The use of SD methodology to develop services for the assessment and treatment of high risk serious offenders in England and Wales.

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Abstract

*In England and Wales, national government has introduced a range of policies for dealing with the most dangerous offenders. These include new sentencing arrangements, new treatment programmes, and enhanced supervision of those released on licence. Policy makers needed to estimate the impact of this policy on the prison population and to consider how much treatment and community supervision capacity would be needed over time. They worked with a small SD consultancy to develop and build a model using **ithink** software, to enable a variety of scenarios to be tested, adopting a group model building approach. A number of staff received training in SD, including model building. The paper outlines the policy background, model structure and examples of scenarios. As well as being a practical application of SD to a sensitive area of public policy, the project is an example of what can be achieved within a relatively short intervention.*

Introduction

System Dynamics is being used extensively by the authors to assist decision making and integration of policy implementation along long service user flows crossing multiple agency boundaries. The work has involved national level studies to influence government policy on delayed hospital discharges (Wolstenholme et al, 2004a) and more recently to assist local heath and social care communities in the UK to interpret and apply national policy frameworks for older people (Wolstenholme et al, 2004 b and c) and for mental health reform (Wolstenholme et al 2006). The system described in this paper is at the interface between health care and criminal justice, the treatment of dangerous offenders having severe personality disorder.

Background policy and motivation

In England and Wales, an aim of criminal justice agencies is to protect the public from serious violent or sexual offenders. The impact on victims and their families is clearly very significant. More generally these offences also have a disproportionate effect (to their overall number) on public and political perceptions of crime, risk and fear of crime. For our society they continue to attract high levels of media interest and public protection is high on the political agenda.

The problem for criminal justice agencies is that these offenders are among the most difficult to manage and perhaps also the least likely to rehabilitate. A significant proportion, around 2,000 to 2,500 offenders in high secure prisons, can be characterised as "dangerous and suffering from severe personality disorders". They pose challenges both in the criminal justice system and health services. Their assessment and treatment remain contentious issues with uncertainty about the taxonomy of diagnosis, assessment, treatment modalities and their effectiveness at reducing risk of further offending and easing institutional management. Any attempt to provide services for this group faces challenges of organisation and service delivery, with complex multidisciplinary approaches being needed as well effective interagency working.

In the UK we started to tackle some of these issues through the Dangerous and Severe Personality Disorder (DSPD) Programme (British Journal of Psychiatry (2007) Supplement 49 – in press, full reference awaited). This is a range of pilot assessment and treatment services hosted either in prison or secure hospital settings, with the stated objectives:

To enhance protection of the public and improve mental health outcomes by understanding better:

> *How to identify, assess and treat those who are dangerous and severely personality disordered*
>
> *The nature and challenges of treatments and service delivery involving multi-disciplinary teams working across agencies*

The extent to which treatment might reduce (or manage better) the risks of re-offending and how best to move on those offenders who have benefited from the programme, as well as those who have not

To strengthen the clinical, service delivery and policy evidence base in this area, informing the options for future services, and the costs and benefits

Key Programme deliverables include four high secure pilot projects providing 300+ DSPD places (HMP Whitemoor, HMP Frankland, Rampton High Secure Hospital and Broadmoor High Secure Hospital), and 75 medium secure and community places, as well as a pilot for women offenders with severe personality disorders.

These various projects are intended to test out service delivery models and the possible working of pathways for those that benefit from the interventions and those that do not. In this context, therefore, the question about the shape of future services raises significant issues about their organisation, particularly given that they are expected to "sit" within the broader framework of prison and secure hospital provision. The high cost of these services also makes it important that their planning is evidence based and informed by realistic - and credible - projections of demand and effectiveness. The complexities involved also mean that there is a need to communicate a clear and coherent picture to various stakeholders. Given this range of challenges the SD approach provides an effective framework for organising our experience and information, and provides the ability to make projections while quantifying some of the uncertainties involved.

A key issue for these services is the comparatively long periods that need to be factored into the planning and our assessment of interventions. Sentences are either determinate, or indeterminate – with release dependent on risk assessment, once a minimum "tariff" has been served – generally in excess of 4 years. For this group of offenders current treatments, too, are generally expected to be between 3 -5 years. This means that the time frame for population projections needs to be long enough to capture the full "life cycle" of people entering the criminal justice system and that the benefits could only sensibly be assessed over a period of 10-20 years. Again the effect of feed backs and the stock and flow organisation of models in SD lends itself naturally to this type of problem.

Assessing the benefits also poses serious challenges. Our experience of these services is limited. Yet we still need to think about the problem of how best to manage an increasing long term prison population, what interventions might prove effective and what impact we might expect in terms of public protection. The ability to test out assumptions about the impact of different approaches, including of legislation is clearly important.

For policy makers the ability to approach these complex problems in a systematic, organised fashion, one that is capable of bringing together, as a whole, a view of the entire system when most people who work in it glimpse only their part, is clearly very attractive. However this on its own would be limited. The ability to quantify the flows,

the work involved, its impact on resources, and to compare between variants or alternative approaches makes the SD approach compelling. Crucially, however, all this depends on being convinced about the reliability of projections to build up our confidence that the models accurately capture the essential elements of the processes we are trying to describe and create credibility with other stakeholders in the organisation. In this respect we were fortunate in having a long run of data on life sentence prisoners (a significant subgroup) with which to validate the model.

Development and use of the model

Since DSPD is a pilot programme, a key issue is to consider what progress is being made: are the programme objectives being met, and how should we mould the future shape of services, particularly in the context of the broader strategic development for offender services, as well as developments in the National Health Service? Our approach here has been to draw together the available programme experience, in terms of delivery and in the emergent finding of research or other studies, and to use the model to explore some alternative scenarios, estimating the impact of changes in policy of the introduction of new sentence types, treatment regimes and community supervision arrangements on the population of dangerous offenders over time. The main parts of the system across which dangerous offenders are distributed include prison, high secure hospital, and community supervision (which may include people living in the community and those living in more specialist resources within communities, such as medium secure hospital or hostel). By representing this population in a model, policy makers would have a tool that would enable them to test the impact of a variety of scenarios on future numbers.

Given that an important element of the new policy was the introduction of new treatment regimes within both prison and high secure hospital, the model would also be used to support capacity planning for these treatment centres. Key constraints here include recruitment of, and time taken to train, specialist staff to run the treatment centres, as well as the pace at which the physical capacity of treatment services might grow. The model would therefore need to simulate assessment and treatment capacity growing over a period of years; it could not be generated simply by directing large numbers of staff around the system.

Some of the main questions to be asked of a model would include:-

- how many prisoners of this kind can we expect there to be?
- how will they be distributed across the different stages of sentence?
- what programme capacity would be required under various scenarios including constraints on growth?
- if the programme successfully treats people, what impact will that have on the rate of release of these prisoners, and how many will require supervision in the community?

Methodology

The project took place over a six month period starting in April 2006 and had the benefit of experience of a system dynamics approach being used in 2005 (unpublished) in relation to the same population of offenders, but at a regional level. The modelling team comprised a model developer / facilitator and a facilitator/project coordinator, whose work was overseen at all times by an expert adviser. The main roles of each were:-

Model developer / facilitator

To attend all meetings, conduct additional fieldwork, build different iterations of the system dynamics model, produce model documentation, report back to the main stakeholder groups, design and deliver training to members of the client team.

Project coordinator / facilitator

To agree terms of reference with the client, attend and jointly facilitate main workshop sessions, and ensure delivery of the main project outcomes

Expert adviser

To oversee and quality assure the model development, attend main stakeholder meetings, lead on designing and delivering training to members of the client team.

The modelling process can best be characterised as a brief, group model building approach, with flexible involvement of different members of the group. This collegiate approach reflected the different roles and remits of the various project stakeholders. There were **number** of groupings, each with overlapping membership:-

The policy team

This consisted of the full-time civil servants whose job it is to develop and oversee national policy for dealing with DSPD offenders. The team comprises a mixture of policy makers, practitioners (such as psychologists) and researchers. Meetings were held sometimes with the whole group, but more usually either with the team managers or the practitioner / researchers.

The role of the team managers was to influence the structure of the emergent model. The most senior manager, having a grounding in operational research, became increasingly involved in detailed technical aspects of model-development, especially in establishing the initial conditions for the model, and ensuring its accuracy in replicating the historical numbers of prisoners in the system.

The practitioner / researcher sub-group also influenced the structure and design of the model. They contributed most of the detailed data inputs. As the project developed, they were identified as the main personnel to be trained in using the model. This training would include an introduction to system dynamics, specific training around the use of ***Ithink*** software, and a detailed introduction to the model itself.

Stakeholder Sub-groups

Stakeholder sub-groups were ad hoc groupings of those responsible for managing particular parts of the system, typically either prison or secure mental hospital managers. Their main role was to advise on the stock-flow representations of the parts of the model dealing with the structured programme element of a prison sentence, or hospital stay.

The programme board

The board has formal responsibility for the policy, and includes many of the groupings already identified, whether as full members or as staff in attendance at meetings. The board received updates on the development of the model, and full presentations of the model as it emerged.

Wider stakeholder meeting

At the close of the project, the model was presented to a wider stakeholder group, comprising many of those who had been involved in the project along with a wider range of practitioners and researchers, including those responsible for release of offenders and their subsequent management in the community.

This configuration of groups differed somewhat from that encountered in other modelling projects within the public sector. The precise form taken by a group-modelling project (Vennix, 1996) will vary according to the preferences of a modelling team and its previous experiences of conducting similar projects, but also with the nature of the client organisation, its established formal and informal structures, and its political context. Sometimes it is possible for a modelling team to propose and implement a very structured methodology (Luna-Reyes et al, 2006) with prescribed roles for a modelling team and expectations of a client.

What does seem to be the key to the success of any group model-building project is the consistent involvement of the same small (around 5-10 members) group throughout each stage of a project. Here, that was achieved through the commitment of the staff group, who were involved in the conception, development, first iteration, revision, and completion of the final version, of this model. Consistency was achieved, even although the project involved a sequence of meetings with various ad hoc groupings.

The Model

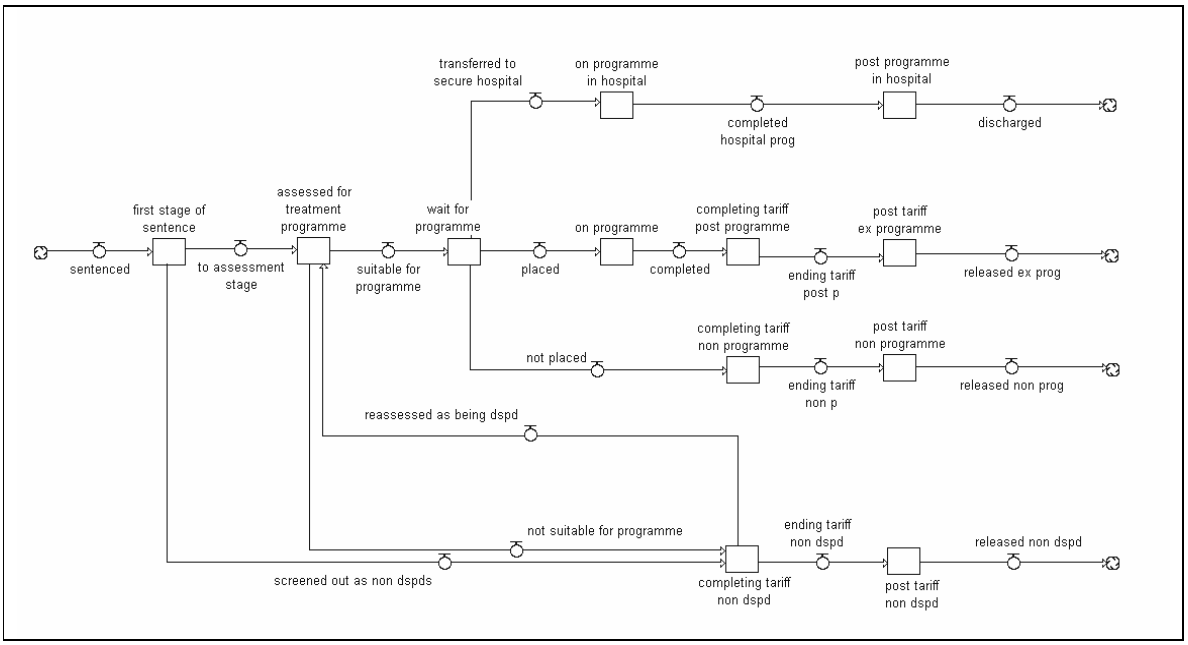
There were two main stages in this project, each lasting approximately three months. The mid-point was marked by a presentation to the project board, the result of which was that various additions and modifications were proposed. Whereas the first iteration of the model was largely built by the modeller/facilitator the second benefited from a more hands-on role being taken by the staff-team.

Two models were built, using ***Ithink*** software. Only the second is described in detail. The client required a model with a long time horizon; prison terms and expected treatment periods for these offenders would be lengthy. The initial conditions in the model should be as accurate as possible. The preferred means of achieving that was to build up the prison population by running the model to the start point of the new policy (2003) over a forty year period. Although it would have been possible to choose a start time for the model of 2003, and input initial values which had been calculated separately, the staff team's preference was for the model itself to generate the 2003 values. This had the potential of creating a more flexible backdrop against which to test the impact of the treatment programme, its timing, the relative contributions of assessment and treatment to benefits measured by serious offences prevented or access to services. So the model runs for a 60 year period, comprising the 40 years prior to 2003 (during which the specialist treatment programmes did not exist) and the 20 years following implementation. The graphs shown only cover the last 20 years.

The model represents the male prison population in England and Wales of the sentence-types most likely to include men diagnosed as DSPD. These include the new **indeterminate sentences** (IPP) and those sentenced to **life imprisonment** (a particular type of indeterminate sentence). The model also represents a subset (DSPD males) of those on **determinate sentences** (those sentenced to 4 years or more), but not everybody on these sentences, in which case the model would include almost the whole prison population. The main difference between indeterminate and determinate is that prisoners sentenced to the former can only be released if the Parole Board allows this. Men on determinate sentences must be released after serving their time. The term "tariff" means the minimum time that must be served before being eligible for parole.

The model uses arrays to represent these three sentence types.

Figure 1: Simplified Version of DSPD Stock / Flow Structure



This illustrates the main movements of men from being sentenced, screened out as not DSPD (some of whom are later reassessed as being DSPD and referred back for treatment), assessed for treatment, through treatment programme in prison or hospital, and then to completion of sentence tariff. On completion of tariff, prisoners are eligible to apply for parole, but this is subject to a rigorous risk-assessment. Most will spend many years in the post-tariff stage, and some might never be released. Following release, they are supervised in the community.

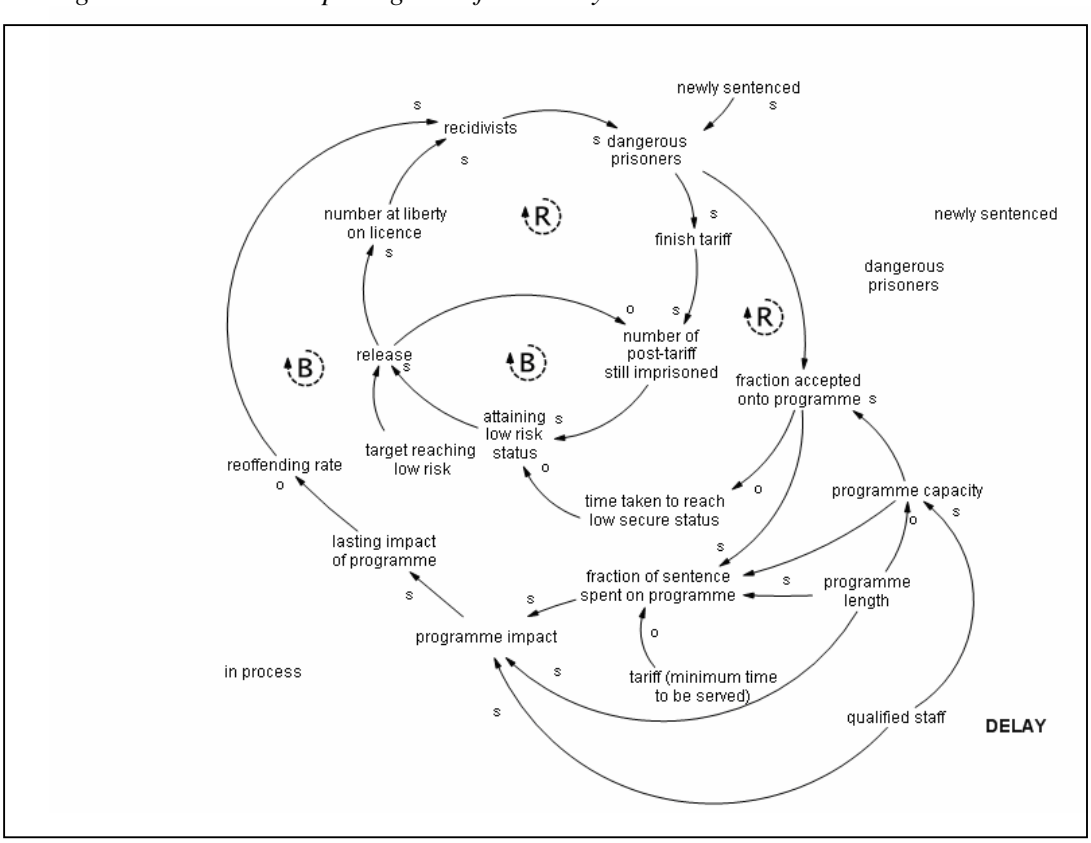
Figure 1 shows that there are effectively four routes through the system, resulting in four different "post-tariff" stocks:-

- Those defined as DSPD who completed a treatment programme in prison (in the main model, not shown here, further subdivided between those who successfully completed the programme and those who did not)
- Those defined as DSPD who completed a treatment programme in secure mental hospital (if they meet the terms of the Mental Health Act), further subdivided as above
- Those defined as DSPD who, for various reasons, either a lack of programme capacity or because the individuals had not been considered suitable, did not go on a treatment programme
- Those who are non-DSPD, so obviously do not go on the treatment programme

Main Feedback Loops

The main feedback loops operating within this system are shown in the CLD below

Figure 2 – Causal Loop Diagram of DSPD System



The main feedback loops concern:

1. The capacity constraints of treatment programmes (availability of suitably specialist qualified staff, availability of suitable facilities, how many can be in treatment, timing of treatment towards beginning / middle/ end of sentence, fraction of sentence spent in treatment)

2. The impact of treatment on levels of risk (if treatment is effective, men will progress towards lower security categories faster, and become eligible for release sooner) – in the longer term, fewer of those released on licence will re-offend

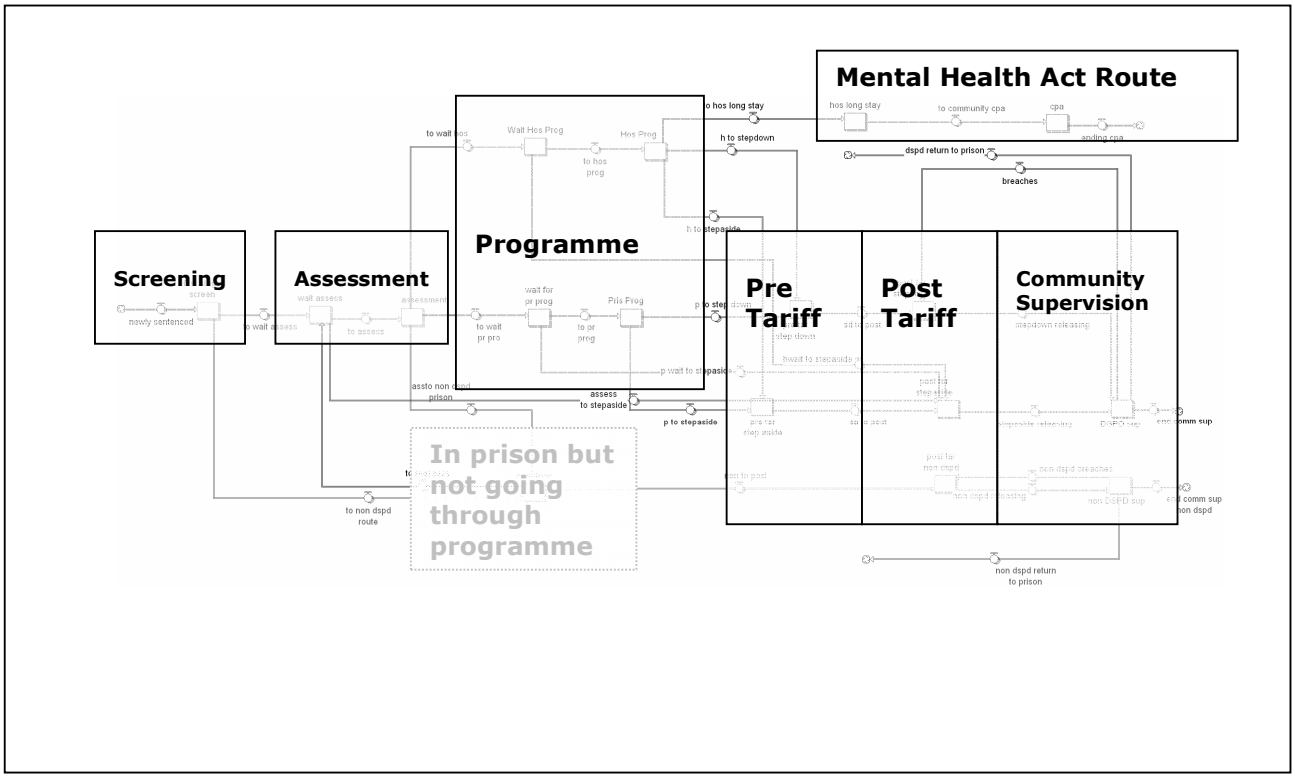
Client representatives probably felt more confident about representing the treatment capacity constraints rather than the treatment impact effects. This is a highly sensitive area, and the time-scales over which the new policy would have an impact amount to many years. At such an early stage in the implementation cycle, there would be no data about the long-term impact of the programme, and it would be understandable for

policy-makers to be cautious about estimating this. Nevertheless, one of the key dynamics of the factors governing release from prison is the level of risk (for which a proxy measure would be the distribution of prisoners across formal "security categories"[1]).

A More Detailed Description of the Model

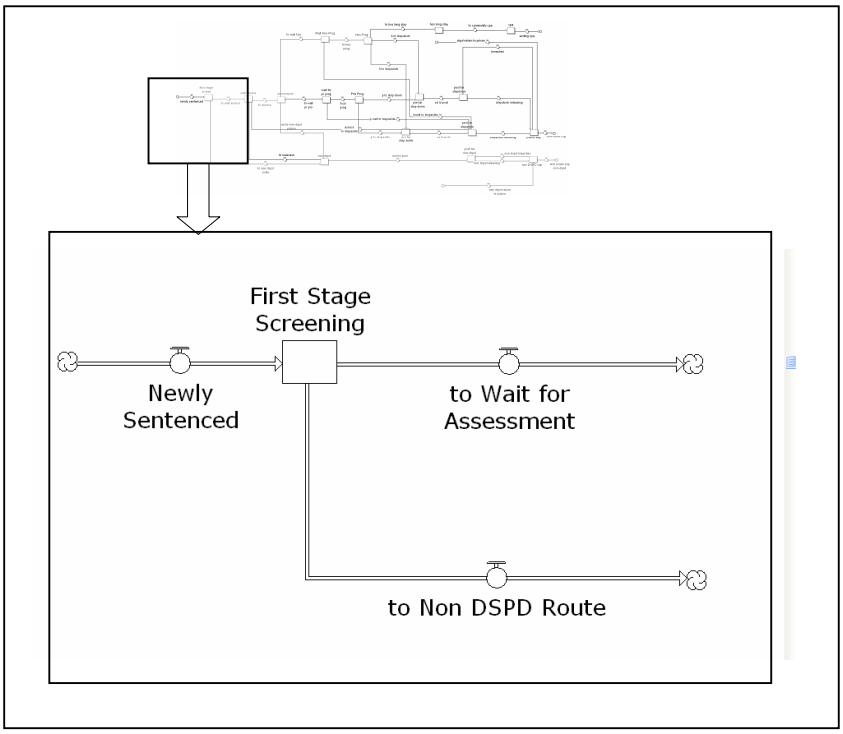
The detailed stock-flow structure of the **Ithink** model is represented in Figure 3. It is not necessary for readers to be able to make out the individual variable names which will be explained in a series of smaller diagrams describing each stage in the process.

Figure 3: Detailed Stock – Flow Structure with Main Stages Superimposed



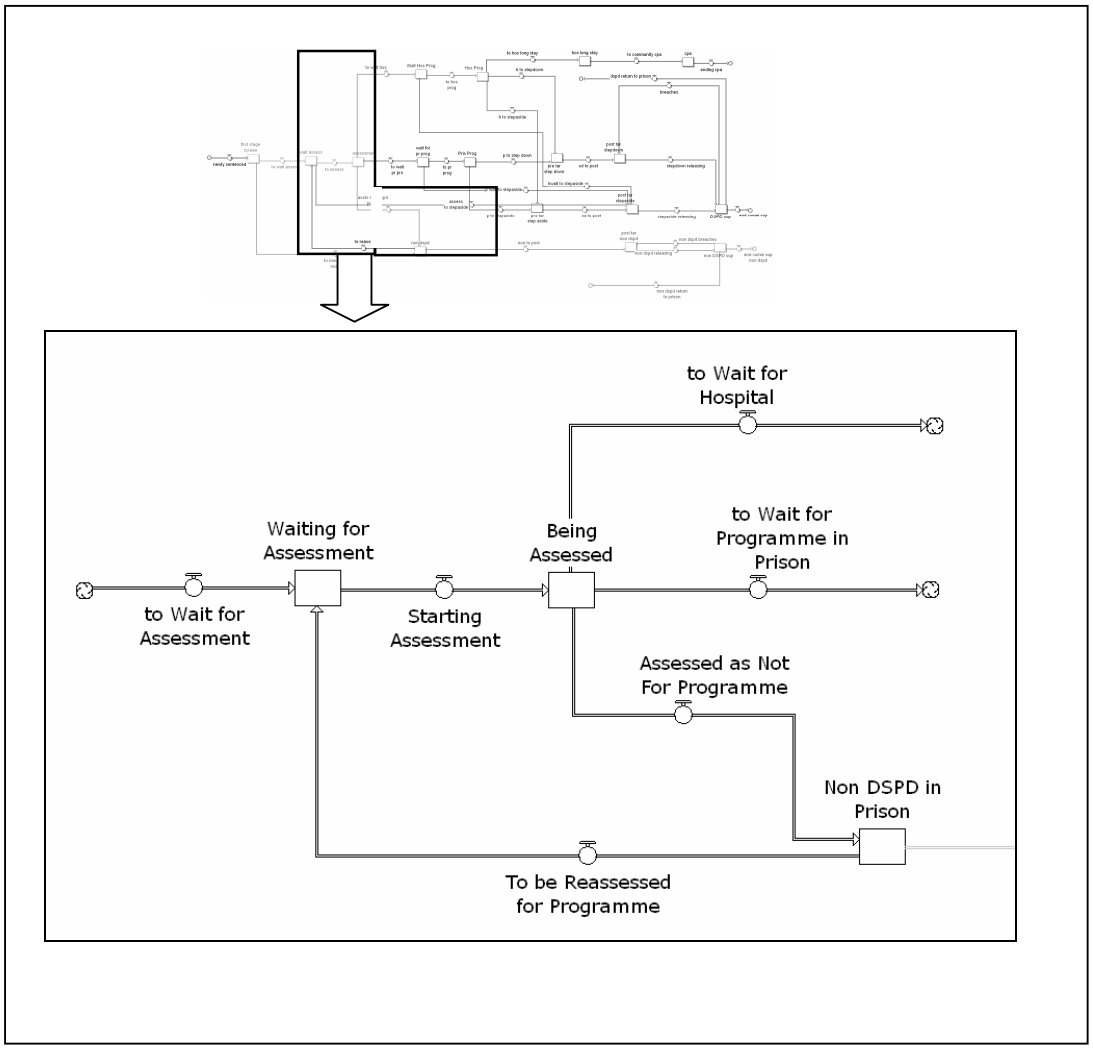
[1] Achievement of a low-security classification is a necessary – but not a sufficient – condition for release on parole

Figure 3.1 Screening Stage



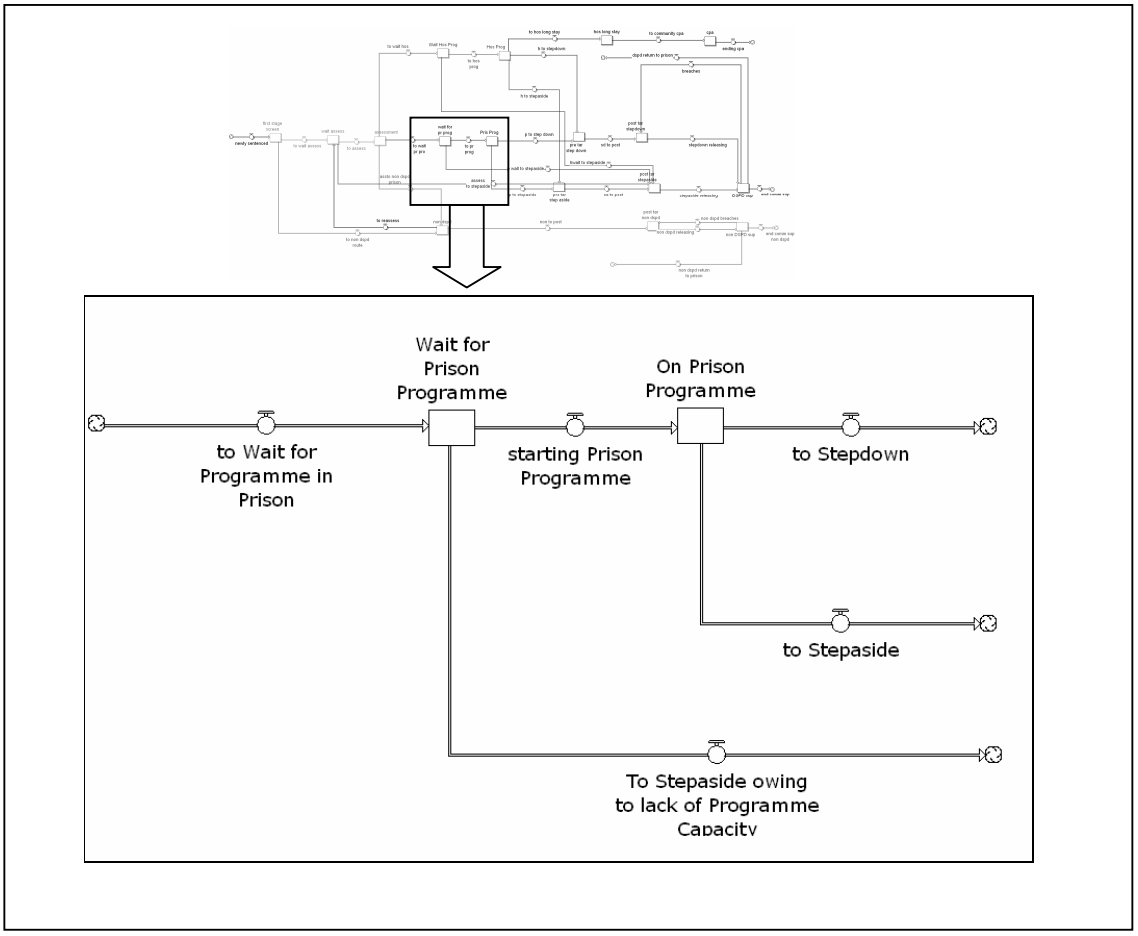
Men enter the system at the point of being sentenced. The newly sentenced rate is exogenous, based on historical data and assumptions about how courts will use the new indeterminate sentences. During the first stage of the sentence (which might actually take several years for those on life sentences), men who do not meet the criteria for DSPD (the majority of prisoners) are screened out and complete their sentence without going on the treatment programme. The remainder proceed to be assessed for the programme. Those going on to the assessment stage include those who are considered as possibly meeting the criteria for DSPD.

Figure 3.2 – Assessment Stage



At the assessment stage, men who meet the DSPD definition and who are deemed suitable candidates for the treatment programme proceed to the stage of waiting for a programme place. Assessment is capacity constrained. Men might therefore have to wait to be assessed. Under extreme conditions (hopefully not replicated in reality), some men would wait so long that they missed out on the treatment programme, their sentences having been spent waiting for assessment, represented in Figure 3.2 as the flow "assess to stepaside" . The rule applied in the model was that men whose tariff ended whilst they were still waiting for assessment would proceed to the post-tariff stage without having been on the programme phase.

Figure 3.3 – The DSPD Treatment Programme – Prison Version



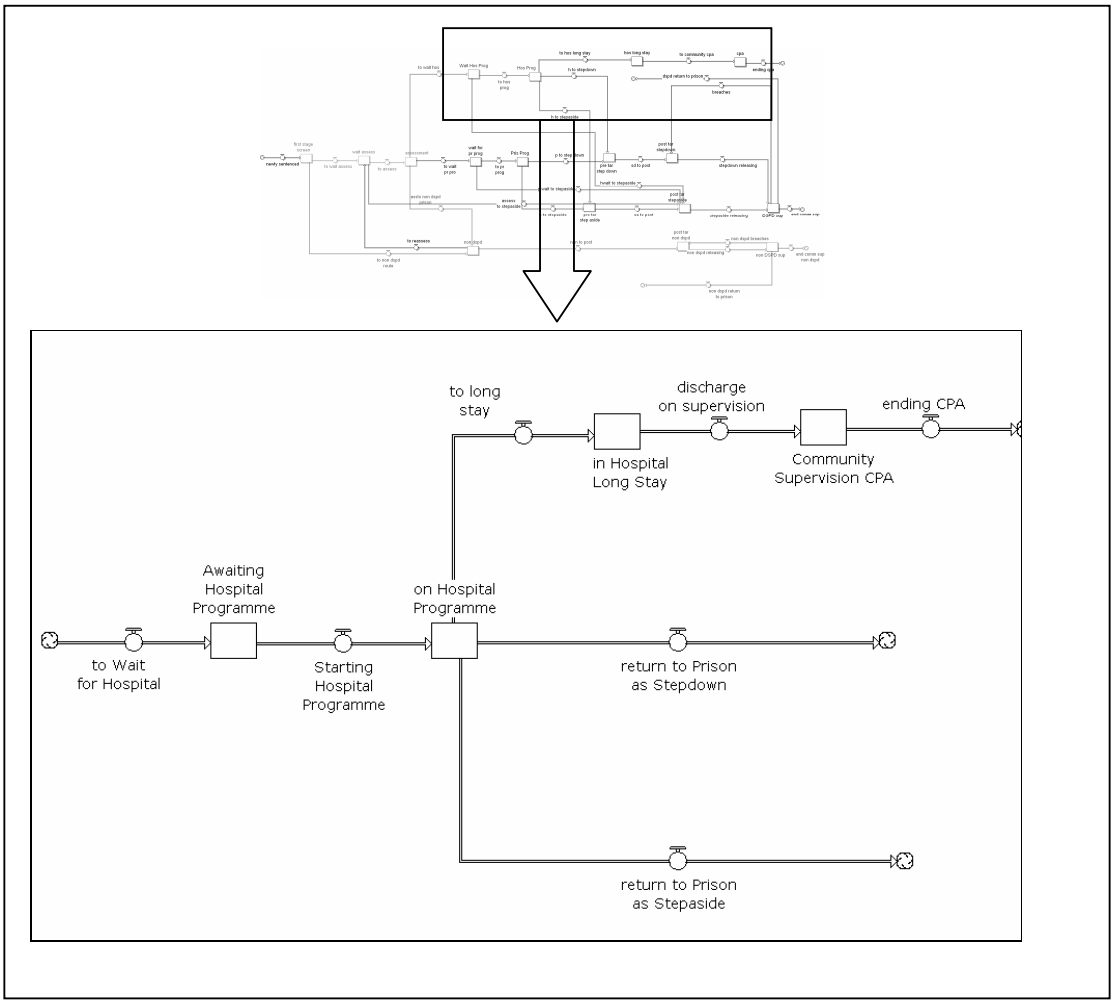
Some men go from assessment to "wait for treatment in prison". In reality, there are variations on this dynamic. Some treatment programmes admit men in order to assess them, meaning that if the outcome of assessment is a recommendation "to treat" the prisoner is already occupying a treatment place, and so proceeds to the full treatment programme with no further delay.

The structure represented in the main model is that those who are assessed as requiring treatment in a prison setting will then have to wait for a treatment place. Treatment places are capacity constrained, and throughput is governed by the number of places and the average length of stay in treatment (5 years, although this would be a variable to be adjusted reflecting differing approaches to treatment). Onward movement from the treatment programme is either to "stepdown", meaning that the programme has been effective and men will move down through security classifications at a faster rate than the untreated population, or to "stepaside", meaning that treatment has not been effective and men will move down through security classifications at a slower rate or, perhaps not at all, given that the risk of re-offending had not changed.

Note that if treatment places are insufficient to meet demand, and waiting times for treatment get so long that men would still be waiting for treatment even when their tariff is complete, men are taken off the waiting list into the post-tariff state, and with a "stepaside" profile, because they were untreated. This is similar to the dynamic described under Assessment. This route provides a safety valve in the model under extreme conditions, and would not be expected to be replicated in a programme of treatment services designed to meet the anticipated demand. However if the treatment programme is not extended beyond the limited pilot stage this is a strong possibility.

The model allows for various inputs to be made setting treatment programme capacity. Because availability of trained staff is limited, the treatment capacity is normally modelled as having an initial amount, with more phased in over a ten-year period, in accordance with policy makers' expectations about resources.

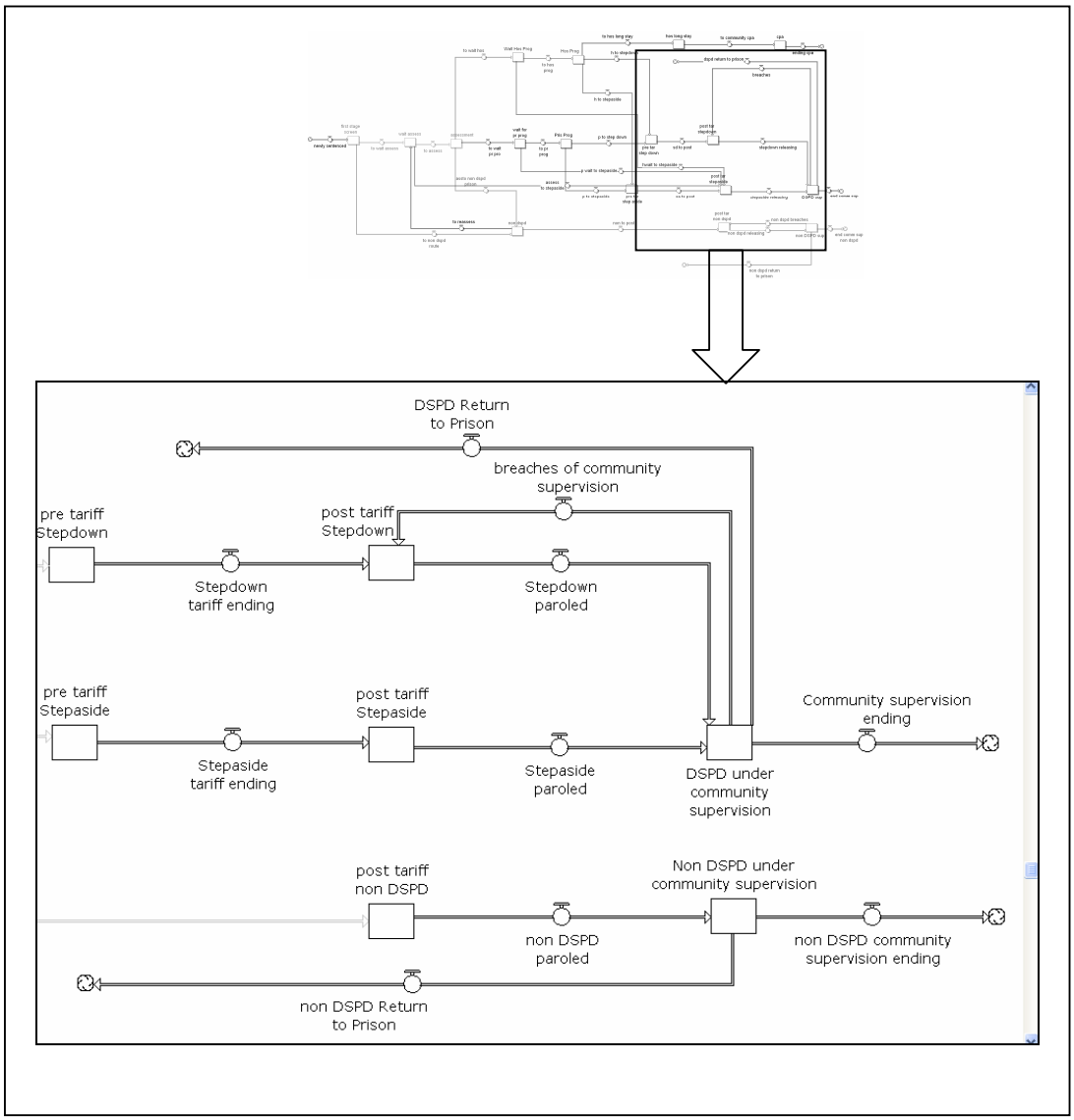
Figure 3.4 – The DSPD Treatment Programme – Hospital Version



Some who require treatment are transferred to a treatment programme in high secure hospital. This is only possible if they meet the criteria for being held under the Mental Health Act – under English legislation, having a personality disorder may not be sufficient grounds for detention, and clinicians also have to be satisfied that the individual is "treatable". This pathway has almost identical characteristics to the prison programme route described above. At the end of the programme, men either return to prison ("stepdown" for those whose treatment has been effective, "stepaside" if not). Others might never return to prison but remain in hospital (but not on the special programme) as long stay patients, eventually being released to community supervision under the "care programme approach".

It is probable that transfers to hospital will be more readily sought for prisoners on determinate sentences – the hospital route provides a means whereby the most dangerous can be held without limit of time, but only if they have a mental disorder of sufficient severity.

Figure 3.5 Pre-Tariff, Post-Tariff and Community Supervision



For each of the routes through prison, it is important to differentiate between the part of the sentence for which they are "pre-tariff" (having time to serve before being eligible for parole) and "post-tariff" (having completed the minimum term, but still awaiting release on parole which, for some, may never come). The time left "pre-tariff" for those coming off treatment programmes is calculated dynamically, because it will depend on the length of waiting time that was experienced pre-programme, and that will have varied according to the programme capacity and length of stay.

Men released into the community are subject to supervision either as part of their parole conditions, or if these have expired and the offender is still high risk, under Multi-agency Public Protection Arrangements. If they do not meet the terms of their licence

they may be recalled to prison. Community supervision is long-term (for life if that was the sentence), and the model provides a count of the numbers released to community supervision, differentiating between those who have been on a treatment programme and those who have not. The model also simulates recidivism. People breaching their licence return to the post-tariff stage in prison; those re-offending return to being newly-sentenced.

There is undoubted scope to model community supervision in more detail.

Model Outputs

The main model outputs described the big picture of how many prisoners could be expected at each stage (pre-programme, on programme, pre-tariff, post-tariff, community-supervision) over the next 20 years, given assumptions about sentence rates, and mean sentence length.

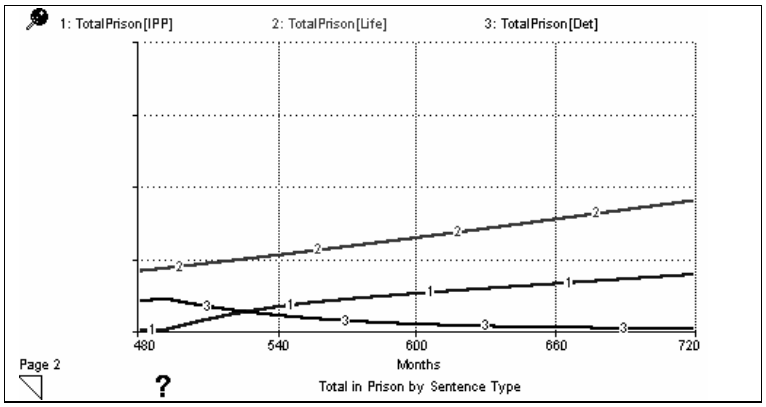
In addition, the client wanted to consider whether there would be enough special treatment places, based on assumptions about the percentage of new prisoners of each kind who would be suitable for treatment, programme capacity and length of stay.

The model structure itself posed interesting policy questions. For life-sentenced prisoners, having a mean tariff length of 15 years, where the mean programme length is 5 years, most of the sentence will be spent not on the programme. If prisoners should go on a treatment programme early in sentence, they will spend much longer in prison post-programme. How should that time be spent? Can the gains made on the programme be consolidated, or will they gradually wear off? Or would it be better to delay admission to the programme until later in sentence, so that the treatment experience might contribute towards preparation for release? Whilst it would be inappropriate to comment in detail on the nature of these discussions, there is no doubt that such questions for policy makers have a more potent force when posed by (or on behalf of) the model.

As an outcome of the group model-building process, many such policy discussions were triggered, not just about programme timing, but also about clarifying assumptions about the intended purpose of the programme, its outcomes in terms of distribution of prisoners across security categories, whether there should be separate assessment and programme capacities (with two queues) or should assessment be a subset of programme capacity, guaranteeing that following a successful assessment a prisoner can proceed straight to the programme without delay.

Owing to the policy-sensitive nature of the project, actual numbers on some graphs are not shown.

Figure 4: Base Case Numbers of Prisoners of Each Kind

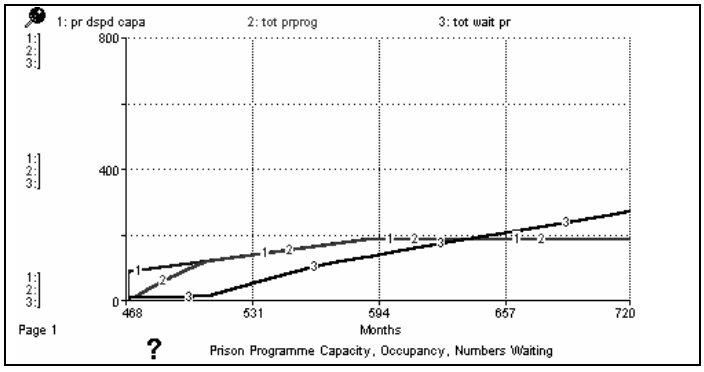


This graph shows the expected numbers of all life prisoners, all IPP prisoners and "dangerous" determinately-sentenced prisoners on the twenty year period from 2002. Figures are available for the previous forty years, but their only purpose is to set the 2002 distribution of prisoners across sentence-stages. There is a gradual increase in the number of life-sentenced prisoners, consistent with policy assumptions about sentence rates and average tariff lengths i.e. that tariff lengths are likely to get longer and numbers being sentenced will slowly increase.

At the same time, it is assumed that courts will be using the new (IPP) sentence type to dispose of those dangerous men found guilty of committing offences that previously carried a determinate tariff. Over time, the number of dangerous men on determinate sentences reduces, as the newly-sentenced are given indeterminate sentences.

Figure 5.1: Prison Programme Capacity (base case)

This graph shows the prison programme capacity, the total placed, and the total numbers who are waiting for a programme place.

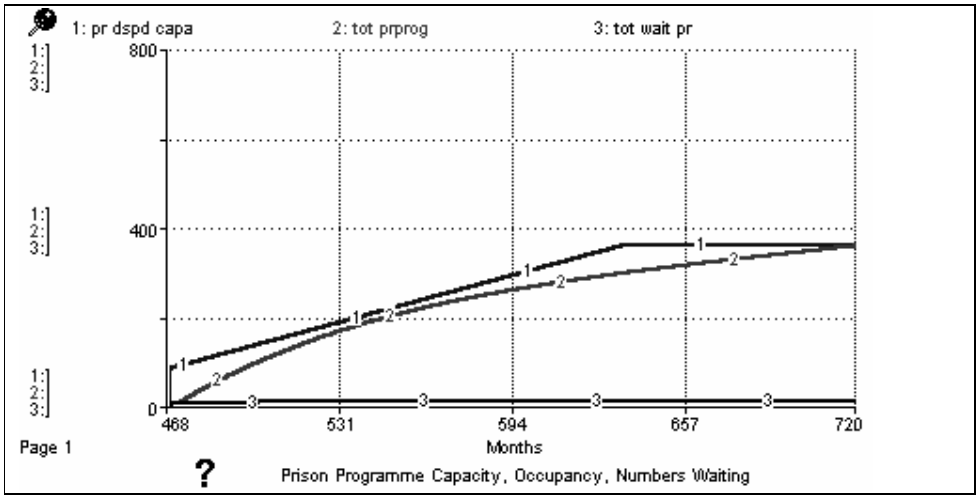


The special treatment programme starts in year 2003, and the policy built-into the model is to place only those in the early stages of sentence on the programme. The programme starts with a capacity of 80 places, and grows at a rate of 10 places per year (shown as a ramp-style increase rather than in annual steps). Based on this assumption, the programme fills steadily reaching full capacity within three years. From then on, the programme operates at full capacity, and with a steadily rising waiting list.

The model interface allows users to vary their assumptions about programme size and maximum possible growth.

Figure 5.2: Prison Programme Capacity (increased)

In the example below, an annual rise of 20 over 14 years would be more likely to provide sufficient capacity over the next 20 years, when another increase in capacity would be indicated, other things being equal. As noted above, the number of prisoners of this kind in the system is steadily increasing.

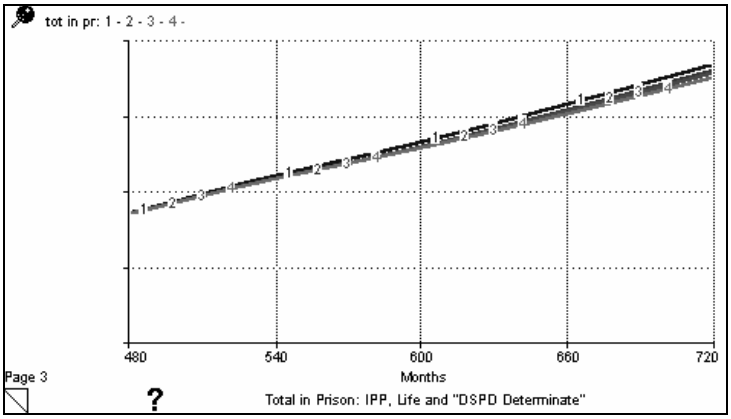


Other possible solutions would include reducing programme length (but perhaps at the expense of programme effectiveness in reducing risk) or increasing the threshold of eligibility for treatment.

Similar considerations apply to the planning of hospital programme places.

Figure 6: Impact of Programme Effectiveness on Prison Population

As well as enabling the user to investigate these rather linear (not completely, because of the impact of assessment and programme capacity) phenomena, it is possible to look in more detail at the impact of the programme on the prison population. If the programme is effective in reducing the level of dangerousness of its users, and they consequently progress faster through to lower categories of security, then as more are placed on the programme, the prison population is reduced On the other hand those in the step aside group may stay for longer, hence increasing the prison population).



The graph shows a comparison of the whole DSPD population in prison (IPP, Life and Determinate combined) over four different model runs. In the first, there is no programme capacity. In the second there is the "base case" capacity with annual increases as described above. In the third, enough capacity is loaded into the system to ensure that everyone who needs a treatment place gets it without any waiting. The final run represents the same (effectively unlimited) capacity, with the added factor that everyone completing the programme successfully completes it and enters the fastest flow through to a lower security category.

For the current set of assumptions it is most striking that the programme has a very limited effect on overall prison numbers. This is largely due to the long tariff lengths that determine a large part of the overall length of stay in prison, combined with a risk-averse representation of parole policy, where prisoners are held for a substantial time even having reached the lowest security category. However, under some scenarios – e.g. high assessment and low treatment availability – the prison numbers can be significantly higher owing to more risky offenders being identified and staying longer in custody.

It also illustrates that the main purpose of the DSPD policy is <u>not</u> primarily treatment with a view to reducing the size of the prison population but treatment as a part of a system of public protection. The point is that those who are being released into the community under supervision should have become less dangerous as a result of the programme's impact.

Conclusions

This project provides a live example of a relatively brief project to support public policy making using group model-building. It contains findings that are relevant to group model building, as well as providing an example of a model representing the main dynamics of treatment programmes within prison.

The success of the group model building component is easy to recognise but harder to measure. Although various formal and informal groupings were involved at different stages of the modelling project, there was always a representative of the core policy staff group present at each of these meetings. By this means the core group retained a sense of ownership of the model structure, and were content with the main stock-flow representations and feedback loops.

In the second iteration, the staff group were more assertive in describing the stock-flow structure, requiring facilitation, rather than direction, from the modeller, along the lines of: "we see things this way; how can we represent this best?" The manager, having knowledge of management science but not specifically system dynamics, began to work directly with the Ithink software, and other members of the team gained hands-on experience, more at the level of formatting diagrams rather than model-building. Towards the end of the project, most of the core group underwent four days of training in system dynamics using this software, based around this model.

In the experience of the modelling team, that represents a more detailed engagement with system dynamics concepts and constructs than is normally achieved in projects of this brevity.

The main outcomes are:-

- a useful map in the form of a stock-flow diagram of the prison / hospital / special programme treatment system, which itself triggered fruitful policy discussions
- some broad estimates of the likely numbers of prisoners who will be flowing through this system over the next 20 years
- an approach to capacity planning in which capacity can be added in a number of ways, and its impact shown on the whole system, largely through the effects of having large numbers waiting, some of whom will not benefit from the special treatment programme
- the beginnings of an understanding of how system dynamics might bring useful insights in planning other aspects of the criminal justice system

References

Hirsch G, Homer J, McDonnell G and Milstein B, 2005. Achieving Health Care Reform in the United States: Towards a Whole System Understanding, Paper presented at the *23rd International Conference of the System Dynamics Society*, Boston, USA.

Luna-Reyes LF, Martinez-Moyano IJ, Pardo TA, Cresswell A, Andersen D, Richardson GP. 2006. Anatomy of a group model-building intervention: building dynamic theory from case study research. *System Dynamics Review* **22**(4): 291-320

Rouette AJA, Jongebreur W, van Hoof P, Heijmen T, Vennix JAM. 2004. Modelling Crime Control in the Netherlands**,** *Proceedings of the 22nd International Conference of the System Dynamics Society*

Wolstenholme EF, Monk D, Smith G and McKelvie D. 2004a. Using System Dynamics to Influence and Interpret Health and Social Care Policy in the UK.
Proceedings of the 22nd International Conference of the System Dynamics Society Oxford, England.

Wolstenholme EF, Monk D, Smith G and McKelvie D. 2004b. Using System Dynamics in Modelling Health and Social Care Commissioning in the UK, *Proceedings of the 22nd International Conference of the System Dynamics Society* Oxford, England.

Wolstenholme EF, Monk D, Smith G and McKelvie D. 2004c. Using System Dynamics in Modelling Mental Health Issues in the UK, *Proceedings of the 22nd International Conference of the System Dynamics Society* Oxford, England.

Wolstenholme EF, Repper D, Monk D, Todd D and McKelvie D. 2006. Reforming Mental Health Services in the UK - Using System Dynamics to support the Design and Implementation of a Stepped Care approach to Depression in North West England, *Proceedings of the 24th International Conference of the System Dynamics Society* Nijmegen, Netherlands

Vennix, JAM and Gubbels JW. 1992. Knowledge Elicitation in Conceptual Model Building : A Case Study in Modeling a Regional Dutch Health Care System, *European Journal of Operations Research* **59**(1): 85-101.

Vennix JAM. 1996. Group Model Building, Facilitating Team Learning using system dynamics, Wiley London.