Assessing the implementation and outcomes of a food prescription program in Ontario, Canada: A realist evaluation

by

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Author's Declaration

This thesis consists of material all of which I authored or co-authored: see Statement of Contributions included in the thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

I understand that my thesis may be made electronically available to the public.

Statement of Contributions

I, Megan Delamere, authored Chapters 1, 2, and 4 of this thesis under the supervision of Dr. Warren Dodd. These chapters were not written for publication. Chapter 3 consists of a manuscript written for publication. Co-authors of the manuscript are indicated in Chapter 3 and contributions to the work are described below in order of authorship.

Chapter 3

I, under the supervision of Dr. Dodd, have been the primary researcher and contributor to writing and preparing this manuscript to date. Contributions by co-authors have been primarily to the total research effort as members of the research team. Further contributions by co-authors to the written work is forthcoming.

Dr. Matthew Little is a member of this thesis committee and a collaborator on the study. He is the principle investigator on the quantitative evaluation of the Fresh Food Prescription Program (FFRx), and holds an on-going partnership with The SEED. Dr. Little provided support with project development and coordination, and debriefing sessions. Dr. Little contributed to designing and conducting the study, as well as reviewing and revising the manuscript.

Dr. Laura Jane Brubacher is a member of the research team, and conducted an additional qualitative study based on FFRx. Dr. Brubacher provided support with conducting focus groups, data analysis, and debrief sessions. Dr. Brubacher contributed to designing and conducting the study, as well as reviewing and revising the manuscript.

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Dr. Warren Dodd is the supervisor of this thesis and research. Dr. Dodd provided support throughout all stages of the project. Dr. Dodd contributed to designing and conducting the study, as well as reviewing and revising the manuscript.

Abstract

Background: Social prescribing has grown in popularity around the world as a method for health care practitioners to address the social determinants of health. Social prescribing is the process of a practitioner identifying a non-medical, social need in a patient, and then developing a non-medical prescription to connect them to community services. A subset of social prescribing is food prescribing, in which patients who are typically identified as food insecure are connected with services to provide access to nutritious foods. The Fresh Food Prescription Program (FFRx) was implemented beginning in 2021 by the SEED, a working group of the Guelph Community Health Centre (GCHC). Clients of the GCHC who were identified as food insecure and experiencing a cardiometabolic health condition were provided weekly vouchers for fruits and vegetables at the SEED's online grocery store.

Research question: The objectives of this research were 1) to describe the experiences of participants with FFRx 2) to evaluate impacts of FFRx on household food security, diet patterns, health, and well-being and 3) to identify how various contexts and mechanisms shaped differential program experiences and outcomes among FFRx participants.

Methods: Semi-structured interviews (n=23) were conducted with FFRx participants along with follow-up focus groups and individual discussions (n=10). Guided by realist evaluation, a hybrid thematic analysis was utilized to identify context, mechanisms, and outcomes in the data.

Results: Three key program outcomes were identified: 1) increased food access; 2) improved physical health and diet quality; and 3) improved mental health. Participants shared that they enjoyed having more food available to them and were able to purchase produce that was previously inaccessible due to financial constraints. Participants also noted that they consumed more fruits and vegetables during the program, as well as less nutrient poor foods. As a consequence, many participants associated their increased consumption of fruits and vegetables with improved physical health symptoms, more energy, and better sleep. Participants highlighted that they felt less stress throughout the program due to the stability of food access, increased social connections, and improved self-esteem.

Discussion and conclusion: This study builds on current understandings of food prescribing, through demonstrating how these program can benefit participants through enhancing food access as well as self-reported physical and mental health. Importantly, this study also acknowledges the need for long-term, sustainable programming and funding to support food prescribing initiatives. The research elucidated the importance of developing programs that are context-aware and include supportive mechanisms that foster agency among participants. Further, this research serves as a starting point for future realist evaluations to be conducted, and highlights program design elements that could be implemented in future food prescribing programs.

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List of Abbreviations

CISP	Canadian Institute for Social Prescribing
CMOC	Context Mechanism Outcome Configurations
COVID-19	Coronavirus disease 2019
FFRx	Fresh Food Prescription Program
GCHC	Guelph Community Health Centre
NHS	National Health Services

Chapter 1: Introduction

1.1 Background

1.1.1 Social Prescribing

The term social prescribing was first used in the United Kingdom (UK) decades ago, but until recently lacked a standardized definition. Muhl et al. (2023) recently established a global definition of social prescribing utilizing the Delphi method that explored both a conceptual and operational definition, as well as provided a framework for the implementation of social prescribing to help identify whether interventions fit within the social prescribing domain. Based on this work, social prescribing is defined as "a means for trusted individuals in clinic and community settings to identify that a person has non-medical, health-related social needs and to subsequently connect them to non-clinical supports and services within the community by co-producing a social prescription – a non-medical prescription, to improve health and well-being and to strengthen community connections" (Muhl et al., 2023a). This definition highlights the connection and collaboration between clinical and community resources as a basis of social prescribing in order to mitigate the effects of unmet social needs in patients of primary care.

Social prescribing has expanded rapidly over the past decade, with programs identified as social prescribing now being implemented in over 20 countries (Morse et al., 2022; Muhl et al., 2023a). Resources such as guides, evaluations, and seminars have been developed to help streamline the implementation of social prescribing, and an increased number of groups are continuing to form as hubs for social prescribing (Social Prescribing Network, n.d.; Wells et al., 2019; World Health Organization, 2022). Social prescribing first gained momentum in the UK,

where the National Health Service (NHS) placed an emphasis on more personalized health care (NHS, 2019; Wells et al., 2019). Indeed, with a push for more sustainable models of care within the NHS, social prescribing is promoted as a method of making traditional healthcare more sustainable by addressing social aspects of health (Bickerdike et al., 2017). In the UK, there is strong support for social prescribing at the policy level, demonstrated in the appointment of a National Clinical Champion for Social Prescribing, and the Secretary of State advocating for more non-clinical interventions to support a holistic view of health (Bickerdike et al., 2017; Tierney et al., 2020). The NHS published a goal of connecting 900,000 individuals with social prescriptions by 2024 (Mulligan & Nowak, 2021). In 2016, the Social Prescribing Network was created, due to the rise in pilot programs for social prescribing in the UK, and the network now helps push the field forward through supporting research and hosting conferences (Morse et al., 2022; Social Prescribing Network, n.d.).

There has also been a rise in popularity of social prescribing in Canada, with the formation of the Canadian Institute for Social Prescribing (CISP), a national hub for sharing social prescribing practices (Canadian Institute for Social Prescribing, 2023). In Ontario, the Alliance for Healthier Communities is leading the social prescribing movement (Alliance for Healthier Communities, 2020). Between 2018-2020, the Alliance for Healthier Communities implemented one of the first multi-site social prescription research projects in Canada in collaboration with 11 member organizations (Alliance for Healthier Communities, 2020; Wells et al., 2019). The Alliance shared that the clients of social prescribing programs experienced improvements in self-reported mental health, capacity to manage health, and sense of connection and belonging, while

acknowledging challenges in capacity of staff and organizations with implementation of social prescribing programs (Alliance for Healthier Communities, 2020).

In the field of social prescription, it is important to differentiate between 'social prescribing' and 'signposting'. Signposting describes recommendations given by a healthcare provider to address the social determinants of health, but there is a lack of follow through with the client to facilitate access to the required social supports and services (Husk et al., 2020; Morse et al., 2022). Signposting lacks the core components of social prescribing, including person-centeredness, integration, and trackability, and is therefore a separate entity from social prescribing (Kimberlee, 2015; Morse et al., 2022; White et al., 2022). A critical aspect of social prescribing is working to remove barriers for clients to access the services being prescribed and routinely following up with clients throughout the process to receiving this care (Kimberlee, 2015; Mulligan et al., 2020). Often, the work of connecting patients with services and following-up is assigned to the 'link worker', which is most prominent in the UK's model of social prescribing (Bickerdike et al., 2017; Wells et al., 2019). Link workers take referrals and develop a plan for individuals before connecting them with social supports and programs to target their individualized needs and strengths (Kiely et al., 2021; Wells et al., 2019). A similar role exists in Canada, though there is more flexibility and plans are often developed with healthcare providers as opposed to the link workers (Wells et al., 2019). Some countries have created new roles for healthcare staff to administer these prescriptions, while other countries have healthcare professionals refer to a link worker who then works with clients to determine appropriate prescriptions (Bickerdike et al., 2017; Morse et al., 2022). Nowak and Mulligan (2021) put forward three fundamental values for social

prescribing in their call to action: the presence of foundational relationships between healthcare providers and their patients' and communities; rooting social prescribing in building on strengths of both clinicians and participants; and a need for tracking and follow-through with clients' progress.

There is limited evidence on if and how social prescribing effectively addresses health outcomes, indicating a need for more research and evaluation of social prescribing programs (Bickerdike et al., 2017). There is some evidence that social prescribing can improve social inclusion, mental well-being, physical health markers, and self-management of health (Bhatti et al., 2021; Sonke et al., 2023). Participants of social prescribing programs often reflect fondly on their experiences with the programs during qualitative research (Grover et al., 2023). Studies and evaluations of social prescribing often have a limited number of participants, which contributes to small sample sizes and limits the generalizability of research results. Often studies experienced significant loss to follow-up, with some studies on social prescribing reporting that over 20% of participants were no longer engaged by the end of the study (Bickerdike et al., 2017; Grant et al., 2000; Grayer et al., 2008). Evaluations often do not report on engagement with prescribed activities, and studies that do report attendance have stated low attendance for the first appointment to initiate an intervention (Bickerdike et al., 2017; Grant et al., 2000). There is a lack of understanding of continued engagement with social prescribing programs, and it is essential to understand how to encourage engagement in future programs. The complexity of social prescribing can make evaluation difficult, but there is a need for nuanced evidence to assess the implementation and effectiveness of social prescribing programs across various populations

(Bickerdike et al., 2017; Morse et al., 2022). It is important to elucidate what approaches work, whom they work for, why, and in what circumstances (Muhl et al., 2023a). Information generated through asking these types of evaluation questions could be used to tailor the approaches taken by social prescribing programs for sub-populations, such as adjusting the methods of recruitment, program implementation, and follow-up (Berrtotti et al., 2018; Morse et al., 2022).

1.1.2 Food Security

The definition of food security has historically been fluid and evolving, beginning with a definition that only encompassed availability of food (Shafiee et al., 2022). There are now four main dimensions of food security which include access, availability, utilization, and stability. The first pillar, availability, addresses food supply and what is available for consumers (Clapp et al., 2022; FAO, 2008). The definition of food security then expanded to incorporate the pillar of food access which incorporates consumers having the financial means to access food, as well as transportation and physical access (Peng & Berry, 2018). The addition of utilization as a pillar addresses consumption of nutrients, quantity of food, food preparation, and distribution of food within the household (Clapp et al., 2022; FAO, 2008; Peng & Berry, 2018). The fourth pillar, stability, addresses food security over time, where individuals are consistently able to maintain adequate food and nutrient intake (FAO, 2008). There has been a recent movement to further expand the concept of food security to incorporate two more pillars: agency and sustainability (Clapp et al., 2022). Agency addresses the importance of a person's ability to exert control over their circumstances, and to make choices and act on those choices to improve their well-being (Clapp et al., 2022). Sustainability as a final pillar addresses food security long-term, whereas stability

considers more short-term and individual experiences. Including sustainability as a pillar of food security allows consideration of the connections between ecosystems, political economy, society, and food systems both now and into the future (Clapp et al., 2022).

1.1.2.1 Food Insecurity

Food insecurity is understood as inadequate or insecure access to food due to financial constraints (Tarasuk, Li, & Fafard St-Germain, 2022). By not meeting the pillars of food security, a household could be understood as food insecure, and it has become clear that food insecurity is not only a food problem, but rather an income problem (Tarasuk, Li, & Fafard St-Germain, 2022). Research has shown an association between food insecurity and poorer diet quality, lower nutrient intake, and an inability to manage disease, all of which impact the health of food insecure individuals (Kirkpatrick & Tarasuk, 2008; Seligman et al., 2010). Individuals experiencing food insecurity experience higher risk of health conditions and higher acute care costs than their food secure counterparts in both Canada and the United States (Berkowitz et al., 2018; Dean et al., 2020; Tarasuk et al., 2015). As severity of food insecurity increases, there is a corresponding increase in the odds of admission and readmission to the hospital, as well as longer hospital stays (Berkowitz et al., 2018; Men et al., 2020).

1.1.2.2 Addressing food insecurity in Canada

Addressing food insecurity in Canada has become an increasingly pressing issue with the rise in prevalence of food insecurity, the poor health outcomes associated with food insecurity, and the burden of food insecurity on healthcare costs. Food insecurity is on the rise in Canada, with 17.8% of households in the ten Canadian provinces having experienced food security in 2021-

2022. In Ontario, 11.8% of people were living in food insecure households in 2011/2012, which increased to 19.2% of people in Ontario experiencing food insecurity in 2022 (Tarasuk et al., 2019; Tarasuk, Li, & St-Germain, 2022).

There has been a significant growth in understanding and measurement of food insecurity; however, the prevalence of food insecurity continues to rise, and few interventions are developed to address the root causes of food insecurity (Dachner & Tarasuk, 2018). Emergency food services have become a central approach to contend with food insecurity across Canada, with the emergence of services such as soup kitchens dating back to the Great Depression (Wakefield et al., 2013). Food banks were first implemented as an emergency food service in the 1980s and have since grown in number and usership (Wakefield et al., 2013). However, the suitability of food banks as a response to food insecurity continues to be debated (Tarasuk et al., 2020). One critique is that the presence of emergency food services provides cover for a lack of policy change at various levels of government, as governments are able to rely on charitable interventions to address hunger rather than instituting or improving larger-scale poverty alleviation policies and programs (Dodd & Nelson, 2020; Wakefield et al., 2013). It is argued that the existence and persistence of food banks therefore reduces motivation for addressing the root cause of food insecurity. Another critique of emergency food interventions includes their operational challenges such as inefficiencies, food quality, and accessibility (Dodd & Nelson, 2020). Research shows that only a small fraction of food insecure people utilizes food banks, with those experiencing severe food insecurity being more likely to access food banks than those experiencing moderate or marginal food security (Tarasuk, Fafard St-Germain, et al., 2020). However, even within severely food

insecure households, a minority of this population accesses food banks (Tarasuk, Fafard St-Germain, et al., 2020). It has been argued that food banks, and emergency or charitable food services overall, are therefore an ineffective response to food insecurity.

Food insecurity is considered to be an outcome of low incomes, as probability and severity of food insecurity is closely linked to income amount, source of income, and geographic location. Further, households relying on social assistance experience a greater odds of severe food insecurity (Kirkpatrick & Tarasuk, 2009; Tarasuk et al., 2019). This understanding, as well as experiences from different provinces, has led to calls for income-based policy change in Canada to address food insecurity. In British Columbia, a modest increase in social assistance income led to a decline in moderate and marginal food insecurity (Li et al., 2016). Similarly, the introduction of a poverty reduction strategy in Newfoundland and Labrador has been associated with a decline in household food insecurity levels (Loopstra et al., 2015). However, the focus of legislation being discussed has typically targeted food access programs rather than income-based solutions (McIntyre et al., 2016).

1.1.2.3 Food Landscape in Guelph, Ontario

Guelph is a city in Southwestern Ontario with a population of approximately 145,000 people. Approximately 7% of Guelph's population experiences poverty. Food costs have recently been on the rise in Guelph, and Canada more broadly, with even higher cost increases for nutritious food (Charlebois et al., 2022, 2023; Needham et al., 2018). In 2018, it was estimated that it would cost a family of four approximately $210 CAD per week to maintain a nutritious diet (Needham et al., 2018), although this figure has likely increased in the years since. Food insecurity has also

been on the rise; a representative survey finding that 1 in 8 households in Guelph were experiencing food insecurity at the end of 2020, with nearly two thirds of those households sharing that they had not been experiencing food insecurity prior to the pandemic (Nutritious Foods Workstream, 2022). A recent sign of increased food insecurity in the Wellington-Dufferin-Guelph (WDG) region was the increased demand and use of emergency food services. However, with fewer than 25% of food insecure households accessing the services, Guelph's emergency food programs may not be meeting the needs of food insecure individuals (Nutritious Foods Workstream, 2022). As of July 2021, there were 39 food access services in Guelph, including multiple foods banks, one free meal program, and some free or low-cost markets (Nutritious Foods Workstream, 2022). Through research completed in 2013, it was established that users of emergency food access services in the city of Guelph and Wellington County appreciated that many food banks operated on choice-based models (in contrast to services that provided food items with limited or no choice), and that there was a large amount of emergency food available (Dodd et al., 2013). However, there are also several aspects of emergency food services in Guelph and Wellington County that users found challenging, including a lack of clarity and transparency around eligibility, concerns around quality of food, and access challenges such as transportation and operating hours (Dodd et al., 2013; Nutritious Foods Workstream, 2022).

1.1.3 Food Prescribing

Food prescribing programs follow a social prescribing model to connect patients with community resources to provide access to healthy food (Joshi et al., 2019). Food prescribing programs have gained traction in recent years as a potential intervention for addressing food

insecurity and associated health outcomes. Food prescribing programs are typically developed through collaboration between clinics and community organizations to foster effective implementation of a program, as well as collaboration with research teams for evaluation (Slagel et al., 2023). Six main forms of produce prescribing programs have been identified: voucher programs (which are the most common), cash back rebate programs, garden-based programs, subsidized food box programs, home delivery meal programs, home delivery meal programs, and clinical food bank collaborative programs (Cafer et al., 2022). Voucher programs provide participants with vouchers or coupons for produce, that can be used at local farmers markets or stores (Bhat et al., 2021; Cafer et al., 2022; Stevenson et al., 2023). Important implementation elements of voucher food prescribing programs include coordination with a shopping location or grocery store, as well as tracking of voucher redemption (Stevenson et al., 2023).

Due to food prescribing's increased popularity and traction in recent years, there have been multiple pilot programs developed and evaluated, especially in the United States. Research conducted on food prescription has primarily been pre-post designs, often shared as evaluations of preliminary programs (Little et al., 2022). Findings from these evaluations have been promising, with a growing body of evidence that food prescription programs improve food security for participants during the program (Jones et al., 2020; Ridberg et al., 2019; Riemer et al., 2021). However, it is important to note there is an ongoing debate in the literature surrounding the relationship between food prescribing and improvements in food security. Some researchers have raised concerns regarding the sustainability of any reductions in food insecurity observed at the end of programs, in addition to the limited capacity of food prescribing programs to address the

structural causes of food insecurity (Tarasuk & McIntyre, 2022). A further and significant challenge in food prescribing is the lack of longevity and programmatic sustainability of most initiatives, as these initiatives regularly rely on short-term funding cycles (Bertotti et al., 2018; Bhat et al., 2021).

Across reviews and evaluations of food prescribing programs, there are promising findings beyond improving food security, including evidence that participants experience significant improvements in diet quality during a food prescription program (Bhat et al., 2021; Heasley et al., 2021; Little et al., 2022; Slagel et al., 2023; Trapl et al., 2018; Wu et al., 2022). Improvements in diet quality included reductions in fast-food consumption and eating out (Slagel et al., 2023; Trapl et al., 2018), as well as increased intake of fruits and vegetables (Bhat et al., 2021; Heasley et al., 2021; Little et al., 2022; Slagel et al., 2023; Zimmer et al., 2022). There has been some evidence of food prescribing improving cardiometabolic risk factors as well, including lowering body mass index (BMI), blood lipids, and changes to HbA1c (measure of blood sugar) (Bhat et al., 2021; Little et al., 2022; Wu et al., 2022). However, there is some variance in findings with some studies finding no change, or not a statistically significant change in these clinical indicators (Little et al., 2022). Qualitative evaluations have found that participants in food prescribing programs often have positive experiences with the programs, with participants sharing that their involvement positively impacted their well-being and helped to alleviate barriers to food access supports (Johnson et al., 2023; Zimmer et al., 2022). There is some evidence that food prescribing programs might impact the mental health of participants as well as help address social isolation, especially in programs with an education or group component (Zimmer et al., 2022). With the growth of

popularity of food prescribing programs there has been a call for more research and evaluations of impact and implementation of these programs, especially in Canada, as studies typically have lasted approximately six months, with most studies being conducted in the United States or the UK (Bhat et al., 2021; Little et al., 2022). More specifically, there is a need there is a further need to understand how these programs work, for whom they work, and why.

1.1.4 The SEED and Guelph Community Health Centre

The SEED is a working group of the Guelph Community Health Centre (GCHC), with the goal of building a more equitable food system in Guelph, while providing members of the community with a food access program that maintains autonomy and dignity. This non-profit organization was initially formed as a community food hub through a community-university partnership, with the goal of addressing needs faced by the Guelph-Wellington Community and gaps in food access programs identified in previous literature (Dodd et al., 2013). Challenges for accessing food services in Guelph-Wellington included stigma, lack of accessibility, a lack of understanding around eligibility for food access programs, and poor quality of food (Dodd et al., 2013; Dodd & Nelson, 2020; Nelson & Dodd, 2017). The SEED has expanded and now encompasses multiple sub-projects addressing food security in the city of Guelph and Wellington County, with the goal of addressing the identified challenges and incorporating characteristics that community members appreciated (Dodd & Nelson, 2020). Projects of the SEED include an online sliding scale grocery store named Groceries From the SEED, a community garden, a volunteer-based kitchen dedicated to upcycling food, distribution of wholesale and rescued food, as well as the Fresh Food Prescription Program (FFRx).

FFRx is a food prescribing program which provided access to fruits and vegetables to food insecure households experiencing at least one diet-related health condition. FFRx was established as a sub-project of The SEED. The GCHC is an organization that provides healthcare and social services to individuals and families in the Guelph-Wellington area who may typically find it difficult to access care. The GCHC prioritizes vulnerable populations in the community, including people who are newcomers to Canada, low income, unhoused, or belong to other marginalized communities. There are two locations in Guelph which provide participants with access to interdisciplinary health teams and connect clients with other community programs and services.

1.2 Study Rationale

With the implementation of the second pilot of FFRx, the SEED staff and research team identified a need for a qualitative study investigating participant perspectives and experiences with the program. Specifically, there was a desire to understand how the experiences may have differed between participants, what worked well about the program, and what could be improved. Since results will be shared with the SEED and Guelph Community Health Centre, findings can be utilized to inform future iterations and expansions of the program.

There has also been a global increase in the implementation of social prescribing programs as a means for healthcare providers to address social determinants of health. Food prescribing programs, a subset of social prescribing, have increased as well to address food insecurity. However, most evidence for the effectiveness of food prescribing has been based in the United States. There is a need for understanding how food prescription programs work in Canada, for whom they work, and why. With the ongoing discussions of interventions aimed at addressing

food security, and where best to direct resources, it is important to understand the ways in which food prescription programs benefit participants beyond financial support. This research will add to the discourse around food prescribing's impact on food security and engage with food prescribing holistically to explore the benefits and potential challenges of programs such as FFRx.

1.2.1 Study Objectives

The overall goal of the research project was to evaluate a fresh food prescription (FFRx) program for food insecure households in Guelph, Ontario. Anchored by a community-engaged, interdisciplinary, and intersectoral approach, and in partnership with the Guelph Community Health Centre, the research goals of the overarching project were:

(1) To evaluate the impacts of FFRx on household food security, dietary patterns, and health

(2) To evaluate the perceived effectiveness of the FFRx model for participants

As a part of these research objectives, I conducted qualitative, semi-structured interviews with participants to gather an understanding of their experiences with FFRx. My research objectives included:

1) To describe the experiences of participants with FFRx
2) To evaluate impacts of FFRx on household food security, diet patterns, health, and well-being
3) To identify how various contexts and mechanisms shaped differential program experiences and outcomes among FFRx participants

1.3 Consideration and statement of positionality

Prior to sharing methods and findings, I want to acknowledge how my position as a researcher may have influenced data collection and analysis. Though it is not possible to address all aspects of my identity and its influence on the research, it is important to acknowledge ways in which my lived experiences and position as an evaluator likely played a role in this research study.

I identify as a young, cisgender, white woman who was born and raised in Canada, who grew up middle class. I completed an undergraduate degree at the University of Guelph in Biomedical Science and had lived in Guelph, ON for approximately five years at the time of data collection. Throughout my undergraduate degree I gained some knowledge in quantitative research and literature reviews. I had limited exposure to qualitative research, public health, social prescribing, or food security prior to this project, and I am grateful for the support of the FFRx team as well as my advisor, Dr. Warren Dodd, for providing training and broader context on these areas. I was able to participate in weekly meetings with FFRx team members for approximately one year which included the FFRx lead, researchers Dr. Warren Dodd and Dr. Matthew Little, and occasionally customer service staff. These meetings allowed me to gain insight into the implementation of FFRx and the program context.

There were various ways in which I was able to relate to participants, including calling Guelph 'home' and being familiar with the area, as well as my personal ongoing mental health challenges. However, I worked to listen actively to each participant and ask follow-up questions to understand their experiences as deeply as possible without making assumptions based on my lived experiences. During interviews, there were several times I was reminded of my own

privileges and knowledge gaps surrounding food insecurity, or experiences of racism or xenophobia described by participants. There were likely times that my differing experiences from those of participants placed me as an 'outsider'.

As an evaluator, I was situated somewhere between an internal or external evaluator. I was a part of the research team investigating the impacts and implementation of FFRx; however, I also spent time assisting with program implementation and supported the FFRx lead. During this time, I got to know some participants through helping place orders and conducting quantitative data collection prior to the interviews that were the source of data for this thesis research. Some participants requested to talk more regularly, and we were able to build a rapport prior to qualitative data collection. These experiences and my long-term involvement with FFRx placed me as more 'internal' of an evaluator. However, I was not involved throughout the full duration of the program nor with the initial development of FFRx. I was also not directly employed by the program being evaluated, placing me as 'external'. It is crucial to identify the nuance between internal and external evaluations, and my position in relation to FFRx may have allowed for some benefits from being situated internally as I had contextual knowledge of the program (Conley-Tyler, 2005). Further, I benefited from being 'external' due to perceived objectivity, as I was able to assure participants that I was uninvolved in program design or decisions (Conley-Tyler, 2005). These experiences may have influenced data collection in terms of participants' willingness to share information with me, as well as what I chose to include in the semi-structured interview guide.

Ongoing reflections occurred throughout data collection and analysis to address how my personal experiences may have influenced my relationship to the data. Through regular check-ins and discussions with the research team members, I was able to discuss my experiences of data collection and analysis with individuals who had differing relationships to participants and the program, as well as different lived experiences. Overall, this team debriefing supported the research process and enhanced the validity of the results presented.

Chapter 2: Methods

2.1 Fresh Food Prescription Program (FFRx)

The initial pilot of the Fresh Food Prescription (FFRx) took place in 2020 as part of the Guelph Community Health Centre's (CHC) growing interest in connecting clients with community services through social prescribing programs (Guelph CHC, 2019). The initial pilot program enrolled 60 participants who were experiencing food insecurity and at least one diet related health outcome such as hypertension, high cholesterol, diabetes, or a micronutrient deficiency (Heasley et al., 2021). Participants were referred to FFRx by a healthcare provider, then prescribed weekly vouchers for the 12-week program, which were redeemable for fruits and vegetables at in-person community food markets run by The SEED (Heasley et al., 2021). The vouchers were valued at $10 per week, per person in the household, to a maximum of $50 per household per week (Heasley et al., 2021). The findings from this first pilot study were promising, with participants expressing a largely positive experience during interviews and surveys (Heasley et al., 2021). Quantitative data collected after the intervention indicated an increase in fruit and vegetable consumption, and a decrease in food insecurity for participants (Heasley et al., 2021).

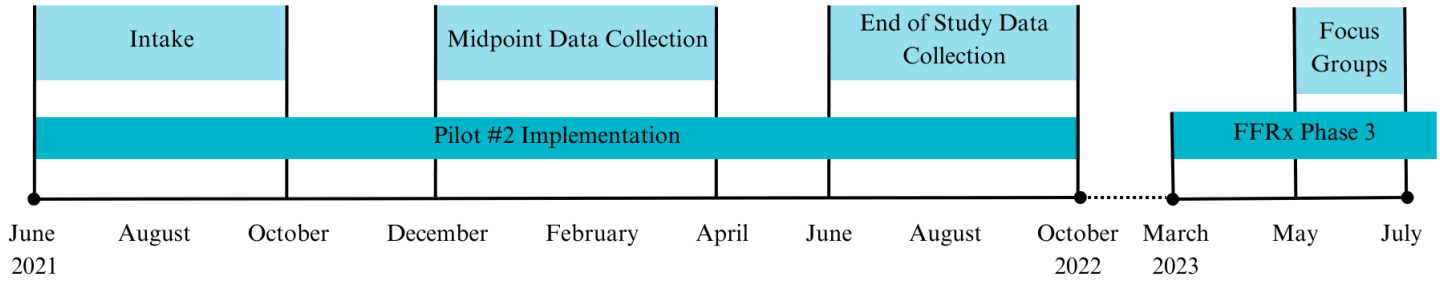

Figure 1. Timeline of FFRx program implementation. 'End of Study Data Collection' included both an endline survey (quantitative data) with all participants as well as semi-structured interviews with a subset of participants.

The research team conducted a second pilot program beginning in April 2021 with 62 participants, who received weekly coupons of the same value ($10 per week, per person in the household, to a maximum of $50). However, this second pilot ran for one year. The coupons were redeemable for fruits and vegetables through The SEED's online sliding scale grocery store referred to as 'Groceries from The SEED'. The produce was available at a discounted rate, and participants had access to the rest of the store's products at the deepest discount available, although the coupons were only applicable to the fruits and vegetables. Participants were able to order the groceries online, over the phone, or in-person, with options for pick up or delivery. Ordering could be completed at any time, while delivery and pick up were offered twice a week (Tuesdays and Fridays). A team of The SEED's customer service representatives were available every day to assist participants with ordering and any concerns they had about the store while being available twice a week for participants to order in-person.

As seen in Figure 2, baseline quantitative data were collected from participants in the form of blood work and a survey at the time of intake, with another survey conducted at the mid-point of the program. At the completion of the program, a follow-up survey was completed, as well as blood work and blood pressure. Surveys included questions to assess participants' levels of food insecurity and perceived health, as well as socioeconomic data such as income bracket, employment, and utilization of Ontario Disability Support Program (ODSP). Qualitative interviews were conducted at the end of the program on a rolling basis as participants were either nearing completion or completed the program. Follow-up qualitative data were collected in the

form of focus groups and follow-up interviews. Participants experienced a pause in support until March 2023 as the GCHC team actively sought funding opportunities for a third phase of FFRx.

2.2 Theoretical Framework: Realist Evaluation

A realist evaluation was used to evaluate FFRx and understand the underlying mechanisms that led to various outcomes for participants. Realist evaluations are based in realism, which holds the ontological position that both the material and social world are real, and understands it is possible to gain knowledge about this reality (Niiniluoto, 2002b, 2002a). Realism also acknowledges ontological depth, where there are layers to reality that are important to understand when investigating outcomes (Jagosh, 2019). Programs, including social prescribing, can therefore be understood as real and having real effects, and we are able to understand what causes change through investigation of generative causation (Greenhalgh et al., 2015). Generative causation is the concept of underlying mechanisms generating outcomes, primarily through interactions between individuals and structures, as opposed to successionist causation, where outcomes are awarded to specific events that occur in succession (Jagosh, 2019). Realist evaluation is a form of theory driven evaluation, which is being used increasingly in the public health field, and in food security contexts (Gilmore et al., 2019; Lam et al., 2021). Realist evaluations seek to understand program theory through context-mechanism-outcome configurations, which identify patterns of interaction between contextual factors and program mechanisms, and how they lead to outcomes (Tilley & Pawson, 1997). A realist evaluation asks questions regarding "how, why, for whom, and under what conditions" does the intervention work (Tilley & Pawson, 1997). This style of evaluation explores the factors that lead a program to function effectively, considering the

complexity of a program by exploring mechanisms by which the program works and the complex layers of context surrounding the program (Jagosh, 2019; Lam et al., 2021; Rycroft-Malone et al., 2012). Addressing context is an important strength of realist evaluations, as context has a strong influence on individuals and community health outcomes and food security. Earlier forms of evaluation ignored context, and might address only the observable outcomes; however, realist evaluations understand that interventions may have different outcomes in different contexts (Tilley & Pawson, 1997). A key aim of realist evaluations is to identify and explain the mechanisms at work, and how they lead to various outcomes (Tilley & Pawson, 1997). Asking who the program works for is another unique feature of realist evaluations. Investigating differences and similarities between individuals who benefited or did not benefit from programs can help ensure socially inclusive programing (Lam et al., 2021). Realist evaluations are important when looking to scale up, expand, or replicate programs as they help to identify what works and would need to be replicated, as well as investigating how to adapt interventions to new contexts (T. Greenhalgh et al., 2015; Lam et al., 2021).

A realist evaluation lens was added to the project following the completion of the 23 semi-structured interviews, as the data highlighted the importance of contextual factors in participants' experiences of FFRx. A realist evaluation lens allowed our research team to further explore the generative causation of key outcomes of FFRx, and answer the questions "how, why, for whom, and under what conditions" did FFRx work (Tilley & Pawson, 1997).

2.2.1 Defining Context, Mechanisms, and Outcomes

At the centre of realist research methods are Context Mechanism Outcome Configurations (CMOC), which help to understand causality within complex programs and interventions through the interactions of context and mechanisms that lead to various outcomes (Tilley & Pawson, 1997). Context (C) has been defined differently across realist evaluation literature, with Pawson & Tilley (1997) defining context as "social rules, values, and sets of interrelationships" in their initial work on realistic evaluation. Others have defined context as something that exists prior to the introduction of a program or intervention, or the set of circumstances into which a program was introduced (Greenhalgh & Manzano, 2022; Jackson & Kolla, 2012). Pawson & Tilley (1997) emphasized the importance of understanding context in relation to mechanisms, where mechanisms only operate within certain contextual circumstances, and definitions of context should encapsulate this relationship (Greenhalgh & Manzano, 2022). Greenhalgh & Manzano (2022) explored how to understand context within realist evaluations and discussed the importance of understanding context not only as 'things' or 'settings', but as a set of forces and relationships such as psychological, economic, or organizational. It is important to define context within each realist evaluation, as the definition should be relevant to each question being asked, however it is nearly impossible to distinguish between context and mechanisms when understanding context as complex and dynamic (Greenhalgh & Manzano, 2022). For the purpose of this thesis research, which sought to provide a context-driven explanation of FFRx, context will be conceptualized as underlying, dynamic, and emergent forces or relationships which interact with each other and with mechanisms (Greenhalgh & Manzano, 2022; Greenhalgh et al., 2017).

Mechanisms (M) are understood as actions taken within programs, resources offered by programs, and stakeholders reasonings in response to actions or resources (Dalkin et al., 2015; Jackson & Kolla, 2012). For this thesis research, the definition of mechanisms will include resources, activities, and actions offered by FFRx and by staff involved with implementing the program. However, it is important to note that mechanisms and context are interconnected, and there can be a lack of clarity between context and mechanisms, as some forces can act contextually as well as mechanistically in different situations (Greenhalgh & Manzano, 2022). This reality meant that identifying contextual and mechanistic aspects was an on-going, iterative process throughout analysis.

The definition of outcomes includes changes that occurred as a result of the program. Intended outcomes of FFRx were defined through on-going discussions with the research team and program implementors to be: 1) changes to food access for program participants; 2) changes to mental health and well-being of program participants; and 3) changes to physical health of program participants.

2.3 Study Participants

FFRx program staff recruited 62 participants, who were identified as food insecure, as well as having at least one cardiometabolic or nutrition-related condition. These conditions included high cholesterol, hypertension, irritable bowel syndrome, celiac disease, obesity, eating disorders, or vitamin/mineral deficiencies. Throughout the study, five participants dropped out: one due to feeling they would not benefit from the program, one felt they were not in financial need, one did not like the variety of food available, and two moved out of the region. With these participants

dropping out, a total of 57 participants were involved in the program for one year. Recruitment into the program took place through the Guelph Community Health Centers (CHC), where healthcare providers would identify patients as potential participants who might benefit from the program. Healthcare providers would then refer them to FFRx staff, who would contact these individuals to screen for eligibility. If eligible, and they agreed to participate, the individual would register with the program and complete an informed consent process.

All participants from the overall study were then invited to complete interviews toward the end of their program to explore experiences with FFRx. Participants were contacted by a staff member of the program and were invited to complete an interview. I contacted participants who expressed interest to schedule a time and provide them with more information about the interview process. I had previously met many of the participants in-person or spoken with them over the phone to schedule or conduct data collection associated with the quantitative end of study survey. This initial connection enhanced rapport with some participants and facilitated recruitment with the qualitative component of the study. Participants were invited to be interviewed over the phone or in person at either CHC location, and interpreter services were offered to participants as needed. For individuals who did not speak English, scheduling and recruitment was completed through an interpreter, along with the interview. Interpreters were utilized for participants who spoke Arabic, Cantonese, Dari, or Persian. At the outset of the interview, I provided an overview of the study and reviewed the consent process with participants. I then asked for verbal consent, including consent to having the interview audio recorded and anonymous quotes being shared. Individuals who chose to participate in an interview received a $40 voucher to use at Groceries from The

SEED, and transportation costs were covered for participants who wished to conduct the interviews in-person. Reasons for individuals not participating in qualitative data collection included a lack of interest, complex mental and physical health challenges, and time constraints.

2.4 Data Collection

A total of 23 semi-structured interviews were conducted; five interviews were in person and 18 interviews were over the phone. In total, six of the participants used an interpreter during their interviews, while the other 17 interviewees spoke English in the interviews. All the interviews were audio recorded and transcribed verbatim. The interview guide contained four main topics to be addressed in each interview, along with potential prompts to encourage further conversation. The topics included opinions of the program; relationships with staff; autonomy and decision making; and perceived health and well-being. As the goal was to conduct a realist evaluation, the interviews investigated the impacts of the program, but also how context and mechanisms at various levels (e.g., individual-level, program-level) may shape experiences with the program. Interviews were conversational and participants were encouraged to share any thoughts or feelings about the program. Participants were regularly reminded that anything they shared would not impact their chance to participate in future programs. This flexibility allowed me to gain understanding about participants' lives and experiences with FFRx, as well as build trust and rapport with participants.

Following the completion of interviews and a preliminary analysis of transcripts, it was determined by the research team that follow up focus groups with participants could be conducted to enhance our collective understanding of the depth and breadth of participants experiences as

well as address gaps in the initial interview data. Recruitment for focus groups was conducted within the pool of interview participants, as they were already interested in being involved in qualitative data collection. Two focus groups were conducted (n=7 participants across both focus groups). The first included four participants, one of whom attended as both an interpreter and research participant, while the second included three participants with two interpreters present. A third focus group was organized, with three people scheduled to participate; however, only one individual attended the focus group so a follow-up interview was conducted with this individual. Two more follow-up interviews were conducted with participants: one struggled with attending focus groups due to timing and felt more comfortable having a discussion alone outside their home; the second participant cancelled twice last-minute and often struggles with agoraphobia, so their follow-up was conducted over the phone.

It is important to note that many FFRx participants had challenges attending in-person data collection even when transportation was provided. Explanations provided included mental health challenges, emergencies arising, forgetting about appointments, and challenges with phone service being disconnected. These challenges meant that our research team had to be flexible in scheduling data collection with participants and needed to pivot to over-the-phone data collection for multiple participants when in-person interviews were initially scheduled.

2.5 Data Analysis

2.5.1 Coding and Analysis Process

The initial 23 interviews were transcribed verbatim, then open coding was conducted, followed by a form of rapid analysis where summaries of answers for each interview prompt were placed in a table. This table helped to identify where data was rich and where gaps were present. Some initial ideas around contextual factors, mechanisms, and program outcomes were identified through meetings with the research team and discussing the preliminary findings. The table was used in the creation of a guide for follow-up discussions with participants with questions to fill gaps in the data. Questions were also drafted to member check the initial findings and identify links between CMOs that arose within the table. After the follow-up focus groups were conducted, they were transcribed verbatim. After transcription, I engaged in data immersion and familiarization by listening to the interview and follow-up recordings and re-reading transcripts while editing for clarity. Following this, *NVivo Release 1.7.1* ® was used for inductive line-by-line coding, with specific attention to barriers and facilitators of program outcomes. As more interviews were analyzed, the codes were refined and consolidated to develop a codebook that was reflective of the data (DeCuir-Gunby et al., 2011). Through this consolidation, themes were categorized as context, mechanisms, and outcomes, and links between CMOs were identified. The developed codebook was then applied in a second round of coding, focused on highlighting the various contextual factors, mechanisms, and outcomes. I engaged in memoing throughout the analysis process to expand on ideas and explore identified CMOs (Birks et al., 2008). Memos were a space to note ideas of context, mechanisms, outcomes, or connections between them, as well as

questions or thoughts I wanted to discuss with fellow researchers to maintain open lines of communication. Memoing also provided me with an opportunity to reflect on the analysis and keep track of the analysis process for future reference. Regular check-ins occurred between research team members throughout analysis to ensure validity and rigor in results, and to share ideas in the development of CMOCs (Creswell & Miller, 2000).

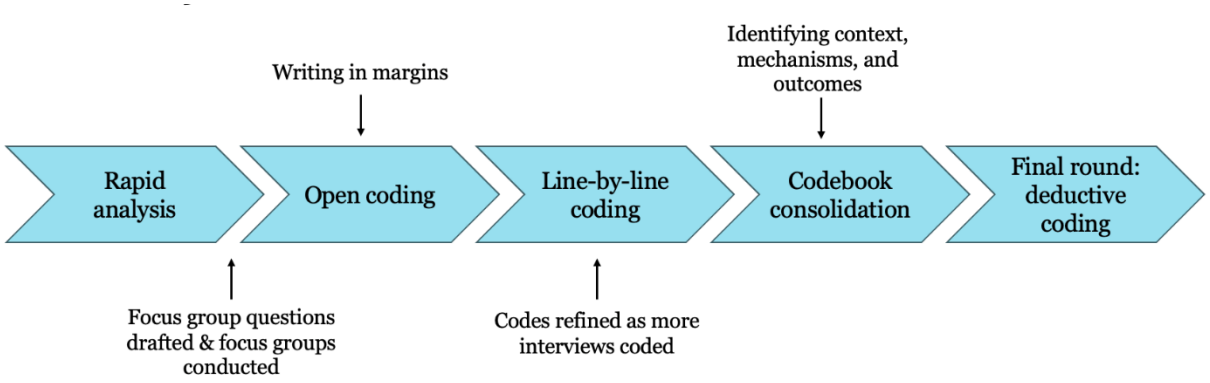

Figure 2. Diagram of coding and analysis process of qualitative data

Chapter 3: Assessing the implementation and outcomes of a food prescription program in Ontario, Canada: A realist evaluation

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3.1 Introduction

Social prescribing is a method employed by care providers to recognize non-medical, health-related social needs, and link eligible participants to non-clinical resources in the community, where a social prescription is collaboratively produced across community and clinical partners (Muhl et al., 2023a). Social prescribing first gained momentum in the UK but has seen a rise in popularity around the world over the last decade, with social prescribing programs now being implemented in over 20 countries (Morse et al., 2022; Muhl et al., 2023a). Further, there has been a rise in popularity of social prescribing in Canada, with the formation of the Canadian Institute for Social Prescribing (CISP), a national hub for sharing social prescribing practices (Canadian Institute for Social Prescribing, 2023). In the province of Ontario, the Alliance for Healthier Communities is leading the social prescribing movement and implemented one of the first multi-site social prescription research projects in Canada (Alliance for Healthier Communities, 2020; Wells et al., 2019). There is some evidence that social prescribing can improve social inclusion, mental well-being, physical health markers, and self-management of health (Alliance for Healthier Communities, 2020; Bhatti et al., 2021; Sonke et al., 2023). However, there is limited evidence on the ways in which social prescribing addresses health outcomes, with a need for more research and evaluation of social prescribing programs (Bickerdike

et al., 2017). The complexity of social prescribing can make evaluation difficult, but there is a need for nuanced evidence to assess the implementation and effectiveness of social prescribing programs across various populations (Bickerdike et al., 2017; Morse et al., 2022).

One non-medical need that programs have worked to address through social prescribing is food insecurity. Food insecurity is recognized as inadequate or insecure access to food due to financial constraints (Tarasuk, Li, & Fafard St-Germain, 2022). Food security is often understood as comprised of four pillars, including food availability, access, utilization, and stability (FAO, 2008). The pillar of food access addresses whether consumers have the financial means to access food, as well as transportation and physical access (Peng & Berry, 2018). Research has shown an association between food insecurity and poorer diet quality, lower nutrient intake, and an inability to manage diseases, all of which might impact the health of food insecure individuals (Kirkpatrick & Tarasuk, 2008; Seligman et al., 2010). Food insecure individuals often experience a higher rate of diet-related conditions such as hypertension or nutrient deficiencies, as well as increased risk of non-diet related conditions such as mood and anxiety disorders, post-partum mental health disorders, chronic pain, and prescription opioid use (Davison et al., 2015; Gundersen & Ziliak, 2015; Men, Elgar, et al., 2021; Men, Fischer, et al., 2021; Tarasuk, Gundersen, et al., 2020).

Food prescribing is a sub-category of social prescribing that aims to leverage healthcare interactions to address food security, particularly food access. Food prescribing programs follow a social prescribing model to connect patients with community resources to provide access to healthy food (Joshi et al., 2019). The most common form of food prescribing is voucher programs, which provide participants with vouchers or coupons for produce or other foods, which can be

used at local farmers markets or stores (Bhat et al., 2021; Cafer et al., 2022; Stevenson et al., 2023). Across reviews and evaluations of food prescribing programs, there are promising findings extending beyond improving food access, including evidence of improvements in diet quality while participants are enrolled in a food prescription program (Bhat et al., 2021; Heasley et al., 2021; Little et al., 2022; Slagel et al., 2023; Trapl et al., 2018; Wu et al., 2022). With the growth in popularity of food prescribing programs, there has been a call for more research and evaluations of impact and implementation of these programs, especially in Canada, as studies typically have lasted approximately six months, with most studies being conducted in the United States or the UK (Bhat et al., 2021; Brubacher et al., in press; Little et al., in press, 2022). More specifically, there is a further need to understand how these programs work, for whom they work, why, and in what circumstances.

The objectives of this study were to describe the experiences of participants with FFRx, evaluate the impacts of FFRx on perceived food security, diet patterns, health, and well-being. This study contributes novel insights into how various contexts and mechanisms shaped differential program experiences and outcomes among participants of a food prescription program.

3.2 Methods

3.2.1 Study Context

This study was conducted in Guelph, a city in Southwestern Ontario, Canada. As of 2021 Guelph had a population of approximately 144,000 people, with approximately 11% with a low-income status (City of Guelph, 2021). Food costs have recently been on the rise in Guelph, and

Canada more broadly, with even higher increased costs for nutritious food (Charlebois et al., 2022, 2023; Needham et al., 2018). Food insecurity has also been on the rise; a recent representative survey found that 1 in 8 households in Guelph were experiencing food insecurity at the end of 2020, with nearly two thirds of those households sharing that they had not been experiencing food insecurity prior to the COVID-19 pandemic (Nutritious Foods Workstream, 2022).

One organization working to address food insecurity in Guelph Ontario is The SEED (capitalized for stylistic purposed – not an acronym). The SEED is working toward the goal of building a more equitable food system in Guelph while providing members of the community with a food access program that maintains autonomy and dignity. This non-profit organization was initially formed as a community food hub through a community-university partnership, with the goal of addressing needs faced by the Guelph-Wellington Community and gaps in food access programs identified in previous literature (Dodd et al., 2013; Nelson & Dodd, 2017). The SEED is a working group of the Guelph Community Health Centre (GCHC). The GCHC is an organization that provides healthcare and social services to individuals and families in the Guelph-Wellington area who may typically find it difficult to access care. Projects of the SEED include an online sliding scale grocery store named Groceries From the SEED, a community garden, a volunteer-based kitchen dedicated to upcycling food, distribution of wholesale and rescued food, as well as the Fresh Food Prescription Program (FFRx). The Fresh Food Prescription Program (FFRx) is a food prescribing program which provided access to fruits and vegetables to food insecure households experiencing at least one diet-related health condition.

This study was part of a larger evaluation of the Fresh Food Prescription (FFRx) program in collaboration with the SEED. The SEED is a branch of the Guelph Community Health Centre (GCHC) which encompasses multiple sub-projects addressing food security in the city of Guelph and Wellington County, with the goal of addressing the identified challenges and incorporating characteristics that community members appreciated (Dodd & Nelson, 2020). An initial pilot of FFRx was conducted in 2019-2020 where sixty participants who were experiencing food insecurity and at least one cardiometabolic health condition were prescribed weekly vouchers for produce for 12 weeks (Heasley et al., 2021). The evaluation of the first pilot showed promising results of improved food security and diet quality (Heasley et al., 2021). The second pilot of FFRx began in April 2021 with 62 participants receiving weekly coupons of the same value ($10 per week, per person in the household, to a maximum of $50). The program lasted for one year, with 57 participants remaining at the program endline, and coupons were redeemable for fruits and vegetables through The SEED's online sliding scale grocery store referred to as 'Groceries from The SEED'. Participants also had access to other sections of the 'Groceries from The SEED' store where they were able to purchase foods at the lowest sliding scale price, as well as a 'free food' section which was updated weekly, beginning part-way through the second FFRx pilot. The produce was available at a discounted rate, and participants had access to the rest of the store's products at the deepest discount available, though the coupons were only applicable to the fruits and vegetables. Participants were able to order the groceries online, over the phone, or in-person, with options for delivery or pick up. Ordering could be completed at any time, while delivery and pick up were offered twice a week (Tuesdays and Fridays). Customer service representatives were available every day to assist participants with ordering and any concerns they had about the store

while being available twice a week for participants to order in-person. Enrollment in the program began in April 2021 on a rolling basis, with all participants completing the program by November 2022. Participants experienced a pause in support from FFRx after November 2022, but were then able to access FFRx again beginning in March 2023 when additional funding became available. The re-initiation of the program is not a part of this evaluation.

This study was informed by realist evaluation in order to identify key outcomes, and how interactions between context and mechanisms led to the generation of outcomes. Realist evaluations are beneficial for understanding complex programs, and ask "how, why, for whom, and under what conditions" does a program work (Tilley & Pawson, 1997).

3.2.2 Data Collection

All participants who were involved with FFRx were contacted at the completion of their one-year intervention and offered an opportunity to participate in qualitative data collection. This recruitment occurred through July to September 2022, both over the phone and in-person when participants were contacted to complete quantitative surveys. A total of 23 semi-structured interviews were conducted; five interviews were in person and 18 interviews were over the phone. In total, six of the participants used an interpreter during their interviews, while the other 17 interviewees spoke English in the interviews. All the interviews were audio recorded and transcribed verbatim. The interview guide contained four main topics to address in each interview, along with potential prompts to encourage further conversation. The interviews explored the impacts of the program, but also how context and mechanisms at various levels (e.g., individual-level, program-level) may shape experiences with the program, to adhere to realist evaluation

framework. Interviews were conversational and participants were encouraged to share any thoughts or feelings about the program. Participants were regularly reminded that anything they shared would not impact their chance to participate in future programs. This flexibility allowed researchers to gain understanding about participants' lives and experiences with FFRx, as well as build trust and rapport with participants. Follow-up discussions occurred from May to July 2023 with 10 of the 23 participants to fill in gaps in the data from initial interviews and discuss and validate initial findings with these participants.

3.2.3 Data Analysis

Transcripts of the 23 interviews were initially analyzed using a rapid qualitative analysis method where summaries of answers were placed within a table to identify gaps. This approach informed the design of follow-up discussions. All qualitative data were then open-coded, followed by inductive line-by-line coding. Codes were consolidated and refined to form a codebook that highlighted context, mechanisms, and outcomes. This codebook was then applied in a final round of deductive coding identifying context-mechanism-outcome configurations (CMOCs). Application and consolidation of codes was completed using *NVivo Release 1.7.1* ® software.

3.3 Results

3.3.1 FFRx Program and Participant Context

A diverse group of participants were enrolled in FFRx and agreed to participate in interviews. All participants were experiencing food insecurity prior to the program, as well as having at least one diet-related health condition. On top of these contextual factors, of the 23

participants interviewed there were multiple participants who experienced complex mental health concerns. This group included individuals with anxiety and depressive disorders, agoraphobia, as well as other psychiatric conditions. Participants also varied in race, ethnicity, and culture, with some participants having grown up in the Guelph community, elsewhere in Canada, or arriving to Canada more recently. Some participants shared that they had previously experienced various traumas, and some had family members currently in dire situations, causing them significant stress during the time they were involved in FFRx. Broader context at the time of the study included the ongoing COVID-19 pandemic, as well as a rise in food and living costs due to inflation. Participants expressed that these contextual factors may have impacted their experiences with the program, such as increasing their need for food access and delivery.

Table 1. Description of participant contextual factors

Characteristic	**No. (%), proportion, or mean (95% confidence interval)**
Gender	
Man	7 (30.4)
Woman	16 (69.6)
Age at enrolment in years	53 (47.3, 58.7)
Age group at enrolment	
20 – 39 years	5 (21.7)
40 – 59 years	10 (43.5)
60+ years	8 (34.8)
Race/ethnicity	
White	10 (43.5)
Black	2 (8.7)
Indigenous to Turtle Island	1 (4.3)
Asian (including Arabic, East Asian, South Asian, or Southeast Asian)	7 (30.4)
Latin American	1 (4.3)
Chose not to respond	2 (8.7)
Household size	3.7 members (2.6 members, 4.7 members)
Household size group	
1-2	9 (39.1)
3-4	8 (34.8)

5-6	3 (13.0)
7+	3 (13.0)
Household income group ($CAD)	
0-19,999	13 (56.5)
20,000-39,000	7 (30.4)
40,000 +	2 (8.7)
Don't know / prefer not to say	1 (4.3)
Value of vouchers redeemed (CAD)	$1,549 ($1,187, $1,912)
Proportion of vouchers redeemed	93.8%

3.3.2 FFRx addressed food access

3.3.2.1 Increasing availability of food: "there were a lot of fruit and vegetables that were available"

Participants shared that they felt there was a large variety of foods available to them through FFRx, stating that "there was a lot of fruit and vegetables that were available in and out of season" (P13). In addition, participants shared that while other food support programs often focused on non-perishable foods, FFRx made fresh produce available to them, which helped participating families to cook healthy and culturally relevant meals. However, some participants suggested that there were some foods they wished they could have that were not available, such as pineapple or culturally relevant vegetables. There was also a desire for more consistency in what foods were available over time. Participants generally felt that the program had a sufficient availability of foods and improved the supply of food available to them. The variety of food available through the Groceries from the SEED website was a key mechanism for ensuring availability of food for participants.

3.3.2.2 Addressing food access for participants: “access with the delivery is a big thing”

Across initial interviews and follow-up discussions, participants shared that they experienced an increase in access to food through their involvement with FFRx. Participants highlighted home delivery as a key mechanism of the program that allowed them to access fresh food, saying “the access with the delivery is a big thing” (P14). Indeed, delivery was viewed as critical to FFRx program effectiveness, as participants often mentioned contextual factors (e.g., inability to drive, mental health challenges, physical health challenges) that made it challenging for them to access food from the grocery stores or from other supports such as the food bank. For example, one participant with children who experiences chronic pain and limited mobility stated, “my grocery was left at my door, right? It's a big difference when you are going [grocery shopping] with this physical condition. It was really hard for me to do it by myself with four kids” (P19). Further, for participants with children, finding the time to purchase groceries was highlighted as a consistent challenge. One father of seven children, two of which have disabilities, highlighted that the “delivery option… really helps because I am really busy with the family and because of our family’s size” (P6). Across participants, it was clear that delivery offered through FFRx was a key mechanism in improving food access.

Options for ordering either online or over the phone were other program characteristics that helped to remove barriers to food access for participants. One participant shared, “there was no barrier to me if I had a phone or I had a laptop” (P19). Some participants highlighted that their mental health had previously made it challenging to access food and that ordering online was beneficial. The mechanism of ordering online through Groceries from the SEED allowed the participants with diverse mental health challenges to access food without needing to leave their

home. The option of ordering over the phone allowed individuals who struggled with technology or faced other barriers to still access the program. There was staff support to assist the participants with navigating the program, and participants highlighted their support as helpful to increasing food access.

The provision of coupons and their total value was another key mechanism in improving food access for participants. Several participants shared that there were foods they could now purchase using their coupons that they had not previously been able to afford. For example, one individual highlighted “the fruits, especially, usually I couldn't afford to buy, for example, strawberries, blueberries, raspberries, that I used in this program. It helped me a lot” (P19). However, the increase in food costs over the duration of the program also led to an increase in the cost of food at the SEED. This change in cost left some participants feeling that their coupon value was no longer sufficient to access the foods they needed. When asked about the amount of money received on the weekly coupon, a participant shared “it wasn’t enough…because everything is expensive now…when the program started it was really good. But after a while…it wasn't enough at all" (P5). This sentiment was echoed by many participants, particularly those with large families. In contrast, several participants shared that although they were not able to order as much as prices rose, they still felt the coupon amount was sufficient.

Many participants mentioned that FFRx increased access to foods outside of those provided by the program, by freeing up some money to spend on accessing other foods. A participant with four children and a physical disability shared, “the money I saved from buying vegetables and fruits. Instead of that, I used my money for fish and some meat… for my family to use.” (P19).

Participants also were able to access other foods on the Groceries from the SEED website at a discount and some participants utilized the "free food" section. Overall, participants felt that their access to food improved while enrolled in FFRx through the provision of coupons and through freeing up of money for purchasing other foods.

3.3.3 FFRx changed participants' perceptions of their physical health

3.3.3.1 Changing participant dietary patterns: "before the program, I didn't eat fruits and vegetables"

During interviews, many participants highlighted that they felt their health improved throughout the FFRx program. When asked what they thought contributed to this improvement, most participants identified the mechanism to be an increase in fruit and vegetable consumption. One participant stated, "I think it's physically better, because I eat more vegetables and fruit" (P17). Some participants shared that they had rarely eaten fruit and vegetables prior to the program. One participant who lives alone and struggles with complex mental health challenges shared that "before the program I didn't eat fruits and vegetables…And as it progressed, I started eating more and more" (P13). Individuals highlighted a variety of reasons for their lack of fruit and vegetable consumption, with some participants sharing that they did not enjoy them, and others sharing that they previously did not have access or had to prioritize purchasing a larger quantity of food on a budget rather than being able to prioritize nutritious foods.

Participants shared various improvement in health outcomes that they felt were associated with their increased fruit and vegetable consumption. For example, one participant mentioned, "energy wise, I am feeling so much better because, I'm drinking kale smoothies, cooking a lot of vegetables

and fruit…it has changed a lot in my life" (P23). Participants frequently shared that energy levels increased during the program, as well as other changes such as improved blood sugar levels and improved sleep.

During follow-up interviews, some participants highlighted that they did not notice the changes in their physical health until they no longer had access to the program. One participant reflected on the experience of being without FFRx, saying:

> Because I didn't have any access to the vegetables, I didn't realize how much I missed them. When I had to introduce it into my weekly budget, I'm thinking, 'oh my gosh, it's either I buy this or buy this.' And my blood sugar was really off those couple of months because I couldn't afford the fresh vegetables (P22)

Participants also shared that because of their involvement in FFRx, they felt that they consumed fewer foods that were nutrient poor, while consuming more nutrient dense foods. Some participants highlighted that these changes in dietary patterns were a result of purchasing food on the Groceries from the SEED website, where there was limited nutrient-poor food available, and coupons could only be utilized on produce. Families felt they noticed changes in the health and dietary patterns of all family members during their involvement in FFRx.

3.3.3.2 Improving food literacy: "I learned so much"

Some participants mentioned that they felt their dietary changes had been a result of mindset shifts or changing perceptions of food throughout the program. One form of change was participants starting to enjoy fruits and vegetables, or trying new foods, through the increased access to produce from FFRx. For example, as one father shared, in relation to the impact of FFRx in shaping his children's preferences, "this taught us, and also taught my kids, [to love] fruits and

vegetables where they used to be picky with certain things, certain fruits and vegetables" (P1). Participants shared that they tried new foods through the program as well, which helped them find more fruits and vegetables that they enjoyed, and they felt more positive toward consumption of fruit and vegetables.

Participants shared that being involved in FFRx encouraged them to prioritize fresh foods in their diets and gave them to opportunity to focus on themselves and their eating habits. One participant highlighted that "prior to the program, I wasn't being mindful of incorporating those fruits and vegetables consistently into my diet, even the vegetables, making it a larger portion" (P18). Other participants echoed this sentiment that they became more mindful of the importance of fruits and vegetables and tried to more frequently incorporate them into their meals. Many participants with children shared that they had previously prioritized their children's diet, but this program allowed them to focus on their own food habits as well. One mother stated that she would normally put an emphasis on packing her child a balanced meal for lunch, and that during this program she began a habit of making herself a balanced lunch at the same time. She said "[the program] made me really focus on me…so now when I'm packing his, I have two containers out and I pack mine at the exact same time" (P14). The program allowed participants to begin to prioritize their own needs, and care for themselves using the prescribed food. Participants shared that the program had encouraged them to feel "responsible for yourself" (P14) and take control of their health. This sense of responsibility was most prevalent in individuals who entered the program with a desire to adjust their health during the year. Participants shared that this accompanied an ability to meet the recommendations given to them by dietitians or other

healthcare providers. However, participants did not mention any significant change in relationships to healthcare providers as a result of FFRx. When asked about the strength of these relationships or the experience of receiving the food prescription, the majority of participants did not connect their relationship with healthcare providers with their overall experience of the program.

3.3.4 FFRx addressed participants' mental health and well-being

3.3.4.1 Providing interpersonal connections: "the food was the only social contact I had for a long time"

During interviews, some participants expressed an improvement in their mental health during the program. In particular, several participants highlighted increased interpersonal connections as a benefit of the program that positively impacted their mental health. Interactions with staff at the Guelph CHC or FFRx volunteers represented an important mechanism for promoting increased interpersonal connections. These interactions were especially important for participants who lived alone. One participant who lived alone, renting one room, described looking forward to deliveries saying:

> The food was the only social contact I had for a long time in the winter…I'd look forward to a food delivery for my social life…It may sound like a miniscule event, but that's what you look for when you're locked up in a small space for a long time (P21).

Some participants shared that staff interactions over the phone helped to improve their mental health through feeling more supported. One participant who experiences complex mental health challenges shared that a specific customer service staff often helped to improve her mood and feel connected to someone. She stated "she's very understanding. You tell her you're having a bad day, and she has the right words." (P13) For participants who were not fluent in English,

interpreters allowed them to connect more deeply with staff, and help them to feel comfortable and valued. One participant shared that “using interpreters makes me happy because whatever is in my heart and in my mind [I can] say it, and she's transferring to you guys” (P19). Indeed, the use of interpreters helped participants to experience increased interpersonal connections with the program staff.

The food provided by FFRx also facilitated connections through more frequently meals with family members or through sharing food within communities. One participant described how he would make soup with the vegetables from FFRx, and “bottle it all up in mason jars. And I’d pass them out to some of the other people here in the [housing] complex who I know are, aren't that well off either” (P9). Another participant described that the food from FFRx facilitated quality time with family members, saying “me and my kids, we had such a good time learning new stuff and cooking together” (P23). Across interviews, it was clear that increased interpersonal connection with staff, volunteers, family, and community members contributed to improvement in the mental health and well-being of participants.

3.3.4.2 Improving self-esteem: “I just felt better about myself”

Participants highlighted changes to their self-esteem during the program. In particular, participants who were parents highlighted a change in how they viewed themselves and corresponding improvements in their mental health. Parents mentioned that they felt better about themselves because their children were receiving more nutritious foods. One mother of four highlighted that, “as a mother, I'm telling you, when the kids are not complaining about ‘what

should I eat?' Or 'this is not enough.' That's our whole world. That is everything for us as a mother." (P23).

Participants also mentioned that they felt they were "treated as a human" and that being treated with care and dignity improved their own self-worth. Participants highlighted that this experience was distinct from other experience with different food access programs. One participant shared, "with the SEED program, you feel you have dignity. Like the other places it makes you feel like you're less of a human" (P12). Participants indicated that they felt they had agency within FFRx and were able to execute choice and a degree of control over their involvement with the program. Many participants stated that choice was a key feature of the program that they enjoyed, with one participant enthusiastically sharing, "I love this program because I can choose what I want from vegetables or fruits" (P5). FFRx was often compared to other food support programs, and the sense of agency felt within FFRx was noted as a unique program feature. Indeed, one participant shared that with other food support programs, she felt she "[had] to take whatever they have" (P22).

A challenge for participants' self-esteem during the program was concerns surrounding quality of food. While many participants were pleased with the quality of fruits and vegetables they received from the program, a minority of participants shared their concerns about the food quality. A few participants shared that they received orders of fruits and vegetables that had begun to spoil, which negatively impacted their self-esteem. One participant said that after an order where some fruit had spoiled, she was thinking "is this really all that I'm worth? Am I worth the garbage? Do they give everybody else top line products? And I get all the moldy fruit and stuff…is that all

I'm entitled to?" (P14). This sentiment appeared to be more common among individuals without children or who lived alone, perhaps since these individuals tended to use food more slowly, allowing additional time for the food to spoil.

Despite these challenges, many participants indicated that the straightforward nature of ordering led to participants feeling they had done something to care for themselves that day or made a positive choice. This experience was particularly beneficial for participants with complex mental health challenges. One mother who experienced severe anxiety expressed that the benefits of ordering online helped to improve her self-esteem.

> When my mental health [was] really bad, I couldn't get out because of my anxiety…It was so much better just for me to turn on my computer and I can order healthy stuff, and it made me feel better afterwards…Now I have some healthy stuff in there. It makes me feel better. I have good things for my children (P22).

Other participants shared that consuming more fruits and vegetables helped to improve their self-esteem. When asked about the changes in how he felt during the program, one participant said, "I felt good about [the fact that] I was doing the right thing" (P9). Participants who had been motivated to make changes to their health and diet while receiving support from FFRx mentioned that the changes they made, including consuming more fruits and vegetables, helped to improve their self-esteem.

3.3.4.3 Changes in stress: "It reduced a lot of stress"

Across interviews, many individuals highlighted a noticeable decrease in stress as a result of program participation. Stressors were highlighted as a key challenge to many participants' mental health, with one participant saying, "financial stress is just really, really killing the family"

(P12). Participants shared that they felt some relief from financial stress during the program. One participant, who was a grandmother living in a multi-generational home, stated that the program was "very helpful because it helps financially pay for the food and then makes it less stressful for all the financing" (P8).

All participants were experiencing food insecurity at the time of enrolment in the program, so had experienced a lack of access to food. However, most participants mentioned that they no longer needed to worry about whether they could financially afford fruits and vegetables, as they were now guaranteed a weekly supply. In particular, participants who were parents felt that they had reduced stress due to being able to meet the needs of their children through the program. One mother said:

> It reduced a lot of stress. As a mother, always moms are thinking, 'I have to meet my kids' needs'… this was a really excellent program to help me with that… actually it helped a lot, because the money I was saving from that, I could buy my kids' other [things they] need like shoes or clothes (P19).

Receiving consistent access to fresh foods impacted participants' mental health and reduced stress, and this was highlighted as an important outcome experienced during the program. This sense of security and stability of food access was a key theme highlighted by participants, and the consistent weekly coupon uploads with biweekly deliveries help to facilitate this stability.

It is important to acknowledge that while participants experienced stability and increased food security during the year that the program was implemented, they did experience a gap in support lasting a few months at the conclusion of the second pilot program, prior to their enrollment in a third phase. Participants shared that this gap was very challenging and expressed

a lot of anxiety around the end of the program. One individual said "my anxiety was high, because I was used to getting strawberries, fruit, apples, and then this program stopped, and I was kind of heart broken. I was really upset" (P15). This experience highlighted the importance that FFRx had on participants' food security and their sense of food stability.

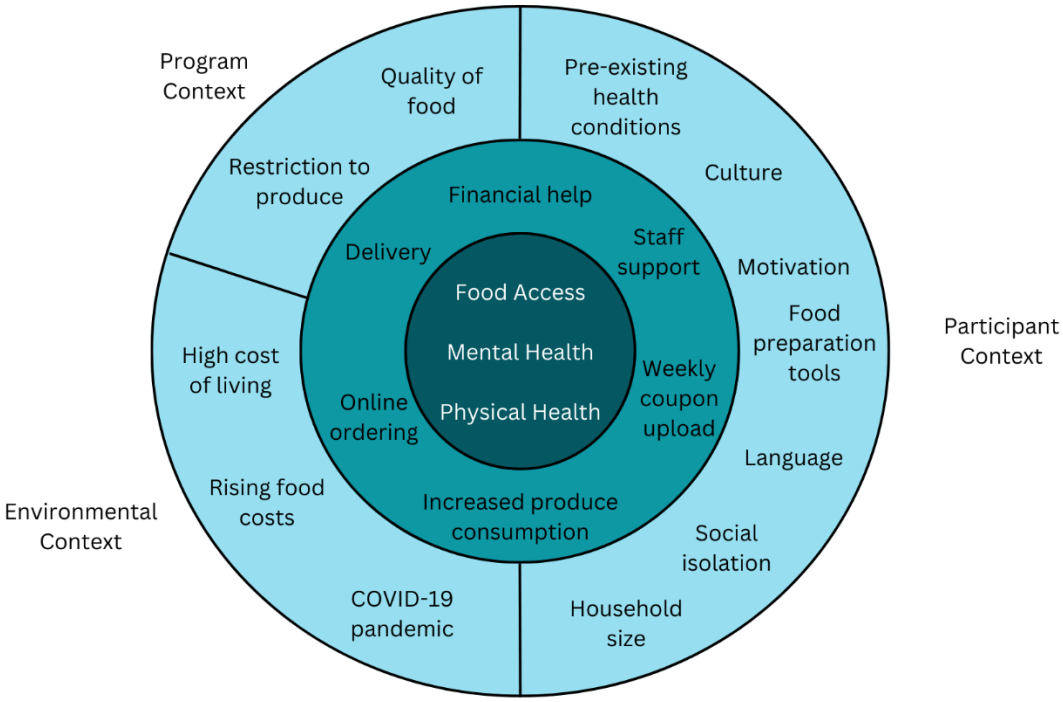

Figure 3. Context Mechanism Outcome Configuration (CMOC) for the Fresh Food Prescription Program (FFRx) where the outermost circle represents context, the middle circle represents mechanisms, and the innermost circle represents the three key outcomes.

3.4 Discussion

This study used a realist evaluation framework to examine the interactions between context and mechanisms involved in a food prescription program, and how these interactions contributed to outcomes for participants. Three key outcomes were identified for participants of FFRx: increased food access, changes in physical health, and changes in mental health. Participants in

the program varied in age, family size and living situation, with multiple participants living with complex mental health challenges and physical health conditions. These individual contextual factors impacted outcomes and participants' experiences with the program, along with broader context such as the rise in food and living costs and the COVID-19 pandemic. The use of a realist evaluation highlighted how mechanisms such as staff support, delivery, and ordering options were crucial in facilitating program outcomes. These were identified as crucial program elements and would be beneficial to include in future food prescribing programs.

Of note, staff involved in FFRx implementation understood the contextual factors in participants' lives, such as complex mental or physical health, that might mitigate the impacts of a food prescribing program. Staff provided frequent, individualized support, ordering options, and delivery, to ensure that participants were able to navigate and make full use of FFRx. Participants identified staff's individualized support as crucial to helping them access food and improve their social connectedness. This finding aligns with insights from a previous study that highlighted the importance of staff engagement in the success of a food prescribing program (Joshi et al., 2019). Though the relationships participants built with FFRx staff was crucial to reaching positive outcomes, participants did not highlight relationships with healthcare providers as an important mechanism to achieve program outcomes. Social prescribing literature highlights the importance of relationships with healthcare providers in developing a social prescription; however, our findings suggest that these relationships were not a prominent program feature when FFRx participants reflected on their overall experience with FFRx (Muhl et al., 2023b; Mulligan & Nowak, 2021). Indeed, FFRx participants seemed to consider their experience of FFRx as separate

from their experiences with healthcare providers, only making the connection between the two in terms of now having an ability to meet recommendations made by healthcare providers to consume more fresh foods. This finding may highlight an opportunity for food prescribing to be implemented through other access points outside of primary care contexts.

Consistent with previous studies, our research showed that food access improved for participants while enrolled in the program (Bhat et al., 2021; Heasley et al., 2021; Wu et al., 2022). However, participants shared that their increase in food access did not continue throughout the pause in the program, due to no longer receiving the coupons. It is crucial to understand the implications of ending an intervention for participants, with sustainability consideration and long-term planning central to creating future food prescribing programs. Participants noted that while the program was active, they experienced improvements in availability and access to foods, primarily fruits and vegetables, as well as a sense of stability and agency throughout the program. Although this iteration of FFRx prescribed coupons that applied exclusively to produce, participants shared that food access improved with other foods as well, due to coupons freeing up a portion of their income that could then be spent on other foods. A previous study evaluated patient experiences with a fruit and vegetable prescription in which a pre-selected box of fruits and vegetables was provided, and this study found that participants wished for more autonomy through an ability to choose their fruits and vegetables (Johnson et al., 2023). Consistent with this finding, participants in FFRx appreciated the agency that they experienced through placing their own food orders and selecting fruits and vegetables that they wanted. In line with previous research, delivery also helped to alleviate the physical, mental, and logistical barriers to food access (Zimmer et al.,

2022). Overall, program design, when carefully considered alongside participant context, is an important mechanism in facilitating program outcomes including food access. Indeed, participants connected program design elements to experiences of security, stability, and agency.

Previous studies have called for more research into the ways in which food prescribing programs may influence the mental health of participants (Zimmer et al., 2022). Our study added to the literature through addressing the link between food prescribing and mental health. The mental health of most participants improved through their involvement in FFRx via increased interpersonal connections, improved self-esteem, and decreased stress. Participants with children especially experienced a decrease in stress and improvement in self-esteem because of the opportunity to provide nutritious food to their children. Another group of participants that particularly experienced improvements in mental health were individuals who lived alone. Social isolation is a predictor of poor mental and physical health, with individuals who are socially isolated having higher rates of depression and anxiety (Evans & Fisher, 2022). Social supports have been found to lower rates of depression and anxiety, particularly in individuals experiencing social isolation (Evans & Fisher, 2022). The individualized support and communication that FFRx participants received to support their use of the program additionally acted as emotional and social support. These findings highlight a potential opportunity for food prescribing to simultaneously address mental health through social support while enhancing food access.

The use of realist evaluation methods highlighted how interactions between contextual factors and program mechanisms contributed to outcomes. As food prescribing, and social prescribing more broadly, increase in popularity, it is important to understand how programs work,

who they work for, and why (Bhat et al., 2021; Little et al., 2022). Realist evaluations are beneficial for answering these questions and increasing understanding of interactions between context and mechanisms and how they generate program outcomes. Key strengths of realist evaluations include an ability to model complexity of programs and move beyond a linear view of causation (J. Greenhalgh & Manzano, 2022; Tilley & Pawson, 1997; Wood et al., 2021). There is some lack of clarity surrounding data collection and analysis methods in realist evaluations. However, previous explorations of realist evaluations were used to inform the data collection and analysis, and other rigorous qualitative analysis methodology was implemented to ensure valid results in this study. Realist evaluations could be better integrated into social prescribing initiatives by ensuring programs develop initial theories of how the program works, with anticipated context, mechanisms, and outcomes that can then be evaluated throughout program implementation (Wood et al., 2021). Realist evaluations can enhance understanding of food prescribing initiatives, as well as inform program expansions or the implementation of new programs by highlighting the contextual factors and mechanisms that were key to successfully achieving program outcomes.

3.4.1 Limitations

This study included individuals living in one city in Ontario and who were participants of one specific food prescribing program. Thus, participant experiences and the context in which they experienced FFRx may not be reflective of participants in other locations or other food prescribing programs. It is also important to note that not all FFRx participants chose to participate in interviews, and individuals who declined to participate in interviews may have been less involved or connected to the program. A final limitation is that participants may have been hesitant to share

any challenges experienced with the program. We worked to mitigate this limitation through ongoing reassurance that answers would not impact participants' involvement in future iterations of FFRx.

3.5 Conclusion

In the context of the COVID-19 pandemic, a rise in food insecurity, and increased popularity of social prescribing interventions, our study employed realist evaluation methods to assess the impacts of a fresh food prescribing program (FFRx) in Guelph, ON. The study highlighted the ways in which a food prescribing program can impact participants beyond addressing food insecurity, with our findings demonstrating that participants experienced improvements in physical and mental well-being throughout their enrollment in FFRx. In addition, results demonstrated the mechanisms that led to improved food access for participants, such as individualized support from program staff, food delivery, and diverse food ordering options. Our study elucidated the integral role that program staff play in the experiences of participants in a food prescribing program in order to overcome barriers to accessing the program. Overall, our research adds to evidence of food prescribing programs positively impacting participants through improvement in food access, physical health, and mental health. Further implementation of realist evaluations can improve the understanding of the interactions between context and mechanisms to facilitate outcomes in food prescribing programs.

Chapter 4: Conclusion

4.1 Summary of key findings

This thesis research evaluated the implementation and outcomes of a fresh food prescription program in Guelph, ON, for individuals experiencing food insecurity and cardiometabolic health conditions. A realist evaluation framework was implemented to understand who the program worked for, how it worked, and why. Three key outcomes were identified for the Fresh Food Prescription Program (FFRx) participants: increased food access, changes to physical health, and improved mental health. Interviews and focus group discussions highlighted contextual factors that influenced participant experiences with FFRx including household or family size, mental health challenges, and physical health conditions. Elements of program design such as food delivery and ordering options acted as mechanisms that interacted with contextual elements to contribute to outcomes for participants.

Food access improved for participants during their involvement with FFRx, due to receiving weekly coupons to purchase fruits and vegetables. Participants highlighted that the provision of coupons allowed for them to purchase produce that they previously may not have been able to afford. Food delivery and online ordering were key mechanisms for improving food access for participants who struggled to leave their homes to grocery shop or utilize food banks due to physical or mental health conditions. Participants shared that FFRx benefited their access to food beyond fruits and vegetables, because coupons freed up money that could then be spent on other foods (i.e., meat or dairy). Participants shared that their dietary patterns and physical health improved due to their involvement in FFRx, stating that they consumed more fruits and vegetables

and less nutrient poor foods during the program. Individuals also experienced a shift in how they thought about their diets, feeling that they now viewed fruits and vegetables as a more important component of their diet than they did prior to FFRx. Participants experienced higher energy levels, improved sleep, and changes in how they managed conditions such as diabetes and attributed these changes to their increased fruit and vegetable consumption. The third outcome generated through FFRx was improved mental health and wellbeing. In particular, individuals who lived alone experienced improvements in mental health due to increased social interactions with delivery volunteers and phone calls with FFRx staff. Parents also experienced improved mental health through increased self-esteem knowing they were able to provide fruit and vegetables for their families and meet their children's needs.

Our findings highlight the importance of understanding participant context when designing and implementing food prescription programs. These results underscore the opportunity for food prescription programs to address physical health, food access, and mental health through interactions between context and program mechanisms.

4.2 Strengths and Limitations

Various aspects of this study provided both strengths and limitations to the research. First, a key strength of this research was the opportunity to follow up with participants after initial data collection and preliminary analysis. Very few studies evaluating food prescription programs have previously collected data after the end of a program, but our team was able to discuss findings with participants during a pause in FFRx. The addition of follow-up focus groups allowed for member

checking of initial findings, which filled in gaps in initial data. In addition, these follow-up focus groups explored participant experiences with the program pause.

Second, a strength of our research was the diverse backgrounds and experiences of our participants. The broad range in family size, age, cultural background, and time living in the city of Guelph allowed us to understand the impacts of FFRx across different participant contexts. The diverse backgrounds of participants also meant that multiple participants felt more comfortable speaking a language other than English. Another strength of the study was our access to interpreters through the Guelph Community Health Centre (CHC) which allowed participants to share their thoughts and experiences in the language that they felt most comfortable. However, the use of interpreters could also be a potential limitation as some information might be lost or not interpreted accurately during interviews. We mitigated this limitation by reminding interpreters to interpret verbatim and asked for clarification when needed.

Third, I was involved with quantitative data collection, as well as helping with implementation of FFRx toward the end of the program, prior to conducting qualitative data collection. Further, I had met many participants in person or over the phone prior to conducting their interview, and I had been able to build some rapport through these interactions. This foundation of rapport was a strength in that participants may have felt more comfortable sharing their thoughts and experiences with me during subsequent interviews and focus groups. A potential limitation was that participants may have felt uncomfortable sharing negative experiences with FFRx, as they had heavily relied on the program and wanted to ensure it would be re-started. I

worked to mitigate this limitation by assuring participants that their feedback would not prevent them from being involved in future iterations of FFRx.

All participants who completed FFRx were asked if they would like to participate in qualitative data collection in the form of semi-structured interviews, with 23 participants agreeing to the interview. A potential limitation was that there was a difference between the FFRx participants who agreed to participate in an interview, and those who declined. Future research could explore alternative approaches for engaging participants in qualitative data collection to examine experiences with food prescribing programs. Overall, this study allowed us to gain a deeper understanding of participant experiences with this one food prescribing program, and to gather data on the context, mechanisms, and outcomes of FFRx.

4.3 Contributions to research and practice

4.3.1 Contributions to academic literature

This research addressed a gap in academic literature as there have been very few qualitative studies evaluating food prescribing programs (Johnson et al., 2023). This study is also one of the first studies employing realist evaluation methods when evaluating a food prescribing program. This research was able to identify the context and mechanisms involved in a food prescribing program, and how they contributed to outcomes of increased food access, improved physical health, dietary quality, and mental health. Previous literature has identified barriers to program use including challenges with transportation to markets or with utilizing vouchers at markets (Little et al., 2022). Importantly, FFRx overcame transportation barriers through providing food delivery, and voucher use was streamlined through online ordering. Another challenge identified in

qualitative studies of food prescription programs has been a lack of autonomy or empowerment of participants, however a sense of agency has been identified as a key pillar of food security (Johnson et al., 2023; Little et al., 2022). This lack of autonomy is often connected to program design features, such as the provision of standardized food boxes where participants have limited or no choice over the food in the box. In contrast, FFRx provided participants with the opportunity to select their produce and place an order for what they wished to receive (Johnson et al., 2023; Zimmer et al., 2022). Further, FFRx participants highlighted that choice and autonomy were key aspects of the program that they appreciated, supporting the importance of agency in food prescription programs. This study complements the quantitative evaluation of FFRx by providing further context that expands on participant experiences with the program. While quantitative data did not highlight many significant changes in physical or mental health, the qualitative results pointed to an overall positive impact of FFRx on participants' physical and mental health. During follow-up focus groups and interviews, questions were posed to participants as to why they felt blood work and surveys may not have shown significant improvements in health outcomes. This process enabled us to further elucidate contextual factors that may have influenced quantitative data. For example, a participant who had shared overwhelmingly positive feedback on her experience with FFRx explained that she felt the lack of change in blood work and survey answers may have been impacted by important stressors external to FFRx. She shared that members of her family were in a refugee camp, and her diabetes symptoms had worsened along with her increased stress about her family's safety. However, when she was able to share specifically about FFRx, she highlighted decreased financial stress, improvements in her self-esteem as a mother, and improved diet quality. During interviews and focus groups, participants were able to parse out

what changes they felt were related to FFRx, and what challenges might have been outside the scope of the program.

This study was structured as a realist evaluation, which has not been common in evaluation of food prescribing programs. Previous qualitative studies used behaviour change models or process evaluations, and many focused on facilitators and barriers to program use (Esquivel et al., 2022; Johnson et al., 2023; Schlosser et al., 2019; Zimmer et al., 2022). The implementation of a realist evaluation offered new insights into the impact of participant context on the outcomes of a food prescription program, as well as what program elements were key mechanisms in generating outcomes. Realist evaluations have been explored as a beneficial tool for evaluating complex programs, particularly ones addressing food insecurity (Lam et al., 2021). Theory-driven evaluations have often been used to assess programs looking to address food insecurity and understand health or nutrition outcomes (Lam et al., 2021). Realist evaluations are particularly useful in addressing multiple outcomes and addressing complexity and non-linear causation of outcomes. This study serves as a starting point for implementing realist evaluations to assess food prescribing in research. Continuing to apply realist evaluation methods as well as implement other evaluation styles can help provide new insights into the structure and function of food prescription programs.

4.3.2 Contributions to practice

This research was conducted through a partnership with the Guelph Community Health Centre (GCHC) to evaluate FFRx. Thus, it is important to consider the implications of the research on the work of the GCHC. This study can help to inform future planned iterations of FFRx

implemented in other sites such as university or rural settings. Findings emphasize the importance of staff involvement and individualized support for participants in successful implementation of FFRx, which should be considered in future program development. Participants highlighted improvements in their utilization of the program when staff would reach out to remind them of available vouchers or help them to place an order. Participants living alone and experiencing isolation emphasized how interactions with program staff and volunteers increased feelings of connectedness and improve their mental health. These experiences are critical to consider in the development of future programs in order to provide participants with a sense of connectedness and improve mental well-being while addressing food insecurity and health concerns. Other key program elements of FFRx were food delivery and options for ordering online or over the phone. It was evident that these mechanisms were essential for participants experiencing mental or physical health challenges to access FFRx and should be maintained in future iterations of the program. These findings encourage the use of food delivery, online or phone ordering, and individualized support in future food prescribing programs to achieve intended program outcomes among participants.

This study employed realist evaluation methods to understand who the program worked for, how it worked, and why. Findings highlighted that FFRx participants felt positively about their experience with FFRx, and it appeared to be effective for most individuals. However, participant context played an important role in determining which program mechanisms were most necessary for participants to experience improvements in food access and well-being. This research exhibits the importance of understanding participant context when evaluating food prescribing programs

and addressing which program elements were key mechanisms for ensuring a program is successful. Future food prescribing programs should consider utilizing realist evaluation methods when assessing their programs, and care providers should consider context-mechanism-outcome configurations (CMOCs) when designing a food prescribing program.

4.4 Implications, future research, and concluding thoughts

There are several ways in which future studies could build on this research. First, this study had a unique approach in applying realist evaluation methods. Future research should consider implementing realist evaluation in order to understand how different contextual factors interact with program mechanisms to contribute to program outcomes. Our study collected qualitative data from participants of the food prescribing program; however, future realist evaluations should consider involving program staff and volunteers in evaluations. The inclusion of these individuals may allow for deeper understanding and new perspectives on the interactions between context, mechanisms, and outcomes within food prescribing programs.

The data for this research were collected at the end of participants' involvement with FFRx, and follow-up focus groups were conducted during a pause in the program. Including data collection after an intervention has ended, if applicable, could help deepen understanding of long-term impacts of a food prescribing program. There is also room for studies to evaluate food prescribing program that extend past one year to understand if outcomes change throughout time. Future research could expand upon any of the three key outcomes identified in this study. In particular, there is room to further investigate the link between food prescribing and mental health including improvements in social connections and self-esteem.

The goal of this study was to understand how FFRx worked, who it worked for, and why. Our findings highlighted that most participants felt positively about the program, and experienced outcomes of improved food access, physical health, and mental health. Participant context played a key role in their experiences of FFRx. Individuals who lived alone highlighted how interactions with program staff and volunteers helped to facilitate program outcomes and mentioned that they felt the vouchers were sufficient to purchase enough fruits and vegetables for the week. Participants living with multiple family members shared that they spent time cooking together as a family, and that their children enjoyed the benefits of FFRx; however, would have appreciated vouchers of higher value when food costs increased. Program elements such as online ordering, food delivery, and customer service staff support were critical in ensuring positive outcomes for FFRx participants and should be maintained in future iterations of the program. Overall, FFRx positively impacted participants' health and well-being through the prescription of vouchers for fruits and vegetables.

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Appendices

Appendix A: Semi-structured Interview Guide

Questions (BIG)	Follow-up	What we want out of this	Actively listening for
Intro – State Verbal Consent Script • Let participants know when we have started recording • A short introduction to myself (My name is Megan and I'm a Masters student in Public Health Sciences at the university of waterloo, and this interview is going to be a part of my master's thesis – I live here in Guelph) • A reminder that the answers will all be anonymous, and that their answers won't impact whether the program continues or whether they will be included in the program		Help participants feel comfortable, that this is a safe place to share	
Can you tell me a little bit about yourself?	What is your living situation?	Context	• Gathering context of their lives • When looking at CMOs context will be important; some personal

	How long have you been living in Guelph? *following up with "what's that like"		context of participants may be helpful
What was your experience like with this program?	If we get one-word answer: Did you feel good or bad about the program overall? What made it good OR what made it bad?	Rapport building Helping make this interview a safe space for the participant to share their opinion More understanding about the participants' overall experiences (overall positive or challenging) Facilitators	• Language skills • Are participants more big picture or small detail focused? • Story tellers / short answers • Ideas on how to prompt further in upcoming questions • Pace of conversation • Idea of how it's working with the interpreter • Depth and breadth of answer
Next, I am going to be asking more about your experiences in the program, specifically we are going to ask about both		Transition	

the good things and bad things. We hope these answers can help improve the program for future participants if it is able to continue! This is a chance to have your opinions heard to help us improve.			
Positives / facilitators *If positives were brought up in Question 1:* Can you explain more about that? OR Are there any other positive experiences you had? *If positives were brought up in Question 1:* Thank you for telling me about the challenges you experienced, I really appreciate it. Were there any positive experiences you can think of? Can you tell me about them?	What were some things that worked well for you? What felt easy? ➔ What made that good / what made that easy?	Understanding WHY experiences were positive, what made them positive – what facilitated that For the seed – gives some intel into what aspects of the program worked well / stood out to participants Gather more positive experiences, help participants feel like they are able to share	• Aspects of their lives / context • Mechanisms that facilitated positives

Challenges / barriers *If challenges not brought up in 1st Q:* Did you experience any challenges/barriers during the program? If yes, what were they? *If challenges were brought up in 1st Q:* Can you elaborate on ___? Were there any other challenges you experienced? Is there anything you would change anything about the program?	What is it like not being able to communicate with staff in your own language? Did you feel like ordering was difficult or easy? Did you have to throw any foods out? ➔ Did you have the right tools to prepare and store food? ➔ What foods did you tend to throw out? Why those? Did anything not work, or was anything hard for you? Were there other foods you wish were	Understanding more about how participants' individual aspects / social determinants of health (i.e. income, family size, race, culture) impact their experience with the program; how it intersects with their engagement + ability to benefit from the program	• Cultural foods • Language barriers • Family sizes + family dynamics • Resources (i.e. for preparing/storing food, financial resources) • Substance use • Housing situations • Employment

	available/covered by the coupons?		
Transition We are now going to talk a little bit more about your experiences with staff. Remember this won't get back to any staff, any feedback they hear will be anonymous.			
Power Dynamics, Healthcare Providers, and Staff **Individual Level** What were your experiences like with staff in the FFRx program?	What were your experiences on the phone with staff? Was this program helpful in meeting recommendations made by your care providers (i.e. dietitian)?	Power dynamics between the participants and healthcare providers, as well as between participants and program staff	• Power dynamics • Feelings of discrimination

How do you feel your relationship is with healthcare providers at the CHC? Did this change at all through your involvement in the program? **Organizational / systems level** How do you think your experience with the CHC differs from your experiences in other healthcare settings such as the hospital or walk-in-clinics? Have you used other where you get food such as the food bank? How has your experience with the SEED and FFRx been similar or different from those?	Is there a difference in how the staff make you feel? Do you feel more or less dignity through the SEED or through food banks?	Understanding the benefits or downfalls of programs like this being 'medicalized'	• Autonomy • Dignity • Being respected •

** lots will say no to this *If high language skills, can give this context; There is debate surrounding programs like this being linked with a clinic versus stand alone* What was your experience like of being prescribed fruits and vegetables by your doctor? Does it feel similar or different to a typical prescription of medication?			
Autonomy + Decision Making Did you feel you had enough choice? Was the amount of money on the coupons enough?	Do you wish you had more choice on what to use the money on? At any time did you feel pressured to use your coupons?	Autonomy – ability to make own decisions about how best to utilize the program Trying to get at value of food security interventions compared to guaranteed basic	• Autonomy and ability to make own decisions • Feelings of pressure • Dignity • Empowerment

Did you like being provided coupons for fruits and vegetables, or would you find it more useful to be provided a gift card to a store like Walmart or Nofrills? ➔ Or being provided cash?	What did you do with the food – did you share it with others? Did you want the coupons to apply for other foods than just fruits and vegetables? ***Asking about putting kids first	income (proof, Canadian institute for health research)	
Transition Now I want to ask a little bit about how you felt during the program and any changes you experienced.			
Perceived Health + Well-being Throughout the last year, did you notice anything different or any changes in how you were feeling? ➔ Physical or mental or emotional	Were there any other changes? Did you notice any differences in your family?	How this impacted participants well-being Relationship between diet and mental health – or other program	• Financial stress • Family size • Income • Coupons for all foods vs fruits and vegetables • Relations to covid

What were those changes? (Asking more details about them (ie. When, what was the difference)) Why do you think that was? / What do you think led to those changes? Did you change how you think of taking care of your health during the program? it	Did receiving the coupons relieve financial stress? (Did getting the coupons make money less stressful) Why? Did you feel like the value of your coupons were enough to get the fruits and vegetables you needed? ➔ Did this change over time? Did any other aspects of your life change?	factors and mental health How this program interacts with stressors experienced by participants - Did the program help ease stress in participants (i.e. stress about their children, finances, etc) Addressing food costs	
Conclusion Recap major things spoken about Was there anything else you'd like to add before we wrap up?			

Big thank you, reiterate what will happen with results "We will be analyzing all the interview answers for themes and writing a report. Are you interested in getting a copy of the results?" *Member checking* Welcome to provide feedback but not mandatory			

Appendix B: Interview Recruitment Script

In a survey for booking quantitative data, participants will be asked:

Are you interested in being interviewed by an FFRx team member about your experience in the program? This will be scheduled for a different day and can be in-person or over the phone. The interview will take around 1 hour. You will receive an extra $30 coupon to Groceries From TheSEED that can be used on any foods as a thank you for your time.

☐ Yes, I will schedule this in the clinic

☐ Maybe, I would like more information

☐ No

During the clinics, after the conduction of surveys, the verbal recruitment script used is:

I saw you expressed interest in being interviewed about your experience in the FFRx program, this would be conducted either over the phone, or in-person at the Downtown or Shelldale locations of the CHC. The interview will ask questions about how you felt in the FFRx program and your experiences. The data will be used to help improve and grow the program for the future, and will be used for a Master's thesis. This study has been reviewed and cleared by a University of Waterloo ethics board. You will receive a $30 gift card to Groceries from TheSEED as a thank you. Is this still something you are interested in? Would you prefer in-person or over the phone?

Over the phone, if participants did not complete the booking survey:

Are you interested in being interviewed by an FFRx team member about your experience in the program? This will be scheduled for a different day and can be in-person or over the phone. The interview will take around 1 hour. You will receive an extra $30 coupon to Groceries from The SEED as a thank you. The interview will ask questions about how you felt in the FFRx program and your experiences. The data will be used to help improve and

grow the program for the future, and will be used for a Master's thesis. This study has been reviewed and approved by a University of Waterloo ethics board.

Appendix C: Ethics Clearance Certificate

UNIVERSITY OF WATERLOO

Notification of Ethics Clearance to Conduct Research with Human Participants

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Principal Investigator: Warren Dodd (School of Public Health Sciences)

Student investigator: Megan Delamere (School of Public Health Sciences)

Co-Investigator: Matthew Little (University of Victoria - School of Public Health and Social Policy)

Other: Navjot Thandi (Guelph Community Health Centre)

Other: Abby Richter (Guelph Community Health Centre)

Other: Eleah Stringer (University of Victoria)

Student investigator: Ebony Rosa (University of Victoria)

Research assistant: Aiza Asif (University of Victoria)

Other: Thomas Armitage (Guelph Community Health Centre)

Other: Avery Zenker (Guelph Community Health Centre)

File #: 44233

Title: Fresh Food Prescription Project with the Guelph Community Health Centre

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The Human Research Ethics Board is pleased to inform you this study has been reviewed and given ethics clearance.

Initial Approval Date: 05/31/22 (m/d/y)

University of Waterloo Research Ethics Boards are composed in accordance with, and carry out their functions and operate in a manner consistent with, the institution's guidelines for research with human participants, the Tri-Council Policy Statement for the Ethical Conduct for Research Involving Humans (TCPS, 2nd edition), International Conference on Harmonization: Good Clinical Practice (ICH-GCP), the Ontario Personal Health Information Protection Act (PHIPA), the applicable laws and regulations of the province of Ontario. Both Boards are registered with the U.S. Department of Health and Human Services under the Federal Wide Assurance, FWA00021410, and IRB registration number IRB00002419 (HREB) and IRB00007409 (CREB).

This study is to be conducted in accordance with the submitted application and the most recently approved versions of all supporting materials.

Expiry Date: 06/01/23 (m/d/y)

Multi-year research must be renewed at least once every 12 months unless a more frequent review has otherwise been specified. Studies will only be renewed if the renewal report is received and approved before the expiry date. Failure to submit renewal reports will result in the investigators being notified ethics clearance has been suspended and Research Finance being notified the ethics clearance is no longer valid.

Level of review: Delegated Review

Signed on behalf of the Human Research Ethics Board

Joanna Eidse, Research Ethics Officer, jeidse@uwaterloo.ca, 519-888-4567, ext. 47163

This above named study is to be conducted in accordance with the submitted application and the most recently approved versions of all supporting materials.

Documents reviewed and received ethics clearance for use in the study and/or received for information:

file: Certificate of Approval - 21-0060.pdf

file: Draft of Interview Guide.docx

file: Interview Consent Log.docx

file: Information Letter_Interviews.docx

file: FFRx Consent Form_version3_2022.05.17.docx

file: Consent Script_Interview.docx

file: Interview recruitment_Script.docx

file: Appreciation Letter_FFRx_2022.05.10.docx

Approved Protocol Version 4 in Research Ethics System

This is an official document. Retain for your files.

You are responsible for obtaining any additional institutional approvals that might be required to complete this study.