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Exploring Household Food Security and Malnutrition Risk with Psychosocial Indicators of
Healthy Ageing in Place: The Food Train - Eat Well Age Well Partnership Project

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Abstract

In Scotland, and United Kingdom, there are stark inequalities in the experience of older age, particularly for those with limited social contact, poorer health, located in deprived neighbourhoods (Centre for Ageing Better 2015). This mixed-methodology research, reports survey findings with n=169 community dwelling older adults in Scotland (average age 79.5), supported with qualitative interviews to evidence the underexplored connection between food insecurity and physiological risk indicators of undernutrition (malnutrition), with psychosocial indicators of healthy ageing. Findings are grounded in collaboration with a third sector social enterprise – Food Train, who provide food shopping and volunteer meal making for those aged 65+. Findings revealed correlations between food insecurity and early indicators of malnutrition risk with poorer wellbeing, and social connectedness. Supported food access mitigates the negative cycle of food insecurity on mental health, via empowerment (locus of control) over one’s life. Qualitative findings suggest that risks of food insecurity may not be financial (food poverty), or attributable to health realities associated with ageing. Rather, psychosocial health and wellbeing diverge as older adults attempt to draw upon available resources, reflective of their own social capital. Mitigators of malnutrition risk includes empowerment through social care located in the third sector, as well as social aspects of food access e.g. social eating, warranting future investigation. These findings are considered post Covid-19, with key policy implications.

Keywords: Food Insecurity, Older Adult, Malnutrition, Undernutrition, Wellbeing, Social connections, Active Ageing, Third Sector

Introduction

Supporting older adults to promote and extend healthy ‘active’ life years, within an age friendly society at home or in a homely setting (ageing-in-place), requires an inclusive and adequately

resourced health and social care system to meet the challenges arising from an ageing population, (Office for National Statistics 2020; World Health Organisation 2019). Active ageing is a goal, which applies to both individuals and population groups to *'optimise opportunities for health, participation and security in order to enhance quality of life as people age'* (World Health Organisation 2015:12). One area overlooked yet offering clear synergy with 'active ageing' in terms of policy and practice, includes integrated community health and social care provision and involvement of third sector organisations. Partnership approaches, particularly in the provision of social care, play a vital, yet under-researched role, in supporting physiological and psychosocial needs for growing numbers of community dwelling older adults, particularly those classed as vulnerable based on economic, physical or mental health criteria (Scottish Council for Voluntary Organisations (SCVO) 2017).

The population structure in Scotland, and the UK more widely, is ageing rapidly. The proportion of those aged 75+ and the very elderly (85+) are expected to rise by 79 per cent between 2016-2041, making this is fastest growing age group in Scotland (Office for National Statistics 2020). The experience of ageing is likely to be shaped by advantage, or indeed disadvantage, experienced cumulatively across the life-course (Centre for Ageing Better, 2015). A focus on 'social determinants' of health (Marmot 2005), highlight that the greatest inequalities are found where older adults live alone, with little or no regular, meaningful social contact, particularly when they reside in more socially deprived areas, (Centre for Ageing Better 2015). To meet the challenges of an ageing population, The Scottish Government's national strategy for older people articulates a vision for Scotland where *"older people are valued as an asset, their voices are heard and they are supported to enjoy full and positive lives in their own home or a homely setting"* (The Scottish Government 2011:3). More recently,

The Scottish Government (2019) publication; '*A Fairer Scotland for Older People*' identified priority actions to tackle barriers, identified by older people themselves, limiting 'positive old age' such as financial insecurity, planning for life changes, accessing adequate integrated health and social care, and feeling connected to communities.

Evidence suggests that the support available to older adults is falling short of expectations and national commitments to ensure healthy, active, connected and secure ageing (Asenova, Bailey, and McCann 2013; Watkins et al. 2017). Rapid, large-scale austerity measures implemented by the Westminster government since 2010, have necessitated local authorities to implement cuts to health and social services. In order to accommodate these cuts, UK wide research by The Health Foundation (2018) indicates that between 2006-2016, local authority budgets reduced overall 'non-statutory' care for older adults 65+. In Scotland, the previous rate of growth for funding social care has slowed from 3.2% to 1.8%, for NHS and social care (The Scottish Government 2018a). Some of the care duties which now stand outside the statutory social care services, include 'non-personal' care duties such as food shopping, meals on wheels, facilitating attendance at day centres/lunch clubs, laundry and housework. Some of these well known and valued services such as 'meals on wheels' run by the Royal Voluntary Service have been withdrawn after 80 years operating in the community (Third Force News 2018). In order to bridge the gap in social care provision, local authorities and health boards have formed Health and Social Care partnerships contracting various third sector care and commercial support providers to offer a range of assistance that supports the legal obligations of delivering Free Personal and Nursing Care at home (Asenova et al. 2013). The provision of social care through partnerships such as Food Train reflects the increased demand and use of the charitable third sector, where 35% of the activities supported in the third sector in Scotland are community social care orientated (Scottish Council for Voluntary Organisations (SCVO) 2017).

Evidencing the longer term ‘social risks’ associated with the contraction, suspension and/or re-distribution of health and social care services have illustrated gaps in provision for community dwelling older adults (Gray and Barford 2018). In addition, local authorities now have reduced capacity to address inequality and implement policy innovation based on health and social care intervention and prevention across society (Asenova et al. 2013).

Gaining an understanding of ‘ageing-in-place’, and identifying where there may be gaps in health and social care provision, requires an understanding of the ‘material conditions’ faced by older adults (Reher and Requena 2018). These may include financial resources, health realities associated with older age, and the availability of meaningful social connections and ‘social capital’. The concept of social capital (Bourdieu 1984), adapted to health (Putnam 1995), and applied to ageing research (Nyqvist et al. 2016) conveys individual preferences and resources impacting ageing in place. These can be explored in the context of the social relations (family, friends, colleagues) and social connections (links to wider support groups and charitable organisations with a social care focus) in the lives of the older adult. These ‘*bonds, bridges and linkages*’ (Keeley 2007:103) which mobilise community-level action and cooperation, accessed by an older adult, and/or their carer and wider family, requires personal agency to make decisions and address situations which older adults face (Romainoli and Contarello 2019). Agency can be conveyed through that older persons perceived ‘Locus of Control’ (Rotter 1966) they perceive and attribute to their own actions (Internal LoC), to chance, or others (External LoC). The orientation of where an older person attributes control over their life, including their living environment and health is important to capture. In general terms, an internal LoC, rather than external LoC is a positive resource, associated with better self-rated health (Zhang and Jang 2017) and confidence to initiate action to achieve desired goals, also

known as self-efficacy (Jacobs-Lawson, Waddell, and Webb 2011). What remains an issue, particularly in non-clinical, community populations, is when support required by older adults exceed help offered by existing social networks or more formal social care options (Coll-Planas 2016). This is where third sector and social enterprise organisations may ‘fill the gap’, yet older adults are often required to self-direct in the first instance. In addition, health professionals face practical and ethical uncertainty when responding and initiative concerns about issues such as food insecurity for those in their care (Douglas, Machray, and Entwistle 2020). An under-researched issue is where help *is* available for ‘social’ care activities, such as supported food shopping, but is not actively pursued by the older person. This may reflect a diminished ability to assert internal locus of control; to enact decisions, and pro-actively engage with third sector support where available.

Food access, nutrition, and household food insecurity (HFI) are intrinsically linked to the quality, equity and sustainability of active ageing in place, particularly for older adults who live at home. Addressing food access issues which older adults face is considered in this paper as a human rights and social justice issue, where the right and entitlement to nutritious, readily accessible food, within a connected community, is aligned with United Nations Global Sustainable Development Goals (United Nations 2012), particularly *Zero Hunger* (SDG 2), *Good Health and Wellbeing* (SDG 3) and *Sustainable Cities and Communities* (SD 11). However, the right to food is not yet secured in domestic UK policies and is not part of the UK’s Human Rights Act (Human Rights Watch 2019). Incorporating the human right to food within Scots Law is now being proposed through ‘*The Proposed Right to Food (Scotland) Bill*’, Scottish Government (2020). Recent mapping conducted by Urban Roots for the Scottish Government (2020) has found that an estimated 744 organisations are responding to food insecurity in Scotland. FT offers a free meal making service provided by volunteers, however

it is primarily a service that facilitates ease of access to the food system by shopping, delivering and unpacking food within their members homes.

Evidencing the incidence of HFI in community dwelling older adults is challenging, in part due to under representation of this population among food bank members (Douglas et al. 2015). In addition, recruiting a ‘hard to reach’ group of older adults, who may have health impairments, and/or live in socially disadvantaged conditions, presents challenges to ensure accurate representation in health research (Kammerer, Herzog, and Fuchs 2019). Measures of HFI have recently been operationalised in the annual Scottish Health Survey SHeS - The Scottish Government (2018b) reporting a 2% incidence of HFI for adults aged 65+, leading to cautious estimates of 20,725 food insecure older adults in Scotland in 2018. It is likely that this prevalence rate is higher for those older adults facing the greatest inequalities in health, housing and social capital. Smith, Rabbitt and Coleman-Jensen (2017) in their cross-country comparison report titled *‘Who are the World’s Food Insecure’*, has identified five social determinants of adult HFI, including education level, weak social networks, limited social capital, low household income, and being unemployed. These structural barriers to food security, suggest a need to explore HFI beyond financial barriers, which explain much of increased rates of food poverty in the UK for younger age groups, notably single men and young families (The Scottish Government 2018b; The Trussel Trust 2019). This is supported by a secondary analysis of routinely collected household food insecurity data from Scotland (Ejebu et al. 2018). This research yielded four dimensions contributing to adult HFI, in terms of; (i) quantity, and (ii) quality of food, (iii) psychological impacts, and (iv) socially unacceptable food and ways of obtaining food. Adopting a multi-dimensional, biopsychosocial approach to HFI signals opportunities to explore under-researched areas of the latter

dimensions of HFI, as applied to an older adult cohort. In addition, this focus on psychosocial factors and their relationship with HFI offers the potential to uncover more about the *'largely hidden work of coping with food insecurity'* (Douglas, MacIver, and Yuill. 2020 "Discussion" Para. 3), particularly for those with long-term mental and physical health conditions.

People's relationship with food and the nutritional requirements for good health are subject to change across the life-course (Herman et al. 2014). As such, facing HFI as an older adult living at home brings particular physical health risks and vulnerabilities, distinct from younger age groups (Pooler et al. 2019). Older adults often report reduced appetite associated with less desire and motivation to eat (Pilgrim et al. 2015). A range of biopsychosocial factors can affect appetite in older adults (Pilgrim et al. 2015), including hormonal changes, acute illness, functional limitations, anxiety and stress, bereavement and depression. Perhaps most importantly, a lack of opportunities to eat with others and perform meal practices – termed 'social eating' (Nyberg et al. 2018), known to stimulate and maintain appetite (Landi et al. 2016; Nieuwenhuizen et al. 2010). Appetite changes likely contribute to unintentional weight loss, a nutritional risk factor common in the ageing population.

Clinical and epidemiological studies report that 30-40% of elderly adults living in the community are affected by unintentional weight change (McMinn, Steel, and Bowman 2011; Pilgrim et al. 2015) with a five per cent change in weight over six months is considered clinically significant (NHS 2019), although smaller losses for frail or underweight older adults are significant (McMinn et al. 2011). Sustained changes in weight can function as a non-specific but highly clinically relevant indication of underlying illness, psychosocial stress (including bereavement) and disruptions to self-care (Kiesswetter et al. 2020). Conversely, focusing on weight loss may not reveal the nutritional 'health' of the older adult, so caution

extends to how malnutrition and undernutrition is understood and defined, with effort in the UK to adopt the term ‘undernutrition’ in an effort to reposition discourse away from weight alone and to also encompass multifactorial signs and symptoms (BAPEN 2020; European Nutrition for Health Alliance 2006; Stratton, Smith, and Gabe 2018).

An estimated 3 million adults are undernourished in the UK (NICE 2017), and around 1 in 10 older adults (aged 65+) attending their GP exhibit clinical signs of undernutrition (BAPEN 2019). Recent research by Murphy, Aburrow, Guestini, Brown and Wallis (2020), using the newly validated Patients Association Nutrition Checklist has reported ‘risk’ of malnutrition in community dwelling older adults to be as high as 22%. Malnutrition/ undernutrition in an elderly population has been described as a ‘multifactorial failure to thrive’ (Evans 2005), impacting on older adult frailty through muscle wasting and cognitive impairment, leading to increased risk of falls, and disruptions to completing typical daily tasks such as buying or preparing food (BAPEN 2011; European Nutrition for Health Alliance 2006; Roberts et al. 2019). Many early symptoms of undernutrition, including fatigue, feeling cold, frailty, getting thinner, poor concentration and decision making, can be incorrectly interpreted as inevitable signs of ageing among clinicians and older adults (European Nutrition for Health Alliance 2006; Guest et al. 2011; Malnutrition Task Force 2017). Issues of older adult undernutrition remain concealed behind healthy ageing policies and public health discourse where nutrition, diet and weight is synonymous with public health concerns over obesity and weight loss management (Malnutrition Task Force 2017; Pilgrim et al. 2015). In addition, the representation of malnutrition is subject to strong culturally held norms, typically represented within public discourse as extreme underweight and hunger, prevalent in low- and middle-income countries (Fanzo 2019). However, malnutrition or ‘undernutrition’ has the potential to develop in any country, community or home where there are health inequalities, deprivation

and acute public health crises. This has most recently been demonstrated as a result of the Covid-19 pandemic, which has accelerated HFI across populations in Scotland (Scottish Human Rights Commission, 2020) with specific concerns for older age adult health and nutrition (Age UK 2020; The Association of UK Dietitians 2020).

Exploring how food is selected, accessed and prepared reveals the quality of the food system that surrounds the older adult. Day and Jackson's (2017) multi-stakeholder review of nutrition and health, includes concerns over older age malnutrition, stating that nutrition is not simply a matter of diet (energy, macronutrients, vitamins, minerals etc.) but is inclusive of the adequacy of the food system '*created by the family and community and incorporates the complex social systems and interactions that influence lifestyle choices*' (14: 2017). Third sector community-based food services for older adults, including those offered by FT, offers an under-researched role in supporting access to the food system and wider social care needs for those ageing in place. Food Train's involvement is in preventative, personalised social support, realised through their shopping delivery and volunteer meal makers service. In addition, they are at the forefront of raising public awareness of HFI and undernutrition among older Scots through their campaigning project 'Eat Well Age Well'.

There is a research gap in assessing HFI and malnutrition (undernutrition) risk within community populations who are underrepresented in health research and statistics in this area. This research also offers much needed UK (Scottish) primary data to compliment previously secondary data analyses which did not include psychosocial factors in relation to food insecurity and risk of malnutrition (Ejebu et al. 2018) The present research, therefore, evaluates the cycle of physical, social and psychological health factors, particularly the role that food insecurity, and food services mitigating such insecurity, impact upon adults as they

age in their communities. Further, impacts of socio-demographic factors such as gender, living alone and area of deprivation are considered in context of HFI and risk of undernutrition.

Research Questions

Q1) What is the relationship between household food insecurity, physiological (risk of malnutrition and BMI measures), and psychosocial indicators (wellbeing, social connectedness and locus of control)?

Q2) What differences exist between those who are receiving food support services from Food Train and those who do not receive any food support services, in terms of their 'material conditions' (*health status as well as demographic factors*) and social capital (*social support, locus of control*) and wellbeing (including loneliness).

Q3) What are the experiences of Food Train members in relation to food access, and nutrition and the role of food services in their lives and how do these experiences contribute to our understanding of the risk factors involved in developing food insecurity and risk of malnutrition for older adults.

Method

Participants

169 community dwelling older adults provided informed consent and were included in the analysis (aged between 58-98). Participants were recruited from a range of geographical and sociodemographic locations in Scotland where FT currently operates (across seven local authorities). As can be seen in Table 1, of this total sample, N=55 (33%) received supported food access via shopping deliveries from FT.

Table 1 Demographic Variable, Health and Weight

Variable	Response	n	%
Gender	Female	130	77%
	Male	39	23%
Living status	Live Alone	120	71%
	Partner	28	17%
	Child	15	9%
	Other	5	3%
Health status	Very Good	27	16%
	Good	53	31%
	Fair	55	33%
	Poor	21	12%
	Very Poor	11	7%
Disability Status	Yes	118	70%
	No	46	27%
Food Train delivery	Yes	55	33%
	No	106	63%
Meal Prep	Prepare Hot Meals Myself	116	69%
	Friend or Family	19	11%
	A Carer	21	12%
	No Hot Meals	3	2%
SIMD Quintile	Least Deprived	39	23%
Deprivation of Area	Most Deprived	31	18%
Ethnicity	Asian	10	6%
	White	153	91%
	Mixed/other	4	3%
BMI	Underweight (<20)	8	4.7%
	Normal (20-24.99)	51	30.2%
	Overwt/Obese (25-29.99/ 30-39.99)	54/41	32.%/24.3 %
	Severely Obese (>40)	15	8.9%
Age	79.51 (Mean)	8.15 (SD)	58-98 (Range)

Design

This study used a mixed-methods, cross-sectional design. Quantitative survey data was obtained from a community sample with and without access to food support, with an additional sub-sample of semi-structured interviews. The study design and selection of standardised

health and wellbeing measures for the survey are detailed below, and were developed with involvement of a multi-stakeholder group encompassing; 1) Food Train, 2) the Eat Well Age Well Stakeholders Group, made up of health and social care professionals and volunteers, and 3) older adult pilot group. The research project was granted full institutional ethical approval. The Food Train is a social enterprise and registered charity that supports older adult access to food through its shopping and meal making services where their members pay for their own food shopping to be delivered to them by community volunteers for a nominal fee of £5.

Survey Instruments and Measures

A self-report survey (including objective measurements of height and weight) was developed to incorporate a range of validated measures. The Locus of Control (LoC) measure was taken from the Adult Social Care Outcomes Toolkit. These measures had been used in community settings with older age adults as recipients or participants. Inclusion was informed by theoretical and research considerations considered central to gaining an understanding of the issues facing older age adults in this area. Practical considerations including burden on research participant meant that whenever possible, validated short form versions of longer measures were selected.

Demographic questions included: age, gender, ethnicity, marital, employment, caring, housing & living statuses; and self-reported health and disability variables. Scottish Index of Multiple Deprivation (SIMD) was assessed by obtaining participant postcode.

1) Malnutrition Universal Screening Tool – MUST, (BAPEN 2011); - taking objective height and weight measures, and self-reports of weight three-six months ago, whether experiencing acute illness in last week and if weight had fluctuated in the last six months. Data collected was used to calculate Body Mass Index (BMI), a commonly used classification whether a person is a healthy weight for their height and categorised in Table 1.

2) Patients Association Nutrition Checklist – PANC (Murphy et al. 2020; Patients Association 2018); a 4-item checklist, to assess early risk of and contributory factors to undernutrition/Malnutrition, using items including “Are you or your family concerned that you may be underweight or need nutritional advice?”, with higher scores (0-5) indicated greater risk. Section B assessed social, physical or appetite factors that may contribute to undernutrition, like eating difficulties.

3) Food Insecurity Experience Scale - FIES (Food and Agriculture Organisation 2014); an 8-item self-report to measure the multi-dimensionality of food insecurity, including food access, availability, and use. Respondents’ answered how often they experienced items related to food insecurity during the last 12 months, including “[How often were] you worried you would run out of food because of a lack of money or other resources”

4) Short Warwick-Edinburgh Mental Wellbeing Scale – SWEMWBS (Stewart-Brown et al. 2011); 7-item wellbeing scale. Items such as “I’ve been dealing with problems well” assessed wellbeing over the prior two weeks, using a 5-point Likert response scale. The WEMWBS is used in the Scottish Government’s Scottish Health Survey.

5) UCLA3 Loneliness Scale - UCLA3; (Hughes et al. 2004); 3-item self-report scale that measures feelings of social isolation (1= “hardly ever to 3= “often”). Items included “How often do you feel that you lack companionship”.

6) Duke Social Support Index - DSSI; (Koenig et al. 1993), measures on two factors SS1) number of social contacts in the last week and SS2) assesses the quality of social relationships with items like “Do you feel useful to your family and friends (people important to you)?” on a 3-point scale (1= “hardly ever to 3= “often).

7) Locus of Control (LoC) was measured using the Adult Social Care Outcomes Toolkit – ASCOT; (Towers et al. 2015) to measure the participant’s attributions of control (indicative of agency) in their daily life. There are four responses scaled from feeling more to less internal LoC, from which participants could select one: “I feel in control of my daily life”; “Services help me to feel in control of my daily life”; “I have some control over my daily life, but not enough” and “I have no control over my daily life”.

Qualitative Data

Qualitative data was obtained from semi-structured interviews with 15 older adults (69-89 years). More in-depth analyses will be presented in a subsequent publication (Reid and Lido n.d. In Preparation). However, for the purposes of triangulation with the quantitative data, the interviews will focus on areas related to food access such as; a) preferred food preparation and access methods, b) perceived enjoyment of food, c) perceived barriers to food access, d) meaning of food. The data was transcribed verbatim and analysed according to the six step analysis procedure detailed by (Clarke and Braun 2013). We have found it useful to include a

representative cross section of tabulated qualitative evidence to bridge between the quantitative outcomes and qualitative lived experiences derived from the study.

Procedure

Full piloting of the proposed survey took place prior to field work. A total of n= 41 individual site visits were made by the researchers to enable data collection. These sites were geographically diverse involving both rural and urban locations and diverse in ‘place’; inclusive of participants homes (including home bound adults), day centres and lunch clubs and a catered ‘afternoon tea’ (with free transport) held in a community venue which enabled more rapid, incentivised data collection. There was also an option to receive the survey by post. Key contacts aligned to the day-to-day running of the FT service (regional managers) as well as involvement from other Third Sector contacts including; The Red Cross, The Cyrenians and Wing Hong Chinese Elderly Centre, ensured that we maximised purposive sampling opportunities. The challenges of recruitment of older adults, particularly those who are very elderly, infirm and from lower socio-economic backgrounds were mitigated through the application of the TiBAR model of recruitment (Kammerer et al. 2019). These were 1. build up Trust, 2. offer Incentives (such as our ‘afternoon tea’), 3. identify individual Barriers and 4. be Responsive (TiBaR).

Through Eat Well Age Well networks, we made initial contact with prospective lunch club organisers, and/ or individual participants to arrange a research visit (when visiting at home). Data was collected by pairs of trained researchers. The participants were encouraged to involve

a friend and family member should they wish not to be interviewed alone, however interviewers worked in a minimum of pairs to deliver the survey verbally, and at least one researcher in the group was PVG-checked for safety. The procedural steps were inclusive of; 1) Gaining informed consent after the participant information sheet was read aloud by researcher or read by participant, 2) measuring weight and height following the survey, if it was deemed physically safe for the participant to do so, 3) completion of survey with researcher support if required (e.g. reading aloud), 4) interviewing participants who had shown willingness to extend their involvement in the research 5) a de-brief and ‘check-in’ with participants to advise (verbally and with leaflets) for follow-up help should issues such as food insecurity and loneliness etc arise. All procedural steps were individualised to the needs and wishes of the participant, including the right to withdraw from the study at any point. In addition, basic cognitive checks (asking what day it was, what country we live in) were initiated at the start of the data collection to ensure that the prospective participant was able to provide informed consent. The survey could take between 10 minutes to 40 minutes to complete, depending on the individual circumstances of the participant.

Analysis

Descriptive statistics (Table 1) indicated that we reached an elderly (Mean age 79.5 SD:8.5), mostly female (77%) sample living at home alone (71%) from diverse socio-economic areas. The health status of this sample was diverse. The majority of the sample indicating ‘fair’ to ‘good’ health with 7 per cent indicating that their health was very poor. However, though health status was rated in positive terms, 70 per cent of the sample were indicated they were living with a physical or mental health disability. The nutritional and food access realities of the sample were also heterogenous; 69 per cent of the sample preparing hot meals themselves

with a small percentage indicating that they never prepared hot meals (2%). Additionally, supported meal making was evidenced by 25 per cent of the sample who indicated that friends, family or a carer prepared meals. Overall, 55 participants (33%) were in receipt of FT services. BMI measures indicated that the sample was representative of the wider older population, with most participants in the upper range of normal to overweight. Just under five per cent of the sample were recorded as ‘underweight’ through assessment using the MUST. However, we draw attention to the wider indicators and early indicators of undernutrition/malnutrition recorded through the PANC screening tool which may be more useful to highlight early signs of malnutrition in community samples

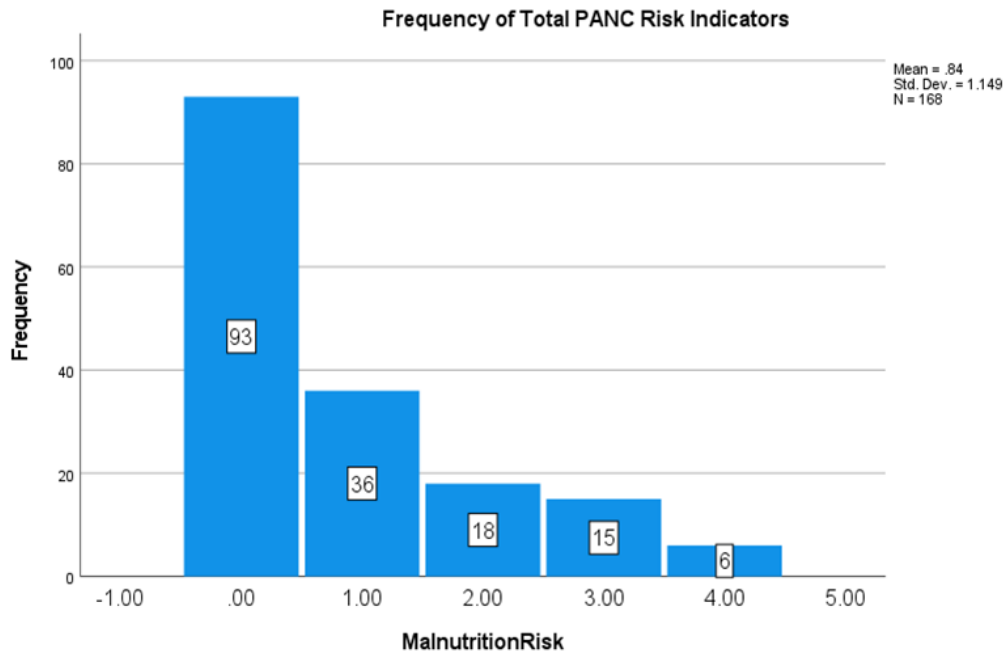
In terms of HFI, 88.8% of the sample reported being food secure (that is indicating ‘no’ for all 8 food insecurity items), and a cumulative total of 95.60% indicating 1 or below indicators of food insecurity. This leaves the remaining 4.4% with moderate (3)- severe (8) food insecurity. In terms of Malnutrition risk, the percentage of respondents indicating yes on any of the four risk factors was overall was 44.6% (n= 75) of the valid sample (n=168)- spread across risk indicators as indicated in Table 2. This means 55.4% reported no malnutrition risk (including don’t know responses). 32.1% of the sample scored low-moderate risk (answering yes to 1 or 2 items), with 12.5% of the sample scored in the moderate-high risk zone (answer yes to 3 or 4 items). See Figure 1 for breakdown of frequency for culminative risk for the sample. Although this cannot be compared directly to prior research, such as Murphy et al.’s (2020) estimate of 21.7% of their sample at risk, namely because as we did not include ‘don’t know’ answers along with yes indicators as they did (due to validity reasons). Our sample still appears to be high for a community sample, when considering our more conservative estimate is more than double the Murphy et al. (2020) figure. Therefore, although food insecurity (largely

surrounding economic factors) indicated globally lower percentages, malnutrition risk was higher than expected based on Murphy et al. research.

Table 2: Frequency of Malnutrition Early Risk Indicators for Sample Using PANC measure

Risk Factors on PANC	% of sample (168 valid)	N
Family Concern (Item 1)	15.5%	26
Unintentional Weight-loss (Item 2)	19.6%	33
Loss of Appetite/ Interest in Eating (Item 4)	22.0%	37
Rings Looser (Item 3)	26.8%	45
Risk Factors % of Sample	55.4%	93
YES to one or two Risk Factors (Low-Moderate Risk)	32.1%	54
YES to three or four risk factors (Moderate-High Risk)	12.5%	21
Overall at risk (= Yes to any)	44.6%	75
Over no risk (=No/Don't Know)	55.40%	93

Figure 1: Frequency of Total PANC Risk Indicators (Culminative Risk)



Normality checks of the data indicated that most of the computed dependent variables, outlined under measures above, were found to have non-normal distributions (Shapiro-Wilkes $p < 0.05$), and cell sizes between Food Train and non-Food Train members were largely unequal (55 versus 106 valid). Excepting, social support and wellbeing, which approximated normal distributions on a histogram fitted with normal curve, and SIMD which was distributed largely normally with slight negative skew (more participants than expected in the most deprived decile). Therefore, it was decided to employ non-parametric inferential statistics unilaterally, which are presented below.

RQ1) In order to tests the relationships between psychosocial wellbeing and connectedness as we age, and as related to food security and nutritional measures, correlations were run for our Scottish sample of older adults. Ageing correlated (weakly and negatively) with less food insecurity [Age with FIES $Rho(167) = -0.188$, $p = 0.014$], and lower BMI, but less deprivation

[Age with SIMD; $Rho(129) = 0.256, p = 0.003$] meaning the oldest adults were less likely to live in deprived areas. When running non-parametric equivalents, the relationship with wellbeing was no longer significant at $Rho(167) = 0.133, p = 0.086$, but in the predicted direction, older age with lower wellbeing.

As regards RQ1, Table 3 illustrates that for our older adult community sample, Wellbeing (SWEMBS score) significantly correlated in the predicted direction with other psychosocial variables, that is with lower levels of Loneliness reported ($p < 0.001$) and greater levels of Social Support (both variables $p < 0.001$). Furthermore, significant relationships were found for Food Insecurity and Malnutrition Risk (both moderately strong, and negative in direction $p < 0.05$), meaning higher levels of food-related risk factors were associated with lower levels-of wellbeing.

Finally, Locus of Control was also significantly related to Wellbeing ($p < 0.05$), such that greater Wellbeing was associated with greater self-reported control over one's life. Physiological measures of BMI were unrelated to Wellbeing ($p > 0.05$), as was neighbourhood deprivation ($p > 0.05$).

Table 3: Correlations of Wellbeing (SWEMBS) with Psychosocial and Food-Related Variables

(n=169)

Variable	Loneliness	SS1 (i)	SS 2 (ii)	Malnutrition Risk	HFI	LoC
Spearman Rho (169)	-0.443**	.352**	.526**	-.310**	-.231**	-.382**
*p<.05, **p<.01						
(i) SS1: Social Support (Number of Contacts Made)						
(ii) SS2: Social Support (Quality of Social Contacts)						

As regards community sample correlations with older adults’ risk of malnutrition (as assessed by total PANC score), Table 2b. illustrates such risk was significantly correlated with lower Wellbeing (as above), greater Loneliness, less report Social Support (both measures), greater Food Insecurity and a more external locus of control, that is less empowerment over one’s life (all $p < 0.05$).

Table 4: Correlations of Malnutrition Risk (PANC) with Psychosocial and Food Related

Variable	Wellbeing	Loneliness	SS1 (i)	SS2 (ii)	HFI	LoC
Spearman Rho (169)	-.310**	.264**	-.196*	-.183*	.159*	.258**
*p<.05, **p<.01						
(i) SS1: Social Support (Number of Contacts Made)						
(ii) SS2: Social Support (Quality of Social Contacts)						

To explore the directionality of these relationship more fully- that is to specifically explore the risk indicators for malnutrition impacting upon psychosocial health, the non-parametric equivalents of an unrelated t-test, Mann-Whitney U tests, were run on PANC indicators, and

difference emerged for those at early risk of malnutrition due to family concern around weight loss (PANC item 1), indicating lower rank means for Wellbeing [for SWEMWBS U(166)= 1406.500, Z= -1.887, p= 0.05] and Loneliness [for UCLA U(166)= 2315.500, Z= 2.191, p= 0.03]. In addition, those at more risk of malnutrition on this variable, had higher rank means for experiencing Food Insecurity [for FIES U(167)= 2108.500, Z= 2.095, p= 0.04], as well as lower BMI [for BMI U(161)= 1013.000, Z= -3.243, p= 0.001].

Further evidence was revealed by PANC item 3, indicated rings becoming looser, indicated significantly lower rank means for Wellbeing [for SWEMBS U(166)= 2000.000, Z= -2.570, p= 0.01], and lower average social contact over the past week [for Duke SSI1 U(167)= 2236.000, Z= -1.924, p= 0.05], but greater rank means for loneliness [for UCLA U(166)= 3453.000, Z= 2.623, p= 0.009].

The final risk factor for malnutrition is loss of appetite or interest in eating (PC4) and yields stronger findings in terms of difference on psychosocial indicators, but also food insecurity and BMI (as would be expected). Those at nutritional risk on PANC item 4 revealed an association indicating lower rank means for Wellbeing [for SWEMWBS U(166)= 1298.000, Z= -4.134, p< 0.001], Loneliness [for UCLA U(166)= 3275.500, Z= 3.673, p< 0.001] and Social Support [for Duke SSI1 U(166)= 2499.500, Z= -2.348, p= 0.019] in terms of social contact over the past week. In addition, as with the first indicator of malnutrition risk, the last also supports that those at more risk of malnutrition revealed significantly higher Food Insecurity [for FIES U(167)= 2773.500, Z= 2.437, p= 0.015].

Taken together, the non-parametric tests above yields evidence of the co-relational nature of physiological risk factors, such as indicators of malnutrition risk and food insecurity with poorer psychological health, and weaker social connections, and there is initial (n.s) evidence that such malnutrition and psychosocial risk factors (e.g. on PC1) may be associated not just with malnutrition risk but evidenced in lower BMI.

RQ2) In order to test the differences exist between those who receive weekly services from Food Train, and those who do not receive any food support services, Mann-Whitney U-tests were again employed to explore simple differences between these two groups (Food Train members and non-Food Train members), and indicated differences in means (i.e. stochastic likelihood of mean differences) between the two groups in terms of social support [for Duke SSI2 $U(160)= 3482.500$, $Z= 2.045$, $p= 0.041$], whereby Food Train members, in need of food support services, reported weaker overall social support.

The Locus of Control variable was analysed using Chi Square, in a cross-tabs design in order to best take into account differences between empowerment over one's life versus empowerment over one's life with the help of services, and significant differences were found, $\chi^2(3, 150)= 20.434$, $p< 0.001$, such that Food train members were less likely than their peers to say they felt empowered with control over their lives (generally) but were more likely (than their peers and expected counts) to say that they felt empowered over their lives due to the use of social services, specifically that '*Services help me to feel in control of my daily life*'. There does not appear to be Food Train/ non-food train differences for those who report feeling disempowered (with some or no control over their lives).

These findings taken together are interesting, as it appears despite being at greater nutritional and psychosocial risk (indicated by malnutrition risk being associated with poorer social outcomes overall, and poorer social support for Food Train members particularly), Food Train members are reporting greater empowerment over their lives due to such services, demonstrating service potential to combat loneliness, isolation and protect mental health.

No significant differences emerged between Food Train and non-Food Train recipients on nutritional variables- of(mal)nutrition and food access, nor on measures psychological measures of wellbeing and loneliness. These non-significant findings may further support the success of active members of such services, as they appear no more nutritionally at risk than their non-service receiving peers. It is worth noting, there were no differences between the Food Train and non-Food Train groups in terms of living alone, nor deprivation (unexpectedly), and no gender differences emerged within any of the above analyses- perhaps due to the dwindling cells sizes (especially in Food Train customers).

Food Train members did report poorer overall health [$U(159)= 1911.000$, $Z= -3.654$, $p< 0.001$], which is perhaps a catalyst for initiating contact with such services. Equally they report feeling less control over their lives in general than those not in receipt of such food support services. Yet, Food Train members were more likely to say that services helped them maintain a sense of control over their lives ($p<.001$), indicated the empowering older adults is one mechanism by which food train can mitigate against the negative mental health impacts of food insecurity and reduced physical health in ageing.

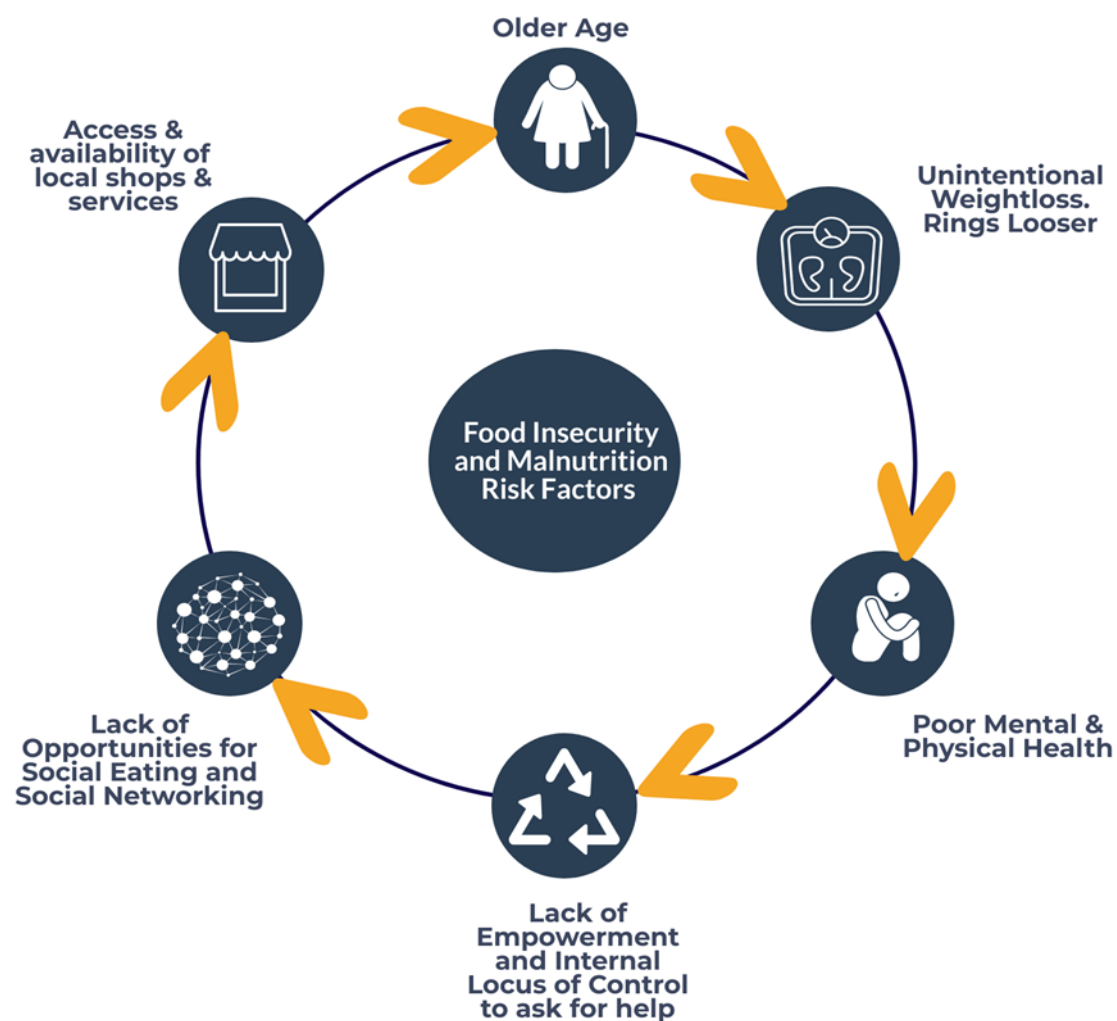
RQ3) Qualitative analysis from interviews conducted with existing Food Train members explored the ‘lived experienced’ around their relationship with food, food access and social eating more widely, and a partial summary is presented in Table 3 which helps to inform triangulated story of risk factors (Figure 2). A fuller analysis will be reported in follow up academic outputs (Reid and Lido n.d. In Preparation). However, Table 5 illustrates indicative overarching themes, organising themes and sub-themes with illustrative quotes, outlining barriers and bridges to maintaining independence as one ages at home.

Table 5: Thematic Summary of Food Access and Nutrition for Older Age Adults

Super-ordinate Theme	Organising Theme	Sub Theme	Indicative Quote
Perceived barriers to food access & nutrition	Intra-personal barriers	<i>Wellbeing, motivation & control</i>	<i>people have been very good, but uh, it can be a thing, and aye and anxiety sometimes you know uh, I've not got the energy to go across the town and get some messages [food shopping]</i>
	Inter-personal barriers	<i>Social networks & social eating</i>	<i>it was different when ma husband was alive, I liked if he said, "Well I've enjoyed that"you know, if you cooked something but now {pause} it doesn't matter</i>
			<i>this spiral of, "Ach ah can't be bothered eatin' it's just fer me", an' "there'll be nobody comin' round", so a don't need to cook fer anyone else</i>
Societal, structural barrier	<i>Stigma, changing society & loss of high street</i>	<i>Now where I live, um, we've had both a butcher and a fish shop close</i>	
Facilitators to access food support services	Bridging the social gap	<i>Support losses</i>	<i>I think most people now, if they can get in touch with the right people or organisation, yer, Food Train, they should be able to eat well if they can afford it... but I still think there are people out there who just, maybe depressed, on their own, can't be bothered</i>
		<i>Cuts to statutory services</i>	<i>They [carers] used to have two hours to each client, if you get one you don't know, they're in an' out like a yo-yo</i>
	Maintaining independence	<i>Maintaining meaningful social contact via food support</i>	<i>she brought me fishcake, which was haddock and salmon with chilli in the centre, you know, like these chicken things that have got- Kiev or something, in the middle... so, she introduced me to that, and a nice salad, and [the meal maker] is only a young lady! ah thought she'd be an old lady in a tweed suit</i>
		<i>Supporting independent home-living</i>	<i>he'd say [son] "Any time you need anything phone me", but ah'm no a person to bother somebody, so that's where, Food Train comes in</i> <i>Ah just like mah independence, 'cause I've got, kinda like, so you know that I always have a meal in [from meal maker service]</i>

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Figure 2: Cycle of Risk for Undernutrition and Household Food Insecurity for Older Community Dwelling Older Adults



The triangulated findings, from survey analyses and qualitative interviews, reveals an integrated picture of the biopsychosocial constructs highlighted as having direct association with HFI and malnutrition/undernutrition. This integrated picture emphasises the need to

understand how barriers to food access are influenced by the health realities of the older person. This includes *growing older*, facing changes to *physical health* (including *unintentional weight-loss*) and experiencing *poor mental wellbeing* (evident in a lack of desire or motivation to shop and cook), especially when food consumption is no longer paired with social interaction (*social eating* opportunities – qualitative finding). It is important to recognise how the older person is negotiating and engaging in decision making, and how their *locus of control* enables or hinders their ability to find and access suitable services within their local *community*, including deciding if and when to draw on family support networks for assistance (both qualitative and quantitative finding). Not all older adults will choose to utilise more intimate family networks to meet their food access needs and may prefer to involve social care partnerships who can facilitate access to the wider food system from home to protect their independence. However, our work highlights the importance of wider screening of community samples. Although acute illness must be ruled out, tools such as the PANC have allowed a wider understanding of how early indicators signalling risk which extend beyond BMI and food insecurity, tie into negative psycho-social outcomes.

Discussion

This mixed-methods research explored a range of physical and psychosocial risk factors facing older adults who live at home in Scotland in the context of food access and nutrition (risk of malnutrition/undernutrition). We offer new insights into the role of third sector food support services facilitating food access and social contact within a personalised, community-based approach. We were able to reach a very elderly sample, average age nearly 80, spread across geographically diverse locations in Scotland. Despite a normally distributed BMI and low

levels of food insecurity, they nevertheless reported higher levels of malnutrition risk indicators than expected from comparable research (Murphy et al. 2020). In addition, age was correlated (negatively) with BMI, indicating that ageing was indeed associated with weight loss in our sample. Around one third of the participants were receiving support to cook at home via several connections including friendship, family ties, and social care networks, including FT. Survey results revealed a picture whereby ageing was linked with poorer psychosocial outcomes, as with food-related insecurity and malnutrition risk variables. Particularly malnutrition risk factors measured through The Patient Association Malnutrition Checklist (Patients Association 2018), such as family concern over weight, and unintentional weight loss indicators (RQ 1). We did not find rates of undernutrition as high as 1 in 10 as has been previously reported (BAPEN 2019), nor indicators of food insecurity due to financial concerns including area of deprivation (SIMD). However we did however find indicators of malnutrition (undernutrition) risk for nearly half (44.60%) of the sample reporting at least one early physical malnutrition risk indicators, which were then associated with further psychosocial risk factors. Although caution must be used given differences in how the tool may be used for those selecting to take part in our research and those visited by healthcare professionals ‘in the field’. We may never have a clearly standardised indicator of either prevalence or risk of malnutrition, other than in carefully controlled clinical settings (which presently has no global guidance for baseline data gathering). This is largely because when working with vulnerable older adults in community settings, issues around malnutrition and under-nutrition are difficult to quantify. Yet indicators, such as PANC, able to be administered a range of health and caring professionals, offer an excellent opportunity to screen more widely in the field, and for healthcare-related professionals (and volunteers), to open conversations for those who are at risk and signpost to support, thereby intervening at an early stage. Our high levels of malnutrition risk indicate that such short and simple tools, such as those advocated by Murphy et al. (2020) are much needed

outside clinical settings, offering great potential for use in community screening for social isolation as well as malnutrition risk.

We report that Food Train members displayed poorer physical outcomes in comparison to those not in receipt of food support services (RQ2), including being more likely to identify themselves as having a disability. However, this group have been able to take action, independently, or more likely supported through their networks, to access food access support through available social care partnerships. Furthermore, non-parametric Mann-Whitney U-test points to the role of food support services, such as shopping delivery and meal making, as potentially mitigating against these poorer outcomes for those facing food insecurity and malnutrition risk, as when compared with those not utilising food support services, FT members were more likely to report that services (FT) enabled them to feel more in control over their lives.

Ultimately empowerment (LoC) emerges as a protective factor, associated with greater wellbeing and reduced food insecurity. Utilising social care support services to enhance personal control, seems a powerful variable for disrupting the food insecurity-malnutrition risk-negative psychological and social outcomes 'cycle'. Thus 'feeling in control' and 'utilising services to feel in control' enabled older persons to take advantage of the *'bonds, bridges and linkages'* needed for healthy ageing embedded in place (Rimaioli and Contarello 2019). Unlocking valuable social capital in the form of networks, contacts and social skills acquired over one's life course (Nygqvist et al. 2016) to access what may be available in the community, often depends on active, self-directed referral for access. These findings concur with those reported by Voluntary Health Scotland (2017) whereby older adults, particularly those with

multiple morbidities and those nearing the end of their lives, can realise the biggest quality of life improvements with the support of integrated health and social care. Social care that reaches into the homes of vulnerable adults through trusted social networks and community linkages, is necessary, where there may be psychosocial barriers inhibiting self-initiated referral.

The recently completed mapping exercise by Urban Roots (Scottish Government, 2020), found that relatively few organisations responding to food security enabled food access to adults in their homes [e.g. through delivery of food shopping (12%) or hot meal delivery (2%)]. Most organisations orientated food access through attendance at clubs and external venues (46%). Many participants in our sample improved their access to food through connections to lunch clubs and engagement with social networks. Despite these resources, malnutrition risk persists, and such risk is linked with a host of not just physical, but psychological and social risk factors, potentially spiralling with age. However, empowerment with social eating opportunities is one mechanism by which the cycle can be broken, and Food Train, emerged as a potential vehicle through which physically vulnerable adults can feel more in control as they age in place at home. Therefore, we argue more research is required to explore the role of personal agency (inclusive of control and empowerment) in enabling vulnerable older adults who are facing inequalities in health and wellbeing to maximise their independence at this stage of their lives. It is important to situate the needs of the older adult within a dialogue that also takes into account their own capacity and confidence to make their own decisions about when and where to ask for help to complete essential daily tasks of living such as food shopping and meal making.

It is important to equip and connect a range of health and caring professionals with the necessary discourse to feel confident to speak about issues of food insecurity which may be health limiting for vulnerable groups (Douglas, Machray, et al. 2020). Online spaces for healthcare practitioners and those with roles in supporting the third sector would enable the exchange of knowledge about the use of screening tools and avenues of support for non-clinical (community) screening in the UK. However, the ultimate safety net of rights based legislation does not (yet) exist in Scotland or in the UK which offers statutory protections for the right to food. The Scottish Human Rights Commission, (2020) has produced a briefing report on the Right to Food in Scotland during Covid-19 which reinforces that food access continues to be distributed inequitably in Scotland. The newly committed Good Food Nation Bill (The Scottish Government 2014) - *currently paused, awaiting introduction following emergency Covid-19 legislation*, commits to transition Scotland to a fair, healthy and sustainable food system by 2025. However, it has been highlighted that this Bill does not go far enough to secure the right to food for Scotland's most vulnerable communities (Scottish Government 2020). We await the much-needed Right to Food (Scotland) Bill (Scottish Government, 2020) and the Good Food Nation Bill (The Scottish Government 2014) in order to better align with United Nations Global Sustainable Development Goals, particularly Zero Hunger (SDG 2) (United Nations 2012).

The survey findings, complemented by qualitative experiences which were integrated to present a cycle of risk (Figure 2). This cycle begins to reveal a more in-depth story, which we will continue (Reid and Lido n.d. In Preparation), to illustrate the barriers and mediators necessary for secure food access. These findings support previous research which recognises that the adequacy of the food system is best understood as being created across complex social systems and interactions that influence lifestyle, including eating practices (Bennett et al. 2015;

Day and Jackson 2017). For instance, solitary eating practices were used to explain why restrictive meal preparation practices were adhered to, due in part to having fewer opportunities to benefit from preparing food for others and consuming food in the company of others (social eating) as previously highlighted in the research by (Landi et al. 2016; Nieuwenhuizen et al. 2010). This food insecurity and malnutrition risk cycle (Figure 2), offers a basis to inform more statistically powerful designs of primary research or, as well as frameworks for national exploration and linkage to secondary data such as SHeS.

We have highlighted policy and practice implications of our research, however we further offer the academic and healthcare related fields variables of interest when exploring food insecurity and malnutrition risks, particularly with community samples. Namely, attributing HFI to a lack of financial resources alone, may conceal the role of psychosocial factors such as agency, decision making and help-seeking for older adults who are facing HFI, particularly those living alone, who may be socially isolated. This finding concurs with qualitative research by NHS Scotland (2015) where 25 key informants, across a range of health and social care services, reported that some of their older age clients had nothing to eat in the house, were more likely to deny they had a problem with food access than younger clients, and importantly, were refusing food bank referrals. Likewise, our research has perhaps offered more ‘indirect’ than ‘direct’ links between food insecurity and mental health, exploring more nuanced ways that older adult's relationship with food alters as they age in place, often alone at home, diverging from economic models of food insecurity. It is worth considering that the foregrounding of ‘financial’ barriers (*because of money or other resources*) in how food insecurity items are measured using the United Nations Food Insecurity Scale – FIES (Food and Agriculture Organisation 2014), may also implicitly under emphasise Ejebu et al.’s (2018) call to

psychological and social factors, which the older adult may be facing as they try to access a sustainable, enjoyable, supply of nutritious food.

Social determinants of health, such as perceived social support and locus of control, as well as structural barriers in society, such as the under-funding for social care initiatives, are equally important to capture. Financial concerns, or deprivation did not emerge as a strong indicator of food insecurity in our survey work, nor qualitative findings. Food poverty does not wholly explain why older adults face food insecurity issues. This finding concurs with review of human nutrition and human health research by Day & Jackson (2017), which highlights that in order to fully understand how and why nutrition and food access may be inadequate; it is necessary to understand the complex social systems and interactions that influence lifestyle choices. This also extends to how to best survey HFI for older adults, if it is the case that the FIES is only offering a partial picture in national surveys (e.g. SHeS).

It is necessary to invest in the development of social networks and community partnerships available to older adults, integral to support participation with their 'food system'. This need extends to improving opportunities for social eating (Vesnaver and Keller 2011) through community initiatives supported in the Third Sector such as volunteer-led meal making which can offer social contact and food access to those most at physical and psychosocial risk. The pairing of food access with social interaction is critical to maximising the benefits of improved food security. Over one third of the 744 organisations responding to food security in Scotland (Scottish Government, 2020), reported that they already pair food access with social activities such as events and befriending, as well as providing nutritional advice. Recognising the human right to access food, paired alongside pleasure and enjoyment from food, situated in a

connected community, offers a model of food security based on principles of dignity for older adults living in the community.

Our findings suggest that conceptualising HFI and establishing a common basis for understanding and conversing about what food insecurity and undernutrition looks like for older adults in their communities, requires a clear positioning of the food insecure person in ‘place’ to ideally prevent escalating risks to health and wellbeing. Currently there is an absence of routine screening for older age malnutrition in community settings in the UK using standardised measures. We do not currently have a standardised indicator of either prevalence or risk of malnutrition for community dwelling older adults. Therefore, to ensure early detection and prevention of malnutrition as a condition in its own right, we further recommend the use of community-based malnutrition screening tools such as the PaperWeight Armband (Malnutrition Task Force 2020b) and PANC (Patients Association 2018) which both provide accessible, straightforward screening which can be utilised by wide range of health and social care providers as well as concerned family or friends to open up a ‘scaffolded’ dialogue about early indicators of malnutrition risk. In addition, such findings may offer implications for newer iterations for ‘nutrition wheels’ (Murphy, Mayor, and Forde 2018). It is important to continue to build a picture of risk, supported with standardised surveillance measures of older age malnutrition (undernutrition) in older age communities and to push for wider societal discourse as evidenced through national campaigns like; UK Malnutrition Awareness Week (Malnutrition Task Force 2020a) and the Eat Well Age Well Project.

Contextualising the work within current Covid-19 crises

During the Covid-19 pandemic, we have witnessed how quickly food systems and access to food can be disrupted, placing previously food secure adults at increased risk of malnutrition, particularly for those adults instructed to shield and limit social contact (Age UK 2020; Scottish Human Rights Commission 2020). During Covid-19, Food Train support services and community based social care partnerships have expanded quickly to help large numbers of older adults to cope with the acute pressures associated with social distancing measures including shielding. During May 2020, we produced a rapid collaborative report to inform policy recommendations and to contextualise the acute rise in food insecurity for older adults which Food Train was able to respond and adapt their service (Carruthers et al. 2020). Our research findings, despite being collected pre-Covid-19, when contextualised within the current pandemic, illustrate the vital work of social enterprises and third sector organisations in filling the social care gap for those who are facing the largest inequalities. In particular, we call for a rights based, person centred approach to be facilitated in a health and social care globally. The social care sector is facing unprecedented pressure in terms of its sustainability to respond to an ageing population coupled with magnitude of the impact of Covid-19 on recipients of services, their carers and volunteers. Beyond the Covid-19 pandemic, ensuring smooth access to food systems within connected communities cannot be fully realised when the model for social care funding is based on short-life funding streams and precarious job security for paid staff. In order to create an age friendly society and to promote dignified human welfare, we need to maximise the health of all citizens in the area of food security, nutritional health and wellbeing, particularly the most vulnerable, socially isolated older adults in society. In order to achieve these goals we recommend four main calls for action which are closely tied to the outcomes of this research.

1. Risk of malnutrition, undernutrition and health communication about HFI, embedded into basic training for statutory health and social care professionals
2. Community based prevention and surveillance, including mandatory screening for malnutrition risk for statutory health and social care professionals with a role in supporting vulnerable older people
3. Longer term investment into third sector, community-led food access and befriending initiatives for vulnerable older people
4. Delineate between food insecurity and food poverty in research and policy to build more holistic methods of measurement, intervention and national surveillance.

Limitations and future research directions

The present research was ambitious in its design as well as its geography and chosen sample. Working in partnership with Food Train enabled us to gain access to an older adult (often very much older) cohort of community dwelling older adults who were heterogenous in how they were experiencing old age. However, even with this route of access and adherence to principals of the TiBAR model of recruitment (Kammerer et al. 2019), we did not reach those adults most at risk of HFI and malnutrition and it is likely that our survey represents the experiences of older age adults who still have the physical and mental capacity to attend lunch clubs. interact through their social networks to engage in self-report survey research. On reflection, one method to enhance the recruitment and participation of more vulnerable older adults would be to utilise the integrated role of community volunteers which is instrumental to the running of Food Train. Involving volunteers, who themselves are often older age, to become co-investigators (Buffel 2015), could have enhanced recruitment and supported delivery of the

survey and associated interviews. This may have lessened the burden and barriers to take part, due to familiarity and perceived safety of disclosing to a trusted person within the home environment. This is an opportunity for further research.

Connected to this issue of design and recruitment, it was clear that our sample size (particularly the Food Train cell size) was not powerful enough to provide a robust and representative dataset which offers an opportunity to engage in parametric statistical analysis. This may be why indicators such as living alone and social deprivation failed to reveal consistent support for increasing physical and psychosocial risk factors, with deprivation (SIMD) only emerging as significantly correlated with age in general (the oldest adults being from the least deprived areas). However, this study does provide one of the first such datasets from an elderly cohort of community dwelling older adults in Scotland and we consider it a useful starting point for future researchers to build upon.

Many social enterprises and charities in the Third Sector routinely capture a range of demographic and lived experience data related to their own members and clients as part of reporting to funders and for internal monitoring purposes. We recognise the untapped value in utilising this data, within data management safeguards to build a more complete and potentially more statistically powerful surveillance that reveals inequality and need within communities in relation to food access and nutritional issues. Simple variables such as gender, postcode, age, living status as well as psychosocial factors such as motivation to seek help with supported shopping, could be used as secondary data for research purposes going forward. Third sector organisations can also be supported through academic partnerships, to utilise ‘novel big data approaches’ (Lido, Reid, and Osborne 2019) which may help evidence the older persons access

to the food system, such as GPS tracking of shopping deliveries to older adults and nutritional analysis of shopping items requested by the older adults. Integrating research and data acquisition into the internal monitoring of social care and third sector organisations offers a clear pathway to engage in knowledge exchange with partners in this sector as well using this data as evidence to inform and adapt to changing funding and policy landscapes.

Final conclusions

The exploration of health and wellbeing, using the interlocutor of food and food access, has provided a rich lens from which to begin to evidence social care provision located in the third sector. Service such as Food Train are crucial to supporting both the food access and nutritional health of older people living in their communities. Our research reinforces the importance of situating the right to food access, within a socially connected community, where the relationship older adults have with food functions as an indicator of the quality of active ageing and ageing in place. Our emerging evidence provides an important platform to inform agendas for public health interventions, policy contexts and how we monitor and survey for the incidence and risk of HFI and malnutrition in older adults. This research offers a timely contribution as the Scottish Government has re-focused its efforts and funding priorities to recognise food access as a human right protected with Scots law (The Scottish Government 2020). This move to secure food access within a rights based framework of policy enhances the chance of success that by 2025, Scotland will be a '*Good Food Nation*' with wellbeing at the heart of this vision; where everyone in Scotland has ready access to the healthy, nutritious food they need (The Scottish Government 2014).

Research Ethics

This research study was granted ethical approval from the College of Social Science Ethics Committee, University of Glasgow,

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Conflict of interest

The authors declare no conflicts of interest with respect to the research, authorship and/or publication of this article.

Declaration of contribution of authors

KR led on drafting the manuscript as well as leading on design, ethical approval and qualitative analysis for the research. CL led on quantitative analysis and write up of analysis

as well as providing critical revision of the manuscript. HR compiled a literature review which helped to inform the introduction of the manuscript. HR, LC, MC and KH provided suggested revisions of the manuscript. KH supported field work for the study.

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