



NHS East Midlands

Health and Social Care Dementia Modelling

Developing Commissioning Capability

Project Report

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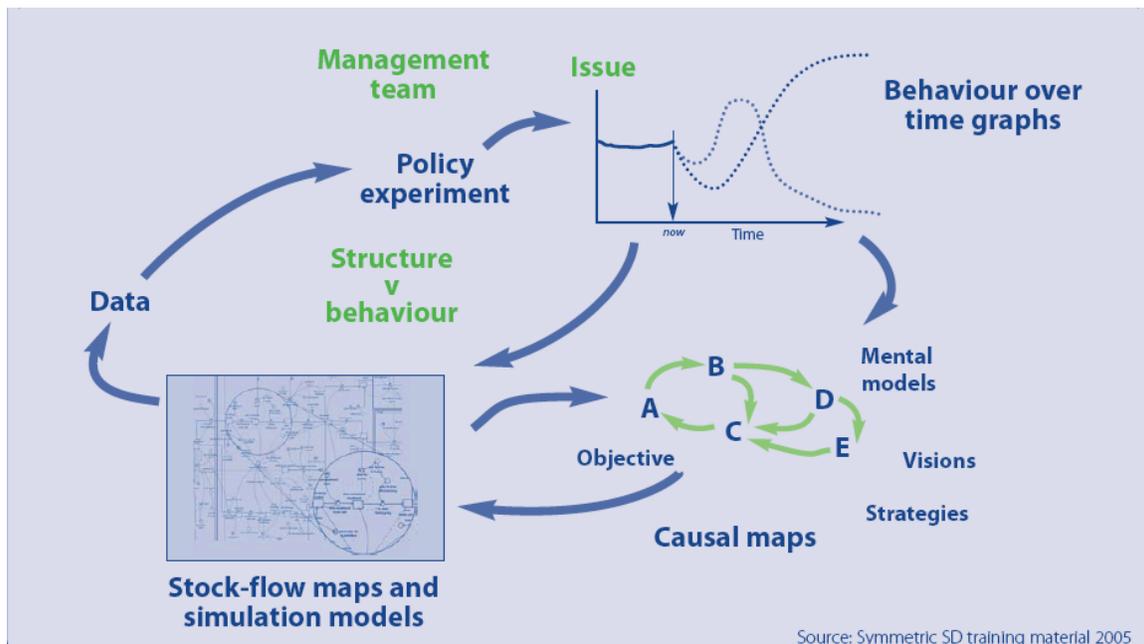
1 Introduction

- 1.1 Symmetric^{sd} was commissioned by the East Midlands Development Centre (EMDC) and partners to develop a System Dynamics ‘whole system’ model focusing on dementia. The aim was to enable commissioners to test and demonstrate the most effective routes for implementing their dementia strategies.
- 1.2 NHS Lincoln agreed to be the development site for the model. Meetings took place from May through to September 2010 to progress the design of the model, agree the range of service initiatives to be tested and review the results. Further development work took place and the model was launched at a regional event on 18th November 2010. Local implementation workshops were then held in 3 locations through to the end of January 2011.
- 1.3 The project is now complete and this report sets out the key learning from it.

2 The nature of System Dynamics Modelling

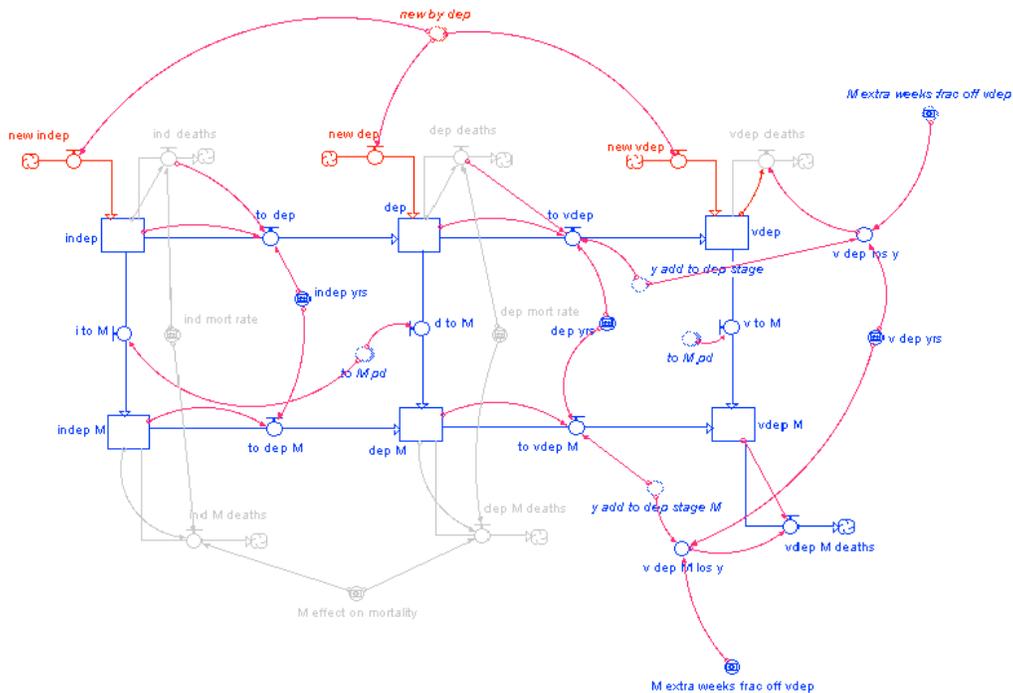
- 2.1 Symmetric^{sd} is a consultancy specialising in systems thinking and System Dynamics modelling within the public sector. Systems thinking is an innovative approach to exploring complex issues. It helps managers, policy makers, clinicians and practitioners develop a systemic view of their organisation; and understand how actions in one part may give rise to effects elsewhere. It helps people build, explore and visualise perspectives of their organisation and their operating environment using a body of qualitative tools and techniques.
- 2.2 System Dynamics is the well-established, practical and theoretical underpinning of systems thinking. System Dynamics uses powerful ‘stock and flow’ process mapping and quantitative computer simulation modelling to enable stakeholders to test alternative or new policies for consistency and robustness before implementation and without risk. In particular, System Dynamics is capable of highlighting some of the unintended consequences of decision-making as well as giving greater confidence in the achievability of intended consequences.
- 2.3 We work with a modelling group established jointly with the client. The process of then producing a model is an iterative one and is summarised below:

Figure 1 - System Dynamics Modelling Process



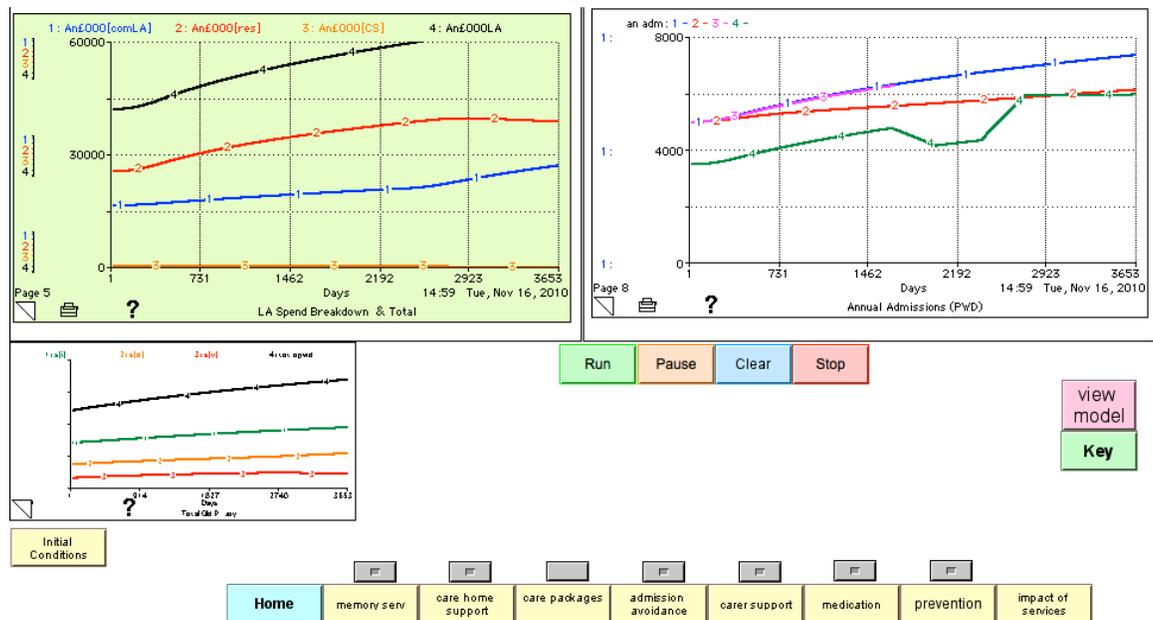
- 2.4 The process will usually begin in the lower right hand quadrant, where we establish some of the mental models and causal relationships relevant to the field of study. This enables us to create the stock/flow maps that represent those relationships. These are populated by data, shown in the upper left hand quadrant. The model is run and the results displayed in graphical format.
- 2.5 Typically, we will run through this process at least five times and sometimes significantly more frequently, depending on the complexity of the issues being modelled.
- 2.6 The stock/flow map for the Dementia model is shown in Figure 2 overleaf. The process is similar to that of developing a care pathway, but there are some significant differences. The Stock/Flow map:
- Is dynamic - it contains data, and data that is capable of updating itself
 - Includes feedback loops that enable the model to represent relationships, and impact of change, across a system
 - Shows the impact of change over time

Figure 2 – Dementia Model – Stock/Flow Map



- 2.7 Whilst the process of developing a model requires specialist knowledge and expertise, the use of the model once complete is much more straightforward. The model is operated through a user-friendly dashboard, which requires only minimal training. A version of that used for the Dementia model is shown in Figure 3, overleaf.
- 2.8 This displays the main outputs from the model - graphs, indicating change over time. The examples shown are based a run over a 10 year period. The diagram also shows some of the basic controls within the model that allow the settings and assumptions behind the model to be varied. The model is designed for use with local data, so can be tailored to any given setting. The data required is relatively straightforward and in general does not require separate data collection. The data categories used in the model might differ from those normally found in service databases, requiring users to make informed estimates based on some secondary analysis. Data can be derived from any known research in a related area or the best information available from the modelling group.
- 2.9 The model also includes assumptions about how the local health and social care system and components within it, work. These assumptions can also be varied locally should more appropriate information be available.

Figure 3 – Dementia Model Dashboard



2.10 So, in summary, System Dynamics models, in conjunction with our applied method:

- Enable the ‘Whole System’ to be represented - reflecting the complex and dynamic relationships within Health and Social care
- Act as a ‘Flight simulator’ for strategic decision making - offering organisations risk free planning and testing with immediate results
- Offer the opportunity to build a more representative business case - taking account of impact across Health and Social care services and organisations
- Enable the process of engaging stakeholders - supporting the ‘ownership’ of the results through group model building

3 Developing the East Midlands Dementia model

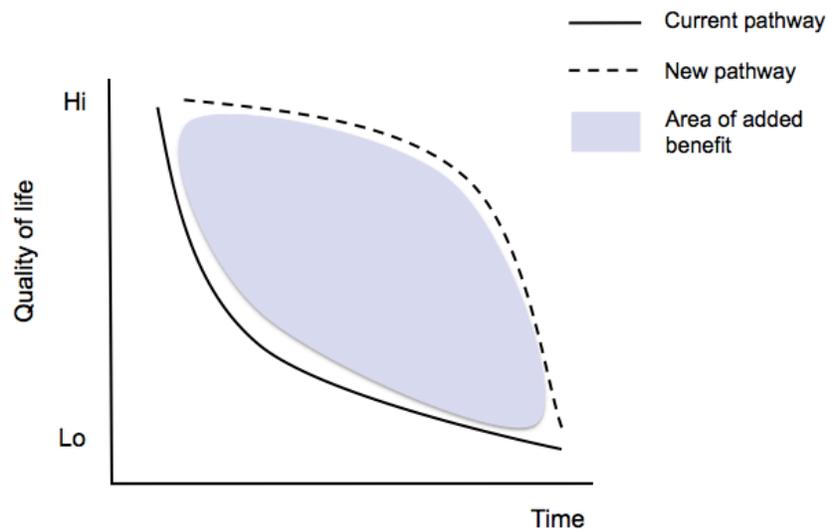
Background

3.1 We used the process set out in Section 2 above to develop a Dementia model for the East Midlands Region. The broad context for the work in the East Midlands is shared by the whole of England and was set out in the National Dementia Strategy in 2009¹. It indicated that over the next

30 years there would be a doubling in the number of people with dementia and a trebling in cost.

- 3.2 For commissioners, especially in the current economic climate, this poses challenging questions about priorities - essentially whether to fund this growth at the expense of other services. The project was interested in finding an alternative strategy - getting better value from the resources available and seeking to avoid some of the expected cost increase by adopting new service initiatives.
- 3.3 To test the impact of these initiatives, 2 performance measures were adopted:
 - *Impact on cost* - against the underlying growing cost curve, what would be the net impact on cost of introducing new service initiatives? Could the rate of growth be contained or even reduced?
 - *Impact on admissions to hospital and care homes* - compared to existing service models, what would be the net effect of the new service initiative on the use of higher cost hospital and care home facilities?
- 3.4 Impact on admissions was also seen as a proxy quality measure. Whilst recognising that admission to hospital and care homes is the most appropriate option for some users at specific times, improving the ability of the system to maintain support for people at home would be the basis of a strategy to improve the quality of life for people with dementia. This is represented in Figure 4 below.

Figure 4 - Optimising the quality of life for people with Dementia



Key features of the East Midlands model

3.5 The model developed for the East Midlands region has the following key features:

- **Population** - the model focuses on the population aged 65 and over with dementia. This is stratified within the model into 3 groups, formed as a composite of the level of need and location of service use. The model recognises that movement between groups for people with Dementia is usually towards an increasing level of dependency. It also recognises that at any one time a proportion of the population will not have been diagnosed. In the model, patients are diagnosed following progress through a memory service. The 3 groups are:
 - Independent - those with dementia, usually living at home, supported by carers and not using any specific dementia services
 - Dependent - those with dementia, usually living at home but in receipt of specific dementia services
 - Very Dependent - those with dementia, usually living within a care home setting

- **Service initiatives** - there are 6 initiatives within the model, each of which has been described locally through the modelling group and refined through wider discussion. The model recognises that any given initiative will have a variable impact on the population groups, and indeed some will only be targeted at one specific group. The cost, activity and degree of impact are user defined. Where research is known, the model uses the relevant data; the modelling group fills any gaps. The initiatives chosen for the East Midlands were:
 - **Memory Services** - access for people with dementia has the effect in the model of slowing down the rate of transit between the 3 groups; the services described and costed are generic and can be delivered by any provider. The effect is researched², but as with the rest of the model, the settings are completely user defined. The model is usually run with this (and Medication services below) switched on as part of the base run indicating that there is already an underlying level of Memory service in place; should this not be the case in any given locality then the service can be switched off as part of the base run and added as new initiative

- *Care Home Support* - the assumption is that external support and training for Care Home staff from a specialist team enables the Care Home to better support users and avoid hospital admission, especially at times when users might display challenging behaviours, for example post UTI
 - *Admission Avoidance* - the model includes support from a specialist team for people with dementia living at home; the suggestion is that this enables unnecessary acute admissions to be avoided
 - *Carer Support* - the impact in the model shows the reduction in demand for care home placement from people with dementia based on the delivery of support to their carers; the impact is researched and shows up to a 28% reduction³
 - *Medication* - the model reflects the suggested impact of the earlier adoption of appropriate medication regimes by slowing down the rate of transit between the population groups. The principles are researched⁴, but again can be defined by users
 - *Prevention* - the model reflects the impact of health promotion programmes by controlling the new incidence of dementia; users determine the level, although there is some research available as a guide⁵
- **Output graphs** - these cover a 10-year period going forward and include the effects of the service initiatives for both the NHS and Local Authorities. Having established a baseline run, the cost graphs enable the net effect of the service initiatives to be measured. Additional graphs look at activity changes, such as hospital Occupied Bed Days. This, together with the impact on specific areas of LA expenditure, such as the balance between Residential Homes and Care Packages, also act as a proxy indicator of quality of life for people with dementia
 - **Dashboard** - as indicated previously, the dashboard screen is where users of the model will spend most of their time. It houses the output graphs, described above, plus the basic controls to enable users to run the model. It also accommodates control switches to enable the service initiatives to be turned on or off, for the whole or part of the 10-year period. Finally, it provides links taking users to specific parts of the model where the background data and/or settings can be input, as follows:
 - *Population* - covering the basic population data for people aged 65, broken down into the 3 groups (independent, dependent and very dependent) with incidence and prevalence data applied to each group

- *The 6 service initiatives* - allowing changes to individual cost, activity and impact settings
 - *Care packages* - enabling the basic costs of NHS and LA of care at home to be set
- *Demand and Capacity tools* - for some service initiatives (Memory Services, Admission Avoidance and Carer Support) we have included sub-screens that show the level of potential demand for the given service from the local population, compared to the supply, as indicated by the service level settings used. This ensures that in using the model, the potential for overcapacity can be monitored and eliminated

4 Key learning points

4.1 The model has been rolled out for use in the East Midlands and we are adapting the model for use with other clients. So the product is live and we will continue to get feedback on its use, from a range of sources. At this stage, we believe that the key learning points from the project and use of the model to date, have been as follows:

i) On the outcomes of using the model

- The underlying trends in the growth of people with dementia and the costs of care show that the ‘do nothing’ option will be very challenging for commissioners. For the pilot population (c 700k) and the indicative costs used, this would mean at the end of the 10 year period of the model, no discernible improvement in the quality of life for people with dementia; and an increase in annual spend as follows:
 - For NHS services - approx. £19m pa (and rising) or 53% above current spend on dementia
 - For LA services - approx. £27m pa (and rising) or 57% above current spend on dementia
- Implementing the individual service initiatives included in the model will reduce this level of increase but may not produce actual net savings against the starting point. However, there are some real opportunities for cost avoidance. In addition, the model shows that there are equally opportunities for delivering an improved quality of life for people with dementia. As a broad indicator, the current work shows the following effects:

Service initiative		NHS impact		LA impact	
		£'s	Qual	£'s	Qual
1	Admission avoidance	∩∩	∩∩	-	-
2	Care home support	∩	∩	-	-
3	Carer support	∩	∩	∩	∩
4	Prevention	∩∩	∩	∩∩	∩

Key	
∩∩	Strong positive impact
∩	Positive impact
-	Neutral impact

- The results of local modelling will assist commissioners in making informed choices, especially in conjunction with local partners. The costs and benefits to agencies may not be shared equally, but the model shows this and can help provide a platform for appropriate negotiations.

ii) On the process of developing the model

- System Dynamics as a method suited the complex environment of dementia services
- The process of forming the modelling group ensured a greater shared understanding of the issues being faced by all the stakeholders
- The process of group model building is helpful in building broader ownership of the need for change and acceptance of the consequences of it. Formal consultation will still need to be considered; but the level of preparatory work and local involvement that would be able to be demonstrated will be significant in helping to make a strong case for any change, and delivering the change quickly

- Work outside the modelling group, especially with wider Regional and National stakeholders, helped broaden the applicability of the model to other health and social care settings

iii) On training and support

- As part of the project we ran a regional launch event followed by 3 local workshops to assist with implementation of the workshop. Over 60 people were involved from throughout the East Midlands. The follow-up sessions were important in to re-inforce the use of the model at a local level
- Our experience is that users generally navigate their way around the model fairly easily - the ‘Dashboard’ screen design helps with this. In addition, the model is provided complete with on screen help menus and a full user manual. These should be sufficient to enable new users to find their way around the model. We have found, though, that some external support is helpful if users wish to undertake a more rapid familiarisation with the model and so begin to use the model earlier
- As with all of our SD models, the Dementia model will work best when operated by an inter-agency group of Commissioners, Public Health specialists, Dementia Clinicians, the Voluntary Sector etc. Data analysts will be helpful in sourcing some of the core data for the model and will play a key part in its use. However, the model relies on more than a simple data set - it needs local groups to input details of how services operate locally, make assumptions about impact and review the results against current practice. At its best, the model will be an active planning and commissioning tool

4.2 As part of the development process, the EMDC funded the purchase of a distributed software licence for the model that will allow an unlimited number of users. This means that the model is now available for commissioning groups as a free good, enabling them to load local data and review local results. The only caveat is that, should they enhance the model (by funding, for example, the addition of more service initiatives) then commissioners should similarly license their version for distributed use. In this way, a process of continuous improvement can be supported and those who originally funded the initial model can benefit from subsequent additional development and investment by others.

5 Conclusions

- 5.1 It is clear that commissioners face significant challenges in commissioning Dementia services, given the growth in the incidence and cost projects. This is also at a time when significant efficiencies are expected in the NHS and Local Authorities are facing major reductions in budgets. The model offers a way of understanding the impact of all those factors locally - within individual agencies and across partnerships.
- 5.2 The underlying structure and assumptions within the model seem robust, with some elements based on existing researched effects and others resulting from informed discussions within the modelling group and with wider regional and national agencies. In use, the model enables commissioners to feed in their local population data. They are also free to alter the underlying assumptions if they wish. This is important, as there may be longer-term developments or other emerging research that demonstrates different effects; and so we have tried to ensure that the model remains future proof.
- 5.3 We are grateful to the EMDC and its partners for the opportunity to work with them in the development of a new way of supporting the commissioning of Dementia services. Our particular thanks go to colleagues at NHS Lincoln for trialling the model; and to all those who took part as members of the Modelling group and secured its rigorous development. We wish you all luck in its future use.

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References

- ¹ Department of Health, *Living well with dementia: A National Strategy*, February 2009
- ² Bannerjee, S et al, *Improving the quality of care for mild to moderate dementia: an evaluation of the Croydon Memory Service Model*, International Journal of Geriatric Psychiatry 2007; 22: 782–788.
- ³ Mittleman, Mary S et al, *Improving caregiver well-being delays nursing home placement of patients with Alzheimer disease*, Neurology, 2006;67;1592-1599
- ⁴ Rait, G et al, *Survival of people with clinical diagnosis of dementia in primary care: cohort study*, BMJ 2010;341:c3584
- ⁵ Ritchie, K et al, *Designing prevention programmes to reduce incidence of dementia: prospective cohort study of modifiable risk factors*, BMJ 2010;341:c3885