A review of the Department of Health and Social Care's Funding Reform Model

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1. Introduction

The Department of Health and Social Care (DHSC) is responsible for setting the overall direction for social care policy and funding in England. Recently DHSC has developed in-house modelling capacity to examine likely implications of possible reforms to the system for funding social care. This departs from the process used by the Dilnot Commission on the Funding of Care and Support, where modelling of the implications of the proposed reforms was commissioned from the Public Social Services Research Unit (PSSRU) at the University of Kent and the London School of Economics[1].

Given the complexity of the models involved, the many uncertainties and data constraints, and the high level use of the outputs produced, good quality assurance is vital. The DHSC does much internal quality assurance, but understandably (and commendably) decided to commission an independent external review of the department's modelling approach. This paper writes up our main findings from that review.

This review has focused on the DHSC's Adult Social Care 'Funding Reform Model' (referred to throughout as the "FRM"). This model is used to examine state funding for social care under proposed funding systems as compared with the current system, and conduct distributional analysis of proposed reforms. The FRM interacts closely with the PSSRU's Aggregate Demand Model, and the outputs of the FRM are combined with DHSC's 'Long Term Demand' (LTD) model to produce projections for the future level of state spending on social care under different funding systems. We have not reviewed these models in detail, but have considered the implications of the way they interact with the FRM.

We are very grateful to the analysts at DHSC who have given their time to help us understand the departments' models, write up model descriptions for us, and answer our many questions. While we cannot fault the assistance given to us, we do note that there does not seem to be a complete and maintained set of documentation on the FRM model. We would recommend that some resource is put into this, and that said documentation is made publicly available via the department's website. This would not just help to safeguard the department's analytical capacity from the turnover of expertise, but also open the FRM up to further independent scrutiny and suggestions for improvement.

The main findings from our review of the FRM are written up in this report. In Section 2 we briefly describe the workings of the FRM, and how it interacts with some of the other models used by DHSC. In sections 3-6 we discuss our main findings relating to the overall structure of the model, the data and assumptions used, the sensitivity of the model, and how the outputs of the model are used. Section 7 concludes.

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[1] Commission on Funding Care and Support (2011) Fairer Care Funding: The Report of the Commission on Funding Care and Support, Department of Health, London. See in particular Volume II (Analysis and evidence supporting the recommendations of the Commission on Funding of Care and Support) available at: http://webarchive.nationalarchives.gov.uk/20130221121551/https://www.wp.dh.gov.uk/carecommission/files/2011/07/Volume-II-Evidence-and-Analysis1.pdf

2. The Funding Reform Model

2.1 Overview

The Funding Reform Model (FRM) has been developed by DHSC to model the effect of potential reforms to the criteria for eligibility for state assistance with social care costs.
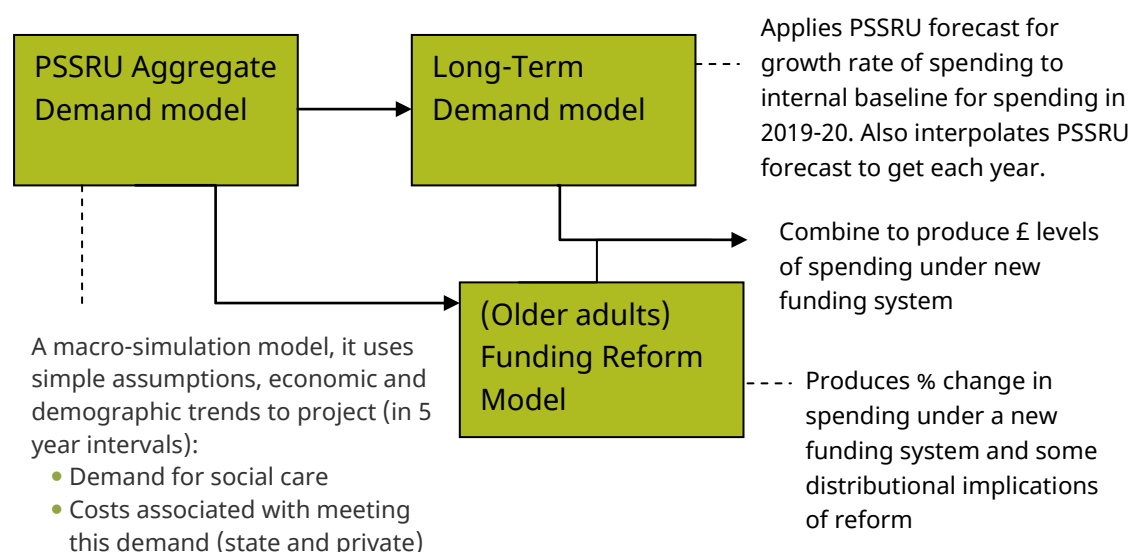
This model is not stand alone. It relies on projections for social care user numbers from the PSSRU Aggregate Demand Model. Created and maintained by researchers at the LSE-based Personal Social Services Research Unit (PSSRU), this model projects future numbers of self- and state-funded users of care services, the demographic characteristics of people in different care settings, and the public cost of care out to 2035 (amongst other things).

The FRM forecasts state expenditure on social care under different funding systems *relative* to the current system. In order to produce an estimate of the *level* of state spending on social care under different reforms, the FRM outputs are combined with the DHSC's Long Term Demand (LTD) model. The LTD model adapts spending projections from PSSRU to match the department's own baseline for social care spending in the medium term. Applying the effect of a reform in terms of the percentage change in spending relative to the current system from the FRM, with the LTD model spending forecasts under the current funding system, gives the forecast cash spend under the proposed reform (and therefore the cash-terms impact of reform).

Figure 2.1 illustrates diagrammatically the links between these models.

DHSC also have models for working age adults[2], and for forecasting the financial implications for councils of deferred payment agreements (where adults can defer paying their care fees until their death so they do not have to sell their home).

Figure 2.1. Interactions between the Funding Reform Model and other models

PSSRU Aggregate Demand model

Long-Term Demand model

Applies PSSRU forecast for growth rate of spending to internal baseline for spending in 2019-20. Also interpolates PSSRU forecast to get each year.

Combine to produce £ levels of spending under new funding system

(Older adults) Funding Reform Model

A macro-simulation model, it uses simple assumptions, economic and demographic trends to project (in 5 year intervals):
- Demand for social care
- Costs associated with meeting this demand (state and private)

Produces % change in spending under a new funding system and some distributional implications of reform

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[2] Responsibility for children's social care policy falls with the Department for Education.

2.2   How the Funding Reform Model works

The FRM takes a *micro-simulation approach* – in other words total state spending at a given point in time is modelled by calculating and adding up state spending on specific individuals. This is necessary because the eligibility criteria for state assistance with social care costs are complex and depend on individuals' circumstances. These circumstances currently include income, wealth and needs; in the future they could also include a measure of how much someone has spent to date on their own care, or how much time they have spent in care.

To calculate state spending on a given person, the model needs to know what needs they have and whether they are eligible for state funding (based on a set of criteria that could include their income, wealth and history of care use). In practice the FRM only models individuals who are assumed to have care needs, so this dimension of the problem is simplified. To convert this to total state spending, the model also needs to know how many people in the total care receiving population look like that individual, and how many people in total receive social care services. This information is taken from the PSSRU Aggregate Demand Model.

Who is in the model?

The model starts with survey data on a sample of adults aged 65 and over that reported having care needs. These data contain lots of economic and demographic information about this group of people, including their income, wealth, marital status and household composition. This will be important for calculating their eligibility for state funding, and for weighting the individual level results based on how representative each person is of the wider population of people needing care in England.

The survey data do not tell us how much care someone has used in the past (or how much they will need in future). However, care histories are needed in order to (i) to calculate eligibility for state support under funding regimes where eligibility depends on past spend or needs, and (ii) model asset depletion (which is key for knowing whether or not an individual meets the financial criteria for state support with care costs). Care histories are therefore assigned to individuals in the FRM from other data sources. Since there are so many possible care histories a person could have experienced, the sample is cloned to give 16 of each person. Four of each person are assumed to be in domiciliary care (with one in each of four levels of intensity), while six of each person are assumed to be in residential care and six in nursing care. This means the model can simulate a wider variety of care histories for a given original sample size, yielding more stable results.

Each person in the model, independent of any of their characteristics (except sex), is randomly allocated a care history – i.e. details of what care they have used to date. Those in residential or nursing care receive a length of stay in that setting, a random draw of whether or not they previously received domiciliary care, and (if the draw comes up yes) a length of stay in domiciliary care. Those in a domiciliary setting receive only this last component. Care histories are defined in terms of a number of months, rather than whether they received care in a particular month. For example, a care history could be 1 year each of low, medium, high and very high intensity domiciliary care, followed by 3 years of residential care – a cumulative 7 years of receiving care services.

The process of cloning and allocating care pathways takes no notice of how probable it is that a particular individual will end up in that care setting. Intuitively, we might think that at a given point in time it's more likely that a 90 year old would be in residential care than a 70 year old. In order to take this into account, each (cloned) person in the data is given a weight based on how many people with their characteristics PSSRU expect to be in the care setting they are in during the quarter/year being modelled, as a proportion of all people in that care setting at that time. The weights are based on their age, sex, marital status and housing tenure status (all known from the original survey).

How is state spending calculated?

At this point, we have a set of individuals with demographic characteristics (including age, sex, marital status and housing tenure status whether they have a partner), care histories and a measure of income and wealth (assumed to be that at the start of their care journey). The FRM also assigns each individual possible unit costs for their care. For residential and nursing home care there is some variation in the possible costs, which reflect differences around England in the cost of provision, and the assignment of these costs to individuals is done randomly.

To run the model, the analyst chooses a quarter in the future (say Q1 2035) for which they would like to forecast government spending on social care. They can choose multiple periods if they so wish. They programme in a set of eligibility criteria that determine who gets state assistance with adult social care. (The first time they do this it has to be the current funding regime, but subsequently the eligibility criteria can be altered to reflect possible reforms to the funding regime. The outputs of the model under the alternative funding regime(s) can then be compared with those from the current funding regime, to give an estimate of the proportional impact of the reform on state spending.)

The FRM will then, for each individual, calculate whether she is eligible for state support in each four week period since the start of her care history until the quarter being modelled. For example, if the analyst wants results for 2035, and an individual has a 7-year care journey, she will start receiving care services in 2028. Based on her assets the model determines whether she is eligible for state contributions towards her care costs at that point. If she is, then her income and assets are used to calculate how much she is expected to contribute from each towards her care costs, and the remainder is counted as state spend. If she isn't, then her care costs are calculated and, any care spending in excess of income (less some assumed non-care spending) is subtracted from the assets that are available to her for the next month. This repeats, cycling through every month until it reaches the period of interest (say Q1 2035), at which point the model extracts eligibility and state spending for that individual in that period and stores it for later. The process then starts again with the next individual in the model, each time storing the result for the final period of interest.

How does the model go from individuals to total state spending?

Once the model has been run for all individuals, the results are aggregated to give total state spending on social care, by care setting, at a given point in time. This aggregation uses two sets of weights. The first set determines how much weight to give to a particular individual in a given care setting – this is based on external estimates from PSSRU of the future demographic composition of those receiving particular types of care. The second set of weights are common across all individuals in a given setting. They are set so that if the model is running the current funding system then it will exactly match the total

number of people PSSRU project will be receiving state funded care in each care setting in the period of interest. If an alternative funding system is being run, the number of state funded users can change, but the total number of care users (state and self-funded) will continue to match the PSSRU projections.

Outputs from the model

Despite this weighting, the level of spending projected by the FRM does not match that from the DHSC's long-term demand model. The outputs of the FRM are therefore used to calculate the *proportional* difference in state spend between the current and any alternative funding regime. This proportional difference is then applied to the level of spend forecast by the LTD model to produce the forecast *level* of state spending on social care under the modelled alternative funding regime.

By running the model for every quarter between 2019/20 and 2035/36, a time series for state spending on social care under various potential reforms can be obtained. The model can also produce other 'distributional analyses' – in other words, describing how the differences in state support for social care vary across individuals according to their characteristics.

3. Model review: overall approach

We start by making a number of observations about the structure of the FRM, first in terms of its 'retroactive' nature, and second, in terms of the interactions between the FRM and the DHSC's other models

3.1 'Retroactive' nature of the model

The FRM is somewhat unusual for a micro-simulation model, and it is quite structurally different from the micro-simulation model developed by PSSRU for a similar purpose as part of the Dilnot Commission's work.

A typical dynamic micro-simulation model would start with a population in a base year, and then follow that population over time as their circumstances change – for example, as their health and care needs evolve, and as their asset position changes. Such a model essentially runs off a number of transition probabilities that govern how individuals move between states (for example, the probability of moving from no care to domiciliary care, or the probability of moving from domiciliary care to residential care), and assumptions about how income and assets evolve over time (with and without care needs). A time series for something like state spending on social care is obtained by summing across individuals each year.

The FRM works somewhat differently, in that each year of a time series is calculated independently with care histories simply 'retroactively' assigned to individuals (almost) at random. In other words, there is no direct relationship between estimated care receipt of any particular individual if the model is run for 2020 and for 2021 (even though in reality, care history in 2021 will normally be care history in 2020 plus one year).

What are the pros and cons of the different approaches?

- At first glance, the data requirements of the FRM's approach may seem simpler, but in reality the data requirements of the two approaches are fairly similar. A normal dynamic micro-simulation model requires a number of transition probabilities (for example, between types of care), while the retroactive model requires a care history in terms of length of stay to date in different care settings. However, these are inextricably linked, and so given data on one the other could be computed. Most of the data the DHSC has access to come more naturally in terms of lengths of stay, rather than probabilities of transitions, and therefore a model that takes those data directly requires fewer manipulations of the input data. This probably makes it easier for DHSC analysts to understand how to incorporate the data into the FRM approach, and how to adjust that as new data become available.

- The FRM is Excel based (albeit using VBA), while a traditional micro-simulation approach would require running in statistical or programming software such as Stata or R. Given the rate of staff rotation in the civil service, we can appreciate the desirability of having the FRM set up in Excel, rather than in software for which expertise are currently less widespread.

- The main cost of the FRM approach is that individuals are not followed over time. This means that it is difficult to conduct distributional analysis that is based on lifetime circumstances for a particular generation. The best that can easily be calculated is distributional analysis with respect to the history of experience to date for those of a given age in a given year. This difficulty is discussed in more detail in Section 6. Distributional analysis with respect to lifetime circumstances would flow much more naturally from a traditional dynamic micro-simulation model, where a particular group of individuals can be followed over time – for example, from 2020 until they are all dead. However, it is worth noting that such analysis would require the model to project care use a long way into the future (perhaps to 2055 if one is interested in the (remaining) lifetime circumstances of those aged 65 in 2020). It could be that the data requirements to do this are felt to be too uncertain to merit doing this, even if the structure of the model meant that technically the capacity was there to do so.

On balance, a more traditional dynamic micro-simulation model – that starts in one year and follows a particular sample of individuals over time – would be a technically better approach for the departments' modelling needs, and would allow for additional kinds of interesting distributional analysis to be conducted. However, given the perceived requirements for ease-of-use and ease of transfer of knowledge given analyst turnover, the structure of the FRM could be deemed to represent a reasonable compromise. That said, it is notable that the Department for Work and Pensions has been able to develop and maintain Pensim2 which is a cutting edge, more traditional, dynamic micro-simulation model. We recommend that DHSC discuss with DWP colleagues about how they are able to maintain Pensim2 – for example through reduced analyst turnover or comprehensive documentation – and the resources required, and consider whether anything can be learnt from this different approach. We also suggest that DHSC create a record of the pros and cons of the different approaches, and the reasons that the department has developed the FRM in the way that it has, which would be of benefit to future analysts seeking to understand or revisit this decision.

Recommendations:

- The current modelling team at DHSC should attempt to establish from former colleagues a better understanding of the process through which the FRM was developed, and the reasons for taking this approach rather than developing a more traditional dynamic micro-simulation model. DHSC should also discuss with colleagues at DWP how they are able to maintain their Pensim2 model, and the resources that that requires, and consider whether anything can be learned from that comparison. The advantages and disadvantages of the different approaches, and the trade-offs involved should be documented for the benefit of future analysts.

3.2   Interactions between the FRM and the other models

As described in Section 2, the FRM is not a standalone model. It takes input from the PSSRU aggregate demand model, it is calibrated so that some of the outputs match those of the PSSRU model when the current funding system is modelled, and it is combined with

the outputs of the DHSC's LTD model to get levels of state spending under alternative funding regimes. These interactions are important.

The FRM uses projections from the PSSRU model of the proportion of individuals in each care setting with different demographic characteristics (interactions of age, sex, marital status and housing tenure) to weigh individuals in the FRM sample. This means that the FRM sample becomes representative of the population within each care setting. The FRM results are also grossed up so that the number of individuals who are self- and state-funded in each care setting, under the current funding regime, match those projected by the PSSRU model.

The advantage of this approach is that the FRM is calibrated to an external model that is thought to be the best projection for future demand for social care by broad demographic groups. There are however, two difficulties that arise.

First, despite the calibration of the FRM to the PSSRU aggregate demand model (through weighting and grossing factors), the level of spending under the current funding regime predicted by the FRM is different to that of the DHSC's LTD model – even in the very short term (before factors such as differential cost uprating would be expected to matter). This is because the LTD model normally uses a slightly more up to date baseline estimate for state funded social care, and assumes some additional efficiency savings.   DHSC circumnavigate this discrepancy by using the FRM to calculate proportionate differences between state spending under proposed funding regimes and the current regime, and then applying that difference to the forecast level of spending from their LTD model (which is consistent with the PSSRU model). This has the attraction of meaning that they only have one forecast for state spending under the current funding regime.

The second potential difficulty is that the PSSRU model and the FRM model both involve a number of assumptions about the same things, and these are not necessarily fixed to be the same across the two models. In most cases they would be, since it is unlikely that PSSRU and DHSC will disagree on the best baseline assumption to be employed. However, this is not always the case – for example, the two models implicitly assume different things about changes in length of stay in care over time.

Perhaps more importantly, this also causes an issue for sensitivity analysis that DHSC might want to conduct. DHSC's current sensitivity analysis takes the PSSRU projections for aggregate self- and state- funded users in each care setting as given. In other words, it illustrates the sensitivity of the *proportional* cost of a funding reform to factors such as user numbers or care costs. However, first, it is possible that for some sensitivity analysis there would be a knock on consequence on the proportional cost of the reform that arises from a different level of baseline spending. This could only be captured by simultaneously conducting sensitivity analysis of both the overall level of aggregate demand, and the effect of a funding reform modelled by the FRM, to a particular data input or assumption. One may also be interested directly in the sensitivity of the *level* of state spending on social care under some different funding regime to a particular data input or assumption. This would again require sensitivity analysis where the data input/assumption are varied in both the PSSRU model and the FRM.

This suggests that DHSC may want to work more closely with PSSRU to understand the interactions between their two models, and to conduct some joint sensitivity analysis

where the equivalent assumptions are varied in both the PSSRU model and the FRM model. Some specific examples are discussed in more detail in Section 5.

Recommendations:

- Sensitivity analysis should be explored that jointly varies the equivalent assumptions in both the PSSRU aggregate demand model and the FRM.

4. Model review: data and assumptions

We turn now to examining the data and assumptions used in various aspects of the FRM. We consider, in turn, the population modelled, individuals' care histories, care costs, and the assessment of eligibility for state support.

4.1   The population modelled

Being a micro-simulation model, the FRM requires input data on a sample of individuals and their relevant characteristics (for example, demographic characteristics that affect care needs, and income and assets that affect eligibility for state support). For this purpose, the FRM uses as its base sample 1,136 adults surveyed in the English Longitudinal Study of Ageing (ELSA) who are aged 65 or over, live in a private household in England, and report needing assistance with at least one activity of daily living (ADL).

DHSC's objective when making this latter restriction is to include only in the model those who require care (rather than the whole population). Sample size concerns meant that the sample could not be restricted to those reporting assistance with two or more ADLs, which is closer to the definition of care needs that would be eligible for state support. The sample of individuals simulated in the FRM is therefore more akin to those "who need, or are very likely to need care in future" than those who currently need care. An important question is to what extent those who report requiring assistance with one ADL do indeed go on subsequently to require assistance with more than one ADL, over what time frame, and whether this differs according to individuals' characteristics.

ELSA is a good choice for the FRM sample of individuals and their characteristics. It is a representative survey of the population of older private households in England, with a decent sample size (for a survey) and good information on disability, income and wealth, and household characteristics. Unfortunately ELSA does not contain data on those in nursing or residential care homes (while the survey does follow individuals into residential care settings, it does not sample from this population and is not designed to be representative of those who live in communal establishments). This is certainly a significant limitation in the context of projecting social care spending. However, we know of no other suitable data source that does contain this information. Similarly, while the sample size of ELSA is limiting in some respects – it is not large enough to draw a sample who require assistance with two or more ADLs, to focus on those reporting receiving care, or to estimate how income and wealth vary with severity of need – there is no other data source with a larger sample size that we could recommend using in preference. At the current time the FRM uses ELSA data from 2010/11 despite data from 2014/15 (and soon 2016/17) being available. When time allows the department should remove any 'hard-coding' of the input data, make changing the input data in future an easier process, and switch to using more up to date ELSA data. This is unlikely to make a substantial difference to the results however (though the importance of this will increase over time), so this need not be a short term priority.

The FRM uses this same sample of individuals to represent the population aged 65 and over in every year between 2018 and 2035. The downside of this is that different generations (i.e. those of a given age in different years) may differ in terms of their health, demographic characteristics and financial circumstances. The model circumnavigates this

issue to some extent by weighting the ELSA sample so that the proportion of individuals with particular demographic characteristics are represented in the different care settings in the proportions expected by the PSSRU AD model, and that model does make explicit assumptions about generational differences in care needs, household composition and housing tenure. However, the FRM does not factor in differences between generations' income and wealth, despite there being evidence of large differences in income and home ownership between generations (see, for example, Cribb, Hood and Joyce (2016)).[3] This again may be offset somewhat by the second weighting procedure in the FRM, whereby the results are grossed up so that the number of individuals in each care setting who are self-funders, and who are state funded, match those projected by the PSSRU AD model. However, this will not be perfect compensation, particularly if the generational differences in income and assets are different for individuals with different characteristics. DHSC should therefore examine how sensitive the outputs of the FRM are to changes in population characteristics (income and housing wealth in particular) over time, and consider building generational differences into their population input data if these are large enough to matter.

Recommendations:

- Use ELSA data to examine the extent to which those reporting requiring assistance with one ADL go on to require assistance with more than one ADL, over what timeframe, and how this differs according to individuals' characteristics.

- Make the process of changing the input data on the sample and their characteristics easier (for example, remove any hard coding of sample sizes), and update the sample used to be drawn from ELSA 2016/17 once these data are made available.

- Examine how sensitive the outputs of the model are to changes in the income and wealth (and, to a lesser extent, other characteristics) of the sample over time. This could be done by 'ageing' the ELSA sample and by simulating data for the younger population from other sources or assumptions. (For example, if the ELSA sample is thought to be representative of the income/wealth of the 65+ population in 2020, then it would be representative of the 80+ population in 2035, and data on those aged 65-79 could be simulated from information on those aged 50-64 in the ELSA data or other assumptions.) Alternatively, it might be possible to get projections for the income/wealth of the future population (conditional on some demographic characteristics) from other external sources, such as perhaps the outputs of the DWP's PenSim2 model.

4.2   Care histories

The ELSA data do not contain good data on care histories (and the sample size would be too small for robust analysis in any case), so the expanded sample of individuals in the FRM are allocated care histories that are estimated using other data. Since no good,

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[3] Cribb, J., Hood, A., and Joyce, R. (2016) The Economic Circumstances of Different Generations: The Latest Picture, IFS Briefing Note 187

nationally representative, source of data exists on individuals' full care histories these are pieced together using a number of different sources of information.

These care histories are constructed from: a distribution of length of stay in residential care settings, a probability of having received domiciliary care prior to residential care, and a distribution of duration of receipt of domiciliary care services (of various intensities). Each of these components is separately allocated to individuals, which then together form the individuals' care history. We discuss each component in turn.

Length of stay in residential care settings

Information on the distribution of lengths of stay in residential and nursing care come from BUPA data on completed lengths of stay in 305 BUPA care homes, covering the 11,565 BUPA care home residents who died between Nov 2008 and May 2010. DHSC use the distribution of length of stay from the full sample of residents (i.e. not distinguishing between residential and nursing residents), but then make an adjustment for different lengths of stay in residential and nursing care – increasing the average residential care stay and decreasing the average nursing care stay so there is a 25% difference between the two. A different distribution is used for men and women, with the median length of stay for men being 50% lower than that of women.

Since the data are about completed lengths of stay, whilst the FRM requires uncompleted lengths of stay (because in any one year only a small percentage of care users will be at the end of their journey), DHSC then apply a transformation to the data to create a 'transformed' uncompleted length of stay distribution.

There are a number of concerns with these data:

- The BUPA data are not nationally representative. This is a particular concern for residential care, given the very low proportion of individuals who were receiving residential care in the BUPA data compared to other data sources. While weighting the BUPA may help to some extent, it is unlikely to be able to fix things if BUPA residential care residents are very different to the average residential care user.

- The BUPA data only capture the spell of care in a particular care home that ends in death. This will therefore understate lengths of stay if individuals move between homes, or move in and out of care in a given home. This is a particular concern for nursing home lengths of stay, since individuals may have been in residential care in a different location before the final spell of nursing care. (Administrative data on council supported residents suggests that between March 2007 and March 2008, 3.5% of the over 65 population "permanently" resident in a residential or nursing care home moved either from residential to nursing care, or vice versa[4]).

- The BUPA data includes both self-funders and state supported residents (defined according to their funding status at death), and the self-funders have considerably greater lengths of stay on average (predicted self-payer status is associated with a

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[4] Community Care Statistics, Supported residents (adults) – England, 2008. Available from NHS Digital at https://digital.nhs.uk/data-and-information/publications/statistical/community-care-statistics-social-services-activity/community-care-statistics-supported-residents-adults-england-2008

34.8% longer length of stay on average[5]). This has two potential implications. First, if self-funders are choosing to use residential care at lower levels of health needs than the state would support, then this would suggest lengths of stay (at least for the purposes that DHSC want) are being overstated. Second, if self-funders have longer lengths of stay because need is in some way correlated with financial resources, then this has implications for how lengths of stay should be allocated to individuals in the FRM.

Given the concerns about the BUPA data we would strongly recommend that DHSC explores options for new data on lengths of stay – in particular, on uncompleted lengths of stay for a representative sample of the population. Our understanding is that DHSC have been examining data from Care UK for that purpose.

The distributions of lengths of stay in residential and nursing home care (and the distribution of duration of receipt of domiciliary care services that are described below) are assumed to be constant over time. There are little data to help inform whether this is a good or bad assumption. However, it is worth noting that it is at odds with the assumptions made in the PSSRU AD model. The PSSRU model assumes both that life expectancies are increasing and that the rates of disability are unchanged at each age. This would mathematically imply that the mean length of stay across the whole population is increasing (either due to more people experiencing care needs, or longer lengths of stay for the same proportion of the population needing care). DHSC should calculate the implications of the PSSRU assumptions for average lengths of stay over time, and examine how sensitive the FRM outputs would be to changing the assumed length of stay distributions in line with this.

The FRM outputs under the current funding system will be quite insensitive to the assumed length of stay (if total user numbers is unchanged). However, the implications of different reforms – specifically those involving caps on lifetime private contributions to care costs – are potentially sensitive to the assumed distribution of lengths of stay. This will be important to acknowledge when results from the FRM are produced and disseminated.

Lengths of stay in residential or domiciliary care are drawn from the appropriate distribution (where that differs for men and women in the case of residential care) and are allocated at random (conditional on sex) to individuals in the FRM. This random allocation is surprising – in particular, it implies that length of stay is assumed to be independent of age. This feels implausible, and indeed in the BUPA data there is unsurprisingly a strong correlation between length of stay and age. DHSC should consider relaxing this assumption. This may be important given generational differences in income and wealth. DHSC should also test the sensitivity of the model results to the allocation of lengths of stay that are correlated with wealth, in case the correlation between funder status and length of stay observed in the data is due to needs rather than choice.

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[5] Forder, Julien and Fernández, José-Luis (2011) *Length of stay in care homes.* PSSRU Discussion Papers, 2769. PSSRU, London School of Economics and Political Science, London, UK

Recommendations:

- Better nationally representative data on uncompleted lengths of stay should be obtained as a matter of priority. Depending on whether this reveals any big differences in lengths of stay around particular points of the distribution, and the policy reforms considered, and this may be important for the modelled implications of different reform options.

- *Un*til better length of stay data can be obtained, the results of the FRM should be tested for sensitivity to differences in assumed lengths of stay, and this highlighted alongside modelled results as appropriate.

- The implications of the implicit assumptions of the PSSRU AD model for changes in length of stay over time should also be calculated, and the effect of incorporating such changes in the FRM model should be tested.

- The allocation of lengths of stay to individuals in the FRM should be altered so that it depends on age. The sensitivity of the FRM outputs to introducing positive correlation between lengths of stay and income and/or wealth should also be examined.

Probability of having domiciliary care prior to residential care

DHSC take their estimate of the probability of receiving domiciliary care before residential or nursing care taken from a PSSRU survey of individuals admitted to care homes in 2005[6]. These data are far from ideal: a small number of disproportionately urban local authorities, high rates of non-response (or missing data), and sufficiently small sample size that DCLG deemed it inappropriate to use for the intended purpose of estimating the determinants of spending need.

We know of no better source of data from which the required probability could be obtained, and so would recommend that DHSC explore the possibility of new data collection to address this issue. (This may be in the process of being addressed, using new data from PSSRU.) Simple sensitivity analysis could be conducted to test the importance of the probability of previous domiciliary care assumed. Our judgement is that the main results of the FRM are unlikely to be greatly affected by this, and if so, this need not be a short term priority.

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[6] Robin Darton, Julien Forder, Andrew Bebbington, Ann Netten, Ann-Marite Towers and Jacquetta Williams (2006) Analysis to Support the Development of the Relative Needs Formula for Older People: Final Report, PSSRU Discussion Paper 2265/3, July 2006

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Recommendations:

- Test the sensitivity of the FRM results to changes in the probability of residential/nursing home care residents having previously had domiciliary care.

- Explore the options for new data collection to understand better the relationship between domiciliary care and residential care.

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Duration of receipt of domiciliary care services

Information on the duration of receipt of domiciliary care comes from the 2005 User Experience Survey.[7] The questionnaire, conducted by post, primarily asked about satisfaction with care services, but included one question about the duration of care receipt.

Although the survey had good coverage of a range of local authorities (according to the accompanying publication "the sample of authorities is broadly representative of the views of service users across England") and (for a survey) a large sample size (N = 28,511), there was a high rate of non-response by individuals asked to participate. Non-response varied across local authorities and was correlated with intensity of care receipt, which one might be concerned would be correlated with duration of care receipt.

Duration of care may also be underestimated for a second reason. The wording of the question ("For how long have you been receiving help from Social Services in your own home?") could lead to respondents answering about only a subset of their care – only help they have received from the council that happened in their home. With respect to the former, some people may not count care that they self-funded before becoming eligible. With respect to the latter, services outside of the home should still count towards our measure of "community care" spending by local authorities. (In the UES 48% of respondents receive only home care services. 21 per cent of the sample reporting receiving meals services, 22 per cent reported going to a day centre, 41 per cent reported receiving community nursing services and 8 per cent reported receiving another type of service.)

Given the quality of this data we would recommend that DHSC explore collecting alternative data on the duration of domiciliary care received. We understand that they are doing so, having recently gained access to data from Mears (a domiciliary care provider), which may provide a better source of data for this input to the FRM.

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[7] Malley J., Netten A. and Jones K. (2007) Using Survey Data to Measure Changes in the Quality of Home Care. Analysis of the Older People's User Experience Survey 2006, PSSRU Discussion Paper 2417/2, November 2007

Recommendations:

- Test the sensitivity of the model outputs to the assumed probability of having domiciliary care prior to residential or nursing home care. With the outcome of that determining the level of priority assigned, new data collection to elicit a better understanding of the relationship between domiciliary care and residential/nursing home care (and the transition between the two) should be explored.

- Examine the representativeness and quality of the new Mears data on the duration of receipt of domiciliary care services. Particular attention should be paid to the risk that this captures only a part of individuals' domiciliary care history, due to changes in provider over time. If these data are of sufficient quality then the FRM should switch to drawing a distribution of domiciliary care duration from this source. If these data are still not deemed to be either representative, or of sufficient quality, then further data collection should be considered.

Summary on care histories

The data available from which to estimate care histories for inclusion in the FRM is considerably lacking. While DHSC is probably using the best data available, and is actively looking to use new and better data sources, serious consideration should be given to new data collection in this area. The emphasis should be on national representation, uncompleted care histories, the interaction between different types of care receipt (and duration of those), and the association between care receipt (and duration of receipt) and individuals' characteristics. Such data are difficult and costly to collect, since it requires large sample surveys and specific surveys to capture the institutional population. However, data on the risk of needing different types of care over the lifecycle would be very valuable. It would have applications not just in modelling the costs and benefits of reforms to the funding of social care, but also in educating individuals about the chance of late life events, and the implications of that for individuals' private finance decisions and other life choices.

Recommendations:

- Serious consideration should be given to the collection of better data on the risk of needing care over the lifecycle, the durations of different types of care, and the association of these with individuals' characteristics. These data would ideally be at a nationally representative level that does not depend on provider. One option might be to add a consistent set of recall questions to a number of nationally representative surveys (for example, ELSA and the Health Survey for England (HSE)), in addition to a bespoke survey that attempts to boost the sample size from the care receiving population, and a bespoke survey of the institutional population. Clearly this will not benefit the FRM or the policy development process in the short (or even medium term), and doing it well would require significant resource. However, investment in this area would be sure to have longer term benefits.

4.3   Care costs

Unit costs for state-funded residential and nursing care are taken from local authority administrative data (specifically the 2016/17 Adult Social Care Finance Return, published the NHS digital as Personal Social Services: Expenditure and Unit Costs, England). These are the best data that could be hoped for in terms of capturing unit costs of state funded care. However, it is worth considering whether current unit costs are an appropriate baseline for forecasting future expenditure. Local authority spending has, on average, fallen by over 20% since 2009–10[8]. To reduce spending some councils have cut the fees that they pay to providers. It remains to be seen whether these unit cost cuts will be sustainable for providers in the medium-term, especially given pressures in the sector from the national living wage.

For self-funders data come from the Small and Medium size Enterprise (SME) survey 2016/17. According to the DHSC this covers around 60% of beds in the care market, but may be an underestimate of average fees as smaller providers tend to be cheaper. The department should also consider whether the SME data includes only fees charged to self-funders. If their data include state-funders in private-provided beds this could be an additional underestimate of the fees paid by self-funders. DHSC is probably right that the SME survey represents the best and most up-to-date data available. However, given the sensitivity of the FRM outputs to the assumed care costs, ongoing attention should be paid to other data sources that may become available on self-funders' care costs.

Separately for self- and state- funders, the distribution of costs is split into six equally sized groups, and the median of each group is calculated to get 6 cost levels. These act to proxy regional variation in the cost of residential and nursing home care. In the FRM, individuals are randomly allocated one of the 6 cost pairs. DHSC should explore the sensitivity of allocating individuals to care costs conditional on housing wealth, which is also likely to vary regionally in a way that correlates highly with care costs. It would be interesting to try allocating care costs according to region of residence (which is known in the ELSA data),

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[8] Neil Amin-Smith, David Phillips and Polly Simpson (2018) Adult social care funding: a local or national responsibility? IFS Briefing note BN227

but this would require PSSRU producing a regional breakdown of their demand forecasts in order that the grossing weights could be correctly applied, and meaningful results generated.

The cost of domiciliary care is taken from the same local authority administrative data as is used for state-funded residential and nursing care costs. Only one rate is used, for both self-funders and state funded users, based on the England-wide average unit cost. This is then scaled by an assumed number of hours to give the weekly rate for the four domiciliary care intensities.

There are two disadvantages to this. First, there are reasons to believe that privately funded domiciliary care is more costly than state provided domiciliary care (as is the case for residential care). This could lead to an underestimation of asset depletion in the FRM, and understatement of progress towards a cap on lifetime private care costs (if it is actual private spend that counts).

Second, unit care costs for home care services vary significantly around the country – ranging across Local Authorities from +35% to -23% of the England-wide average according to data from the PSSRU.[9] Even looking only at regions (which disguises a lot of variation) there are differences of +/-15%. Given that the FRM already proxies for regional differences in residential and nursing home costs by assuming 6 possible levels of costs it does not seem that it would be too difficult to incorporate differences in domiciliary costs in an analogous way.

Along with all other financial variables in the model, care costs are assumed to increase in line with inflation over time. This almost certainly means the model underestimates care costs in future (and by an increasing amount over time). The PSSRU Aggregate Demand model assumes that care costs will increase in real terms by 2.2% per year in future[10]. The assumption of no real cost increase over time has important implications for the FRM projections since, all else equal, higher costs relative to income or wealth increases state spending by reducing the proportion of costs covered by copayments, and increasing the proportion of users eligible for state assistance. The implications will be particularly large for funding reform options involving a cap on private contributions to care spending (particularly if the level of any such cap does not similarly increase over time). DHSC should therefore examine the possibility of including uprating of care costs over time in the FRM as soon as possible, and examine the sensitivity of the FRM outputs to the assumed rate of cost growth.

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[9] Personal Social Services: Expenditure and Unit Costs, England 2015/16, table 16.

[10] Raphael Wittenberg and Bo Hu (2015), Projections of Demand for and Cost of Social Care for Older People and Younger Adults in England, 2015 to 2035, Box 1

Recommendations:

- The assumption that unit costs for state-funded residential and nursing home care remain at their 2016/17 levels requires careful justification given the recent cuts to local authority spending on social care and concerns about the financial sustainability of providers. This is particularly important given the current lack of cost uprating in the model.

- Ongoing attention should be paid to the estimates of self-funded domiciliary care costs, and whether any new emerging data would suggest that revised estimates would be appropriate.

- Serious consideration should be given to incorporating different levels of domiciliary costs in the FRM, in a manner analogous to that for residential and nursing home costs, in order to proxy for regional variation in these costs.

- The sensitivity of the FRM results to introducing non-random allocation of care costs – in particular, introducing positive correlation between care costs and housing wealth, or correlation between care cost and region of residence – should be examined. This could have important implications, and the advantage of having cost variation in the FRM is likely to be considerably diminished without such correlation.

- The FRM should be adjusted to allow above inflation increases in care costs over time as soon as possible. At the very least the department should illustrate the sensitivity of the FRM projections to this. Furthermore, there is a strong argument for changing the baseline assumption to be that care costs increase in real terms by 2.2% per year, matching the assumption made by PSSRU in their aggregate demand model.

4.4   Assessment of eligibility for state support

Once individuals in the FRM have been allocated care histories, their eligibility for state support for that care is calculated (for every four week period since the start of their care history) based on their income, wealth, and the charging parameters of the system of state funding being modelled.

Individuals' incomes and wealth as observed in the ELSA data are assumed to be their income/wealth at the start of their care journey. This implicitly assumes that no one in ELSA has been depleting their assets before being observed in the 2010/11 data. This is probably not unreasonable. The ELSA data only includes individuals that still reside in private households, and very few of these individuals have partners in residential or nursing care. Reported wealth is therefore unlikely to have been affected by previous spending on expensive residential care. Individuals may have been reducing their assets to pay for domiciliary care, but this is probably not a large concern given average spending on domiciliary care relative to income for self-funders, and given that DHSC use a sample from ELSA that includes adults who are "about to need care" (discussed in section 4.1).

Income and assets are assumed to evolve over time in line with inflation (in the absence of being drawn down to fund care needs). This is not a bad assumption for non-housing wealth (see Crawford 2018), but it is likely to understate the growth over time in housing wealth.

Eligibility for state-supported care is currently calculated on the basis of assets, care type, and whether there is anyone else resident in the home. If an individual is eligible, then their income is used to determine how much must be contributed to the cost of care and how much is paid by the state. If an individual is not eligible, then the model assumes that the individual spends all of their income above a minimum amount before using assets to pay for care. The minimum amount they currently use is the same for state-funded individuals as self-funded individuals. However, given that self-funders are on average likely to be wealthier/with higher incomes, they may be used to a higher level of non-care expenditure, which would result in faster asset depletion than predicted by the model. The sensitivity of the FRM results to the assumed rate of asset depletion for self-funders should be tested, though this is not expected to make a significant difference to the model outputs.

Recommendations:

- Test sensitivity of the FRM outputs, particularly under alternative funding scenarios, to different assumptions about the evolution of housing wealth over time.

- Test sensitivity of the FRM to the assumed non-care spending of self-funders. This could involve not just a higher level of non-care spending among self-funders, but a level that also increases with income.

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5. Model review: Sensitivity

The projections produced by the FRM are uncertain. There are two main causes of uncertainty. First, there is randomisation in the model – in particular, the allocation of care histories and care costs to individuals. This could mean the results are sensitive to the particular draws allocated. Second, the model involves lots of assumptions that may not prove to be correct in future. Sensitivity analysis is used to test how big this uncertainty is, and how changes in assumptions affect the projections of the FRM.

5.1   Uncertainty caused by randomisation

The FRM uses randomisation: individuals are given care histories, with three components randomly drawn from the length of stay distributions implied by the data. They are also randomly allocated residential and nursing care costs. It is important to test whether (and by how much) the results of the model change when care pathways and care costs are re-randomis9ed.

Our understanding is that DHSC has done limited testing of the stability of the FRM results, by running the model 20 times. They report finding differences of <2% to total projected state spending under the current funding regime that arise from the different allocations of random care histories. We recommend that DHSC does further sensitivity analysis, increasing the number of runs from 20 to say 100 times, ideally changing both the randomly allocated care histories and care fees each time, and calculating the average and standard deviation of their estimates – not just for funding under the current system but also for every reform modelled as well. This range of uncertainty should be illustrated around their results when the FRM outputs are used in policy development or when any analysis is published.

Recommendations:

- Further analysis should be conducted to test the variation in the FRM results that arise from the randomisation in the model. This should be examined both for the current funding system, and any modelled reforms, using a higher number of replications than has been used to date.

- The degree of uncertainty around the FRM projections should be made explicit when the analysis is used.

5.2   Sensitivity to data and assumptions

The results of the FRM will also be sensitive to all the data and assumptions used in the modelling process. For example, if costs in future turn out to be different to those assumed then the projected level of state spend will be very different. Testing how the results of the model change when input data and assumptions vary is very important – especially for assumptions or data that are particularly uncertain. For example, if we know the data from which length of stay distributions are estimated is of poor quality and

therefore the resulting estimated distribution highly uncertain, we would be much more concerned about this if the FRM projections were really sensitive to assumed length of stay than we would be if the projections did not change much regardless of what was assumed about length of stay.

Sensitivity analysis conducted

DHSC has conducted some sensitivity analysis of the FRM. In particular, they have examined the stability of their projections for the proportionate cost of several possible funding reforms (relative to the current funding system) to user numbers, unit costs of care, the length of time spent in care and home ownership among the care using population. In their 'basic' sensitivity analysis they have examined the impact of simply changing their baseline assumptions by +/-10%. In their more 'advanced' sensitivity analysis they have examined the impact of using new or different data, or more nuanced changes in assumptions based on likely alternative possibilities. (In addition, the department have worked with PSSRU to test the sensitivity of their user number projections to i) Demography ii) Disability rates and intensity iii) Home ownership iv) Information care provision.)

It is worth noting that there is an important distinction between the sensitivity of the *level* of state spending and sensitivity of the *proportional cost* of a reform (and sensitivity of the *level cost* of a reform). Many factors are likely to have a large impact on the level of state spending, but a much smaller impact on the proportional cost of a reform – since they have a large impact on the level of spending under both the current and reformed funding system. DHSC has mainly focused on the sensitivity of the *proportional* cost of reforms as estimated by the FRM, rather than on the *level* cost of reforms.

A brief discussion of the sensitivity analysis that DHSC has conducted follows:

- *User numbers*
  The level of state spending is very sensitive to user numbers – increases in user numbers across all settings increase spending proportionately (i.e. a 10% increase in user numbers results in a 10% increase in spending). The *proportional* impact of reforms is, however, unaffected by increases in user numbers across all settings.

  Alternative user numbers that impact different care settings differently have different impacts. In general, increases in the number of individuals in residential and nursing care (the more expensive care settings) have a bigger impact on cost under the current system than increases in the numbers receiving domiciliary care. When considering the relative cost of different reforms, the effect of alternative assumptions about user numbers depends on the reform being considered. For example, increases in user numbers weighted towards residential care have a bigger impact on funding reforms involving caps on private care costs, while increases in user numbers weighted towards domiciliary care has a bigger impact on the projected benefits to state spending of including housing in the means test for domiciliary care.

  To give a sense of scale, the PSSRU's "Improved health" scenario (which assumes a 13% increase in residential and nursing home user numbers and no change in the number of users of domiciliary care) increases the estimated cost of implementing a £72,000 cap on private care contributions from around 18.6% to around 19.2%. In

other words, while the results of the FRM are sensitive to user numbers, the sensitivity is small relative to the estimated cost of the reform.

- *Care fees*
  Increasing care fees unsurprisingly has an important impact on the level of state spending (one that is slightly more than proportional as there is both increased spending on those eligible, an increase in those eligible, and faster asset depletion among those who not initially eligible). A change to the assumed level of care fees also affects the estimated proportional cost of reforms (in additional to the level cost of reforms). For example, a 10% increase in costs was estimated by DHSC to increase the proportionate cost of introducing an extended means test and £72,000 cap on private care contributions from around 19% to around 24%.

  This sensitivity is important as the cost of care is relatively uncertain. (Recent changes in the data used by DHSC to estimate costs of care led to 'decrease of hourly unit cost for community care by 12%; increase of state funded residential and nursing care costs by 3% on average; decrease of self-funder care fees by 8% on average'.) This emphasises the need for DHSC to consider carefully and justify its choice of baseline costs and to reassess the lack of cost uprating the in the FRM.

- *Length of stay*
  Changes in the assumed length of stay have a minimal impact on cost forecasts under the current funding system in DHSC's sensitivity analysis. However, it is worth remembering that this analysis assumes that user numbers remain as projected by PSSRU (and therefore, implicitly changes in the assumed length of stay are offset by changes in the proportion of individuals implied to ever need care). DHSC should conduct further analysis in which they test the sensitivity of their projections to changes in length of stay that also change user numbers (i.e. both are caused by some uncertainty about the underlying health of the population), but this would require coordination with PSSRU to vary the assumptions jointly in both the LTD and the PSSRU Aggregate Demand model.

  The estimated proportional cost of some reforms is sensitive to assumed length of stay – most notably reforms that involve caps on private contributions to care costs. However, as with user numbers, the uncertainty in the proportional cost seems relatively small when compared to the overall cost of the reform.

- *Home ownership*
  Under the current funding system, the only impact of a change in the assumed rate of home ownership is on the relative weights given to home owners and renters when aggregating the individual-level model results. Through this channel home ownership rates appear to have a very limited impact on the forecast costs of reforms such as caps on private care costs or increases in the capital thresholds in the eligibility means test. The assumed rate of home ownership does, however, substantially affect the predicted saving to the state from reforms that would include housing in the means test for domiciliary care. This suggests that DHSC need to be confident in their understanding of the home ownership rates assumed by PSSRU in their modelling.

- *Freezing thresholds*

By default, all of the parameters of the funding system (including any eligibility thresholds, minimum income guarantees, etc) remain constant in real terms in the FRM. However, in the past these have often been frozen in nominal terms – for example capital limits have been fixed since 2010. DHSC test the impact of freezing various combinations of these thresholds in nominal terms. Freezing income allowances and capital limits in the current system at 2015/16 levels results in 5% lower state spending in 2020-21, and 24% lower spending if frozen until 2035/36. By contrast, freezing the level of a lifetime cap on care costs increases state spending.

In summary, DHSC has tested the sensitivity of the proportion cost of reforms as estimated by the FRM to some of the main drivers of overall cost. This analysis has indicated that the projected costs of funding reform can, depending on the reform being considered, indeed be very sensitive to assumptions made about future user numbers, care costs, lengths of stay, and home ownership patterns. Of these, care costs and home ownership rates are potentially the most important for the proportionate cost of funding reforms (depending on the reforms being considered), while user numbers and care cost also have large impacts on the projected level of state spending (under both the current funding system and proposed reforms).

Further sensitivity analysis

There is much more sensitivity analysis that the department should do. Many suggestions were made in Section 3, in light of particular uncertainty around some of the data inputs and assumptions used in the model. We summarise these points here. In addition, DHSC should test the sensitivity of their results to changing a number of assumptions simultaneously, in order to get a sense of the extent to which they interact. We also recommend the department conducts sensitivity analysis of their distributional analysis, not just of the proportionate change in overall state spending.

DHSC has also mainly focused on the sensitivity of the *proportional* cost of reforms as estimated by the FRM, rather than on the *level* cost of the reforms . As was noted in Section 3, sensitivity of the *level* of spending or of the £ terms cost of a proposed reform requires joint sensitivity analysis where the relevant assumptions are altered in both the PSSRU aggregate demand model and the FRM. Such analysis has not been conducted to date and we recommend it should.

Recommendations:

- More sensitivity analysis should be conducted where the assumptions being examined are varied in both the FRM and the PSSRU aggregate demand model. This is important in order to illustrate the sensitivity of the *level* of spending under a reformed funding regime to uncertainty about the future, and to illustrate uncertainty around the estimated level cost of a proposed reform. This is particularly important for assumptions around user numbers, care costs, and length of stay (where user numbers may also want to be simultaneously varied).

- In addition to the sensitivity analysis conducted so far, the sensitivity of the FRM results should also be explored with respect to:

   – Changes in the assumed levels of income and wealth of the base sample over time

   – Changes in the level of non-care spending of self-funders (which affects the rate of wealth depletion)

   – Differences in assumed lengths of stay (in particular, those implied by PSSRU AD model's assumptions around disability prevalence and life expectancy, and those suggested by new data that becomes available – such as that from Care UK)

   – Introducing a positive correlation between length of stay and an individual's income and/or wealth when care histories are allocated

   – Changes in the assumed probability of residential or nursing home residents having previously had domiciliary care

   – Introducing some non-random allocation of care costs across individuals, for example based on reported region of residence in ELSA or positively correlated with housing wealth

- The sensitivity of the FRM results should also be examined with respect to changing a number of assumptions simultaneously – for example, to illustrate "really bad" or "really good" scenarios. This would have the advantage of highlighting how particular assumptions might interact with one another.

- The sensitivity of distributional analysis to the assumptions made in the FRM should also be routinely tested, alongside the sensitivity of the overall projected state spend (particularly where the overall projected state spend is found to be sensitive to the assumptions made).

5.3   Using and presenting sensitivity analysis

The uncertainty around modelled results arising from the randomisation in the model should be presented alongside the results themselves (this could, for example, be done using 'confidence bands' on graphs published). Sensitivity of the modelled results to the

underlying assumptions should also be prominently illustrated and/or discussed. It will be important to be clear about the sensitivity of the proportionate cost of reforms, the level cost of reforms, and the level of spend under particular reforms (which require slightly different analyses).

It will also be important to explain intuitively what is driving the modelled results to be sensitive (or not) to certain underlying assumptions. For example, explaining that anything that makes the total number of users, or total cost, under the current funding system larger will increase the level of state spending under both the current and alternative funding systems, but will only increase the proportional impact of reform on cost if these new users disproportionately qualify for state funding.

There is also some illustrative and descriptive analysis that could be produced that would help users understand why the results produced by the FRM are, or are not, as sensitive as one might expect to changes in certain assumptions. For example, producing a graph of the distribution of costs that arises from the distribution of length of stay in a residential care setting combined with the average cost of care (in the highest and lowest cost 'area'), and combining that graph with the level of a proposed cap on private contributions to care, could help explain why changes in the length of stay distribution have only a relatively small effect on the overall cost of the reform.

6. Model review: Using the FRM to evaluate the impacts of reforms

In this section we consider whether the FRM is suitable for answering the kind of questions that DHSC might be interested in, in terms of the impact of potential funding reforms. We consider, in turn, the use of the FRM for the assessment of: the impact on the overall level of state spend, the distributional impact across the country, and the distributional impact across individuals.

6.1 Impact of funding reforms on the overall level of state spending

One of the most important questions surrounding any proposed funding reform is the likely impact on the overall level of state spending on social care.

Subject to the uncertainties surrounding the data input into the model, and the assumptions made, (discussed in more detail in Sections 4 and 5) the FRM model produces the desired projections of the proportional difference in state spending on social care under alternative state funding eligibility criteria. When combined with the outputs of the LTD, this yields a projection for the level of state spending under alternative funding regimes, and consequently the difference in the level of state spending between different funding regimes.

It is important to recognise, however, that there are potentially some costs that would arise from funding reforms that are not modelled. These could include:

- *Transitional costs*
  Spending on adult social care varies significantly around the country, and very little of the variation is explained by the government's most recent assessment of how much they *think* different areas need to spend (see Phillips and Simpson 2017).[11] It is therefore possible that despite the existence of national eligibility criteria for state-supported adult social care, the eligibility criteria implemented in practice vary considerably around the country.

  It seems likely that funding reform would lead to more rigorous enforcement of eligibility criteria or greater public awareness of their entitlements (particularly if a lifetime cap is introduced). To the extent services in some parts of the country are not meeting minimum national standards; this could result in a one off increase in the level of social care spending to a permanently higher trajectory as a result of equalising service standards around the country.

- *Administration costs*
  Changes to the system of social care funding would likely entail increased administrative costs (principally associated with assessing individuals care needs and financial situation) that are not modelled in the FRM. If these increases are proportionate to increases in spending on care services, then this will be captured

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when the FRM output is combined with the LTD. However - in the case of the introduction of a lifetime cap on care costs - these increases would be more than proportionate to the increase in user numbers as the policy would likely require regular monitoring of all individuals with care use (regardless of whether they may be eligible for state funding at that point in time) in order to keep track of their progress towards the cap. DHSC currently produce an off-model estimate of these assessment costs, which should be presented alongside the main model outputs.

- *Impact on related areas of spending*
  Eligibility for publicly funded social care services can affect benefit entitlement and demand for other public services (including NHS services). The FRM models the reduction in attendance allowance spending (a disability benefit for the over 65s) that would result from increased state funding of residential care. The impact on NHS social care spending (through the continuing health care programme) and benefits for carers are, however, not modelled.

These costs should be acknowledged, and if possible and appropriate, cost estimates for these should be provided alongside the cost modelled by the FRM. Our understanding is that DHSC do this for, for example, the additional assessment costs that might be associated with introducing a cap on private contributions to care costs.

6.2   Impact of funding reforms across the country

The relative cost of reforms to the funding of social care will differ around the country depending on unit costs, the type of care services needed by local residents (principally the split between domiciliary and residential care), and the income and wealth of local residents. The cost could also evolve differently over time depending on local variation in economic and demographic trends.

Given that social care is funded by local authorities, ideally DHSC would model the impacts of funding reform options at a local authority level. One may even want to consider whether, and how, the cost of reform options differs depending on whether progress towards a cap on private cost was to be calculated using local unit costs or a nationally fixed average cost). The locally estimated costs could then be compared with indicative forecasts for different local revenues (e.g. based on historic business rates and council tax revenue growth by local authority).

The difficulty is that the FRM is not granular enough to conduct analysis at the sub-national level, let alone at the local authority level. The sample sizes from the underlying ELSA data are not large enough. DHSC should therefore consider carefully how the local implications of proposed funding reforms can be examined, likely using 'off-model' analysis.

6.3   Impact of funding reforms across individuals

A key advantage of a micro-simulation approach to modelling the impact of potential funding reforms is the opportunity to conduct distributional analysis. In other words, rather than simply looking at how the overall level of state spending will differ, the

distribution of effects – and in particular, how individuals in different circumstances will be affected differently – can be examined.

It should be remembered that the FRM only includes the care needing population. Therefore for any distributional analysis that is to be of the population as a whole, rather than just within the population of care users, the outputs of the FRM need to be recombined in an appropriately weighted way with data on the non-care using population. Our understanding is that DHSC do this by using the ELSA data on *all* those aged 65 and over, identifying (for example) quintile bounds of income and wealth, and then associating each individual in the FRM to population level quintiles based on those bounds. Any state spending on that individual is then determined to be state spending on that income/wealth quintile. This approach will work for distributional analysis where the outcome of interest is not affected by the number of non-care users (such as total state spend or number of users), but a different approach would be required if other outcomes (such as proportion of a quintile who use state funded care, or average state spend across all members of a quintile) became of interest.

There are two important issues DHSC need to be careful with when presenting any distributional analysis:

- First, the effects of some funding reforms will change substantially over time (even in the absences of changes in the underlying characteristics of the population). In particular, reforms that introduce caps on the amount of time individuals must privately fund in care, or the total level of private spending on care, may have little impact in the short term, but longer impacts in the medium term as more individuals have the opportunity to reach such a cap. This will affect not just the overall number of beneficiaries, but also the characteristics of beneficiaries.

- Second, the distributional analysis that one would ideally like to conduct is examining *for a given generation* who wins/loses from a reform (and by how much) *over their lifetimes*. Unfortunately this question cannot be easily answered using the FRM as it stands, since unlike a traditional dynamic micro-simulation model, the FRM does not follow a generation from 2020 through the future until death. The FRM can at best inform about whom, in a given year, has gained/lost given their care history to date. While this can be conditioned on age, it is not necessarily representative of the generation's lifetime experience as a whole, as some may have future care needs, while others may have already passed away and be in effect missing from the sample. The lack of ability to conduct such distributional analysis is probably the biggest structural problem with the FRM, particularly in light of some of the policy reform options likely to be considered.

With these important issues in mind, there are a number of individual characteristics across which one would like examine the impact of proposed reforms. The FRM is well suited to examining the distributional impact across some of these, but less so for others.

- *Distribution of care needs*
  The main motivation for state funded social care is insurance – to pool risks and redistribute from those who are 'lucky' with respect to health to those who are 'unlucky'. It is therefore important to examine how different funding reforms impact individuals differently depending on their lifetime care needs. Subject to

the caveats above (i.e. that the time period in question matters, and that any given period does not reflect the lifetime experience of a cohort) the FRM does permit examining how proposed reforms impact on individuals differently according to their care histories to date (either in terms of duration in care, or total spending on care). It is also possible, and interesting, to examine how the impact of reforms differs according to the joint distribution of care histories and income, thereby illustrating how the insurance aspect of different systems varies across the income distribution.

- *Wealth and income*
  There is considerable political concern about how the impacts of proposed reforms would impact on those with different levels of resources. Individuals in the FRM should be representative in terms of their income and wealth, and so (again subject to the caveats above) such distributional analysis can be constructed. There are, however, three notes of caution. First, wealth is assumed to be drawn down over time to fund care, in a way that potentially differs depending on the funding reform in question. DHSC's approach for dealing with this (examining how the impacts of the reform differ with respect to wealth *at the start of care histories*) seems reasonable. Second, there are generational differences in income and wealth that mean 'raw' positions in the income/wealth distribution could be highly correlated with age, as will be the impact of reforms (since care needs are also highly correlated with age). To avoid any spurious correlations here, distributional impacts by income/wealth should probably condition on age. Finally, wealth and income are highly correlated, and the underlying ELSA sample only consists of 1,136 individuals. The impact of reforms across individuals according to the joint distribution of income and wealth should therefore be treated with caution because of the underlying sample sizes involved.

- *Other demographic characteristics (age, sex, ethnicity)*
  DHSC presumably want the capacity to conduct distribution analysis across the many demographic characteristics that are common to government impact assessments. Of these, sex is easy to consider using the FRM, since the model is representative by sex. Similarly, the distribution of effects by current marital status could easily be produced. Ethnicity is not possible due to both the small sample sizes in the underlying ELSA data and because the PSSRU aggregate demand model does not provide projections by ethnicity. Age is complicated – while the FRM is representative by age, and so technically distributional analysis can be produced, any such analysis would need to be carefully interpreted due to lifecycle patterns in care use and generational differences in financial resources.

- *House values / housing tenure*
  The FRM aims to be representative by housing tenure, and so it is possible to illustrate how the impact of reforms differ according to whether individuals are owner-occupiers or not. The impact by housing wealth may also be interesting – however, any distributional analysis along this dimension would have to be interpreted carefully, as the FRM currently does not have any formal geographical variation, and does not have care costs that correlate with housing wealth, when in fact there may be a strong correlation in reality that would affect the distributional assessment of modelled reforms.

- *Care setting (domiciliary, residential, nursing home care recipients)*
  The FRM also allows distributional analysis to be produced across individuals in different care settings at a given point in time. This may be useful in explaining the mechanisms through which individuals gain or lose from proposed funding reforms. However, again, any such distributional analysis would need to be interpreted carefully as the FRM only lends itself to snapshot distributional analysis at a given point in time, and individuals are likely to transition through different care settings over their lifetimes.

In summary, there is lots of distributional analysis that the FRM can do, but in all cases careful thought should be given as to whether there are important timing, generational or other conflating issues that need to be discussed or controlled for.

Recommendations:

- In all distributional analysis the results will need to be carefully presented and interpreted to be careful of timing effects, lifecycle effects, and confounding factors (such as generational differences in resources).

- Distributional analysis with respect to history of care needs should be illustrated, to highlight the different degrees of insurance provided by different funding regimes.

- To the extent possible, transition and administrative costs associated with reforms should be described alongside the costs modelled within the FRM.

- The FRM cannot easily be used to compare the lifetime impact of different reforms for a particular cohort of individuals. If this is crucial for policy discourse then the FRM will need adapting, but doing so will involve a reasonable amount of work and will require additional data/assumptions. In the short term DHSC will just need to be explicit about the distributional analysis that can and cannot currently be modelled, and ensure to present and interpret the distributional analysis that can be done appropriately.

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7.   Conclusions

In this report we have attempted to give a thorough independent assessment of the DHSC's Adult Social Care 'Funding Reform Model'. We have reached our understanding of the model, and drawn our conclusions, after a short but intensive process of reading written documentation and bespoke notes from DHSC, reading papers around the underlying data sources, and discussing the model at length with DHSC analysts. We would like to thank those analysts for being so helpful, forthcoming and candid throughout the work.

In general our assessment is positive. The FRM, while not the best technical solution to modelling the impact of potential funding reforms, is a good compromise given the constraints the department currently faces in terms of analyst turnover and typical skill set. The main downside of the approach taken is the inability to easily model the lifetime implications of funding reforms for a particular generation of individuals. However, the overall cost to the state in any given year can be projected, and distributional analysis on many interesting margins can be examined – this analysis will just require appropriate and careful interpretation.

Some of the data underlying the FRM are far from ideal – in particular that relating to individuals' care histories. DHSC is aware of this issue, and has already been seeking to obtain further data to assess and update the assumptions used in the FRM. We would strongly encourage them to continue this process, and in particular seek to obtain nationally representative data (not just data from particular care providers). While potentially expensive to collect, such data would find considerable use beyond being used in the FRM. Data on the risk of needing care over the lifecycle, and the association of that with individual characteristics, are important not just for projecting state spending, but also for informing individuals about late life risks, and helping them to make appropriate decisions in light of that.

Given the uncertainties in many of the data sources and assumptions made in the FRM, sensitivity analysis is vital. DHSC have already done some of this, and we have made a number of recommendations for further sensitivity analysis. The results of this should be presented alongside projections for the modelled costs of reform options, to ensure that policy makers and others are appropriately informed about the degree of uncertainty involved, and what the main drivers of alternative outcomes could be.

In addition to recommending additional sensitivity analysis, we have made a number of other recommendations throughout this report, ranging from ones we believe to be straightforward (e.g. modelling distributional analysis with respect to care histories) to ones that are potentially more difficult (e.g. incorporating generational differences in income and assets), and from ones that we feel are relatively important (e.g. incorporating cost uprating in the model) to those that we expect to be less so (e.g. updating the ELSA base data used). Not all of these suggestions can be implemented in the short term, and we leave it to DHSC to decide which recommendations they consider sufficiently feasible and urgent to focus on in the near future.

One final broad recommendation we would like to make is that DHSC see their FRM as a long term important resource, and continue to invest in the development of the model even when the short-term policy making pressures have subsided. We would recommend

that DHSC reconsiders whether a more traditional dynamic micro-simulation model would be better suited to their needs in the longer run, and whether such a model could be maintained. DWP may be able to give some guidance as to the resources and processes required, given their experience with their PenSim2 model. Even if the current FRM structure is maintained, there is much about the model that could be finessed and improved. There would be considerable benefit to updated and better documentation being written, and collated in one place, to protect DHSC's institutional knowledge from future staff turnover. This should also be made publicly available – both for reasons of transparency, and because further independent scrutiny is likely to result in additional suggestions for improvement. Finally, in addition to investment in the FRM itself, there is a lot to be gained through investing in better data collection now that would improve the degree of confidence in the modelling outputs in future. It is of no doubt that this would be of benefit to future policy making – not just in social care funding reform, but around social care more widely.