Chapter 1

Renfrewshire Council Exploratory Project

1.1 Introduction

As described in Section **??**, the Social Care Survey (SCS) is collected annually by the Scottish Government and provides a snapshot of individuals receiving social care in all 32 Scottish local authorities during a census week - usually including the date the 31st of March (Scottish-Government, 2017c). The cross-sectional nature of this administrative data means it does not identify every individual who receives social care in any given financial year. This has implications for the interpretation of research projects using the SCS and the statistical inferences that can be applied to the data when linked with other sources of information.

In order to gain a better understanding of the data the SCS captures an exploratory study was conducted to assess social care data for individuals from one local authority only. This project aimed to analyse complete data for all individuals over a ten-year period to assess the validity of the SCS as a representation of social care delivered in any given financial year. In particular, the exploratory analysis aimed to: quantify the number of home care users receiving home care during the census week as a proportion of the total number receiving home care in each year, identify what differences (if any) exist between individuals captured and not captured by the census, and assess whether values captured by the SCS (i.e. the total hours of home care provided) are representative of care received by an individual throughout the year. Given intentions to amalgamate the SCS with administrative resources collected by ISD and move to a quarterly collection of data (ISD, 2017), the exploratory project also aimed to quantify the proportion of all individuals that would be identified by two, three, or four survey repetitions per financial year.

As social care data in Scotland has rarely been used for research purposes, this exploratory

project also offered the opportunity to assess the format, content, and suitability of the data from a research perspective. Ideally, data would be analysed from a number of local authorities for comparison. However, as described below, acquiring sensitive data of this nature is a lengthy and complicated process, relying heavily on the goodwill of the participating local authority. Despite early intentions to approach multiple local authorities, practical considerations limited the project to data collected from Renfrewshire Council.

1.2 Background

The decision to approach Renfrewshire Council as a potential source of data was due to convenience given previous cooperation between the council and UBDC on other projects. Another local authority was also approached but preliminary discussions suggested that whilst the purpose of proposed research was supported, the council was unlikely to be able to provide sufficient resource to facilitate data sharing. Preliminary meetings with data analysts from Renfrewshire council confirmed that data could be provided to facilitate the proposed research and the formal process of obtaining data using UBDC's controlled data service was instigated in April 2016.

Renfrewshire Council area accounts for 3.2% of the total population of Scotland and has a similar proportion of individuals aged over 60 compared to the rest of the country (24.4% v 24.2%) (NRS, 2015). The mortality rate is very slightly higher than recorded for the rest of Scotland (10.9% v 10.3%) with the main causes of death being cancer, circulatory diseases, and respiratory diseases (NRS, 2015). Life expectancy at birth is lower than the Scottish average for both males and females (75.9 v 77.1 & 80.6 v 81.1) (NRS, 2015). Sixty-three percent of dwellings in Renfrewshire fall into the lowest council tax bands A-C (NRS, 2015) which is a higher than the percentage seen in the whole country (61%) (NRS, 2016). Of all datazones in the Renfrewshire Council area, 37.3% fall into the most deprived 30% of Scottish datazones - the ninth highest rate out of all 32 local authorities (Scottish-Government, 2017a). Datazones in the area show marked differences in SIMD scores with some of the most and least deprived datazones in the whole of Scotland and a spread of urban and rural neighbourhoods (Scottish-Government, 2017a).

In terms of social care, the 2017 SCS (Scottish-Government, 2017b, supp.charts) shows that the proportion of over 65s receiving home care provided or administered by Renfrewshire dipped a little between 2011 and 2015 but has nearly returned to 2010 levels (52.4 per thousand in 2010, 49.4 per thousand in 2017). Historically, this is lower than levels seen across Scotland as a whole, although national levels are now very similar to those seen in Renfrewshire (60.8 per thousand in 2010 to 48.9 per thousand in 2017). The absolute

Table 1.1: Definitions of home care types

Type of home care	**Definition**
Care at Home (Mainstream	The aim of care at home is to help vulnerable people of all ages live independently and securely in their own homes by providing personal and housing support services. Care at home services are provided very much on each individual's own circumstances and needs.
Reablement	Provides support and encouragement to help keep up or increase the skills and confidence needed to be able to return home after a stay in hospital or after an illness.Most people referred for care at home will receive a reablement service in the first instance to help support and improve independence. Long term services can be provided following reablement if ongoing support is needed.
Rapid Response	
Community Mental Health	
Extra Care Housing	
Housing Support	
Overnight Services	

numbers of over 65s receiving home care in Renfrewshire in the 2010 census week was 1812 versus 1603 in the 2017 census (Scottish-Government, 2017b, supp.charts).

More recent versions of the SCS collect information on home care (such as personal care or reablement), housing support and meals services provided during the census week. In addition, data on services such as community alarm, telecare, social worker, and self-directed support that are provided at any time during the financial year is also collected (Scottish-Government, 2017b). The purpose of the exploratory project was to compare service provision of those services collected in the census week. As the vast majority of this data is focussed on home care services, the analysis concentrates on this service only. Home care refers to services received in the home such as personal care or reablement (described in section **??** ans summarised in table 1.1).

1.2.1 Research Questions

- To what extent does SCS data capture the number of individuals receiving home care across each financial year?
- Are there differences in the age and gender of the individuals that are/are not captured by the census?
- Is there a difference in the intensity and duration of care provided those that are/are not captured by the census?
- For individuals that *do* have packages of care during the census week, is the value of total hours of home care received reflective of the total hours of home care received in the financial year?
- What proportion of the total amount of individuals receiving home care would be captured if more than one census was conducted in each financial year?

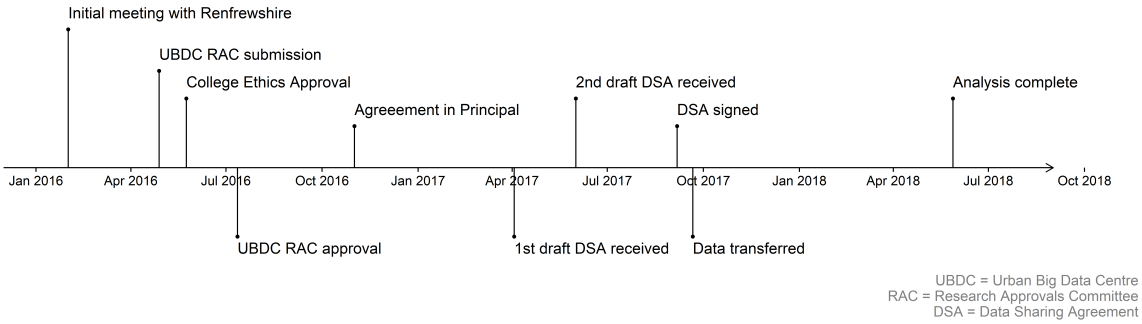
1.3 Methods

1.3.1 Project approvals and timeline

The exploratory project utilised the controlled data service provided by UBDC and therefore required approval from UBDC's Research Approvals Committee (RAC). This process is more fully explained in section **??** Approval from RAC was gained on 01/06/2016 (Appendix A). Ethical approval for the study was gained from the University of Glasgow College of Social Sciences Research Ethics Committee on 24/05/2016 (Appendix B).

Following academic and ethical approval the process of obtaining a data sharing agreement (DSA) between the University of Glasgow and Renfrewshire council was instigated. This involved the production of an agreement in principle and privacy impact assessment as a basis for the DSA. Production of the DSA involved the input of legal teams from both institutions as well as liaison with data analysts at Renfrewshire council and UBDC. The initial draft was produced by the local authority with amendments from both sides before final completion and signing 06/09/2017. Final transfer of data took place on 21/09/2017. An illustration of this timeline is shown in figure 1.1

Figure 1.1: Timeline of Renfrewshire exploratory project



1.3.2 Data

As with all services provided by Renfrewshire council, home care data is collected to ensure efficient management of the service and as evidence of service provision (Renfrewshire-Council, 2015). Recording of individual episodes of care also helps with budgetary management of the service.

For the purposes of analysis distinction is made between *episodes* and *packages* of home care. An episode of care refers to each instance a carer visits a home care client in their own home. A package of care is the collection of repeated episodes an individual routinely receives in a week.

Data provided for the purposes of this exploratory study included anonymised information on; how many days per week, how many hours per day, service provider (e.g. local authority or independent provider), type of care (e.g. mainstream or reablement), start date and end date for every episode of home care delivered to individuals in the Renfrewshire council area between April 2006 and April 2017. Demographic information detailing gender and year of birth was also provided.

As all episodes of home care were delivered over a period of time, data was provided for some episodes where the care was first delivered as early as 2004 or as late as Summer 2017 (e.g. a home care episode starting in December 2005 and running to December 2006 was included in the data transfer). Data detailing information on community alarm and telecare services provided by Renfrewshire council were not analysed as part of this project.

Analysis focussed on individuals over the age of 65. An unexpectedly large number of individuals (n = 112, 0.01%) had a year of birth recorded as 1900 (compared to n = 68 born between the years 1901 and 1910). A similar phenomenon was reported in the SCS linkage process (described in chapter **??**) with the deduction that 1900 was a code for missing data. In this analysis these records were omitted. To protect anonymity individual month and day of birth were not shared meaning age was calculable from year of birth only.

The SCS requests information on the total weekly hours of home care each individual received during the census week. To replicate this information, every episode of care in the exploratory dataset was summarised. For each episode of home care, the number of hours per day was multiplied with days per week to give a weekly total of home care hours for each episode. To identify *packages* of home care, episodes of home care with the same start and end date and of the same home care type, were added together. For example, an individual receiving home care of the type "Care at Home (Mainstream)" with an episode of care lasting 1 hour in the morning for 3 days a week, an episode of care lasting 45 minutes at lunchtime 7 days a week, an evening episode of 30 minutes 7 days a week, and night-time episode of 45 mins 7 days a week, would have a total weekly home care hours count of 17 hours per week for that home care type. Finally, the totals for all types of home care were summed to give an overall weekly total for each individual.

1.3.3 Analysis

To enable analysis of the proportion of individuals captured by the census in each year, a time-series was created for the study period 27th March 2006 to 28th March 2016 at weekly intervals. The value of total hours of home care each individual was receiving at each of the 523 weekly time points was identified. From this time series weekly counts of the total number of individuals receiving home care were calculated. Maximum and

minimum values and measures of central tendency of these weekly values were compared to the total number of individuals receiving home care, and total number of those not captured by the census, in each financial year.

As it was possible for individuals to receive more than one package of care in each financial year, individuals were grouped by those that had at least one package of care during the census week and those that had none. This enabled comparison of the proportions of each age group, gender, and type of home care received by whether an individual had been identified in the census or not.

To assess the difference in the type of care received by individuals in each of these groups, comparison was made of the total hours of home care and total duration of care they received. Linear regression models were fitted for the financial years 2010/11 to 2014/15 using total weekly hours of home care or package duration (in weeks) as dependent variables. A dummy variable indicating whether an individual had a least one package identified in a census was used as the independent predictor. To compare how differences in care varied across age, gender, and care type groups, further linear models using the same parameters were fitted to subsets of data containing these groups. This enabled comparison of intercept and coefficient values. As the home care packages of the types "Community Mental Health", "Overnight Services", "Housing Support", and "Extra Care Housing" accounted for less than one percent of packages of care, individuals receiving these types of care were omitted from these analyses.

For individuals that received multiple packages of care, one of which was captured by a census, the net difference in total weekly hours of home care received across all packages was calculated in order to summarise the variation in care. For example, an individual initially receiving 6 hrs of care, experiencing a break in care to zero hours, and then receiving a new package of care of 7 hrs before a further drop to 2 hrs would have a net difference of $(-6 + 7 - 5) = -4$ hours. The distribution of this value across all individuals was then assessed.

Additional variables indicating whether home care packages were "live" at three, four, six, eight, and nine months before the census of each financial year were appended to the dataset. This enabled counts of individuals who would be captured by six-monthly, four monthly, and three monthly census repetitions.

All data cleaning and analysis was conducted using the R language and environment for statistical computing version 3.4.0 (R-Core-Team, 2017) with additional software packages: `dplyr` v0.7.4 (Wickham and Francois, 2017), `tidyr` v0.7.2. (Wickham and Henry, 2017), `forcats` v0.2.0 (Wickham, 2017), `purrr` v0.2.4 (Henry and Wickham, 2017), `lubridate` v1.6.0. (Grolemund and Wickham, 2017), `tibbletime` v0.0.2 (Dancho and Vaughan, 2017), `magrittr` v1.5 (Bache and Wickham, 2014), `broom` v0.4.2 (Robinson,

2017), `ggplot2` v2.2.1 (Wickham and Chang, 2016), and `ggthemes` v3.5.0 (Arnold *et al.*, 2018) via the Integrated Development Environment RStudio v1.0.143 (RStudio-team, 2016). Data was held securely in the safe haven environment described in section **??**

1.4 Results

1.4.1 Descriptive statistics

After data cleaning, information on 41,002 packages of home care received by 10,130 individuals during the period 2006 to 2016 were included in the analysis. The number of records retained at each stage of the cleaning process is shown in table 1.2. Of these packages, 28,775 described actual packages of care. The remainder described place holders for each individual where they were not receiving care, either because of a break in care or because care provision had ended altogether. These 12,227 records showed a value of zero for the total hours of homecare received and in the case of care provision having ended, showed an end date of 28th March 2016.

Table 1.2: Number of records at each stage of data cleaning

Data Cleaning stage	Number of records
Initial home care file	106,111
Including over 65s only	92,723
Summarised to packages of care	41,002[1]
Packages of non-zero hours of care	28,775

[1] Total number of individuals = 10,310

Mean age of those included in the analysis was 80.8 years and median age was 81. Sixty-four percent of individuals (n = 6,515) were female. Detailed breakdown of age and gender groups is shown in figure 1.2. The highest absolute numbers of individuals are found in the 76-85 age group. Statistical disclosure control meant that grouping an additional age group for over 95s was not possible.

Seventy-eight percent of home care packages (n=22,484) were provided for "Care at Home (Mainstream)" with "Reablement" type packages making up the majority of the remainder (Figure 1.3). Only 60 packages of care for over 65s were classified as being provided for "Community Mental Health" or "Overnight Services" during the study period. "Reablement" packages were first coded as such in the financial year 2010/11 meaning "Care at Home (Mainstream)" made up an even larger proportion of care packages prior to this.

Almost two-thirds of home care packages in the study period provided care at intensities of less than 10 hours per week. Only 1,352 (4.7%) packages over the 10 year study period

Figure 1.2: Count and proportion of indidividuals receiving home care by age and gender

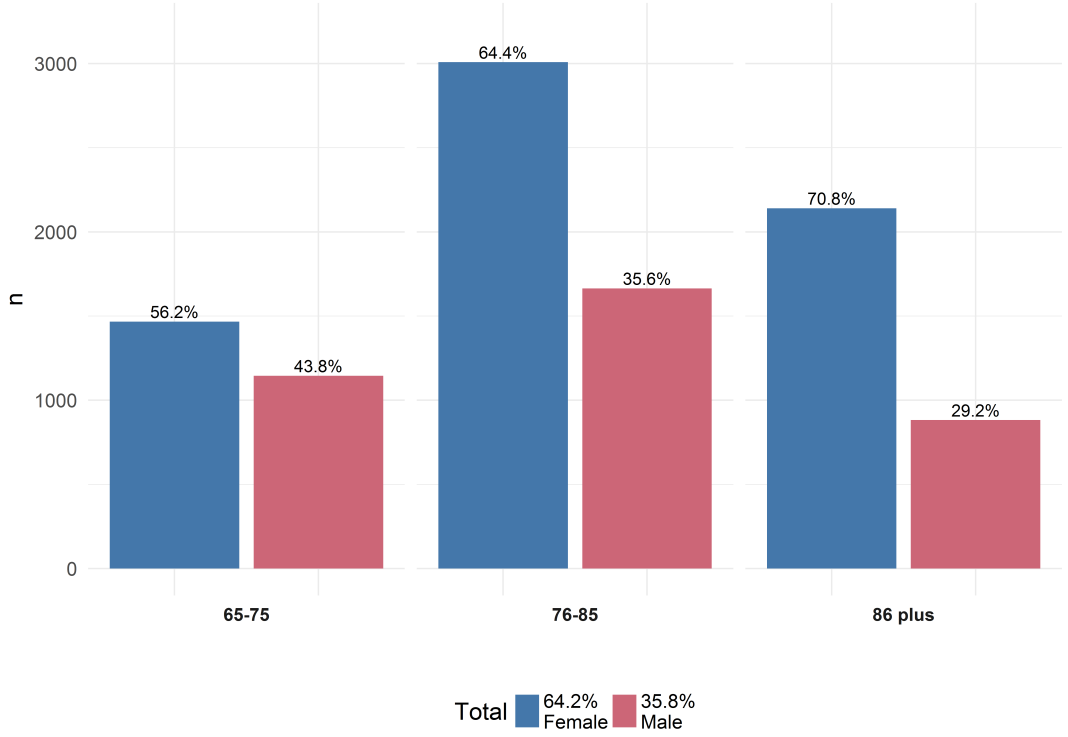


Figure 1.3: Count and proportion of home care type

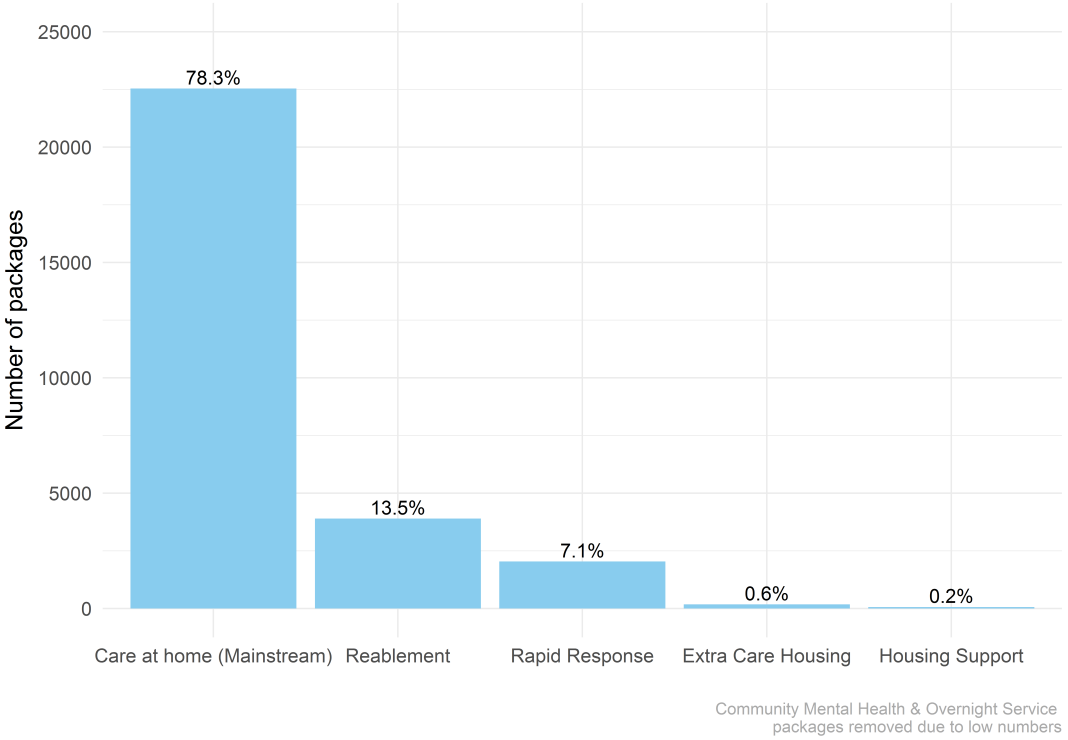
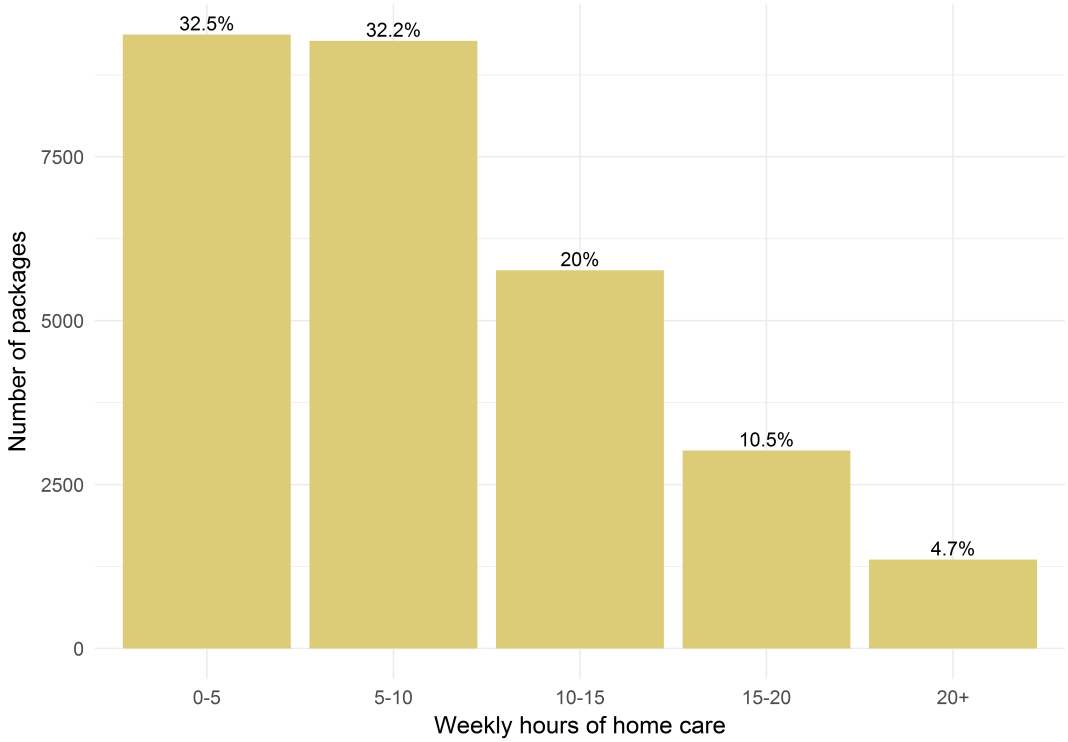
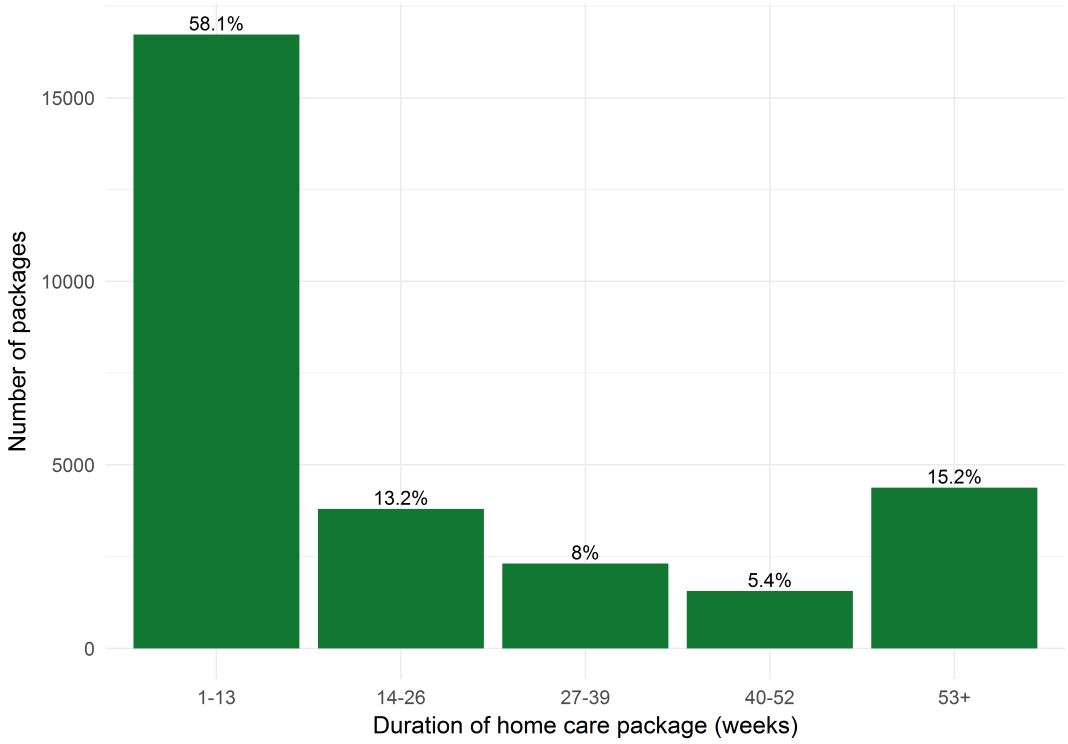


Figure 1.4: Count of packages of care by intensity



provided high intensity care of over 20 hours per week (figure 1.4). Eighty-five percent of packages lasted for less than one year (figure 1.5).

Figure 1.5: Count of packages of care by duration



1.4.2 Distribution of individuals receiving home care

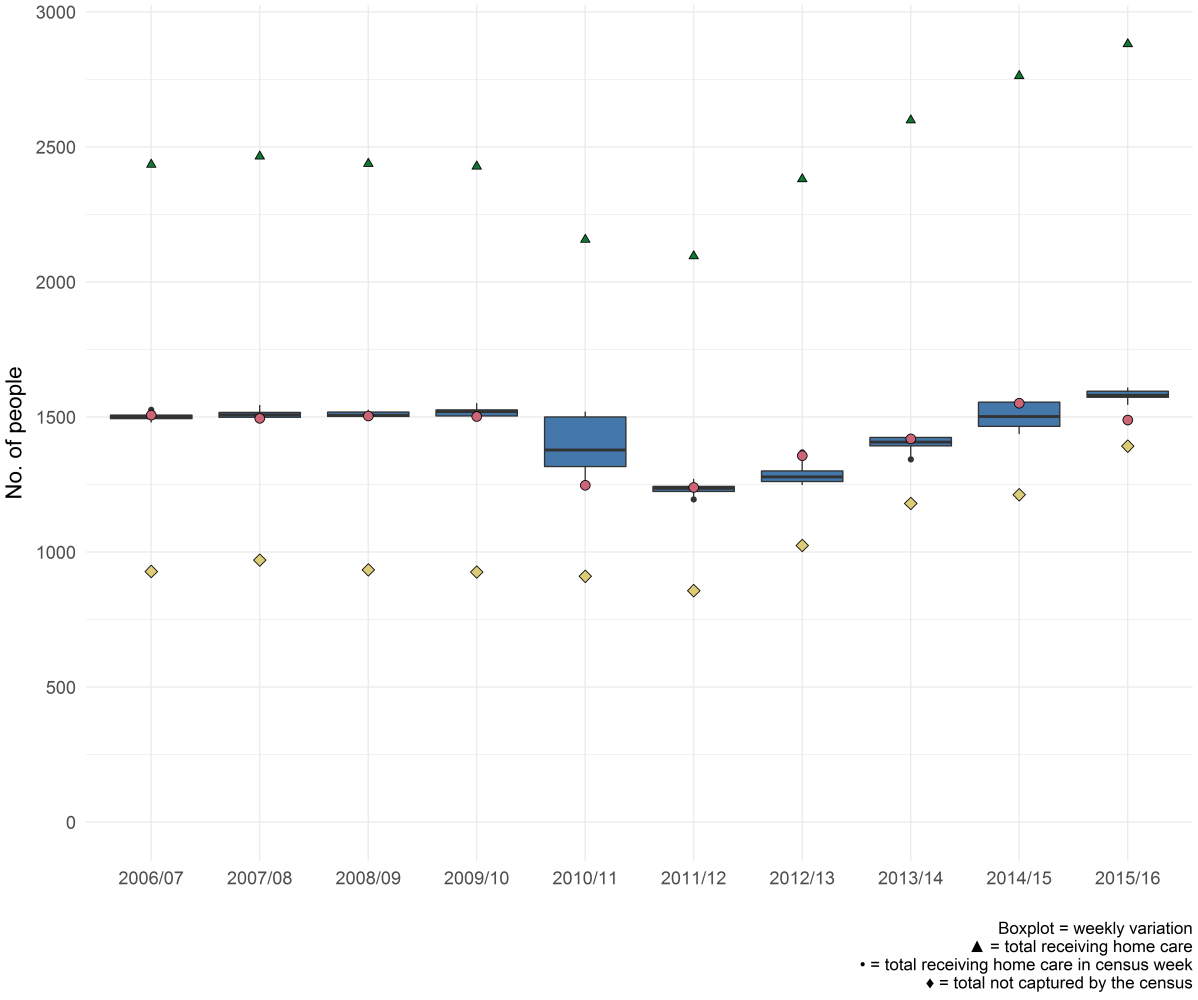
Table 1.3 and figure 1.6 show the variation in the number of people receiving home care during each financial year. There is little weekly variation within years with the exception of financial year 2010/11 which saw a large drop in the total number of individuals receiving care. The variation in years following this show gradual increases and overall numbers return to pre-2010/11 levels by 2014/15.

Figure 1.6 and table 1.3 also indicate that number of individuals receiving home care and captured by the census is between 51.7% and 61.9% of the total number of individuals that will receive care in that year. The trend shows a decreasing proportion of individuals are captured by the census.

Table 1.3: Variation in the number of individuals receiving home care

Financial Year	min	max	mean	sd	median	range	IQR	Total individuals receiving home care	Total individuals not captured by census	Ratio of individuals captured by census (%)
2006/07	1479	1527	1502.51	11.75	1501	48	15	2435	928	61.89
2007/08	1488	1544	1508.65	12.61	1508	56	18	2465	970	60.65
2008/09	1486	1527	1508.63	9.96	1508	41	16	2438	934	61.69
2009/10	1488	1551	1516.43	15.62	1520	63	24	2428	926	61.86
2010/11	1256	1520	1399.39	90.85	1378	264	176	2157	910	57.81
2011/12	1195	1271	1234.19	15.21	1236	76	19	2096	857	59.11
2012/13	1248	1369	1288.44	36.55	1278	121	39	2381	1024	56.99
2013/14	1343	1436	1405.52	21.17	1408	93	31	2599	1180	54.60
2014/15	1437	1568	1505.50	44.68	1502	131	90	2763	1212	56.13
2015/16	1545	1609	1582.60	13.27	1580	64	21	2881	1392	51.68

Figure 1.6: Variation in the number of individuals receiving home care



1.4.3 Comparison of individuals with/without any packages in the census

Table 1.4 shows the number of individuals with at least one package captured by the census compared to those that have zero packages during the census week in each financial year. There is very little variation in the proportions in each group over time.

As shown in figure 1.7, there is very little difference in age and gender groups between those that are not captured by the census in each year compared to those that are represented in the census.

Figure 1.8 shows that there are similar proportions of individuals receiving each type of homecare in each financial year regardless of whether or not they have any packages of care captured by the census. The figure also shows the increasing proportion of "Reablement" packages over time from almost no packages in 2010/11 to approximately 14% of all packages delivered in 2014/15. "Care at home (Mainstream)" type packages saw a drop

Table 1.4: Count of individuals with packages captured by census

Financial Year	Individuals with zero packages captured by census (n)	Individuals with at least one package captured by census (n)
2010/11	864 (40.3%)	1279 (59.7%)
2011/12	797 (38.2%)	1289 (61.8%)
2012/13	945 (39.8%)	1430 (60.2%)
2013/14	1080 (41.7%)	1513 (58.3%)
2014/15	1138 (41.4%)	1614 (58.6%)

Figure 1.7: Proportion of individuals receiving home care

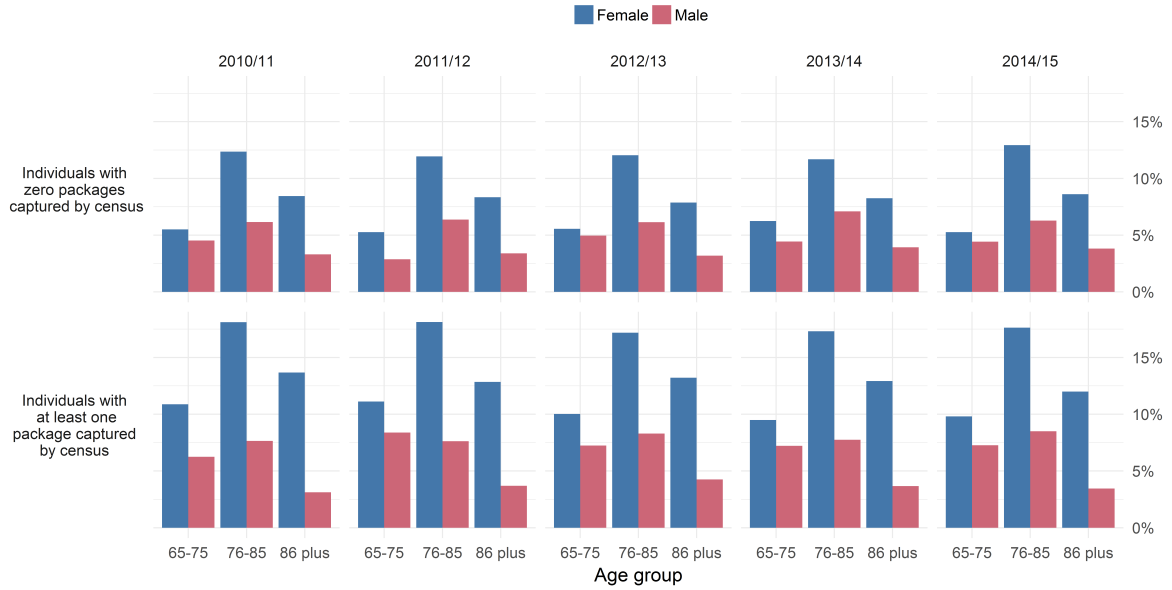
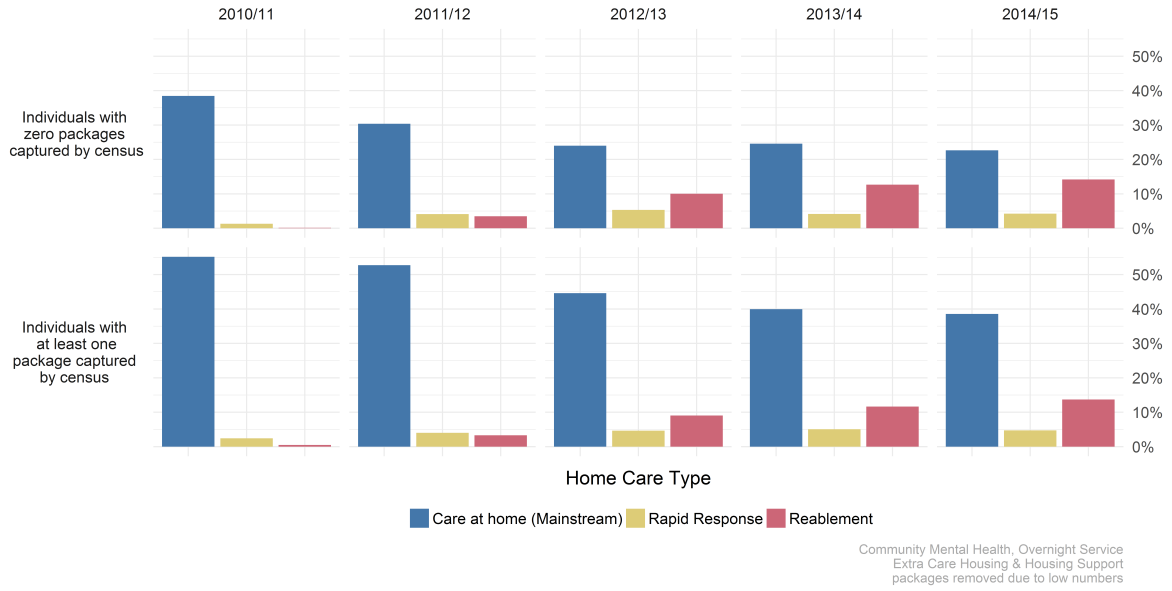


Figure 1.8: Proportion of individuals receiving home care



from approximately 82% to 60% of all packages over the same period.

1.4.4 Comparison of package intensity for individuals with/without any packages in the census

Comparison of the total weekly hours of home care (intensity) that individuals with/without any packages in the census receive (figure 1.9) shows that there is very little difference in median values. However, as time progresses, the median value for total hours of home care is slightly larger for those with no packages of care captured in the census.

This trend is shown in table 1.5 which shows the intercept and coefficient of total hours of home care in linear regression models for each year (in bold) with presence of at least one, or zero packages in the census as a categorical predictor. Over time, the intercept value increases from 6.26 hours in 2010/11 to 8.41 hrs in 2014/15 indicating a general increase in intensity for individuals with at least one package in the census. There is a statistically significant difference in the amount of hours of care received between those that have at lease one package in the census and those that have no packages in every financial year. The coefficient value is negative in 2010/11 but positive in all other years and increases over time. However, the difference in groups is modest (the 1.2 hrs increase in intensity in 2014/15 is equivalent to approximately 10 minutes extra care per day).

Table 1.5 also shows the results of the same linear regression model applied separately to individuals from groups of different gender, age, and home care type. The differences between theses groups become more apparent over time with all groups (apart from the

Figure 1.9: Variation in intensity of home care

"Rapid Response" care type) showing statistically significant differences in 2014/15. Intercept values for total hours of home care vary slightly across different groups with "Rapid Response" and "Reablement" packages more likely to have higher values - particularly in later years. Differences between groups also vary with older age groups and "Reablement" care type packages showing larger coefficient values for those with zero packages captured by the census. The largest difference is seen for "Reablement" packages in 2014/15 with an expected 2.14 hrs increase for those with zero packages compared to those with at least one package in the census. This is equivalent to an 18.3 minute increase in care per day. The variation in total hours of care between home care types is plotted in figure 1.10.

Table 1.5: Regression models of package intensity

Financial Year	Gender	Age group	Type of home care		estimate	std.error	statistic	p value
2010/11				**(Intercept)**	**6.255**	**0.115**	**54.630**	
				No package in census	**-0.415**	**0.193**	**-2.147**	**<0.05**
	Female			(Intercept)	6.184	0.134	46.091	
	Female			No package in census	-0.435	0.234	-1.861	0.063
	Male			(Intercept)	6.450	0.220	29.338	
	Male			No package in census	-0.428	0.346	-1.237	0.217
		65-75		(Intercept)	7.200	0.243	29.573	
		65-75		No package in census	-1.534	0.417	-3.678	<0.05
		76-85		(Intercept)	5.803	0.164	35.386	
		76-85		No package in census	-0.084	0.276	-0.303	0.762
		86 plus		(Intercept)	6.065	0.204	29.764	
		86 plus		No package in census	0.119	0.340	0.349	0.727
			Care at home (Mainstream)	(Intercept)	6.266	0.118	53.245	
			Care at home (Mainstream)	No package in census	-0.430	0.198	-2.177	<0.05
			Rapid Response	(Intercept)	5.470	0.490	11.169	
			Rapid Response	No package in census	0.332	0.908	0.365	0.716
			Reablement	(Intercept)	9.958	1.602	6.216	
			Reablement	No package in census	-1.792	3.582	-0.500	0.625

Table 1.5 continued from previous page

Financial Year	Gender	Age group	Type of home care		estimate	std.error	statistic	p value
2011/12				**(Intercept)**	**6.754**	**0.118**	**57.119**	
				No package in census	**0.426**	**0.203**	**2.097**	**<0.05**
	Female			(Intercept)	6.701	0.146	46.012	
	Female			No package in census	0.485	0.251	1.929	0.054
	Male			(Intercept)	6.871	0.201	34.101	
	Male			No package in census	0.297	0.344	0.866	0.387
		65-75		(Intercept)	7.414	0.224	33.119	
		65-75		No package in census	-0.504	0.434	-1.161	0.246
		76-85		(Intercept)	6.391	0.175	36.605	
		76-85		No package in census	0.718	0.291	2.468	<0.05
		86 plus		(Intercept)	6.576	0.229	28.772	
		86 plus		No package in census	0.892	0.373	2.390	<0.05
			Care at home (Mainstream)	(Intercept)	6.551	0.127	51.631	
			Care at home (Mainstream)	No package in census	0.295	0.223	1.323	0.186
			Rapid Response	(Intercept)	7.770	0.413	18.826	
			Rapid Response	No package in census	0.748	0.634	1.180	0.239
			Reablement	(Intercept)	8.573	0.480	17.868	
			Reablement	No package in census	0.250	0.737	0.339	0.735

Table 1.5 continued from previous page

Financial Year	Gender	Age group	Type of home care		estimate	std.error	statistic	p value
2012/13				**(Intercept)**	**8.375**	**0.118**	**70.736**	
				No package in census	**0.586**	**0.202**	**2.896**	**<0.05**
	Female			(Intercept)	8.460	0.144	58.950	
	Female			No package in census	0.363	0.249	1.458	0.145
	Male			(Intercept)	8.190	0.209	39.100	
	Male			No package in census	1.031	0.348	2.964	<0.05
		65-75		(Intercept)	8.034	0.231	34.830	
		65-75		No package in census	0.917	0.383	2.394	<0.05
		76-85		(Intercept)	8.398	0.181	46.311	
		76-85		No package in census	0.544	0.306	1.779	<0.05
		86 plus		(Intercept)	8.611	0.212	40.545	
		86 plus		No package in census	0.391	0.381	1.027	0.304
			Care at home (Mainstream)	(Intercept)	8.054	0.140	57.715	
			Care at home (Mainstream)	No package in census	0.139	0.248	0.561	0.575
			Rapid Response	(Intercept)	10.172	0.388	26.193	
			Rapid Response	No package in census	-0.218	0.589	-0.370	0.712
			Reablement	(Intercept)	8.830	0.262	33.668	
			Reablement	No package in census	1.806	0.419	4.309	<0.05

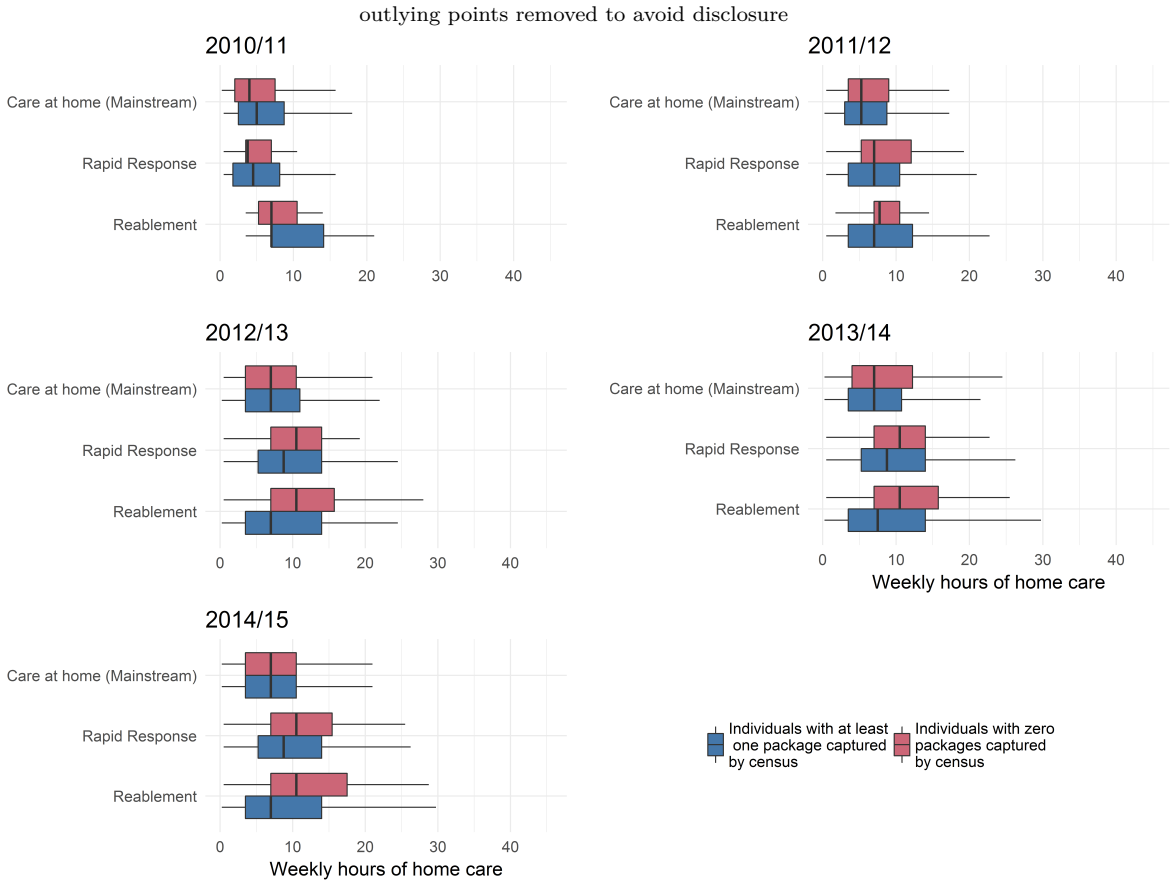
Table 1.5 continued from previous page

Financial Year	Gender	Age group	Type of home care		estimate	std.error	statistic	p value
2013/14				**(Intercept)**	**8.531**	**0.117**	**72.894**	
				No package in census	**0.995**	**0.198**	**5.038**	**<0.05**
	Female			(Intercept)	8.560	0.145	58.926	
	Female			No package in census	1.092	0.253	4.322	<0.05
	Male			(Intercept)	8.464	0.196	43.167	
	Male			No package in census	0.844	0.313	2.699	<0.05
		65-75		(Intercept)	8.624	0.222	38.794	
		65-75		No package in census	0.774	0.387	2.001	<0.05
		76-85		(Intercept)	8.420	0.176	47.958	
		76-85		No package in census	0.953	0.295	3.233	<0.05
		86 plus		(Intercept)	8.607	0.221	38.879	
		86 plus		No package in census	1.240	0.367	3.378	<0.05
			Care at home (Mainstream)	(Intercept)	8.159	0.143	57.052	
			Care at home (Mainstream)	No package in census	0.766	0.247	3.101	<0.05
			Rapid Response	(Intercept)	9.621	0.356	27.037	
			Rapid Response	No package in census	0.944	0.603	1.565	0.118
			Reablement	(Intercept)	9.239	0.241	38.259	
			Reablement	No package in census	1.364	0.383	3.562	<0.05

Table 1.5 continued from previous page

Financial Year	Gender	Age group	Type of home care		estimate	std.error	statistic	p value
2014/15				**(Intercept)**	**8.411**	**0.114**	**73.466**	
				No package in census	**1.197**	**0.189**	**6.340**	**<0.05**
	Female			(Intercept)	8.369	0.141	59.267	
	Female			No package in census	1.298	0.234	5.539	<0.05
	Male			(Intercept)	8.498	0.195	43.498	
	Male			No package in census	0.996	0.319	3.126	<0.05
		65-75		(Intercept)	8.427	0.219	38.538	
		65-75		No package in census	0.878	0.383	2.294	<0.05
		76-85		(Intercept)	8.374	0.169	49.619	
		76-85		No package in census	1.175	0.280	4.201	<0.05
		86 plus		(Intercept)	8.458	0.222	38.051	
		86 plus		No package in census	1.456	0.347	4.194	<0.05
			Care at home (Mainstream)	(Intercept)	8.004	0.138	57.848	
			Care at home (Mainstream)	No package in census	0.623	0.238	2.617	<0.05
			Rapid Response	(Intercept)	9.992	0.385	25.960	
			Rapid Response	No package in census	0.694	0.612	1.134	0.257
			Reablement	(Intercept)	8.898	0.230	38.757	
			Reablement	No package in census	2.135	0.352	6.072	<0.05

Figure 1.10: Variation in intensity of home care - by type



1.4.5 Comparison of package duration for individuals with/without any packages in the census

Figure 1.11 shows a comparison of the total duration of care for individuals with or without any packages in the census for each financial year. A clear difference can be seen for those with no packages captured by the census who have much shorter total duration of care. Results of linear regression models fitting package duration against presence or not of at least one package in the census (table 1.6) confirms statistically significant differences between all groups (with the exception of "Reablement" packages in 2010/11). These differences are large e.g. the overall coefficient in 2014/14 is -54.32 weeks suggesting individuals with zero packages captured by the census have care duration, on average, over a year shorter than those with at least one package in the census.

Intercept values in table 1.6 gradually decrease over time which is likely due to censoring at the end of the time series. Within years there is a large difference in intercept values. Older age groups, as well as "Rapid Response" and "Reablement" type packages all show much lower values than the total seen in each year. Variation in duration of care by home care type is plotted in figure 1.12

Figure 1.11: Variation in duration of home care

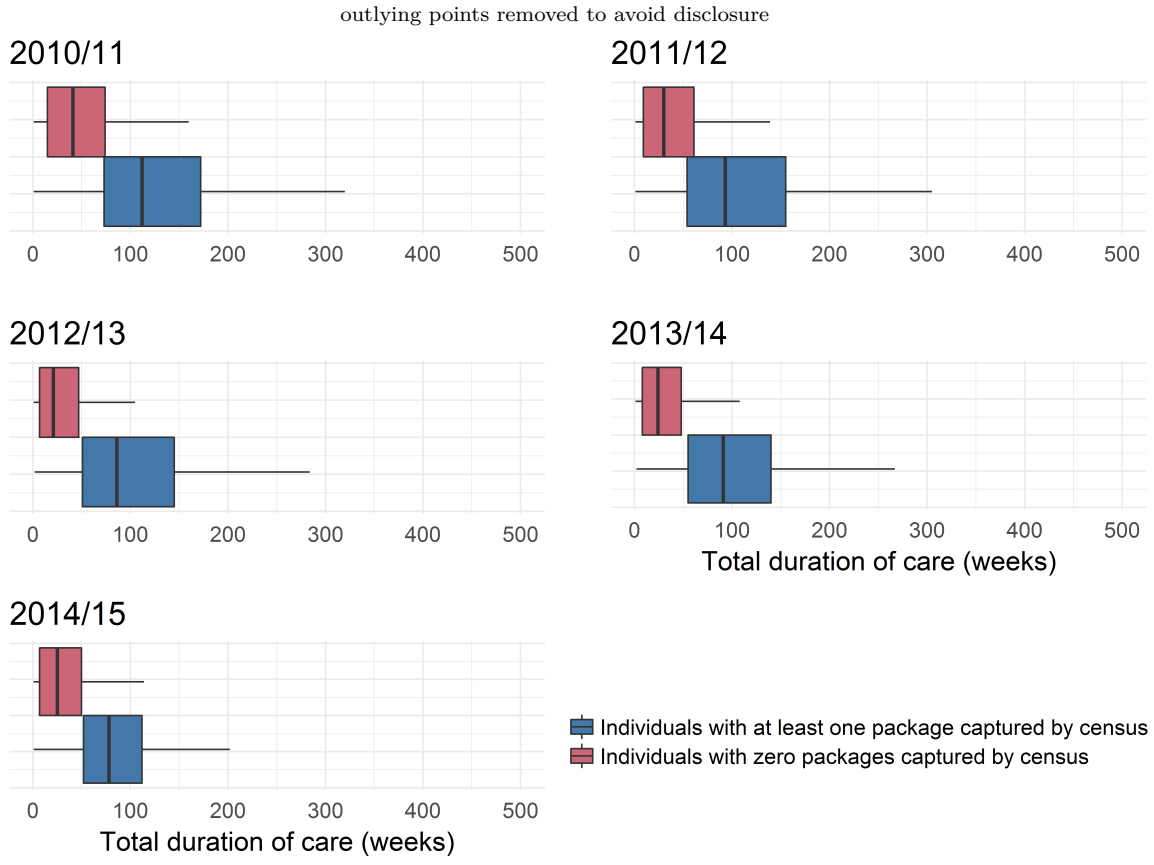


Table 1.6: Regression models of package duration

Financial Year	Gender	Age group	Type of home care		estimate	std.error	statistic	p value
2010/11				**(Intercept)**	**131.19**	**1.55**	**84.80**	
				No package in census	**-76.55**	**2.62**	**-29.18**	**<0.05**
	Female			(Intercept)	132.62	1.83	72.40	
	Female			No package in census	-75.29	3.20	-23.54	<0.05
	Male			(Intercept)	127.36	2.89	44.12	
	Male			No package in census	-78.09	4.59	-17.01	<0.05
		65-75		(Intercept)	146.55	3.31	44.22	
		65-75		No package in census	-98.60	5.68	-17.35	<0.05
		76-85		(Intercept)	130.26	2.29	56.81	
		76-85		No package in census	-73.53	3.89	-18.89	<0.05
		86 plus		(Intercept)	117.76	2.51	46.83	
		86 plus		No package in census	-60.34	4.21	-14.32	<0.05
			Care at home (Mainstream)	(Intercept)	131.56	1.58	83.35	
			Care at home (Mainstream)	No package in census	-76.67	2.67	-28.77	<0.05
			Rapid Response	(Intercept)	140.74	7.85	17.92	
			Rapid Response	No package in census	-90.23	14.54	-6.21	<0.05
			Reablement	(Intercept)	17.57	5.87	2.99	
			Reablement	No package in census	-11.24	13.98	-0.80	0.43401

Table 1.6 continued from previous page

Financial Year	Gender	Age group	Type of home care		estimate	std.error	statistic	p value
2011/12				**(Intercept)**	**111.31**	**1.44**	**77.39**	
				No package in census	**-67.55**	**2.49**	**-27.09**	**<0.05**
	Female			(Intercept)	113.67	1.73	65.70	
	Female			No package in census	-67.69	3.00	-22.55	<0.05
	Male			(Intercept)	106.17	2.58	41.15	
	Male			No package in census	-67.21	4.46	-15.06	<0.05
		65-75		(Intercept)	122.75	2.72	45.06	
		65-75		No package in census	-85.49	5.27	-16.23	<0.05
		76-85		(Intercept)	109.74	2.25	48.73	
		76-85		No package in census	-67.86	3.79	-17.92	<0.05
		86 plus		(Intercept)	101.08	2.49	40.60	
		86 plus		No package in census	-49.92	4.13	-12.09	<0.05
			Care at home (Mainstream)	(Intercept)	117.92	1.58	74.84	
			Care at home (Mainstream)	No package in census	-68.29	2.78	-24.56	<0.05
			Rapid Response	(Intercept)	79.82	4.45	17.96	
			Rapid Response	No package in census	-55.49	7.03	-7.89	<0.05
			Reablement	(Intercept)	63.15	3.16	19.98	
			Reablement	No package in census	-51.53	5.06	-10.18	<0.05

Table 1.6 continued from previous page

Financial Year	Gender	Age group	Type of home care		estimate	std.error	statistic	p value
2012/13				**(Intercept)**	**104.68**	**1.20**	**87.51**	
				No package in census	**-69.14**	**2.06**	**-33.51**	**<0.05**
	Female			(Intercept)	105.59	1.45	72.89	
	Female			No package in census	-67.85	2.53	-26.84	<0.05
	Male			(Intercept)	102.72	2.12	48.49	
	Male			No package in census	-71.45	3.57	-20.01	<0.05
		65-75		(Intercept)	120.31	2.73	44.05	
		65-75		No package in census	-80.02	4.61	-17.34	<0.05
		76-85		(Intercept)	102.25	1.77	57.92	
		76-85		No package in census	-67.40	3.01	-22.38	<0.05
		86 plus		(Intercept)	95.62	1.87	51.00	
		86 plus		No package in census	-63.47	3.35	-18.94	<0.05
			Care at home (Mainstream)	(Intercept)	117.05	1.52	77.20	
			Care at home (Mainstream)	No package in census	-71.43	2.71	-26.38	<0.05
			Rapid Response	(Intercept)	85.41	3.12	27.40	
			Rapid Response	No package in census	-60.22	4.88	-12.34	<0.05
			Reablement	(Intercept)	69.45	1.64	42.46	
			Reablement	No package in census	-55.95	2.68	-20.91	<0.05

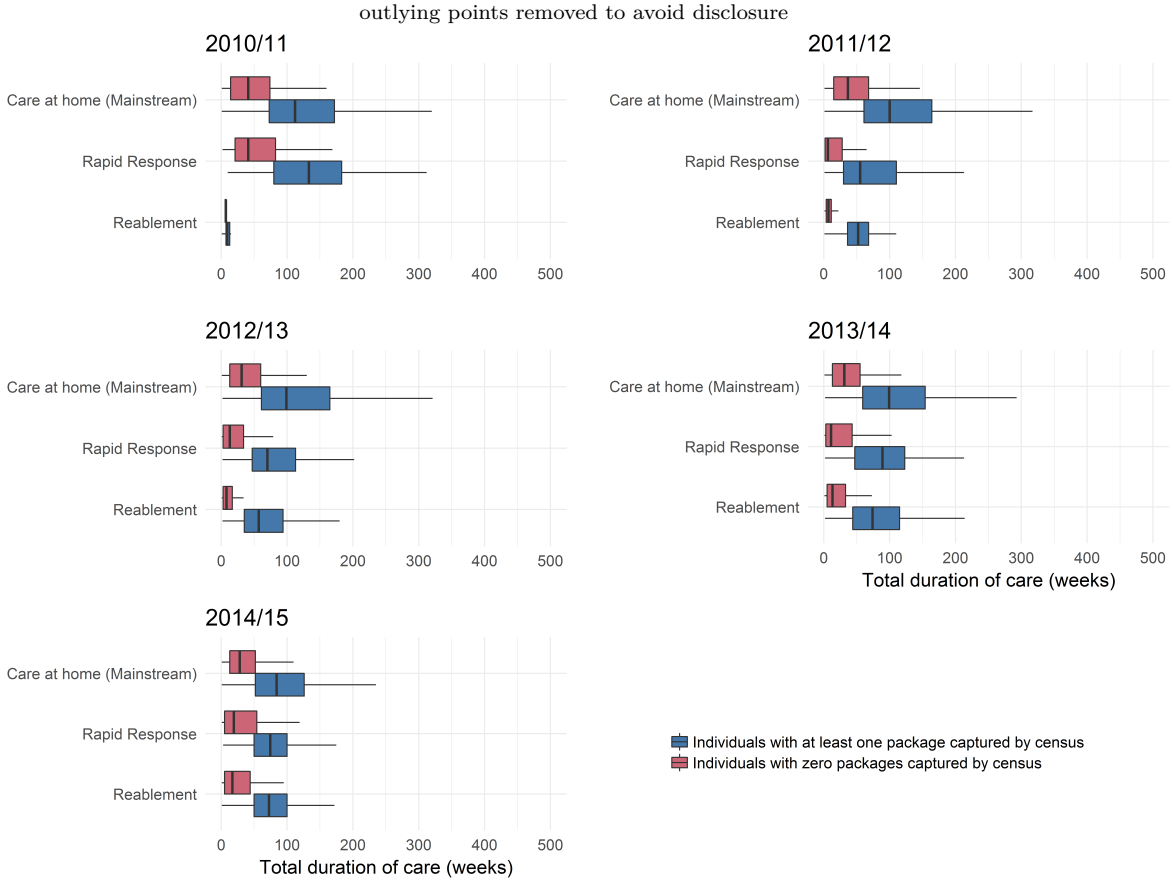
Table 1.6 continued from previous page

Financial Year	Gender	Age group	Type of home care		estimate	std.error	statistic	p value
2013/14				**(Intercept)**	**104.94**	**1.09**	**95.88**	
				No package in census	**-68.39**	**1.86**	**-36.75**	**<0.05**
	Female			(Intercept)	107.27	1.38	77.99	
	Female			No package in census	-68.11	2.41	-28.20	<0.05
	Male			(Intercept)	99.80	1.77	56.28	
	Male			No package in census	-67.59	2.84	-23.78	<0.05
		65-75		(Intercept)	121.50	2.42	50.14	
		65-75		No package in census	-86.25	4.23	-20.39	<0.05
		76-85		(Intercept)	103.77	1.62	63.93	
		76-85		No package in census	-68.17	2.74	-24.87	<0.05
		86 plus		(Intercept)	91.45	1.69	53.97	
		86 plus		No package in census	-52.46	2.84	-18.44	<0.05
			Care at home (Mainstream)	(Intercept)	114.43	1.46	78.32	
			Care at home (Mainstream)	No package in census	-69.58	2.54	-27.40	<0.05
			Rapid Response	(Intercept)	93.32	3.05	30.59	
			Rapid Response	No package in census	-67.26	5.30	-12.69	<0.05
			Reablement	(Intercept)	82.70	1.49	55.68	
			Reablement	No package in census	-61.07	2.38	-25.69	<0.05

Table 1.6 continued from previous page

Financial Year	Gender	Age group	Type of home care		estimate	std.error	statistic	p value
2014/15				**(Intercept)**	**90.76**	**0.99**	**91.86**	
				No package in census	**-54.32**	**1.63**	**-33.23**	**<0.05**
	Female			(Intercept)	91.79	1.20	76.25	
	Female			No package in census	-54.28	2.00	-27.11	<0.05
	Male			(Intercept)	88.64	1.73	51.27	
	Male			No package in census	-54.28	2.83	-19.19	<0.05
		65-75		(Intercept)	106.95	2.30	46.56	
		65-75		No package in census	-71.40	3.98	-17.95	<0.05
		76-85		(Intercept)	84.83	1.34	63.13	
		76-85		No package in census	-48.84	2.24	-21.79	<0.05
		86 plus		(Intercept)	85.24	1.68	50.62	
		86 plus		No package in census	-47.48	2.65	-17.91	<0.05
			Care at home (Mainstream)	(Intercept)	98.60	1.40	70.59	
			Care at home (Mainstream)	No package in census	-56.46	2.41	-23.46	<0.05
			Rapid Response	(Intercept)	80.31	2.52	31.88	
			Rapid Response	No package in census	-45.33	4.02	-11.28	<0.05
			Reablement	(Intercept)	75.47	1.26	59.82	
			Reablement	No package in census	-48.43	1.95	-24.79	<0.05

Figure 1.12: Variation in duration of home care by care type



1.4.6 Variation in care packages captured by census

Descriptive statistics of the net difference in total hours of home care for those individuals that have at least one package captured by the census *and* more than one package in a financial year are shown in table 1.7. The variation is plotted in figure 1.13. The median value of the net difference in total hours of home care for individuals with multiple packages of "Care at home (Mainstream)" is close to zero in all years with interquartile ranges (IQR) varying from 4.25 to 8.5hrs. These individuals account for approximately 60% of all those captured by the census with multiple packages of care.

The remaining individuals see larger negative values for the net difference in total hours of home care over the financial year with wider IQR values. Linear regression of the net difference in total hours of homecare with home care type as an explanatory variable (table 1.8) shows statistically significant results in all years except 2010/11.

Table 1.7: Variation in net difference of total hours of homecare by care type

Financial Year	Type of home care	number of packages	number of unique individuals	mean	sd	median	IQR	25th percentile	75th percentile
2010/11	Care at home (Mainstream)	1456	561	0.23	5.01	-0.13	4.25	-2.00	2.25
2010/11	Rapid Response	54	21	-1.04	3.97	-0.13	4.63	-3.31	1.31
2010/11	Reablement[1]	*	*	-4.20	5.75	0.00	10.50	-10.50	0.00
2011/12	Care at home (Mainstream)	1241	437	0.73	5.52	0.25	5.25	-1.75	3.50
2011/12	Rapid Response	133	47	-1.42	7.25	-1.75	8.75	-7.00	1.75
2011/12	Reablement	119	38	-5.52	5.28	-5.25	7.00	-10.00	-3.00
2012/13	Care at home (Mainstream)	1528	486	0.42	7.49	0.00	6.50	-3.00	3.50
2012/13	Rapid Response	242	72	-2.55	7.33	-2.50	10.75	-8.75	2.00
2012/13	Reablement	537	167	-4.61	7.39	-5.25	10.00	-10.00	0.00
2013/14	Care at home (Mainstream)	1648	498	-0.37	7.50	0.00	8.00	-4.50	3.50
2013/14	Rapid Response	277	87	-3.52	7.70	-3.75	12.25	-8.75	3.50
2013/14	Reablement	672	209	-2.52	8.80	-3.50	13.00	-9.50	3.50
2014/15	Care at home (Mainstream)	1373	468	0.28	7.03	1.00	8.50	-3.50	5.00
2014/15	Rapid Response	241	73	-1.94	10.29	-3.50	14.00	-10.50	3.50
2014/15	Reablement	643	216	-2.75	7.94	-2.25	10.50	-8.75	1.75

[1] Numbers too low to be disclosed

Figure 1.13: Variation in net difference of total hours of care by care type

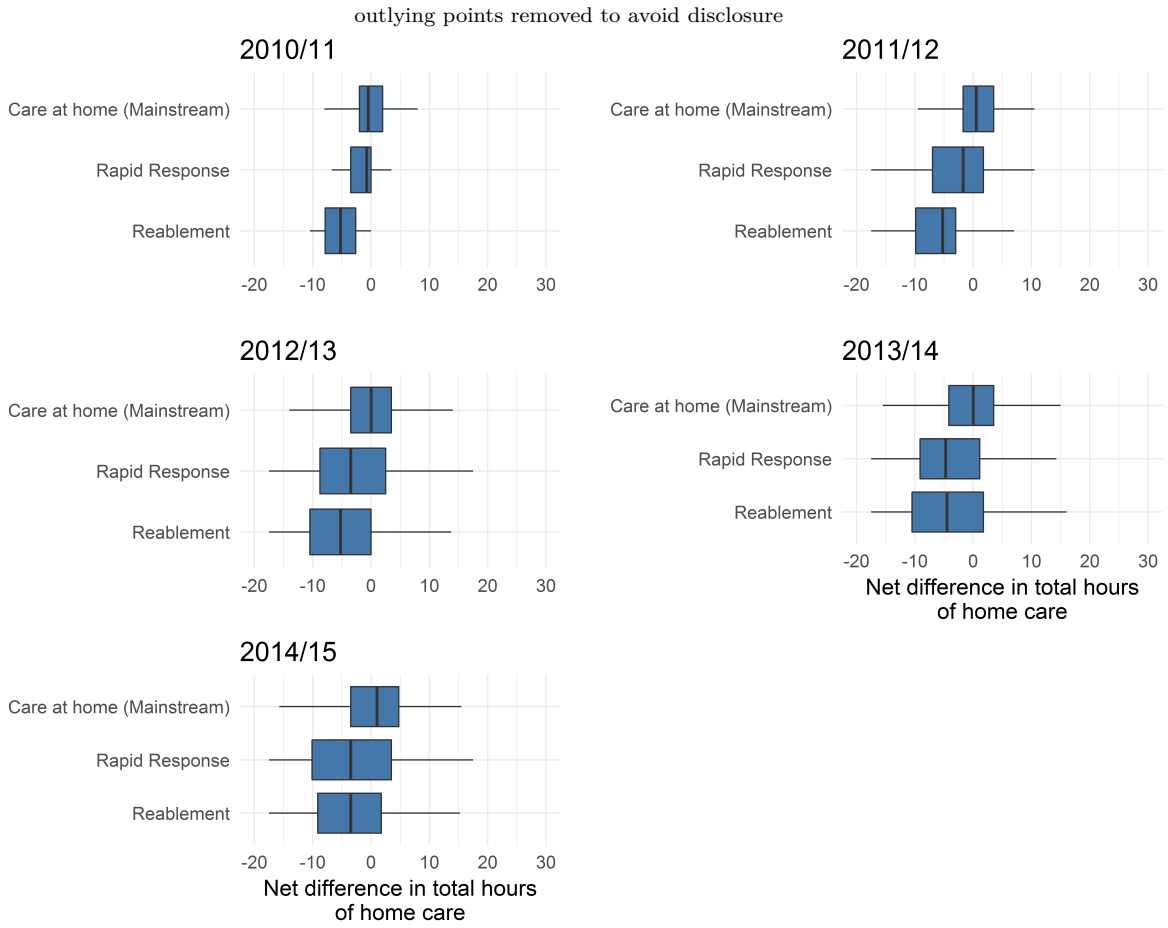


Table 1.8: Regression models of net difference in total hours of care by home care type

Financial Year		estimate	std.error	statistic	p value
2010/11	(Intercept)	0.0562	0.1973	0.2846	
	Rapid Response	-1.3300	1.0386	-1.2805	0.2009
	Reablement	-5.3062	3.3102	-1.6030	0.1095
2011/12	(Intercept)	0.7082	0.2739	2.5858	
	Rapid Response	-2.5433	0.8790	-2.8936	<0.05
	Reablement	-6.2806	0.9684	-6.4857	<0.05
2012/13	(Intercept)	0.1091	0.3313	0.3292	
	Rapid Response	-2.9493	0.9222	-3.1981	<0.05
	Reablement	-5.2183	0.6551	-7.9661	<0.05
2013/14	(Intercept)	-0.4347	0.3440	-1.2637	
	Rapid Response	-3.5078	0.8921	-3.9321	<0.05
	Reablement	-3.2064	0.6328	-5.0675	<0.05
2014/15	(Intercept)	0.0459	0.3481	0.1320	
	Rapid Response	-2.3576	0.9476	-2.4879	<0.05
	Reablement	-3.5078	0.6194	-5.6627	<0.05

1.4.7 Multi-census

Table 1.9: Proportion of individuals captured by census and hypothetical multi-census in each financial year

Financial Year	Total receiving home care (n)	Captured by census (%)	Captured by six-monthly census (increase) (%)	Captured by four-monthly census (increase) (%)	Captured by three-monthly census (increase)(%)
2006/07	2435	62.1	75.5 (13.4)	80.9 (18.8)	84.2 (22.1)
2007/08	2465	60.7	74.5 (13.8)	80.1 (19.4)	83.2 (22.4)
2008/09	2438	61.7	75.0 (13.3)	81.3 (19.6)	84.5 (22.8)
2009/10	2428	61.9	75.5 (13.7)	81.1 (19.2)	83.9 (22.0)
2010/11	2157	57.8	72.8 (15.0)	82.9 (25.1)	85.8 (28.0)
2011/12	2096	59.1	73.4 (14.3)	78.9 (19.8)	82.6 (23.5)
2012/13	2381	57.0	68.2 (11.3)	73.9 (16.9)	77.8 (20.8)
2013/14	2599	54.6	68.1 (13.5)	73.7 (19.1)	78.8 (24.2)
2014/15	2763	56.2	69.7 (13.5)	86.6 (30.4)	87.8 (31.6)
Mean	2418	59.0	72.5 (13.5)	79.9 (20.9)	83.2 (24.2)

Table 1.9 shows the percentage of the total number of individuals receiving home care in each financial year that would be captured if six-monthly, four monthly, or three-monthly census had been conducted and the increases these would signify. A bi-annual census would have captured an average of 72.5% of individuals that received home care during the study period - an average increase of 13.5% from the census. Tri-annual census collection would have captured an average 79.9% of individuals (average increase of 20.9%) whilst a quarterly census collection would have captured an average 83.2% of individuals (average increase of 24.2%).

The largest increases are seen in the years where the number of individuals captured by a single census are relatively low compared to other years, in particular 2010/11, 2013/14, and 2015/16.

1.5 Discussion

1.5.1 Findings

This exploratory project has investigated the variation in packages of care from one Scottish local authority area and aimed to: a) quantify the proportion of individuals in receipt of home care during Social Care Survey census week, b) describe the differences in individuals that receive some care during the census week and those that don't, c) validate the value of total weekly hours of care compared to the rest of the financial year for those that *do* receive some care during the census, and d) assess the difference in the proportion of individuals that would be captured by hypothetical extra census dates.

Between 51.7% and 61.9% of all individuals receiving home care in the years 2006/07 to 2015/16 had "live" packages of care during the SCS census week. The trend is decreasing with the minimum value being recorded in the most recent year of data. This trend likely

reflects the increase seen in the proportion of "Reablement" type packages of care which are designed to be implemented for short periods of time following hospital discharge. The shorter duration of these packages means they are less likely to coincide with the census date. There are no significant differences in the overall proportion or demographic structure of the group that are not captured by the census compared to the group that are in each financial year.

Individuals that have no packages of home care captured by the census in each year have a considerably shorter total duration of care. This is seen across all care types and age and gender groups. The most likely explanation for this is that no matter what care type, some individuals go on to require longer term care and thus receive more contiguous packages which eventually coinciding with a census date. Those that have zero packages captured by a census truly are short-term users of care. It is impossible, with this data, to account for what proportion of this is due to care no longer being required, to mortality, or to other causes.

Those without any packages captured by a census are also more likely to have slightly more total hours of home care per week. This is a moderate increase and affects individuals receiving "Reablement" type care to a greater extent. The difference for individuals receiving "Care at home (Mainstream)" type packages (the large majority) is equivalent to, on average, 10 minutes per day extra care.

For approximately 50% of individuals that *do* have at least one package of care captured by a census - the value of total weekly hours of home care that they receive in the census week is absolutely representative. This is because they only receive one package of care during the financial year and are likely recipients of long-term care. **Make sure the results show this clearly**

The remaining individuals receive multiple packages of care during the financial year or stop receiving care altogether. There are differences in the variation in the net-difference of total hours of home care for these individuals depending on the type of care they receive. Individuals with "Care at home (Mainstream)" type packages (again a majority**how much??**) show mild variation with median values close to zero. Half of these packages in 2014/15 (the year with the widest IQR) see a net difference value between -30 minutes to +40 minutes of care per day.

Those receiving "Reablement" or "Rapid Response" type packages (**quantify**) are more likely to have negative net difference values. It is possible these are short-term packages of care that started soon before the census and end soon after resulting in negative values. The IQR in 2014/15 indicates half of these packages see variations of care between -75 or -90 to +15 or +30 minutes of care per day respectively.

Adding an additional 1, 2, or 3 census weeks in each financial year to the data analysed in

this project increases the proportion of individuals that would be surveyed by an average of 13.5%, 20.9%, or 24.2% to 72.5%, 79.9%, or 83.2% respectively.

1.5.2 Limitations

This analysis is limited by the fact that data was obtained from only one local authority area. It is impossible to know if the number of individuals captured or not by the SCS in the Renfrewshire area is indicative of numbers across the country. Given each of the 32 local authorities in Scotland have bespoke methods of delivering and recording social care the findings from this analysis can not be generalised to a national level. However, given the difficulties in obtaining data of this kind, the analysis gives some indication to stakeholders of the validity of the SCS.

Furthermore, the method of summarising data into packages of care is subjective and may differ from the method used by Renfrewshire council to complete the SCS. Absolute numbers of individuals receiving home care in each financial year in this analysis are similar to those returned by Renfrewshire council to the SCS overall with some mild discrepancy in later years. Eligibility to be included in the home care census has changed over the years (e.g. "Housing Support" being included as home care and then collected as a separate type of service in later years) and the collection of individual-level data did not begin until 2010/11. Whether this has changed how data is collated at the local level for return to SCS is unknown but may explain differences in counts.

1.5.3 Implications

The analysis in this chapter suggests the SCS provides a good cross-sectional sample of individuals receiving home care in any given financial year. The proportion of this sample appears to be decreasing in more recent years but still accounts for at least half of all individuals receiving care.

Increasing the frequency of data collection to four times a year could potentially increase the sample size to approximately 83%. Whether the extra administrative resources associated with this would be too great for both local authority and Scottish Government analytical teams is a matter which would require further consideration. This would certainly result in more short-term packages of care being captured by data collection enhancing the representativeness of the SCS.

The value of total hours of home care returned to the SCS is an accurate cross-sectional value but is not completely indicative of care received throughout a financial year. A majority of individuals have no, or only a modest, variation in the total weekly hours of home care they receive during a financial year. However, a proportion of individuals

(**25%??**) have large changes in total hours of homecare and these cannot be indented in SCS data. The main analysis in this thesis, and any other research using the SCS as a data source, cannot infer home care receipt over a year from this value as it risks producing biased results. Collection of start and end dates of all home care packages received in a financial year in the SCS would rectify this problem.

The analysis of the data from Renfrewshire council has shown there are different patterns in the duration and intensity of home care packages according to the type of care being provided (e.g. between "Care at home (Mainstream)" and "Rapid Response" type packages). The SCS does not collect data on the categorisation of care type and therefore these differences cannot be accounted for in research using the SCS. Adding a standardised classification of home care type to the SCS would allow a richer interpretation of home care users for both official statistical reporting and research purposes.

1.5.4 Future work

Future work using this data should consider the difference in individuals receiving care at different time intervals (e.g. first six months of the year). If the census week were to capture a higher proportion of individuals in a more narrow time-frame then alternative types of statistical analyses, such as time-to-event analysis, may be possible using SCS data.
The data from Renfrewshire council also offers the opportunity to longitudinally analyse home care use by age, gender, and type of home care groups. Quantifying any differences in the change over time in the amount of home care used would be of interest to both researchers and local authority providers.

Each individual in the dataset has data with multiple values of Scottish Index of Multiple Deprivation (SIMD) for different time periods. Future analysis should include this variable with the correct SIMD score added to the time series at the appropriate time period. Accounting for socioeconomic position in all analyses would provide a richer picture of service allocation. Time constraints prevented such analysis in this chapter.

1.6 Conclusion

Analysis of individual level social care data from Renfrewshire council area suggests that the number of people recorded as receiving home care by the Social Care Survey captures between 52% and 62% of the total number of people that will receive home care during a financial year. Those not captured during a census week are individuals receiving short-term care only. The value of total weekly hours of home care recorded during the

census week, whilst an accurate cross-sectional figure, is not an accurate representation of care receipt over the whole financial year for a small proportion of individuals. Collection of additional data, such as start and stop dates for all packages of care and type of home care delivered, would improve the inferences that can be made from the SCS currently.

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