Systems Modeling of Lancashire Drug Intervention Programme (DIP)

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Abstract

In the UK, drug misuse gives rise to between £10 billion and £18 billion a year in social and economic costs, 99% of which are accounted for by problematic drug users. There are strong links between problematic drug use and crime. The Drug Interventions Programme (DIP) is a critical part of the Government's strategy for tackling drugs. The implementation of the UK Drug Intervention Programme poses a number of challenges. This includes providing a through-life approach to drug user treatment management. This must take place within a multi-agency system some of which have been newly formed. This paper discusses a study working with one such coordinating body – Lancashire Drug Action Team (DAT) in its Drug Intervention Programme (DIP) strategy. Initial work has focused on Aftercare Services in the Burnley area. A systems modelling approach using System Dynamics has been adopted.

1. Introduction

In the UK, around 4 million people use at least one illicit drug each year and around 1 million people use at least one of the most dangerous drugs (such as ecstasy, heroin and cocaine) classified as Class A. Many of these individuals will take drugs once, but for around 250,000 problematic drug users in England and Wales, drugs cause considerable harm to themselves and to others. Drug misuse gives rise to between £10 billion and £18 billion a year in social and economic costs, 99% of which are accounted for by problematic drug users. There are strong links between problematic drug use and crime. Around three-quarters of crack and heroin users claim to be committing crime to feed their habit. 75% of persistent offenders have misused drugs and those who use heroin and/or cocaine commit almost 10 times as many offences as those who do not use drugs.

2. Background

2.1 Background to DIP

The Drug Interventions Programme is a critical part of the UK Government's strategy for tackling drugs. Until September 2004, it was known as the Criminal Justice Interventions Programme (CJIP) but the name was changed to ensure that the focus was on drug treatment rather than crime prevention.

It began as a three-year programme to develop and integrate measures for directing adult drug-misusing offenders out of crime and into treatment. Recent Home Office announcements on increasing certain types of intervention have confirmed that it will continue for the foreseeable future. These processes will gradually become the normal way of working with drug-misusing offenders across England and Wales.

The Programme, believed to be a world-first, involves criminal justice and treatment agencies working together with other services to provide a tailored solution for adults - particularly those who misuse Class A drugs - who commit crime to fund their drug misuse. Special measures for young people are also being implemented.

The programme was initially funded at £447m for three years but the DIP-specific budget is now settled at about £165m a year. Delivery at a local level is through Drug Action Teams, using integrated teams with a case management approach to offer access to treatment and support. This begins at an offender's first point of contact with the criminal justice system through custody, court, sentence and beyond into resettlement.

Key partners to the Home Office are the criminal justice agencies such as the police, prisons, probation officers and the courts, along with the Department of Health, the National Treatment Agency and treatment service providers and those who provide linked services such as housing and job-seeker support.

In the first year, 2003/4, the programme rolled out its various components in 25 Drug Action Team areas across England which cover 30 police Command areas with high levels of acquisitive crime, normally property crime such as burglary, shoplifting,

robbery and so on. The current total involved in testing has reached 64. A further 32 Police areas will be added from April 2005.

2.2 Drugs Modelling Using System Dynamics

A very well known example of System Dynamics (SD) drugs modelling is Homer's work for the US government in tackling the cocaine epidemic of the 1990s (Homer, 1997; it is well described in Sterman (2000)). The US government officials relying on census data were unable to get a grip on size of illegal cocaine drug use and whether or not the police measures were being successful.   Homer and his workers constructed a dynamic model of the drug epidemic, including drivers such as "word of mouth on the street" to set the epidemic off and the eventual decline following the rising of the morbidly rate amongst users and their peers. The SD modelling was able to provide a relatively accurate prediction of the pattern of the epidemic, and far more detailed analysis than had previously been available.

SD has been widely used to represent the abuse of drug and alcohol use and misuse, and the various counter measures. Schreckengost (1991) described CIA work to estimate heroin imports. Goluke, Landeen and Meadows (1981, 1981) developed a model of addictive behaviour based on alcoholics. Holder and Blose (1987) developed a model of community response to alcoholism. Homer et al (1982) developed SD models of tobacco smoking. These studies are described in Sterman (2000).

Our work is in the provision of care rather than prediction of addiction cycles that was covered by Homer and his work with cocaine. We are using SD to model the provision of treatment care. Wolstenhome (2005) and others described work in health care provision, is more relevant.   SD is used to evaluate alterative health management approaches. Wolstenhome recommends using SD to identify and encourage sustainable whole system solutions rather than short-term fixes. That is the aim of our SD modelling of DIP management.

2.3 Background to Current Involvement With SD Drugs Policy Modelling

An initial meeting with a Lancashire Assistant Chief Constable led to a meeting in Lancashire with the Superintendent in charge of Serious Crime and the Inspector who was later to take the strategic lead in the Lancashire Drug Action Team.

The following issues indicated that a Systems Modelling approach might be relevant. DIP services are provided by numerous agencies with a variety of disciplines and, require the management of a complex set of alternative treatment services. There is a strong requirement for joined-up working, with different agencies sharing information about offenders passing through the system, and trying to ensure that they do not "fall between the cracks".

3. Challenges of the Project

The focus of the work is ex-offenders who have been released from prison and are problematic drug users. They are a very difficult to help for a number of reasons, especially their likelihood to re-offend. There may be a "30 minute window" between

release from prison and re-offending if they are not provided with immediate support, due to the peer pressure as they meet up again with former associates, as well as their own great psychological needs on having to reconnect with the outside world.

Even if they do receive support, they are very likely to re-offend.   If they continue in their illegal drug use, due to the cost of their crime, they will require a consistent, high level of regular crime to support their habit. They will require rapid access to Benefits immediately on release to ensure that their basic needs are met without resorting to crime. They will require immediate access to methadone or other legal substitutes for their illegal drug use.

They will require immediate housing but drug users are banned by certain housing agencies. Only a very few of them will ever be able to support themselves with work. The best that most can hope for is 3 or more years on a course of methadone to replace their illegal drugs. It is a very challenging group to help!

As well as the difficult nature of the client group, there were other challenges. The use of SD modelling is commonplace for strategic level planning (e.g. The Homer work in the US was looking at drug usage at a National Level), the Lancashire work is very much at the operational end, with those involved with day-to-day management of users. The aim is to provide a tool to be regularly used by each of the 8 area co-ordinators within their areas. This means that the tools that are provided must be very targeted at the needs of these coordinators.

A problem with working at this level is the budgetary constraints. The cost of one package of work must complete with the cost of a drug support worker. We were challenged by our DIP client to show that the benefits of our analysis more than covered our costs, i.e. that the work produced savings, or other benefits, that more than covered the costs of drug support resources that could have been employed!

The project was carried out as a series of small work packages. The initial focus was on aftercare in Burnley (one of the 8 Lancashire DIP areas). The main focus of DIP is aftercare, and so it was a good place to start. If successful in Lancashire then it could well have applicability across other DIP areas across the UK.

Aftercare is defined on the Home Office Website (www.drugs.gov.uk) as follows,

"Aftercare is the support that needs to be in place after a drug-misusing offender is released from prison, completes a community sentence or leaves treatment. This support does not consist solely of treatment but includes access to additional support for issues such as housing, financial management, family relationships, learning new skills and employment."

Hence, those working in this area recognise that unless they provide an all round package of support, their work will be wasted and that their clients will very rapidly re-offend."

One of our Home Office contacts, who had previously worked with the Ministry of Defence, felt that there was a lack of rigour in home affairs, in comparison with the

MoD, where all major procurements must be supported by OR modelling, as part of the Parliamentary Scrutiny process. More quantitative assessment is not been easy to conduct, as the clients are not easy to count as they often slip in and out of treatment. Despite the difficulties, the Lancashire stakeholders are open to using greater rigour in their assessments, which will assist their case in bidding for the numerous government grants that are available in the area.

4. Modelling Approach

4.1 Introduction

The SD modelling approach is described in two parts. There was a qualitative phase of Influence Diagramming (ID) of the whole process. Following this, detailed SD modelling focusing on aftercare of released prisoners who are problem drug users was undertaken.

Vennix (1996) describes how workshop-based methods can be very effective for both the qualitative and quantitative phases. For two particular parts of the project, workshops were invaluable. The modelling team were invited to present at the start of the project to a group of 40 drug treatment workers from one area meeting for team building purposes, which was challenging for the project team. The groups were divided into 3 teams and asked to produce flip charts for their areas. They were tasked very firmly to focus on the steps in the service and treatment processes and not on anecdotes of their problem areas. These proved a most valuable insight into the processes and the bases of the stock flow diagrams that were later generated.

The other area where workshop methods were used was data collection. Initially, a DIP member was tasked to go off and provide the required data. This had to be supported by additional input. Two DIP Area Coordinators were later assigned to provide data, in a day workshop with the consultants. The latter process was far more insightful because they had a deep knowledge of the process, which they applied. They took ownership of the data provision process. This approach would be used much earlier in any future projects.

The SD model development was done by the consultants with feedback from client teams. However, now that an initial model has been constructed, in future projects it will be possible to have workshops with DIP representatives walking through, and extending, the current model from the beginning of a study.
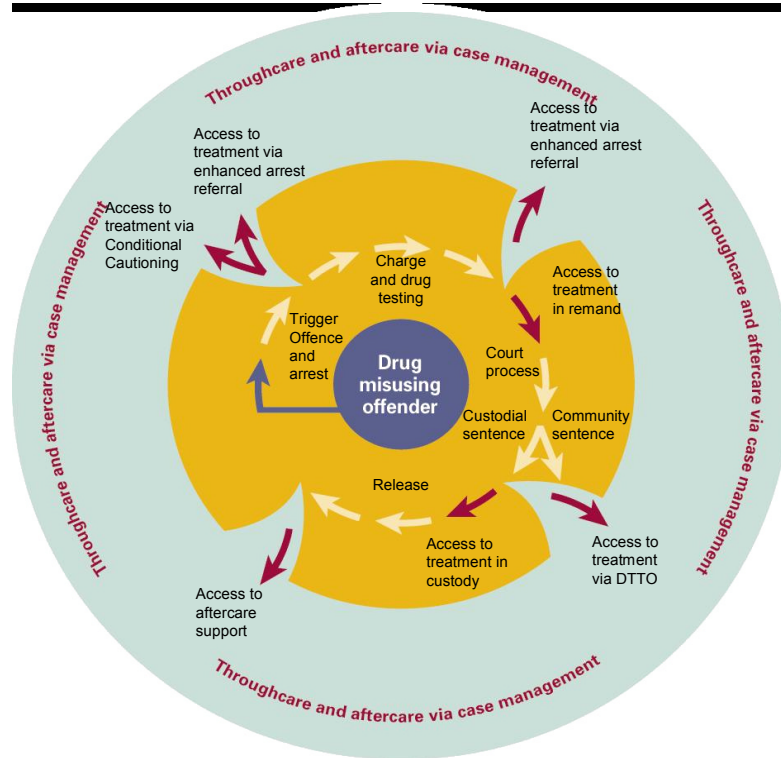
4.2 Influence Diagram

Figure 1 shows the Criminal Justice Intervention Process (CJIP), the forerunner of DIP, developed by the Home Office, starting with the drug misusing offender in the centre of the circle and follow round the various paths, through treatment, or otherwise (Home Office 2004).

In addition to the CJIP diagram, interviews were conducted with stakeholders, identifying their role, their relationship to other roles, problems/ opportunities with the new CJIP, resource issues, and measures of effectiveness. Cognitive Maps were

generated using from informal interviews from knowledgeable representatives from Lancashire DIP (Eden, Jones and Simms, 1983). One of the stakeholders had constructed a Mind Map of the main issues that he perceived they were facing. These were all referred to in constructing the ID.

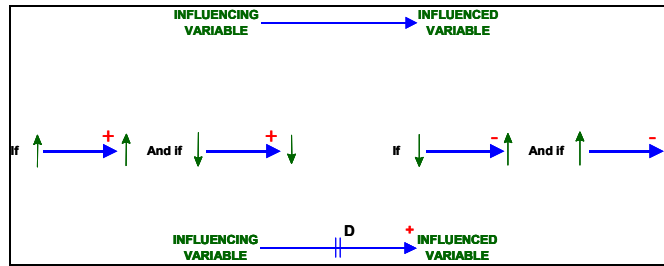A build-up of the final ID is shown in Figure 2.

Key: Start in centre with Drug misusing offenders and follow arrows for potential pathways.
DTTO = Drug Treatment and Testing Order - A sentence for drug offenders that is community-based, supervised by the Probation Service; it is an alternative to prison
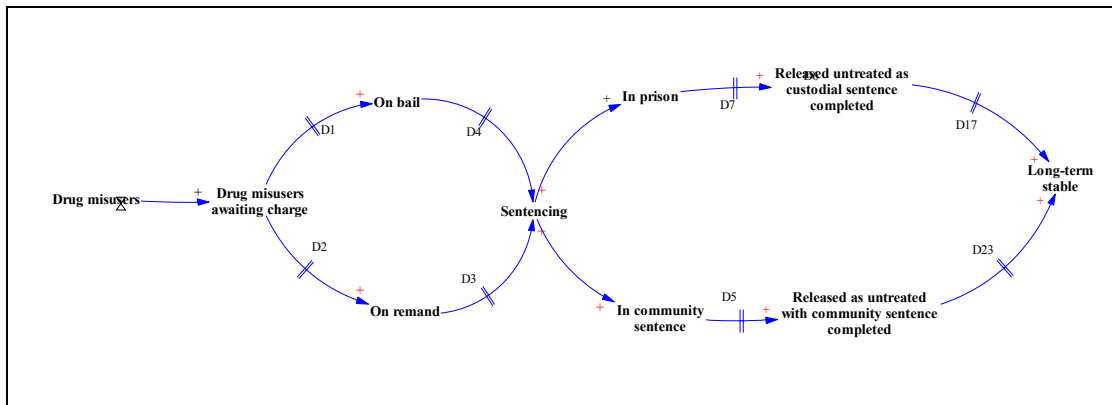
Figure 1 The Criminal Justice Intervention Process (CJIP) (Home Office) (Precursor to the Drugs Intervention Programme) (Home Office, 2004)

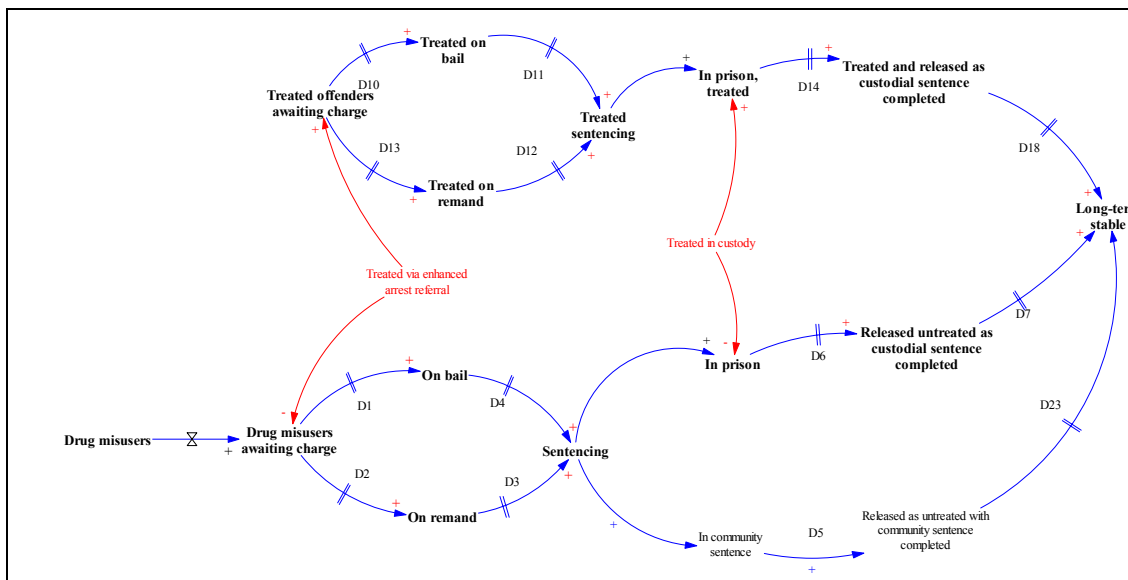# Drug Offender Treatment Influence Diagram

A positive (+) influence implies that if the tail variable were to be increased in value, then the head variable would also be expected to increase. If the tail variable were to reduce then so would the head. A negative (-) influence suggests that if the tail variable were to increase the head variable would be expected to reduce and vice-versa
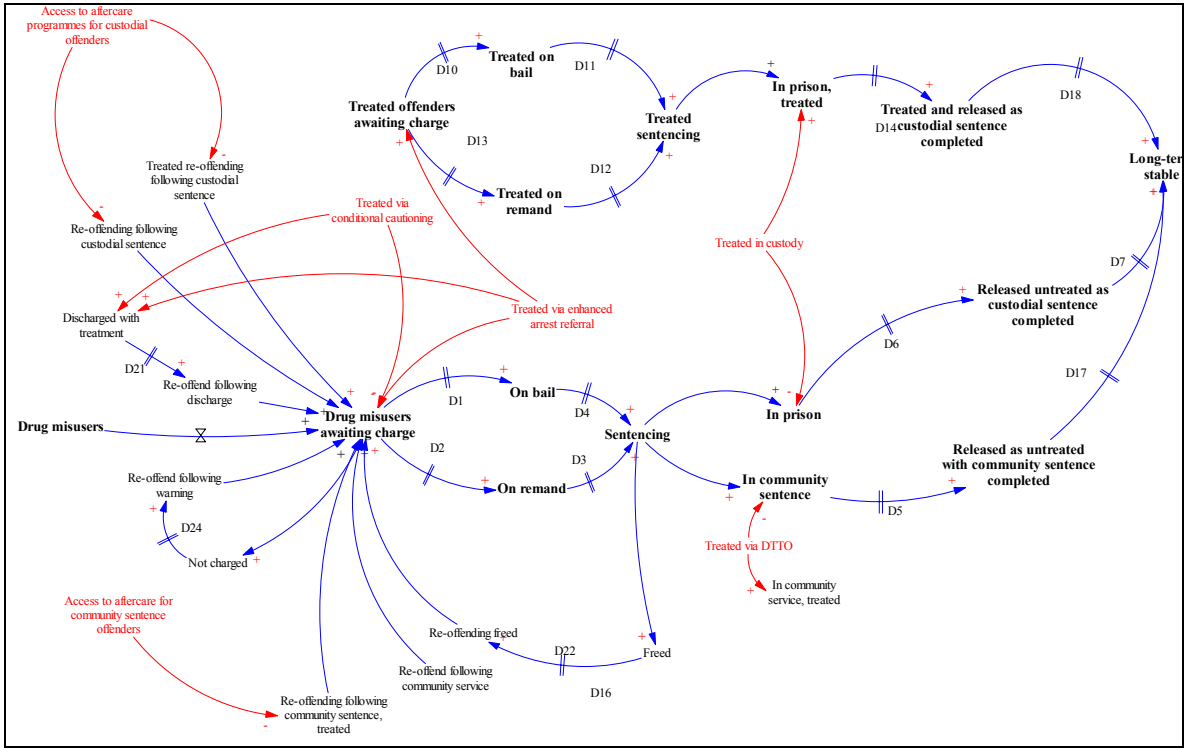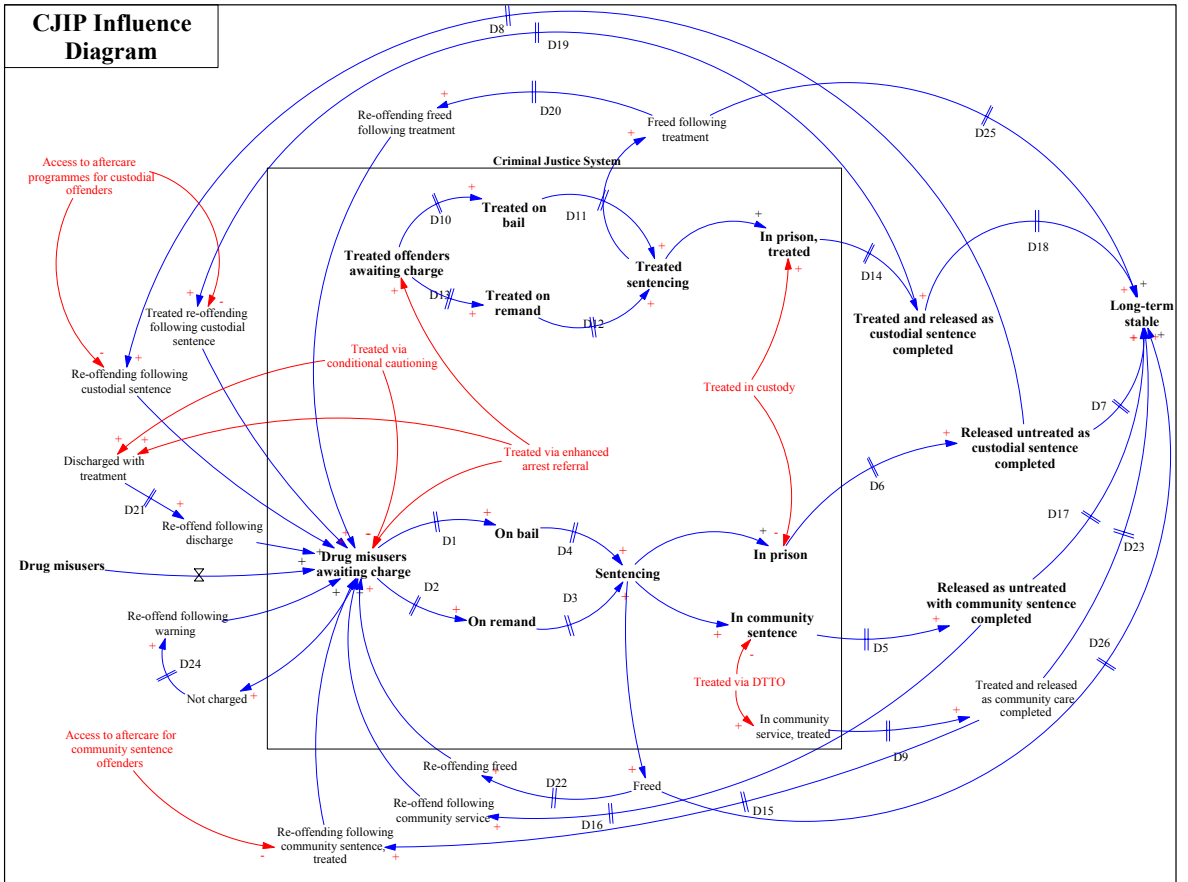
2A ID Notation

2B. Drug misusers passing through the Criminal Justice System

**2C. Drug misusers in prison passing into treatment -
either via enhanced arrest referral (i.e. on arrest) or in custody**

2D. Drug misusers in prison pass into treatment and the impact of aftercare

2E. Full CJIP Diagram - Shows pathways from prison to re-offending or long-term stability

Figure 2 Drug Offender Treatment Influence Diagram

The stakeholder group to which the ID was presented was a mix of representatives from Police, Drug treatment service providers, housing services, Prison, Social Services, and Probation Services, none of whom had any knowledge or experience of SD or Operational Research (OR). The ID gave them the following:

- An insight into how a structured, modelling approach could be applied to their area

- A model that linked up processes, resources, and recipients of CJIP into a process that could be assessed

- It provided links to identify the most meaningful measures of effectiveness and policies

- Identification of positive feedback structure. If offenders are not cared for properly in prison they will more rapidly re-offend, leading to resources being overwhelmed and the situation further deteriorating.

The response of the meeting was a strong, near unanimous feeling, that the SD modelling approach would provide them with increased rigour in doing their job, and improved cost-effectiveness. Their enthusiasm was a tribute to their open-mindedness and willingness to consider new approaches.

The DIP stakeholders agreed that we should focus on aftercare for the Burnley area for a quantitative SD model.

4.3 System Dynamics Model

The high level stock flow diagram described in Figure 2 was not used directly in the next phase of the study, as it was not sufficiently detailed. It was clear that a more detailed view of aftercare would need to be developed.

A number of interviews were held. Based on the process maps from the workshop with the 40 drug treatment workers described above, a stock flow diagram (with no equations) was constructed initially to capture the main pathways and issues. This was used in a series of interviews with groups of workers. They were walked through the map and asked to talk though the issues. The stock flow diagram, with its multiple levels proved a useful repository for issues.

It became clear that aftercare could be broken into "enablers" and "suppliers", as shown in Figure 3, below. Enablers help problem drug users to find the support services that they need and include Prison Link (helping prisoners to find support when they come out) and Progress 2 Work (helping drug users with Benefits and employment issues). Suppliers are the services that are needed by problem drug users when the leave prison and include Housing, Tier 3 (supplying the methadone treatment), Tier 2 (providing general health care), and the Benefits Agency.
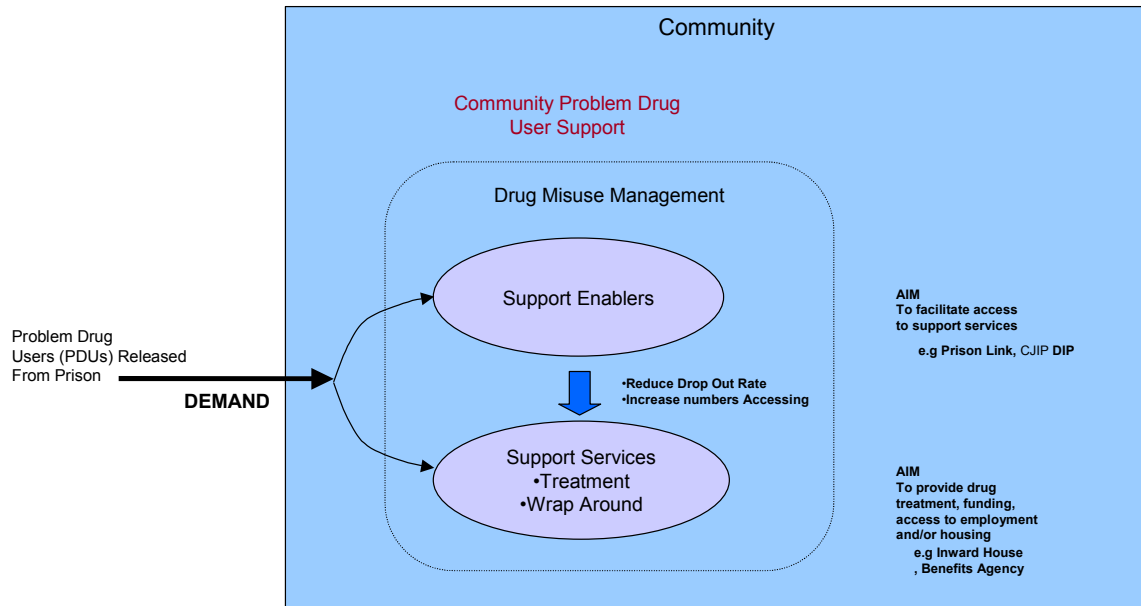
Figure 3 Structure of Enabling and Support Services as shown in the SD Model

The structure of the stock flow diagram is shown in Figure 4. Problem Drug Users (PDUs) can enter support services either by the service enablers, or directly from prison, as indicated by the arrows.

An extract from the main parts of the Stock Flow diagram is shown Figure 5 and Figure 6 below in two parts. The first part represents ex-prisoners being released, and the second shows them receiving treatment.

Figure 4 shows that the model is in two parts, a spreadsheet with the data dictionary and policy levers. The spreadsheets gives the breakdown of number of ex offenders coming into the area each month and their requirement for support services e.g. number of jobless, homeless etc. These can be varied though policy levers in the spreadsheet and within the model.

An array structure is used to indicate the proportions of PDUs receiving enabling services. The next phase are the proportions then entering support services (Tier 3, Tier 2 etc). The final phase, residential rehabilitation is for those that completely finished Tier 3 and are completely detoxicated. Note that for each service there is a drop out without a loop to re-enter. This is because those dropping out from enablers or services tend to be so seriously alienated from the drug treatment system that it takes a great deal to change in their attitude before they are ready to recommit to treatment.

Note that with only part of the process currently included, prison is not included, it is not possible to those who re-offend and back round via the criminal justice system, a potential positive feedback loop in Figure 2.
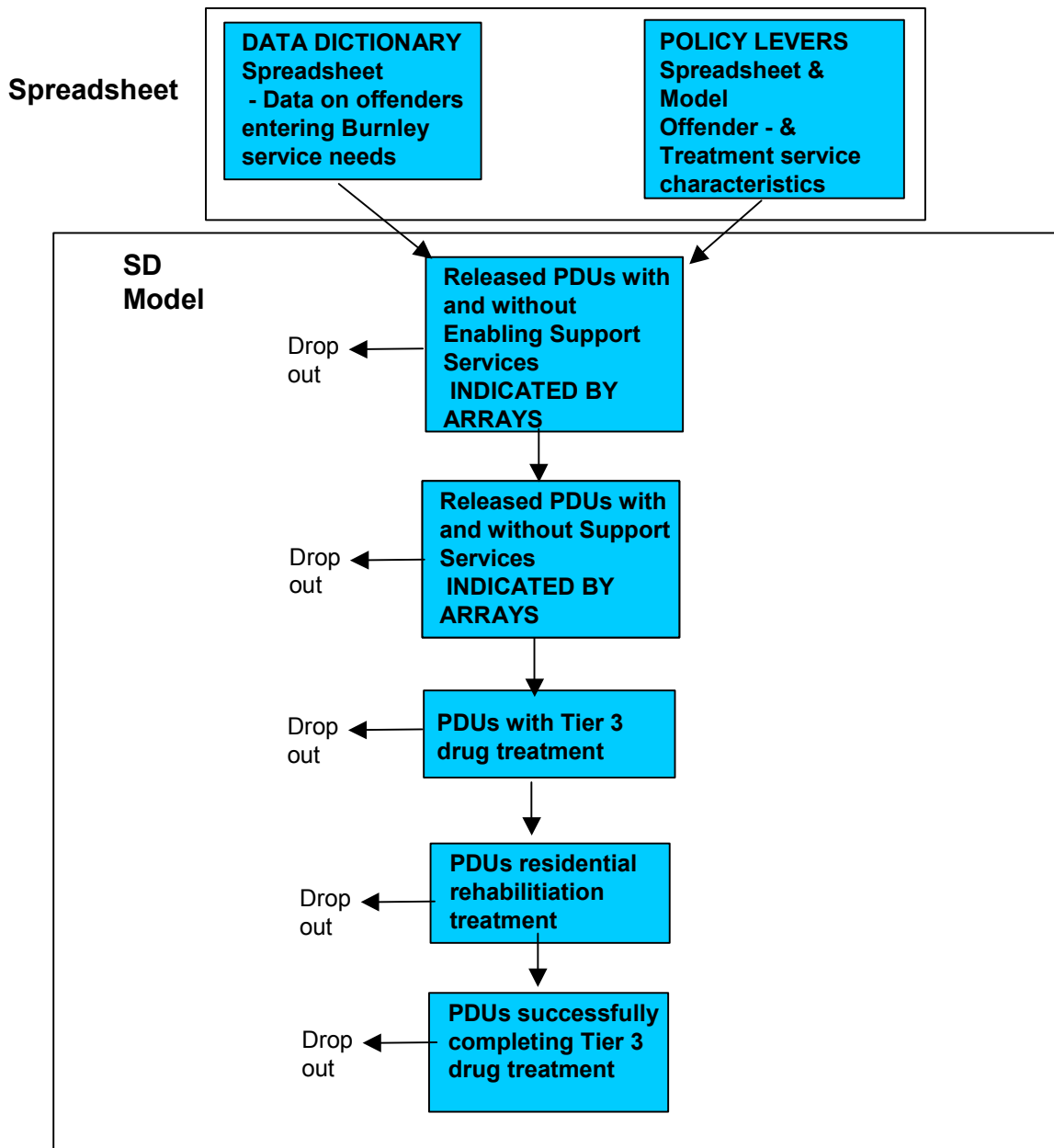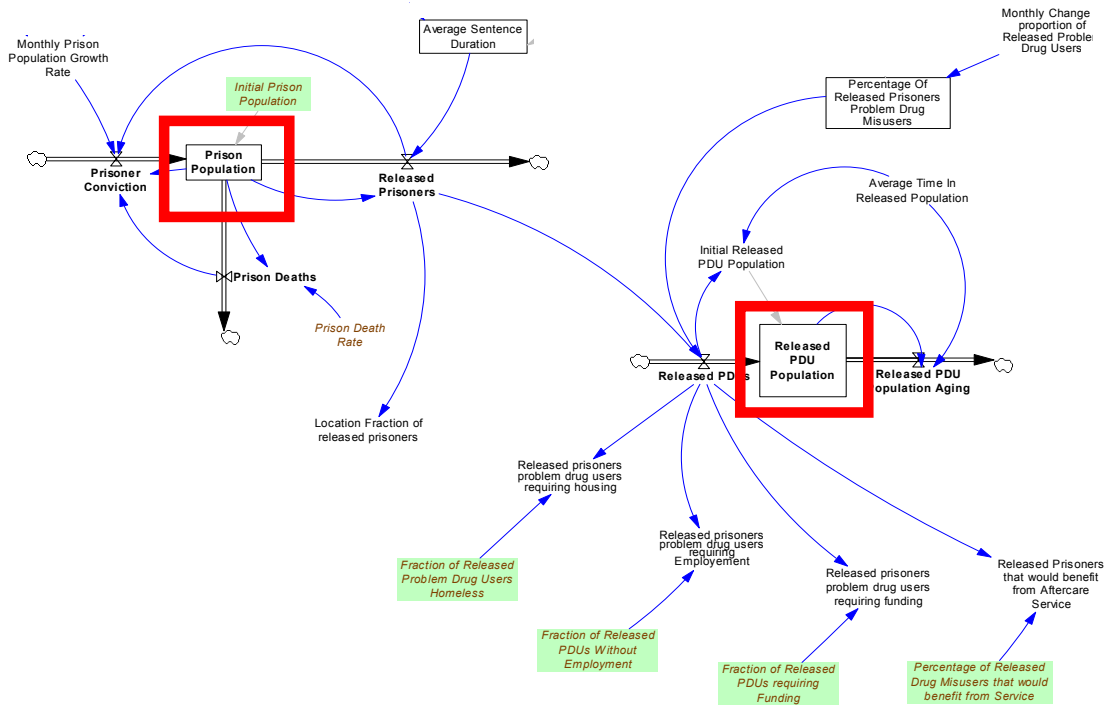
Figure 4 Structure of System Dynamics Model

Figure 5 shows PDUs being released into the Burnley area. The shaded variables are their requirements in terms of number homeless, unemployed etc, based previously gathered statistics accessed from the spreadsheet.

Figure 5 Problem Drug Users Coming Out of Prison Requiring Treatment

Shaded (green) shows main treatment categories

Figure 6 starts with PDUs awaiting treatment. They then either drop out or move into treatment. In treatment, they pass through the treatment successfully, drop out or move into residential rehab, which is only open to those who are completely clear of drugs.

MODEL KEY

Figure 6 PDUs Accessing Services

The main policy levers represented in the model are shown in Figure 7, with the factors used in this study highlighted.

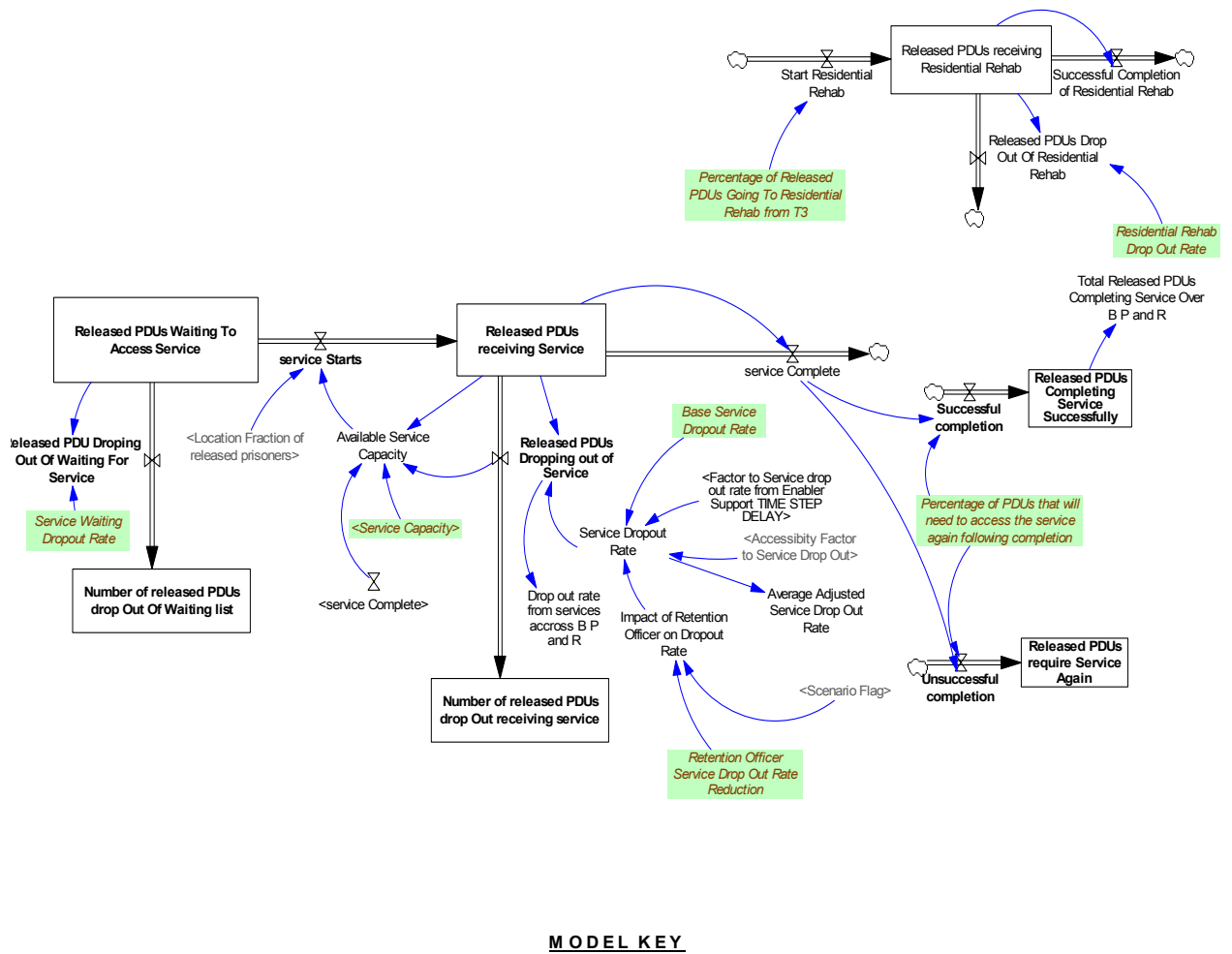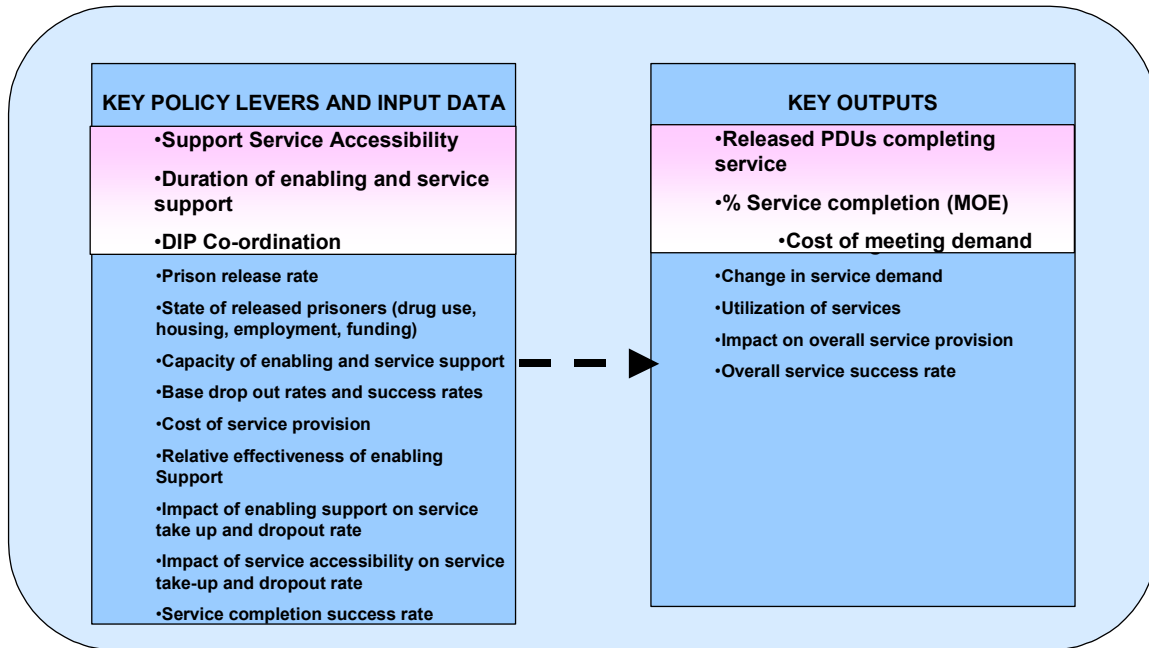| KEY POLICY LEVERS AND INPUT DATA	KEY OUTPUTS
•Support Service Accessibility	•Released PDUs completing service
•Duration of enabling and service support	•% Service completion (MOE)
•DIP Co-ordination	•Cost of meeting demand
•Prison release rate	•Change in service demand
•State of released prisoners (drug use, housing, employment, funding)	•Utilization of services
•Capacity of enabling and service support	•Impact on overall service provision
•Base drop out rates and success rates	•Overall service success rate
•Cost of service provision	
•Relative effectiveness of enabling Support	
•Impact of enabling support on service take up and dropout rate	
•Impact of service accessibility on service take-up and dropout rate	
•Service completion success rate	

Factors used in this study are highlighted

Figure 7 Key Policy Lever and Outputs

5. Initial Analysis from Study

The SD model was able to provide a prediction of the number of problem drug users completing treatment and the associated cost over a five-year period. It has been possible to use the model as a test bed to compare policies, some of which are under consideration by DIP. This is at the preliminary stage at present. However, the following policies have been tested as leverage point analysis, in order of impact:

- The overall level of coordination by DIP between all the services was increased by 10% access rate by users. This has by far the greatest impact on released PDUs completing services

- Increase by 10% access rate to each of the enabling services, in turn. Using this approach, it was possible to see which enabling service would have the greatest impact if access by problem drug users were to be increased. Increasing one of the services by 10% had the next greatest impact overall

- As suggested by one of the DIP co-ordinators, a retention officer was added for immediate follow up enquiries where a client fails to show for a treatment appointment. This came out as the third greatest impact

  The time spent at each of the enabling services was increased for each in turn by 10%. This led to a very small difference in PDUs completing services.

From the above comparisons, there were clear differences between the results for each in turn which could be logically explained.

This gives confidence that the SD model could be a policy test bed, differentiating between polices and used for prediction of the effectiveness and costs of competing policies. The team is now undertaking validation of the model through policy testing and analysis as well as formal model testing

In the course of the study, a number of blockers that limits the effectiveness of treatments were identified and are shown in Table 1. Recommendations were made to Lancashire DAT as to how the SD model could be used (in some cases with small modifications) for testing new policies in each of the areas.

Limited effectiveness of handover between CARATS (Counselling, Assessment, Referral, Advice and Throughcare Services - Prison drug treatment service) and Prison Link (coordinating access to outside support agencies)
Housing Services - Housing full
Job Centre Plus - Perceived blockage, as there is a reluctance to provide jobs to released drug users
Little available Tier 1& 2 (basic health care) capacity in Burnley, Pendle and Rossendale
Tier 3 (main Methadone treatment) is full
Little treatment for non-opiate abusers
Admin requirement gone up for Tier 3 so little time for treatment
No Tier 4 (Residential Rehabilitation that occurs after Tier 3) that is local to Burnley, Pendle and Rossendale
Poor information flows increase drop out
Poor data availability

Table 1 Blockers to Overall Service Effectiveness

6. Conclusions and Way Ahead

Although at an early stage, the SD Drugs Treatment Model has been shown to be a potentially valuable tool for predicting the cost and impact of alternative treatment policies.

The other phases of DIP within Burnley, beyond aftercare, need to be incorporated, including arrest referral and in-prison treatment services. These will give a full picture and will enable re-offending to be covered. It is intended that the SD model be extended to cover the other areas of Lancashire DIP. The basic model structure will be unchanged but the data will need to be updated. Workshops will be used for any model re-structuring and data capture.

It is envisaged that the model be used as a tool to support individual DIP coordinators in their planning. The SD model will aid their understanding of the dynamics of managing

treatment services. The data in the model itself will be enhanced as the DIPs increase in their experience of managing DIP (the current set-up with DIP Coordinators, a new job with new personnel has only recently been established).

The data collection required by the model should enable a more rigorous management than is currently possible. It is expected that this increased rigour from both the modelling and data collection should assist Lancashire DIP in their bids for Government grants that are available in the area.

It is hoped that the tool implemented in the other DIP areas. The Home Office has shown interest in providing support, which should help with the budgetary constraints mentioned above.

It is hoped to extend the SD modelling approach that has been used in this model beyond the drugs area to cover other Police areas. We believe that this type of systems thinking tool has very wide applicability.

There is widespread public perception that much of the widespread gathering of data by Government, for example in health and education is creating bureaucracy with no improvement in government processes. Wolstenhome's (2005) paper has shown that in the Health Area, that "…operational managers employ a series of well-intended, survival tactics to meet performance targets and avoid patient bottlenecks".   Modelling as we have described has great potential utility in helping managers in drug management to avoid similar systems problems.

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