. Although this research included socio-demographically diverse participants, which helped uncover intersectionality/inequities, sub-groups were not equally represented (e.g., gender). This may have led to unequal representation of views/experiences. Finally, the study relied on self-reported data, which might be linked to recall or social desirability biases. This was mitigated by using a multi-method approach and maintaining cultural sensitivity throughout the research process.

6. Conclusion

The CAN-HEAL study revealed stigma in the AIR community around the use of "mental health" term in healthcare settings. Alarming rates of poor mental well-being (55%) were found, and negative changes in MH were reported, supporting the YSIE phenomenon. The negative changes are not straightforward; they

are complex, dynamic, multi-faceted, and related to micro/macro-aggression, cross-cultural pressures, and challenging living conditions. Intersections between different socio-demographic factors amplified the negative changes in MH and exacerbated inequities. Culturally and structurally competent healthcare and structural/policy reformation are required to tackle MH inequities.

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CHAPTER SIX: DISCUSSION AND CONCLUSION

1. Introduction

The overall aim of this research was to thoroughly explore the complex food/nutrition, leisure physical activity (LPA) and mental health (MH) needs in Arab immigrants/refugees (AIR) in Ontario, Canada, with the goal of co-identifying potential MH-promoting opportunities and improving the MH of AIR. This project was conducted in partnership with the AIR community and integrated and honoured Arab cultural values throughout the research process to enhance cultural sensitivity and collect data that reflect the actual needs of this historically marginalized population. The overarching research questions that were addressed in this dissertation are: 1) *What are the complex food/nutrition, leisure physical activity and mental health experiences and needs among Arab immigrants/refugees in Ontario, Canada?, and 2) Can improved access to culturally appropriate foods and leisure physical activity opportunities promote the mental health and well-being of this population, and if so, how?* Three different, yet interrelated, studies were formatted as journal articles and addressed the following broad objectives:

1. Perform an in-depth, culturally sensitive exploration of experiences, needs and factors that impact the food security status and dietary intake as they relate to the mental health of Arab immigrants/refugees.
2. Conduct an intensive, culturally sensitive examination of experiences, needs and factors that affect leisure physical activity participation as they relate to the mental health of Arab immigrants/refugees.
3. Implement an extensive, culturally sensitive assessment of experiences, needs and factors that impact the mental health of Arab immigrants/refugees.

These studies show how food security, nutrition, LPA, and MH are experienced and perceived by AIR and how this can help inform the co-design of future culturally sensitive research and programs that appreciate the Arab community's values and needs. These three studies were co-developed to produce novel community-informed interdisciplinary knowledge about AIR's MH needs and the connection between food/nutrition, LPA, and MH. As well, the integrated examination of the issues at hand in these

studies provides an opportunity for informing future community health research, policies and/or programming that address complex and stigmatized health needs in marginalized communities.

This chapter discusses the key themes of the three studies by showing how the use of integrated methodological and theoretical approaches helped effectively uncover the complex and multi-faceted nutrition, LPA, and MH experiences and needs in the AIR community. The chapter discusses the advocacy and knowledge mobilization efforts executed throughout this project to support the AIR community. In this chapter, I also outline the research strengths and limitations and the contributions this project makes to the literature, including to the multidisciplinary area of immigrant health studies and community research approaches and methodology. Finally, the chapter concludes with a summary of how the project's findings as a whole provide an opportunity for informing future directions for co-created, culturally sensitive/safe health research, policy and programming with AIR communities.

2. Discussion of the Key Findings

This dissertation comprises three interrelated studies (chapters 3, 4 and 5). Mental health of AIR is a key component of all three studies. Chapter 5 extensively explores MH in the AIR community, using a holistic 'social determinants of health' (SDoH) framework, which uncovered multiple socio-economic and political contexts/factors that were found to exert an impact on AIR's MH individually and collectively, resulting in substantial MH inequities. The use of an integrated bio-psycho-socio-cultural framework in chapters 3 and 4 facilitated an in-depth exploration of the relationship between food/nutrition, LPA and MH, including pathways and mechanisms through which food/nutrition and LPA can affect AIR's MH. The key findings of these three studies are integrated below, using four umbrella themes to organize the discussion: 1) interconnections between food/nutrition, LPA, and MH, 2) the effects of intersectionality and inequities on AIR, 3) cultural sensitivity/safety in nutrition, LPA and MH promotion and services, and 4) an upstream and downstream approach to health promotion.

2.1. Interconnections between Food/Nutrition, LPA, and MH

The relationship among food/nutrition, LPA and MH has been evident throughout this research. The use of the SDoH framework helps provide broad insights into this relationship by integrating various factors and complex contexts that shape AIR's MH (Fig. 5.4). Distinct socioeconomic and political contexts/factors (e.g., inflation, inaccessibility of the food system, lack of availably of accessible LPA services) and intermediary determinants (e.g., language barriers, health status) were found to affect AIR's MH in complex, non-sequential ways, where interactions were found to exist between these contexts and factors. For example, discriminatory policies and racism were associated with poor working conditions and low income, which impeded healthy lifestyle, food security and MH. The utilization of a bio-psycho-socio-cultural framework helps to provide a more *in-depth* understanding of the relationship and interactions between food/nutrition, LPA, and MH by integrating various factors, contexts, processes and pathways/mechanisms through which food/nutrition and LPA were found to impact AIR's MH. For example, lack of accessibility to culturally appropriate and nutritious foods for many people in the study was associated with poor nutrition, which in many cases related to low energy, lethargy, low LPA levels and poor MH among AIR participants. Furthermore, LPA was recognized by AIR participants as helpful in motivating them to eat healthfully (e.g., increasing vegetable intake) to be able to work out or participate in activities, which was associated with positive MH. Participants in this research also reported that MH status affected their LPA participation and eating behaviours, where feeling down or depressed was associated with consuming unhealthy foods and a sedentary lifestyle. The relationship between nutrition/dietary intake, fitness and MH has been reported in previous research about the general population (Grave, 2020; Strasser & Fuchs, 2015). The bio-psycho-socio-cultural approach, however, shed light on various unique contexts and factors that often interact with nutrition, LPA, and MH, resulting in a more complex relationship compared to the broader population. Some examples of these distinct factors/stressors reported by AIR participants in this research included racism and fear of anti-

Arab harassment which presented barriers to seeking food aid when needed and exercising outdoors, and so were associated with food insecurity, poor nutrition and low LPA participation, social isolation and negative MH. Moreover, lack of availability of culturally appropriate foods and LPA opportunities that meet AIR's cultural needs and proscriptions were associated with difficulties maintaining ethnic identity, poor dietary intake, low LPA levels, and negative MH. Similar barriers and issues were found for AIR living in other parts of Canada and in other Western countries (Chevrier et al., 2023; Elshahat & Moffat, 2020; Elshahat & Newbold, 2021; Vatanparast et al., 2020).

2.2. The Effects of Intersectionality and Inequities on AIR

Across the three studies covered in this thesis, multiple complex health and social inequities and vulnerabilities were found within the already vulnerable AIR community, and those emanated from intersections among various socio-demographic characteristics and identities (e.g., gender, socio-economic status, parenthood, religion, disability). Intersectionality is a concept that acknowledges the various axes of marginalization, including different facets of one's social and political identities and how these can intersect/interact, resulting in different modes of discrimination, oppression and inequities (Crenshaw, 2006; Weldon, 2008). A more holistic approach to intersectionality has been proposed by many anthropologists who emphasize the role of culture and how it can intersect with institutional barriers and systemic failures to meet different cultural needs, giving rise to complex inequities and vulnerabilities (Degnen & Tyler, 2017; Henne, 2018). In the context of nutrition, this research shows that while the AIR community shares common concerns about food/nutrition in Canada (e.g., food safety, high-priced healthy foods), intersections among different socio-demographic factors and systemic barriers contribute to nutrition inequities. For example, Muslim AIR participants with disabilities associated with dietary restrictions reported complex and distinct challenges maintaining their nutritional well-being, where they faced significant barriers to obtaining nutritious, healthy foods that meet their religious *and* disability-

related dietary restrictions. Moreover, AIR mothers, particularly single parents with low socio-economic status, reported that they frequently reduced their dietary intake and nutritional well-being to healthfully feed their children. This has been previously reported in research about mothers living in food insecure households in the US (Olson, 2005), though not specifically amongst AIR.

The CAN-HEAL research also found various intersections between different socio-demographic characteristics and identities that were associated with LPA and MH inequities. For example, low-income parents compromised their own well-being needs to register/pay for their children to participate in exercise/sports programs and improve their MH. Recently arrived AIR participants residing in underserved areas faced stressful barriers to accessing culturally appropriate services, which impeded their MH. Visibly Muslim women (i.e., wearing *hijab*) suffered discrimination and detrimental impacts of anti-Muslim hate, where they reported fear of hate crimes and harassment as major barriers to LPA resulting in poor MH. Similar findings have been reported for Muslim women in the UK (Benn et al., 2011; Dagkas & Hunter, 2015). Refugees from war-torn/occupied countries experienced a distinct homeland trauma, worries about their family back home and systematic discrimination in family reunification, which related to negative MH. The intersectional experiences of micro/macro-aggression, socio-cultural exclusion and poor living conditions found in this research were collectively associated with a reported decline in AIR's MH after immigration, which aligns with the 'years since immigration effect' (YSIE) phenomenon. This is consistent with previous systematic review of YSIE research, which found a decline in immigrants' MH since arrival (Elshahat et al., 2022). An original finding from the CAN-HEAL qualitative research, however, is that the negative changes in MH are not straightforward; they are complex, dynamic, and multi-faceted, and vary in intensity according to intersections between different characteristics/identities (e.g., gender, religion), institutional barriers and systemic failures. Collectively, the intersections shown in this research underline that nutrition, LPA, and MH needs are not

a one-size-fits-all and highlight the need for tailored programs and policies that consider the situations and needs of individuals and sub-group within the AIR community.

2.3. Cultural Sensitivity/Safety in Nutrition, LPA and MH Promotion and Services

Across the three studies incorporated within this dissertation, cultural sensitivity in support services and programming (including nutrition, LPA, and MH-promotion programs) has been a key component emphasized by AIR for positive MH. Cultural sensitivity can broadly be defined as the awareness/acknowledgement and respect of distinct cultural needs and values of different ethnic groups and building on this by honouring these values when designing any program/service designed to support a particular group (Brooks et al., 2019). Cultural sensitivity is fundamental determinant of health promotion services utilization and positive health outcomes for ethnic minorities (Tucker et al., 2011). Lack of availability of culturally sensitive food programs, dietitian services, LPA facilities, and MH care that appreciate and honour the distinct cultural and religious proscriptions and values of the Arab community was associated with social exclusion, and negative MH among AIR participants in this research.

In healthcare practice, the term ‘cultural competency’ has widely been used. Cultural competency is broadly conceptualized as the affective, behavioural, and linguistic skills and attitudes of empathy possessed and exercised by healthcare providers to help enhance effective communication with patients from different cultural backgrounds (Truong et al., 2014). The concept has often been criticized for suggesting that healthcare providers should strive to master a specific level of knowledge, skills and understandings of different ethnic minorities’ cultures (Duke et al., 2009). This focus on promoting the acquirement of attitudes, knowledge and skills makes culture competency viewed as a ‘static’ level of achievement (e.g., being ‘competent’ in communicating with multi-cultural patients much in the same way as being competent in reading an ECG or conducting a physical exam) (Kumagai & Lypson, 2009). Kleinman and Benson (2006) also warn against the stereotyping that can emanate from the cultural

competency's series of "do's and don'ts" that standardize how individuals of a given ethnic background should be treated in healthcare settings. This can lead to the assumption that certain ethnic groups have a shared core set of beliefs and perceptions due to fixed ethnic traits, resulting in substantial stigmatization and marginalization. Health and social care providers should be fully aware of the range of social norms and cultural values of separate ethnic groups without any pre-judgements, as individuals from the same ethnic background can have different beliefs and perceive health symptoms differently, based on different socio-demographic characteristic and unique experiences (Aggarwal et al., 2016). For example, this research found that first-generation AIR over 30 years of age identified the term "mental health" as culturally inappropriate and offensive. Conversely, the term was relatively viewed as innocuous by younger adults and second-generation AIR who had already normalized the use of MH in Western populations.

Over the past years, there has been a growing interest in the concept of 'cultural safety' (Curtis et al., 2019). Unlike cultural competency, the 'cultural safety' concept goes far beyond gaining skills and knowledge of cultural customs; it acknowledges power differentials in society, and emphasizes the need for reflecting on the power differences (between healthcare and service providers and patients/clients) with a focus for delivering tailored quality care by allowing patients/clients to determine whether the provided care is safe (Laverty et al., 2017; Papps & Ramsden, 1996). This can be achieved by requiring healthcare and service providers to examine/question their own assumptions, beliefs, culture, biases, prejudices, and stereotyping and their impact on clinical/support interactions and the quality of the provided care. This approach is proposed to prevent 'othering', marginalization, internalized oppression, and exclusion in health and social care by moving to the culture of healthcare and service providers and settings instead of the culture of the patient/client who may be viewed as the 'exotic other' (Curtis et al., 2019). The focus on cultural safety can be particularly important in MH care delivery, due to stigma

around this topic that is pervasive in many cultures, as well as the systemic racism against many marginalized ethnic minorities, which may collectively make many vulnerable people reluctant and terrified of seeking care (Milroy et al., 2023). In the context of this research, AIR mothers reported the fear of their children being taken away from them as a barrier to disclosing any MH symptoms. This example underscores the importance of cultural safety in health and social care systems to remove barriers and provide quality and safe care to historically marginalized populations.

2.4. Upstream and Downstream Approach to Health Promotion

As part of this research, various socio-political and community-level actions were proposed to improve AIR's nutritional well-being, LPA levels and MH and thereby reduce health and social inequities among them. According to the upstream and downstream approach, effective health promotion intervention plans should consider and focus on two fundamental strategies: 1) macro-level strategy (upstream) that is tied to structural determinants of health and addresses the root causes of inequities in society, and 2) micro-level strategy (downstream) that focuses on issues related to equitable access to health and social care resources that are tailored to each group's needs (McMahon, 2022). Upstream interventions are mainly designed to address the causes- of-the-causes of illness, whereas downstream interventions are primarily developed to mitigate the effects of the causes of poor health. Integrating upstream and downstream strategies provides a promising opportunity for acting on economic, legal, and political structures to eliminate structural barriers to equitable health, while maximizing support by enhancing accessibility to culturally sensitive and safe programs, resources and services (Gehlert et al., 2008).

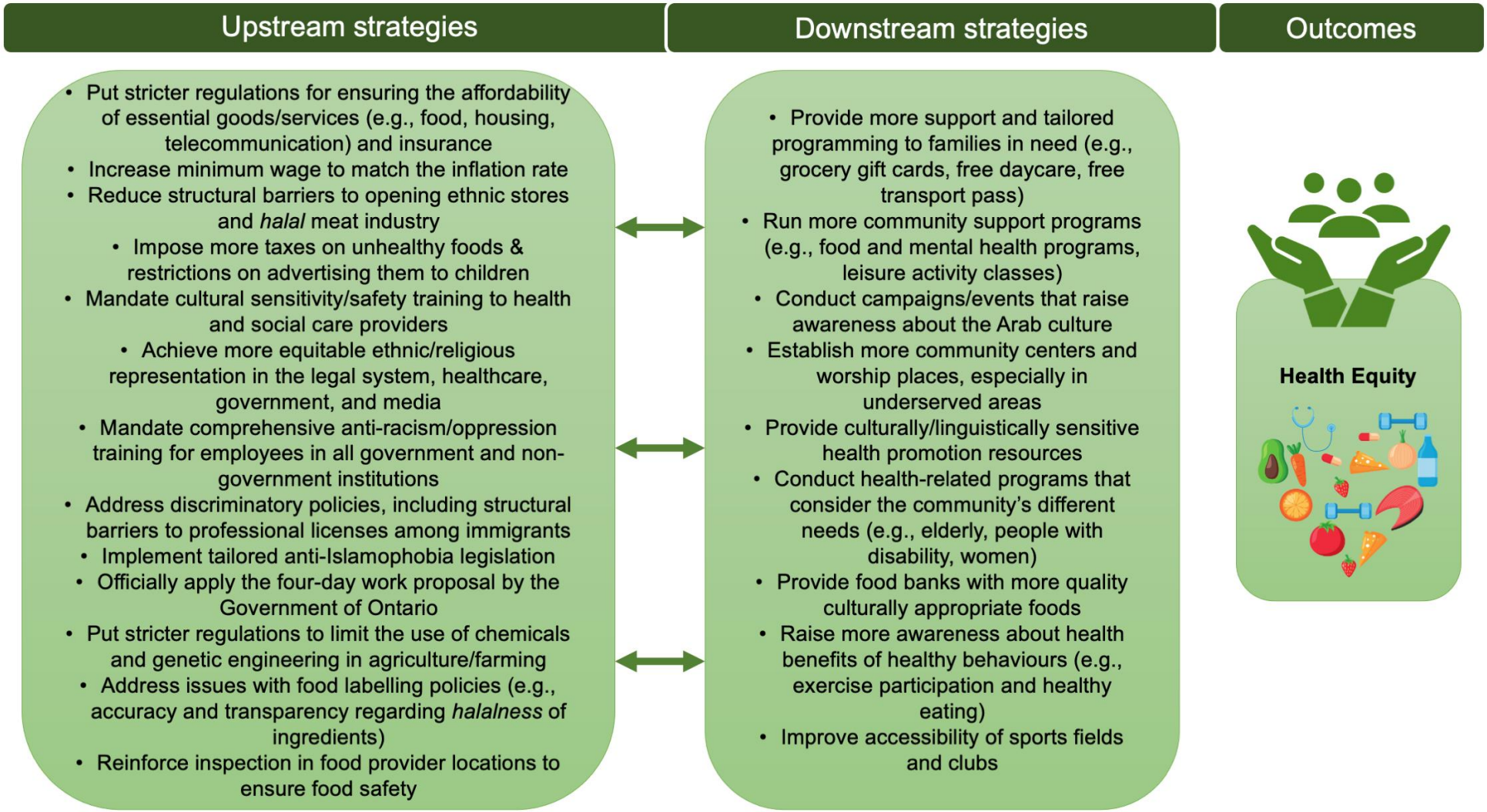
Using an integrated upstream and downstream approach, the socio-political and community-level actions proposed in the CAN-HEAL research as a whole have been analyzed and visually illustrated in a conceptual model that presents an amalgamated action plan with the aim of addressing the complex and multi-layered health and social needs of the AIR community and informing next steps for achieving

health equity (Fig. 6.1). The model shows numerous socio-political actions needed at an upstream level to address structural barriers to equitable health across various systems (e.g., economic, legal and political, food, health and social care systems). Examples of such actions include increasing Ontario's minimum wage (Government of Ontario, 2023a) to match inflation rates, provide more equitable employment opportunities, introducing stricter regulations for ensuring the affordability of essential goods/services, achieving more equitable ethnic/religious representation (e.g., in healthcare, government), and repealing discriminatory policies/practices in employment (e.g., requiring Canadian experience). Previous research about AIR in Canada has also indicated that there is a need for increased governmental income support to improve food security (Moffat et al., 2017; Vatanparast et al., 2020). For example, the Resettlement Assistance Program is a federal support program for government assisted refugees that provides financial assistance and various essential services (e.g., housing) (Government of Canada, 2024). For privately sponsored refugees, the Blended Visa Office-Referred Program provides financial support divided between the government and the private sponsor (six months each) (Government of Canada, 2023a). The Joint Assistance Sponsorship Program involves a partnership between Immigration, Refugees and Citizenship Canada and community organizations to support refugees with special needs (e.g., trauma) by providing them with income for up to two years (Government of Canada, 2023b). A mixed-method study in Quebec, Canada found that privately sponsored Syrian refugees experienced higher food insecurity than their government assisted counterparts (Chevrier et al., 2023). This could in part be explained by the large influx of privately sponsored Syrian refugees to Canada between 2015-2017, which put considerable demands on sponsoring organizations and the available resources (Janzen et al., 2021). Other support programs at the provincial level include Ontario Works which provides employment assistance and financial support as well as the Ontario Disability Support Program that provides people with disabilities with income support and benefits for health costs (Government of Ontario, 2022, 2023c). While these support programs are helpful in assisting newcomers' transition and integration into Canada, it is worth

noting that increases in income to match inflation rates are essential to reduce poverty and hunger (DeClerq & O'Brien, 2023). Furthermore, systemic barriers to equitable employment need to be addressed to improve people's food security, health, and quality of life. For example, a Syrian refugee participant in our research, who has 10+ years' experience as a physician in their homeland, expressed frustration with the system stating that they do not want social assistance, which makes them feel unproductive. Instead, they need equitable employment opportunities that appreciate their multi-year experiences, so they can work and improve their self-esteem, MH and well-being.

Our upstream-downstream model also presents various community-level actions at the downstream level to maximize support by empowering and enhancing accessibility to health-related programs, resources, and services, particularly to those in need, to achieve health equity. Overall, the model emphasizes the importance of *both* upstream and downstream strategies and shows an interrelated relationship between them, where many actions relate and are required in order to effectively achieve health equity outcomes. To push for social justice and address discriminatory policies against racialized groups, more advocacy and community-based awareness campaigns are needed about the lived experiences of minority people and how such policies affect their health and well-being. Such campaigns can not only help in achieving the goal of addressing structural issues, but also have the potential of empowering and improving the community's MH and well-being by building solidarity.

Fig. 6.1. Upstream-downstream-based health promotion action plan from the CAN-HEAL project



3. Advocacy and Knowledge Translation and Mobilization

The CAN-HEAL project has implemented some of the actions (as proposed in the upstream-downstream model above) towards addressing some of the needs that are viable at the project's scale (CAN-HEAL, n.d.). The performed actions are twofold: 1) actions for advocacy, empowerment, and social justice, and 2) actions for health promotion and service improvement.

3.1.Actions for Advocacy, Empowerment and Social Justice

Throughout the project, various actions have been implemented by co-designing tailored, culturally sensitive initiatives that aims to empower the AIR community, and advocate for addressing the complex health-threatening structural issues (e.g., discriminatory policies) that impede achieving social justice. For example, the project collaboratively worked with the National Council of Canadian Muslims (NCCM) on an Ontario-wide socio-political initiative called 'Action Against Islamophobia Week' that aimed to mobilize the community to call on the Canadian government to take concrete actions against the alarming rise in anti-Muslim hate crimes in Canada. The initiative was implemented in February 2021 and constituted two parts: 1) a virtual workshop with policy-makers (including Members of Parliament), professionals/activists and youth, and 2) a campaign calling on the Government of Ontario to push for the legislation of the 'Our London Family Act', which was initially proposed after the murder of the Muslim family whose innocents lives were taken in hate crime in London, Ontario in June 2021 (NCCM, 2021). Another initiative is 'Proudly Arab', a community-based awareness campaign that features stories by AIR community members' about their pride in their Arab identity in order to raise awareness about the richness and strength of the Arab culture as well as challenge misconceptions and stereotypes of Arabs Canadians.

Virtual community-based cultural competitions were also conducted, featuring cultural foods and their importance for one's well-being with the aim of advocating for the improvement of accessibility to cultural food items, cultivating cultural pride, and helping raise awareness and reduce food bullying (e.g., in workplaces and schools). Other community-based initiatives are '*Hikayati*' (my story) and 'inspiring immigrant', which featured inspiring Arab immigrants in Canada and their stories of success with the aim of empowering AIR, fostering a sense of belonging and challenging stereotypes of the Arab community. These initiatives collectively helped empower the AIR community and contributed to improved well-being, as informally reported by many community members, who admitted that this project and the associated support actions have cultivated a feeling of hope that there is light at the end of the tunnel.

3.2. Actions for Health Promotion and Service Improvement

Several culturally sensitive initiatives have been designed with the aim of enhancing health education and promotion within the AIR community and informing health and social care service improvement. For example, as part of the project, a nutrition education cookbook was designed (in Arabic, English and French) to help provide accessible nutrition information, promote healthy food/nutrition behavior, preserve cultural foods through traditional recipes, raise awareness about the connection between food and mental well-being as well as educate service providers about the complex food needs in the Arab community. Additionally, two other community-based books have been produced to provide culturally sensitive information on physical activity and mental well-being, provide culturally appropriate wellness-promoting activities and strategies, as well as educate practitioners about the complex MH and wellness needs in the Arab community. Further, a positive self-talk storybook has been developed to provide a collection of culturally sensitive stories that foster positive self-talk, self-compassion, and self-care with the aim of promoting positive MH and well-being of the AIR community.

The CAN-HEAL project also collaborated with numerous health and social care providers (e.g., physicians, psychotherapists, case and social workers, occupational therapists, kinesiologists, dietitians, nutritionists), clinics and community-based organizations to hold seven virtual panels/webinars/workshops on health-related topics, including nutrition, MH and physical activity, which were collectively attended by over 400 community members. The aim of these panels/webinars/workshops was two-fold: 1) to promote the community's health and well-being, and 2) to communicate the CAN-HEAL research findings and foster dialogue with practitioners about potential avenues to improve the accessibility, cultural safety, and quality of health and social care in Canada. Notably, many MH professionals have agreed to apply the research findings and start using more culturally appropriate and sensitive terms instead of MH in their practice.

4. **Strengths and Limitations**

A strength of this project is that it integrated community-based participatory research (CBPR) and integrated knowledge translation (IKT) approaches to identify areas for policy change and social reformation as well as create applicable knowledge for health and social care service improvement. Furthermore, the research employed holistic and rigorous theoretical frameworks to guide the research to effectively meet the aims and objectives of the project. As an Arab immigrant, my cultural background, identity, and experiences have aided the implementation of this research. For example, cultural safety and sensitivity principles were followed throughout the research process by accommodating participates' needs and honoring the AIR community's values (e.g., interview time flexibility during *Ramadan*, conducting the research in English, Arabic and/or French according to each participant's language preferences). This helped develop a sense of belonging and fostered cultural understanding, and thereby aided the collection of reliable data that reflect the actual needs and priorities of the AIR community.

This research was conducted over Zoom, which could be associated with some technical difficulties. To mitigate this, a training on the use of the Zoom platform was provided to participants as needed. Overall, this limitation was outweighed by various advantages, including time- and cost-effectiveness and feasibility of recruiting hard-to-reach participants from wider geographical areas. The project focused on Ontario, which may not make the findings generalizable to other locations in Canada where social, economic, and political contexts and health and social care policies differ. There was a possibility/risk of selection bias in this study since many of the individuals who volunteered to participate in the research experienced food insecurity and/or health challenges. However, this risk was mitigated by integrating three sampling strategies (convenience, snowball and purposive) to enhance diversity in the recruited sample, including different socio-demographic characteristics (e.g., socio-economic status, length of residency). The socio-demographic diversity in the recruited sample helped reveal multiple inequities within the AIR community, though sub-groups were not equally represented, which may have resulted in unequal representation of experiences among some sub-groups. Although the survey sample size was small, the results overall are eye-opening and provide valuable insight into food/nutrition, LPA, and MH experiences and inequities in the AIR community. Qualitative data collected in this study helped provide in-depth insight into longer-term experiences of food (in)security, LPA, and MH that would not have been possible with a survey alone. Research interviews were performed until data saturation, which was achieved at the 41st interview. An additional nine interviews were conducted to reach 50 to enhance study rigour. All data in this study were self-reported, which may be associated with social desirability or recall biases. This was mitigated to some extent by triangulating three different methods – survey, interviews, and Photovoice.

5. Contribution to the Literature

The CAN-HEAL project makes multi-faceted and significant contributions to the literature. These are categorized and summarized below under two major subsections: 1) the multidisciplinary area of immigrant health research, and 2) innovative methodological approaches to community health research.

5.1. The Multidisciplinary Area of Immigrant Health Research

The three studies incorporated within this dissertation collectively revealed various eye-opening findings that are important to the field of immigrant health research. Integrating the 'social determinants of health' (SDoH) framework and the 'years since immigration effect' (YSIE) theory together with following cultural safety/sensitivity best practices (e.g., honouring the cultural values of AIR, using culturally appropriate terminology) revealed the complex MH experiences, needs and trends in the AIR community. This is an important contribution to the literature as most MH research has used biomedically informed approaches that overlooks cultural safety/sensitivity (Elshahat et al., 2022; Elshahat & Moffat, 2022). A recent systematic review of 58 immigrant MH studies found a gap in YSIE research, and emphasized the need for more studies that employ the YSIE theory to obtain an in-depth understanding of immigrants' MH experiences after immigration (Elshahat et al., 2022). The review also highlighted the need for integrating other potential theoretical concepts/frameworks (e.g., SDoH) to aid an extensive exploration of MH issues among immigrants and to inform the development of tailored and culturally sensitive interventions. To my knowledge, this is the first study to integrate a SDoH framework and YSIE theory to effectively explore AIR's MH needs and priorities. This integrated approach not only revealed alarming trends (e.g., a reported decline in MH years after immigration), but also uncovered numerous intersecting socio- demographic, cultural, economic, political, and structural factors and contexts that aggravate MH inequities in the AIR community. For example, Muslim parents reported deep concerns, fear and worry about their children losing their cultural/religious identity in a secular society, especially with a lack of affordable Islamic schools. Moreover, all Muslim participants reported fear about the safety of their family, especially women

with *hijab*, due to the rise in anti-Muslim hate incidents/crimes in Canada. First-generation AIR aged 30 years and older reported barriers to accessing MH support, largely due to a lack of cultural safety/sensitivity in Canadian health and social care systems that normalize the use of the term 'mental health', a term that was considered to be offensive and culturally inappropriate. These findings are important for policy-makers, health and social care providers, practitioners, public health professionals and service planners to know about as they provide in-depth insight into the complex and various multi-level needs of the AIR community that can help guide effective, tailored interventions, policies and programs to positively promote AIR's MH.

A novel contribution of this research to the literature is the development of an integrated upstream-downstream model of intervention that presents the socio-political and community-level actions proposed in this project to promote the MH of AIR. This is a unique contribution given that previous research mainly centered around the downstream level by focusing on health behavioural interventions that aims to mitigate the effects of the causes of poor health, overlooking the root causes of health inequities in society (Ndumbe-Eyoh & Moffatt, 2013). A systematic review of intersectoral actions/interventions for healthy equity found that 88% of studies (n= 17) focused on a downstream approach (Ndumbe-Eyoh & Moffatt, 2013). This has been criticized as most of the social determinants of health are related to structural issues (i.e., lie outside the health sector's sphere), which requires a holistic approach to tackle barriers to health equity at all levels (McMahon, 2022). This can be particularly critical for immigrants who often face numerous systemic barriers and stressors (e.g., discriminatory policies, racism) that place their health at higher risk than the broader population (Elshahat et al., 2022). This research addresses this gap by presenting a holistic model that integrated both upstream and downstream approaches of intervention to effectively address the complex and multi-layered health needs among AIR (Fig. 6.1). This model provides a promising opportunity for public health specialists, service planners, and policy makers to fully understand and effectively act on the complex needs of AIR and achieve health equity for this population.

5.2. Innovative Methodological Approaches to Community Health Research

A novel contribution of this research to the methodology literature is the use of a collaborative approach that integrates community-based participatory research (CBPR) and integrated knowledge translation (IKT) principles. Previous research that deployed a collaborative technique has mainly focused on either CBPR or IKT approach (Jull & Giles, 2017; Nguyen et al., 2020). Integrating both approaches provides a promising opportunity for effectively addressing the complex community health issues by advocating for social justice to address social determinants of health and co-producing applicable knowledge to guide the design of effective, tailored health promotion interventions and inform culturally safe/sensitive health and social care. While this integrated approach can be useful to address the health needs of any population, its utility can be substantial for immigrants/refugees who often experience various structural issues that require community-led advocacy and who embody unique cultural beliefs that need to be fully understood and honoured when designing health promotion services and programs (Elshahat et al., 2022). This research adopted an integrated CBPR and IKT approach which has aided effective advocacy work (e.g., socio-political community-based campaigns to address the MH-threatening rise in anti-Muslim hate), and the production of applicable knowledge that has been efficiently used for culturally sensitive health promotion and service improvement (e.g., health-focused panels/workshops with practitioners and service providers).

Another strong contribution to the literature made by this research is the use of the Photovoice methodology to examine the complex food/nutrition, LPA, and MH needs of AIR by enabling participants to create photographic evidence on the sophisticated health and socio-political issues that they might be unable to effectively express through regular interviews. Most of previous research of AIR used either quantitative surveys, qualitative interviews/focus groups or combination of both, showing a gap in the use of Photovoice in this community (Elshahat & Moffat, 2022; Elshahat & Newbold, 2021). The CAN-HEAL research has addressed this gap by employing Photovoice (alongside qualitative interviews and a questionnaire survey).

Photovoice helped empower participants to think critically/deeply and speak up about various complex and stigmatized health and social issues, which helped uncover eye-opening findings regarding MH, food insecurity, and LPA that have not been revealed in previous research of AIR. For example, one participant captured a photo of an automated teller machine (ATM) taking money to symbolize the MH-threatening issue of lack of accommodations for Muslims, whose religion strictly prohibits paying interest/usury, and so they cannot secure housing through bank mortgages. Another participant provided a photo of lambs to symbolize struggles Muslims in Canada face to practice their rituals and culinary traditions for *Eid Al-Adha* (Muslims' Holiday of Sacrifice), which was associated with psychological distress.

This project adopted an online model (through the Zoom platform) due to COVID-19 pandemic restrictions. Although the initial/primary goal was to follow the national COVID-19 public health measures, it turns out that adopting such model has been associated with new advantages and opportunities in terms of engaging the community and maximizing the impact of this research. Over the past few years, there has been a growing interest in the online model for qualitative studies, though its use was mainly limited to regular qualitative interviews or focus groups (Archibald et al., 2019; Gray et al., 2020). The unique contribution made by this project is that it demonstrates that an online model is not only efficient for qualitative data collection from a wide range of socio-demographic groups, but that it is also valuable in terms of facilitating multi-level community partnership (i.e., with community leaders, students, and organizations), advocacy, and knowledge translation work. For example, the online model aided the engagement and recruitment of many hard-to-reach groups (e.g., residents of underserved areas, men who typically don't participate in research about topics such as food and MH, working parents, and people with disabilities) whose voices are often not amplified in research. This online model also facilitated the establishment of partnership with communities across Ontario; something that is hard to achieve through the regular in-person format given the high cost of travel and accommodations for the researcher. Additionally, the community-based advocacy

and knowledge translation work that brought together numerous stakeholders and community members across Ontario (and sometimes across Canada) to take action to address systemically rooted issues and promote AIR's health and well-being, would not have been feasible without the adopted online model.

6. Conclusion

The CAN-HEAL project has reached many conclusions, the most universal of which is that food/nutrition, LPA, and MH experiences and needs of the AIR community are complex and multi-layered and vary considerably according to intersectional experiences related to different socio-demographic factors (e.g., gender, income, religion, place of residence, country of origin), cross-cultural pressures, living conditions and racism. The use of three different methods (qualitative interviews, Photovoice, and a questionnaire survey) in this research helped reveal AIR's unique experiences, needs and priorities regarding food/nutrition, LPA, and MH.

The research found alarming prevalence of poor mental well-being (55%), food insecurity (65%) and low LPA levels (87%) among the participants. Of first-generation immigrant participants, 86.8% reported negative changes in MH since migration, which is consistent with the findings of negative health outcomes that arise after immigration in the 'years since immigration effect' research. This project's qualitative findings, however, suggest that these negative changes are not straightforward; they are complex and dynamic, and mainly related to structural barriers, poor living conditions, and system failures to accommodate the distinct cultural needs of the AIR community. Intersections between different socio-demographic factors (e.g., gender, length of residency, income, parenthood, religion, immigration status), amplified the negative changes in MH, played a considerable role in how nutrition, food security and LPA impacted AIR's MH, and exacerbated inequities within the AIR community. This research has demonstrated that the relationship between food/nutrition, LPA and MH among AIR is multi-faceted, and

that there is a multiplicity of psycho-socio-cultural pathways and processes via which diet quality, cultural foods and LPA can contribute to shaping AIR's MH.

As part of this research, a concrete socio-political and community-level action plan that is guided by an integrated upstream-downstream approach has been co-developed to effectively address the complex and multi-layered needs among AIR and achieve health equity for this marginalized population. As a community-engaged project, some of these actions that are feasible at the project's scale have been implemented, which has contributed to improved well-being within the AIR community, as informally reported by many community members. Finally, it is important to note that the goal of improving AIR's health and well-being is multi-faceted and long-term and so intersectoral collaboration efforts between health and non-health sectors should constantly be exerted to effectively address the complex needs of this historically racialized/oppressed population.

7. **Future Directions and Opportunities**

The CAN-HEAL research findings and innovative methodological approaches provide a unique opportunity for guiding future research, advancing future community-engaged research, and informing policy and practice, which will not only help improve the health and well-being of AIR but also support other similar ethnic groups. The suggested future direction and opportunities are organized below under three prime subsections: 1) implications for future research, 2) recommendations for governmental agencies and institutions, and 3) recommendations for policy and practice.

7.1.Implications for Future Research

As part of the CAN-HEAL research, a comprehensive community-informed action plan has been proposed and involved various interventions that need to be implemented to achieve health and social equity for AIR.

Looking ahead, formal intervention research that addresses the issues raised by AIR in this project is required in Ontario. This would include intervention design, feasibility testing, executing, and measuring the effectiveness (including cost-effectiveness) of the implemented interventions. The interventions that are cost-effective and show the most significant positive impact on AIR's health and well-being can be scaled up.

Given that the findings of this Ontario-focused project may not apply to other locations, including Canadian provinces where polices and systems are different, it is recommended that similar community-engaged research is conducted with AIR living in such locations and nations. The conducted research should ideally follow a protocol that is similar to the one adopted in this project, including integrated theoretical and methodological frameworks, as well as incorporating cultural safety and sensitivity principles.

The methodological framework employed and presented by this project, including the integrated CBPR and IKT approach and the online model, is transferable to other hard-to-reach populations, including other ethnic immigrant minority groups (e.g., South Asians, Latinos), and therefore presents a promising opportunity to other researchers who conduct research in marginalized communities globally. Adopting such methodological framework will not only help effectively empower/engage the studied communities and provide in-depth insight into their distinct actual issues, needs and priorities, but will also pave the way for setting concrete community-informed action plans for promoting health and social equity for these populations.

7.2.Recommendations for Governmental Agencies and Institutions

This project has provided many lessons on areas for improvements to advance community-engaged research and thereby, promote the well-being and sustainability of communities and eliminate health and social inequities. Based on the lessons from this community-engaged project, evidence-based

recommendations are made for implementation by governmental agencies and institutions. One of the prime recommendations is to invest in providing more funding opportunities to support the conduct of meaningful community-engaged research. This can be performed by allocating funds to develop joint internship programs that encourage students/youth to engage in the conduct of community-engaged research by providing appropriate stipends. This approach would not only help strengthen community-engagement and support researchers (so they can direct their efforts towards the implementation of the research) but would also provide an excellent opportunity for students/youth to develop valuable knowledge and level-up their skills through a paid program. Governmental agencies should also provide more financial support and resources to community organizations to increase their engagement in community-engaged research. Allocating more funding for community-engaged research and its related activities (e.g., designing health promotion initiatives) is a crucial step towards advancing this important research that has the potential to directly promote the health and well-being of communities, and strengthen community action.

Another important recommendation is that institutions should provide an intensive tailored training to researchers who conduct community-engaged research on topics that involve trauma, such as MH. Previous evidence shows that individuals who work in the context of a collective community trauma, without receiving appropriate intensive training by the institution they work in are at high risk for developing vicarious trauma and feelings of disruption (Rothschild, 2022; SAMHSA, 2023). Indeed, this applies to MH community-engaged researchers whose work primarily involves active listening to traumatic experiences over a prolonged period of time and addressing community's complex needs. This is particularly *very* critical for researchers who work with a historically racialized and collectivistic community to which they belong as it significantly places their well-being at risk. Protecting the well-being of community-engaged researchers should be a priority for institutions and this can be fulfilled by providing them with intensive culturally appropriate training and support.

7.3. Recommendations for Policy and Practice

This research has showed various actions that need to be taken in terms of policy and practice to improve the health and well-being of AIR. Although all actions are important, some of them, particularly those related to achieving cultural sensitivity and safety in services, require quick implementation to achieve health equity for AIR, given that this population often embodies distinct cultural beliefs and values, which if not properly accommodated, would exacerbate health and social inequities. To make progress towards achieving food/nutrition equity for AIR, ethnic grocery stores that provide cultural foods should be supported by the government through financial aids, and incentives to encourage the opening of more of these stores. The government should also give more financial support to food banks to provide more quality/ nutritious culturally appropriate foods that meet the cultural food proscriptions and dietary needs of AIR. Furthermore, facilitating equitable employment opportunities is needed to eliminate poverty and improve food security among AIR.

To help achieve LPA equity for AIR, service planners should improve cultural sensitivity and safety of exercise/sports facilities by accommodating the distinct cultural/religious needs of AIR (e.g., providing women-only hours and spaces with female guards). Ensuring accessibility of such services is also important and can be achieved by accommodating the various needs of different AIR groups, including the elderly and those with a disability. Furthermore, the government should give more financial support (e.g., aids, grants) to community centers and organizations to provide more culturally sensitive/safe LPA free programs that accommodate cultural proscriptions and the distinct needs of different AIR groups (e.g., working parents, mothers with different-aged children).

In terms of health and social care systems, a comprehensive and cultural sensitivity/safety training that involves an in-depth practical component on how to provide culturally sensitive/safe care to AIR should be

mandated for health and social care providers. This is particularly critical for stigmatized topics and health issues (e.g., mental health) that if not properly approached by care providers, would result in substantial harm to individuals that need support. The CAN-HEAL project has made substantial progress in revealing the actual and complex needs of AIR in terms of how health and social care providers should approach MH with this community. Indeed, the project has exerted enormous efforts to help enhance the use of these findings by initiating dialogue with care providers and clinics from across Canada to start incorporating them into their practice. Ensuring the applicability of these findings should be a continuous process that is considered and supported by service planners and policy makers to achieve health equity for AIR.

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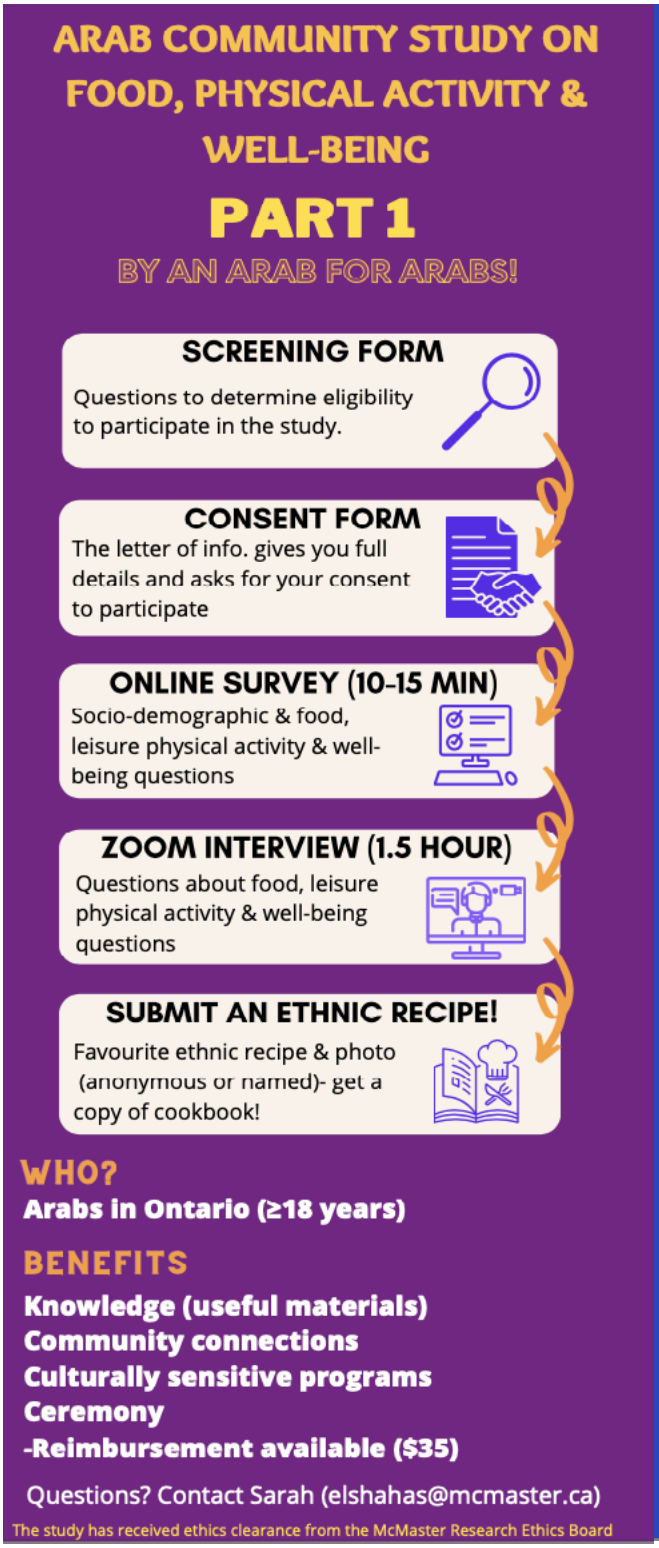
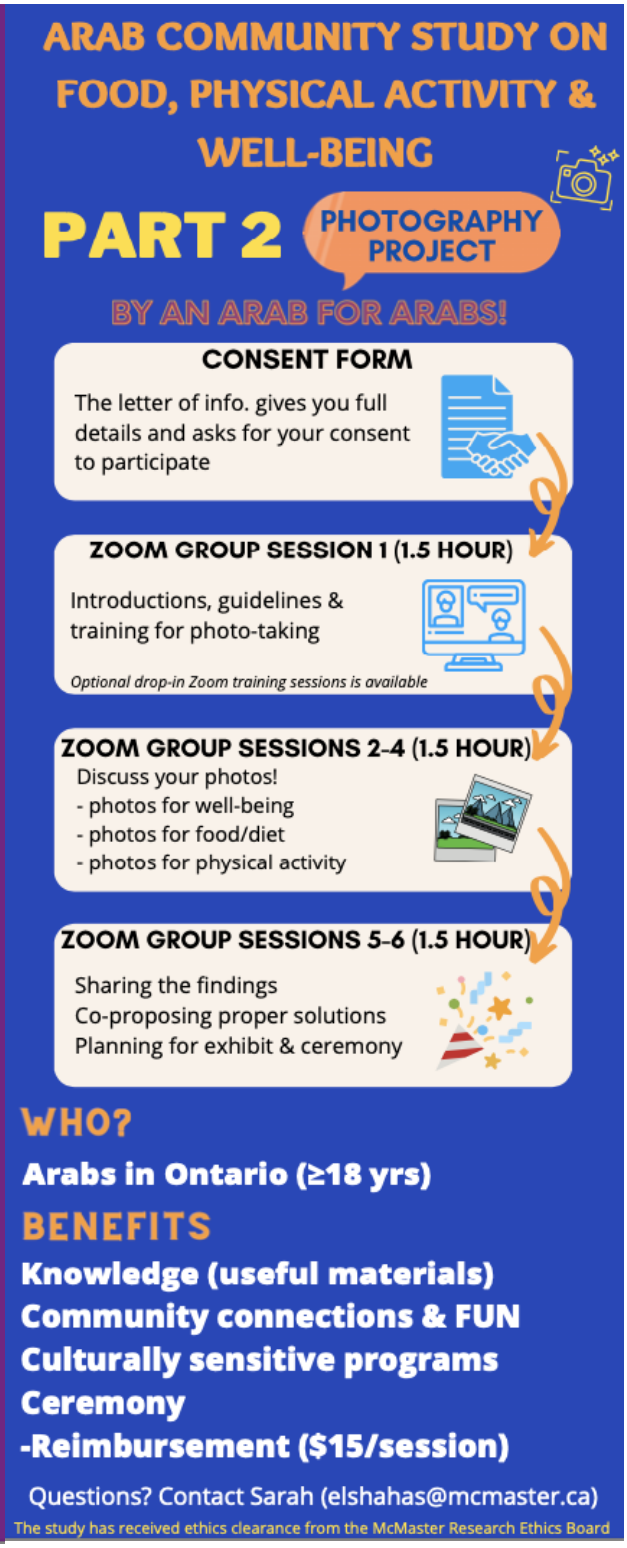
Appendix A: Posters for recruitment





Appendix B: Screening form for participant recruitment

Salaam!
My name is Sarah Elshahat, PhD candidate in Anthropology at McMaster University. As a newcomer from the Middle East, I am excited to conduct the first-ever community-engaged project with the Arab community in Ontario, Canada that explores nutritious, culturally appropriate foods and leisure time physical activity as ways to promote health and well-being of Arab newcomers to Canada. By your participation in this project, you will not only learn many skills and useful tips for improving the health and well-being of yourself and significant others, but you will also get empowered and together we can bring a positive social/policy change to improve our lives in our new home, paving the way for a better future for our generations!

If you have not already, please check out these infographics and letters of information, for insight into the study, including the different roles you can play, compensation, benefits vs. risks, and confidentiality.

After reading the materials, if you found yourself interested in being part of this meaningful project, please fill out the sign-up form below that include some questions that aim to confirm your eligibility and learn more about you as this project strives to include 25-30 diverse participants in terms of age, gender, Arab country, geographical location in Ontario, socio-economic status, length of residency and immigration status.

Given that only 25-30 participants will be recruited, there is a question at the end of this form, asking that if are not contacted as a participant would you like to learn about the study findings and participate in widely disseminating it.

Finally, I would like to acknowledge that this a community-engaged research that is designed and conducted for the better of our entire community, as we are All "one hand", whatever your role is, it will be of huge value and highly appreciated!

Regarding confidentiality, the information that you provide in this sign-up form will be handled by me and kept on a password protected computer and will be destroyed once the study is completed unless you opted to be contacted for future similar research.
This study has been reviewed and cleared by the McMaster Research Ethics Board.

If you have any questions about the project or even me, please feel free to reach out to me at (elshahas@mcmaster.ca). Thank you!

Section 1- Confirming eligibility.

-Conditional question- Are you an Arab immigrant or refugee (not international student) to Canada aged ≥ 18 years old and living in Ontario? (Yes, No)

If no → Thank you for your interest. We are sorry to say you are not eligible for this project that mainly targets Arab newcomers aged ≥ 18 years

Section 2- Background information

1. **Name:**
2. **Email address:**
3. **Phone number if you would like to also be contacted for recruitment over phone:** *(not mandatory)*
4. **What is your age?** (18-30, 31-49 & >50)
5. **Please insert your gender:** (open ended)
6. **Are you born in Canada?** (yes, no)
7. **From which Arab country do you originate?** (open ended)
8. **In which city/town do you live in Ontario?** (open ended)
9. **How long have you been living in Canada?** (<2 years, 2-5 years, >5 to 10 years, >10 to 15 years, >15 years)
10. **What is your residency status in Canada?** (Canadian Resident, Permanent resident, Temporary resident)
11. **What is your marital status?** (single, married)
12. **Do you have children** (yes, no)
13. **What is your current job?** (open ended)
14. **What is your highest level of education?** (Up to Grade 8, did not finish high school, Finished high school, but no college or university, College diploma or university degree)
15. **What is your immigration status in Canada?** (voluntary immigrant, refugee, asylum seeker)
16. **Which languages do you speak fluently?** (English, Arabic, both Arabic & English)

Section 3- Study participation questions

17. **I can participate in the following parts of the study:**

a. Part 1 (i.e., the online survey, the 1.5-hour qualitative interview and recipe submission).
b. Part 2 (i.e., the six 1.5-hour group sessions for the photovoice project).
c. Part 1 and 2

18. **Do you own or have access to digital camera (including mobile phone)? (**Yes, No)
19. **Are you willing to use your personal camera to take photographs for the purpose of the photovoice project? (**Yes, No)

20. Which of the following apply to you regarding Zoom?

a. I am confident in using Zoom and can participate in Zoom-based interviews
b. I prefer to have training about Zoom before the interview
c. I cannot use Zoom due to internet issues.

21. For social media communication, I prefer and use: (Facebook, WhatsApp, Instagram, Twitter)

22. I prefer to have the interview in: (Arabic, English, Both)

23. I prefer to participate in interviews and photovoice sessions: select all the options that suit you: (In the morning (before 12pm), In afternoon (between 12-5pm), Evening (after 5pm))

24. If you are not recruited for this study, do you want to learn about the results by receiving copies of the dissemination materials over email? (Yes, No)

25. If you are not recruited for this study, are you willing to participate in disseminating the findings? (Yes, No**)**

26. Do you want to be contacted for any upcoming similar research with the Arab community and understand that I can always say no to the request? (Yes, No**)**

27. I would like to be contacted on: (phone, email, both)

Appendix C: Letters of information

DATE: _____

LETTER OF INFORMATION / CONSENT

Study on food, leisure-time physical activity and well-being among Arabs in Ontario

Principal Investigator:
Dr. Tina Moffat
Department of Anthropology
McMaster University
Hamilton, Ontario, Canada
(905) 525-9140 ext. 23906
E-mail: moffatcs@mcmaster.ca

Student Investigator:
Sarah Elshahat
Department of Anthropology
McMaster University
Hamilton, Ontario, Canada
(905) 525-9140 ext. 23906
E-mail: elshahas@mcmaster.ca

Purpose of the Study:
The purpose of this project is to explore nutritious food/diet and leisure-time physical activity (LTPA) as a way to promote health, well-being and wellness of Arab newcomers to Ontario, Canada. The research will specifically investigate your perceptions of well-being and wellness as it relates to food/diet and LTPA as well as the factors that impact your nutritious eating and LTPA participation. Furthermore, the study will explore how nutritious, culturally appropriate food and LTPA opportunities can shape your well-being and wellness. This will help inform the proposal and development of effective tailored interventions that promote culturally relevant, nutritious diets and LTPA, improving the health and well-being of the entire Arab community, including yourself and your family! This is part of my PhD research under the supervision of Dr. Tina Moffat.

You are invited to fill out a brief 10-15-minutes online confidential socio-demographic survey, that asks you some background, food/diet, physical activity and well-being questions, and then participate in an individual 1.5-hour Zoom-based/or telephone-based interview as part of the above-mentioned study. This research is done in partnership with an Arab community advisory group specially created for this research. The advisory group of community representatives will help with recruitment, serve as consultants to ensure research success, and will help with communicating the findings of the study once it's completed. These community representatives are XXXXXX.

Methods:
The link to the online socio-demographic questionnaire is included in the invitation email. This will take 10-15 minutes to complete. Then you will be invited to participate in an interview over Zoom/Phone. The time for the interview will be coordinated with you over email/phone to make sure it works for you, me and the volunteer researcher who will attend to take notes.
With your permission the interview will be audio-recorded (through Zoom) and notes will be taken. At the end of the interview, you will be invited to submit a traditional community/family recipe if you wish through a sign-up form (link for the sign-up form is included in the invitation email) within two-three weeks after the interview, alongside a photo of the dish and a quotation about what it means to you and your well-being. These recipes and the associated information will be used to co-produce an Arab community cookbook that will be nationally distributed to raise awareness about the Arab community's needs. You will be given the choice to either be named or

acknowledged anonymously in the cookbook. Please see the attached sheet (in the email) for the guide with the questions that you will be asked in the interview.

Potential Harms, Risks or Discomforts:
The project has minimal risks. You may feel embarrassed or worried about how the volunteer notetaker and I will react to what you say. You may also feel concerned about losing privacy when sharing your personal experiences and perceptions about food/nutrition, physical activity and well-being. However, you do not need to answer questions that you do not want. Furthermore, you are welcome to leave the study at any time. As well, the shared information and responses will be anonymously analyzed and presented in this research. You will also be provided with a list of support resources. Finally, I am a newcomer from the Middle East myself which will facilitate communication and cultural understanding with you, helping minimize any embarrassment and create a sense of connection and belonging. Below we describe the steps that we are taking to protect your privacy.

Potential Benefits:
Though participants may not directly benefit from participating in the study, through your participation in this project, you may learn many skills and useful tips for improving the health and well-being of yourself and significant others. Your participation in this study will help inform the development of effective interventions for programs about nutrition and physical activity that are culturally/religiously sensitive to the Arab community. Furthermore, given that this is community-engaged research, we may become empowered and together we can bring about positive social/policy change to improve our lives in Canada. This will hopefully pave the way for a better future for our generations.

As part of this study, we will produce an Arabic cookbook. You will receive an electronic copy of this, alongside other useful materials that communicate the study findings, such as photobooks, infographics. Finally, as a valued participant in this study you will be invited to an end of study ceremony where policy makers and stakeholders will be invited to communicate the study findings and raise our needs as a community to push for social change. In this ceremony you will get to know other people from the Arab community, enhancing social connectedness.

Payments/Reimbursements:
In appreciation of your participation in this study, you will receive a “thank you” $35 e-grocery gift card over email. This will be sent after the completion of the interview.

Confidentiality:
Every effort will be made to protect your confidentiality and privacy. However, sometimes people might be identified through the stories they tell, though this is more likely to occur in studies that are conducted in settings where people know each other (e.g., school, club, program), which is different from ours. Any information that you provide will be kept on a password protected computer and will be destroyed once the study is completed. The responses to the online socio-demographic questionnaire are anonymous. As for the interviews, we will never connect your name to anything you tell. We will be anonymizing the audio-recorded file by giving serial numbers to the audio-recorded file without any names.

For Zoom recording, every effort will be made to maintain privacy. Besides the consent for recording in this form, I will ask for your consent again before the recording starts. The meeting will not be publicized to prevent unwanted guests. Zoom settings will be adjusted to prevent cloud, automatic and local recording by participants and IP address access. Since this is an individual interview, there is no risk that other participants can use third party applications to record sessions without the host’s permission or knowledge. The recordings will be deleted from the Zoom server immediately after each session.

Nobody except myself and the volunteer researchers (who will sign an oath of confidentiality) will have access to the information you provide. However, we plan to publish the study findings. While the findings will be anonymously presented in any report/article, some well-known journals may

ask for the anonymized data to verify its originality. In this case, we will send it and request that they are deleted immediately after verification.

Participation and Withdrawal:
Your participation in this study is voluntary. If at any point during the interview you would like to withdraw, you are more than welcome. We will remove any responses that have been collected. The last date to withdraw from the study is November 1st, 2021. You can withdraw by sending me an email at (elshahas@mcmaster.ca).

Information about the Study Results:
Once we have the study results, we will produce different material and visuals to help you and your family learn about the study findings in an interesting way. You will receive a copy of all the materials to your email and other social media platforms (if you prefer) according to your answers in the consent below. Furthermore, you can request hard copies to your mailing address. Finally, you will be invited to the end-of-study ceremony where the study findings will be presented and discussed in presence of stakeholders and policymakers who will be invited as well.

Questions about the Study:
If you have questions or need more information about the study itself, please contact me at:
Sarah Elshahat (elshahas@mcmaster.ca)

This study has been reviewed by the McMaster University Research Ethics Board and received ethics clearance. If you have concerns or questions about your rights as a participant or about the way the study is conducted, please contact:

McMaster Research Ethics Secretariat
Telephone: (905) 525-9140 ext. 23142
C/o Research Office for Administrative Development and Support
E-mail: ethicsoffice@mcmaster.ca

CONSENT

- I have read the information presented in the information letter about the study being conducted by Sarah Elshahat and Dr. Tina Moffat, McMaster University.
- I have had the opportunity to ask questions about my involvement in this study and to receive additional details I requested.
- I have been given a copy of this form.
- I agree to act as a participant in the study.

Name of the participant _____ Date: _____

1. I agree that the interviews can be audio recorded. [ ] Yes, [ ] No

2. I would like to receive a summary of the study's results.
   [ ] Yes, please send them to me at this email address_____
   And to this number on WhatsApp _____
   And to my social media account(s) at _____
   And to my mailing address at _____
   [ ] No, I do not want to receive a summary of the study's results.

3. I agree to be contacted for similar future research with Arab newcomers and understand that I can always say no to the request. [ ] Yes, [ ] No

DATE: _____

LETTER OF INFORMATION / CONSENT

Study on food, leisure-time physical activity and well-being among Arabs in Ontario, Canada

Principal Investigator:
Dr. Tina Moffat
Department of Anthropology
McMaster University
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Student Investigator:
Sarah Elshahat
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Hamilton, Ontario, Canada
(905) 525-9140 ext. 23906
E-mail: elshahas@mcmaster.ca

Purpose of the Study:
The purpose of this project is to explore nutritious food/diet and leisure-time physical activity (LTPA) as a way to promote health, well-being and wellness of Arab newcomers to Ontario, Canada. The project will use photography of food, LTPA, well-being-related scenes and events for a better understanding of Arab community's perceptions and needs. This will help inform the proposal and development of effective tailored interventions that promote culturally relevant, nutritious diets and LTPA, improving the health and well-being of the entire Arab community, including yourself and your family! This project is part of my PhD research under the supervision of Dr. Tina Moffat,

You are invited to participate in a photovoice project that constitutes six 1.5-hour Zoom-based sessions. This research is done in partnership with an Arab community advisory group specially created for this research. The advisory group of community representatives will help with recruitment, serve as consultants to ensure research success, and will help with communicating the findings of the study once it's completed. These community representatives are XXXXXX.

Methods:
You are invited to participate in six 1.5-hour photovoice group sessions over Zoom. These sessions will include a group of ten Arab newcomer participants, including yourself, besides me and a volunteer researcher who will be attending to take notes. Please make sure you are staying a quiet place without distractions. The time for the first session will be coordinated through a survey to identify the times that work for all of us. We will determine the times for the 5 other sessions together during the sessions (i.e., determine time for session 2 during session 1).
Given that this project involves photographs, with your permission, the sessions will be video recorded (through Zoom) and notes will be taken. The aim of videorecording is to record your presented photographs that do not include any identifying features of humans (not you). These photos can be shared with the "share screen" feature in Zoom, therefore, you are welcome to switch your camera off if you prefer.
Please see the attached sheet (in the email) for instructions for the whole photovoice project.

Potential Harms, Risks or Discomforts:
The project has minimal risks. You may feel embarrassed or worried about how the volunteer notetaker and I will react to what you say. You may also feel concerned about losing privacy when sharing your views when discussing the photographs on food/nutrition, physical activity and well-being. However, you do not need to answer questions that you do not want. Furthermore, you are welcome to leave the session at any time. Finally, I am a newcomer from the Middle East myself which will facilitate communication and cultural understanding with

you, helping minimize any embarrassment and create a sense of connection and belonging. Below we describe the steps that we are taking to protect your privacy.

Potential Benefits:
Participants may not directly benefit from participating in the study, but you may learn many skills and useful tips for improving the health and well-being of yourself and significant others. Your participation in this study will help inform the development of effective interventions for designing nutrition and physical activity programs that are culturally/religiously sensitive to the Arab community. Furthermore, given that this is community-engaged research, we may also become empowered and together we can bring a positive social/policy change to improve our lives in Canada. This will hopefully pave the way for a better future for our generations.

As part of this study, we will produce an Arabic cookbook. You will receive an electronic copy of this, alongside other useful materials that communicate the study findings, such as photobooks, infographics. Finally, as a valued participant in this study you will be invited to an end of study ceremony where policy makers and stakeholders will be invited to communicate the study findings and raise our needs as a community to push for social change. In this ceremony you will get to know other people from the Arab community, enhancing social connectedness.

Payments/Reimbursements:
In appreciation of your participation in this project, you will receive a "thank you" $15 e- grocery gift card for over email after each of the six sessions.

Confidentiality:
Every effort will be made to protect your confidentiality and privacy. However, sometimes people might be identified through the stories they tell, though this is more likely to occur in studies that are conducted in settings where people know each other (e.g., school, club, program), which is different from ours. Any information that you provide will be kept on a password protected computer and will be destroyed once the study is completed. Once we have collected the information, we will remove all participant names from the data, so no one will be able to identify you. We plan to publish/use the participants' photographs to produce various materials such as photobooks to push for social and policy change. We will never connect your name to your photographs, ideas, or quotes.

For Zoom recording, every effort will be made to maintain privacy. Besides the consent for recording in this form, I will ask for your consent again before a recording starts. The meeting will not be publicized beyond the 10 recruited Arab participants, including you, to prevent unwanted guests. Zoom settings will be adjusted to prevent cloud, automatic and local recording by participants and IP address access. However, it is possible for participants to use third party applications to record sessions without the host's permission or knowledge. Therefore, I will review confidentiality at the beginning of every session. The recordings will be deleted from the Zoom server immediately after each session.

Nobody except myself and the volunteer researchers (who will sign an oath of confidentiality) will have access to the information you provide. However, we plan to publish the study findings. While the findings will be anonymously presented in any report/article, some well-known journals may ask for the anonymized data to verify its originality. In this case, we will send it and request that they are deleted immediately after verification.

Participation and Withdrawal:
Your participation in this study is voluntary. Once the study has started you can still leave. To stop participating in the photovoice group session, you can stay and stop talking or you can leave the Zoom session. If you have already spoken, it will not be possible to remove your responses from the recorded conversation. This is because group discussions are interconnected. What one person says can bring up other comments from the group. If you withdraw, however, I will ask you if I can use the material that you contributed so far.

The last date to withdraw from the study is November 1st, 2021. You can withdraw by sending me an email at (elshahas@mcmaster.ca)

Information about the Study Results:
Once we have the study results, we will produce different material and visuals to help you and your family learn about the study findings in an interesting way. You will receive copies of all the materials to your email and other social media platforms (if you prefer) according to your answers in the consent below. Furthermore, you can request hard copies to your mailing address. Finally, you will be invited to the end-of-study ceremony where the study findings will be presented and discussed in presence of stakeholders and policymakers who will be invited as well.

Questions about the Study:
If you have questions or need more information about the study itself, please contact me at:
Sarah Elshahat (elshahas@mcmaster.ca)

This study has been reviewed by the McMaster University Research Ethics Board and received ethics clearance. If you have concerns or questions about your rights as a participant or about the way the study is conducted, please contact:

McMaster Research Ethics Secretariat
Telephone: (905) 525-9140 ext. 23142
C/o Research Office for Administrative Development and Support
E-mail: ethicsoffice@mcmaster.ca

CONSENT

- I have read the information presented in the information letter about the study being conducted by Sarah Elshahat and Dr. Tina Moffat, McMaster University.
- I have had the opportunity to ask questions about my involvement in this study and to receive additional details I requested.
- I have been given a copy of this form.
- I agree to act as a participant in the study.

Name of the participant _____ Date: _____

1. I agree that the photovoice sessions can be video recorded and understand that I can switch my Zoom camera off if I prefer [ ] Yes, [ ] No

2. I understand and agree that during these six sessions, I should stay in a quiet place without distractions. [ ] Yes, [ ] No

3. I want to be identified as the creator of the photos I take in any knowledge mobilization avenues, such as exhibit or photobooks [ ] Yes, [ ] No

4. I would like to receive a summary of the study's results
   [ ] Yes, please send them to me at this email address_____
   And to this number on WhatsApp _____
   And to my social media account(s) at _____
   And to my mailing address at _____
   [ ] No, I do not want to receive a summary of the study's results.

5. I agree to be contacted for similar future research with Arab newcomers and understand that I can always say no to the request. [ ] Yes, [ ] No

Appendix D: Survey

Please fill out this confidential socio-demographic survey that contains some background, diet, physical activity participation and well-being questions. This survey will help determine potential avenues for promoting nutritious diet and leisure physical activity opportunities to improve Arab communities' health and well-being. The survey will take about 10-15 minutes to fill out. Thank you!

Background socio-demographic questions:

1. **What gender do you identify as?** (Open ended)

2. **What is your age?**
   a. 18-30
   b. 31-49
   c. 50-59
   d. 60+

3. **From which Arab country do you originate?** (open ended, or list with 22 countries)

4. **What is your current job?**

5. **What is your current employment status?**
   a. Employed Full-Time
   b. Employed Part-Time
   c. Seeking opportunities
   d. Retired
   e. Prefer not to say.

6. **How many children do you have in your home?**
   a. None
   b. 1
   c. 2-4
   d. More than 4

7. **Were you born in Canada?**
   a. Yes
   b. No

8. **How long have you been living in Canada?**
   a. Less than 2 years
   b. 2-5 years
   c. 6-10 years
   d. 11-15 years
   e. 16+ years

9. What is your residency status in Canada?
a. Canadian Resident
b. Permanent Resident
c. Temporary Resident

10. What is your immigration status in Canada?
a. Voluntary immigrant through skilled worker-track
b. Voluntary immigrant through family reunification track
c. Refugee
d. Asylum seeker

11. In which city/town do you live in Ontario? (open ended)

12. How long have you been living in Ontario?
a. Less than 2 years
b. 2-5 years
c. 6-10 years
d. 11-15 years
e. 16+ years

13. What is your highest level of education?
a. Some high school
b. High school
c. College diploma or university degree
d. Post-graduate degree
e. Prefer not to answer.

14. What is your total yearly household income from all sources before taxes?
a. Less than $20 000
b. $20 000 - $39 999
c. $40 000 - $79 999
d. $80 000+
e. Prefer not to answer.

15. What is your marital status?
a. Single
b. Married
c. Prefer not to answer.

16. Which languages do you speak fluently?
a. Arabic
b. English
c. Both Arabic & English

17. Do you have a private vehicle?

a. Yes
b. No
c. Prefer not to say.

Food security questions (*For these statements please consider the situation of you and your household for the past year*)

18. You worried that food would run out before you got money to buy more:

a. Often true
b. Sometimes true
c. Never true

19. The food that you bought didn't last, and you didn't have money to get more:

a. Often true
b. Sometimes true
c. Never true

20. You had to use food services (i.e. food banks, community kitchens) to help feed your family.

a. Often true
b. Sometimes true
c. Never true

21. You couldn't afford to eat balanced meals:

a. Often true
b. Sometimes true
c. Never true

22. You could not afford food that meet your cultural/religious restrictions or preferences:

a. Often true
b. Sometimes true
c. Never true

23. Did you ever cut the size of your meals or skip meals to feed your children because there wasn't enough money for food?

a. Yes
b. No

24. Were you or anyone in your household ever hungry but did not eat because there was not enough money for food?

a. Yes
b. No

25. If yes, how often did this happen?

a. Almost every month
b. Some months, but not every month
c. Only 1 or 2 months

26. Please list up to 6 food outlets (e.g., grocery store, restaurant) or organizations (community food centre, mosque) that support your Arabic food needs that you use in your city on a regular basis.

Diet quality questions.

27. Please tick how often you eat at least ONE portion of the following foods? (a *portion includes: a handful of grapes, an orange, a serving of carrots, a side salad, a slice of bread, a glass of pop*)

(1. Fruits (tinned/frozen/fresh), 2. Vegetables (tinned/frozen/ fresh but not potatoes), 3. Milk/yogurt/cheese, 4. Beans/pulses, 5. Whole grain foods, 6. Sweet foods/drinks, 7. Salty foods)

a. Rarely or never
b. Less than 1 a week
c. 1-2 times a week
d. 3-6 times a week
e. 1-2 times a day
f. 3-4 times a day
g. 5+ a day

28. Please tick how often you eat at least ONE portion of the following foods? (a *portion includes: 3 ounces of meat/fish [One hand-size piece], two eggs)* (1. Red meat, 2. poultry (chicken, turkey), 3. Processed meat/meat products, 4. White fish, 5. Oily fish, like salmon, mackerel, 6. Eggs)

a. Rarely or never
b. Less than 1 a week
c. Once a week
d. 2-3 times a week
e. 4-6 times a week
f. 7+ times a week

Physical activity questions

29. **How much time do you spend doing moderate intensity physical activity in a typical week? (*i.e., physical activity here means any activity for work such as, lifting heavy things, for transport, such as cycling to work, for household such as sweeping, for leisure such as playing sports) (Moderate intensity activity means the activity during which you can comfortably talk but not sing, such as brisk walking*)**
    a. None
    b. 1 hour or less
    c. More than 1 hour but less than 2 ½ hours
    d. 2 ½ hours or more

30. **How much time do you spend doing vigorous intensity physical activity in a typical week? (*i.e., physical activity here means any activity for work such as, lifting heavy things, for transport, such as cycling to work, for household such as sweeping, for leisure such as playing sports) (Vigorous intensity activity means the activity during which you cannot* say more than a few words without gasping for breath, such as running)**
    a. None
    b. ½ hour or less
    c. More than ½ hour but less than 1 ¼ hour
    d. 1 ¼ hour or more

31. **In a typical week, on how many days do you do moderate intensity sports or recreational (leisure) physical activities? *(Moderate intensity activity means the activity during which you can comfortably talk but not sing, such as brisk walking*)**
    a. None
    b. 1-2
    c. 3-5
    d. 6-7

32. **In a typical week, on how many days do you do vigorous intensity sports or recreational (leisure) physical activities? *(Vigorous intensity activity means the activity during which you cannot* say more than a few words without gasping for breath, such as running)**
    a. None
    b. 1-2
    c. 3-5
    d. 6-7

33. How much time do you spend doing moderate intensity sports or recreational (leisure) physical activities? *(Moderate intensity activity means the activity during which you can comfortably talk but not sing, such as brisk walking*)

a. None
b. 1 hour or less
c. More than 1 hour but less than 2 ½ hours
d. 2 ½ hours or more

34. How much time do you spend doing vigorous intensity sports or recreational (leisure) physical activities? *(Vigorous intensity activity means the activity during which you cannot* say more than a few words without gasping for breath, such as running)

a. None
b. ½ hour or less
c. More than ½ hour but less than 1 ¼ hour
d. 1 ¼ hour or more

35. Please list up to 6 places where you regularly do leisure physical activity (e.g. gardening, walking, etc.) in your city on a regular basis.

Well-being questions

Please respond to each item by marking one box per row, regarding how you felt in the last two weeks:

36. Feeling cheerful:

a. All of the time
b. Most of the time
c. More than half the time
d. Less than half the time
e. Some of the time
f. At no time

37. Feeling relaxed:

a. All of the time
b. Most of the time
c. More than half the time
d. Less than half the time
e. Some of the time
f. At no time

38. Feeling active and vigorous:
a. All of the time
b. Most of the time
c. More than half the time
d. Less than half the time
e. Some of the time
f. At no time

39. Waking up feeling fresh:
a. All of the time
b. Most of the time
c. More than half the time
d. Less than half the time
e. Some of the time

40. Daily life has been filled with things that interest you:
a. All of the time
b. Most of the time
c. More than half the time
d. Less than half the time
e. Some of the time

Thank you for taking the time to fill out this survey!

Appendix E: Interview guide

Questions about your perceptions of wellness and well-being

1. How do you perceive wellness/well-being in general?
2. According to the perceptions you juts mentioned, how would you describe/rate your wellness/well-being status in Canada?
3. How do you perceive wellness/well-being as it relates to food/nutrition?
4. How do you perceive wellness/well-being as it relates to leisure time physical activity (LTPA)?

Questions about the factors that impact your food security (*i.e., having a reliable access to affordable, quality food that meets your dietary needs & preferences*) & nutritious/healthy eating

5. What are your perceptions about food (in)security?
6. According to the perceptions you juts mentioned, how would you describe/rate your food security status in Canada?
7. What are your perceptions about nutritious/healthy eating?
8. According to the perceptions you juts mentioned, do you consider yourself to eat nutritiously in Canada?
9. From your perspective and experience, what are the barriers to your food security and nutritious/healthy eating?
10. From your perspective and experience, what are the facilitators to your food security and nutritious/healthy eating?
11. How do different sociodemographic characteristics/identities (e.g., age, gender) impact your food security status and nutritious/healthy eating?
12. How do different external influences (e.g., environmental stressors, accessible services) impact your food security status and nutritious/healthy eating?

Questions about the factors that impact your LTPA participation (i.e., *physical activity participation during leisure time)*

13. What are your perceptions about LTPA?
14. From your perspective and experience, what are the barriers to your LTPA?
15. From your perspective and experience, what are the facilitators to your LTPA?
16. How do different sociodemographic characteristics/identities (e.g., age, gender) impact your LTPA participation?
17. How do different external influences (e.g., environmental stressors, accessible services) impact your LTPA participation?

Questions about how food security status, nutritious eating and LPA participation shape your wellness/well-being and resilience (*i.e., positive adaptation against adverse life events through utilizing available relevant resources/assets*)

18. How does food security status shape and affect your wellness/well-being and resilience?
19. How does nutritious/healthy eating shape and affect your wellness/well-being and resilience?
20. How does LTPA participation shape and affect your wellness/well-being and resilience?

Questions about potential culturally sensitive interventions

21. From your perspective, what are the best short-term intervention(s) to improve your food security and nutritious/healthy eating and what are their components?
22. From your perspective, what are the best long-term intervention(s) to improve your food security and nutritious/healthy eating and what are their components?
23. From your perspective, what are the best short-term intervention(s) to improve your LTPA participation and what are their components?
24. From your perspective, what are the best long-term intervention(s) to improve your LTPA participation and what are their components?

25. Is there anything else you would like to tell us about food/diet, LTPA and well-being we have not asked today?

Thank you so for sharing your thoughts with us today. We really appreciate all that you have shared with us!