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**A cross-sectional survey of the access of older people in the Scottish Highlands to general medical practices, community pharmacies and prescription medicines**

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## **ABSTRACT**

### **Background**

Access to medicines and healthcare is more problematic in remote and rural areas.

### **Objectives**

To quantify issues of access to general practitioners (GPs), community pharmacies and prescribed medicines in older people resident in the Scottish Highlands.

### **Methods**

Anonymized questionnaires were mailed to a random sample of 2,000 older people ( $\geq 60$  years) resident in the Scottish Highlands. Questionnaire items were: access and convenience to GP and pharmacy services (10 items); prescribed medicines (13 items); attitudinal statements based on the Theoretical Domains Framework (12 items); quality of life (SF8, 8 items); and demographics (12 items). Results were analysed using descriptive, inferential and spatial statistics, and principal component analysis (PCA) of attitudinal items.

### **Results**

With a response rate of 54.2%, the majority reported convenient access to GPs (89.1%) and community pharmacies (84.3%). Older age respondents ( $p < 0.0001$ ) were more likely to state that their access to GP services was not convenient and those in rural areas to community pharmacies ( $p < 0.01$ ). For access to prescribed medicines, those in poorer health ( $p < 0.001$ ) and taking five or more regular prescribed medicines ( $p = 0.002$ ) were more likely to state access not convenient. PCA identified three components of beliefs of capabilities, emotions and memory. Those with poorer health had more negative scores for all ( $p < 0.001$ ). Those reporting issues of access to prescribed medicines had more negative scores for beliefs of capabilities ( $p < 0.001$ ) while those of older age, living alone, and taking five or more regular prescribed medicines (all  $p < 0.001$ ) had more negative scores for emotions.

**Conclusion**

While the majority of respondents have convenient access to their GP practice, pharmacy and prescribed medicines, there is a need for further review of the pharmaceutical care of those of older age with poorer health, living alone in the more remote and rural areas and taking five or more prescribed medicines.

**Key words**

rural health services; access; convenience; prescription drugs; questionnaire

## INTRODUCTION

Access to medicines and healthcare generally is more problematic in remote and rural areas. Studies conducted in Australia,<sup>1</sup> Canada,<sup>2,3</sup> England,<sup>4</sup> Scotland,<sup>1,5</sup> have employed qualitative approaches (focus groups and interviews) with older people living in remote and rural settings to explore aspects of health and social care provision. Similar findings were reported around issues of: difficulties in accessing care, and the continuity and efficiency of care; balancing many trade-offs, e.g. with access issues and the pleasures of countryside living; travel costs in accessing care; and centralisation of services. Haggerty et al noted four key problems of: having to repeatedly restart the care seeking process with different providers; abandoning the care process; unwarranted use of emergency services; and health deterioration.<sup>2</sup> Where in-situ health and social care services were available, these were valued highly. Prior et al identified added value of these services resulting from their social, economic and human contributions, e.g. by enabling social interaction, providing employment opportunities and enhancing the skills base.<sup>1</sup> While these studies provided rich data around health and social care, there was little specific attention to medicines related issues and none attempted to quantify these issues. In an area level spatial analysis based on postcodes of community pharmacies, Todd et al reported that 89% of the population of England can access a community pharmacy within a 20 minute walk.<sup>6</sup> The authors also recommended further research around the perceptions and experiences of people around the accessibility of community pharmacy services.

The Scottish Government Urban Rural Classification provides standard definitions of rural areas in Scotland,<sup>7</sup> as described in Table 1.

<INSERT TABLE 1 HERE>

NHS Highland is the largest geographical health board area in the United Kingdom (UK), covering approximately 32,500 km<sup>2</sup> (12,500 miles<sup>2</sup>) and 41% of the entire land mass of Scotland, but with a population of around 310,000 (6% of Scotland) is an area of low population density. Only 25.8% of the population live in 'urban areas' compared to 69.5% of the entire population of Scotland.<sup>7</sup> Moreover, within Highland 40.4% of the population live in 'remote rural' locations. Just under half (43%) of all general medical practices in Highland have been granted the right to dispense prescription items for its patients due to the lack of financial viability for a community pharmacy.

In 2009, the Scottish Government introduced the '2020 Vision for Health and Social Care', part of which focuses on improving the quality and outcomes of current models of

care for older people to ensure that they are valued, that their voices are heard and that they are supported to enjoy full lives in their own home or homely setting.<sup>8</sup> Strategic aims are to tackle health inequalities, improve care for those with long term conditions, and make special provisions for older people. Multimorbidity, defined by the World Health Organisation as 'the co-occurrence of two or more chronic medical conditions in one person',<sup>9</sup> is highly prevalent in older people. Epidemiological data indicate that multimorbidity increases markedly with age, being prevalent in almost two thirds of those aged 80 years and over.<sup>10,11</sup> Given the emphasis on evidence based therapeutics within healthcare, older people are likely to be prescribed multiple medicines. Recent prescribing data for Scotland highlight that 28.6% of those aged 60-69 years were receiving four to nine medicines and 7.4 % ten or more medicines; in those aged  $\geq$  80 years the figures rose to 51.8% and 18.6 %, respectively.<sup>12</sup> While there is much emphasis on the need for appropriate selection and prescribing of medicines in older people,<sup>13</sup> and promoting medicines adherence,<sup>14</sup> enabling convenient access to medicines is clearly a fundamental requirement in their care.

In 2013, the Scottish Government published its strategy for pharmaceutical care, 'Prescription for Excellence', which describes an integrated, multidisciplinary approach to optimising pharmaceutical care. While pharmaceutical care is a broad term encompassing medicines prescribing, adherence, review etc., appropriate access to medicines is an integral component. Of note, there is an explicit statement of the need to explore how remote and rural populations can be supported further.<sup>15</sup> Previous survey research conducted within NHS Highland in those aged 18 years and over identified that older respondents and those living alone were significantly less likely to consider their access to prescribed medicines convenient.<sup>16</sup> Given the policy direction of the Scottish Government, the medicines related needs of older people and the general lack of quantitative research, the aim was to quantify issues of access to general practitioners (GPs), community pharmacies and prescribed medicines in older people resident in the Scottish Highlands.

## **METHODS**

### **Study design**

A cross-sectional survey using a postal questionnaire.

### **Questionnaire development**

The questionnaire was developed, based on prior research,<sup>16</sup> then reviewed for face and content validity by an expert panel with extensive expertise in policy, practice and research related to older people and medicines: two senior clinical pharmacists; two academic researchers; a senior pharmacist based in the Scottish Government; and a consultant physician specialising in the care of older people. The questionnaire was piloted by mailing to a random sample of 200 members of the general public resident in the Scottish Highlands aged 60 years and over, along with a letter inviting participation stating the research background and aims, and a reply paid envelope. Piloting resulted in minimal changes to questionnaire wording and format; pilot responses were excluded from the final dataset.

The final study questionnaire contained items on: access and convenience to GP and pharmacy services (10 items); dispensing and collection of prescribed medicines (13 items); attitudinal statements (12 items); health related quality of life (SF8, 8 items)<sup>17</sup> and demographics (12 items). The attitudinal statements were developed with reference to the Theoretical Domains Framework (TDF) of behavioural determinants. TDF was derived from 33 psychological theories and 128 theoretical constructs, which are organised into 14 overarching domains.<sup>18</sup> The statements were developed around those domains most relevant to access to prescribed medicines (e.g. memory, attention and decision processes, social influences, emotions etc.) Item responses were a combination of closed options, 5-point Likert scales (strongly agree to strongly disagree) and open text.

### **Sampling**

The questionnaire was mailed in November 2014 to a random sample of 2000 members of the general public aged 60 years and over resident in the Scottish Highlands. The sample was obtained from CACI, consumer database 'Ocean', a vast and powerful database containing 56 million United Kingdom names and addresses, with actual and modelled lifestyle data.<sup>19</sup> A sample size of 2,000 was calculated to allow for a response rate of around 50%, as per our previous, similar research,<sup>16</sup> and to permit sub-group analysis. One thousand responses would give a precision of 3% with confidence intervals of 95%. The following evidence based strategies were adopted to maximise the response rate: an invitation letter from academic and healthcare institutions; clear explanation of

the purpose of the research; provision of a reply paid envelope; and up to two reminders sent to non-respondents at monthly intervals.<sup>20</sup>

### **Analysis**

Data were entered into SPSS version 21.0, with a data entry reliability check performed on 10% of entries, and analysed using descriptive and inferential statistics. Respondent postcodes were used to determine their Scottish Index of Multiple Deprivation (SIMD) quintiles and rurality using the Scottish Urban-Rural Classification.<sup>21</sup> Chi-square tests were used to determine any associations between categorical variables (e.g. age, living arrangements, deprivation, rurality) and the outcomes of convenience to GP, pharmacy and medicines. Given the multiple hypotheses being tested, the p-value of statistical significance was subjected to a Bonferroni adjustment of  $\leq 0.05/n$ , with n being the number of hypotheses.<sup>22</sup>

The attitudinal items measured on 5-point Likert scales were subjected to principal components analysis (PCA) – a statistical technique used to reduce a large number of items or variables to a smaller, more manageable number of components.<sup>23</sup> The suitability of the data for PCA was tested via determination of the correlation matrix for co-efficients ( $\geq 0.3$ ), the Kaiser-Meyer-Olkin measure of sampling adequacy ( $\geq 0.6$ ) and Bartlett's test of sphericity ( $\leq 0.05$ ). The number of components was determined via Eigenvalues  $> 1$  and visual inspection of the scree plot. Oblique (Promax) rotation was used to aid the interpretation of the components as, from a theoretical perspective, there was reason to assume that selected attitudinal items were correlated.<sup>23</sup> Internal consistencies of the resulting component(s) were tested using Cronbach's alpha. Alpha internal consistencies greater than 0.60 are regarded as desirable for psychometric scales.<sup>24</sup> Total component scores were obtained by assigning scores of 1 (strongly agree) to 5 (strongly disagree) to each of the Likert statement responses, with negatively worded items being reverse scored. Differences between groups (e.g. age, living arrangements etc.) in relation to component scores were tested using Mann-Whitney U test (2 groups) or Kruskal-Wallis ( $> 2$  groups).

Spatial analysis was conducted with the aim of assessing respondents' ease of access to medicines. Spatial analysis is simply a process of extracting or creating new information about a set of geographic features.<sup>25</sup> Geographical Information Systems (GIS) Software Survey results were added to the Geographical Information Systems (GIS) Software ArcMap 10.3.1 to carry out spatial analysis on the following respondents:  $> 60$  years; convenient and no convenient access to prescribed medicines, where convenient included 'very easy', 'easy' and 'okay' responses; no convenient access included

'difficult' or 'very difficult' responses. Respondents were plotted on a digital map using easting and northing co-ordinates 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 eight fold urban rural classification was added using data from the Scottish Government Statistics website. Nearest neighbour analysis (NNA) was used to consider the spatial patterning of respondents.<sup>26,27</sup> The resultant z-score and p-value demonstrates the statistical significance of rejecting the null hypothesis (i.e. 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 radii around GPs and pharmacies at five miles. The centre of each buffer is the easting and northing associated with the postcode of the GP or pharmacy.

### *Ethics*

This study was approved by the Ethical Review Panel of the School of Pharmacy and Life Sciences at Robert Gordon University, UK; the North of Scotland Research Ethics Committee advised that the study was exempt from NHS ethical review.

## **RESULTS**

### **Demographics**

One thousand and forty-two questionnaires were received, 77 were returned undelivered giving an adjusted response rate of 54.2%. One hundred and seventy-nine respondents (17.2%) required assistance from another person (usually a relative) to complete the questionnaire. The demographics of the respondents are given in Table 2. The majority (89.1%, 928) were aged 75 years and over, living in areas of remoteness (remote small towns or more remote, 70.5%, 720) and living in areas of mixed deprivation (83.4%, 869) while just under half (40.1%, 418) were living alone.

<INSERT TABLE 2 HERE>

### **Health related quality of life**

Respondents' health related quality of life (SF-8 scores) are given in Table 3. While nearly two thirds of respondents (64.7%, 934) reported their health in the past four weeks as good or better, one third (35.6%, 371) reported moderate to very severe bodily pain, one third (35.0%, 364) reporting physical health or emotional problems limiting social activities somewhat to completely and one fifth (22.1%, 231) reporting personal or emotional problems interfering with daily activities somewhat to completely.

<INSERT TABLE 3 HERE>

The median number of visits in the last three months to the general practitioner (GP) for their own health was 1 (IQR 0-3), and a community pharmacy for medicines 1 (IQR 0-3).

### **Access to GP practice**

The median distance travelled from home to access the GP practice was 2 miles (IQR 1-5, maximum 40). Two thirds travelled by car (67.6%, 704), fewer by foot (16.3%, 170) or public transport (4.7%, 49), with the median time taken to get there 10 minutes (IQR 10-20, maximum 90). Two thirds (68.7%, 515) found travelling to their GP practice very easy or easy, while 20% (208) reported this as okay and 9.4% (94) as difficult or very difficult. The majority (89.2%, 929) found their GP practice convenient. Reasons given for those (7.6%, 79) reporting inconvenience were largely due to: immobility; reliance on others; travelling when ill; difficulties in getting an appointment; awkward location (e.g. steep hill, stairs); and costs incurred. There was a statistically significant association with respondent age and convenience of access, with older age respondents more likely to state that their access was not convenient (see Table 4).

<INSERT TABLE 4 HERE>

### **Access to community pharmacy**

The median distance travelled from home to access the pharmacy was 1.5 miles (IQR 0.75-6, maximum 100). Just over half travelled by car (55.1%, 574), less by foot (20.6%, 215) or public transport (5.6%, 56), with the median time taken to get there 10 minutes (IQR 6-20, maximum 120). Two thirds (63.7%, 663) found travelling to their GP practice very easy or easy, while 17.5% (182) reported this as okay and 8.5% (89) as difficult or very difficult. The majority (84.3%, 878) found their community pharmacy convenient. Reasons given for those (6.7%, 70) reporting inconvenience were largely due to: distance; no local pharmacy; immobility; and reliance on others. There was a significant association between rurality and convenience with those in the most rural areas more likely to state that their access was not convenient (see Table 5).

<INSERT TABLE 5 HERE>

### **Prescribed medicines**

The majority of respondents (88.7%, 924) were regularly prescribed medicines. Of these, the median number of prescribed medicines was 4 (IQR 3-7, maximum 27). Respondents got their prescribed medicines largely every month (46.4%, 429), every two months (37.7%, 348) or every three months (5.5%, 51). Most (81.9%, 757) used the same pharmacy to get their prescribed medicines while 1.2% (11) used different pharmacies and 16.3% (151) dispensing doctors. Reasons given for choices made were: lack of access to pharmacy and only option; ease and convenience of access; pleasant staff; and efficient services. Most (71.0%, 656) collected their own prescribed medicines, while less, 13.7% (127), had someone else collect for them (usually a relative, neighbour or friend) and 13.1% (121) had their medicines delivered. More than three quarters (79.3%, 733) reported that it was 'very easy' or 'easy' to get their prescribed medicines, while 15.4% (142) reported 'okay' and 2.6% (24) 'difficult' or 'very difficult'. Of the respondents who felt that they did not have convenient access all were over 75 years of age, 53.6% (13) were female, 26.3% (6) collected their own medicines and 47.4% (11) lived alone. There were statistically significant associations with health status and convenience, and number of regular prescribed medicines and convenience. Older age respondents, those in poorer health and those taking five or more regular prescribed medicines were more likely to state that their access was not convenient (see Table 6).

<INSERT TABLE 6 HERE>

Survey respondents who felt that they had convenient access to prescribed medicines were not distributed randomly but clustered (NNA:  $z=-43.19$ ;  $p<0.0000001$ ). Figure 1 shows clustering mainly follows population distribution. Respondents who felt they did not have convenient access (2.6%, 24) were distributed randomly (NNA:  $z=-1.14$ ;  $p=0.25$ ). Figure 1 also shows that the distribution of respondents who felt that they did not have convenient access was distributed across accessible, remote and very remote rural areas. While the majority of these respondents lived within a 5-mile radius of a dispensing doctor or pharmacy, there were respondents who felt they had convenient access to prescribed medicines who lived outside this 5-mile radius.

<INSERT FIGURE 1 HERE>

Just over one tenth (15.4%, 142) needed support or help to get their prescribed medicines, largely in the form of medicines being delivered by pharmacy, and the help of family, friends, neighbours and carers. Thirty-three respondents (3.6%) reported problems in getting their prescribed medicines due to reasons of immobility, relying on others and non-availability of medicines. The GP was the most frequently reported source of information on prescribed medicines (79.7%, 736) followed by the pharmacist (28.5%, 263), patient information leaflet supplied with the medicines (12.7%, 117), nurse (11.3%, 104), the internet (4.4%, 41), and family and friends (4.1%, 38). Responses to the question, 'how often does your GP speak to you about your prescribed medicines to see if you are getting the best from them and that you still need them?' are given in Table 7. While almost half (44.8%, 414) had a review every time they were seen, one sixth (16.7%, 156) reported seldom, never or only if they asked and a further 13.3% (123) did not know.

<INSERT TABLE 7 HERE>

Those respondents prescribed regular medicines and accessing the same pharmacy (n=757), were asked, 'how often does your pharmacist speak to you about your prescribed medicines to see if you are getting the best from them and that you still need them?'. Responses are given in Table 8. Almost half (47.4%, 359) stated that they did not see a pharmacist, almost one tenth (7.9%, 60) reported seldom, never or only if they asked and a further 9.9% (75) did not know.

<INSERT TABLE 8 HERE>

Responses to attitudinal statements of those receiving regular prescribed medicines (n=924) are given in Table 9. While the majority agreed/strongly agreed that getting their medicines easily fitted into their daily activities (89.3%, 825) and that getting their medicines was easy (89.6%, 828), one sixth (17.2%, 159) agreed/strongly agreed that it was a burden to others and one tenth (9.4%, 86) that they were worried about getting their medicines.

<INSERT TABLE 9 HERE>

When attitudinal items were subjected to principal component analysis, the correlation matrix contained multiple coefficients above 0.3. The Kaiser–Meyer–Olkin measure of sampling adequacy (0.796) and Bartlett’s test of sphericity (significance < 0.001) confirmed the factorability of the items. Three components had an eigenvalues exceeding 1.0, with the three-component solution explaining 68.8% of the variance. The three components all had high internal reliability and were labelled as: component 1, beliefs of capabilities (Cronbach’s alpha 0.785); component 2, emotions (Cronbach’s alpha 0.785); and component 3, memory (Cronbach’s alpha 0.770).

The median scores for each of the three components was as follows: beliefs of capabilities, 7 (IQR 4-8) on a scale of 4 to 20, with 4 representing the most positive responses; emotions, 8 (IQR 4-8) on a scale of 4 to 20, with 4 representing the most positive responses; and memory, 4 (IQR 2-4) on a scale of 2 to 10, with 2 representing the most positive response (Table 9).

In terms of component 1, beliefs of consequences, those in poorer health had significantly more negative attitudinal scores ( $p < 0.001$ ) as did those stating that access to prescribed medicines was not convenient ( $p < 0.001$ ). For component 2, emotions, older age respondents had significantly more negative attitudinal scores ( $p < 0.001$ ) as did those in poorer health ( $p < 0.001$ ), those living alone ( $p < 0.001$ ), those taking five or more regular prescribed medicines ( $p < 0.001$ ), and those stating that access to prescribed medicines was not convenient ( $p < 0.001$ ). For component 3, memory, only poorer health was related to significantly more negative attitudinal scores ( $p < 0.001$ ).

In response to the final question seeking other comments relating to prescribed medicines, many praised the services they received, using terms such as ‘excellent’, ‘helpful’, ‘happy to assist’, ‘attentive’, ‘good’, ‘no problems’, ‘grateful’ and ‘lucky’. Where negative comments were given, these were around the lack of continuity of doctors and pharmacists with locums providing services and a perceived lack of engagement leading

feelings of frustration. Several commented on the lack of attention to reviewing medicines, and that while there were no issues at present, there were concerns about the future.

## DISCUSSION

The key findings of this survey of older people in the Scottish Highlands are that most respondents, including those in very remote rural areas, reported convenient access to GPs, pharmacies and prescribed medicines. Most travelled to the GP and pharmacy by car, a journey which took a median of 10 minutes, with only a minority of around one tenth reporting this to be troublesome. There was a mixed picture of those reporting access as inconvenient. Older age respondents were more likely to report inconvenience to their GP practice while those in the most remote areas were more likely to report inconvenience to a pharmacy. Those in poor health and those prescribed five or more regular medicines were more likely to report inconvenience of access to prescribed medicines. Respondents perceived a lack of medicines review by their GP and pharmacist. In terms of the three components identified from PCA of the attitudinal statements related to access to prescribed medicines, those with poorer health had more negative scores for all three components of beliefs of capabilities, emotions and memory. Those reporting issues of access to prescribed medicines also had more negative scores for beliefs of capabilities while those of older age, living alone, and taking five or more regular medicines had more negative scores for emotions.

To our knowledge, this is the first study which has reported quantitative data of access to GP practices, pharmacies and prescribed medicines in a population, the majority of whom were in remote and rural areas. The use of behavioural determinants derived from a framework of behavioural theories (TDF) is a key study strength. The approach to analysis was comprehensive, comprising descriptive and inferential approaches. Given the number of hypotheses being tested, a Bonferroni adjustment was applied to reduce the likelihood of Type I errors.<sup>22</sup> Spatial analysis was undertaken to identify any geographical location based associations,<sup>25-27</sup> and PCA used to reduce the number of TDF derived attitudinal statements to components for further analysis. Promax rotation was the preferred approach given that several of the statements were likely to be correlated.<sup>23</sup> There are, however, several limitations to the study hence the findings should be interpreted with caution. While the response rate for a general public survey is encouraging, there is still the potential for recruitment, response and other biases. Notably, we were unable to compare the respondents and non-respondents and similarly were unable to determine if the respondents were representative of those resident in the Scottish Highlands. Given that the study was conducted within the Scottish Highlands, the findings may not be generalisable to other geographical areas of Scotland or countries with different healthcare structures and systems. In addition, the data were all self-reported hence there may be issues with both validity and reliability, particularly

since around a fifth of respondents required assistance from others to complete the questionnaire.

Scottish government strategies focus on the quality and outcomes of care for older people<sup>8</sup> and, in relation to pharmaceutical care specifically, that there is a need to explore how those in remote and rural areas can be supported to achieve optimal outcomes.<sup>15</sup> The novel findings of this study are that the majority of respondents, including those in very remote rural areas, considered access to the GP practice and pharmacy convenient. Interestingly, the only significant association with being very remote and rural was related to access to a pharmacy, with almost 15% stating that the pharmacy was not convenient. The spatial analysis reinforced the lack of any association between geographical location and convenience of access to prescribed medicines. Indeed there were respondents who felt they had convenient access to prescribed medicines living outside a 5-mile radius of a dispensing doctor or pharmacy. It therefore appears that the perception of convenience is individual and not related solely to location, with those reporting inconvenience citing immobility and reliance on others. Given that so many respondents travelled by car to the GP and pharmacy, collecting their own medicines, inconvenience may become more of an issue with increasing age and problematic driving. A review of current guidance and evidence on driving in older age highlighted that many older people wish to continue to drive and consider driving as an essential. Driving cessation can have negative effects reducing quality of life and independence, and this may be more marked in those in the most remote and rural areas. The authors reinforce that 'arbitrary age-based cut-offs and screening programmes to determine licensing renewal are ineffective and unsupported by evidence'.<sup>28</sup>

The association of convenience to a pharmacy and remoteness may reflect the lack of pharmacies in very remote rural areas leading to the supply of prescribed medicines by dispensing doctors. The associations between convenience of access to prescribed medicines, and health status and more than five regular medicines are different to those identified in a survey of the general public aged 18 years and over in the Scottish Highlands.<sup>16</sup> These differences are likely due to the very different populations studied and indeed the findings of the first survey promoted a more in-depth investigation of older people. Previous qualitative studies conducted have also provided in-depth descriptions of issues of access to healthcare in remote and rural areas. While these have not focused specifically on medicines, they have reported difficulties in accessing care and while they acknowledge that residents of these areas trade off the pleasures of

countryside living, the issues of access may become more worrisome with advancing age, deteriorating health and isolation from family members.<sup>1-5</sup>

Considering the combined findings of access to GPs, pharmacies and prescribed medicines, it is clear that the majority of respondents reported no issues. For those reporting inconvenience, the key associations were related to older age, rurality, poorer health status and taking five or more regular medicines. PCA of the attitudinal statements gave three components related to TDF domains of beliefs of capabilities, emotions and memory. For these, the majority of respondents scored positively, highlighting no issues of concern. While variables related to more negative scores differed across components, combined findings were poorer health, older age, living alone, stating access to prescribed medicines not convenient and taking five or more regular medicines. There may therefore be merit in targeting these individuals for support from health and social care practitioners. TDF can be used in research to characterise and quantify the domains of behaviour which need to be targeted in any intervention. Michie et al reported recently a Delphi type consensus exercise aiming to develop a cross-disciplinary taxonomy of evidence based BCTs,<sup>29</sup> which were then mapped to specific TDF domains.<sup>30</sup> Appropriate BCTs to effect beliefs of capabilities, emotions and memories could be trialled by practitioners to alleviate concerns over convenience.

Respondents noted a lack of medicines review by either the GP or pharmacist, with 30% stating that the GP either seldom reviewed the medicines, never, only if asked or did not know. Despite most respondents collecting personally their medicines from the same pharmacy and valuing the service, almost half reported never seeing a pharmacist. While we acknowledge that these data are self-reported and only from the respondents' perspective, there may be a need to review practices, particularly given the prevalence of multimorbidity and prescribing of multiple medicines.<sup>10,11</sup> Traditionally polypharmacy has been classified in terms of the number of medicines, with five or more regular medicines being deemed polypharmacy.<sup>31,32</sup> Analysis of data in this study using a cut-off of five or more regular medicines identified associations with reported inconvenience to access to prescribed medicines, and emotions such as worrying about getting medicines. Patterson et al., however suggested, as part of a Cochrane review in 2012 (later updated in 2014), that there should be a change in emphasis from inappropriate polypharmacy (prescribing of many medicines which are either inappropriate or no longer indicated) to appropriate or optimal polypharmacy (appropriate prescribing of many medicines).<sup>33</sup> Efforts are therefore required to review medicines regimens to promote appropriate polypharmacy given the links between inappropriate polypharmacy and healthcare

resource utilisation, adverse drug events and suboptimal medicines adherence. A recent systematic review of the published literature identified 46 tools which can be used to identify potentially inappropriate prescribing and high risk medicines in older people.<sup>13</sup> The Scottish Polypharmacy Guidelines, which have been disseminated to all practitioners in Scotland, describe a seven step process of medicines review.<sup>34</sup> Given the perceived lack of medicines review by the respondents in this study, there may be merit in exploring the extent to which these guidelines have been implemented into practice and the extent of patient involvement in the review process. This would also align to some of the aims of Prescription for Excellence which articulates the role of pharmacist independent prescribers in patient management.<sup>15</sup>

While the findings reported and policy documents cited relate to Scotland, the issues of access to medicines and appropriate prescribing and use of medicines in older people resonate more widely. This is evidenced by the statistic that half of the world's population lives in remote and rural areas. There are major international initiatives focusing on the provision of healthcare in such areas.<sup>35</sup> Furthermore, an analysis of prescribing trends in the United States between 1999 and 2012, highlighted that polypharmacy (defined as  $\geq 5$  prescription medicines) increased from 24% to 39% for those aged 65 and above.<sup>36</sup> While there is likely to be variability across countries, a narrative literature review identified that this is a widespread global issue,<sup>37</sup> and polypharmacy has been stated to be a 'a global risk factor' for older people.<sup>38</sup>

Qualitative research is warranted to provide further understanding of the issues of access to medicines in those in older people with poorer health, living alone and taking five or more prescribed medicines in remote and rural areas. This could lead to the development, implementation and evaluation of interventions to enhance care.

## **CONCLUSION**

This study has identified that the majority of respondents in the Scottish Highlands reported having convenient access to their GP practice, prescribed medicines and pharmacy. There is, however, a need for further review of the pharmaceutical care of those of older age with poorer health, living alone and taking five or more prescribed medicines in the more remote and rural areas.

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Table 1 Scottish Government Urban Rural Classification<sup>7</sup>

Urban Areas	Settlements of $\geq 3,000$ people
Rural Areas	Settlements of $< 3,000$ people
Accessible Rural	Settlements of $< 3,000$ people and within 30 minute drive of a settlement of $\geq 10,000$
Remote Rural	Settlements of $< 3,000$ people and with a drive time of over 30 minutes to a settlement of $\geq 10,000$
Large Urban Areas	Settlements of $\geq 125,000$ people
Other Urban Areas	Settlements of 10,000 to 124,999 people
Accessible small Towns	Settlements of 3,000 and 9,999 people and within 30 minute drive of a settlement of $\geq 10,000$
Remote Small Towns	Settlements of between 3,000 and 9,999 people and with a drive time of over 30 minutes to a settlement of $\geq 10,000$
Very Remote Small Towns	Settlements of 3,000 and 9,999 people and with a drive time of over 60 minutes to a settlement of $\geq 10,000$
Accessible Rural	Areas with a population of $< 3,000$ people, and within a 30 minute drive time of a settlement of $\geq 10,000$
Remote Rural	Areas with a population of $< 3,000$ people, and with a drive time of over 30 minutes but less than 60 minutes to a settlement of $\geq 10,000$
Very Remote Rural	Areas with a population of $< 3,000$ people, and with a drive time of over 60 minutes to a settlement of $\geq 10,000$

Table 2 Respondent demographics (N=1042)

<b>Demographic</b>	<b>% (n)</b>
<b>Age (years)</b>	
60-64	4.0 (42)
65-69	3.1 (32)
70-74	3.0 (31)
75-79	40.3 (420)
80-84	29.5 (307)
85-89	12.8 (133)
≥ 90	6.5 (68)
Missing	0.9 (9)
<b>Sex</b>	
Female	37.0 (386)
Male	35.4 (369)
Missing	27.6 (287)
<b>Living arrangements</b>	
Spouse of partner	51.6 (538)
Lives alone	40.1 (418)
Lives with other	6.0 (62)
Missing	2.3 (24)
<b>Scottish Index of Multiple Deprivation quintiles</b>	
1 (most deprived)	5.1 (53)
2	17.3 (180)
3	33.9 (353)
4	32.2 (336)
5 (least deprived)	10.0 (104)
Missing	1.5 (16)
<b>Scottish Urban Rural classification</b>	
1 Large urban areas	0
2 Other urban areas	25.0 (256)
3 Accessible small towns	4.8 (49)
4 Remote small towns	5.3 (54)
5 Very remote small towns	7.4 (76)
6 Accessible rural	11.0 (113)
7 Remote rural	14.0 (143)
8 Very remote rural	32.6 (334)
Missing	1.6 (17)

Nationality	
British	93.2 (971)
Other	0.5 (5)
Missing	6.3 (66)
Ethnic background	
White	98.7 (1028)
Black	0.1 (1)
Other	0.1 (1)
Missing	1.2 (12)
English as first language	
Yes	94.6 (986)
No	4.2 (44)
Missing	1.2 (12)
Highest level of education	
School	67.6 (704)
College	19.2 (200)
University	11.4 (119)
Missing	1.8 (19)

Table 3 Respondent health related quality of life (SF-8) (N=1042)

Overall, how would you rate your health in the past 4 weeks? (% , n)						
Excellent	Very good	Good	Fair	Poor	Very poor	Missing
5.6 (58)	25.0 (261)	34.1 (355)	25.0 (260)	8.2 (85)	1.1 (11)	1.2 (12)
During the past 4 weeks, how much did physical health problems limit your usual physical activities (such as walking or climbing stairs)?						
Not at all	Very little	Somewhat	Quite a lot	Could not do physical activities	Missing	
26.2 (273)	25.6 (267)	18.9 (197)	19.3 (201)	8.6 (90)	1.4 (14)	
During the past 4 weeks, how much difficulty did you have doing your daily work, both at home and away from home, because of your physical health?						
Not at all	Very mild	Mild	Quite a lot	Could not do daily work	Missing	
38.1 (397)	16.0 (167)	16.5 (172)	17.8 (185)	8.8 (92)	2.8 (29)	
How much bodily pain have you had in the past 4 weeks?						
None	Very mild	Mild	Moderate	Severe	Very severe	Missing
22.5 (234)	23.0 (240)	17.4 (181)	26.2 (273)	8.7 (91)	0.7 (7)	1.5 (16)
During the past 4 weeks, how much energy did you have?						
Very much	Quite a lot	Some	A little	None	Missing	
4.7 (49)	41.7 (435)	33.8 (352)	15.9 (166)	2.9 (30)	1.0 (10)	
During the past 4 weeks, how much did your physical health or emotional problems limit your usual social activities with family or friends?						
Not at all	Very little	Somewhat	Quite a lot	Could not do social activities	Missing	
36.7 (382)	27.0 (281)	14.9 (155)	12.9 (134)	7.2 (75)	1.4 (15)	
During the past 4 weeks, how much have you been bothered by emotional problems (such as feeling anxious, depressed or irritable)?						
Very much	Quite a lot	Some	A little	None	Missing	
2.8 (29)	8.8 (92)	16.6 (173)	27.8 (290)	42.7 (445)	1.3 (13)	

During the past 4 weeks, how much did personal or emotional problems keep you from doing your usual work or other daily activities?

Not at all	Very little	Somewhat	Quite a lot	Could not do daily activities	Missing
51.4 (536)	25.0 (260)	10.9 (114)	7.4 (77)	3.8 (40)	1.5 (15)

Table 4 Associations between respondent demographics and convenience to GP practice

<b>Demographic</b>	<b>Convenient, % (n)</b>	<b>Not convenient, % (n)</b>	<b>p-value (Chi square)</b>
Age (years) (n=939)			<0.0001*
60-69	98.6 (73)	1.4 (1)	
70-79	94.3 (417)	5.7 (25)	
80-90	90.3 (382)	9.7 (41)	
≥ 90	80.0 (48)	20.0 (12)	
Health status (n=999)			0.015
Excellent	93.1 (54)	6.9 (4)	
Very good	94.2 (243)	5.8 (15)	
Good	93.5 (319)	6.5 (22)	
Fair	90.9 (229)	9.1 (23)	
Poor	84.3 (70)	15.7 (13)	
Very poor	71.4 (5)	28.6 (2)	
Living arrangements (n=984)			0.094
Lives alone	90.3 (365)	9.7 (39)	
Lives with spouse, partner, other	93.3 (541)	6.7 (39)	
Scottish Index of Multiple Deprivation (n=992)			0.135
1 (most deprived)	87.8 (43)	12.2 (6)	
2	93.8 (166)	5.2 (11)	
3	93.3 (321)	6.7 (23)	
4	92.1 (293)	7.9 (25)	
5 (least deprived)	86.5 (90)	13.5 (14)	
Scottish Urban Rural classification (n=991)			0.182
2 Other urban areas	90.1 (227)	9.9 (25)	
3 Accessible small towns	83.3 (40)	16.7 (8)	
4 Remote small towns	90.4 (47)	9.6 (5)	
5 Very remote small towns	94.7 (71)	5.3 (4)	
6 Accessible rural	93.5 (101)	6.5 (7)	
7 Remote rural	94.8 (127)	5.2 (7)	

8 Very remote rural	92.5 (298)	7.5 (24)
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p-value of significance reduced to  $\leq 0.05/5$  via a Bonferroni adjustment, i.e.  $\leq 0.01^*$

Table 5 Associations between respondent demographics and convenience to pharmacy

<b>Demographic</b>	<b>Convenient, % (n)</b>	<b>Not convenient, % (n)</b>	<b>p-value (Chi square)</b>
Age (years) (n=940)			0.098
60-69	95.8 (69)	4.2 (3)	
70-79	93.8 (390)	6.2 (25)	
80-90	91.6 (370)	8.4 (34)	
≥ 90	85.7 (42)	14.3 (7)	
Health status (n=937)			0.103
Excellent	94.3 (50)	5.7 (3)	
Very good	94.7 (232)	5.3 (13)	
Good	92.9 (303)	7.1 (23)	
Fair	91.9 (215)	8.1 (19)	
Poor	84.7 (61)	15.3 (11)	
Very poor	100 (7)	0	
Living arrangements (n=916)			0.051
Lives alone	90.4 (340)	9.6 (36)	
Lives with spouse, partner, other	93.9 (507)	6.1 (33)	
Scottish Index of Multiple Deprivation (n=939)			0.102
1	93.9 (46)	6.1 (3)	
2	92.8 (154)	7.2 (12)	
3	90.0 (278)	10.0 (31)	
4	93.4 (295)	6.6 (21)	
5	98.0 (97)	2.0 (2)	
Scottish Urban Rural classification (n=933)			<0.01*
2 Other urban areas	93.9 (235)	6.1 (9)	
3 Accessible small towns	97.9 (47)	2.1 (1)	
4 Remote small towns	98.0 (50)	2.0 (1)	
5 Very remote small towns	95.9 (71)	4.1 (3) 7.8 (8)	
6 Accessible rural	92.2 (94)	5.3 (7)	
7 Remote rural	94.7 (126)	14.3 (40)	
8 Very remote rural	85.7 (240)		

p-value of significance reduced to  $\leq 0.05/5$  via a Bonferroni adjustment, i.e.  $\leq 0.01^*$

Table 6 Associations between respondent demographics and convenience of access to prescribed medicines

<b>Demographic</b>	<b>Convenient, % (n)</b>	<b>Not convenient, % (n)</b>	<b>p-value (Chi square)</b>
Age (years) (n=927)			0.013
60-69	100 (58)	0	
70-79	98.3 (395)	1.7 (7)	
80-90	98.3 (395)	1.7 (12)	
≥ 90	91.7 (55)	8.3 (5)	
Health status (n=926)			<0.001*
Excellent	100 (35)	0	
Very good	99.1 (229)	0.9 (2)	
Good	98.1 (317)	1.9 (6)	
Fair	96.4 (241)	3.6 (9)	
Poor	93.7 (74)	6.3 (5)	
Very poor	75.0 (6)	25.0 (2)	
Living arrangements (n=917)			0.188
Lives alone	96.6 (364)	3.4 (13)	
Lives with spouse, partner, other	98.0 (529)	2.0 (11)	
Scottish Index of Multiple Deprivation (n=934)			0.430
1	97.9 (46)	2.1 (1)	
2	98.8 (163)	1.2 (1)	
3	96.5 (306)	3.5 (11)	
4	97.1 (300)	2.9 (9)	
5	96.9 (95)	3.1 (2)	
Scottish Urban Rural classification			0.205
2 Other urban areas	98.7 (232)	1.3 (3)	
3 Accessible small towns	100 (48)	0	
4 Remote small towns	93.6 (44)	6.4 (3)	
5 Very remote small towns	95.7 (66)	4.3 (3)	
6 Accessible rural	98.1 (104)	1.9 (2)	
7 Remote rural	98.4 (124)	1.6 (2)	

8 Very remote rural	96.4 (292)	3.6 (11)	
Source of prescribed medicines			0.740
Same pharmacy	97.1 (715)	2.9 (21)	
Different pharmacies	100 (10)	(0)	
Dispensing doctor	98.0 (145)	2.0 (3)	
Number of regularly prescribed medicines			0.002*
<5	99.0 (417)	1.0 (4)	
≥5	95.6 (392)	4.4 (18)	

p-value of significance reduced to  $\leq 0.05/7$  via a Bonferroni adjustment, i.e.  $\leq 0.007^*$

Table 7 Frequency of medicines review by GP, as reported by respondents (N=924)

<b>Frequency</b>	<b>% (n)</b>
Every month	2.8 (26)
Every 2 months	6.3 (58)
Every 3 months	0.4 (4)
Every 6 months	4.4 (41)
Every 9 months	0.2 (2)
Every 12 months	4.3 (40)
Every time I am seen	44.8 (414)
Varies	1.5 (14)
Seldom	4.1 (38)
Only if I ask	2.6 (24)
Never	10.0 (92)
Don't know	13.3 (123)
Missing	5.2 (48)

Table 8 Frequency of medicines review by pharmacist, as reported by respondents  
(N=757)

<b>Frequency</b>	<b>% (n)</b>
I don't see a pharmacist	47.4 (359)
Every month	2.2 (17)
Every 2 months	3.6 (27)
Every 3 months	0
Every 6 months	0.1 (1)
Every 9 months	0
Every 12 months	0.3 (2)
Every time I am seen	8.7 (66)
Varies	0.8 (6)
Seldom	1.8 (14)
Only if I ask	3.2 (24)
Never	2.9 (22)
Don't know	9.9 (75)
Missing	19.0 (144)

Table 9 Responses to attitudinal statements (N=924)

Statement	Strongly agree = 1, % (n)	Agree = 2, % (n)	Unsure = 3, % (n)	Disagree = 4, % (n)	Strongly disagree = 5, % (n)	Missing % (n)
Getting my prescribed medicines easily fits into my daily activities	42.0 (388)	47.3 (437)	2.9 (27)	2.4 (22)	0.6 (6)	4.7 (44)
I am confident that I will always get the prescribed medicines I need	44.9 (415)	46.3 (428)	4.1 (38)	1.2 (11)	0.1 (1)	3.3 (31)
For me, getting my prescribed medicines is very easy	44.9 (415)	44.7 (413)	2.6 (24)	3.2 (30)	0.6 (6)	3.9 (36)
I feel relaxed about getting my prescribed medicines	39.9 (369)	43.8 (405)	2.8 (26)	4.8 (44)	3.6 (33)	5.1 (47)
Component 1, beliefs of capabilities. Cronbach's alpha, 0.785 Median total component score = 7 (IQR 4-8) on a scale of 4 to 20, with 4 representing the most positive responses. * items reverse scored						
I need help from others to get my prescribed medicines*	11.3 (104)	11.5 (106)	1.4 (13)	26.2 (242)	40.6 (375)	9.1 (84)
I feel it is a burden to others to help me get my prescribed medicines*	5.3 (49)	11.9 (110)	4.2 (39)	30.3 (280)	36.6 (338)	11.7 (108)
I sometimes worry about getting my prescribed medicines*	3.4 (31)	6.0 (55)	1.8 (17)	34.2 (316)	44.3 (409)	10.4 (96)
I sometimes feel nervous about getting my prescribed medicines*	3.4 (31)	4.4 (41)	3.1 (29)	34.8 (322)	44.6 (412)	9.6 (89)
Component 2, emotions. Cronbach's alpha, 0.711 Median total component score = 8 (IQR 4-8) on a scale of 4 to 20, with 4 representing the most positive responses. * items reverse scored						
I sometimes forget to order my prescribed medicines*	2.7 (25)	9.4 (87)	2.7 (25)	34.6 (320)	39.2 (362)	11.3 (105)
I sometimes forget to collect my prescribed medicines*	4.3 (40)	4.1 (38)	1.5 (14)	36.1 (334)	42.6 (394)	11.2 (104)
Component 3, memory. Cronbach's alpha, 0.770						

Median total component score = 2 (IQR 2-4) on a scale of 2 to 10, with 2 representing the most positive responses. \* items reverse scored