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Access to medicines in remote and rural areas: a survey of residents in the Scottish Highlands & Western Isles

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Abstract

Objectives

Sparsely populated areas are potentially predisposed to health inequalities due to limited access to services. This study aimed to explore and describe issues of access to medicines and related advice experienced by residents of the Scottish Highlands and Western Isles.

Study Design

Cross-sectional cohort study

Methods

Anonymised questionnaires were mailed to a random sample of 6000 residents aged ≥ 18 years identified from the electoral register. The questionnaire contained items on: access to medicines; interactions with healthcare services; and perceptions of the services. Results were analysed using descriptive, inferential and spatial statistics.

Results

Adjusted response rate was 49.5% (2913/5889). Almost two thirds (63.4%, 1847) were prescribed medicines regularly, 88.5% (1634) of whom considered the source convenient. Pharmacy (73.8%, 1364) or dispensing GP (24.0%, 443) were the most accessed sources. Prescription medicine advice was mainly obtained from the GP (55.7%, 1029). Respondents ≥ 80 years old were significantly ($p < 0.0001$) more likely to live alone (45.3%, 92) compared with those < 80 (15.8%, 424). Almost a fifth (16.5%, 31) of those > 80 years living alone disagreed that they obtained prescribed medicines from a convenient source. The majority of respondents who felt they did not have a convenient medicines source, regardless of urban/rural classification, lived within five miles of a pharmacy or GP practice.

Conclusions

Respondents accessed medicines and advice from a variety of sources. While most considered their access to medicines convenient, there were issues for those over 80 years and living alone. Perceived convenience would not appear to be solely based on geographical proximity to supply source. This requires further exploration given that these individuals are likely to have long-term conditions and be prescribed medicines on a chronic basis.

Key words (3-5)

rural health services; access; convenience; non-prescription drugs; prescription drugs

Introduction

The Scottish Government's 2020 vision for health and social care provision is to enable people to live longer, healthier lives in their own home or a homely setting.¹ Strategic aims are to: tackle health inequalities; improve care for those with long-term conditions; and make special provisions for the elderly and other vulnerable patient groups. In line with previous action plans, emphasis is placed on the need to promote self-care for acute episodes and chronic conditions.² Medicines are the main therapeutic intervention for modifying disease or illness, and access is vital to sustain health. In the UK, the Medicines Act 1968 regulates the supply of medicines (Box 1).

<INSERT HERE - Box 1: UK legal classifications of medicines³>

Within the National Health Service (NHS) in Scotland in 2012/13 there were 98.6million prescription items dispensed at a total cost of £1.12billion.⁴ In addition, over 2 million items were supplied via the community pharmacy minor ailments service (MAS) at a total cost of £4.45million.⁵ The MAS allows eligible people to register with a pharmacy for the consultation and treatment of common self-limiting conditions to obtain P or GSL medicines free of charge.⁶ However, access to medicines (POM, P and GSL) is potentially an issue which may impact patient care in remote and rural areas of Scotland due to the limited access to general practitioner (GP) and community pharmacy services.

In those geographical areas where a community pharmacy service cannot be sustained, a Health Board may grant a general medical practice the right to dispense prescription items for its patients. NHS Highland is the largest geographical Health Board in the United Kingdom, covering approximately 32,512 km² (12,507 miles²), representing 41% of the entire land mass of Scotland, but the population is only around 310,000 resulting in a low population density. Only 25.8% of the population live in 'urban areas' (defined as settlements $\geq 10,000$ people) compared to 69.5% of the entire population of Scotland.⁷ Just under half (43%) of general medical practices in Highland are dispensing practices. Moreover, within Highland 40.4% of the population live in 'remote rural' locations (defined as settlements < 3,000 people, and with a drive time of over 30mins to a settlement of 10,000 or more).⁸

NHS Western Isles comprises an archipelago of islands 130 miles long, 40 miles off the North West coast of Scotland and has a population of around 26,500 serviced by ten GP practices across multiple sites.

The Scottish Government has very recently published a strategic document, *Prescription for Excellence*, which describes a vision for novel pharmaceutical care services to be developed within the community setting in Scotland over the next decade. This articulates an integrated, multidisciplinary approach to optimising pharmaceutical care for each patient. Pharmaceutical care is defined as "the responsible provision of drug therapy to achieve agreed outcomes that improve an individual's quality of life".⁹ There is an explicit statement of the need to explore how remote and rural populations can be further supported in terms of pharmaceutical care provision.⁹

There is a need to profile issues around access to medicines (POM, P and GSL) from the patient perspective in the remote and rural areas of Scotland. This study builds on the work undertaken in an unpublished study in 2009 evaluating patient perspectives on access to medicines in their locality.¹⁰ One of the recommendations was a need for further research focusing on the perceived need of the general public in terms of medicine provision.

Research aim

The aim was to explore and describe issues of access and convenience to medicines and medicines related advice in the general public resident in the Highlands and Western Isles.

Methods

Settings and subjects

The study population was a random sample of the general public, aged 18 years and over, resident in the areas of the Highland and Western Isles Councils, identified from the electoral roll.

Questionnaire development and validation

A draft questionnaire was adapted and developed from the telephone interview schedule used in the 2009 study.¹⁰ Face and content validity of the draft questionnaire were reviewed by a team of 4 experienced researchers and practitioners. The final questionnaire comprised 19 items over four pages, designed using Snap software. Questions contained items on: demographics; access to medicines provision; interactions with healthcare services; perceptions and attitudes of the general public to these services; and demographics including health status . Question types were a combination of closed, 5-point Likert scales and open response items.

Data collection and analysis

Anonymised, postal questionnaires were sent to 6000 members of the general public living the catchment area. A sample size of 6000 was used to allow for a response rate of around 25% and to permit sub-group analysis.

Evidence based strategies employed to maximise the response rate included: professionally developed coloured questionnaires; an invitation letter from a higher education institution; anonymised responses; provision of reply paid envelopes; following up non-respondents.¹¹ Questionnaires were sent in November 2010 along with a covering letter a describing the study background, aims and providing reassurance of anonymity and confidentiality. Up to two reminders were sent to non-respondents at monthly intervals.

Data were entered into a password protected SPSS database (Version 21 SPSS Carey Ltd), with a data entry reliability check performed on a random sample of 10% of questionnaires. Descriptive statistics

including frequency, percentage, mean, standard deviation, median, inter-quartile range were used to profile residents. Inferential statistics, including Chi-square test, were used to measure associations.

Rurality and deprivation of respondents was determined using the Scottish Government's Scottish Urban-Rural Classification 2011/12⁷ and Scottish Index of Multiple Deprivation¹² respectively based on the postcode of the respondents.

Spatial analysis was conducted with the aim to assess respondents' interaction with locally available services. The analysis addressed three specific types of respondent; those without a convenient source for accessing prescribed medicines; those who do not use a pharmacy as a first point of contact for advice about medicines; those who were >80 years. Survey results were added to the Geographical Information Systems (GIS) software ArcMap 10.2 to carry out spatial analysis on the following respondents: < 80 years old; >80 years old; no convenient source for prescribed medicines; did not attend a pharmacy for medicines advice. Respondents were plotted on a digital map using easting and northing coordinates associated with their home residence postcode. Similarly, the location of dispensing and non-dispensing GPs and pharmacies were plotted by postcode. A layer showing the Scottish Government 8 fold urban rural classification was added using data from the Scottish Government Statistics website.⁸

Nearest neighbour analysis (NNA) was used to consider the spatial patterning of respondents. The resultant z-score and p value demonstrate the statistical significance of rejecting the null hypothesis (that the features are randomly distributed). A negative Z score indicates clustering, whereas a positive score means dispersion or evenness. The proximity 'buffer' tool was used to highlight radiuses around GPs and pharmacies at distances of 1mile and 5miles. The centre of each buffer is the easting and northing associated with the postcode of the GP or pharmacy.

Ethics and research governance

This research was approved by the Ethical Review Panel, School of Pharmacy & Life Sciences,
Robert Gordon University, Aberdeen, United Kingdom.

Results

Characteristics of respondents

The adjusted response rate was 49.5% (2913/5889 after removing those returned undelivered).

Respondent demographics are given in Table 1 and compared to Highland population data collected during the Scottish Census 2011.¹³ The mean (standard deviation) age was 57.0 years (16.1), compared to census mean of 50.9 years.

<INSERT TABLE 1 HERE>

The median rating for health status on a scale of 1 (as bad as it can be) to 5 (as good as it can be) was 4 (interquartile range 4-5) with 92.2% (2687) giving a rating of 3 and above. The median number of visits to a healthcare professional in the last year was 2 (interquartile range 0-4) for a GP and 1 (interquartile range 0-6) for a community pharmacy.

Almost two thirds of respondents (63.4%, 1847) were prescribed repeat medicines. Of these 1847 respondents, 88.5% (1634) agreed that they obtained their prescribed medicines from a convenient source. These patients were taking a median of 3 medicines (interquartile range 2-5) and largely obtained these from a pharmacy (73.8%, 1364) or via their dispensing GP practice (24.0%, 443). Respondents ≥ 80 years old prescribed regular medicines were significantly less likely to consider their source of medicines convenient versus those < 80 (83.2%, 149 vs. 90.2%, 1481 respectively: $p=0.035$). If they required information about their prescription medicines, their first port of call would be either their GP (55.7%, 1029) or pharmacist (39.3%, 725), with small numbers using sources such as the internet, family and friends.

Of those 366 respondents living alone and taking prescribed medicines, 13.8% (45) disagreed that they obtained their prescribed medicines from a convenient source. This figure rose to 16.5% (31) of those aged > 80 years and living alone.

The first port of call for support in the management of minor ailments (conditions requiring little medical intervention to treat) were community pharmacies (42.0%, 1224), GPs (33.3%, 969), the internet (11.8%, 345), family/friends (4.5%, 131) and NHS 24 [NHS operated 24/7 health helpline] (2.9%). Non-prescription medicines were largely accessed via community pharmacies (50.7%, 1478) or non-pharmacy outlets including shops and supermarkets (35.4%, 1031).

<INSERT TABLE 2 HERE>

Table 2 shows that those respondents ≥ 80 years old are significantly ($p < 0.0001$) more likely to live alone (45.3%, 92) compared with those < 80 (15.8%, 424). Also, in comparison with those < 80 , respondents who were ≥ 80 years old were significantly ($p < 0.001$) more likely to be prescribed more medicines; consider their health to be in worse condition ($p < 0.0004$); access health services more including general practitioner ($p < 0.001$), community pharmacy ($p < 0.001$) or hospital outpatient appointment ($p < 0.026$).

Access to medicines or medicines related advice - spatial analysis

Survey respondents > 80 were not distributed randomly but are clustered (nearest neighbour analysis: $z = -23.87$, $p < 0.001$). Figure 1 shows that clustering mainly follows population distribution. Most survey respondents > 80 did not live within one mile of a pharmacy (58.7%) or GP Practice (61.5%). Figure 1 gives an overview of this and shows that only those living within the area's small towns or the urban capital of the Highlands were within 1m. Most survey respondents > 80 do, however, live within five miles of a pharmacy (78%) or GP practice (88.1%). Clusters were visible that were not within five miles: all of which within very remote and rural areas.

<INSERT FIGURE 1>

Convenience of source of prescribed medicines or medicines related advice - spatial analysis

Survey respondents who felt that they did not have a convenient source for prescribed medicines were not distributed randomly but clustered (nearest neighbour analysis: $z = -26.92$; $p < 0.001$). Figure 2 shows clustering mainly follows population distribution. We can see that there are respondents within urban, accessible rural, remote rural and very remote rural areas who felt they did not have a convenient source – many of these respondents appeared to live within close proximity to a GP or pharmacy, suggesting that perceptions of convenience are not solely related to physical distance. The suggestion is confirmed using 5 mile buffering – showing that the majority of those who felt they did not have a convenient source actually lived within five miles of a pharmacy or GP practice. There are pockets of respondents reporting an inconvenient access to medicines less than five miles from a GP or pharmacy living around some urban areas and small towns. Other pockets of respondents reporting an inconvenient source of medicines access were found more than five miles away from either a GP or pharmacy around: all of which within very remote and rural areas.

<INSERT FIGURE 2>

Discussion

Summary of main findings

The vast majority of respondents perceived that they were in good health. Almost two thirds of respondents were prescribed regular medicines of which 88% believed that they obtained these from a convenient source. However, those respondents who were ≥ 80 or who were living alone were statistically less likely to find their source of medicines convenient compared with younger respondents. Furthermore, those respondents >80 years old were significantly more likely to live alone, be prescribed more medicines, consider their health to be in worse condition and access health services more than younger respondents. Most survey respondents >80 did not live within one mile of a pharmacy but did, however, live within five miles of a pharmacy (78%) or GP practice (88.1%). It is a major finding of this research that the cohort of the population which considers itself in the worst health, and is prescribed the most medicines, is also the most likely not to consider their point of access to those medicines convenient.

Medicines were largely obtained from pharmacies (73%) and a GP was the most likely first point of contact for information about medicines (56%), however, community pharmacies remained the first point of contact about minor ailments (42%). Survey respondents who felt they did not have a convenient source for prescribed medicines were not distributed randomly but clustered. Perceptions of convenience were not solely related to physical distance or rurality. Other factors including access to a car or the ability to drive in certain ruralities are likely to be more important than simply proximity to an access point for a pharmacy or dispensing GP practice. Likewise, mobility, or place of work and opening hours of local services are all likely to affect the responses of patients as to whether they feel their geographically close medicines services are convenient.

Strengths and limitations of this research

The response rate of 50% exceeded our expectations for a survey of the general public, and generated responses of 3000. Furthermore, comparison to population data demonstrates that the respondents were representative and hence the findings are likely to be generalisable.

The geographical area over which the sample was taken is diverse ranging from urban town and city centres to remote island communities. Although there was heterogeneity with respect to rurality in the respondents, we believe that this is likely to be representative of the population living within the Highlands and Western Isles of Scotland. In addition, these issues are likely to be similar to other mixed, remote and rural populations across Europe and beyond.

However, we are aware of the limitations of our research and thus the findings should be interpreted with caution. Notably, the findings are based on self-reports and hence may lack internal validity. Due to time restrictions, we were unable to undertake a test-retest reliability assessment.

In addition, the buffer zones of one and five miles were considered to be acceptable proximities for pedestrian or vehicle access to local services but these figures could be debated.

Comparison with the findings from other literature

There would appear to be a paucity of research utilising spatial analysis to map views of convenience to medicines access and advice, linking respondent proximity to locally available services.

It is well recognised the elderly are prescribed and consume more medicines than the general population, with one study reporting this to be about three times higher.¹⁴ When considered alongside our findings, it is clear that there are public health issues related to access to medicines and the safe and effective use of medicines for those elderly patients living alone.

Implications for practice

Prescription for Excellence provides a landmark for the pharmacy profession in Scotland to completely redesign and implement patient focused services in collaboration with GPs and the full multidisciplinary team to deliver proficient and effective pharmaceutical care. This publication was

preceded by a succession of pivotal documents published by The Scottish Government.^{2, 15, 16} and the development of pharmacy practice generally. *Prescription for Excellence* stresses the urgent need to research and clearly define the pharmaceutical care needs of patients living in remote and rural areas of Scotland as a first step in developing and implementing population models to meet these defined needs. One solution would appear to be a potential role for specialist public health pharmacists to lead the strategic review and needs assessment of pharmaceutical services at regional levels, to develop strategies to increase access to medicines and related advice. This study has gone some way to defining these needs and the focus on elderly patients living alone. Furthermore, the spatial analysis identified that geographical proximity to a GP or pharmacy does not necessarily guarantee patients find their source of medicines or medicines advice convenient. The reasons for this are not clear but convenience could be influenced by many complex and inter-related factors.

Reduced access to medicines and advice in remote and rural areas is a public health concern. Telepharmacy has been used to enable remote and rural populations within the USA and Australia to access quality pharmaceutical care services including home medication reviews.¹⁷ In addition to medication reviews, technology has also been adopted to provide counselling for remote dispensing services.¹⁸ The potential, therefore, to utilise technology to enable the public to access medicines in areas where there are limited access to pharmacies should be investigated.

This study has highlighted the need for further research to be conducted to describe the pharmaceutical needs of specific subsets of the population, especially the elderly who are living alone. Qualitative phenomenological research is warranted to explore and provide an in-depth understanding of individual perspectives of the elderly, their experiences of access to and the safe and effective use of medicines, the key issues to be tackled and their views of potential solutions.

Conclusions

Those who are elderly, and particularly those living alone, are more likely to find accessing medicines and medicines related advice inconvenient. It is also apparent that geographical proximity to services does not necessarily relate to improved perceptions of convenience. Further research is required to greater understand the issues experienced by those living in remote and rural areas.

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Conflict of Interest Statement

The authors declare that there are no conflicts of interest.

Keypoints (3-5 bulleted)

- Those respondents over 80 years old are statistically significantly more likely to live alone, be prescribed more medicines, consider their health to be in worse condition and access health services more than younger respondents.
- Those patients living alone were less likely to find their source of medicines convenient, a figure which rose in those patients >80 years old.
- Most survey respondents over 80 do not live within one mile of a pharmacy or GP Practice. Most survey respondents over 80 do, however, live within **five** miles of a pharmacy or GP practice.
- Perceptions of convenience to medicines access are not solely related to physical distance or rurality.
- A GP was the most likely first point of contact for information about medicines, however, community pharmacies remained the first point of access for medicines and advice about minor ailments.

References

1. The Scottish Government. A route map to the 2020 vision for health and social care. Edinburgh: The Scottish Government; 2013.
2. The Scottish Government. Better Health, Better Care: Action Plan. Edinburgh: NHS Scotland; 2007.
3. UK Statute Law Database. Medicines Act 1968. Available at: <http://www.statutelaw.gov.uk/legResults.aspx?LegType=All+Primary&PageNumber=61&NavFrom=2&activeTextDocId=1662209>. Accessed April 14th, 2014.
4. Information Services Division Scotland, NHS National Services Scotland. Community Pharmacy: Prescription Cost Analysis. Available at: <http://www.isdscotland.org/Health-Topics/Prescribing-and-Medicines/Community-Dispensing/Prescription-Cost-Analysis/>. Accessed Feb/28, 2014.
5. Information Services Division Scotland, NHS National Services Scotland. Community Pharmacy: Pharmacy Services - Minor Ailments Service. Available at: <http://www.isdscotland.org/Health-Topics/Prescribing-and-Medicines/Community-Dispensing/Pharmacy-Services/>. Accessed Feb/28, 2014.
6. The Scottish Government. Establishing effective therapeutic partnerships: a generic framework to underpin the Chronic Medication Service element of the community pharmacy contract. Edinburgh: Scottish Government; 2009.
7. The Scottish Government. Scottish Government Urban/Rural Classification 2009/2010. Edinburgh: The Scottish Government; 2010.
8. The Scottish Government. Urban rural classification: classifying other geographies. Available at: <http://www.scotland.gov.uk/Topics/Statistics/About/Methodology/UrbanRuralClassification/Urban-Rural-Classification-2011-12/Other-Geographies>. Accessed Feb/28, 2014.
9. The Scottish Government. Prescription for excellence: a vision and action plan for the right pharmaceutical care through integrated partnerships and innovation. Edinburgh: The Scottish Government; 2013.
10. Farmer J, Munoz S. Rural community pharmacy models: an exploration of community perceptions. 2009;.
11. Edwards P, Roberts I, Clarke M, DiGuseppi C, Pratap S, Wentz R. Increasing response rates to postal questionnaires: systematic review. *Br Med J* 2002;**324**:1183-91.
12. The Scottish Government. Scottish Index of Multiple Deprivation. Edinburgh: The Scottish Government; 2012.
13. The Scottish Government. Scotland's Census 2011. Available at: www.scotlandscensus.gov.uk. Accessed Dec/7th, 2013.
14. Law R, Chalmers C. Medicines and elderly people: a general practice survey. *Br Med J* 1976;**1**:565-8.
15. Scottish Executive. The Right Medicine: A Strategy for Pharmaceutical Care in Scotland. Edinburgh: NHS Scotland; 2002.
16. Scottish Executive. Building a Health Service Fit for the Future: A National Framework for Service Change in the NHS in Scotland. Edinburgh: NHS Scotland; 2005.
17. Kimber MB, Peterson GM. Telepharmacy - enabling technology to provide quality pharmacy services in rural and remote communities. *J Pharm Pract Res* 2006;**36**:128-33.
18. Clifton GD, Byer H, Heaton K, Haberman DJ, Gill H. Provision of pharmacy services to underserved populations via remote dispensing and two-way videoconferencing. *Am J Health-Syst Pharm* 2003;**60**:2577-82.

Box 1: UK legal classifications of medicines**Prescription Only Medicines (POM)**

Prescription Only Medicines can be obtained from registered (registered as per the requirements of Section 72 of the Medicines Act 1968) pharmacy premises by patients on presentation of a prescription issued by an appropriate practitioner (a doctor, dentist or non-medical prescribers such as nurse independent prescriber, pharmacist independent prescriber or supplementary prescriber).

Pharmacy Medicines (P)

Members of the public can obtain these medicines without a prescription but only from a registered pharmacy, supplied by a pharmacist or pharmacy support staff under the supervision of a pharmacist.

General Sale List Medicines (GSL)

These medicines can be obtained by members of the public from any retail premises with a locked facility. Medicines must, however, be supplied in the original manufacturer's packaging.

Table 1 – Respondent demographics (n=2913)

Characteristic	% (n)	% Highland HB Population data
Age (years)		
≤29	6.1 (179)	7.1
30-39	7.8 (228)	9.3
40-49	16.9 (492)	16.6
50-59	21.6 (630)	19.6
60-69	24.1 (702)	21.4
70-79	15.8 (461)	15.8
≥80	7.0 (203)	10.4
missing	0.6 (18)	
Sex		
male	43.0 (1253)	48.9
female	56.7 (1651)	51.1
missing	0.3 (9)	
NHS Highland district		
Badenoch, Strathspey/ Nairn, Ardersier	11.4 (331)	1.4
Caithness	11.2 (325)	1.5
East Ross	7.2 (210)	1.2
Inverness east	15.3 (446)	1.2
Inverness west	9.3 (270)	1.2
Lochaber	6.8 (198)	1.2
Mid Ross	7.9 (229)	1.2
Skyle, Lochalsh, West Ross	7.4 (215)	1.3
Sutherland	5.6 (164)	1.6
missing	18.0 (525)	
Scottish Urban Rural classification 2011/12		
1	0 (0)	0
2	19.8 (576)	23.6
3	0 (0)	0
4	8.1 (237)	10.6
5	13.5 (394)	14.5
6	9.0 (262)	9.5
7	9.2 (268)	10.5
8	38.0 (1107)	31.3
Missing	2.4 (69)	
Scottish Index of Multiple Deprivation		
1	5.3 (153)	8.6
2	22.1 (643)	19.4
3	36.3 (1056)	33.2
4	25.0 (729)	30.0
5	9.0 (263)	8.7
missing	2.4 (69)	

Living circumstances		
with spouse, partner	62.2 (1811)	53.4
alone	17.7 (516)	32.8
other	19.5 (568)	13.8
missing	0.6 (18)	
Education		
university	18.0 (524)	26.1
college	25.3 (738)	24.0
secondary school	52.5 (1529)	49.9
missing	4.2 (122)	
Employment status		
full time	35.1 (1023)	50.0
part time	13.6 (395)	14.8
retired	37.0 (1079)	17.0
unemployed	3.3 (97)	4.0
student	1.0 (29)	5.1
other	8.1 (236)	9.0
missing	1.9 (54)	
Ethnic origin		
Scottish	81.1 (2363)	76.9
English	14.7 (427)	16.4
other	3.6 (106)	6.7
missing	0.6 (17)	

Table 2 – Age versus determinants of health

Characteristic	≤ 60 years	61-79 years	≥ 80 years	p-value
Self-reported Health status % (n) 1,2 (poorer) 3,4,5 (fair to excellent)	5.8 (93) 94.2 (1502)	6.6 (71) 93.4 (1006)	13.5 (27) 86.5 (173)	P<0.0004 (Chi-square) ie with age, health status worsens
An appointment or home visit from a general practitioner	Median 2 (IQR 0-4)	Median 2 (IQR 1-4)	Median 3 (IQR 1-5)	P<0.001 (Kruskal-Wallis)
Attended a hospital outpatient clinic	Median 0 (IQR 0-1)	Median 1 (IQR 0-2)	Median 1 (IQR 0-2)	P<0.026 (Kruskal-Wallis)
Attended a community pharmacy for medicines or advice	Median 1 (IQR 0-4)	Median 2 (IQR 0-6)	Median 1 (IQR 0-7.75)	P<0.001 (Kruskal-Wallis)
Number of prescribed medicines	Median 0 (IQR 0-2)	Median 3 (IQR 1-5)	Median 4 (IQR 1-7)	P<0.001 (Kruskal-Wallis)
Living alone % (n) Yes No	12.0 (191) 88.0 (1402)	21.3 (233) 78.7 (859)	45.3 (92) 54.7 (111)	P<0.0001 (Chi-square) ie with increasing age, more living alone

Figure and Table Legends

Figure 1 – Access to medicines or medicines related advice - spatial analysis

Figure 2 – Convenience of source of prescribed medication -spatial analysis

Table 1 – Respondent demographics (n=2913)

Table 2 – Age versus determinants of health