The role of digital exclusion in social exclusion

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1 Introduction

This research was commissioned by Carnegie UK Trust to examine the relationship between digital exclusion – lacking access to online resources and services – and social exclusion. Social exclusion encompasses a range of impacts but broadly describes a situation where individuals are unable to participate fully in social life to the detriment of individuals and society as a whole.

The project comprised two parts and two broad phases.

Phase 1 of the research involved two elements. Firstly, to review and **summarise the available literature** on the links between digital exclusion and social exclusion to identify the current state of knowledge about digital and social inclusion. The first phase also involved **preliminary analysis of the Scottish Household Survey** to assess which survey questions could be used as indicators of social exclusion and the extent to which these varied by internet access. Overall, 7 indicators of social exclusion were created. They were:

- Convenience of local services
- Active living
- Transport
- Socially Connected
- Mental Health
- Use of local services
- Long-term physical and mental illness or disability.

In phase 2, further analysis of the data was carried out to examine whether internet access was an explanatory variable in shaping patterns of social exclusion across these different dimensions. The data analysis incorporated a broad range of potential causal and explanatory variables to identify and quantify the contribution of digital exclusion to social exclusion

The analysis in phase 2 was not to provide robust complete analysis of each dimension of social exclusion, but rather to examine whether internet access was a significant factor in each. The analysis of the links between social exclusion and digital exclusion has had to be driven by the data that is available. The modelling has been limited by the data that is available in the survey.

The analysis focuses on data relating to 'access to' and 'use of' the internet. These measures are seen as proxies for digital participation. It is recognised however, that digital participation is in practice a much concept broader than this and requires people to have the required level of digital skills to maximise the opportunities that the internet offers and mitigate the risks. This is particularly significant as the number of people without access reduces and the question of *how* people use the internet, rather than whether they use it at all, becomes more important. The 2015 Scottish Household Survey contains new questions which focus on this broader interpretation of digital skills and use.

2 Literature review

In this section we provide a brief review of the literature around digital exclusion and social exclusion before moving on to reviewing the relationship between digital and social exclusion.

2.1 Digital exclusion

Digital exclusion involves the unequal access and capacity to use information and communication technologies (ICTs) that are seen as essential to fully participate in society (Schejter et al 2015). Since the 1970s, the use of ICTs has spread unevenly and many still remain digitally excluded (Selwyn 2004, Dutton et al. 2014). Around 1.3 million people in Scotland are either not online or do not have the basic skills to use the internet (RSE 2014).

Van Dijk (2005) identifies a sequential relationship between social inequalities and unequal access to digital technologies. This is supported by RSE 2014. It reports on a strong relationship between SIMD and internet uptake in Scotland with internet uptake among the 10% most deprived in Scotland at 53% compared to 81% for the 10% least deprived. Schejter et al 2015 builds upon Van Dijk's sequential model of social inequalities and digital exclusion adding that the inclusive and participatory aspects of contemporary ICTs (particularly through the use of social media and online discussion forums) are essential in terms of citizen's participation in society. The study emphasises the social dimensions of ICT use and suggests the social consequences of exclusion warrants further exploration.

Literature in the area of digital participation emphasises both the material factors that drive digital exclusion as well as the attitudes, skills and cultures of internet use. With 78% of the UK population currently online there are a number of cultures of internet use from those use the internet throughout the day to those who do not have any interest in going online – currently 18% of the UK population (Dutton et al. 2014).

Within the context of explaining digital exclusion, various studies emphasise the benefits of digital participation. For instance, the Royal Society of Edinburgh define it as a 'right' and Koss et al. 2014 define it as a 'virtuous circle' with benefits for individuals in terms of improving educational outcomes, employability, health and wellbeing and reducing isolation as well as benefits for SME's, charities and government. The wide-ranging benefits that are outlined in these studies encompass the factors that have been identified as dimensions of social exclusion in this study.

The benefits of digital participation are echoed in UK and Scottish Government targets to increase digital participation. For instance, the Scottish Governments 'digital participation' strategy aims to make Scotland a 'world-class digital nation by 2020, supporting Koss et al 2014 'this is for everyone' position. In the 'Digital Participation: a National Framework for Local Action' the Scottish Government states that internet use has benefits for education and training, finding work and flexible working, healthcare and remote provision, increasing social interaction and enabling the consumption of information and services for those with accessibility issues. With this in mind, the Scottish Government aims to roll out broadband to 95% of premises in Scotland by 2017[1]. Similarly, the UK government digital service has targets to digitise key services and the Department for Work and Pensions has set a target of 80% of Universal Credit applications to be completed online by 2017. In this sense, digital by default is creating further requirements to go online which may have increasing implications for social exclusion.

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1   The Royal Society of Edinburgh emphasise the danger in setting a target that excludes 5% of the population as this may serve to exacerbate existing inequalities.

2.2 Changes in digital exclusion over time

How digital exclusion is defined has changed in recent literature. Positions based on a simple 'user/non user' and internet 'have/have not' understanding have shifted to an exploration of the gradations of internet use and a 'skills divide' (van Dijk 2012). For instance Helsper 2008 identifies advancing steps of digital engagement from basic use involving individual communication, intermediate use involving individual networking and advanced use involving civic participation. This nuance highlights not only non-internet use as an aspect of digital exclusion but lack of digital literacy that prevents a fuller engagement. Therefore, access to ICTs becomes more nuanced to include analysis of the attitudes, skills and types of engagement that underlie ICT use (Helsper 2012).

Helsper and Van Deursen's 2015 study of internet use/non-use among older adults encompasses a number of material and socio-psychological factors and identifies negative attitudes towards the internet related to a lack of trust in digital technologies, perceptions of feeling too old to engage with the internet, the range and types of internet experience, as well as traditional and digital literacy as key explanations why some older adults are offline. They suggest that non-users give a variety of different reasons for non-use, couched in terms of gender, age, and household composition.

For example, the study shows that female non-users were more likely to have an internet connection at home but not use it. This gender difference is most pronounced in older adults who suggest that technologies are a more masculine domain (Helsper and Van Deursen 2015). Further, over-75s perceived themselves to be 'too old' to use the internet although this was not necessarily the case for highly educated older adults. For highly educated adults, who traditionally lead a more active lifestyle, the reasons for non-use were described more in relation to available time.

Recent literature focused on areas related to skills and knowledge in terms of understanding digital exclusion as much as internet access. People with higher levels of digital skills will be more able to take advantage of the benefits that internet access offers. Van Dijk and Van Deursen 2014 address the digital divide in terms of the difference in internet skills. Van Dijk and Van Deursen 2014 build on previous models (2009) to include operational (basic skills), formal (navigation and orientation), information (user information needs), strategic (capacity to use the internet as a means to reach particular goals and improve position in society), as well as social, creative and mobile skills. Helsper and Van Deursen 2015 add that communication and socio-emotional skills should be included in this framework as these are important skills in the context of social media. This reflects a further development in the understanding of digital skills beyond access and functional use to reflect the increasing levels of interaction between people online. Van Dijk and Van Deursen 2011 note that educational attainment is a key explanatory variable in understanding the variance in internet skills.

The development of digital skills is affected by social environments and patterns of learning through family, friends, schooling and workplace. Van Deursen et al 2014 explore digital skills and patterns of seeking support from others in the Netherlands. The study shows that a large majority of internet users are completely self-reliant; this group largely consists of males rather than females and those with higher educational attainment. A second pattern consists of internet users that rely on direct and informal support from family and friends. This group consists of more females than males and those with lower educational attainment. A third identifies users that rely on formal support for internet use through courses, help desks and colleagues that consists of those with lower to medium educational attainment. The study is interesting in pulling out patterns of learning digital skills. Helsper and Van Deursen 2015 point out that traditional literacy is an important factor in determining internet use in the Netherlands and shows a clear explanation of digital exclusion.

In terms of the Scottish context, Ipsos MORI Scotland have previously conducted research for the Carnegie UK Trust (2013) exploring digital exclusion in Glasgow where internet uptake is one of the lowest in the UK, with 40% of households offline.

The study emphasised the relationship between poverty and digital exclusion. In contrast to rural areas, where digital exclusion has traditionally been attributed to poor connectivity and infrastructure, exclusion in urban areas is associated with social justice issues. For instance, digital exclusion was most prevalent among the DE socio-economic group, and further segmentation analysis highlighted low take-up among pensioners, non-working adults and those living in social rented tenures. Further differences by age and gender were identified in terms of attitudes to internet use. For instance, less than a third of those aged 65 and over were interested in accessing the internet. Among reasons for not going online, a preference for face-to-face communication was cited as well as a fear and lack of trust in ICTs and cost. The study differentiated between those who simply reject internet use (43%) compared to potential users (57%) who have a curiosity and inclination towards going online.

2.3 Social exclusion

Social exclusion can be understood in relational terms as the (in) capability to take part in the life of the community that affects individual quality of life and the equity and cohesion of society (Sen 1992, Levitas et al 2007). Social exclusion is multidimensional and involves the lack of economic, social and cultural capabilities/resources to take part in a social system that move beyond traditional discussions of poverty and deprivation as the inability to meet basic needs (Helsper 2012). Gradations of social exclusion are highlighted with 'deep social exclusion' referring to deprivation from multiple capabilities and resources within a social system (Levitas et al 2007). This understanding of social exclusion presupposes digital exclusion as it has been shown that engagement with ICTs is a prerequisite to equal and full participation in society especially given the participatory nature of contemporary ICTs (Schejteret al 2015).

In their report The Multi-dimensional Analysis of Social Exclusion (for the last government's social exclusion task force) Levitas et al take as their working definition of social exclusion:

"Social exclusion is a complex and multi-dimensional process. It involves the lack or denial of resources, rights, goods and services, and the inability to participate in the normal relationships and activities, available to the majority of people in a society, whether in economic, social, cultural or political arenas. It affects both the quality of life of individuals and the equity and cohesion of society as a whole."

This definition of social exclusion is interesting in terms of mapping the relationship between digital exclusion. There has been a relative lack of research into the social impact of digital exclusion as well as the social role of ICT use as a dimension of social exclusion (Schejter et al 2015).

2.4 Linking digital and social exclusion

There are a number of social and personal factors that help us to understand digital exclusion but the relationship between digital and social exclusion remains poorly understood. Helsper and Galacz 2009 attempt to map out the relationship between digital and social exclusion showing that there are a number of different views regarding the interaction of both fields. For instance, digital participation can help to mitigate social exclusion by introducing disadvantaged groups access to the benefits of internet use. However as long as social inequalities remain offline (e.g. in terms of education) these will translate into inequalities online as those who are socially excluded are less likely to have access to the internet and lack digital skills. Norris 2001 and Rodger 2003 identify an S shaped curve model to theorise the relationship between digital and social exclusion. Rodger 2013 shows that those who are socially excluded will catch up over time in terms of their access to ICTs and that will help them to overcome their disadvantage, however Norris 2001 argues that the maximum uptake of ICTs among the socially excluded will remain lower than the average population so inequalities will remain. The discussion hypothesises the way in which digital participation may help to overcome social exclusion however digital participation in and of itself will not tackle social exclusion as inequalities remain in terms of access and types of internet use.

Helsper 2008 explores the relationship between social exclusion and digital exclusion, highlighting that 9% of the adult population suffer deep social exclusion and have no meaningful engagement with the internet (Helsper 2008: 11). This corresponds with analysis of the 1999 Scottish Household Survey, which shows that the excluded are less likely to use ICTs (Fitch 2002).

Individuals who are socially isolated are less likely to participate in the advanced networking aspects of ICTs and individuals who are economically disadvantaged are less likely to use ICTs for government and financial services that would provide them access to the services they need (ibid:9). This suggests that those who suffer from particular social exclusions are least likely to benefit from the ICT applications that may help them tackle their disadvantage (Helsper 2012). People who are social excluded are likely to remain socially excluded.

Further studies have emphasised the relationship between digital and social exclusion by exploring children's' engagement with ICTs (Helsper and Livingstone 2007). Jackson 2006 has identified a relationship between digital exclusion and educational attainment showing that children from socially deprived backgrounds who use the internet have higher scores on standardised tests, which suggests that digital exclusion has the potential to exacerbate social inequalities.

According to the Technology-Enhanced Learning Research Programme 2012, to 'prosper in the 21st century, people need to be confident digital collaborators and communicators' and reflecting this, many schools are incorporating digital technologies into the classroom to create more interactive environments. However, research by Valentine et al 2002, highlights some resistance to ICT use among children based on whether this is seen 'deviant' or 'normal' identities among young people. This suggests that as with adults, digital exclusion among children is dependent both on access to resources as well as children's social relations.

Haddon 2000 explores the relationship between digital exclusion and social exclusion by examining the impact of ICT use on single parents and the young elderly. Studies have previously identified the prevalence of loneliness and economic deprivation among single parents and the young elderly, which make an interesting case study for research (ibid, Hardey 1989). The study shows that engagement with ICTs is dependent on the perception of how useful they are and the extent to which people in their existing social networks use ICTs. Given that ICT use is dependent on prior engagement there can be a low willingness to access services online potentially leading to further exclusions (Haddon 2000). A recent study conducted by the Equality and Human Rights Commission 2015 has shown that two thirds of older people are living alone and at potential risk of social isolation, it is worthwhile to study the impact of digital exclusion on these groups to examine the relationship between social and digital exclusion.

In particular, Koss et al. 2014 discuss the impact of digital participation in minimising social exclusion in terms of the impact on loneliness and depression among older people. Barnes et al 2006 in the 'social exclusion of older people: evidence from the first wave of the English Longitudinal Study of Ageing (ELSA) final report' identify that older people who have access to the internet are three times less likely to be socially excluded. Furthermore, a study conducted by the Phoenix Centre 2009 shows that depression is 20% lower in retired adults who use the internet that reflects the effects of digital participation, particularly the use of social networking on mental health and wellbeing. The number of people living in the household effects the reduction of depression, with the largest effect on people living alone.

2.5 Discussion

The relationship between ICT and social exclusion is dependent on the type of usage (Helsper 2012). Exclusion from certain type of ICT usage will impact on social exclusion more than other types of usage (ibid). The economic and social impacts of ICTs are complex and contradictory and a direct impact on social exclusion is hard to measure (Gibbs 2001). However, the perception that digital inclusion will remediate social

exclusion remains within policy domains and is based on the assumption that ICTs are inherently 'inclusionary technologies'.

Bradshaw et al 2004 identifies the importance of distinguishing between macro drivers that increase social exclusion, risk factors that signal vulnerability to social exclusion and triggers that have a causal impact on social exclusion. Situating digital exclusion within this framework will be useful in eliciting the relationship between social and digital exclusion.

The exact relationship between digital and social exclusion remains poorly understood. Identifying causality is difficult given that technology and society are deeply embedded and it is unclear how the two interact. For instance, few longitudinal studies have shown a change in individuals' social inclusion through a sustained engagement with ICTs (Anderson 2005). However, the previously mentioned study by the Phoenix Centre 2009 does show the positive effects of digital participation on indicators of social exclusion. Nevertheless, it is unclear whether internet use in and of itself can help to overcome social exclusion as inequalities mediate access to the internet and types of internet use.

3 Availability of SHS data for examining internet access and social exclusion

In this section, the availability of SHS data for the analysis is briefly summarised in relation to:

- information on internet access and related variables
- facets of social exclusion
- other potential casual factors.

3.1 Information on internet access and related variables

There are two key measures in the SHS relating to digital inclusion – household access to the internet and whether adults use the internet. These are relatively long-standing questions that have been in the survey, with only minor revisions, for a number of years.

A number of other questions relating to internet access were asked in 2014. These include:

- how households connect to the internet
- frequency of internet usage
- where respondents access the internet for their own personal use
- how adults access the internet
- use of local council's online services in the last year, if any
- use of government online services in the last year, if any.

Generally, questions relating to the internet have been asked of around 1/3 of the SHS sample. This equates to around 3,400 responses. The main exception is internet use. This is asked of around half of the SHS random adult sample (around 4,800 respondents). As internet access currently stands at 80% (See section 4), the total sample size of those without internet access is just under 700.

A number of new questions on internet usage were added in 2015, covering areas such as confidence in undertaking different activities, types of use, and attitudes towards accessing public services online. However, the 2015 is currently in the field and this data will not be available until autumn 2016.

3.2 Social exclusion

As noted in the literature review, social exclusion is multidimensional and covers various different facets relating to economic, social and cultural resources. There are a wide range of different indicators in the SHS that could be considered to be indicative of some facet of social exclusion. Below, we have listed 17 potential question areas. A number of these are sets of questions rather than single questions. For example, confidence in local services covers 10 different services.

We have grouped them into three very broad groupings below. However, the underlying dimensions of social exclusion are discussed in more detail in the next section where we suggest 6 scales relating to different dimensions of social exclusion for the Stage 2 analysis.

Additionally, for some potential indicators, it is arguable whether they are a dimension of social exclusion, an indicator of deprivation, or alternatively, an outcome measure. However, at this stage we have taken an inclusive approach – including any question that could potentially be viewed as related to social exclusion.

Social interaction, participation in the community, and wider participatory activities

- Confidence in being able to rely on neighbours.
- Whether the respondent volunteers
- Frequency of visits to the outdoors for leisure and recreation.
- Whether been to various cultural activities – including cinema, theatre, and live music events.
- Whether done any various cultural activities – including dancing, painting, and craft-work.
- Whether participated in various sports – including football, swimming, bowls, and snooker.

Confidence and self-esteem

- How strongly you feel you belong to your immediate neighbourhood.
- Information on mental health and wellbeing through the WEMWBS batches of questions.
- Whether "I can influence decisions affecting my local area"
- Confidence in the local police

Accessing services

- Whether has a bank, building society account, or other type of account
- Use of various council services in past 12 months – including sports and leisure facilities, libraries, and museums and galleries.
- Frequency of use of public services.
- Convenience of local services – including Doctor's surgery, Post Office, and Public transport.
- Whether travelled by air in the last year.
- Whether has a car
- Whether currently holds a driving licence.

Almost all of these are asked in the adult section of the SHS questionnaire, the second half of the SHS questionnaire. This has a slightly smaller sample overall than the household section. However, all these questions are asked in all 12

streams of the questionnaire, so there is no drop in the available sample size because of issues around streaming.

Some of these questions – such as whether they volunteer – have been asked on an annual basis for a considerable period of time. This means that changes over time could be examined in Stage 2 and, if necessary, two years of SHS data could be combined to increase the available sample size. Other variables, such as undertaking various cultural activities, are asked on a biennial basis, making it difficult to conduct time series analysis or to increase the sample size by combining survey years.

3.3 Indicators of deprivation and other confounding factors

As noted in the literature review, there are a number of indicators covering various dimensions of deprivation, and other confounding factors, that potentially link to social exclusion. Among the potential indicators of deprivation would be:

- Household income.
- Set of questions on material deprivation – including, have enough money to take part in a hobby, or to repair/replace broken electrical goods.
- Whether have any savings.
- Currently behind with rent or mortgage.

Other potential confounding factors would be:

- Age
- Tenure
- Area deprivation
- Urban/rural indicator
- Educational qualifications
- How is your health in general
- Physical or mental illness.

4 Creating indicators of social exclusion

In this section, we first provide an overview of internet access and usage and then give a description of the full list of potential indicators of social exclusion and how these differ by internet access. These variables are then included in a factor analysis in order to develop indicators of different dimensions of social exclusion. Finally, we outline seven indicators or different dimensions of social exclusion.

4.1 Summary of internet access and usage

In 2014, 80% of households in the SHS had access to the internet[2] (Table 4.1). Access is lower in:

- The 20% most deprived areas (69%)
- Social rented housing (61%)
- Households with low income. (60% with income less than £6,000 pa, 51% with income between £6,001 and £10,000 pa)[3].

Table 4.1: Summary of access to the internet by deprivation, tenure and household income, SHS 2014

	Access	No Access
Deprivation		
Most deprived 20%	69%	31%
Rest of Scotland	83%	16%
Tenure		
Owner-occupied	87%	13%
Social rented	61%	38%
Private rented	89%	11%
Other	56%	44%
Household income		
£0-£6,000	60%	39%
£6,000 – £10,000	51%	48%
£10,001 – £15,000	63%	37%
£15,001 – £20,000	78%	21%
£20,001 – £25,000	85%	15%
£25,001 – £30,000	93%	7%
£30,001 – £40,000	96%	4%
£40,001 and over	99%	1%
All	80%	20%

In terms of usage, 82% of adults either use it for work, for personal use, or a combination of the two and 18% of adults do not use the internet at all[4] (Table 4.2).

Table 4.2: Summary of internet usage by age group, tenure, to the internet by deprivation, tenure and household income, SHS 2014

	Internet user	Does not use the internet
Deprivation		
Most deprived 20%	75%	25%
Rest of Scotland	84%	16%
Tenure		
Owner-occupied	85%	15%
Social rented	69%	31%
Private rented	95%	5%
Other	72%	28%
Banded age		
16-24	98%	2%
25-34	96%	4%
35-44	96%	4%
45-59	89%	11%
60-74	66%	34%
75 plus	24%	76%
Household income		
£0-£6,000	72%	28%
£6,000 – £10,000	60%	40%
£10,001 – £15,000	65%	35%
£15,001 – £20,000	74%	26%
£20,001 – £25,000	83%	17%
£25,001 – £30,000	89%	11%
£30,001 – £40,000	93%	7%
£40,001 and over	99%	1%
All	83%	17%

2   N = 3,316 in 2014

3   All figures from SHS Annual Report 2014 available at www.gov.scot/shs

4   N = 4,787 in SHS 2014. This is higher than the question on access because it is asked of 6 of 12 questionnaire streams rather than 4 of 12.

Non-use of the internet is highest among:

- Older adults (34% of those aged 60-74 did not use the internet, and 76% of 75+)
- Adults in households with low incomes (28% in households with income less than £6,000 pa, 40% in households with between £6,001 and £10,000 pa).
- Adults in the 20% most deprived areas (25%).
- Adults in social rented housing (31% do not use the internet).

Access to the internet at home and internet use are relatively closely aligned. However, there are a small but significant proportion of adults who have household access to the internet but do not use it, or do not have access at home but do make personal use of the internet. (Table 4.3).

Table 4.3: Household access and personal use of the internet[5]

	Percentage	Number of respondents
No household access, does not use (exc. work use)	12%	586
Household access, do not use (exc. work use)	6%	174
No household access, uses internet	2%	71
Household access, uses internet	80%	2,295
Total	**100%**	**3,126**

In 2014, a question was introduced into the SHS about frequency of use. Overall, 85% of people who said they use the internet for their own personal use, use it every day, with 12% using it at least one a week.

There would be merit in exploring any differences between access and use and their relationship with facets of social inclusion. However, the number of cases where household access and internet use differ is small and unlikely to allow robust analysis, even if different waves of the SHS were combined to increase sample sizes. For the modelling purposes we have focused on internet access.

5   Weighted to the adult population. Because these results are weighted to the adult population, they differ from those given previously on household access. Weighting them by households would give 18%, 5% 2%, 74% respectively.

Table 4.4: Frequency of internet use among personal users

	Percentage	Number of respondents
Every day	85%	1,934
At least once a week (but not every day)	12%	326
Less than once a week	2%	61
Monthly	1%	42
Don't know	0%	3
Total	**100%**	**2,366**

4.2 Digital inclusion and potential indicators of social exclusion

Each of the potential indicators of social exclusion was converted into a binary variable for ease of initial analysis against internet access. For example, the Warwick-Edinburgh Mental Health Scale (WEMWBS) was coded into above average and below average to give two relatively equal groups.

Table 4.3 shows the relationship with each of the potential indicators of social exclusion by whether the household has internet access. Row one, for example, shows that whereas 76% of all households have access to a car, this is only 38% of households with no internet access and 83% of households with internet access. The indicators are ordered by the size of the gap between those who have internet access and those who do not.

Internet access is associated with positive outcomes on the majority of the indicators, with a strong association on several.

Access to a car, flying for leisure and having a driving licence are the most strongly associated with internet access:

- While 83% with internet access also have access to a car or van, only 38% of those without internet access have access to a car. There is a similar pattern with whether people have a current driving licence.
- Over 53% of those with internet access have flown for leisure in the last 12 months, compared to 17% among those without internet access.

Table 4.5: Social inclusion indicators by whether have internet access?

	Have internet access?			
	No	Yes	All	Yes minus No
Whether has access to a car	38%	83%	76%	45%
Has taken any flights for leisure in last 12 months	17%	53%	48%	36%
Has a current driving licence	39%	73%	68%	34%
Been to any cultural events or places (cinema, library, live music etc.) in last 12 months	52%	85%	81%	33%
Taken part in any sport (walking, swimming, football etc.) in last 12 months	56%	82%	79%	26%
Done any various activities (read, danced, played musical instrument, sang in a choir etc.) in last 12 months	63%	82%	79%	19%
Has used selected council services (exc Parks) in past month	33%	52%	49%	19%
Volunteer	14%	29%	27%	15%
Visits outdoors for leisure and recreation at least weekly	35%	50%	48%	15%
WEMWBS score – Higher than average.	38%	49%	48%	11%
Has bank or building society account	90%	97%	96%	7%
Convenience of a cash machine – very or fairly convenient	71%	76%	76%	5%
Convenience of a post office – very or fairly convenient	81%	85%	85%	4%
Convenience of a [grocery shop] – very or fairly convenient	91%	94%	94%	3%
I can influence decisions affecting my local area – strongly agree or agree.	22%	24%	24%	2%
Convenience of a doctor – very or fairly convenient	81%	83%	83%	2%
Use a [grocery store] once a week or more	78%	80%	79%	2%
Convenience of public transport – very or fairly convenient	82%	83%	83%	1%
Uses cash machine once a week or more	18%	18%	18%	0%
Could turn to friends/relatives in neighbourhood for advice/support	86%	84%	84%	-2%
Confidence in local police force to prevent crime – very or fairly confident.	66%	63%	64%	-3%
How strongly do you feel you belong to your immediate neighbourhood? – very or fairly strongly	81%	75%	76%	-6%
Uses post office once a week or more	26%	15%	16%	-11%
Uses public transport once a week or more	44%	31%	33%	-13%
Use a Doctor once a month or more	43%	23%	26%	-20%

Similarly, there was a strong association between internet access and a range of indicators that relate to activities undertaken:

- 85% of those with internet access had visited some cultural event or activity in the last 12 months compared to 52% of those who do not have internet access. A similar pattern is seem with sports participation (82% for those with internet access, 56% for those without internet access) participation in leisure activities (82% compared to 63%), and use of council services (52% compared with 33%).
- 29% of those with internet access had volunteered compared to 14% of those who did not have internet access

- 50% of those with internet access visit the outdoors for leisure and recreation at least weekly compared to 35% of those without internet access.

Mental health is positively correlated with internet access: 49% of those with above average mental health have access to the internet compared with 38% of those without internet access.

Having a bank or building society is also correlated with internet access: 97% of those with internet access have a bank or building society compared with 90% of those without access.

Conversely, there are a number of indicators that are negatively correlated with internet access. These include:

- Feeling they belong to the local neighbourhood (75% among those with internet access, 81% among those without internet access).
- Visiting a post-office at least one a week (15% among those with internet access compared to 26% without)
- Using public transport at least once a week (31% among those with internet access compared to 44% without)
- Visiting a doctor at least once a month (23% with internet access compared to 43% without).

There are also a number of indicators where there is no clear association. These include the indicators relating to convenience of local services, feeling that they can influence local decisions, use of grocery stores and cash machines, relying on people in the neighbourhood for support, and confidence in the local police force to prevent crime.

In summary, a sizeable number of potential indicators of social exclusion are strongly correlated with internet access. This may be due to a causal relationship between internet access and these indicators. Alternatively, it may be due to other compounding factors, for example age or levels of deprivation.

Similarly, there is also the possibility that the links between some indicators and internet access are masked by the effects of other factors. For example, while there is no apparent correlation between internet access and feelings of belonging to a local neighbourhood, it may be that once deprivation is controlled for, there is a link between internet access and feelings of belonging.

Overall, the number of social exclusion indicators where there is a correlation with internet access, and range of association across the different indicators, suggest that digital exclusion may play a significant role in some dimensions of social exclusion.

4.3 Grouping the potential indicators into dimensions of social exclusion

As noted previously, there is no single indicator of social exclusion but rather that the concept of social exclusion may cover a number of different dimensions. In Chapter 3, we provisionally grouped the potential variables into 3 broad groupings.

In order to define indicators of the different dimensions of social exclusion for analysis during Stage 2, a factor analysis was first run. Factor analysis is a statistical technique used to determine whether a large number of items can be reduced into a smaller number of core factors. We used the analysis to examine how the 25 potential indicators detailed in Table 4.3 above should be condensed into broader, meaningful groupings. The analysis conducted using principal component analysis with orthogonal rotation (varimax).

There is no single accepted best way of determining the number of factors that the individual components should be distilled into. However, one of the most common methods employed is to extract factors that have an eigenvalue of greater than one and then check that each of the groupings of components is meaningful. Eigenvalues indicate how much variation in the data is 'explained' by each factor. In our initial model, six factors had an eigenvalue of greater than one and all appear to make sense intuitively.

Table 4.6 provides details of the output from the factor analysis. The individual behaviours are shown on the left. The numbers in columns 1 through 6 are measures of how an individual indicator is correlated with the extracted factors. High scores (above 0.40) show a strong correlation between a social inclusion indicator and a factor and are highlighted in the table below.

The six, relatively clear dimensions that most of the 25 variables coalesce into can be labelled:

- Convenience of services. All five services included in the initial 25 variables.
- Active living: going to cultural events/places, using council services, doing various activities, taking part in sport, and volunteering.

Table 4.6: Factor analysis of potential social inclusion indicators

	Rotated component matrix					
	1	2	3	4	5	6
Convenience of a doctor	.71	-.01	.10	.07	-.07	.02
Convenience of a [grocery shop]	.70	.01	-.02	-.01	.08	.05
Convenience of a post office	.70	-.01	.04	.00	.09	.09
Convenience of a cash machine	.68	.01	.06	.05	-.01	.03
Convenience of public transport	.55	.14	-.25	.01	.02	-.06
Been to any cultural events or places (cinema, library, live music etc.) in last 12 months	.08	.66	.08	-.08	.17	-.08
Has used selected council services (exc Parks) in past month	.04	.63	-.06	.02	-.01	.11
Done any various activities (read, danced, played musical instrument, sang in a choir etc.) in last 12 months	-.01	.56	.07	.00	.03	-.12
Whether volunteers	-.06	.53	.09	.08	-.10	.11
Taken part in any sport (walking, swimming, football etc.) in last 12 months	.11	.51	.03	-.10	.45	.09
Whether has a current driving licence	.02	.19	.79	-.01	.11	.03
Whether has access to a car	.01	.18	.78	.06	.12	-.03
Use public transport once a week or more	.06	.17	-.71	-.03	.05	.00
How strongly do you feel you belong to your immediate neighbourhood?	.05	-.01	.09	.71	-.01	.09
Could turn to friends/relatives in neighbourhood for advice/support	.03	.01	.11	.71	-.02	.04
Confidence in local police force to prevent crime	.02	.01	-.09	.43	.15	-.14
WEMWBS score	.03	.00	.06	.28	.53	.03
Use a Doctor once a month or more	.01	.02	-.07	.06	-.69	.17
Use post office once a week or more	.02	-.07	-.05	.02	-.11	.70
Use cash machine once a week or more	.05	.06	.10	.00	-.07	.59
Use a [grocery store] once a week or more	.15	.03	-.17	-.08	.27	.42
Visits outdoors for leisure and recreation at least weekly	-.01	.34	.02	-.02	.36	.31
I can influence decisions affecting my local area	.03	.32	-.08	.28	-.14	-.07
Has bank or building society account	.07	.13	.15	.01	.03	-.14
Taken any flights for leisure in last 12 months	.03	.34	.21	.00	.29	-.14

- Transport: whether has a car, whether has a driving licence and (lack of) use of public transport.
- Socially connected: Whether feel they belong to the neighbourhood, being able to rely on friends, and confidence in local police.
- Health: Mental health and visiting a doctor less than once a month.
- Use of local services: use post office, cash machine, and grocery store more than once a week.

Four of the individual indicators did not correlate highly with any of the six factors. These were – visits to the outdoors for leisure, being able to influence decisions in my local area, having a bank or building society account, and taking any flights for leisure in the last year.

In the next section, we provide details of the scale created for each dimension.

Convenience of services

This is a straight-forward set of questions. A scale was created based on how many of the 5 services are considered very or fairly convenient. As very few people say that two or few services are convenient, these were banded together to give an indicator that has five categories.

Table 4.7 shows that, before controlling for any confounding factors, there is no strong association between convenience of services and internet access, although those with internet access are slightly less likely than those without to have access to two or fewer services (9% compared to 14%).

Table 4.7: Convenience of services by internet access

Convenience of services	Have internet access?		
	No	Yes	Total
0-2 of 5 services	14%	9%	10%
3 services	10%	10%	10%
4 services	20%	23%	23%
5 of 5 services	56%	58%	58%
Total	**100%**	**100%**	**100%**

Active living

There is a considerable overlap between the questions on going to cultural places/events and use of council services. For example, use of library is asked in the cultural activities question and the council services question. Therefore the active living scale was created using 4 of the 5 indicators associated with this dimension (excluding the use of council services). This scale covers sports participation, cultural participation, activities undertaken and whether volunteer. As few people overall score 0 or 1, these were banded together to give an indicator that has four categories.

Table 4.8 shows that there is a strong association between this Active Living scale and internet access. While 41% of those without internet access score 0-1 on this scale, only 11% of those with internet access have a similarly low score. (Preliminary further analysis suggests that this pattern is independent of age although it may reflect other confounding factors.)

Of the 6 factors that came out of the modelling, it is perhaps the factor that comprises the most disparate set of variables.

Table 4.8: Active living scale by internet access

Active living	Have internet access?		
	No	Yes	Total
0-1 of 4	41%	11%	15%
2	25%	20%	21%
3	25%	46%	43%
4 of 4	9%	23%	21%
Total	**100%**	**100%**	**100%**

Transport

Access to a car and whether they have a valid licence are closely correlated, and both variables are inversely correlated to use of public transport. Therefore, instead of creating a scale using these three variables, a variable was created that focused on access to a car and use of public transport only – creating 4 categories; neither, both, just access to a car, just use of public transport. Table 4.9 shows that both access to a car and use of public transport are correlated to internet access.

Table 4.9: Transport scale by internet access.

Transport	Have internet access?		
	No	Yes	Total
No access to car, does not use public transport once a week	28%	6%	9%
No access to car, does use public transport once a week	35%	11%	15%
Access to a car, does not use public transport once a week	29%	63%	58%
Access to a car, and does use public transport once a week	9%	20%	18%
Total	**100%**	**100%**	**100%**

Socially connected

The three questions associated with this factor – feel they belong to a neighbourhood, ability to rely on friends, and confidence in the local police – were used to create a scale on social connections.

While there is little difference by internet access at the low end of the scale (Table 4.10) those with internet access are less likely than those without to score 3 out of 3 (47% compared to 54%).

Table 4.10: Socially connected scale by internet access.

Socially connected	Have internet access?		
	No	Yes	Total
0 of 3	4%	4%	4%
1	11%	13%	12%
2	31%	36%	35%
3 of 3	54%	47%	48%
Total	**100%**	**100%**	**100%**

Mental Health

It is arguable whether health is a dimension of social exclusion. However, we suggest that the Stage 2 analysis should cover the links between mental health and digital inclusion. Instead of creating a scale by combining responses to the WEMWBS mental health indicator with visits to the doctor, we suggest focusing the analysis on the WEBWBS mental health scale. We have used a standard approach of converting the WEBWBS scores into three bands, average (up to +/- 1 standard deviation around the mean), below average and above average.

Table 4.11 shows that those with internet access are more likely than those without internet access to have an above average mental health and wellbeing score (15% compared to 9%) or an average score (74% compared to 66%). Those without internet access are twice as likely to have a below average score (25% compared to 12%).

Table 4.11: Mental health and wellbeing by internet access.

Mental health and wellbeing	Have internet access?		
	No	Yes	Total
Below average	25%	12%	14%
Average	66%	74%	72%
Above average	9%	15%	14%
Total	**100%**	**100%**	**100%**

Use of local services

This is another straight-forward set of questions and we created a scale based on how many of the 3 services closely associated with this factor – namely post-office, cash machines, and grocery shops.

Table 4.13 shows that, before controlling for other factors, the main difference by internet access is in the middle of this scale. Those with internet access are less likely than those without to score 2 out of 3 (20% compared to 27%).

Table 4.13: Use of selected local services by internet access.

Weekly use of selected local services	Have internet access?		
	No	Yes	Total
0 of 3	15%	17%	17%
1	52%	59%	58%
2	27%	20%	21%
3 of 3	5%	5%	5%
Total	**100%**	**100%**	**100%**

Long-term physical or mental illness or disability

For completeness, a further indicator was created – whether anyone in the household had a long-term illness or disability. Table 4.12 shows that households without internet access are more likely than those with internet access to contain someone who have a physical or mental problem.

Table 4.12 Long term illness or disability by internet access.

Anyone in the household with a long-term illness or disability?	Have internet access?		
	No	Yes	Total
No	39%	67%	61%
Yes	61%	33%	39%
Total	**100%**	**100%**	**100%**

5 Is internet access a driver of social exclusion?

This section examines whether digital inclusion is a driver of different dimensions of social exclusions that were detailed in the previous chapter. First we describe our approach to the modelling and examine the key factors that shape patterns of internet access across Scotland.

5.1 Approach to modelling

The modelling was undertaken separately for each of the seven dimensions of social exclusion with the focus being on examining whether internet access played a significant role once the influence of other factors had been accounted for. As well as whether the household had access to the internet, the following variables were used as potential explanatory variables for each dimension.

- Geographic variables:
  – Scottish Index of Multiple Deprivation deciles,
  – SG 6-way Urban/rural indicator.

- Household composition:
  – Anyone retired in household,
  – Any children in household
  – Household working status
  – Anyone in the household with a physical or mental health condition/illness

- Household resources
  – Household Income[6]
  – Access to any cars or vans.
  – Attitudes to how well managing financially these days.

- Other
  – Banded age of Highest Income Householder (HiH).
  – Sex of Highest Income Householder
  – Tenure
  – Highest qualification (of random adult)

The modelling was done primarily using logistic[7] regression (specifically, multinomial logistic regression for most dimensions), complemented by CHAID analysis.

Two forms of logistic regression model were run for each dimension. First, a full model with all the potential explanatory variables included – whether they were significant or not – was undertaken. Secondly, a conditional forward step-wise approach model was run. In short, this is an iterative method than only adds variables to the model if they add any explanatory power. It means that non-significant variables are not included and that factors with more explanatory power will tend to be added to the model in the earlier steps.

In short, if a variable (such as internet access) was significant in driving indicators of social exclusion – independently of any other factor included – we would expect to see it as significant in the full model and to be included in the step-wise forward model.

The regression analysis was complemented by CHAID analysis, a form of analysis that determines how variables best combine to explain the outcome in a given dependent variable. It is especially useful for data expressing categorised values instead of continuous values. One of the key features of CHAID analysis is that it can used to visualise the relationship between the target variable and the related factors with a tree image. If internet access was a key driver overall, we would expect to see it close to the top of the CHAID tree.

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6   Net annual household income.

7   Multinomial logistic regression is used when a dependent variable is nominal or ordinal and when it has more than two categories.

Note on limitations of the analysis

The main remit of the modelling was not to fully model the drivers for each dimension of social exclusion but rather to focus on whether internet access played a significant role. As such, we have focused on main effects and whether internet access is among them.

The analysis is shaped by the data that is available to us. It is constrained by the variables in the dataset. Similarly, the dimensions of social exclusion have been driven by the data available rather than coming purely from a theory. This is a very common issue with secondary analysis. Additionally, there is a tension that some variables are measured at the household level – such as internet access, income, tenure – and some are individual-level factors, such as mental health and a large number of the different dimension of social exclusion.

Finally, we would caution against assuming that significance suggests causation. A relationship between mental health and internet access does not necessarily mean that being online improves mental health (or that the lack internet access is harmful to mental health). What we can say is that, once everything else is controlled for, those with internet access are less likely to have below average mental health than those without internet access.

Note on interpreting Logistic Regression Models

Logistic regression models compare different categories against a reference category. The first two columns indicate the different predictor variables. All variables have been treated as categorical variables.

In Table 5.1, 'Couple neither work' has been set as the reference category for Household Working Status and the other categories are a series of comparisons with this category.

The columns headed 'Sig.', shows whether the factor is significant. A value of less than 0.05 in these columns suggests that this factor is significant. In Table F1a, the figure for 'Working couple' is less than 0.05, it follows that – after controlling for the effect of all other factors in the model – the likelihood among working couples having internet access is different from couples where neither work. However, the figure for 'single working adult' is more than 0.05 suggesting that there is no significant difference between couples where neither work and single working adults.

The column headed 'Beta' indicates the direction of the effect. A positive value indicates that those in the category are more likely to have internet access. For example, 'couple working' households are more likely to have internet access than 'couple not working' households.

The column headed "Exp(B)" gives the odds ratio. This indicates the size of the effect. The further above 1 that the odds ratio is, the greater the increase in likelihood of using at least one substance. The further below 1, the greater the decrease in the likelihood of using at least one substance. A value of 1 for the odds ratio means that a factor has no effect.

Multinomial logistic regression is an extension of normal logistic regression, but with the dependent variable having more than two values. For example, rather than a simple 'None/Any' contrast, the target variable may distinguish between 'None/A little/A lot'. In this instance, two related models would be run: comparing 'none' with 'a little' and comparing 'none' with 'a lot'.

5.2 Modelling access to the internet.

Before modelling the seven dimensions of social exclusion, we analysed access to the internet.

Table 5.1 shows the results of the conditional forward step-wise logistic regression model of internet access.

All of the variables shown in the table above have a significant effect. The first three variables added to the model were household working status, highest qualification, and banded age of HiH and show that:

- Households with a working couple are the most likely to have internet access. Non-working single adult households are the least likely to have internet access.
- The more qualifications, the more likely the household is to have internet access.
- The younger the Highest Income Householder, the more likely that a household will have internet access.

These factors are all strong predictors of whether a household has internet access. Access to cars, tenure, whether they have any children in the household and banded household income were also significant.

Table 5.1: Logistic regression model of internet access: Conditional forward, SHS 2014

Access compared to no access		B	S.E.	Sig.	Exp(B)
Whether have any kids	(Any compared with none)	1.23	.28	.00	3.41
Household working status	(Compared to couple neither work)			.00	
	Single working adult	-.34	.22	.12	.71
	Non-working single	-.65	.17	.00	.52
	Working couple	.72	.31	.02	2.05
	Couple, one works	.25	.27	.35	1.28
Tenure	(Compared to Owner occupied)			.00	
	Missing info/other	-1.28	.36	.00	.28
	PRS	-.14	.22	.53	.87
	LA/HA	-.71	.14	.00	.49
Income band	(compared to £1300 to £10K)			.00	
	Missing info	.55	.29	.06	1.73
	£20000+	.75	.19	.00	2.12
	£15000 – £20000	.68	.18	.00	1.98
	£10000 – £15000	.37	.16	.02	1.45
Whether have access to a car	(Yes compared with no)	1.11	.14	.00	3.03
Highest qualification held	(compared to no qualifications held)			.00	
	Missing/other	.55	.17	.00	1.73
	Degree	1.98	.21	.00	7.21
	Lower than degree	1.11	.14	.00	3.02
HIH banded	(compared to 75 plus)			.00	
	16 to 24	2.67	.32	.00	14.42
	25 to 34	2.33	.27	.00	10.28
	35 to 44	2.30	.26	.00	9.97
	45 to 59	1.93	.21	.00	6.86
	60 to 74	1.39	.17	.00	4.03

The following variables were not significant[8].

- Urban rural indicator
- Area deprivation (though this will be linked to tenure and other variables that are significant).
- Sex of HiH
- Whether anyone has a long-term illness

This suggests that, once the impact of all the other factors in the model had been accounted for these, factors are not driving levels of internet access. Note that this does not mean that the prevalence of internet access does not differ across these factors. For example, 92% of those living in the least deprived area have internet access compared to 66% in the most deprived areas. However, since it is not a significant factor in the regression analysis, this suggests that differences by area deprivation are likely to be because of other factors that are showing as significant – such as tenure, educational

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8   They were not included in the forward condition step-wise model. When the full model of internet access was run, with all variables forced into the model they were not significant.

qualifications, income etc. – that are associated with area deprivation.

CHAID analysis of internet access provides a very similar picture. (Figure 5.1 shows the top of the CHAID model.) The first level factor in the CHAID analysis – the factor with the largest impact – is household working status. Internet access ranges from 52% in non-working single person households to 98% in working couple households.

The most common second level factor is educational qualifications. This is the most important factor within each working status category with the exception of working couples, For example, among non-working single person households, internet access ranges from 30% among those with no educational qualifications, to 79% of those with a degree or higher. Among working couples, SIMD decile is most powerful predictor of internet access, although the values only range between 96% and 100% depending on SIMD decile of area.
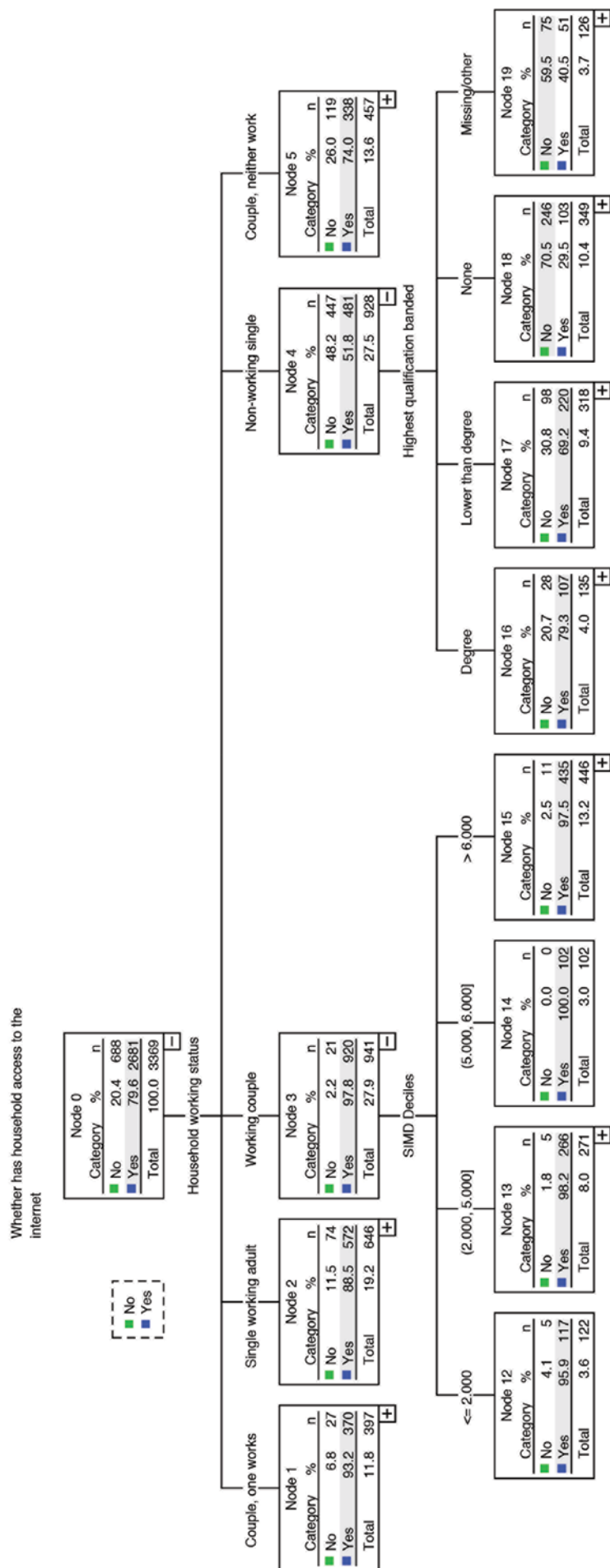
Figure 5.1: Selection from CHAID model of internet access.

5.3 Modelling the Social Exclusion dimensions

Social Exclusion Dimension 1: Access to Services.
Access to Services scale was created based on how many of 5 different services – Post Office, Bank, Doctor, Grocery, and Public Transport – were considered to be very or fairly convenient.

Table 5.2 provides a summary of regression modelling, with full details provided in the Table 7.1 in the appendix. It shows what factors were significant overall and the order in which they were included in the step-wise model. They also indicate the level that each factor appear in the CHAID analysis.

The strongest predictors of access of services were rurality and whether anyone in the household had an illness or disability, although none of the variables proved to have great explanatory power[9]:

- Those in urban areas were more likely than those in rural areas to find access to services convenient (this was particularly the case when comparing those with 0-2 services convenient with 5 of 5 convenient, and between large urban areas and remote and accessible rural areas).
- Those with anyone in the household with an illness or disability were less likely to find a high number of services convenient.

9   The reported pseudo r^2 ranged between 0.05 and 0.12. In multiple regression, r^2 gives an indication of how much variation in the dependent variable is being explained by the model. It ranged from 0 (no variance explained) to 1 (all variance explained). In logistic regression, the corresponding measure is called pseudo r^2. While it is not exactly comparable, it does give some indication of the explanatory power of the model. Three different version of the pseudo r2 are reported in SPSS. We present the range given by these.

Table 5.2: Summary of Access to services modelling

	Significant overall?	Logistic regression step	0-2 vrs 3	0-2 vrs 4	0-2 vrs 5	CHAID levels
Urban/rural	Yes	1			Y	1
Anyone in household with illness/disability	Yes	2		Y	Y	2,3
HIH banded age	Yes	3				3
Tenure	Yes	4	Y			
Highest qualification held	Yes	5	Y	Y	Y	
Income	Yes	6			Y	
Number retired	Yes	7			Y	2
Deprivation	Yes	8	Y			
Any children	No	-				
Household working status	No	-				3
Access to a car	No	-				3
Attitude to how managing financially	No	-				2
HIH banded age	Yes	-				
Sex of HiH	No	-				
INTERNET ACCESS	No	-				

Other significant predictors included banded age of HiH, tenure, highest qualification held, banded income, number of people retired, and area deprivation. The CHAID analysis presents a similar picture with urban/rural classification the first level variable, and a number of factors at the second level. (Figure 8.1 in the appendix shows the top two levels.)

Internet access was not a significant factor.

Social Exclusion Dimension 2: Active lifestyle

The Active Lifestyle scale was based on four different activities: whether the respondent volunteers, whether they go to cultural places/events, sports participation and cultural participation.

Table 5.3 below provides a summary of regression modelling, with full details provided in the Table 7.2 in the appendix.

The strongest predictors of scoring on the active lifestyle scale were qualifications held, whether anyone has a long-term illness or disability and household internet access.

- Those with higher educational qualifications were more likely to score highly on the active lifestyle scale.
- Having a long-term illness or disability reduced the likelihood of scale highly on this scale.
- The third factor included in the model was internet access. Those with internet access were more likely than those without to score highly on this scale.

Internet access is associated with living an active lifestyle. Moreover, as seen in Table 5.3, internet access was significant in each of the contrasts. Internet access is not only significant when comparing the different ends of the scale (0-1 activities versus 4 activities) but also when comparing those at the low end of the scale (0-1 activities compared to 2 activities).

It should be noted that this does not mean that interest access necessarily leads to a more active lifestyle. Causality could work in the opposite direction, with an active lifestyle encouraging internet access. However, this analysis does show that there is a clear association that is independent of all other factors included in the model.

Table 5.3: Summary of Active lifestyle logistic regression modelling

	Significant overall?	Log reg Step	0-1 vrs 2	0-1 vrs 3	0-1 vrs 4	CHAID levels
Highest qualification held	Y	1	Y	Y	Y	1
Anyone in household with illness/disability	Y	2	Y	Y	Y	3
INTERNET ACCESS	Y	3	Y	Y	Y	2
Tenure	Y	4		Y	Y	2
HIH banded age	Y	5		Y	Y	
Any children	Y	6			Y	3
Deprivation	Y	7		Y	Y	
Attitude to how managing financially	Y	8		Y	Y	2
Number retired	N				Y	
Sex of HiH	N				Y	
Urban/rural	N					3
Household working status	N					
Income	N					
Access to a car	N					

Figure 5.2: Selection from CHAID model of active lifestyle.
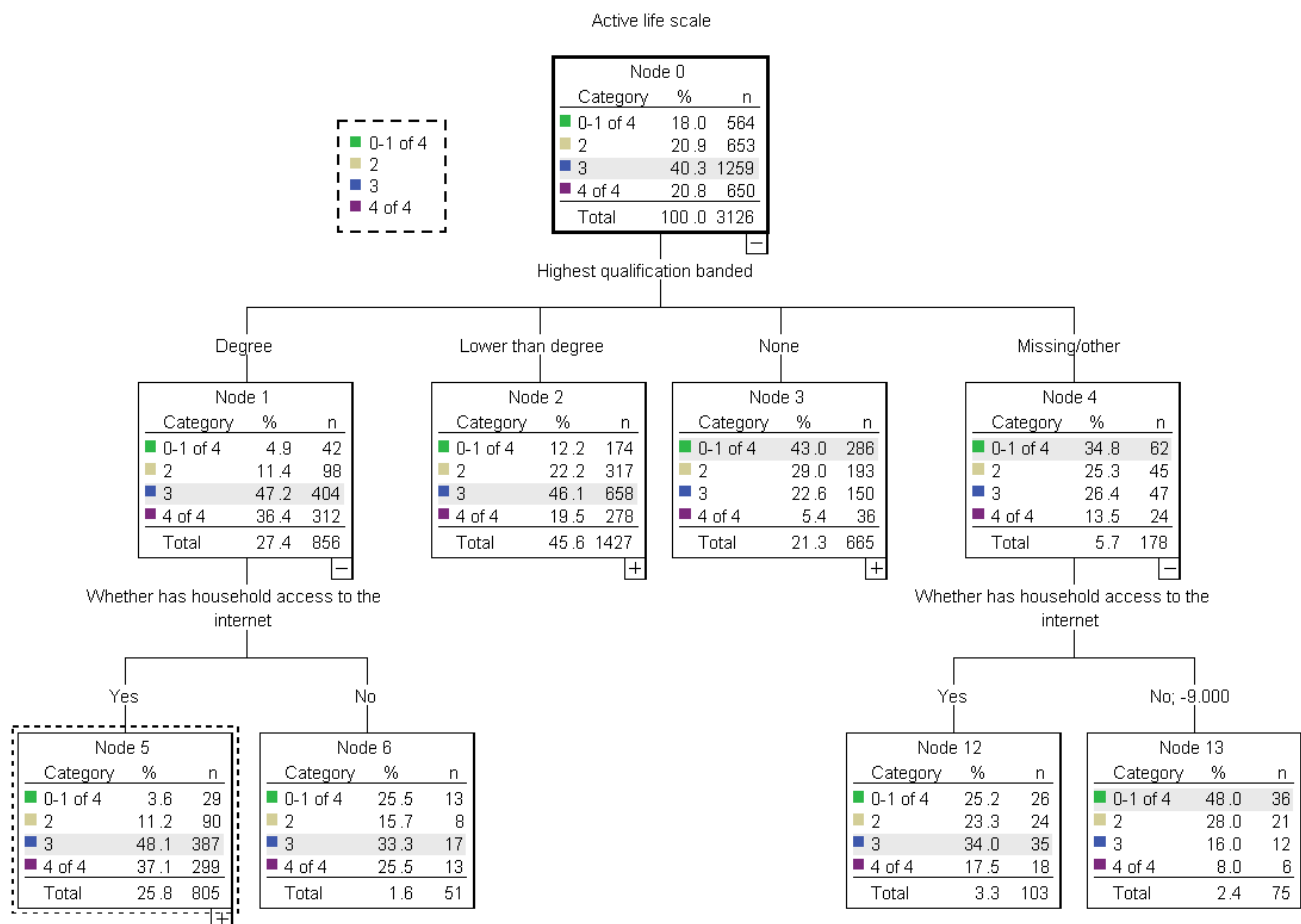
The CHAID analysis of the active lifestyle scale gives similar findings. Level of qualifications was the most powerful predictor of active lifestyle. Among those without any qualification, 43% scored 0 or 1 on this scale, compared with only 5% of those with a degree.

Figure 5.2 shows where internet access was a significant second level factor. Internet access came out as a second level factor among those with a degree and among those with missing information on qualifications. Among those with a degree, 37% of those with internet access scored 4 out of 4 on the active lifestyle scale, compared to 25% of those without internet access.

Social Exclusion Dimension 3: Transport

The transport indicator was created based on whether the household has access to a car and on use of public transport. Neither having access to a car nor using public transport was set as the reference category. Car ownership was excluded from the list of independent variables.

The summary of results is shown in Table 5.4.

A number of factors proved to be significant[10], with the strongest predictors being household working status, tenure and urban/rural classification. A similar pattern is seen in the CHAID model (see Table 8.3 in the appendix).

Internet access was the fourth variable to be included in the model of the transport indicator. However, the relationship appears to be related to access to cars. Once all other factors have been controlled for, households that have internet access are more likely to have access to a car. However, it does not appear that households who have access to the internet are more or less likely than those without internet access to use public transport.

10   The model had greater explanatory power than other, with a pseudo r^2 of between 0.26 and 0.51

Table 5.4: Summary of Transport logistic regression modelling

	Significant overall?	Log reg Step	Neither vrs Take Public transport, no car	Neither, versus, Access to a car, don't use public transport	Neither vrs have access to a car and use public transport	CHAID levels
Household working status	Yes	1		Y	Y	1
Tenure	Yes	2		Y	Y	2,3
Urban/rural	Yes	3	Y	Y	Y	3
INTERNET ACCESS	Yes	4		Y	Y	3
HIH banded age	Yes	5	Y	Y	Y	3
Highest qualification held	Yes	6	Y	Y	Y	2,3
Income	Yes	7	Y	Y	Y	3
Sex of HiH	Yes	8		Y	Y	
Any children	Yes	9		Y		
Anyone in household with illness/disability	Yes	10		Y	Y	
Deprivation	Yes	11		Y		
Number retired	No					
Attitude to how managing financially	No					2
Access to a car	NA	NA	NA	NA	NA	NA

Social Exclusion Dimension 4: Socially connected

The socially connected scale was created based on whether respondents felt they belong to the neighbourhood, being able to rely on friends, and whether they had confidence in their local police.

The summary of results is shown in Table 5.5 with the full results given in Table 7.4

Table 5.5: Summary of Socially connected logistic regression modelling

	Significant overall?	Log reg Step	0-1 versus 2	0-1 versus 3	CHAID levels
HIH banded age	Y	1	Y	Y	1
Tenure	Y	2		Y	2
Any children	Y	3		Y	
Attitude to how managing financially	Y	4	Y	Y	3
Deprivation	Y	5	Y	Y	3
INTERNET ACCESS	Y	6			
Access to a car	N				2
Anyone in household with illness/disability	N				2,3
Highest qualification held	N				3
Number retired	N				
Urban/rural	N				
Household working status	N				
Income	N				
Sex of HiH	N				

Overall, the model was weak with none of the variables being a strong predictor[11]. Banded age of the Highest Income Householder, tenure, and whether there were any children in the household were the first three variables included in the model.

- Older HiHs were more likely to score high on this scale than younger HiHs
- Owner occupiers were less likely to be socially connected than those living in social rented housing
- Having children was positive related to being socially connected.

Internet access was the last variable included in the model, with the significance level on the cusp of the 0.05 cut-off. However, it does not appear as a significant factor in either of the separate contrasts and is not significant in the model that compares the different ends of the scale (those who score 0 or 1 on this scale compared to those who scored 3.) Internet access did not appear as a significant factor in the CHAID analysis. As such, the strength of the relationship between internet access and this measure of being socially connected is weak and the nature of this relationship unclear.

Social Exclusion Dimension 5: Mental Health and Wellbeing

The indicator of mental health and wellbeing was based on converting the WEBWBS scores into three bands – average (up to +/- 1 standard deviation around the mean) below average and above average. Table 5.6 gives the summary results.

Overall, the model was weak with none of the variables being strong predictors[12]. The main drivers of mental health and wellbeing were how the household is managing financially, household working status, whether anyone in the household has an illness or disability.

Internet access is significant. Those with internet access are less likely to have lower than average mental health and wellbeing than those who do not have internet access. However, as it was the second last variable included in the model, the link is relatively weak.

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11   The pseudo r2 ranged from 0.06 to 0.13

12   The pseudo r^2 of the model ranged from 0.09 to 0.17

Table 5.6: Summary of mental health and wellbeing logistic regression modelling

	Significant overall?	Log reg Step	Average compared to below average	Above compared to below average	CHAID levels
Attitude to how managing financially	Yes	1	Y	Y	1
Household working status	Yes	2	Y	Y	2,3
Anyone in household with illness/disability	Yes	3	Y	Y	2,3
HIH banded age	Yes	4	Y	Y	
Any children	Yes	5	Y		
INTERNET ACCESS	Yes	6	Y	Y	2
Urban/rural	Yes	7		Y	3
Income	No				2
Tenure	No				3
Highest qualification held	No				3
Deprivation	No				
Number retired	No				
Access to a car	No				
Sex of HiH	No				

The CHAID analysis gave similar findings. Views on how were managing financially was a first level factor, while internet access was a second level factor (for those who said they were managing very well or quite well). While 9% of those who said they were managing very well or managing quite well scored below average in relation to mental health and wellbeing, this increased to 39% among those who said that they had some financial troubles or don't manage very well (See Figure 8.5). Among those who say they were managing very well or quite well, 17% of those without internet access scored below average, compared to 7% of those with internet access.

Social Exclusion Dimension 6: Use of local services
This scale was created based on weekly use of post-offices, cash machines, and grocery shops. Results are given in Table 5.7

Again, this model had very low explanatory power[13]. Those in remote rural places more likely to use 2 or 3 compared to 0. Council tenants more likely than owner occupiers to use local services.

Internet access was not a significant factor.

Social Exclusion Dimension 7: Whether anyone has illness or disability
For completeness, a final indicator was created – whether anyone in the household had a long-term illness or disability.

Results are summarised in Table 5.8.

The first three variables to be included in the model were household working status, tenure and banded age of the HiH. Internet access was not significant.

13   The pseudo r² ranged from 0.03 to 0.07.

Table 5.7: Summary of use of local services logistic regression modelling

	Significant overall?	Log reg Step	0 vrs 1	0 vrs 2 or 3	CHAID levels
Number retired	Yes	1	Y	Y	2
Urban/rural	Yes	2		Y	1
Tenure	Yes	3	Y	Y	3
HIH banded age	Yes	4			
Any children	Yes	5	Y		
Deprivation	Yes	6	Y		3
Sex of HiH	No				2
Household working status	No				
Anyone in household with illness/disability	No				
Income	No				
Access to a car	No				
Attitude to how managing financially	No				
Highest qualification held	No				
INTERNET ACCESS	No				

Table 5.8: Summary of whether anyone has an illness or disability.

	Significant overall?	Log reg Step	Someone compared with no-one	CHAID levels
Household working status	Yes	1	Y	1
Tenure	Yes	2	Y	2,3
HIH banded age	Yes	3	Y	2,3
Attitude to how managing financially	Yes	4	Y	3
Income	Yes	5	Y	
Access to a car	Yes	6	Y	
Urban/rural	Yes	7	Y	3
Deprivation	Yes	8	Y	
Number retired	No			2
Anyone in household with illness/disability	No			
Sex of HiH	No			
Any children	No			
Highest qualification held	No			
INTERNET ACCESS	No			

6 Discussion and conclusions

The literature review highlighted a number of key findings:

- The digital divide is based around social inequalities that drive low levels of access and skills to use the internet

- Those who are socially excluded are less likely to use the internet and benefit from the internet applications that may help them tackle their exclusion

- Digital exclusion has the potential to exacerbate social exclusion e.g. in terms of poor educational attainment and some studies have shown a positive effect of digital participation on indicators of social exclusion.

However the literature does not provide a definitive picture of the relationship between digital and social though it does highlight that both social exclusion and digital exclusion are complex concepts. Broadly, the literature around digital exclusion highlights the positive impacts of internet use. (Levitas et al 2007). Digital exclusion is more complex than simply having or not having access to the internet, although the data available to us means more complex analysis is not possible.

In terms of the secondary analysis of the SHS data, internet access is a significant factor in four of the dimensions of social exclusion, even if this is relatively weak. The link appears strongest in the active lifestyle dimension of social exclusion, but is also seen in transport (in relation to access to cars rather than in use of public transport) mental health, and being socially connected (although the nature of the association in this dimension is particularly weak and unclear). It is not a significant factor in 3 of the other 7 dimensions of social exclusions (access to services, use of public services, and long-term health).

Overall, however, this supports the view that digital exclusion and social exclusion are linked and that digital participation has a positive impact on some of the dimensions of social exclusion.

The findings around leading an active lifestyle, where the connection does appear to have a strong association is broadly in line with the literature around digital participation. The factors that make up the active lifestyle dimension such as sports participation, cultural participation, activities undertaken, and whether volunteer are often mediated through social interaction online. Shah et al 2003 show, for example, that there are associations between internet use and civic engagement. The Eurobarometer shows that across the EU, 30% use the Internet at least once a week to look for cultural information, buy cultural products or read cultural articles. However, some previous research highlights that high levels of internet use can be associated with lack of physical and social activity (Moreno et al. 2013).

Previous research highlights the links socio-demographic factors such as income, employment status and educational attainment, internet usage, aspects of leading an active lifestyle (Eurobarometer 2013). The analysis shows that the effect of having internet access is independent of other factors included in the model. Among people of similar education levels, income levels and similar employment positions, internet access is associated with more active lives. While this does not mean that internet access necessarily leads to a more active lifestyle, it does show a clear link between digital exclusion and active lifestyles.

In terms of mental health, the association with internet use seen in the modelling is also reflected in much of the literature. For instance,

the Phoenix Centre 2009 shows that depression is 20% lower in retired adults who use the internet for various purposes and, in particular, for social networking. The Scottish Government identifies the healthcare benefits that are facilitated by internet use in terms of connecting healthcare professionals and patients that fit with our findings. However, the literature also highlights the potential for negative impact of internet use on mental health, for example, if online interactions replace face-to-face interactions (Huang 2012). Some studies have also shown an increase in depressive moods after use of social networking sites that should be considered (O'Keeffe et al., 2011). Nevertheless, the modelling suggests that internet access is associated with better mental health and wellbeing.

Our model suggested a weak relationship between being socially connected and internet access. This contrasts with some previous findings that emphasises the benefits of internet use to social connectivity, particularly through social networking, forums/blogs online (Schejeter et al 2015). Internet use facilitates social connectedness as it can help individuals stay in touch with others and increasingly individuals use the internet to find friends and spouses online (Finkel et al 2012). However, our social connectedness scale was based on belonging to a neighbourhood, being able to rely on friends, and whether they had confidence in their local police. Two of three components relate to social connectedness in the local area – whereas the internet access may encourage social connectedness in a different, less local, sphere.

7 Detailed logistic regression tables

Table 7.1: Access to services. Multinomial logistic regression

		3 services compared to 0-2				4 services compared to 0-2				5 services compared to 0-2			
		B	Std. Error	Sig.	Exp(B)	B	Std. Error	Sig.	Exp(B)	B	Std. Error	Sig.	Exp(B)
Deprivation	Most deprived decile	.22	.42	.59	1.25	.20	.37	.58	1.23	.24	.34	.48	1.27
	Second most deprived	-.74	.43	.08	.48	-.03	.36	.93	.97	-.14	.33	.68	.87
	3rd	-.77	.44	.08	.47	-.15	.37	.68	.86	.00	.33	1.00	1.00
	4th	-.10	.42	.80	.90	.33	.37	.36	1.40	.22	.34	.51	1.25
	5th	-.89	.43	.04	.41	.06	.35	.86	1.07	-.08	.32	.82	.93
	6th	-.51	.40	.21	.60	-.32	.35	.37	.73	-.21	.32	.51	.81
	7th	-.62	.40	.12	.54	-.59	.35	.09	.56	-.58	.32	.07	.56
	8th	-.61	.40	.13	.54	-.29	.35	.40	.75	-.18	.32	.57	.84
	9th	-.27	.39	.48	.76	-.41	.35	.24	.66	-.46	.32	.15	.63
	(compared to least deprived decile)	0[b]	.	.	.	0[b]	.	.	.	0[b]	.	.	.
Urban/rural	Remote rural	.05	.32	.87	1.05	.14	.26	.60	1.15	-1.06	.26	.00	.35
	Accessible rural	-.14	.26	.59	.87	-.11	.21	.62	.90	-.99	.20	.00	.37
	Remote small towns	.54	.50	.28	1.71	.49	.43	.26	1.63	.72	.39	.07	2.06
	Accessible small towns	.01	.35	.97	1.01	.19	.28	.49	1.21	.30	.25	.23	1.35
	Other urban	.14	.21	.49	1.16	-.05	.18	.76	.95	.22	.16	.17	1.24
	(Compared to large urban areas)	0[b]	.	.	.	0[b]	.	.	.	0[b]	.	.	.
Number retired	Two+	.35	.46	.45	1.42	.14	.38	.71	1.15	.75	.34	.03	2.11
	One	.01	.39	.97	1.01	-.39	.32	.23	.68	-.02	.28	.95	.98
	None retired	0[b]	.	.	.	0[b]	.	.	.	0[b]	.	.	.
Tenure	Missing/other	.77	.50	.12	2.16	-.83	.56	.14	.44	-.10	.43	.81	.90
	Private rented	.56	.27	.04	1.76	.31	.23	.17	1.37	-.02	.22	.94	.98
	Local Authority/ HA	.50	.23	.03	1.64	.34	.19	.08	1.40	-.03	.17	.84	.97
	(Compared to owner-occupied)	0[b]	.	.	.	0[b]	.	.	.	0[b]	.	.	.
Someone in household with illness/ disability	Yes	-.27	.18	.12	.76	-.63	.15	.00	.53	-.72	.14	.00	.48
	No	0[b]	.	.	.	0[b]	.	.	.	0[b]	.	.	.
Household income	Missing	-.23	.48	.64	.80	-.05	.40	.90	.95	-.85	.38	.02	.43
	£20000+	-.06	.28	.82	.94	-.08	.24	.72	.92	-.41	.21	.05	.66
	£15000 – £20000	-.58	.32	.07	.56	-.16	.26	.54	.85	-.28	.23	.21	.75
	£10000 – £15000	.12	.29	.69	1.12	-.08	.25	.75	.92	-.13	.22	.57	.88
	(compared to < £10,000)	0[b]	.	.	.	0[b]	.	.	.	0[b]	.	.	.
Highest qualification held	Missing other	-.05	.37	.89	.95	.24	.29	.40	1.28	-.06	.26	.81	.94
	Degree of above	.72	.27	.01	2.06	.84	.22	.00	2.32	.55	.20	.01	1.74
	Lower than degree	.45	.23	.05	1.56	.54	.19	.01	1.72	.54	.17	.00	1.72
	(compared to no qualifications held)	0[b]	.	.	.	0[b]	.	.	.	0[b]	.	.	.
HIH banded age	16 to 24	.14	.59	.81	1.15	-.74	.50	.14	.48	-.08	.45	.87	.93
	25 to 34	-.13	.50	.79	.88	-.46	.41	.27	.63	.09	.37	.80	1.10
	35 to 44	.28	.50	.57	1.33	.05	.41	.90	1.05	.64	.37	.09	1.89
	45 to 59	.16	.46	.73	1.17	-.29	.38	.45	.75	.62	.34	.06	1.86
	60 to 74	-.16	.27	.55	.85	-.40	.23	.08	.67	.18	.20	.36	1.20
	(compared to 75 plus)	0[b]	.	.	.	0[b]	.	.	.	0[b]	.	.	.

Table SEDIM7.2: Active life scale

		2 compared to 0-1				3 compared to 0-1				4 compared to 0-1			
		B	Std. Error	Sig.	Exp(B)	B	Std. Error	Sig.	Exp(B)	B	Std. Error	Sig.	Exp(B)
Area deprivation	Most deprived decile	-.15	.37	.68	.86	-.36	.33	.27	.70	-1.02	.37	.01	.36
	Second most deprived	.10	.37	.79	1.10	-.34	.33	.30	.71	-.78	.36	.03	.46
	3rd	-.05	.37	.90	.96	-.72	.33	.03	.49	-1.25	.37	.00	.29
	4th	.42	.37	.25	1.53	-.35	.33	.30	.71	-.62	.36	.08	.54
	5th	.11	.37	.77	1.11	-.38	.33	.25	.68	-.60	.35	.09	.55
	6th	.39	.38	.30	1.48	-.04	.34	.90	.96	-.42	.37	.25	.66
	7th	.03	.37	.93	1.03	-.54	.33	.11	.59	-.67	.36	.06	.51
	8th	.29	.39	.46	1.34	.11	.35	.75	1.12	-.17	.37	.64	.84
	9th	.29	.40	.47	1.33	-.12	.35	.72	.88	-.07	.37	.85	.93
	(compared to least deprived decile)	0[b]	.	.	.	0[b]	.	.	.	0[b]	.	.	.
Children in household	Any children	.29	.21	.17	1.34	.27	.20	.18	1.31	.86	.22	.00	2.36
	None	0[b]	.	.	.	0[b]	.	.	.	0[b]	.	.	.
Tenure	Missing/other	-.12	.43	.79	.89	-.36	.42	.40	.70	-.04	.48	.94	.96
	Private rented	.19	.24	.43	1.21	.12	.22	.60	1.12	-.18	.25	.47	.84
	Local Authority/HA	-.12	.15	.42	.88	-.68	.15	.00	.51	-.51	.19	.01	.60
	(Compared to owner-occupied)	0[b]	.	.	.	0[b]	.	.	.	0[b]	.	.	.
Someone with illness/ disability	Yes	-.38	.13	.00	.68	-.64	.13	.00	.53	-.55	.15	.00	.58
	No	0[b]	.	.	.	0[b]	.	.	.	0[b]	.	.	.
How managing financially	DK/Ref	-1.05	1.06	.32	.35	-.59	.84	.48	.55	-.27	.98	.78	.76
	Some fin difficulties/ deep financial trouble	-.39	.31	.20	.67	-.55	.29	.05	.58	-.23	.33	.48	.79
	Don't manage very well	-.44	.29	.13	.64	-.82	.28	.00	.44	-1.17	.38	.00	.31
	Get by alright	.00	.20	.99	1.00	-.23	.19	.23	.79	-.13	.21	.53	.87
	Manage quite well	.20	.20	.33	1.22	.08	.19	.69	1.08	.13	.21	.53	1.14
	(Compared to manage very well)	0[b]	.	.	.	0[b]	.	.	.	0[b]	.	.	.
Highest qualification held	Missing other	-.10	.23	.66	.90	.31	.23	.18	1.36	.89	.32	.01	2.44
	Degree of above	.82	.24	.00	2.27	2.01	.22	.00	7.49	3.17	.28	.00	23.81
	Lower than degree	.49	.15	.00	1.64	1.33	.15	.00	3.77	1.83	.23	.00	6.24
	(compared to no qualifications held)	0[b]	.	.	.	0[b]	.	.	.	0[b]	.	.	.
HIH banded age	16 to 24	.84	.40	.04	2.32	.99	.40	.01	2.69	1.65	.44	.00	5.20
	25 to 34	.27	.28	.34	1.31	1.03	.27	.00	2.81	.79	.32	.01	2.20
	35 to 44	.13	.27	.63	1.14	.93	.26	.00	2.54	.83	.31	.01	2.28
	45 to 59	.52	.21	.01	1.68	.69	.21	.00	1.99	.62	.26	.02	1.85
	60 to 74	.16	.19	.38	1.18	.57	.19	.00	1.77	.86	.24	.00	2.36
	(compared to 75 plus)	0[b]	.	.	.	0[b]	.	.	.	0[b]	.	.	.
Internet access	Internet access	.49	.15	.00	1.63	.65	.15	.00	1.92	.59	.20	.00	1.80
	(No internet access)	0[b]	.	.	.	0[b]	.	.	.	0[b]	.	.	.

Table 7.3: Transport (compared to no access to a car, does not use public transport)

		No access to car, does use public transport once a week compared to neither				Access to a car, does not use public transport once a week compared to neither				Access to a car, and does use public transport once a week compared to neither			
		B	Std. Error	Sig.	Exp(B)	B	Std. Error	Sig.	Exp(B)	B	Std. Error	Sig.	Exp(B)
Area deprivation	Most deprived decile	-.09	.40	.82	.91	-.10	.40	.80	.90	-.20	.43	.65	.82
	Second most deprived	-.50	.40	.20	.60	-.78	.39	.05	.46	-.42	.42	.32	.66
	3rd	-.08	.41	.85	.93	-.21	.40	.60	.81	-.47	.44	.28	.62
	4th	-.22	.40	.58	.80	-.56	.39	.16	.57	-.65	.42	.12	.52
	5th	.01	.44	.98	1.01	.34	.43	.43	1.41	.10	.46	.83	1.11
	6th	.14	.44	.75	1.15	.20	.43	.64	1.22	.12	.46	.79	1.13
	7th	.17	.47	.71	1.19	.38	.46	.40	1.47	.55	.48	.25	1.73
	8th	-.10	.44	.83	.91	.02	.43	.96	1.02	.00	.45	1.00	1.00
	9th	.12	.50	.81	1.13	.71	.48	.14	2.04	.57	.50	.26	1.76
	(compared to least deprived decile)	0b	.	.	.	0b	.	.	.	0b	.	.	.
Urban/rural	Remote rural	-.48	.43	.26	.62	1.44	.38	.00	4.21	-.42	.47	.38	.66
	Accessible rural	-.21	.40	.60	.81	1.55	.37	.00	4.73	.20	.41	.63	1.22
	Remote small towns	-.74	.33	.03	.48	.01	.35	.98	1.01	-1.01	.43	.02	.36
	Accessible small towns	-.53	.26	.04	.59	.17	.26	.52	1.19	-.59	.31	.06	.56
	Other urban	-.24	.17	.15	.79	.53	.18	.00	1.71	-.16	.20	.42	.85
	(Compared to large urban areas)	0b	.	.	.	0b	.	.	.	0b	.	.	.
Children in household	Any children	-.20	.27	.47	.82	.65	.26	.01	1.92	.51	.29	.08	1.66
	None	0b	.	.	.	0b	.	.	.	0b	.	.	.
Household working status	Single working adult	.19	.33	.56	1.21	-.24	.31	.44	.79	-.48	.35	.17	.62
	Non-working single	.23	.28	.40	1.26	-1.22	.26	.00	.29	-1.57	.30	.00	.21
	Working couple	.30	.48	.53	1.35	.67	.44	.13	1.96	.82	.47	.08	2.26
	Couple, one works	.26	.41	.53	1.30	.04	.38	.92	1.04	.17	.41	.67	1.19
	(Compared to Couple, neither work)	0b	.	.	.	0b	.	.	.	0b	.	.	.
Tenure	Missing/other	-.54	.43	.21	.58	-.91	.45	.04	.40	-2.09	.76	.01	.12
	Private rented	.06	.24	.79	1.07	-1.41	.25	.00	.24	-1.21	.28	.00	.30
	Local Authority/HA	.01	.19	.94	1.01	-1.18	.19	.00	.31	-1.33	.23	.00	.27
	(Compared to owner-occupied)	0b	.	.	.	0b	.	.	.	0b	.	.	.
Someone in household with illness/ disability	Yes, someone with illness/disability	-.29	.16	.08	.75	-.39	.17	.02	.68	-.62	.19	.00	.54
	No	0b	.	.	.	0b	.	.	.	0b	.	.	.
Banded household income	Missing	.39	.33	.24	1.47	.30	.39	.44	1.34	-1.06	.60	.08	.35
	£20000+	.42	.27	.12	1.53	1.46	.27	.00	4.32	.93	.31	.00	2.55
	£15000 – £20000	.50	.22	.02	1.65	.73	.24	.00	2.08	.32	.29	.27	1.38
	£10000 – £15000	.49	.19	.01	1.63	.50	.22	.02	1.65	.40	.27	.14	1.49
	(compared to < £10,000)	0b	.	.	.	0b	.	.	.	0b	.	.	.
Highest educational qualification	Missing/Other qual	.81	.27	.00	2.25	.33	.31	.29	1.40	.52	.38	.17	1.69
	Degree of above	.21	.27	.43	1.23	1.07	.26	.00	2.91	1.32	.30	.00	3.75
	Lower than degree	.45	.18	.01	1.57	.91	.19	.00	2.48	1.27	.24	.00	3.57
	(compared to no qualifications held)	0b	.	.	.	0b	.	.	.	0b	.	.	.
HIH banded age	16 to 24	-.37	.35	.28	.69	-1.04	.39	.01	.35	-1.14	.46	.01	.32
	25 to 34	.53	.31	.09	1.70	-.69	.34	.04	.50	-1.03	.40	.01	.36
	35 to 44	.70	.31	.02	2.02	-.27	.34	.43	.77	-.90	.40	.02	.41
	45 to 59	.16	.26	.54	1.17	.17	.28	.55	1.18	-.45	.34	.19	.64
	60 to 74	.90	.23	.00	2.47	1.05	.24	.00	2.86	.91	.29	.00	2.48
	(compared to 75 plus)	0b	.	.	.	0b	.	.	.	0b	.	.	.
Sex of HIH	Male	.10	.15	.53	1.10	.66	.16	.00	1.93	.42	.18	.02	1.53
	(Compared to female)	0b	.	.	.	0b	.	.	.	0b	.	.	.
Internet access	Internet access	.23	.17	.19	1.26	1.25	.19	.00	3.48	1.23	.24	.00	3.41
	(Compared to no internet access)	0b	.	.	.	0b	.	.	.	0b	.	.	.

Table 7.4: Socially connected scale

		2 compared to 0-1				3 compared to 0-1			
		B	Std. Error	Sig.	Exp(B)	B	Std. Error	Sig.	Exp(B)
Area deprivation	Most deprived decile	-.30	.25	.23	.74	-.52	.26	.04	.59
	Second most deprived	-.41	.25	.11	.66	-.47	.26	.06	.62
	3rd	-.53	.26	.04	.59	-.39	.25	.13	.68
	4th	-.43	.25	.08	.65	-.31	.25	.21	.73
	5th	-.14	.26	.60	.87	.22	.26	.40	1.24
	6th	-.07	.26	.80	.93	.13	.26	.63	1.13
	7th	.02	.26	.93	1.02	-.15	.27	.56	.86
	8th	.07	.26	.78	1.08	.15	.26	.56	1.16
	9th	-.50	.26	.05	.61	-.27	.26	.30	.77
	(compared to least deprived decile)	0[b]	.	.	.	0[b]	.	.	.
Children in household	Any children	.15	.15	.33	1.16	.52	.15	.00	1.68
	None	0[b]	.	.	.	0[b]	.	.	.
Tenure	Missing/other	-.86	.39	.03	.42	-.36	.34	.30	.70
	Private rented	-.35	.16	.03	.70	-.48	.16	.00	.62
	Local Authority/HA	-.14	.14	.33	.87	-.38	.14	.01	.68
	(Compared to owner-occupied)	0[b]	.	.	.	0[b]	.	.	.
How managing financially	DK/Ref	-1.38	.89	.12	.25	-.63	.74	.39	.53
	Some fin difficulties/deep financial trouble	-.55	.24	.02	.58	-.70	.25	.00	.50
	Don't manage very well	-.53	.24	.03	.59	-.59	.25	.02	.55
	Get by alright	-.13	.16	.42	.88	-.16	.16	.32	.85
	Manage quite well	.20	.16	.23	1.22	.20	.16	.22	1.22
	(Compared to manage very well)	0[b]	.	.	.	0[b]	.	.	.
Age of HiH	16 to 24	-1.66	.29	.00	.19	-1.89	.30	.00	.15
	25 to 34	-1.12	.24	.00	.33	-1.54	.24	.00	.21
	35 to 44	-.93	.24	.00	.39	-1.05	.24	.00	.35
	45 to 59	-.54	.22	.01	.58	-.53	.22	.02	.59
	60 to 74	-.13	.22	.54	.87	-.19	.22	.39	.83
	(compared to 75 plus)	0[b]	.	.	.	0[b]	.	.	.
Internet access	Internet access	.16	.15	.31	1.17	-.15	.15	.31	.86
	(Compared to no internet access)	0[b]	.	.	.	0[b]	.	.	.

Table 7.5: Mental health and wellbeing

		Average mental health and wellbeing score compared to below average				Above average mental health and wellbeing compared to below average			
		B	Std. Error	Sig.	Exp(B)	B	Std. Error	Sig.	Exp(B)
Urban/rural	Remote rural	-.12	.24	.61	.89	.59	.29	.04	1.80
	Accessible rural	-.13	.20	.52	.88	.20	.25	.43	1.22
	Remote small towns	-.21	.27	.43	.81	.49	.34	.14	1.63
	Accessible small towns	-.08	.21	.71	.92	.39	.26	.14	1.48
	Other urban	-.09	.13	.48	.91	-.03	.18	.88	.97
	(Compared to large urban areas)	0[b]	.	.	.	0[b]	.	.	.
Children in household	Any children	.64	.18	.00	1.90	.30	.23	.20	1.35
	None	0[b]	.	.	.	0[b]	.	.	.
Household working status	Single working adult	.55	.22	.01	1.73	.69	.30	.02	1.98
	Non-working single	-.30	.18	.09	.74	-.22	.25	.39	.81
	Working couple	.83	.23	.00	2.30	.85	.30	.01	2.33
	Couple, one works	.83	.25	.00	2.29	1.02	.32	.00	2.77
	(Compared to Couple, neither work)	0[b]	.	.	.	0[b]	.	.	.
Someone in household with illness/disability	Yes, someone with illness/disability	-.62	.12	.00	.54	-.71	.16	.00	.49
	No	0[b]	.	.	.	0[b]	.	.	.
How managing financially	DK/Ref	-1.53	.74	.04	.22	-.96	.90	.28	.38
	Some fin difficulties/deep financial trouble	-1.70	.26	.00	.18	-2.89	.44	.00	.06
	Don't manage very well	-1.49	.25	.00	.23	-3.36	.56	.00	.03
	Get by alright	-.74	.20	.00	.48	-1.31	.23	.00	.27
	Manage quite well	-.29	.20	.15	.75	-.40	.23	.08	.67
	(Compared to manage very well)	0[b]	.	.	.	0[b]	.	.	.
Age of HiH	16 to 24	-.41	.31	.18	.67	.24	.41	.56	1.27
	25 to 34	-.77	.24	.00	.46	-.39	.35	.26	.68
	35 to 44	-.87	.24	.00	.42	-.29	.34	.40	.75
	45 to 59	-.99	.21	.00	.37	-.69	.31	.02	.50
	60 to 74	-.11	.19	.57	.90	.31	.26	.23	1.37
	(compared to 75 plus)	0[b]	.	.	.	0[b]	.	.	.
Internet access	Internet access	.33	.14	.02	1.39	.52	.21	.01	1.68
	(Compared to no internet access)	0[b]	.	.	.	0[b]	.	.	.

Table 7.6: Use of selected local services

		Uses one compared to uses none				Uses 2 or 3 compared to uses none			
		B	Std. Error	Sig.	Exp(B)	B	Std. Error	Sig.	Exp(B)
Area deprivation	Most deprived decile	.31	.25	.21	1.37	.44	.28	.11	1.55
	Second most deprived	.02	.24	.95	1.02	.08	.27	.76	1.09
	3rd	.49	.26	.06	1.63	.35	.29	.22	1.42
	4th	.65	.25	.01	1.92	.55	.28	.05	1.73
	5th	.44	.25	.08	1.55	.26	.28	.34	1.30
	6th	-.01	.23	.96	.99	-.22	.26	.40	.80
	7th	-.03	.24	.90	.97	-.36	.27	.19	.70
	8th	.05	.23	.83	1.05	-.27	.26	.31	.77
	9th	.06	.23	.80	1.06	-.05	.26	.86	.95
	(compared to least deprived decile)	0[b]	.	.	.	0[b]	.	.	.
Urban/rural indicator	Remote rural	-.40	.24	.10	.67	.85	.24	.00	2.34
	Accessible rural	-.09	.18	.61	.91	.22	.20	.27	1.25
	Remote small towns	.29	.31	.35	1.33	.54	.33	.10	1.72
	Accessible small towns	-.22	.19	.25	.80	-.05	.22	.83	.95
	Other urban	-.03	.13	.82	.97	-.07	.14	.64	.93
	(Compared to large urban areas)	0[b]	.	.	.	0[b]	.	.	.
Number of people retired	Two retired	-.94	.30	.00	.39	-.50	.33	.13	.61
	One retired	-1.00	.26	.00	.37	-.70	.29	.02	.49
	None retired	0[b]	.	.	.	0[b]	.	.	.
Any children in household	Any children	-.38	.15	.01	.68	-.17	.17	.30	.84
	None	0[b]	.	.	.	0[b]	.	.	.
Tenure	Missing/other	-.12	.37	.76	.89	-.06	.41	.89	.95
	Private rented	.01	.18	.98	1.01	.34	.20	.09	1.40
	Local Authority/HA	.34	.15	.02	1.41	.58	.16	.00	1.79
	(Compared to owner-occupied)	0[b]	.	.	.	0[b]	.	.	.
Age band of HiH	16 to 24	-.06	.40	.89	.94	-.37	.45	.40	.69
	25 to 34	.21	.34	.53	1.24	-.05	.37	.90	.96
	35 to 44	.12	.32	.71	1.13	-.19	.36	.59	.82
	45 to 59	-.38	.29	.20	.68	-.59	.33	.07	.55
	60 to 74	.33	.17	.05	1.39	.02	.18	.93	1.02
	(compared to 75 plus)	0[b]	.	.	.	0[b]	.	.	.

Table 7.7: Whether anyone has an illness or disability in the household.

		Yes, someone in household has physical or mental illness/disease compared to no-one			
		B	Std. Error	Sig.	Exp(B)
Area deprivation	Most deprived decile	.64	.20	.00	1.90
	Second most deprived	.24	.20	.24	1.27
	3rd	.32	.20	.12	1.37
	4th	.27	.20	.17	1.32
	5th	.25	.20	.21	1.29
	6th	.01	.20	.95	1.01
	7th	.29	.20	.16	1.34
	8th	.12	.20	.55	1.13
	9th	.05	.20	.82	1.05
	(compared to least deprived decile)	0[b]	.	.	.
Urban/rural indicator	Remote rural	.57	.18	.00	1.76
	Accessible rural	.31	.15	.03	1.36
	Remote small towns	.27	.21	.19	1.32
	Accessible small towns	.32	.15	.04	1.38
	Other urban	.14	.10	.16	1.15
	(Compared to large urban areas)	0[b]	.	.	.
Household working status	Single working adult	-1.56	.17	.00	.21
	Non-working single	-.13	.14	.37	.88
	Working couple	-1.50	.18	.00	.22
	Couple, one works	-.61	.17	.00	.54
	(Compared to Couple, neither work)	0[b]	.	.	.
Tenure	Missing/other	-.24	.30	.43	.79
	Private rented	-.20	.15	.18	.82
	Local Authority/HA	.66	.12	.00	1.94
	(Compared to owner-occupied)	0[b]	.	.	.
	Missing	-.48	.26	.06	.62
Household income	£20000+	.74	.16	.00	2.10
	£15000 – £20000	.51	.16	.00	1.67
	£10000 – £15000	.40	.14	.01	1.48
	(compared to < £10,000)	0[b]	.	.	.
	Access to a car	-.28	.11	.01	.75
	No car	0[b]	.	.	.
How managing financially	DK/Ref	.23	.58	.68	1.26
	Some fin difficulties/deep financial trouble	1.09	.21	.00	2.96
	Don't manage very well	1.21	.21	.00	3.35
	Get by alright	.62	.13	.00	1.86
	Manage quite well	.27	.12	.03	1.30
	(Compared to manage very well)	0[b]	.	.	.
Banded age of HiH	16 to 24	-2.42	.29	.00	.09
	25 to 34	-1.58	.20	.00	.21
	35 to 44	-1.09	.18	.00	.34
	45 to 59	-.57	.16	.00	.56
	60 to 74	-.43	.14	.00	.65
	(compared to 75 plus)	0[b]	.	.	.

8 Extracts from the CHAID Models

Figure 8.1: Top two levels of CHAID model of number of services considered convenient.

Number of services considered convenient indicator

Node 0

Category	%	n
0-2 of 5 services	10.7	333
3 services	10.3	322
4 services	22.6	706
5 of 5 services	56.5	1765
Total	100.0	3126

Legend: 0-2 of 5 services; 3 services; 4 services; 5 of 5 services

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Node 1 (Acessible rural; Remote rural)

Category	%	n
0-2 of 5 services	16.8	113
3 services	15.4	103
4 services	31.1	209
5 of 5 services	36.7	246
Total	21.5	671

Node 2 (Large urban)

Category	%	n
0-2 of 5 services	9.5	102
3 services	9.7	104
4 services	21.8	235
5 of 5 services	59.1	636
Total	34.5	1077

Node 3 (Accessible small towns; Other urban; Remote small towns)

Category	%	n
0-2 of 5 services	8.6	118
3 services	8.3	115
4 services	19.0	262
5 of 5 services	64.1	883
Total	44.1	1378

hk2_band

Node 4 (Manage very well)

Category	%	n
0-2 of 5 services	10.5	18
3 services	18.7	32
4 services	32.2	55
5 of 5 services	38.6	66
Total	5.5	171

Node 5 (Have some financial difficulties/In deep financial trouble; Don't manage very well; DK/REF)

Category	%	n
0-2 of 5 services	35.7	20
3 services	25.0	14
4 services	23.2	13
5 of 5 services	16.1	9
Total	1.8	56

Node 6 (Manage quite well; Get by alright)

Category	%	n
0-2 of 5 services	16.9	75
3 services	12.8	57
4 services	31.8	141
5 of 5 services	38.5	171
Total	14.2	444

Anyone of retirement age

Node 7 (<= Two+)

Category	%	n
0-2 of 5 services	5.7	6
3 services	7.6	8
4 services	21.0	22
5 of 5 services	65.7	69
Total	3.4	105

Node 8 ((Two+, One])

Category	%	n
0-2 of 5 services	16.4	39
3 services	10.1	24
4 services	17.6	42
5 of 5 services	55.9	133
Total	7.6	238

Node 9 (>One)

Category	%	n
0-2 of 5 services	7.8	57
3 services	9.8	72
4 services	23.3	171
5 of 5 services	59.1	434
Total	23.5	734

Does anyone in the household has a physical or mental problem

Node 10 (No illness/dis in hhold)

Category	%	n
0-2 of 5 services	5.2	42
3 services	7.9	64
4 services	18.6	151
5 of 5 services	68.3	554
Total	25.9	811

Node 11 (One+)

Category	%	n
0-2 of 5 services	13.4	76
3 services	9.0	51
4 services	19.6	111
5 of 5 services	58.0	329
Total	18.1	567

Figure 8.2: Top three levels of CHAID model of Active Lifestyle scale.
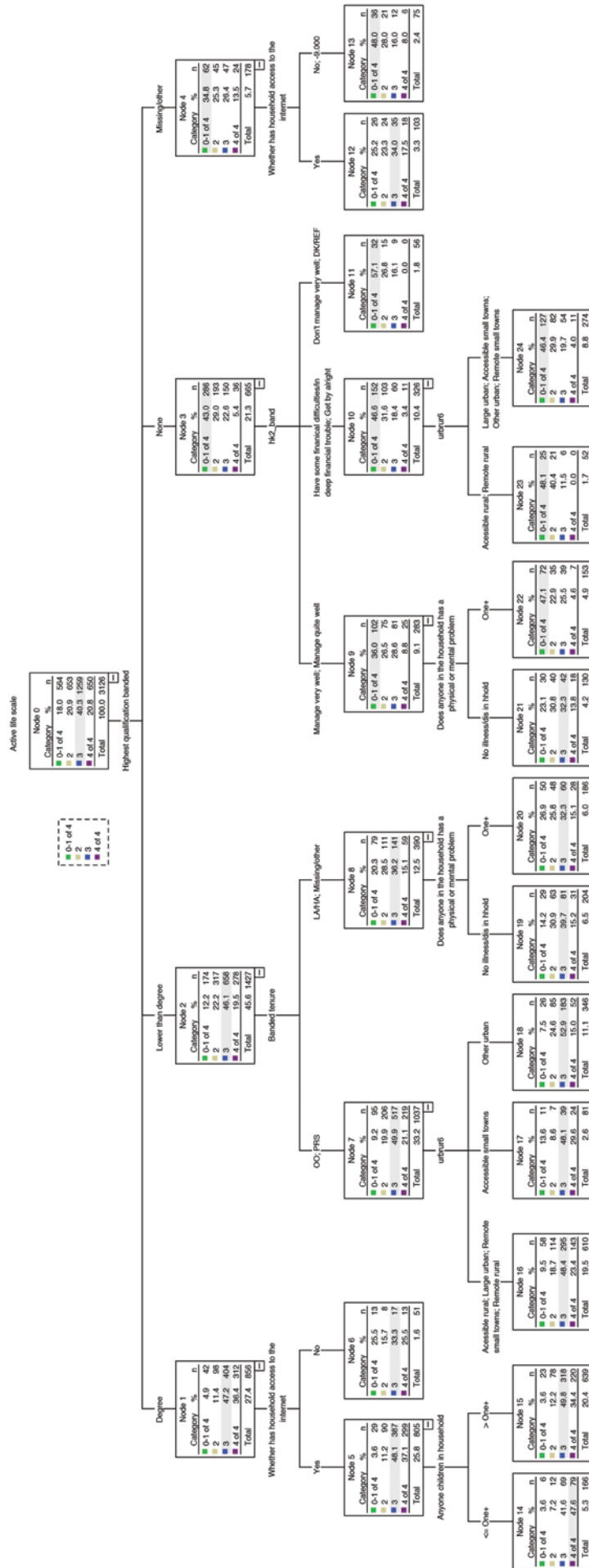
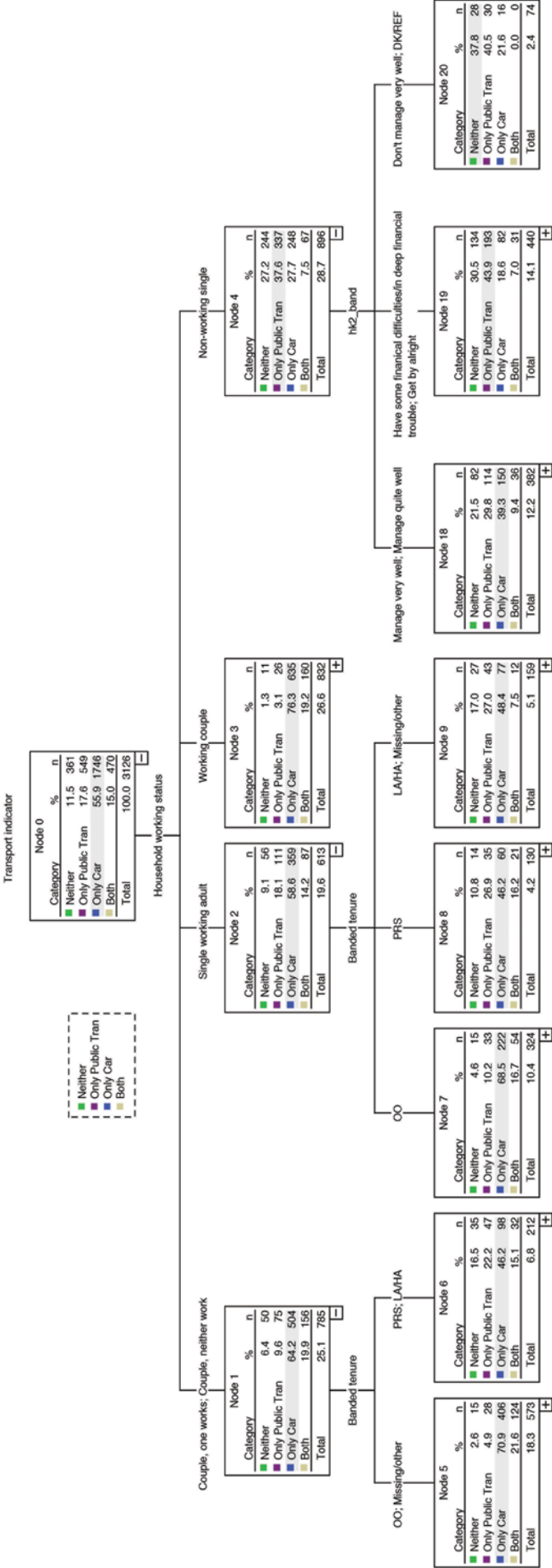**Figure 8.3: Top two levels of CHAID model of Transport indicator.**

Figure 8.4: Top two levels of CHAID model of Socially Connected scale.
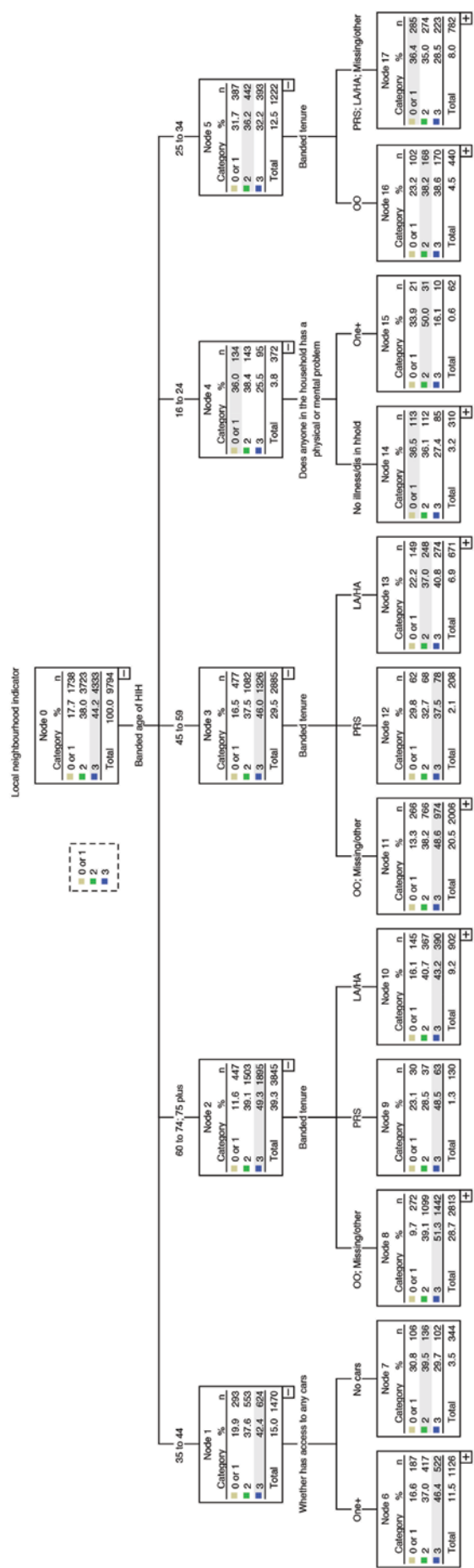
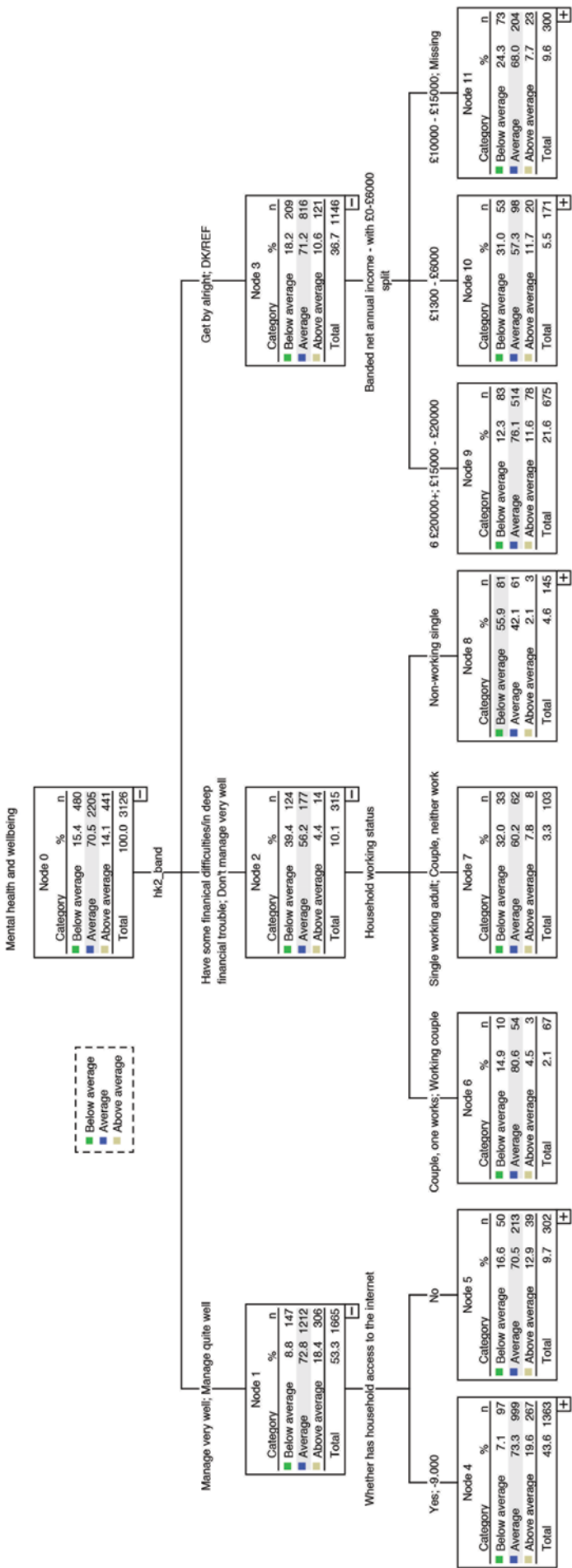**Figure 8.5: Top two levels of CHAID model of Mental health and wellbeing scale.**

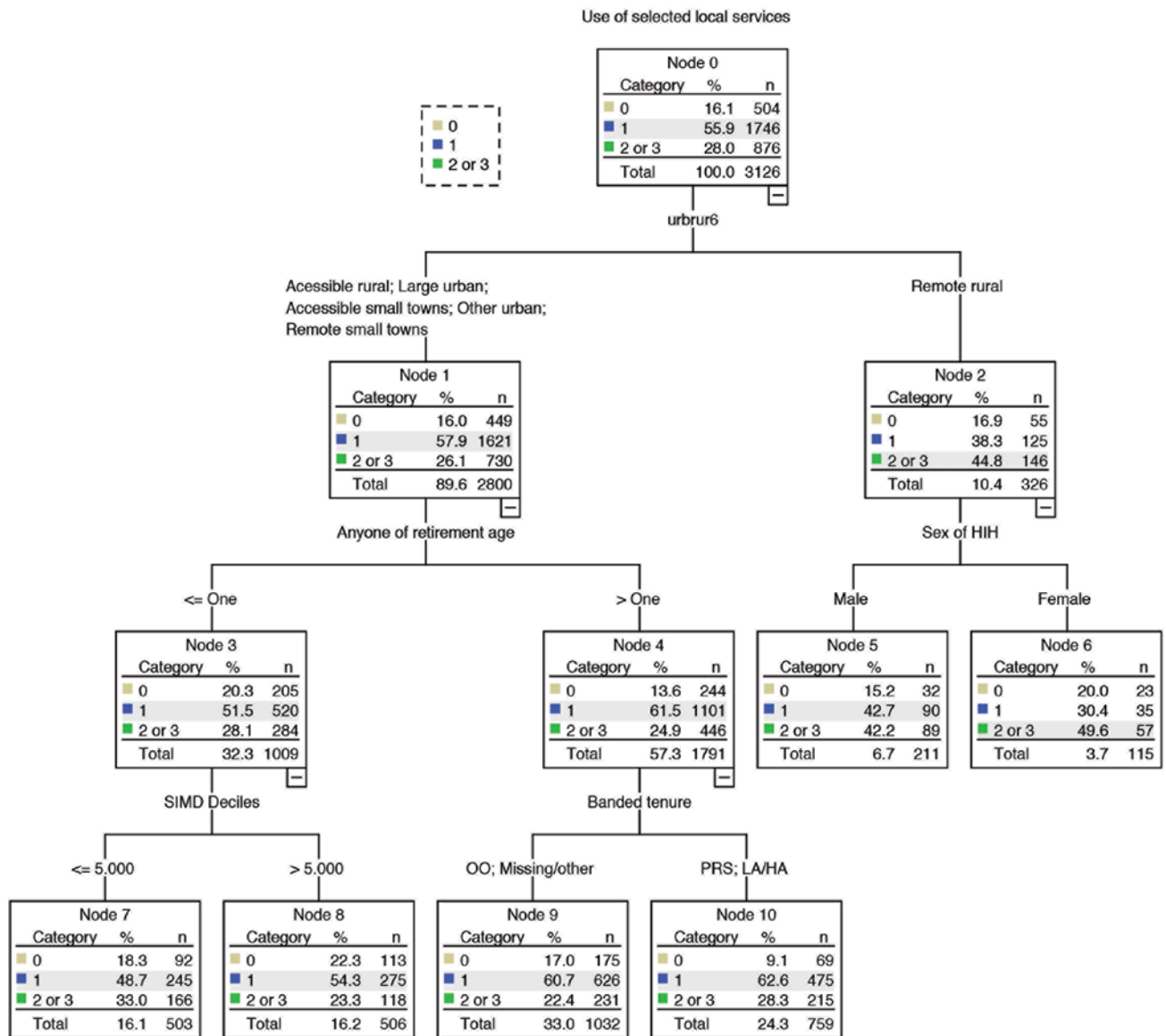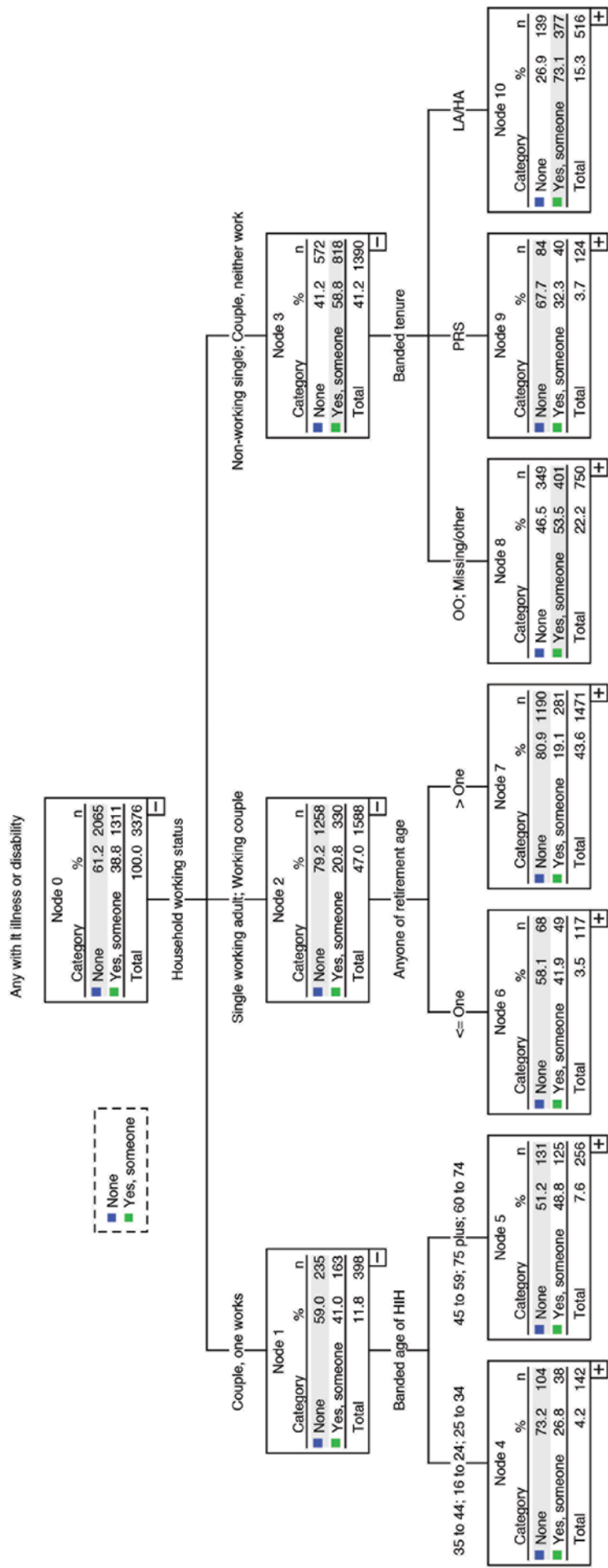**Figure 8.6: CHAID model of Use of selected local services scale.**

Figure 8.7: Top two levels of CHAID model of whether anyone has an illness or disability in the household.

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