

Criminal
Justice
System
Modelling:
The
Queensland
Juvenile
Justice
System

Justice Modelling in the USA

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Overview of Presentation

- Statistical models and operations research models
- Ways OR models are used in criminal justice
- History of criminal justice modelling
- Examples of current USA models
- Advantages of using models
- Difficulties with modelling
- Conclusions



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Statistical Models

- time series, regression, log linear modelling, structural equation modelling
- extrapolate and predict
- ‘black box’ - provide little understanding of the processes involved
- assume that past system behaviour will determine future behaviour
- require accurate historical data
- perform well in times of little change



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Operations Research Models

- mimic systems
- dynamic not static models
- answer “what if” questions about changes in input or system (experimentation)
- Two types of models
 - (dis)aggregated flow models
 - generates outcomes based on rates of flow of groups through the system
 - microsimulation models (discrete event simulation)
 - take into account variability and randomness
 - can aggregate outputs to whatever categories needed



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Ways operations research models are used in criminal justice

- models of criminal justice system
 - prisoner projection models
 - cost benefit models
 - policy simulation models
- models of criminal behaviour
 - criminal career
 - trajectory models
 - recidivism models
- purpose built models to address specific policy questions



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History of Criminal Justice Modelling

- Alfred Blumstein (Carnegie Mellon University, Pittsburgh)
- development of JUSSIM (Belkin, Blumstein, Glass & Lettre, 1972)
 - CJS system aggregate flow model
- subsequent model development
 - CJSSIM - (McEwen & Guynes)
<http://www.ilj.org/publications.html>
 - CANJUS - (Cassidy, 1985)
 - Home Office models (Morgan, 1985; Rice, 1984; Pullinger, 1985)



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Models of Criminal Behaviour

- identify patterns of offending, progression from initial behaviour through to termination
 - small number of offenders account for large proportion of workload
 - examine effect of sub-populations of offenders on CJS
- can model offender career using
 - participation, frequency, seriousness, time between first and last offences
- explain what happens but not why it happens



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Examples of current USA Models

- prisoner projections
 - disaggregated flow model
 - microsimulation models
- sophisticated purpose built models



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Juvenile Forecaster (Urban Institute)

- A free, interactive Web based planning tool
- <http://fjsrc.urban.org/space/new/space.htm>
- Funded by Office of Juvenile Justice and Delinquency Prevention (OJJDP)
- currently under development
- Butts, J. & Adams, W. (2001) *Anticipating Space Needs in Juvenile Detention and Correctional Facilities*



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Description of the Juvenile Forcaster

- designed for juvenile justice professionals
 - provides quick and accessible projections of juvenile custody populations
- user defined disaggregate data
 - categories (e.g. age, gender, offence type)
 - factor (e.g. male/female)
- for each factor and category
 - starting population (stock)
 - admission rate
 - average length of stay
 - anticipated changes to admission rates
 - anticipated changes to length of stay



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Population Modeler

Create Offender Groups #2

Factor #1:	OFFENSE	
Factor #2:	INDIGENOUS	<-
Categories		
	Indigenous	<-
	Non-Indigenous	<-
Add Category Remove Category		
<< Previous Factor Next Factor >> Done Cancel		

Select a label at right, then click one of the <= buttons at left to copy the label to a category or factor name.

Common Factors and Categories

- GENDER
 - Male
 - Female
- AGE
 - Age 13

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Creating a New Projection Scenario

User Name: Anna Stewart

Scenario Name:

Description:

Time Period: Year Month **Periods to Calculate:**

Offender Group	Starting Population	Admission Rate	Expected Change in Admissions		Length of Stay (Days)	Expected Change in LoS	
<input type="text" value="Person, Indigenous"/>	<input type="text" value="20"/>	<input type="text" value="5"/>	None.	<input type="button" value="Set"/>	<input type="text" value="200"/>	None.	<input type="button" value="Set"/>
<input type="text" value="Person, Non-Indigenous"/>	<input type="text" value="20"/>	<input type="text" value="5"/>	None.	<input type="button" value="Set"/>	<input type="text" value="180"/>	None.	<input type="button" value="Set"/>
<input type="text" value="Property, Indigenous"/>	<input type="text" value="50"/>	<input type="text" value="10"/>	None.	<input type="button" value="Set"/>	<input type="text" value="180"/>	None.	<input type="button" value="Set"/>
<input type="text" value="Property, Non-Indigenous"/>	<input type="text" value="50"/>	<input type="text" value="10"/>	None.	<input type="button" value="Set"/>	<input type="text" value="90"/>	None.	<input type="button" value="Set"/>
<input type="text" value="Drug, Indigenous"/>	<input type="text" value="50"/>	<input type="text" value="20"/>	None.	<input type="button" value="Set"/>	<input type="text" value="90"/>	None.	<input type="button" value="Set"/>
<input type="text" value="Drug, Non-Indigenous"/>	<input type="text" value="50"/>	<input type="text" value="20"/>	None.	<input type="button" value="Set"/>	<input type="text" value="30"/>	None.	<input type="button" value="Set"/>

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Population Modeler

Projection for 'By OFFENSE and INDIGENOUS'

[Return to scenario definition.](#) Show results as: [Table](#) [Graph](#) [Comma-delimited \(CSV\) text](#)

Population Projection							
Month	Person, Indigenous	Person, Non-Indigenous	Property, Indigenous	Property, Non-Indigenous	Drug, Indigenous	Drug, Non-Indigenous	Total
0	20	20	50	50	50	50	240
1	22	22	52	44	53	31	223
2	23	23	53	40	55	24	218
3	25	24	54	37	56	21	218
4	26	25	55	35	57	21	219
5	27	26	56	34	58	20	220
6	28	26	56	33	59	20	222
7	29	27	57	32	59	20	223
8	29	27	57	31	59	20	225
9	30	28	58	31	60	20	226
10	30	28	58	31	60	20	227

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Change in Population Composition		
	Start	Month 10
Person, Indigenous	8%	13%
Person, Non-Indigenous	8%	12%
Property, Indigenous	21%	26%
Property, Non-Indigenous	21%	14%
Drug, Indigenous	21%	26%
Drug, Non-Indigenous	21%	9%

Scenario Parameters					
Offender Group	Starting Population	Admission Rate	Expected Change in Admissions	Length of Stay (Days)	Expected Change in LoS
Person, Indigenous	20	5	None.	200	None.
Person, Non-Indigenous	20	5	None.	180	None.
Property, Indigenous	50	10	None.	180	None.
Property, Non-Indigenous	50	10	None.	90	None.
Drug, Indigenous	50	20	None.	90	None.
Drug, Non-Indigenous	50	20	None.	30	None.

Caution: This forecast is based on assumptions defined by the user. The validity of results is wholly dependent on the quality or reasonableness of these assumptions. The Urban Institute and the Office of Juvenile Justice and Delinquency Prevention assume no responsibility for the validity of user-defined forecasts. However, **Juvenile Forecaster** should be cited as the data presentation and analysis package used to generate such forecasts.

The following citation is recommended:

Juvenile Forecaster [data presentation and analysis package].
Washington, DC: The Urban Institute, Justice Policy Center [producer].
Washington, DC: Office of Juvenile Justice and Delinquency Prevention [distributor].

Microsimulation models

- PROPHEET (National Council on Crime and Delinquency)
 - used as a tool in an overall system analysis
 - provides yearly reports of updates and forecasts
 - NCCD conducted system analysis in over 30 American states
- WIZARD 2000 (Austin & Naro, George Washington University)
- JUSTICE (Texas, Fabelo, 1991)
- FEDSIM (Gaes et. al 1992) and FEDSIM II (Simon, 1997)
 - Bureau of Prisons, Department of Justice



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Model type	User (BOP or state)\a	No
Microsimulation		
FEDSIM-2	Bureau of Prisons	1
NCCD Prophet	Arizona, California, Colorado, Connecticut, Florida, Hawaii, Idaho, Illinois, Indiana, Kansas, Kentucky, Louisiana, Maine, Massachusetts, Michigan, Mississippi, Nevada, New Jersey, Ohio, Oklahoma, Rhode Island, Tennessee, Virginia	23
Other\b	Georgia, Minnesota, North Carolina, Texas	4
Flow\c		
IMPACT	District of Columbia, Montana, Nebraska, New Mexico, Vermont, Wyoming	6
Other	Pennsylvania, Oregon, Utah	3
Statistical methods (various)\d	Alabama, Alaska, Arkansas, Delaware, Iowa, Maryland, Missouri, New York, South Dakota, Wisconsin	10
Other (proprietary) \e	New Hampshire, South Carolina, Washington	3
Total users		50

Source United States Government Accounting Office, 1996, Table IV.1 Types of Models Used by BOP and States to Project Prison Populations

Sophisticated purpose built models

- Jonathan Caulkins, RAND Coporation
- modelling and analysing drug markets and their response to policy interventions
- patterns of consumption, costs and penalties of illegal drugs
- e.g. examined the efficacy of “zero tolerance”
 - showed a proportional punishment model reduced overall drug consumption



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Advantages of using models

- implicit made explicit
 - processes involved in the system
 - statistical analysis of data for input into models
 - expectations of impact of proposed changes
- ‘downstream’ impacts of policy and legislative changes
 - ‘what if?’ questions
 - anticipate possible outcomes
- use of the operational data for decision making



Difficulties with Modelling

- construction of models
 - quality of the data
 - model complexity
 - validation of models
 - ability of model users and model builders to work together
- use of models
 - development of credible and feasible scenarios
 - ability to use simulation results
- volatile political environment



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Conclusions

- increasing sophistication of technology and availability of data
- however
 - limitations of the models need to be clearly understood
 - process of modelling is as important as the outputs
 - good technology is not a substitute for good judgement/research/analysis
- modelling enables us to examine and explore things that would otherwise be difficult or impossible



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