



School of GeoSciences

Dissertation

For the degree of

MSc in Food Security

Kieran Fowler

August 2022

ABSTRACT OF THESIS

(Regulation
3.5.13)

Name of Candidate **Kieran Fowler**

Degree **MSc Food Security**

Date **11/08/2022**

Title of Thesis **Assessing the “heat or eat” dilemma across the non-linked Orkney Isles**

No. of words in the main text of **15356**
Thesis

Objective

Analysis of a Subjective Wellbeing dataset for Orkney’s non-linked Isles with the objective of identifying potential drivers of food & fuel insecurity.

Design

The main design of this paper is to perform probit regression modelling on two dependent variables focussing on the risk of an individual being (1) food insecure and (2) fuel insecure. Also, this paper cites the extensive literature on the relationship between Subjective Wellbeing and food insecurity, before statistically and visually testing this hypothesis in the Outer Isles of Orkney.

Sample

This paper focuses on a set of survey results regarding Subjective Wellbeing collected on Orkney’s non-linked isles (connection by plane or ferry only to Orkney Mainland). A survey was conducted in May 2021 to map residents' health, economic and social wellbeing across the non-linked Orkney Isles.

Results

The results from the models suggest: that regarding “heat or eat”, individuals are likelier to cut back on heating in order to eat when faced with financial difficulty. Overall, socioeconomic factors proved to be the main determinants to Outer Isles residents facing risk of food or fuel insecurity. An interesting discussion point was explored around the findings of difficulty in affording transport to Orkney Mainland being a prevalent factor for Outer Isles residents facing food and fuel insecurity.

Conclusion

The paper concludes with recommendations based on the analysis of survey results and interviews held with stakeholders in Orkney. These include: improving access to ferry services for young, old and disabled people; improving the housing stock and energy efficiency of Orkney Isles homes; increasing awareness of emergency support available and begin to reduce the stigma surrounding access to support.

Acknowledgments

Many thanks to Harry Johnson for liaising with me throughout this project and thanks to VAO for providing me with the opportunity to use their data.

Many thanks to Westray Development Trust for supporting me throughout this project.

Thanks to my advisor, Faical Akaichi for all your support in making this project a reality.

Finally, thanks to my partner and to all my family who have helped me every step of the way.

Table of Contents

Abstract of Thesis	I
Acknowledgments.....	II
Table of Figures.....	IV
Table of Tables	IV
1. Introduction	1
2. Background & Literature Review	3
2.1 SIMD Ranks of Orkney.....	4
2.2 Food Insecurity of Outer Isles	7
2.3 Fuel Insecurity of Outer Orkney Isles.....	9
3. VAO Islands Wellbeing Survey	12
3.1 Overview of Dataset.....	12
3.2 Descriptive analysis.....	13
3.2.2 Food Insecurity Bivariate Analysis	17
3.2.3 Wellbeing Scores.....	22
4. Methodology.....	28
5. Results	30
6. Discussion.....	35
7. Conclusion.....	43
References	46
Appendix I	i
Appendix II	ii

Table of Figures

Figure 1. Map of Transport Links of Orkney Archipelago with Orkney Outer Isles in colour (Orkney Islands Council, 2022)	4
Figure 2. Map showing SIMD Quintiles of Orkney Islands (SIMD, 2017).....	7
Figure 3. Food Parcels administered through the Trussell Trust, 2020/2021, by council region (McEwen, 2022)	7
Figure 4. Percentage of Island population accessing emergency food support (Ruth Wilson et al., 2021)	9
Figure 5. Estimated percentage of households facing fuel poverty across the Orkney Isles (The Orkney Partnership, 2021).....	10
Figure 6. Percentage of Orkney Properties build prior to 1919 (The Orkney Partnership, 2021).....	11
Figure 7. Distribution of responses to worried about money, split by food insecurity.....	19
Figure 8. Variance of responses to Four Wellbeing Questions.....	23
Figure 9. Distribution of Subjective Wellbeing scores split by those who responded “yes” or “no” to worrying about food	25
Figure 10. Distribution of Subjective Wellbeing scores split by those who responded “yes” or “no” to worrying about fuel	26
Figure 11. Distribution of Subjective Wellbeing scores split by those who responded “yes” or “no” to difficulty affording transport	27
Figure 12. Bayview House prior to renovation (Westray Development Trust, 2022)	42

Table of Tables

Table 1. Summary of the four pillars from which we can assess Food Security.....	2
Table 2. Summary of related literature linking Subjective Wellbeing and Food Security	3
Table 3. SIMD ranking across Orkney	5
Table 4. Breakdown of food vouchers administered in each Council Ward of Orkney (The Trussell Trust, 2022).....	8
Table 5. Overview of Survey Responses for Demographic variables.....	14
Table 6. Overview of Survey Responses for Health variables.....	15
Table 7. Overview of Survey Responses for Socioeconomic variables	16
Table 8. Chi-square test between worried about food and worried about fuel	18
Table 9. Chi-square testing for employment status and food insecurity	20
Table 10. Chi-square testing for losing income due to Covid-19 and food insecurity.....	20
Table 11. Chi-square testing for £850 disposable income and food insecurity.....	21
Table 12. Chi-square testing for long-term health conditions and food insecurity.....	21
Table 13. Wellbeing Q3 [C1] statistical figures	22
Table 14. T-test between significant variables and happiness score.....	24
Table 15. Marginal effects from the estimation of probit model (PART I).	31
Table 15. Marginal effects from the estimation of probit model (PART II).	32

1. Introduction

According to the Scottish National Isles Survey Plan, 1 in 10 (9.7%) residents across the non-linked Isles in Orkney had to choose between heating and eating in 2020 (Ruth Wilson et al., 2021). This was found to be in comparison to 1 in 14 (7.1%) of Orkney Mainland residents facing the same choice. This paper focusses on exploring the root causes of this choice by exploring food insecurity in the non-linked Isles through analysing the dataset provided by Voluntary Action Orkney (VAO). Over the course of this paper the intention is to clarify the nature of the “heat or eat” dilemma faced by 1-in-10 in the non-linked Isles.

VAO designed a survey measuring the; health status, social connectedness, economic wellbeing, happiness, loneliness and personal security of residents across the non-linked Isles of Orkney, as well as asking residents if they had worried about running out of fuel or food in the previous 12 months. This research makes use of the resultant dataset to explore and identify the main drivers behind food and fuel insecurity across the non-linked Isles. Through the use of monovariate and bivariate statistical analysis and probit regression modelling, factors that are causing individuals in the non-linked Isles to worry about their food and fuel security can be identified.

Food Security is a multi-dimensional phenomenon, defined by the Food and Agriculture Organisation of the UN (FAO) as the continued ability, both physical and economic, to access safe and nutritious food in a dignified and culturally acceptable way (FAO, 2003). In contrast, food insecurity exists mostly due to limited resources to obtain food (Kristie N. Carter, 2011) (FAO, 1996), which can result from many different factors including low-income, housing difficulties, or employment struggles. Table 1 provides a summary of the four dimensions of food security.

Table 1. Summary of the four pillars from which we can assess Food Security

Pillar of Food Security	Literature Summary	Reference
Food Availability	Availability depends on a sufficient supply of safe and nutritious food within proximity of individuals. Availability can be achieved through domestic food production, commercial food imports, food stocks and food assistance.	(Sassi, 2018) (United Nations, 1975)
Access to Food	Depends on the individual's ability to have both economic and physical access to available food. Households can produce or obtain food depending on their access to resources, technology & markets.	(Sassi, 2018) (Sen, 1981)
Utilisation of Food	Utilisation refers to the individual and household's ability to make proper use of obtained food in order to achieve a diet that provides sufficient energy, good nutrition, and adequate sanitation.	(Sassi, 2018) (FAO, 2006)
Stability of Food Supply	Stability of food is reached when a reliable supply of food products is available and accessible to the individual at all times.	(Sassi, 2018) (FAO, 1996)

As well as the multi-dimensional aspect of food security, the framework for assessing the level of food insecurity experienced incorporates a dynamic approach measuring the duration of food insecurity experienced. There are three general types of food insecurity duration: chronic, transient and seasonal.

The following analysis presented in this paper will hope to gain some insight into those facing food insecurity in Orkney's non-linked Isles. For the survey, VAO selected the question: "During the last 12 months, was there a time when you were worried you would run out of food because of lack of money or other resources?" This question is one of a set of eight used for determining the FAO Food Insecurity Experience Scale (FAO, 2022). Whilst FAO makes use of eight sub-questions to provide a scale for the indicator question, VAO decided to use solely the question of running out of food due to lack of money or other resources. This methodology from VAO is the same methodology employed by the National Performance board of the Scottish Government. The Scottish National Health Survey uses this same question as an indicator for identifying the percentage of people facing food insecurity in Scotland (Scottish Government, 2022). Although this question captures the number of people who may be at risk of facing food insecurity at some point, it does not specifically identify those who are food insecure.

Alongside questions relating to running out of food, the survey designed by VAO also included the stock Subjective Wellbeing questions provided by the Office for National Statistics (ONS). ONS has been measuring National Wellbeing in the UK since 2010 with the aim of "looking at Gross Domestic

Product (GDP) and beyond” (ONS, 2018). When Wellbeing is used in conjunction with GDP it can give a fuller understanding of human wellbeing across society (Styka, 2018). Wellbeing measurements help to develop a set of National Statistics that describe Wellbeing in the sense of “how we are doing” as individuals, communities and as a nation (ONS, 2018). This paper makes use of existing literature and highlights the well-established link between food security and Subjective Wellbeing (see Table 2 for a summary of this literature).

Table 2. Summary of related literature linking Subjective Wellbeing and Food Security

Research Summary	Reference
The prevalence of food insecurity was strongly and negatively associated with subjective wellbeing across 138 countries.	(Frongillo., 2017)
The association between the negative effect of experienced food insecurity and poor subjective wellbeing was found to be stronger for more-developed countries.	(Frongillo, 2019)
A global study that found; across all country groups (as defined by World Bank) food insecurity matters to wellbeing.	(Kornher., 2021)
Food insecurity and poor wellbeing are intrinsically linked.	(Kristie N. Carter, 2011)
Found, across a sample of 88 countries, that hunger was related to subjective wellbeing.	(Rojas, 2017)
Results indicated that prior experiences of food insecurity resulted in increased levels of stress, anxiety and depression.	(Styka, 2018)
Found that a one standard deviation increase in instrumented food insecurity decreased life satisfaction by 0.8 points.	(Salahodjaev, 2021)

In contrast to the existing literature which explores the relationship between food security and Subjective Wellbeing – this paper aims to make use of VAO’s Wellbeing survey to highlight root causes of the “heat or eat” situation faced by 1-in-10 in the non-linked Isles. This research will help local organisations and policy-makers to better understand the nature of the relationship between food and fuel insecurity in Orkney and the subsequent challenges facing these island communities.

2. Background & Literature Review

The non-linked Isles (referred hereinafter as the Outer Isles) surveyed by VAO are highlighted in colour on the map in figure 1; in total there are 13 inhabited Outer Isles considered in this study. All of these Island communities are remote rural with the Outer Isles having no physical access to Orkney Mainland (shown in white in figure 1) with connection by ferry routes and airplane routes only. The islands have small populations and strong communities. Across the Outer Isles, there is a population of roughly 2,700, representing around 12% of Orkney’s total population, with Orkney mainland and the linked

Islands being home to approximately 19,500 inhabitants (Scottish Government , 2011) (UK Population Data, 2022).

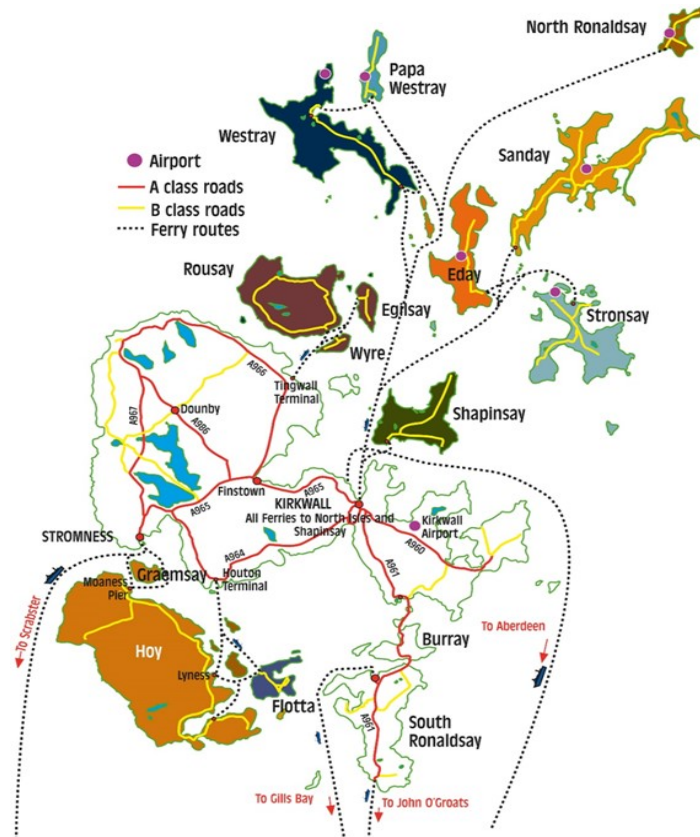


Figure 1. Map of Transport Links of Orkney Archipelago with Orkney Outer Isles in colour (Orkney Islands Council, 2022)

2.1 SIMD Ranks of Orkney

To observe the differing levels of food security across Orkney, the Scottish Index of Multiple Deprivation (SIMD) was used. The database provides a powerful tool for identifying areas where poverty, and consequently food insecurity, occurs. As well as identifying where these areas are, the SIMD dataset allows for the visualisation in the variation of poverty experienced over geographical areas. The SIMD is a relative measure of deprivation across 6,976 small areas (called “data zones”) in Scotland (SIMD, 2017), these areas are ranked from most deprived (rank 1) to least deprived (rank 6,976). SIMD assesses the extent to which an area is deprived across multiple domains: income, employment, health, access to services and housing are considered here. By using data zone codes to identify each region and council ward of the Orkney Isles, differences in SIMD rankings across the archipelago could be compared. There are a total of 29 locations for Orkney with four data zones representing the Outer Isles. The results have been presented in Table 3, with the four Outer Isles zones highlighted.

Table 3. SIMD ranking across Orkney

Data Zone Location	Overall SIMD 2020 rank	SIMD 2020 income rank	SIMD 2020 employment rank	SIMD 2020 access rank	SIMD 2020 health rank	SIMD 2020 housing rank	Ratio of total population to working age population	Mean Household income (Orkney Islands Council, 2021)
Stromness - South	3187	3285	3143	2971	3735	2223	0.611	£32,734
Hoy, Walls & Flotta	2097	3382	2732	12	4785	2160	0.541	£24,092
Kirkwall - Pickaquoy	1995	2316	1990.5	6359	2232	740	0.713	£27,665
Kirkwall - Town Centre	2679	2781	2681	6525	2409	399	0.702	£29,352
Stronsay, Sanday & North Ronaldsay	2476	2913	2770	77	3916	2115	0.559	£25,674
Kirkwall - The Meadows East	2749	2567	2684.5	2825	3239	2061	0.608	£30,876
Eday, Westray & Papay	3153	3776	4038.5	138	4691	2233	0.568	£27,604
Firth	3402	3103	3920	926	3797	5201	0.6312	£37,753
Kirkwall - Glaitness Road & Hornersquoy	3074	2966.5	2236	5216	1999	5214	0.592	£34,474
Shapinsay, Rousay, Egilsay & Wyre	2710	2865	3467	146	3950	1798	0.554	£30,587
Kirkwall - KGS & Bignold Park	4412	4190	4320	5166	3810	4550.5	0.627	£36,474
Kirkwall - South	4336	3951	4311	5781	4143	3445	0.649	£30,833
South Ronaldsay	3421	4400	3751	179	4354	3652	0.570	£34,307
Orphir	4446	5735	5354	165	6020	4701	0.592	£39,834
Kirkwall - Papdale	4471	4175	3927	5237	3795	5045	0.619	£35,743
Burray	4356	5084	5283	280	5198	4593	0.615	£41,094
Evie, Rendall & Gairsay	4790	5498	5872	216	5882	5455.5	0.642	£41,212
Holm	4373	4697	4751	406	4754	5068	0.631	£43,433
Stromness - Outer Town	4911	4690	4444.5	1779	5279	4212	0.582	£38,916
Harray	4434	5026	5038	390	5419	4047.5	0.610	£38,175
Kirkwall - Harbour & North	4851	4759	4461	5010	4072	2653	0.670	£38,188
Birsay & Dounby	4902	6209.5	5321	204	6495	5638	0.590	£39,741
Tankerness	4977	5905	5846	359	5397	6450	0.604	£43,412
Kirkwall - Holm Road	5263	5357.5	4293	4414	4757	4952	0.621	£38,884
Holm East, Toab & Deerness	4607	5551	6055	118	6620	4328	0.601	£40,849
Sandwick & Stenness	5424	6573	6605	309	5930	3895	0.589	£43,139
Stromness - North	5566	5379	5788	5418	5990	1181	0.664	£35,085
St Ola - West	4836	4468	5083	1187	5175	5842	0.600	£41,422
St Ola - East	5616	5520.5	5658	1136	5881	6832	0.592	£50,836

Of the seven lowest overall SIMD ranking areas in Orkney – 4 were the Outer Isles. The Outer Isles all fell in the 50% most deprived bracket, with one area in the Outer Isles falling in the lowest 33% of Scotland. The table shows that areas with the lowest mean income in Orkney, are also often the Outer Isles, with all having a lower mean household income than the Orkney average of £36,289. A well-reported factor of this generally lower income is the nature of employment in the Outer Isles. Jobs on offer are often seasonal and the majority are low-paid, part-time employment (Hopkins, 2022). The lower mean household income plays a factor when considering households' ability to obtain nutritious food products over time (French, 2010). A further explanation for the lower household income may be the low ratios of working age population to overall population present in the Isles. Rural Scotland, and specifically rural Island communities, are under severe threat from depopulation with migration being heavily concentrated amongst younger people – leading to an increasingly ageing population (Scottish Government, 2021). This can have repercussions for communities through labour shortages and cause additional pressure on public services (Orkney Islands Council, 2018). Further to this, (Revoredo-Giha, 2020) in their study examining remote rural prices in Scotland, found that ageing of population in remote areas may bring about an increase in the “remoteness premium” of food prices. This lower household income is coupled with the fact “weekly food, clothing and household goods costs are higher in the islands and remote rural Scotland, compared to urban areas in the UK” (Scottish Government, 2021). This “remoteness premium” combined with lower average income may explain the lower rankings present in the Outer Isles as opposed to Orkney as a whole.

The Outer Isles rank in the lowest 2% in terms of access to services in Scotland – these Islands have costly and generally poor public transport networks (Hopkins, 2022); this poor access incurs additional transportation costs on food and fuel which may diminish the availability of food products as well as individual's ability to access food in comparison to Orkney mainland.

The image in Figure 2 visualises the SIMD scores from Table 2, illustrating the different levels of deprivation found in the Orkney Islands. No data zone in Orkney features in Scotland's most 20% deprived areas. However, the contrast between the Outer Isles and Orkney mainland was noticeable. Of the 5 Orkney data zones in the 20-40% bracket, 2 were Outer Isles with the 2 other Outer Isles wards being in the 40-60% bracket.

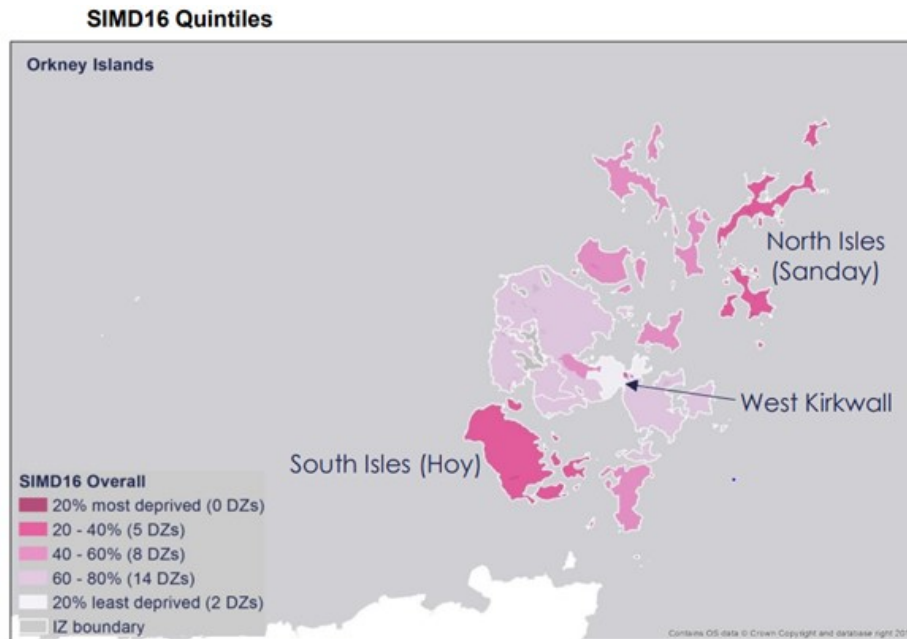


Figure 2. Map showing SIMD Quintiles of Orkney Islands (SIMD, 2017)

2.2 Food Insecurity of Outer Isles

The Orkney Islands is Scotland's least populous council district (Scottish Government, 2021). Yet, as a council district in 2020/2021, Orkney had the fourth highest food parcel distribution rate per population size across Scotland's local authorities (6%), as shown in figure 3 (McEwen, 2022). It is worth noting that this food parcel ratio was only worse in three other council areas in Scotland, all of which are more urbanised than Orkney. Shetland – another island community – ranked 5th overall just behind Orkney with a score of 5.8%.

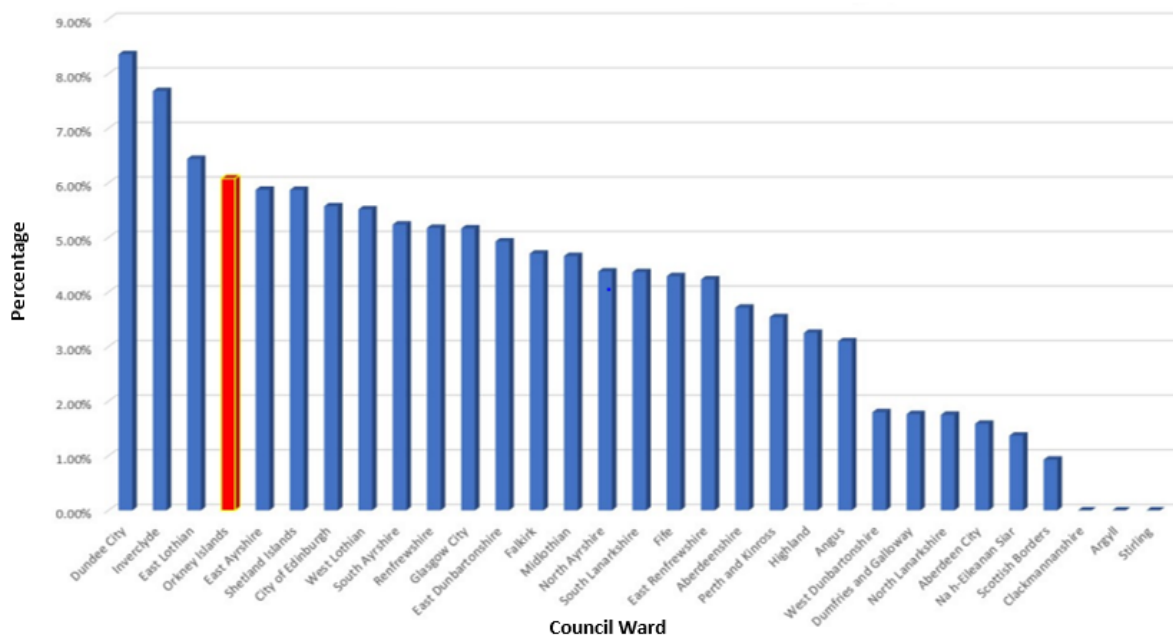


Figure 3. Food Parcels administered through the Trussell Trust, 2020/2021, by council region (McEwen, 2022)

In Table 4, the total number of food vouchers administered in Orkney has been split by each council ward, where the two highlighted rows represent the non-linked Isles. In years 2020/2021, the non-linked Isles wards had 136 vouchers distributed, which was 24% of the total across Orkney that year. In 2020, Covid-19 resulted in a national lockdown in the UK – when lockdown was implemented via Government order, residents of the Outer Isles could not travel off-island. The figures in Table 4 show the spike in usage of emergency food aid in 20/21 (when lockdowns were implemented) was felt most acutely in both the North and South Outer Isles, with the number of those claiming food vouchers at least doubling for both those council wards. This indicates that an individual’s ability to access transport links to amenities, shopping retail chains and vital public services are an important aspect of food security for residents of Orkney’s Outer Isles, specifically the stability of access to available food.

Table 4. Breakdown of food vouchers administered in each Council Ward of Orkney (The Trussel Trust, 2022)

Area	21/22*	20/21	19/20	18/19	17/18	16/17
East Mainland. South Ron and Burray	16	26	36	31	28	20
Kirkwall East	98	133	92	105	98	116
Kirkwall West and Orphir	135	217	197	224	125	116
North Isles	18	49	23	12	10	23
Stromness and South Isles	28	87	41	40	37	36
West Mainland	28	66	36	39	26	51
Unknown	1	4	1	6	4	2
No fixed abode					14	40
Total	324 vouchers 655 clients	575 vouchers 1367 clients	427 vouchers 932 clients	457 vouchers 900 clients	342 vouchers 639 clients	404 vouchers 751 clients

The data presented in table 4 shows an acute difference from the non-linked Isles to Orkney mainland, in terms of emergency food aid, this acute difference was ratified by the Scottish National Isles survey conducted in 2021. The chart in figure 4 details that double the number of people in the Outer Isles (4%) stated they had used food aid in comparison to those in Orkney mainland (2%).

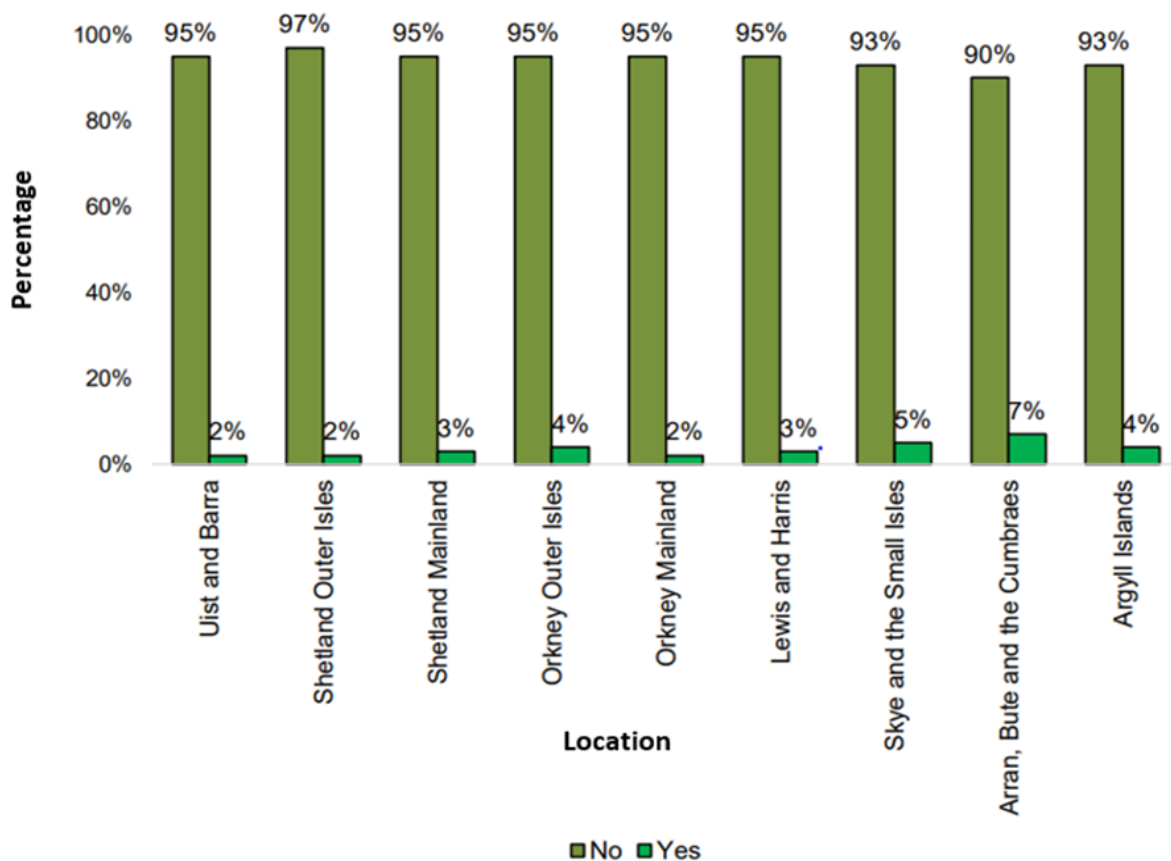


Figure 4. Percentage of Island population accessing emergency food support (Ruth Wilson et al., 2021)

It must be noted that in their Mapping Food Insecurity document, Scottish Government drew attention to the fact foodbank data can distort the overall picture of food insecurity, as only a small percentage of people experiencing food insecurity will actually access a food bank (Scottish Government, 2020). Nonetheless, the foodbank data presented here has highlighted the disparity between food security in the Outer Isles and Orkney mainland.

2.3 Fuel Insecurity of Outer Orkney Isles

The other half of the “heat or eat” dilemma experienced by 1-in-10 Outer Isles residents is fuel insecurity. Orkney has the highest level of fuel poverty in the UK – 63% of households experience some form of fuel poverty over winter months, with the figure rising to over 80% for pensioner households (The Orkney Partnership, 2021). This high level of fuel insecurity is mostly due to inefficient heating systems with no mains gas combined with generally colder, wetter, and windier conditions than the rest of the UK; and poor quality housing stock (Hopkins, 2022) (Scottish Government, 2022).

Figure 5 shows the distribution of fuel poverty across Orkney in 2015. The pattern observed of variance geographically in food security, with the non-linked Isles more disadvantaged than the Mainland or linked South Isles, is repeated for the experience of fuel insecurity.

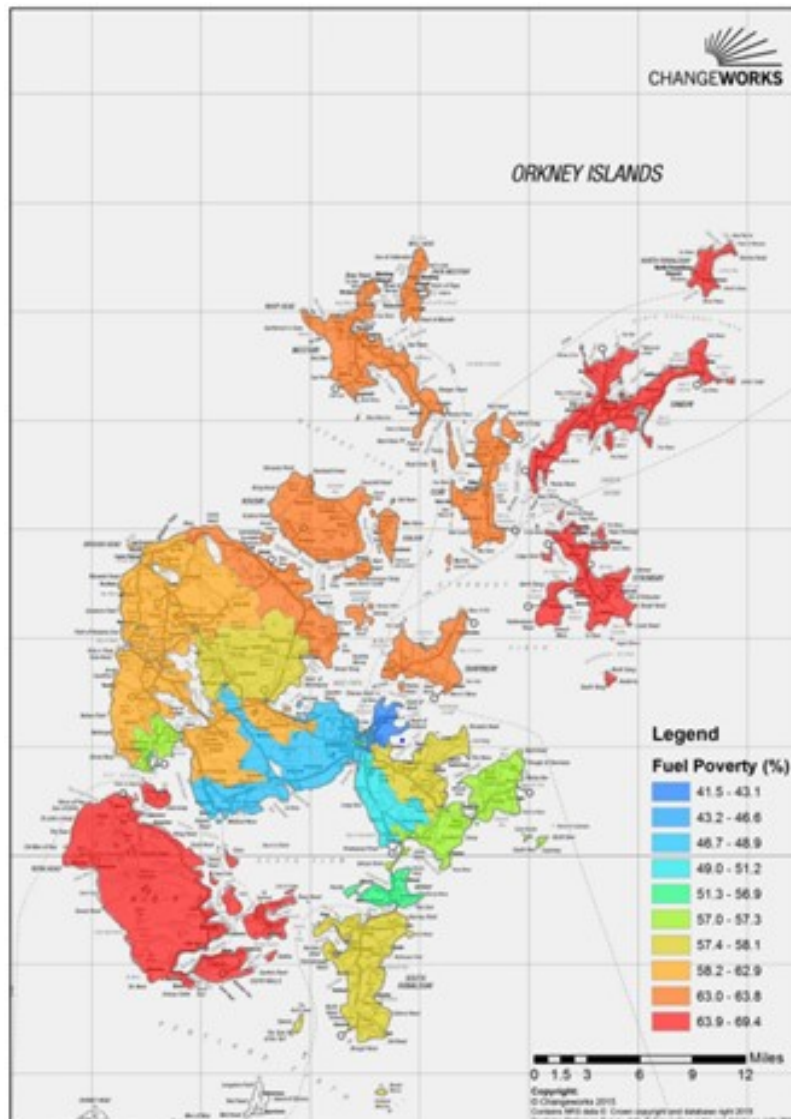


Figure 5. Estimated percentage of households facing fuel poverty across the Orkney Isles (The Orkney Partnership, 2021)

The level of fuel poverty experienced in the Outer Isles may be explained by exploring the housing stock across the Orkney archipelago. Across all of the Outer Isles considered, nearly half of all housing is at least 100 years old. This is in contrast to roughly one third to a quarter of mainland properties being the same age.



Figure 6. Percentage of Orkney Properties build prior to 1919 (The Orkney Partnership, 2021)

Overall then, a poor housing stock and resulting high levels of fuel insecurity across the Outer Isles are potential causes for the lower SIMD scores than that of Orkney mainland. The similar geographical patterns observed across SIMD scores, food bank data and fuel poverty statistics for Orkney, suggest that food insecurity and fuel insecurity are closely linked in the case of the Outer Isles. More generally across the developed world, food insecurity and fuel insecurity have been found to coincide with one another as covered in the literature (Temple JB, 2019) (Lila J. Finney Rutten, 2010). Whilst experiencing fuel poverty, a household's ability to afford food products will be diminished. Furthermore, this relationship can have a severe detrimental effect on individual's mental and physical health (The Trussel Trust, 2018). It may also be considered here, seasonal bouts of fuel insecurity. Orkney's climate is a very wet and windy winter with short summer seasons (Orkney Weather, 2022). The yearly drop in temperature, joined with an increase in both precipitation and wind speeds, may indicate that seasonal fuel insecurity is a likely possibility in the Outer Isles.

In conclusion, the main drivers behind food and fuel insecurity in the Outer Isles are mainly: a lower average household income (Orkney Islands Council, 2016); ageing populations; potentially higher living costs in remote Island communities (Scottish Government, 2021); and a poor housing stock coupled with economically inefficient heating systems.

3. VAO Islands Wellbeing Survey

Having explored an acutely higher level of fuel poverty and an overall greater risk of facing food insecurity in the Outer Isles as opposed to Orkney mainland via the available literature, the VAO Wellbeing data can be used to establish the drivers behind the “heat or eat” scenario in the Outer Isles.

3.1 Overview of Dataset

The data used within this paper is from the survey collected by VAO as part of the Island Wellbeing Project. The survey ran over four weeks in April and May 2021. The survey was anonymous and open to any resident of the Orkney Outer Isles over the age of 16 and was designed to look at factors including health, economic and social wellbeing as well as the impact incurred by Covid-19. The survey was conducted in both paper and online format and generated approximately 350 online responses and 500 paper responses. Paper copies were posted via Royal Mail to each household in Hoy, Graemsay, Sanday, Stronsay, Shapinsay, Rousay, Egilsay and Wyre. In Flotta, and North Ronaldsay, paper copies were hand delivered to residents. In Eday, Westray and Papa Westray copies were available in the shops and other public spaces. Paper copies were also distributed to schools across the Outer Isles. In total, VAO received 816 responses from across the Outer Isles – representing 33% of the total Outer Isles population. All responses were transcribed to a Microsoft Excel database by VAO.

The 10-page survey (attached in Appendix II) covered four sections: “About you” – [A], “Money and finance” – [B], “Health” – [C] and “Social wellbeing” – [D]. All comments sections, as well as the first question “Which Island do you live on?” were removed from the dataset to guarantee total anonymity.

Within this dataset, there were 64 variables present, 60 of which are categorical, across the total 816 observations. The four Subjective Wellbeing questions (scale 1-10) provided by (ONS, 2018) were numeric categorical variables. The four wellbeing questions by ONS were located in the Health section [C]. A total of 21 nulls were present in the four wellbeing questions, due to the importance of the wellbeing questions to the survey, these 21 rows were removed from the dataset – leaving 795 observations considered for analysis. This paper focusses on two questions in particular. Questions 3 and 5 in section [B] focus on the individual facing food insecurity and fuel insecurity over the past 12-months respectively.

Question 3 [B] is the same question used by the National Performance board of the Scottish Government (Scottish Government, 2022) when defining their food security metric. The question the indicator is based on is:

"During the last 12 months, was there a time when: You were worried you would run out of food because of a lack of money or other resources?"

Question 5 [B] follows the same question but instead asks the individual if they were worried about running out of fuel:

"During the last 12 months, was there a time when: You were worried you would run out of fuel because of a lack of money or other resources?"

These two questions are used as indicators in this study for food and fuel insecurity in the Outer Isles, respectively. However, this is caveated; whilst these questions act as indicators for those at potential risk of being food or fuel insecure, they will not suffice as indicators for those who are actually food or fuel insecure. Furthermore, these indicators do not provide any information on the duration or the severity of the insecurity faced. Nonetheless, these two questions will be modelled as dependent variables in this study to see which variables in the survey increase the risk of facing food or fuel insecurity in the Outer Isles.

3.2 Descriptive analysis

Of the dataset used for analysis, where N = 795, a slight majority of the respondents were women. Age was categorical over 6 fixed variables, ranging from 16-25 to 81+. The most common age of surveyed people was between 51-65 years old (36%), with over a quarter of respondents between 66-80. As noted in Table 5, this may explain the 37% response rate from people whom are retired or semi-retired. The dataset has a very limited input from the 16-25-year-old age group, with only 26 respondents. The survey therefore, does not capture the younger generations' views as accurately as hoped. One then must take this factor into consideration when analysing this dataset; the data is more representative of pensioners across the Outer Isles. Of the respondents, nearly all had access to the internet and 93% could turn on a computer.

The majority of individuals (81%) responding to the survey had no children in the house with a quarter of respondents having some form of unpaid caregiving responsibilities. Most respondents kept a decent standard of mental and general health with around 10% of people experiencing bad or very bad general and mental health.

Covid-19 rules and regulations had been in force in the UK over the past year whilst this survey was conducted and 27% of people had declared the loss of income during the Covid-19 pandemic. At the same time, 125 respondents to the survey, representing 16%, had been asked to shield at some point in the twelve months prior to the survey.

In tables 5, 6 and 7 the variation of responses to important variables is presented. In these three tables, all percentages are rounded to the nearest whole number and if there are null responses for questions these are accounted for under NA – if NA is not stated then that variable had no null responses.

Table 5. Overview of Survey Responses for Demographic variables

	Counts	Percentage Share
N	795	100%
Age? Q2 [A]		
16-25 years old	26	3%
26-40 years old	94	12%
41-50 years old	111	14%
51-65 years old	284	36%
66-80 years old	222	28%
81+ years old	58	7%
Gender? Q3 [A]		
Female	472	59%
Male	308	39%
Other	4	>1%
Prefer not to say	11	1%
Children in household? Q4 [A]		
No	645	81%
Yes	150	19%
Employment Status? Q1 [B] (respondents can pick multiple options)		
Employed	289	33%
Self-Employed	181	21%
Unemployed	67	8%
Full-time Student	9	1%
Retired	324	37%
<i>Total counts across responses to Employment</i>	<u>870</u>	
Internet connection and a device to access? Q7[A]		
No	30	4%
Yes	765	96%
Ability to turn computer on? Q6 [D]		
No	50	6%
Yes	738	93%
NA's	7	>1%

Table 6. Overview of Survey Responses for Health variables

	Counts	Percentage Share
N	795	100%
Long-term health conditions? Q5 [A]		
No	552	69%
Yes	243	31%
Unpaid caregiving responsibilities? Q6 [A]		
No	615	77%
Yes	180	23%
General health? Q1 [C]		
Very good	114	14%
Good	347	44%
Fair	256	32%
Bad	60	8%
Very bad	14	2%
NA's	4	>1%
Mental health? Q2 [C]		
Very good	141	18%
Good	339	43%
Fair	234	30%
Bad	61	8%
Very bad	16	2%
NA's	4	>1%
Asked to shield due to Covid-19? Q8 [A]		
No	670	84%
Yes	125	16%
Food insecure? Q3 [B]		
No	688	87%
Yes	106	13%
NA's	1	>1%
Fuel insecure? Q5 [B]		
No	617	78%
Yes	175	22%
NA's	3	>1%

Table 7. Overview of Survey Responses for Socioeconomic variables

	Counts	Percentage Share
N	795	100%
Lost income due to Covid-19? Q2 [B]		
No	584	73%
Yes	211	27%
Able to pay an unexpected bill of £850? Q4 [B]		
No	284	36%
Yes	505	64%
NA's	6	>1%
Difficulty booking transport to attend health appointments? Q5 [C]		
No	655	82%
Yes	140	18%
Difficulty affording plane or boat for health appointments? Q5 [C]		
No	708	89%
Yes	87	11%
Embarrassed to seek economic support if needed? Q8 [B]		
Strongly disagree	90	11%
Somewhat disagree	113	14%
Neither agree or disagree	200	25%
Somewhat agree	225	28%
Strongly agree	161	20%
NA's	6	>1%
Know where to access economic support if needed? Q7 [B]		
Strongly disagree	144	18%
Somewhat disagree	155	20%
Neither agree or disagree	210	26%
Somewhat agree	191	24%
Strongly agree	90	11%
NA's	5	>1%
How often do you worry about money? Q6 [B]		
Never	85	11%
Hardly ever	152	19%
Occasionally	252	32%
Some of the time	198	25%
Often or always	104	13%
NA's	4	>1%

106 people (13%) who completed the survey said they had worried about running out of food in the previous twelve months, whilst 175 people (22%) had worried about running out of fuel in the same time frame.

With regards to the ability to pay an unexpected bill of £850 Q4 [B], 36% of respondents said they would not be able to pay. This figure, of over 1-in-3 having little to no disposable income may be a result of (amongst other things) the SIMD data presented in table 3 earlier, with those in the Outer Isles having, on average, a lower household income. When it came to how often people worry about money, a third of respondents said it was an occasional thing to worry about, with 30% hardly or never worrying about money and 38% often or sometimes worrying about money. Therefore, it can be stated the majority of respondents to the survey worry about money at some level.

When it came to local transport issues, nearly 1-in-5 (18%) said that they faced some difficulty when booking transport for health appointments in Orkney Mainland, with roughly 1-in-10 saying they had difficulty affording the transport needed to attend health appointments in Orkney Mainland.

From the responses generated, only 35% of people would actually agree they know where to access formal economic support if it was needed and nearly half (48%) of respondents would be too embarrassed to ask for the formal support if they needed it. Only 1-in-4 respondents stated that they would be able to overcome feelings of embarrassment when it came to asking for help with household costs. The data clearly indicates a number of Outer Isles residents are unsure of potential avenues of support to seek should they require it, and that feelings of embarrassment prevent some from seeking necessary support when needed.

3.2.2 Food Insecurity Bivariate Analysis

In regards to food insecurity Q3 [B], 106 (13.3%) respondents across the Outer Isles had worried about running out of food in the previous twelve-months to the survey. The following section makes use of Chi-square testing to test for statistical significance between food insecurity and other questions in the survey. Testing the mathematical relationship between food insecurity and other variables allows us to determine which independent variables will be of good fit for regression modelling. For each of the Chi-square tests, the null hypothesis assumes there is no association between the two variables. The alternative hypothesis assumes there is an association between the two variables. For further reading on the theory behind Chi-square testing see (Sharpe D. , 2015) (Rana R, 2015) (Finney D. J., 1968).

Link between food and fuel – “heat or eat”

Table 8. Chi-square test between worried about food and worried about fuel

		Fuel insecure? Q5 [B]		
		Yes	No	Total
Food insecure? Q3 [B]	Yes	50% (87)	3% (19)	13% (106)
	No	50% (88)	97% (601)	87% (689)
	Total	100% (175)	100% (620)	100% (795)
p-value = 2.2e ⁻¹⁶				

Table 8 shows the results of the Chi-square test, testing the significance of the “heat or eat” scenario. From the 106 respondents who were experiencing some form of food insecurity, 82% were also experiencing some form of fuel insecurity – just 19 out of the 106 people who were worried about running out of food were not worried about running out of fuel. This was in stark contrast to the total number of respondents worried about fuel. Of the total number of fuel insecure individuals (175), half (87) also indicated they worried about food – 88 from the 175 fuel insecure individuals selected “no” to worrying about food. These figures suggest that fuel insecurity in the Outer Isles is more independent from that of food insecurity. Regarding “heat or eat”, table 8 shows more respondents to the survey worry about heating and fuel. With respondents who are worried about their food supply, most are also worrying about their fuel supply. This infers fuel insecurity can more often occur independently in the Outer Isles, yet when it comes to food insecurity, it is often entangled with fuel insecurity. The p-value yielded from the test was found to be below the significance level of 0.05. A p-value below 0.05 provides evidence to reject the null hypothesis of no statistical association.

These two variables are further explored in the regression analysis to identify factors which impact an individual to select “yes” to either question regarding running out of food or fuel. However, these two variables were not used to explain each other in the regression analysis due to endogeneity present between the two variables. Therefore, this study cannot identify (through modelling) which form of insecurity is a cause of the other. The cross-tabulation of respondents who selected “yes” to questions 3 & 5 section [B] in table 8, is the furthest most that this study can explore the relationship between the two variables.

The effect of economic variables on food insecurity

This section tests for statistical significance between food insecurity and different economic variables present in the survey, in doing so, key variables are identified for modelling.

As can be seen in figure 7, from those often or always worried about money, 50% were worried about running out of food in the twelve-months prior.

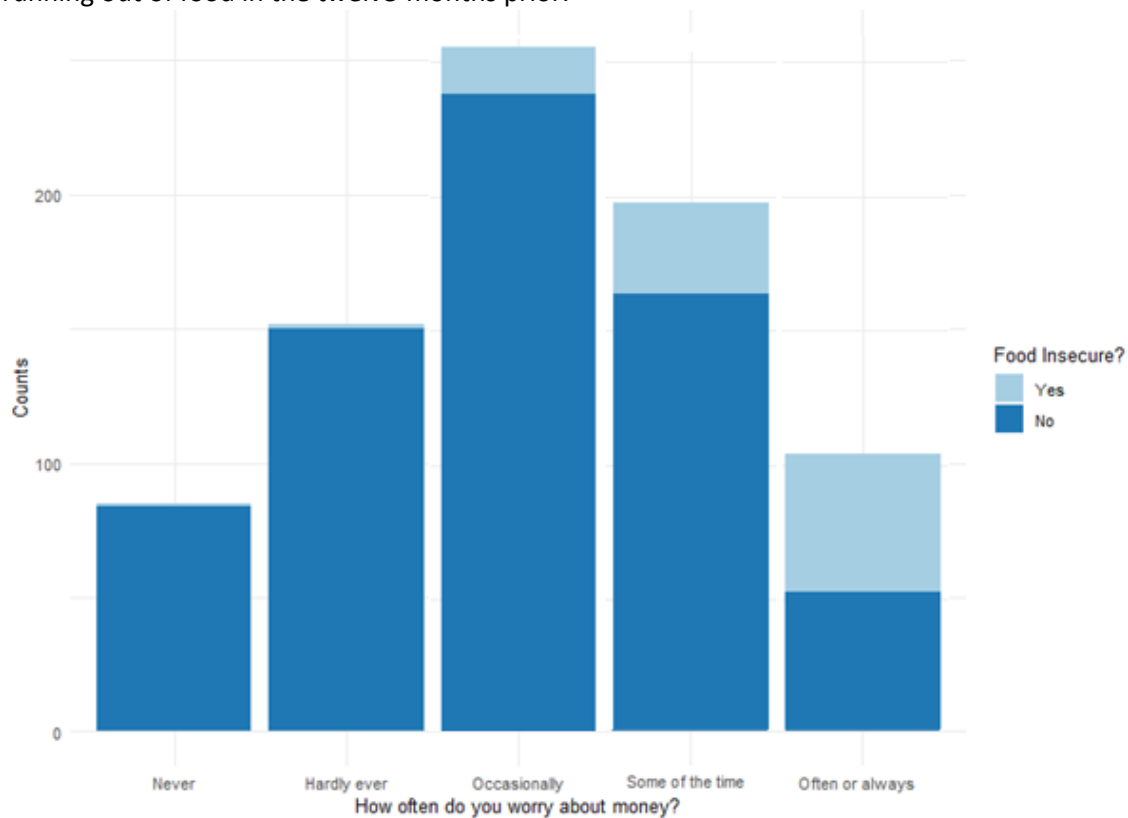


Figure 7. Distribution of responses to worried about money, split by food insecurity

Figure 7 displays that those who are not worried about money are experiencing food insecurity far less than those who are worrying about money. When it came to those who often or always worry about money, 50% said that they were at risk of being food insecure at some point in the past 12 months. Of the total respondents (106) who reported they had experienced food insecurity, nearly half (51) declared they often or always worried about money. It was noted, however, 25% of the total 795 survey respondents declared being worried about money some of the time, with 32% stating they were occasionally worried – in these cases the overwhelming majority were not facing food insecurity.

Table 9 presents the results of the chi-square test to examine how employment status in the Outer Isles interacts with food insecurity. To perform regression analysis, dummy variables were created for each category of responses to employment status.

Table 9. Chi-square testing for employment status and food insecurity

		Employment Status? Q1 [B]				
		Retired	Employed	Self-employed	Unemployed	Total
Food insecure? Q3 [B]?	Yes	9% (29)	12% (34)	9% (17)	43% (29)	13% (106)
	No	91% (295)	88% (255)	91% (164)	57% (38)	87% (689)
	Total	100% (324)	100% (289)	100% (181)	100% (67)	100% (795)
p-value = 0.09						

With a p-value of greater than 0.05 there is evidence to accept the null hypothesis; there is no association between employment status and the risk of facing food insecurity. Interestingly, table 9 shows that around 1-in-10 (11.7%) of those in employment in the Outer Isles still faced the risk of food insecurity at some point in the previous year. The figure was similar for retirees, with 9% of retiree survey respondents facing a lack of food. Of the respondents who declared themselves unemployed, nearly half also declared being at risk of food insecurity over the past 12 months. When split in to dummy variables, from across the options for the employment question, unemployed is the one which relayed the lowest p-value and subsequently, the highest confidence interval of statistical association present between being unemployed and at risk of food insecurity.

Considering the impact of Covid-19 on loss of income, an immediate drop in income can cause a lack of access to food for individuals. Just under a quarter of respondents who had responded yes when asked if they had lost money due to Covid-19 had also said yes to facing food insecurity. The p-value in table 10 was found to be below the significance level of 0.05, resulting in evidence to reject the null hypothesis of no statistical association.

Table 10. Chi-square testing for losing income due to Covid-19 and food insecurity

		Lost income due to Covid-19? Q2[B]		
		Yes	No	Total
Food insecure? Q3 [B]?	Yes	21% (45)	10% (61)	13% (106)
	No	79% (166)	90% (523)	87% (689)
	Total	100% (211)	100% (584)	100% (795)
p-value = 6.737e ⁻⁵				

Table 11 regards the ability to pay an unexpected, but necessary bill of £850. Of the 35% of respondents who said they couldn't afford an unexpected bill of £850, roughly 1-in-3 were facing food insecurity. Of the 106 who had said they were facing some form of food insecurity, just 13 (12%) stated they could afford the unexpected bill of £850. This gives an early indication of the relationship between a lack of disposable income and an individual's resilience to food insecurity. With a p-value below 0.05 there is evidence to reject the null hypothesis in this case.

Table 11. Chi-square testing for £850 disposable income and food insecurity

		Able to pay unexpected bill of £850? Q4 [B]		
		Yes	No	Total
Food insecure? Q3 [B]?	Yes	3% (13)	33% (93)	13% (106)
	No	97% (498)	67% (191)	87% (689)
	Total	100% (511)	100% (284)	100% (795)
p-value = 2.2e-16				

As illustrated in table 12, out of the 106 respondents facing food insecurity, 60 (57%) had long-term health conditions, compared to 46 (43%) who did not have any long-term health conditions. This may be due to poor access to services used/needed in order to obtain available food. The p-value of below 0.05 gives evidence to reject the null hypothesis.

Table 12. Chi-square testing for long-term health conditions and food insecurity

		Long-term health conditions? Q5 [A]		
		Yes	No	Total
Food insecure? Q3 [B]?	Yes	25% (60)	8% (46)	13% (106)
	No	75% (183)	92% (506)	87% (689)
	Total	100% (243)	100% (552)	100% (795)
p-value = 4.088e ⁻¹⁰				

Other relationships with food insecurity

The statistical significance between food insecurity and all of the variables present in the survey was explored to understand which variables to include for regression modelling and which variable were deemed statistically insignificant.

It was found that 'gender', and 'children in household' had no correlation and no statistical significance to food insecurity. However, these variables are still included in the final model as they are of interest to policymakers and researchers alike. Similarly, 'access to internet' and the 'ability to turn on and operate a computer' yielded no statistical significance but were still included for modelling. As well as these variables being of interest to policy makers, the result of bivariate analysis may be affected by a confounding factor elsewhere in the survey. In regression analysis, if all explanatory variables are included, the confounding factor can be overcome, meaning a different result may be obtained for the same relationship.

Variables representing issues around local transport were tested, and found to be significant, those variables being; 'difficulty booking a seat on the transport to health appointments', and being 'unable to afford the cost of booking a seat on the transport to access health services'. Questions relating to the individual's experience of Covid-19 were tested for, being 'asked to shield' was significant, but

being ‘worried about Covid-19’ was not, and therefore was excluded from the model. ‘General health’ and ‘mental health’ were found to be significant. Finally, the questions surrounding the individual being ‘embarrassed to seek economic support’ in a time of insecurity and the individual ‘not knowing where to access support’, were found to be significant and therefore included in the modelling.

Other variables from across various sections of the survey were tested for significance. All bar one variable from Social Wellbeing section [D] provided no evidence to reject the null hypothesis, therefore these variables were left out of the model to improve the overall model fit and accuracy of results. Other variables which provided no evidence to reject the null hypothesis and thus were excluded from the model were ‘unpaid caregiving responsibilities’ and support required/provided Q4 & Q6 [C].

3.2.3 Wellbeing Scores

The characteristics of the 795 responses to the four wellbeing questions Q3 [C] (scale of 1-10), are presented in table 13.

Table 13. Wellbeing Q3 [C1] statistical figures

	How Anxious?	How Happy?	How Satisfied?	How Worthwhile?
Mean	4.17	7.04	7.05	7.25
Standard Deviation	2.67	2.19	2.25	2.32
Variance	7.12	4.78	5.05	5.38
Min	1	1	1	1
0.25%	2	6	6	6
Median	4	8	8	8
0.75%	6	9	9	9
Max	10	10	10	10

Satisfaction and happiness had almost identical mean values with the worthwhile question having a higher mean by only 0.2. The question which had the lowest variance and lowest standard deviation was the happiness question. Anxiety had the largest level of variance across respondents and, marginally, had the larger standard deviation. The lower, median and upper quartiles for happiness, satisfaction and worthwhileness were found to be equal.

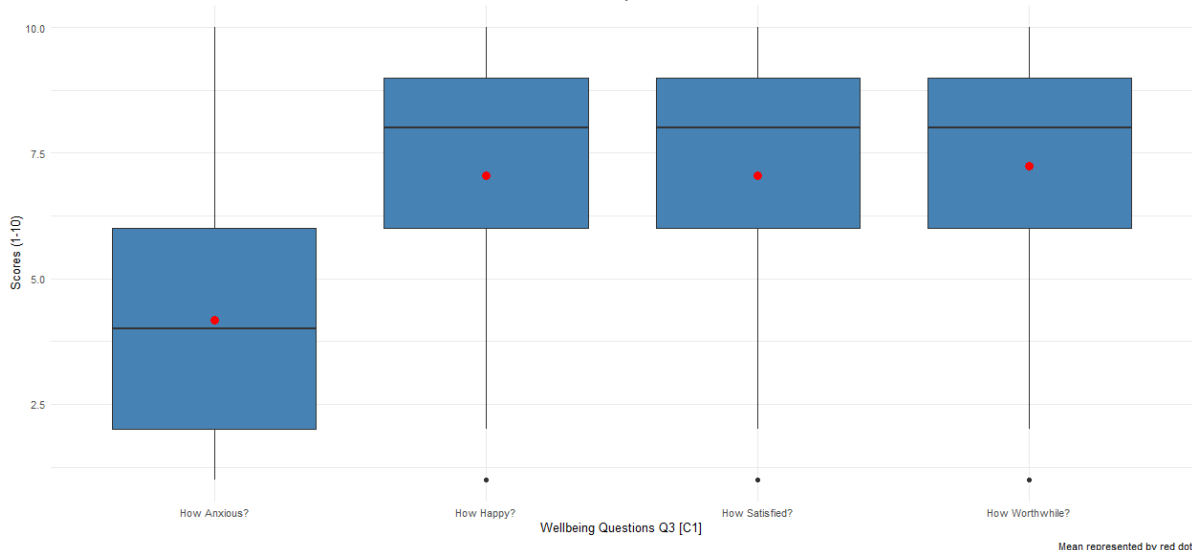


Figure 8. Variance of responses to Four Wellbeing Questions

Figure 8 visualises the data presented in table 13, where the anxiety metric has most symmetrical distribution with the closest mean and median values from all four questions.

A t-test was used to observe if any of the variables present in the survey have an effect on the wellbeing scores – with a specific focus on the “happiness” score.

A t-test, displayed in table 14, will establish if there is a significant difference between the means of two categories in each categorical variable. Observing the differences between the mean value of happiness by category of the variable in question allows for general trends to be identified regarding how the variable impacts happiness. The p-value is used to indicate the probability of the results being obtained by chance and is used to assess the null hypothesis of no statistical association present between happiness and each variable presented in table 14. For further reading on the theory behind the t-test see (Livingston, 2004) (Finney D. J., 1968) (Boneau, 1960).

Table 14. T-test between significant variables and happiness score

		Mean score of how Happy do you feel? (1-10)	t-score	P-value
Facing Food Insecurity?	Yes	5.66	84.92	2.2e-16
	No	7.26		
Facing Fuel insecurity?	Yes	5.84	82.17	2.2e-16
	No	7.38		
General Health? (“Very good” and “Good” = Yes)	Good	7.23	81.24	2.2e-16
	Bad	5.28		
Mental Health? (“Very good” and “Good” = Yes)	Good	7.38	83.97	2.2e-16
	Bad	3.87		
Worried about money? (“Some of the time” and “Often or always” = Yes)	Yes	6.37	75.82	2.2e-16
	No	8.00		
Facing loneliness? (“Some of the time” and “Often or always” = Yes)	Yes	6.10	77.27	2.2e-16
	No	7.75		
Long-term health conditions?	Yes	6.19	80.90	2.2e-16
	No	7.42		
Able to pay an unexpected bill of £850?	Yes	7.34	83.94	2.2e-16
	No	6.50		
Difficulty affording plane or boat for health appointments?	Yes	5.68	85.93	2.2e-16
	No	7.21		
Lost income due to Covid-19?	Yes	6.68	83.87	2.2e-16
	No	7.17		

Due to each p-value < 0.01 (99% confidence interval) there is evidence to reject the null hypothesis of no statistical significance present between each variable and happiness scores. As can be seen, all variables presented in table 14 provided evidence to reject the null hypothesis that there is no difference between means – yes or no responses from each variable resulted in a difference in the mean value of respondents’ happiness.

In the case of food insecurity, those respondents who said “yes” to worrying about running out of food, on average, have a lower overall happiness wellbeing score by a value of 1.6. The story for fuel insecurity is a similar one. Those facing fuel poverty had, on average, a lower happiness score by 1.54, however food insecurity had a higher overall t-score than fuel insecurity, leading to the conclusion that experiencing food insecurity in the Outer Isles will have more of a detrimental effect upon wellbeing than that of fuel insecurity.

The largest t-score present was for the inability to afford transport to make health appointments in Orkney Mainland. The observed differences in mean happiness scores was found to be 1.53.

Other notable differences in mean happiness scores were general health and mental health. Losing income to Covid-19 was also found to be statistically significant in that if an individual had lost income due to Covid-19, they are, on average, likely to have a lower happiness score.

Following on from the t-test, the differences in mean values of Subjective Wellbeing scores, based on food insecurity, fuel insecurity and transport issues, are presented in figures 9, 10 and 11. The differences in mean, median and variance of responses to Subjective Wellbeing are visualised to understand how the distribution of responses to Subjective Wellbeing changes based on issues around food, fuel and transport.

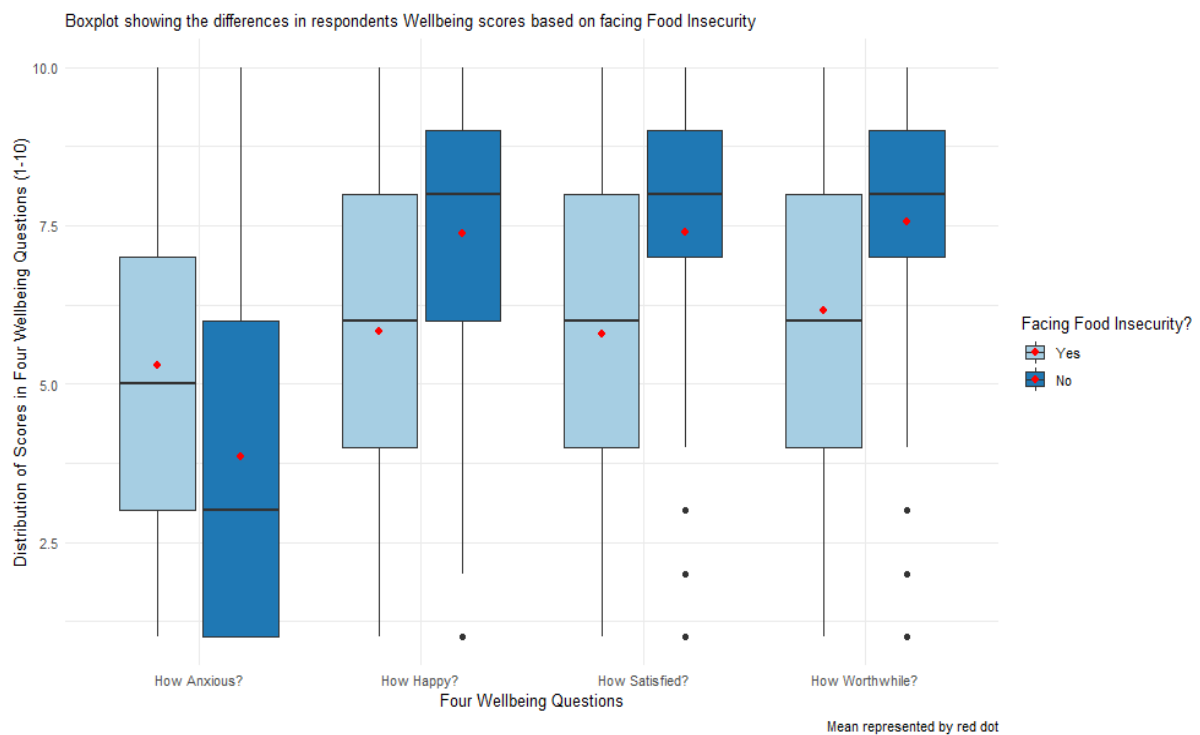


Figure 9. Distribution of Subjective Wellbeing scores split by those who responded “yes” or “no” to worrying about food

The median of individuals who are at risk of being food insecure responding to how happy they are, is the same as the lowest 25% quartile of happiness response from non-food insecure individuals. The differences in distributions of mean and median scores for each wellbeing question depending on whether the individual is worried about food or not, is in line with the literature review cited in table 2, in that, when experiencing food insecurity, Subjective Wellbeing scores are found to be poorer.

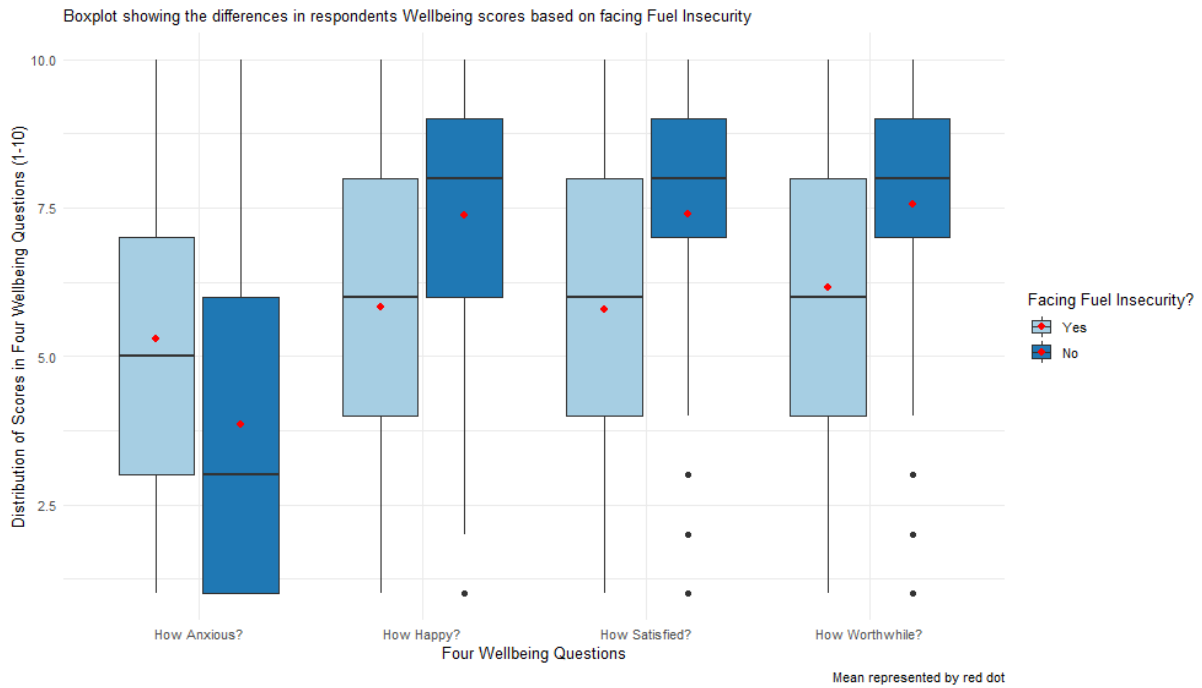


Figure 10. Distribution of Subjective Wellbeing scores split by those who responded “yes” or “no” to worrying about fuel

Figure 10 displays that, overall, facing risk of fuel insecurity creates a larger variance across happiness, satisfaction and worthwhile. Both mean and median are significantly lower across the four Subjective Wellbeing scores if the individual was experiencing fuel insecurity. It was noted the overall variance in anxiety – if not facing fuel insecurity, responses were observed over a large variance, yet, if facing fuel insecurity, the variance of responses to anxiety is far smaller. This clearly indicates a trend: those worrying about facing a lack of fuel experience higher overall anxiety than those who are not facing fuel insecurity.

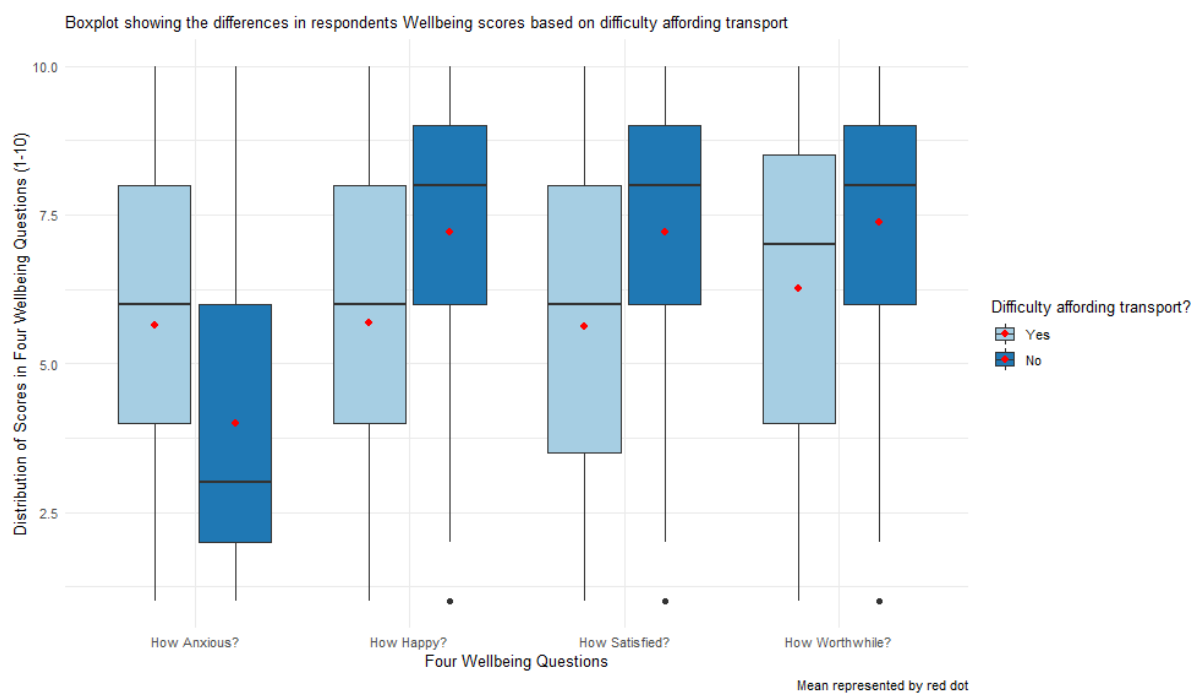


Figure 11. Distribution of Subjective Wellbeing scores split by those who responded “yes” or “no” to difficulty affording transport

Figure 11 details the significant difference in medians of anxiety scores caused by being unable to afford public transport to access health services in Orkney Mainland. The anxiety scores demonstrated vast differences between respondents who were able to afford transport and those who may struggle to afford the transport to Orkney Mainland. The difference in responses to how anxious an individual is feeling show that over 50% of people who struggled to afford transport to access health services were worse off, in terms of anxiety experienced, than all respondents who could afford transport.

In conclusion, visualising the distribution of wellbeing scores affirms the literature reviewed in table 2: facing food insecurity will induce a poorer overall wellbeing. By testing for statistical significance and plotting the distribution of Subjective Wellbeing scores, this paper has added to the existing literature on this subject regarding the relationships between food insecurity and Subjective Wellbeing scores. It was found that fuel insecurity had a very similar effect upon Subjective Wellbeing as food insecurity in the Outer Isles. The strong relationship discovered within this analysis of individuals not being able to afford transport to rural town centres and their corresponding Subjective Wellbeing scores is absent from the literature.

As the ONS Subjective Wellbeing methodology does not form the additional subjective items into continuous scales (Cummins, 2018), the four Subjective Wellbeing questions with their responses over the range 1-10 were split in to binary variables for regression modelling. For happiness, worthwhileness, and satisfaction the transformed binary variables are “yes” or “no” responses where a respondents score of > 7 was deemed as stating “yes” to being happy, feeling worthwhile, and feeling

satisfied with life, with all scores equal to 7 or below deemed as a “no” response. For anxiety the respondent was deemed to have responded “No” to being anxious with a score of < 4 and “yes” with a score of 4 or higher.

Whilst forming binary variables for regression will suffice for this analysis, in ideal conditions Subjective Wellbeing would be recoded into a single variable with the stepped 1-10 scale transformed into a continuous indicator representing overall Subjective Wellbeing. However, the dataset considered for this analysis did not have other suitable variables which could be used to apply this methodology as presented in studies such as (Dolan, 2006) and (Sharpe A. , 1999).

4. Methodology

This paper is concerned with how variables in the survey influence respondents selecting “yes” to either question 3 or 5 in section B – *“During the last 12 months, was there a time when: You were worried you would run out of **food/fuel** because of a lack of money or other resources?”*

To analyse these factors, probit regression modelling is employed. The likelihood of an individual responding “yes” to Q3 and Q5 [B] is regressed on demographic, socioeconomic and health variables from the survey. A probit model is best used when performing regression for binary outcome variables and can be used to estimate the probability that an increase in the independent variable makes the dependent variable fall into one of the two possible binary outcomes (Glen, 2022) – in this instance the two binary options are either “yes” or “no” when describing whether an individual has worried about running out of food or fuel in the previous twelve months.

To assess how specific variables in the survey impact responses to the food and fuel insecurity questions, two probit models are developed. One model concerns the likelihood of responding “yes” to being worried about food as the dependent variable, while the other model has the dependent variable set as the likelihood of respondents selecting “yes” to being worried about their fuel supply. Both models include the same independent variables from across various sections of the survey. By developing two models simultaneously and presenting the results side-by-side, comparisons in the differences a regressor has, in terms of effect, on food and fuel insecurity can be drawn.

Exploring how, if any, of the variables directly impact the likelihood of experiencing food or fuel insecurity, the following formula (1) will be used to represent the general linear regression relationship, where β_0 is the intercept which is a scalar unobserved individual effect (Fernández-Val, 2009), β_n represents the regression coefficient and ε accounts for statistical error (Jacob Cohen, 1983). For this equation Y is a binary dependent variable (food/fuel insecure) which has been observed as a yes or no value. In the data Y is coded as 1 if respondents have chosen yes.

$$Y = \beta_0 + \beta_n * X_n + \varepsilon \quad (1)$$

Therefore, the equation considering the probability of $Y = 1$ is given as:

$$\Pr(Y = 1|X_n) = F(\beta_0 + \beta_n * X_n) \quad (2)$$

Where F is the normal cumulative density function Φ (Mullahy J. , 2017).

From equation (2) the probit regression model can then be derived using a latent, unobserved, dependent variable Y^* , where error ε is of standard normal distribution with a mean of zero and variance σ^2 (Frederick Mosteller, 1977)

$$Y^* = \beta_0 + \beta_n * X_n + \varepsilon \quad (3)$$

(Finney D. , 1971) then gives equation (4), linking equation (2) and (3). Equation (4) considers the probability of $Y=1$, conditional on X_n , based on the proportion of the distribution of Y^* being greater than 0.

$$\Pr(Y = 1|X_n) = \Pr(Y^* > 0|X_n) \quad (4)$$

It then follows: if the latent variable Y^* is greater than 0, Y is observed as 1 – otherwise, when Y^* is equal to or less than 0, Y is found to be 0.

In the case of equation (3) the sign of β_n can be interpreted, denoting the direction of the relationship between the independent variable X_n and dependent variable Y , assessing if X_n drives Y towards 1 or 0, (yes or no, respectively). However, the value of the regression coefficient, in the case of a probit model, uses a log base as its metric (Cook, 2019). β_n in probit modelling represents:

$$\log \left(\frac{\Pr(Y = 1)}{\Pr(Y = 1) - 1} \right)$$

As such, β_n is not used to estimate the strength of association in this analysis. For an easier and more meaningful interpretation the average marginal effects are computed after the estimation of the probit models. Marginal effect indicates the fraction (percentage if the value of the marginal effect is multiplied by 100) change in Y as a result of a unit change in the independent variable. For further reading on the theory behind marginal effects see (Greene, 1996), (Fernández-Val, 2009), (L.N Christofides, 2000)

To estimate the probit models (with one model for food insecurity and one model for fuel insecurity) the software package RStudio (RStudio Team, 2022) is used. The probit model is fitted using the “glm” function which resides in the package “dplyr” (Wickham H, 2022). Following this, the “summary” function displays the p-value and regression coefficient β_n , for n number of independent variables in the model. All coefficient values, the model intercepts, and p-values from the probit regression are

presented in Appendix I. The computed marginal effect as well as their statistical significance are displayed in Table 15.

Whilst this analysis focuses on driving factors behind food and fuel insecurity, the two variables representing food and fuel insecurity could not be used in opposing models to explain the effect one has upon the other. Due to endogeneity, the two variables could not be included in the opposing model as they are correlated. Subsequently these two variables, which form the focus of this study, could not be used to predict the effects they have on each other.

The baseline considered for these two models is a retired person over 65 years of age. This was chosen based on the majority of respondents to survey being of pension age. The baseline was taken as someone with fair overall general health and of fair mental health. When it came to being worried about money, the baseline was selected as; not worried about money.

To measure the general fit of the probit models, McFadden's Pseudo-R² values are used. Pseudo-R² indicates a "goodness of fit" by calculating the proportion of the total variability which is explained by the model (DeMaris, 2002). As the Pseudo-R² value gets higher, the more variance the model can explain.

Another value given is the Bayesian information criterion (BIC) which can be used as a criterion for model selection, with a lower BIC generally indicating a better fit of model (Kenneth P. Burnham, 2004).

Following on from the regression modelling and subsequent analysis of results, interviews with stakeholders and service providers in Orkney are held to extend the discussion of the results. The interviews are used to assess the quality of, and provide context, to the results of this study. The interviews allowed for the author to hear first-hand from subject matter experts how some of these issues highlighted by this study (and potentially any other issues not covered by the survey) are negatively impacting food and fuel security in the Outer Isles.

5. Results

With the baseline set as a 65+ year old retired person who was not worried about money, with fair general health and fair mental health, a probit regression model was created and the average marginal effects of the model are presented in table 15. This analysis makes use of p-values for testing whether to accept or reject the null hypothesis of no statistical relationship present between X_n and Y . For this analysis confidence intervals are set at 99%, 95% and 90%, where 99% = $p \leq 0.01$; 95% = $p \leq 0.05$; 90% = $p \leq 0.1$. The confidence interval for each variable is denoted by asterisks * in table 15.

Table 15. Marginal effects from the estimation of probit model (PART I).

PARAMETERS	PROBIT MODEL 1 Food insecure	PROBIT MODEL 2 Fuel insecure
Demographic		
age16-40 (Yes = 1)	0.105 ***	-0.063 *
age41-65 (Yes = 1)	0.037	0.004
Gender (Female = 1)	-0.010	0.040 *
Children in household? (Yes = 1)	-0.033	-0.002
Internet access? (Yes = 1)	-0.001	0.107 ***
Can you turn computer on? (Yes = 1)	-0.072 *	-0.021
Socioeconomic		
Unemployed (Yes = 1)	0.036	0.035
In employment (Yes = 1)	-0.026	-0.048
Worried about money? – Yes (“Some of the time” and “Often or always” = 1)	0.128 ***	0.171 ***
Worried about money? – Occasionally (“Occasionally” = 1)	0.075 *	0.073 **
Able to afford an unexpected bill of £850? (Yes = 1)	-0.138 ***	-0.231 ***
Embarrassed to seek economic support if needed (“Somewhat agree” and “Strongly agree” = 1)	0.030	-0.027
Do you know where economic support is? (“Somewhat agree” and “Strongly agree” = 1)	0.017	-0.062 ***

(***), (**), and (*) denote statistical significance at (1%), (5%), and (10%) level, respectively

Table 15 cont. *Marginal effects from the estimation of probit model (PART II).*

PARAMETERS	PROBIT MODEL 1 Food insecure	PROBIT MODEL 2 Fuel insecure
Local transport		
Difficulty booking a seat to attend health appointments (Yes = 1)	-0.027	-0.012
Difficulty affording plane or boat to attend health appointments (Yes = 1)	0.131 ***	0.167 ***
General health & COVID-19		
Long-term health conditions? (Yes = 1)	0.065 ***	0.062 **
Mental health? – Good (“Very good” and “Good” = 1)	-0.023	-0.049 *
Mental health? – Ba (“Very bad” and “Bad” = 1)	0.019	-0.003
General health? – Good (“Very good” and “Good” = 1)	-0.013	-0.017
General health? – Bad (“Very bad” and “Bad” = 1)	-0.029	-0.007
Asked to shield? (Yes = 1)	0.033	-0.003
Lost income due to Covid-19? (Yes = 1)	0.025	0.142 ***
ONS Subjective wellbeing		
Happy? – Yes (>7 = yes)	0.016	-0.032
Anxious? – No (<4 = yes)	-0.014	-0.019
Worthwhile? – Yes (>7 = yes)	-0.032	-0.019
Satisfied? – Yes (>7 = yes)	-0.014	-0.008
Model fit		
Chi Square value (pvalue)	249.96 (<0.001)	361.93 (<0.001)
Pseudo-R ² (McFadden)	0.40	0.43
BIC	551.16	652.47
Number of observations	784	783

(***), (**), and (*) denote statistical significance at (1%), (5%), and (10%) level, respectively

The two models developed for food and fuel insecurity were of fairly good fit. The model for fuel insecurity yields a Pseudo-R² value of 0.43 whilst the food insecurity model has a slightly lower Pseudo-R² value of 0.40. Meaning that in both models, nearly half of the variance in food and fuel insecurity can be explained by the independent variables included in the models. Both models yielded interesting results, especially when comparing the different marginal effects obtained for each independent variable.

It was found that several socioeconomic variables proved to be important factors concerning facing food and fuel insecurity. Losing money due to covid-19, the ability to pay an unexpected £850 bill and worrying about money were all significant with p-value lower than 0.01.

With the baseline set as not worrying about money, those who had said “yes” to being worried about money had a higher probability to face fuel insecurity (17.1%) rather than food insecurity (12.8%). The same pattern also holds true for those who ‘occasionally’ worry about money although the difference in effect was less than 0.5%. This implies that worrying about money will more likely induce an individual to experience worrying about fuel rather than food, shedding light on the reality of the “heat or eat” scenario— with the results suggesting an individual will prioritise food over fuel when money is limited. The results show that the ability to pay an unexpected £850 bill reduces the probability of worrying about running out of food and fuel by -13.8% and -23.1% respectively. The much larger marginal effect present in the fuel insecurity model shows that an individual’s access to disposable income and any potential savings can play a role in mitigating the presence of fuel insecurity in the Outer Isles. While this statement is also true for food insecurity, being unable to pay an unexpected bill of £850 has an effect of significant magnitude for an individual experiencing fuel insecurity. These results, again, expand upon the “eat or heat” dilemma in that a lack of money results in people likely to prioritise purchasing food as opposed to fuel. Losing income due to Covid-19 was found to be statistically significant when facing fuel insecurity, with an effect of 14.2%, but was found not to be statistically significant for food insecurity. This could indicate that individuals facing a short-term loss of income are finding it far harder to “heat” rather than “eat”.

These three socioeconomic variables around income and money show: a lack of money and lack of disposable income will impact the food and fuel security of individuals in the Outer Isles. The models suggest that financial difficulties are more likely to impact fuel and heating in the Outer Isles. With high fuel costs, inefficient heating systems and old housing stock (as described in the literature review), the models suggest residents in the Outer Isles who are struggling with money will fall short on fuel before they fall short on food.

The models suggest with a high confidence level that; knowing where to access formal economic support has a negative effect on fuel insecurity by a value of -6.2% (p-value < 0.01). If an individual did know where to access formal support if struggling with household bills, they were less likely to experience fuel insecurity. These results are interesting, specifically to service providers in Orkney. The models have shown that in the Outer Isles, not knowing the avenues for support increase the likelihood of experiencing fuel insecurity– suggesting the avenues to access support may be unclear to individuals in the Outer Isles who are at risk of fuel insecurity.

The model considering food insecurity as the independent variable found that you are more likely to experience food insecurity if you are 16-40 than if you are 65+ with a marginal effect of 10.5% and at a 99% confidence level. This may be explained by younger people in their early careers having fewer savings and also less income. Yet on the contrary, in the model of fuel insecurity, being 16-40 yielded a negative effect (-6.3%) in the 90% confidence level. The negative coefficient, in this case, implies that: if you are in the 16-40 age bracket, you are less likely to experience fuel insecurity than if you are aged 65+. In summary, the results obtained from these two models have demonstrated: younger people in the Outer Isles are more likely to experience food insecurity, with older people more likely to experience fuel insecurity.

Gender had no significance on food insecurity, yet it played a factor in the model regarding fuel. It was found that female respondents to this survey were more likely to be fuel insecure than their male counterparts by an effect of 4%. The p-value for having children in the household led to accepting the null hypothesis of no statistical association between children in the house and being at risk of food and fuel insecurity.

Compared to the baseline of a retired 65+ year old, being in employment or being unemployed was found to have no significant association with facing food or fuel insecurity. Although the results of the Chi-square test suggested that being unemployed was likely to increase the chance of facing food insecurity, the same results were not found within the regression model. Therefore, it can be said that when modelling multiple independent variables, employment status in the Outer Isles bears no statistically significant association to facing food or fuel insecurity. As displayed in table 9, anyone in the Outer Isles, no matter their employment status, may face some form of food or fuel insecurity at any given time due to circumstances other than employment.

Having a long-term health condition did show a statistical significance. If the individual had some form of long-term health conditions, then the chances of experiencing both food and fuel insecurity was increased by 6.5% and 6.2%, respectively. Therefore, local policymakers may wish to consider those with long-term health conditions when devising strategies to combat poverty and improve outcomes

for residents in the Outer Isles. Being asked to shield due to Covid-19 was found not to be statistically significant in the food or fuel insecurity model.

Experiencing bad general health, surprisingly, was found to have no statistical significance in either model. While statistical analysis in table 14 suggested there may be a relationship present – both regression models provided no further findings for those with poor general health. However, those who had responded “good” when asked about their mental health were found to have a negative effect to the value 4.9% with regards to fuel insecurity, suggesting a small level of association between keeping good mental health and lowering the chance of experiencing fuel insecurity in the Outer Isles.

A further point to consider around public health in the Outer Isles is access to health services based in Orkney Mainland. When it came to booking a seat on transport services – it was found to be insignificant to food or fuel security. However, the ability to afford the transport services to access health appointments on Orkney Mainland was found to be a significant factor in both models with 99% confidence levels. With very high confidence levels, not being able to afford the plane or boat to Orkney Mainland increases the chances of an individual experiencing food and fuel insecurity with marginal effects 13.1% and 16.7% respectively.

The Subjective Wellbeing scores when aggregated to binary variables yielded no statistical significance and the probit models provided no further information other than that which is presented in section 3.4. Unfortunately, there are no scale variables present in the database to recode the Subjective Wellbeing scores into one continuous indicator. This single indicator, if possible, may have provided further insight and also used as a dependent variable in future modelling.

6. Discussion

This study has examined the “heat or eat” dilemma experienced in the Outer Isles of Orkney through the analysis of VAO’s Island Wellbeing Survey.

The analysis found that residents in the Outer Isles are more likely to worry about running out of fuel than running out of food. The dataset showed that those facing fuel insecurity in the Outer Isles have a 50% chance of doing so independently of facing food insecurity at the same time. Yet, when an individual is experiencing food insecurity in the Outer Isles, they are very likely to be experiencing fuel insecurity simultaneously. Important factors which were found to increase the level people worried about running out of food or fuel were income and an overall lack of money, as well as difficulties with local transport. The analysis has indicated that individuals faced with financial difficulties in the Outer Isles are likely to prioritise obtaining food and experience a lack of fuel before experiencing a lack of food.

To extend the discussion of the results gathered by this study, interviews were held with stakeholders and service providers in Orkney. In total two interviews were held, both interviewees were employees of charities that operate in Orkney's Outer Isles. Interviewee A was the designer of the Island Wellbeing Survey and a former employee of VAO, Interviewee B is the project officer for a charity that assists households facing fuel insecurity across Orkney.

When regarding the "heat or eat" scenario, both interviewees were asked what they thought the nature of the relationship to be. Interviewee B believed that there was a direct correlation between food and fuel insecurity in the Outer Isles. They suspected that fuel insecurity impacts on food insecurity at a greater level than the opposite, stating that when people are finding it very expensive to heat – it is usually a cause for them to struggle with food bills as well. However, they did suggest that households may prioritise food over fuel when they are struggling financially which is in line with the results from modelling. They believed this to be the case due to fuel and energy generally being a household's largest expenditure, especially in the Outer Isles with energy inefficient housing stock.

Interviewee A would not say that they found food or fuel insecurity to cause one another in the Outer Isles, instead describing both simply as different symptoms of poverty. Poverty was defined by interviewee A as not having enough money to afford the basic essentials. They believed that fuel insecurity can usually be identified as an earlier symptom of poverty because fuel is often a less urgent priority than food. They believed high costs for essential goods in the Outer Isles being a contributing factor, though believed underlying issues such as wages in the Outer Isles not going far enough to be a more pertinent issue. In their study regarding remote rural prices in Scotland (Revoredo-Giha, 2020) found that there was likely to be an increase in prices in rural Scotland, yet not enough of a price increase to be considered economically significant. A point may be made here about the prices of goods in the Outer Isles not being significantly more expensive than the national average – however, general transport costs for Outer Isles residents accessing goods and services may be higher than the national average. A particular issue raised by the survey was those who faced the inability of affording transport to access health services in Mainland Orkney. The results from modelling suggested the inability to afford transport to Orkney Mainland would increase the chances of experiencing food insecurity by a value of 13.1%, and fuel insecurity by 16.7%. It must be noted that after this survey was conducted in May 2021, the local ferry operator OrkneyFerries (operated by Orkney Islands Council) lowered the prices of their fares in the Outer Isles. The new fares, introduced in June 2021, reduced the base rate for adult and vehicle passage by 38% and a further 25% concessionary discount for elderly and disabled passengers was introduced. OrkneyFerries also now offers young people in full-time education a 50% discounted fare (The Orcadian, 2021). This reduction in fares was due to additional funding of £7.855 million granted by Scottish Government for the inter-island ferry service

in Orkney (Orkney Islands Council, 2021). Before this additional funding which allowed for ticket prices to be reduced, the lifeline ferry services operating in Orkney's Outer Isles were some of the most expensive in Scotland (Orkney Islands Council, 2021). The revised fare structure is based upon a Road Equivalent Tariff and has been welcomed by Outer Isles residents since its introduction (The Orkney News, 2021).

However, there remains social inequalities within the fare system. Residents who can afford the upfront cost of bulk buying a booklet of 50 tickets are given a 45% overall reduction in the cost of their fares. Those who cannot afford this upfront cost of 50 journeys will not receive the same level of discount. This is socially unjust and, as this analysis has shown, individuals with little or no disposable income in the Outer Isles are more likely to experience poorer outcomes as it is, without being penalised by this bulk-buying ticket system. Interviewee B mentioned that when people lack disposable income they don't have the spare money to get on the ferry to access retailers, health appointments and general services on Mainland. Interviewee A said when it is difficult for individuals to access transport to Mainland they are consequently lacking access to income maximisation, financial support and employment opportunities. Therefore, focus should be placed on continuing to improve the fare structure of the Outer Isles ferry service to make it as inclusive as possible.

Anyone over the age of 60, and eligible disabled people, in Scotland are entitled to free travel on any local bus service with the National Entitlement Card (National Entitlement Card, 2022). Yet, for the ferry service in Orkney; anyone aged 65 and over, and eligible disabled people, who live in the Outer Isles are entitled to 24 single trips per year on Orkney Ferries, with Papa Westray and North Ronaldsay residents receiving 24 single trips on the plane service (Orkney Islands Council, 2022). This equates to 12 fully-funded round trips each year from the Outer Isles to Mainland for elderly and disabled residents. Whilst this is a very welcome scheme, this offer is clearly not on parity with other areas in Scotland as no timetabled bus services operate in the Outer Isles and the ferry service is the equivalent mode of transport to access rural Town centres. The new OrkneyFerries fare system introduced in July 2021 permit those with YoungScot National Entitlement cards to access a 50% reduction in fares; this (again) is not in line with their peers across the rest of Scotland. As of 31 January 2022, young people between the ages of 5-21 with a YoungScot National Entitlement card are entitled to free bus travel on any local bus service as part of the Scottish Government's plan to build a greener and fairer society (YoungScot, 2022).

Whilst the amendments to ferry fares in Orkney over 2021/2022 have brought about immense benefits for locals, these discrepancies present for young, old and disabled Outer Isles residents are

points worth exploring when looking to improve outcomes in the Outer Isles and beginning to tackle some of the root causes of food and fuel insecurity.

A further point to consider around travel is those with long-term health conditions. Results from modelling suggested an increase in food and fuel insecurity experienced by individuals with long-term health conditions in the Outer Isles – interviewee B thought that the cost and nature of transport from the Outer Isles may compound that fact. With the majority of services based in Mainland Orkney, the high expense of accessing these services may further isolate those with long-term health conditions and increase their likelihood of being at risk of food or fuel insecurity.

When asked about the Outer Isles ferry service being treated in the same manner (in terms of right to access) as a local bus service in Scotland, both interviewees agreed this would be beneficial and would further the improvements brought about by the fare restructure in 2021. Interviewee B stated that reducing transport costs would benefit those who are struggling the most.

A further scheme open to residents of the Outer Isles is the Air Discount Scheme (ADS), also funded by the Scottish Government. The ADS was introduced to travellers in Scotland’s island communities to provide a 50% discount on lifeline air services (Air Discount Scheme, 2022). Since its introduction to core lifeline services, the ADS scheme has been extended to help residents of the Outer Isles travel more frequently at a reasonable cost to other Scottish locations such as Inverness, Aberdeen and Edinburgh (The Orcadian, 2022). These Scottish Government funded schemes have provided immense benefit to residents of the Outer Isles. However, interviewee A mentioned that aside the core cost of the travel, timetables don’t always work for Outer Isles residents – stating that if an appointment and the timetable didn’t match up, it would incur far greater costs due to loss of work and the need to find overnight accommodation. Although timetables and difficulties booking a seat provided no statistical significance in modelling, interviewee A thought they may still play a role even indirectly.

Overall then, this study recommends that OrkneyFerries in their 2021/2022 review, explore the benefits brought about through fare reductions and further these improvements to concessionary pricing. If the Outer Isles ferry service was considered on par with Mainland bus services in terms of equal access, this may bring about reductions in the number of people facing food and fuel insecurity. This study also recommends Scottish Government review historical funding streams to OrkneyFerries and explore the discrepancies faced between the majority of elderly, young and disabled Scottish people and their Outer Isles counterparts. The additional funding provided in the previous financial year should be extended in order to make the two National Entitlement concessionary travel schemes truly universal throughout Scotland and not penalise Orkney Outer Isles residents.

Clearly, challenges to implementing these recommendations are funding, both at national Government and local Council level. The budget set for OrkneyFerries in financial year 2021/2022 stands at £12,612,500 – this includes the additional grant funding received from Scottish Government of £7,855,000 (Orkney Islands Council. Executive Director of Finance, Regulatory, Marine and Transportation., 2021). These figures give an indication of the level of resources needed to maintain, and improve, this lifeline service. The ability of OrkneyFerries to implement further changes is solely dependent on national level funding. It should be noted here that before the £7.8 million injection, OrkneyFerries was considerably underfunded when compared to other ferry services in Scotland (The National, 2019). This study urges the Scottish Government to continue this additional funding to provide parity across all ferry routes in Scotland and improve outcomes for Outer Isles residents.

When it came to the narrative presented in the results section around the effect of age on food and fuel insecurity, both interviewees agreed in principle with the results and provided interesting discussion points. With regards to food insecurity and age, interviewee B mentioned the aspect of people cooking and consuming food, saying they often found that younger adults facing poverty lack access to good-quality white goods which will diminish their ability to cook and store food. Interviewee A mentioned at this point case studies from the Outer Isles, where people were having to turn off appliances such as fridges and freezers to save costs on energy. These comments were extremely interesting as they both allude to the utilisation pillar of food security presented in table 1. With regards to poor utilisation due to a lack access to equipment, interviewee B mentioned vital services operating in Orkney which can provide crisis grants for hardware and kitchen appliances to those who need it. The younger generations who are at risk of insecurity through a lack of knowledge on how to utilise available food is more of a cultural issue however. Longer-term holistic approaches may be needed at local and national government to improve cultural awareness of overall nutrition, such as eating patterns, cooking methods and sources of nutrition. On July 26th 2022, Scottish Parliament passed the Good Food Nation Bill which requires, by law, all health boards and local council authorities to create Good Food Nation Plans (The Scottish Parliament , 2022). This is a welcome step in addressing food poverty in Scotland’s younger generations. Orkney is famed for their natural larder of good quality food (Visit Scotland, 2015) and Orkney Islands Council could benefit from a joined-up food plan which champions local Orkney produce and targets the continued growth of their local food economy, ensuring that they are enabling food businesses to operate in Orkney. An example from which Orkney Islands Council can draw from is East Ayrshire Council who have achieved Gold in the Food for Life Served Here award for fourteen years running (Food For Life, 2022). Thousands of fresh, local and nutritious school meals are served everyday containing organic milk, meat products and seasonal vegetables all obtained within Ayrshire itself (Soil Association Scotland, 2022). Whilst this

promotes a better connection between young people and their food – it does far more for the local economy. These kind of procurement strategies play an important role in community wealth building – working with local businesses to support the local economy. Orkney Islands Council themselves hold a Bronze Food for Life Served Here award and should use the work to-date to build on their Good Food Plan. Alternatively, cultural awareness can be promoted through initiatives driven by 3rd-sector organisations and NGO’s such as the Soil Association. One example is the social movement of Sustainable Food Places (SFP). SFP advocate for a transition to a more healthy and equitable food system (Sustainable Food Places, 2022). Through their ‘Good Food Movement’ SFP look to build public awareness, create active food citizenship and empower local ‘Good Food’ movements.

The models indicated people of 65 years or older were more likely to experience fuel insecurity but those aged 16-40 had a higher chance of experiencing food insecurity. Interviewee A noted the extreme variance in fuel costs and the fact that fuel costs tend to make up a large portion of an older person’s income (usually a pension). Interviewee A suggested the results obtained in the model may be explained by a large variance in fuel costs making it more likely for older Outer Isles residents collecting their pension to experience fuel insecurity. Interviewee B found, from experience, that it was typically people of retirement age who were accessing support from services to meet fuel costs. They added a caveat however, adding that older people experiencing poor outcomes are more obvious to spot and refer to a service, saying that younger people may be less obvious to identify and young people find it more difficult to access services in general.

Regarding the variables around stigma and knowing how and where to access services, both interviewees believed that people in the Outer Isles in general don’t know where to access formal support and may also be too embarrassed to access it. When asked to explain the results (where knowing where to find emergency support decreased the chances of being at risk to fuel insecurity) Interviewee A said that if someone is experiencing financial difficulty and fuel insecurity then it is likely they would feel embarrassed about it. Interviewee B said that people in the Isles ask for help more locally and seldom access Mainland-based support, adding that Isles residents can have difficulty accessing health-based support as Outer Isles residents don’t like accessing services over online/phone. When asked about increasing the awareness and improving the overall accessibility of Mainland-based services in the Isles, Interviewee B stated that there is often not enough funding and resources available for services to increase their presence in the Outer Isles. Both interviewees mentioned the good work currently being undertaken on this issue. For instance, NHS Orkney have the “Money Counts” programme – enabling front-line workers, medical staff, service providers and community workers access to training to implement the “Worrying About Money?” leaflet (Independent Food Aid Network, NHS Orkney, 2022). This programme promotes awareness within

people who are working in the Outer Isles communities of routes to support those who are struggling. On top of that, a recent recommendations report authored by (Hopkins, 2022), advised that routes for self-referral into support in Orkney are enhanced through the implementation of both an online and phone portal. These portals would enable individual's at risk of food or fuel insecurity to find further information and identify organisations that can provide the help they require. The Island Wellbeing Survey shows that a large portion of Outer Isles residents do not know where to access support, and the results of this study show that not knowing where to find support increases the risk of running out of fuel. If the recommendations outlined in (Hopkins, 2022) of enhancing self-referral routes and maximising information sharing between organisations are to be implemented, it may help break down barriers of stigma for accessing support in the Outer Isles.

Regarding the results of no statistical association between any of the employment variables, interviewee A disagreed with this, suggesting that unemployed individuals are most at risk of experiencing a lack of food or fuel. This was mostly due to benefits systems "not going far enough" coupled with inefficient heating systems and poor housing stock. Both interviewees mentioned people on benefits struggle to build any disposable income. Interviewee A thought the results of no association across employment could be due to the relatively large numbers of people experiencing "in-work poverty" in the Outer Isles. Interviewee B mentioned that is often those with low-income employment (especially families) who will struggle most as they don't have the safety net of benefits or a pension.

When it came to individuals worrying about money and the greater level of effect observed for fuel insecurity rather than food insecurity, both interviewees agreed with the results, suggesting a higher threshold is present for an individual crossing into food insecurity and that fuel is often the first household basic to be axed. A similar pattern was found with the inability to pay an unexpected bill of £850 having a greater effect on fuel than food. Both interviewees agreed that having no disposable income would cause the greater effect for fuel insecurity, in that there seems to be a conscious decision present for those who are struggling financially to cut back on energy costs in order to afford food. Both interviewees stated low-paid, part-time, seasonal jobs in the Outer Isles were a direct cause for people lacking disposable income. Interviewee B found through experience those facing 100% fuel poverty are doing so as they have no spare income with all their money going towards household bills and living costs. When asked about income maximisation, both interviewees felt people's incomes (in Orkney in general, not just Outer Isles) are too low. When asked about the introduction of a "Orkney Living Wage" both agreed that this is a good idea in theory – but in reality, were not sure how to increase people's incomes. Interviewee B mentioned strategies such as

employability training and further study for individuals – whilst these are proactive long-term strategies, they do not help people achieve larger incomes in the short term.

The socioeconomic variables tested in the model and the subsequent discussions with stakeholders have shed light on some of the causes of financial difficulties in the Outer Isles, these being mainly the nature of the employment available and energy inefficient housing.

When asked about housing stock in the Outer Isles, Interviewee B stated that often properties in the Outer Isles are expensive to look after and maintain, often have high rent and are very energy inefficient – in essence creating a “perfect storm” of variables driving people into fuel insecurity. They recommended local government engage this issue thoroughly to insulate and upgrade older properties – as well as building new housing fit for purpose in the Outer Isles. In the case of Westray, the north-western most Outer Isle, the local Development Trust has stepped in to build housing of their own. In July 2019 the Scottish Land Fund provided funding to purchase the old harbourmasters house “Bayview” and bring it into community ownership (Westray Development Trust, 2022).



Figure 12. Bayview House prior to renovation (Westray Development Trust, 2022)

Following on from July 2019 to September 2020, and Westray Development Trust was awarded funding through the Scottish Government’s Island Housing Fund to redevelop Bayview into four flats. The flats are made available for rent at around the national average for social rent prices. Three flats are targeted at increasing the housing stock for young individuals working on the island who are seeking affordable and modern accommodation. One double-roomed flat prioritises at providing affordable housing for a young family in Westray. The feedback from the community has been positive, however there is a strong will from residents of Westray for continued development of the

housing stock. Moreover, residents raised their concern that this development added only one home suitable for a family – stating that “we need more homes for families in the island” (Westray Development Trust, 2021).

Further to the work being done in Westray, there are a number of notable housing projects in the Isles, led by community initiatives such as in South Ronaldsay through (Hope CoHousing, 2022), and Papa Westray, where the Papay Development Trust are improving access to appropriate and affordable housing for members of the community through development of social housing, and bringing residential homes to the rental market at affordable prices (Papay Development Trust, 2022).

Initiatives such as community owned housing provides great benefit for encouraging people to live and work in the Outer Isles however, Interviewee B said that from the existing Outer Isles properties, a sizeable portion are majorly inefficient. They also added that the least proactive Isles, in terms of Development Trust’s and local councils engaging the issue and driving change, are usually the worst affected by inefficient housing. Interviewee B concluded by saying work was needed in the Outer Isles to insulate and upgrade older properties – especially amid incoming energy price hikes in UK this winter (Halm, 2022) (BBC News, 2022). Interviewee A also commented on incoming energy prices in 2022 and that the question in the Island Wellbeing Survey “Would you be able to afford an unexpected bill of £850?” essentially becomes an indicator for those who will be at risk of facing fuel insecurity this winter.

Whilst in late-2022, incoming price hikes in energy will draw much focus to short term solutions in helping alleviate people out of immediate fuel insecurity – this study recommends long-term planning from Orkney Islands Council to address this underlying issue of inefficient housing in the Outer Isles.

Although modelling could not add to the existing literature on the relationship between Subjective Wellbeing and food insecurity, results of mathematical and statistical testing presented in figure 9 observed the negative relationship between food insecurity and Subjective Wellbeing is present in Orkney’s Outer Isles in. A relationship of the same nature was also observed for Subjective Wellbeing and fuel insecurity in figure 10. An interesting finding was the mean scores of Subjective Wellbeing were significantly lower if an individual in the Outer Isles was struggling to afford the ferry or plane to attend health appointments in Orkney Mainland as visualised in figure 11.

7. Conclusion

This paper has found that when an individual in the Outer Isles is facing financial difficulties, the risk of facing fuel insecurity is a very real possibility with the risk of facing food insecurity tending not to be far behind. Through exploring the “heat or eat” term introduced in this paper, it has been found

that people will more likely choose to eat as opposed to heat when faced with financial difficulty. People are likely to cut back on energy and fuel expenditure in order to afford food. This is even more pertinent with recent energy price hikes in 2022 (BBC News, 2022) and unfortunately, this means the number of Outer Isles residents at risk of experiencing fuel insecurity is likely to increase over the course of this winter. This increased cost will lead many residents of the Outer Isles to totally reduce their energy usage this winter in order so they can avoid the risk of food insecurity.

The analysis has shown that many residents do not know where to access support if they need it, and may be too embarrassed to do so. Greater work around increasing awareness of the avenues of support should be a priority for service providers, local charities and Orkney Islands Council – especially coming into this winter. Longer-term work is clearly needed to address the housing stock present in the Outer Isles. Orkney Islands Council should be looking to support Outer Isles communities through insulation schemes, new energy-efficient buildings and promoting energy efficiency awareness – whether Orkney Islands Council fund these projects directly, or support local Development Trust’s to achieve housing stock improvements. Whilst housing is a pertinent issue nationwide, the information provided in this study has highlighted the magnitude of pertinence housing currently has in the Outer Isles.

With regards to decreasing the prevalence of food insecurity – policies that enhance access to ferry services for Outer Isles residents may help alleviate some food insecurity through improved access to food retailers and general services on Orkney Mainland. Further improvements to fare structures on the ferry service will also increase an individual’s chances of maximising income through employment or agencies and services. An opportunity to improve outcomes for Outer Isles residents and reduce the number of people facing food insecurity is the development of Orkney Islands Council’s Good Food plan and the furthered development of the local food economy.

In conclusion, the analysis in this paper has led to the following recommendations:

- When devising their Good Food Plan, Orkney Islands Council should truly champion locally sourced food, implementing policies to encourage Orcadian food businesses to thrive.
- The Orkney Good Food Plan should include a commitment regarding the procurement of Orkney Islands Council school canteens, building on their Bronze Food for Life Served Here award. Locally sourced, nutritious meals for all school canteens should be a priority – drawing from other council areas such as East Ayrshire and collaborating with initiatives such as Sustainable Food Places to build an equitable local food supply in Orkney.
- Build on the great work undertaken through NHS Orkney and their ‘Money Counts’ programme. Service providers in Orkney should look to build further capacity for their

frontline and community workers to help support those in need of emergency or financial assistance.

- Service providers should look to increase awareness of the emergency support available and increase their presence in the Outer Isles and, try to begin to reduce the stigma surrounding access to support.
- Scottish Government should extend their funding streams for OrkneyFerries to be on parity with other subsidised ferry services in Scotland.
- OrkneyFerries and Scottish Government should convene on how to extend the two National Entitlement Schemes to include Outer Isles residents.
- Orkney Islands Council should formulate long-term strategies on how to improve the energy efficiency of Outer Isles homes.
- Orkney Islands Council should look at long-term strategies to support Development Trust's based in the Outer Isles in creating affordable housing for residents.

References

- Air Discount Scheme. (2022, July 8). *Air Discount Scheme*. Retrieved from Air Discount Scheme: <https://www.airdiscountscheme.com/>
- Arel-Bundock, V. (2022). *margineffects: Marginal Effects, Marginal Means, Predictions and Contrasts*.
- BBC News. (2022, August 10). *What is the energy price cap and how high will bills go?* Retrieved from BBC News: <https://www.bbc.co.uk/news/business-58090533>
- Boneau, C. A. (1960). The effects of violations of assumptions underlying the t test. *Psychological Bulletin*, vol 57, 49-64.
- Cook, J. R. (2019). Random effects probit and logit: understanding predictions and marginal effects. *Applied Economics Letters*, vol 26, 116-123.
- Cummins, R. A. (2018). Subjective Wellbeing as a Social Indicator. *Soc Indic Res* , vol 135, 879-891.
- DeMaris, A. (2002). Explained variance in logistic regression a Monte Carlo study of proposed measures. *Sociological Methods & Research*, vol 31, 27-74.
- Dolan, P. W. (2006). Dynamic Well-Being: Connecting Indicators of what People Anticipate with Indicators of what they Experience. *Soc Indic Res*, 303-333 (2006).
- FAO. (1996). The Rome Declaration on World Food Security. *Population and Development Review* (pp. 807-809). Rome: Population Council.
- FAO. (2003). *Trade Reforms and Food Security. Chapter 2 – Food Security: Concepts and Measurement*. . Rome: FAO.
- FAO. (2006). *Food Security: Policy Brief*. Rome: FAO.
- FAO. (2022, July 01). *The Food Insecurity Experience Scale*. Retrieved from FAO - Voices of the Hungry: <https://www.fao.org/in-action/voices-of-the-hungry/fies/en/>
- Fernández-Val, I. (2009). Fixed effects estimation of structural parameters and marginal effects in panel probit models. *ván Fernández-Va*, vol 150, 71-85.
- Finney, D. (1971). *Probit Analysis*. Edinburgh: Cambridge University Press.
- Finney, D. J. (1968). *Statistics for Mathematicians* . Edinburgh: Oliver & Boyd.
- Food For Life. (2022, August 7). *Food for Life Served Here*. Retrieved from Food for Life Served Here: <https://www.foodforlife.org.uk/catering/food-for-life-served-here>
- Frederick Mosteller, J. W. (1977). *Data Analysis and Regression*. Massachusetts: Addison-Wesley Publishing .
- French, S. W. (2010). Household income differences in food sources and food items purchased. *Int J Behav Nutr Phys Act* , vol 7, 77.
- Frongillo, E. A.-J. (2019). Food Insecurity is Is More Strongly Associated with Poor Subjective Well-Being in More-Developed Countries than in Less-Developed Countries. *The Journal of Nutrition*, vol 149, 330-335.

- Frongillo., E. A.-J. (2017). Food Insecurity Is Associated with Subjective Well-Being among Individuals from 138 Countries in the 2014 Gallup World Poll. *American Society for Nutrition*, 680-687.
- Glen, S. (2022, July 12). *Probit Model (Probit Regression): Definition*. Retrieved from Statistics How To: Statistics for the rest of us! : <https://www.statisticshowto.com/probit-model/>
- Greene, W. H. (1996). Marginal Effects in the Bivariate Probit Model. *NYU Working Paper No. EC-96-11*.
- Halm, I. v. (2022, August 9). *How UK energy bills are set to surge again*. Retrieved from The New Statesman: <https://www.newstatesman.com/chart-of-the-day/2022/08/uk-energy-bills-price-cap-rise>
- Hope CoHousing. (2022, August 7). *Hope CoHousing*. Retrieved from Hope CoHousing: <https://hopecohousing.org/>
- Hopkins, N. (2022). *A Dignified Approach to Tackling Food Poverty in Orkney - Recommendations for Action*. Kirkwall: Voluntary Action Orkney.
- Independent Food Aid Network, NHS Orkney. (2022, August 9). *Worrying About Money? - Orkney*. Retrieved from Worrying About Money?: <https://www.worryingaboutmoney.co.uk/orkney>
- Jacob Cohen, P. C. (1983). *Applied Multiple Regression/Corellation Analysis for the Behavioural Sciences*. New York: Lawrence Erlbaum Associates.
- Kenneth P. Burnham, D. R. (2004). Multimodel Inference: Understanding AIC and BIC in Model Selection. *Sociological Methods & Research*, vol 33, 261-304.
- Kornher., L. S. (2021). Does food security matter to subjective well-being? Evidence from a cross-country panel. *Journal of International Development*, 1270-1289.
- Kristie N. Carter, et al. (2011). The association of food security with psychological distress in New Zealand and any gender differences. *Social Science and Medicine*, 1-9.
- L.N Christofides, J. H. (2000). On the calculation of marginal effects in the bivariate probit model. *Economics Letters*, Volume 68, Issue 3, 39.
- Lila J. Finney Rutten, A. (2010). Poverty, Food Insecurity, and Obesity: A Conceptual Framework for Research, Practice, and Policy. *Journal of Hunger & Environmental Nutrition*, 403-415.
- Livingston, E. H. (2004). Who was student and why do we care so much about his t-test? *Journal of Surgical Research*, vol 118, 58-65.
- Lüdecke, D. (2018). ggeffects: Tidy Data Frames of Marginal Effects from Regression Models. *Journal of Open Source Software*, 772.
- McEwen, E. L. (2022). *Orkney Food Dignity Recommendations Report. Briefing Document*. Kirkwall: VAO.
- Mullahy, J. (2011). Marginal Effects in Multivariate probit and Kindred Discrete and Count Outcome Models, with Applications in Health Economics. *National Bureau of Economic Research*, NBER Working paper No. 17588.
- Mullahy, J. (2017). Marginal effects in multivariate probit models. *Empirical Economics*, vol 52, 447-461.

- National Entitlement Card. (2022, August 3). *What is the National Entitlement Card?* Retrieved from National Entitlement Card: <https://www.entitlementcard.org.uk/>
- ONS. (2018, September 26). *Surveys using our four personal well-being questions. A guide to what surveys include the four ONS personal well-being questions.* Retrieved from Office for National Statistics : <https://www.ons.gov.uk/peoplepopulationandcommunity/wellbeing/methodologies/surveyusingthe4officefornationalstatisticspersonalwellbeingquestions>
- Orkney Islands Council. (2016). *Orkney's Fuel Poverty Strategy 2017-2022.* Kirkwall: Orkney Islands Council.
- Orkney Islands Council. (2018). *Orkney Economic Review 2018.* Kirkwall: Orkney Islands Council.
- Orkney Islands Council. (2021). *Orkney's Local Child Poverty Action Report 2020-2021.* Kirkwall: Orkney Islands Council.
- Orkney Islands Council. (2021, May 18). *Plan for fairer ferry fares discussed.* Retrieved from Orkney Islands Council: <https://www.orkney.gov.uk/OIC-News/Plan-for-fairer-ferry-fares-discussed.htm>
- Orkney Islands Council. (2021, January 28). *Welcome for ferries funding announcement .* Retrieved from Orkney Islands Council: <https://www.orkney.gov.uk/News?postid=4009>
- Orkney Islands Council. (2022). *Orkney and Hydrogen.* Retrieved from HySeas111: <https://www.hyseas3.eu/news-media/orkney-and-hydrogen>
- Orkney Islands Council. (2022, May 14). *Orkney Transport Guide.* Retrieved from Orkney Islands Council Transport: <https://www.orkney.gov.uk/Files/Transport/Orkney%20Transport%20Guide%20-%20Summer%202022.pdf>
- Orkney Islands Council. Executive Director of Finance, Regulatory, Marine and Transportation. (2021, November 9). *Recommendations Report: Development and Infrastructure Committee: 9 November 2021.* Retrieved from Orkney Islands Council: <https://www.orkney.gov.uk/Files/Committees-and-Agendas/Development%20and%20Infrastructure/DI2021/DI09-11-2021/Item%2010%20%20Internal%20Ferry%20Services%20Summer%202022%20Timetables.pdf>
- Orkney Weather. (2022, May 11). *Orkney Weather - A look at Orkney Weather and Climate.* Retrieved from Orkney Weather: <http://www.orkneyweather.co.uk/#>
- Papay Development Trust. (2022, August 8). *Housing.* Retrieved from Papa Westray Island Development Plan: <https://www.papawestray.co.uk/development-trust/housing.html>
- Rana R, S. R. (2015). Chi-square test and its application in hypothesis testing. *J Pract Cardiovasc Sci* , 69-71.
- Revoredo-Giha, C. et al. (2020). Food prices in Scottish remote rural areas: Are they higher than average Scottish prices? *94th Annual Conference, April 15-17, 2020*, . K U Leuven: Agricultural Economics Society - AES.

- Rojas, M. et al. (2017). Hunger and the experience of being well: Absolute and relative concerns. *World Development*, Vol. 96, 78-86.
- RStudio Team. (2022). RStudio: Integrated Development for R. Boston, MA, USA.
- Ruth Wilson et al. (2021). *The National Islands Plan Survey, Final Report*. Edinburgh: Scottish Government.
- Salahodjaev, R. M. (2021). The Link between Food Security and Life Satisfaction: Panel Data Analysis. *Sustainability*, 13-22.
- Sassi, M. (2018). *Understanding food insecurity: key features, indicators and response design*. New York: Springer International Pub. AG.
- Scottish Government . (2011). Scottish Census 2011 - accessed at www.scotlandscensus.gov.uk. Edinburgh, Scotland.
- Scottish Government . (2020). *Mapping Organisations Responding to Food Insecurity in Scotland*. Edinburgh: Scottish Government.
- Scottish Government . (2021). *A Scotland for the future: opportunities and challenges of Scotland's changing population*. Edinburgh: Scottish Government.
- Scottish Government. (2021). *Poverty in rural Scotland: evidence review*. Edinburgh: Scottish Government.
- Scottish Government. (2022, June 8). *Food Insecurity*. Retrieved from National Performance - Scottish Government: <https://nationalperformance.gov.scot/food-insecurity>
- Scottish Government. (2022). *Scottish House Condition Survey*. Retrieved from Scottish Government: <https://www.gov.scot/collections/scottish-house-condition-survey/>
- Sen, A. (1981). *Poverty and famines: An essay on entitlement and deprivation*. Oxford: Oxford University Press.
- Sharpe, A. (1999). *A Survey of Indicators of Economic and Social Well-being*. Ottawa: Canadian Centre for the Study of Living Standards.
- Sharpe, D. (2015). Chi-Square Test is Statistically Significant: Now What? *Practical Assessment, Research, and Evaluation: Vol. 20, 8*.
- SIMD. (2017). *Child Poverty in the Orkney Islands, A rural deprivation case study*. Edinburgh: Scottish Government .
- Soil Association Scotland. (2022, July 1). *East Ayrshire Council puts more good food on the table by achieving Food for Life Served Here Gold award for the fourteenth year running*. Retrieved from Soil Association Scotland: <https://www.soilassociation.org/our-work-in-scotland/scotland-news/2022/july/01/east-ayrshire-council-puts-more-good-food-on-the-table-by-achieving-food-for-life-served-here-gold-award-for-the-fourteenth-year-running/>
- Styka, J. C. (2018). *Food for Thought: The Effects of Past and Present Food Insecurity on Subjective Well-Being and Child Behavior*. Wooster: Senior Independent Study Theses. Paper 8288. Published by Open Works.

- Sustainable Food Places. (2022, July 10). *About Us*. Retrieved from Sustainable Food Places: <https://www.sustainablefoodplaces.org/about/>
- Temple JB, et al. (2019). Social Assistance Payments and Food Insecurity in Australia: Evidence from the Household Expenditure Survey. *International Journal of Environmental Research and Public Health*, vol16, 455.
- The National. (2019, December 2019). *Double call for Scottish Government to increase ferry funding*. Retrieved from The National Scotland: <https://www.thenational.scot/news/18120316.double-call-scottish-government-increase-ferry-funding/>
- The Orcadian. (2021, September 8). *News: Have your say on revised ferry fare structure* . Retrieved from The Orcadian: <https://www.orcadian.co.uk/have-your-say-on-revised-ferry-fare-structure/>
- The Orcadian. (2022, July 18). *News: Loganair launches new islander discount*. Retrieved from The Orcadian: <https://www.orcadian.co.uk/loganair-launches-new-islander-discount/>
- The Orkney News. (2021, January 29). *Welcome Budget News For Ferries in Orkney*. Retrieved from The Orkney News: <https://theorkneynews.scot/2021/01/29/welcome-budget-news-for-ferries-in-orkney/>
- The Orkney Partnership. (2021). *Locality Plan 2018-2021. Appendix 2*. Kirkwall: Orkney Islands Council.
- The Scottish Parliament . (2022, July 26). *Good Food Nation (Scotland) Bill*. Retrieved from The Scottish Parliament : <https://www.parliament.scot/bills-and-laws/bills/good-food-nation-scotland-bill>
- The Trussel Trust. (2018). *Fuel Poverty Parliamentary Briefing*. London: The Trussel Trust.
- The Trussel Trust. (2022). *Orkney Food Bank Data Report*. Kirkwall: Orkney Foodbank.
- UK Population Data. (2022). *Orkney Population 2021/2022*. Retrieved from UK Population Data: <https://populationdata.org.uk/orkney-population/>
- United Nations. (1975). *Report of the World Food Conference* . Rome: United Nations.
- Visit Scotland. (2015, February 24). *A Taste of Scotland's Foodie Trails*. Edinburgh, Scotland.
- Ward PR, C. J. (2012). Cost and affordability of healthy food in rural South Australia. *Rural Remote Health*, vol 12, 938.
- Westray Development Trust. (2021). *Local Lettings Policy Survey Results*. Pierowall: Westray Development Trust.
- Westray Development Trust. (2022, January 17). *Bayview Housing Project*. Retrieved from Westray Development Trust: <https://westraydevelopmenttrust.co.uk/housing-project/>
- Wickham H, et al. (2022). *dplyr: A Grammar of Data*.
- YoungScot. (2022, July 26). *Young Persons' Free Bus Travel*. Retrieved from YoungScot: <https://young.scot/get-informed/national/young-persons-free-bus-travel>

Appendix I

Coefficient and full p-value from probit regression modelling		Food Insecure? (Yes)		Fuel insecure? (Yes)	
		Coefficient	P-value	Coefficient	P-value
Intercepts		-1.330	0.007	-0.123	0.006
Demographic					
	age16-40 (Yes = 1)	0.701	0.031	-0.407	0.152
	age41-65 (Yes = 1)	0.284	0.280	-0.407	0.919
	Gender (Female = 1)	-0.073	0.638	0.241	0.081
	Children in household? (Yes = 1)	-0.268	0.199	-0.015	0.937
	Internet access? (Yes = 1)	-0.003	0.992	0.747	0.0327
	Can you turn computer on? (Yes = 1)	-0.485	0.073	-0.122	0.634
Socioeconomic					
	Unemployed (Yes = 1)	0.258	0.362	0.201	0.463
	In employment (Yes = 1)	-0.194	0.414	-0.286	0.167
	Worried about money? – Yes (“Some of the time” and “Often or always” = 1)	0.909	0.006	0.880	1.87e-04
	Worried about money? – Occasionally (“Occasionally” = 1)	0.562	0.089	0.444	0.060
	Able to afford an unexpected bill of £850? (Yes = 1)	-0.959	3.95e-08	-1.100	2.53e-14
	Embarrassed to seek economic support if needed (“Somewhat agree” and “Strongly agree” = 1)	0.228	0.144	-0.159	0.242
	Do you know where economic support is? (“Somewhat agree” and “Strongly agree” = 1)	0.131	0.447	-0.376	0.016
Local transport					
	Difficulty booking a seat to attend health appointments (Yes = 1)	-0.218	0.246	-0.075	0.650
	Difficulty affording plane or boat to attend health appointments (Yes = 1)	0.779	4.91e-05	0.805	4.20e-05
General health & Covid-19					
	Long-term health conditions? (Yes = 1)	0.464	0.008	0.351	0.022
	Mental health? – Good (“Very good” and “Good” = 1)	-0.174	0.368	-0.280	0.085
	Mental health? – Ba (“Very bad” and “Bad” = 1)	0.143	0.526	-0.016	0.943
	General health? – Good (“Very good” and “Good” = 1)	-0.097	0.550	-0.100	0.489
	General health? – Bad (“Very bad” and “Bad” = 1)	-0.235	0.401	0.015	0.952
	Asked to shield? (Yes = 1)	0.237	0.260	-0.042	0.824
	Lost income due to Covid-19? (Yes = 1)	0.190	0.258	0.751	1.09e-06
ONS Subjective Wellbeing					
	Happy? – Yes (>7 = yes)	0.121	0.562	-0.191	0.285
	Anxious? – No (<4 = yes)	-0.107	0.596	-0.113	0.512
	Worthwhile? – Yes (>7 = yes)	-0.243	0.213	-0.112	0.508
	Satisfied? – Yes (>7 = yes)	-0.106	0.619	-0.047	0.799
r-squared		0.40		0.43	

Appendix II

Island Wellbeing Survey



This survey aims to map and understand the **health**, **economic** and **social** wellbeing of residents in Orkney's non-linked isles. Please see the next page for details on how this data will be used.



This survey will take you around **ten to fifteen minutes** to complete. Questions are multiple choice, with a comments section on the final page.



This survey is **anonymous**. You must be at least 16 years old and living on one of Orkney's **non-linked isles** to complete this survey. Please complete one survey per person.



Please return your survey using the attached FREEPOST envelope. You can also complete the survey online by visiting **islandwellbeing.org/survey**. The survey will close on the **31st May 2021**.



If you have any questions please contact Harry Johnson, Project Manager, Island Wellbeing Project:

harry.johnson@vaorkney.org.uk / 01856 872897



EUROPE & SCOTLAND
European Social Fund
Investing in a Smart, Sustainable and Inclusive Future

Who are we?

The Island Wellbeing Project is a partnership project between Voluntary Action Orkney and the Development Trusts of Hoy, Stronsay, Sanday, Shapinsay, and Rousay, Egilsay and Wyre. Each island has a Community Wellbeing Coordinator who develops new groups and projects, and who provides one-to-one support to those who need it. Find out more at www.islandwellbeing.org.

Why are we conducting this survey?

This survey will help us understand the health, economic and social wellbeing of residents across the non-linked isles, allowing us to:

- Understand the impact that Covid-19 has had on wellbeing
- Inform the focus of the Community Wellbeing Coordinators
- Understand the potential demand for expanding the Island Wellbeing Project, if funding becomes available
- Support future funding applications for other projects in the isles.

We will also make the key findings of our survey available on our website and will share them directly with relevant organisations, including Orkney Health and Care, Orkney Island Council and Island Development Trusts, GPs and Community Councils.



Throughout the survey you'll see boxes that look like this, explaining why we are asking each section of questions.

Will people know how I have answered? What happens to my completed survey?

We won't ask you for your name or any contact information, so your response to this survey is anonymous. Completed surveys will be combined together and analysed by Harry Johnson, Project Manager at Voluntary Action Orkney. This means that your individual responses cannot be identified by anybody else.

How do I complete the survey?

The survey has four sections: About me, Money and Finance, Health, and Social Wellbeing. Each section is made up of multiple choice questions, with a comments box at the end of the survey. The survey will take around ten to fifteen minutes to complete.

About you



In this section we're going to ask you about some of your characteristics and responsibilities, and experiences of the last year. All of this information helps us understand the results of the rest of the survey.

1

Which island do you live on?

.....

2

How old are you?

-
- 16-25 years old 26-40 years old 41-50 years old 51-65 years old 66-80 years old 81+ years old

3

What is your gender?

-
- Male Female Other Prefer not to say

4

Are there any children under the age of 15, or between the ages of 16 and 18 **and** in full-time education, in your household who you are responsible for?

- Yes No

5

Do you have any long-term physical or mental health conditions or illnesses lasting or expected to last 12 months or more, that reduce your ability to carry out day-to-day activities?

Yes

No

6

Apart from paid work, do you look after or give any support to anyone because they have any long-term physical or mental health conditions or illnesses, or problems related to old age?

Yes

No

7

Does your household have internet connection **and** a device to access it with (e.g. laptop, smart phone, computer, tablet)?

Yes

No

8

Since the outbreak of Covid-19 have you been asked to shield?

Yes

No

9

I am worried about the effect that the Covid-19 pandemic is having on my life right now.

Strongly disagree

Somewhat disagree

Neither agree or disagree

Somewhat agree

Strongly agree

Money and finance



For some people, Covid-19 has increased the cost of living. In response, a lot of islands provided additional financial support, like fuel vouchers and grocery boxes. We want to understand if there's likely to be a continued demand for this kind of support.

1

What is your employment status? If you have more than one role, please choose all that apply.

Employed

**Self-
employed**

Retired

Student

Unemployed

2

Has your household lost income as a result of the Covid-19 pandemic?

Yes

No

3

During the last 12 months, was there a time when you were worried you would run out of food because of a lack of money or other resources?

Yes

No

4

Could your household afford to pay an unexpected, but necessary, expense of £850?

Yes

No

5

During the last 12 months, was there a time when you were worried you would be unable to afford fuel for heating because of a lack of money or other resources?

Yes

No

6

How often do you worry about money?

Never**Hardly
ever****Occasionally****Some of
the time****Often or
always**

In the next section, we are trying to understand if people know where to go for support when they're struggling financially. This will help target awareness raising about support available.

7

If I was struggling to afford household costs (e.g. food, fuel, clothes), I would know where and how to access formal support.

**Strongly
disagree****Somewhat
disagree****Neither
agree or
disagree****Somewhat
agree****Strongly
agree****8**

If I was struggling to afford household costs (e.g. food, fuel, clothes) I'd feel too embarrassed to seek formal support.

**Strongly
disagree****Somewhat
disagree****Neither
agree or
disagree****Somewhat
agree****Strongly
agree****9**

How many people on your island do you think worry about running out of essential household items, like food or fuel, because of a lack of money or other resources?

Nobody**Less than
5%****Between
5-15%****Between
15-30%****More than
30%**

Health



The following questions give us a snapshot of the health and wellbeing of island residents, which you might recognise from other surveys. We will then ask you some questions about your experience of accessing health services.

1

How would you describe your general health?

Very bad

Bad

Fair

Good

Very good

2

How would you describe your mental health?

Very bad

Bad

Fair

Good

Very good

3

How would you score yourself against the following between 1 and 10, where 1 means 'not at all' and 10 means 'completely'?

Overall, how happy did you feel yesterday?

1

2

3

4

5

6

7

8

9

10

Overall, how anxious did you feel yesterday?

1

2

3

4

5

6

7

8

9

10

Overall, how satisfied are you with your life nowadays?

1

2

3

4

5

6

7

8

9

10

Overall, to what extent do you feel that the things you do in your life are worthwhile?

1

2

3

4

5

6

7

8

9

10

4

In the past **two years** have you, or anybody you provide care for, needed and/or accessed support for any of the following? Please mark a box in each row.

	I didn't need support from a service	I received support from a service	I needed support but couldn't access a service*
Help with household jobs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Day care	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Respite care	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Personal care	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
End of life care	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Non-emergency dental care	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Emergency dental care	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Podiatry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Counselling	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Drug / alcohol support	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Psychiatric support	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

***If you needed support but couldn't access a service, why was this? (e.g. too expensive, travel, waiting times, service didn't exist).**

5

When attending health appointments in Kirkwall do you often experience any of the below? Please cross all that apply.

- Being offered an appointment time before/after the first/last plane or boat
- Difficulty affording the plane or boat
- Difficulty arranging support for caring responsibilities (including childcare)
- Difficulty taking time off or finding cover for work
- Difficulty finding somebody to accompany me
- Difficulty booking a seat on the plane
- None of the above
- Other

6

Do you currently provide any of the following to others in your community? If not, with the right support, would you be interested in doing so? This could be anything from an hour a week. Please cross a box in each row.

	I already do this	I'd be interested (voluntary)	I'd be interested (paid)	I'm not interested
Helping with shopping	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Helping with odd jobs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Helping with transport	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Personal care	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Social visits	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Supporting a group	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Social wellbeing



Community has played an important role in the response to Covid-19 but we know that community can mean different things to different people. These questions are designed to help us understand how you relate to those around you.

1

I feel like I belong to my community.

Strongly disagree

Somewhat disagree

Neither agree or disagree

Somewhat agree

Strongly agree

2

Generally, I borrow things and exchange favours with others in my community.

Strongly disagree

Somewhat disagree

Neither agree or disagree

Somewhat agree

Strongly agree

3

If I needed help, there are people who would be there for me.

Strongly disagree

Somewhat disagree

Neither agree or disagree

Somewhat agree

Strongly agree

4

How often do you feel unsafe or at risk of harm where you live?

Never

Hardly ever

Occasionally

Some of the time

Often or always

5 How often do you feel lonely?

Never

**Hardly
ever**

Occasionally

**Some of
the time**

**Often or
always**



In this section, we want to understand more about your experience of online and offline socialising, and your awareness of support available for social issues.

6 If you had access to a computer with internet connection, which of the following would you be able to do? Please tick all that apply.

**Turn the
computer
on/off**

**Search
for a
website**

**Send an
email**

**Watch a
video on
YouTube**

**Join a
video call
(e.g. Zoom)**

7 Before Covid-19 I think there were enough social groups and activities on my island to meet my needs and interests.

**Strongly
disagree**

**Somewhat
disagree**

**Neither agree
or disagree**

**Somewhat
agree**

**Strongly
agree**

8 If I ever felt unsafe or at risk of harm in my community, I'd know how to access formal support and I'd feel comfortable doing so.

**Strongly
disagree**

**Somewhat
disagree**

**Neither agree
or disagree**

**Somewhat
agree**

**Strongly
agree**

Any other comments



Please use the space below to tell us about anything else we haven't already asked you about your wellbeing or experience accessing services and support.

END OF SURVEY

Thank you for taking the time to complete the Island Wellbeing Survey. You can return your survey using the attached FREEPOST envelope or by writing the following address on any envelope, without needing to use a stamp. Please return your response by 31st May 2021.

**FREEPOST SC07788
Island Wellbeing Project
Voluntary Action Orkney
Anchor Buildings, Bridge Street
Kirkwall, KW15 1HR**