

Understanding  
methylamphetamine drug  
markets in an Australian context

By

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# Publications and presentations

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# Table of contents

Certificate of authorship and originality.....	ii
Acknowledgements.....	iii
Publications and presentations.....	iv
Table of contents.....	v
List of figures.....	x
List of tables.....	xv
Abbreviations.....	xvii
Abstract.....	xx
Chapter 1. Introduction.....	1
1.1 Illicit drugs.....	1
1.1.1 Global illicit drug problem.....	2
1.1.2 Australian illicit drug problem.....	4
1.2 A proactive solution to the drug problem.....	6
1.2.1 Intelligence-led policing.....	6
1.2.2 Forensic intelligence.....	8
1.2.3 The intelligence process.....	9
1.3 The intelligence process with respect to MA.....	12
1.3.1 Profiling and comparison of specimens.....	12
1.3.1.1 Synthesis of MA.....	13
1.3.1.2 Profiling of chemical characteristics.....	14
1.3.1.3 Profiling of physical characteristics.....	16
1.3.1.4 Australian drug profiling situation.....	18
1.3.2 Comparison and interpretation.....	19
1.3.3 Integration and analysis.....	21

Table of contents

1.3.4	Dissemination of intelligence products.....	23
1.4	Project aims and objectives .....	26
1.4.1	Interpreting the link value of similarity scores through a dual approach .....	30
1.4.2	Understanding the MA market through relational, temporal, spatial and quantitative analysis .....	30
1.4.3	Development of a dynamic visualisation tool to help generate insights into drug markets	32
Chapter 2.	Prioritising analytical techniques and the investigation of a dual approach.....	33
2.1	Introduction.....	33
2.2	Methods .....	34
2.2.1	Overview of data.....	34
2.2.1.1	ENIPID dataset .....	35
2.2.2	Choice of target variables .....	36
2.2.3	Pre-treatments .....	38
2.2.4	Comparison metrics.....	39
2.2.4.1	Square cosine function (SCF) .....	40
2.2.4.2	Pearson correlation coefficient (PCC) .....	41
2.2.4.3	Euclidean distance (EUC) .....	41
2.2.4.4	Manhattan distance (MAN) .....	42
2.2.4.5	Canberra distance (CAN).....	42
2.2.5	Variability reduction rules.....	43
2.2.6	Comparison process evaluation.....	45
2.2.7	Score evaluation .....	46
2.2.7.1	Deterministic framework .....	47
2.2.7.2	Bayesian framework .....	48
2.2.7.3	Dual approach .....	49
2.3	Prioritisation of analytical techniques for intelligence purposes .....	50

2.3.1	Choice of optimum target variables .....	50
2.3.1.1	Presence of variables in specimens.....	50
2.3.1.2	Assessment of intra-variability and inter-variability of variables.....	51
2.3.1.3	Correlation between variables .....	54
2.3.2	Optimisation of the linked and unlinked populations .....	56
2.3.2.1	GC-MS profiles.....	58
2.3.2.2	IRMS profiles .....	60
2.3.2.3	CE profiles.....	63
2.3.3	Prioritisation of analytical techniques .....	66
2.4	Dual approach for score evaluation .....	67
2.4.1	Deterministic approach .....	67
2.4.2	Bayesian approach .....	68
2.4.3	Practical example of the dual approach .....	70
2.5	Conclusions.....	76
<b>Chapter 3. Understanding Australian methylamphetamine drug markets through various analyses and dynamic visualisations.....</b>		<b>77</b>
3.1	Introduction.....	77
3.2	Methods .....	79
3.2.1	Overview of data .....	79
3.2.1.1	AIDIP dataset.....	79
3.2.1.2	Definition of ENIPID and AIDIP markets.....	80
3.2.2	Chemical class determination.....	81
3.2.2.1	Hierarchical clustering analysis .....	82
3.2.2.2	Evaluation of HCA linkage methods .....	83
3.2.3	Strategic level analysis: general overview of MA markets.....	85
3.2.3.1	Relational analysis .....	85

## Table of contents

3.2.3.2	Temporal analysis .....	87
3.2.3.3	Spatial analysis .....	88
3.2.3.4	Further quantitative analysis .....	88
3.2.4	Operational and tactical level analysis: studying a cluster of seizures.....	88
3.2.5	Development of a web app for visualising and exploring drug markets.....	91
3.3	Strategic level analysis: general overview of MA markets .....	91
3.3.1	Relational analysis.....	92
3.3.1.1	Regional markets .....	93
3.3.1.2	Domestic market.....	95
3.3.1.3	National market .....	97
3.3.1.4	Added value of relational analysis .....	98
3.3.2	Temporal analysis .....	99
3.3.2.1	Regional markets .....	99
3.3.2.2	Domestic market.....	100
3.3.2.3	National market .....	104
3.3.2.4	Added value of temporal analysis.....	105
3.3.3	Spatial analysis.....	105
3.3.3.1	Regional markets .....	105
3.3.3.2	Domestic market.....	109
3.3.3.3	National market .....	111
3.3.3.4	Added value of spatial analysis .....	114
3.3.4	Further quantitative analysis .....	114
3.3.4.1	Purity trends.....	114
3.3.4.2	Precursor trends.....	116
3.3.4.3	Added value of quantitative analysis .....	119
3.4	Operational and tactical level analysis: studying a cluster of interest .....	121



3.5	Development of a tool for visualising and exploring drug markets .....	125
3.5.1	Relational aspect .....	128
3.5.2	Temporal aspect.....	131
3.5.3	Spatial aspect.....	132
3.5.4	Quantitative aspect .....	133
3.6	Conclusions.....	134
Chapter 4.	General discussion, conclusions and future work .....	137
4.1	General discussion.....	137
4.2	Future work .....	141
4.2.1	Developing a more structured way of reporting spatial measures.....	141
4.2.2	Integrating developed approaches into an operational workflow .....	142
4.2.3	Integration of alternative information.....	143
4.2.4	Continual development of the DNV tool created during this research .....	143
4.3	General conclusions .....	144
Appendices	.....	146
Appendix A.	Most common combinations of pre-treatments and comparison metric for ATS 147	
Appendix B.	Correlation and p-values between GC-MS variables .....	148
Appendix C.	Calculation explanation – MCF score equivalents to LR.....	150
Appendix D.	Supplementary data for the dual approach practical example .....	151
Appendix E.	Network plots of regional, domestic and national markets.....	152
References	.....	155

# List of figures

Figure 1: Common types of illicit drugs; icons by Icons8 [3] .....	1
Figure 2: Number of illicit drug users in millions during 2017 [7]; icons by Icons8 [3] .....	3
Figure 3: Weight of global ATS (excluding MDMA), adapted from [7].....	3
Figure 4: Weight and number of Australian (border and domestic) ATS (excluding MDMA) seizures, adapted from [5] .....	4
Figure 5: From data to intelligence, adapted from [14].....	7
Figure 6: Organization and aims of intelligence levels, adapted from [28] .....	9
Figure 7: Transversal intelligence process as presented by Morelato et al. [17].....	10
Figure 8: Most common routes of MA synthesis [43].....	14
Figure 9: An example of the distribution of linked and unlinked specimen scores; orientation of linked and unlinked populations may vary with the comparison metric used .....	20
Figure 10: Current examples of visualisations; A) network plots of heroin seizures [39]; B) link chart of entities in a particular case [102]. .....	25
Figure 11: A) Relationship between the forensic intelligence process and the objectives (1-4) of this research, B) schematic of objectives one to four of this research; icons by Icons8 [3] .....	27
Figure 12: Process for identifying the optimal comparison process for a profile type.....	29
Figure 13: Flow chart of the research conducted in chapter 2 .....	34
Figure 14: Outline of chemical profiling process used to create ENIPID and AIDIP datasets, adapted from [18] .....	35
Figure 15: Example of the EUC distance (black dashed line) and two examples of the MAN distance (black solid line) between two points (black circles) .....	42
Figure 16: Ideal ROC curve example and reference lines.....	46
Figure 17: Distribution of linked and unlinked specimen scores and the evaluation of linkage through two approaches .....	47
Figure 18: Presence of variables in ENIPID GC-MS specimens.....	51

Figure 19: Inter-variability and intra-variability of GC-MS variables, several large seizures were selected to visualise the intra-variability .....	52
Figure 20: Cumulative percentage of number of variables in specimens.....	53
Figure 21: Rho Spearman correlation coefficients between GC-MS variables .....	54
Figure 22: Inter-and intra-variability of scores between ENIPID GC-MS profiles for combinations of comparison metric and VRRs, GC-MS data pre-treated using N+4R .....	57
Figure 23: Optimised distribution of intra-variability (grey line) and inter-variability (black line) of ENIPID GC-MS profiles, using the N+4R/MCF/R4 combination .....	59
Figure 24: Inter-and intra-variability of scores between ENIPID IRMS profiles for combinations of comparison metric and VRRs, IRMS data pre-treated using N; A) all comparison metrics, B) enlarged view of MCF and PCC rows from panel A .....	62
Figure 25: Optimised distribution of intra-variability (grey line) and inter-variability (black line) of ENIPID IRMS profiles, using the N/PCC/R4 combination. Enlarged view of population overlap included.....	63
Figure 26: Inter-and intra-variability of scores between ENIPID CE profiles for combinations of comparison metric and VRRs, CE data pre-treated using N+4R .....	65
Figure 27: Optimised distribution of intra-variability (grey line) and inter-variability (black line) of ENIPID CE profiles, using the N+4R/EUC/R3 combination.....	66
Figure 28: Deep level of the dual approach for the ENIPID subset; A) is the deterministic approach, where solid grey line represents a link; B) is the Bayesian approach, with different lines representing different strengths of LRs for the H1 only.....	71
Figure 29: Flow chart of the research conducted in chapter 3.....	79
Figure 30: Schematic of the regional, domestic and national markets. Regional markets (n=7) pertain to ENIPID specimens seized in each state/territory; the domestic market pertains to ENIPID specimens seized in all the states and territories; the national market pertains to both ENIPID (state/territory) and AIDIP (border) specimens. During the time of seizures explored in this research (i.e. 2011-16), QLD had not supplied any specimens to the ENIPID project. ....	81
Figure 31: An example of an HCA dendrogram which has been cut at a similarity score of 50, the three resultant CCs are outlined in a solid grey rectangle .....	83

## List of figures

Figure 32: Visualisation of different HCA linkage methods; a. nearest neighbour, b. furthest neighbour, c. centroid, d. average and e. Ward.....	84
Figure 33: Relationship between CC, specimen and seizure; A) network plot of connections between CCs, specimens and seizures, B) network plot of CCs and seizures.....	86
Figure 34: A simulated network showing the difference between 2PGs, CCs connected to one seizure and CCs connecting two or more seizures, CCs are represented by black circles while seizures are represented by grey circles.....	87
Figure 35: CE profile labels and the percentage of <i>d</i> -MA needed for a specimen to be categorised into each group.....	90
Figure 36: Different dimensions of analysis with relevant questions to answer and added value, adapted from [102]; icons by Icons8 [3].....	92
Figure 37: Network plot of the NSW regional market, produced from all ENIPID CCs (black circles) and seizures (grey circles) confiscated during 2011-16; network plots of the other regional markets can be seen in Appendix E, see Figure 65 to Figure 69.....	95
Figure 38: Network plot of the domestic market, produced from all ENIPID CCs (black circles) and seizures (grey circles) confiscated during 2011-16.....	96
Figure 39: Network plot of the national market, produced from ENIPID (grey circles) & AIDIP (red circles) seizures confiscated during 2011-12 and relevant CCs (black circles).....	97
Figure 40: Number of CCs lost, gained and retained year to year for regional markets.....	100
Figure 41: Number of CCs observed over time for the domestic market; 46 CC were observed on the market for less than a month.....	102
Figure 42: Six set Venn diagram of the number of CCs from 2011 to 2016. For example, there are nine instances where CCs have existed from 2014 to 2016 only.....	103
Figure 43: Four set Venn diagram of the number of CCs containing ENIPID (domestic) and AIDIP (border) specimens collected during 2011 and 2012. For example, there are two instances where CCs contain specimens collected through the ENIPID and AIDIP projects during 2012 only.....	104
Figure 44: Visualisation of seizures from A) one CC containing seizures made in 99 NSW postcodes and B) one CC containing seizures made in 40 NSW postcodes. Teal polygons	

represent neighbouring postcodes, while red polygons represent isolated postcodes where seizures were made .....	107
Figure 45: An example of the limitation regarding the definition of postcode proximity.....	108
Figure 46: Seven set Venn diagram of inter-jurisdictional combinations and the respective number of CCs. For example, there are seven CCs which are made up of seizures from NSW, SA, VIC and WA. ....	110
Figure 47: Three column Sankey graph; columns 1 to 2 show which country the border seizures have come from; column 2 to 3 show the extent of linkage based on CCs between border seizures and domestic seizures, split by state and territory.....	112
Figure 48: Quarterly purity of specimens in each regional (rows one to seven), domestic and national markets, during 2011-16.....	115
Figure 49: Annual median purity of MA specimens (2011 to 2016); adapted from the IDDR [5] .....	116
Figure 50: Precursors present in MA specimens as a proportion of number of specimens, collected 2011-16 through the ENIPID and AIDIP projects.....	117
Figure 51: Synthetic route of manufacture of MA border and domestic specimens as a proportion of analysed specimens, data acquired from the IDDR 2017-18 [5].....	118
Figure 52: Cluster of interest outlined in red extracted from the domestic MA market, seizures collected during 2011-16 .....	122
Figure 53: Break down of the precursor route for specimens in CC74 identified in the domestic MA market; only the three VIC specimens seized during 2015 (dotted line) were part of one seizure .....	123
Figure 54: Example of network layouts available in the web app; A) Fruchterman-Reingold, B) Kamada-Kawai, C) Graphopt and D) Reingold-Tilford.....	128
Figure 55: Example of the functionality of showing and hiding MOP seizures for the same network; A) MOP (seizure leaves) are present, B) MOP (seizure leaves) are absent .....	130
Figure 56: View of the date range slider function, shifting the set date range (i.e. 3 months) as seen in panes A) to B) to C) will update the chart area to show the desired links .....	132

List of figures

Figure 57: View of network plot and its respective choropleth map showing the postcodes in which the simulated specimens were hypothetically collected ..... 132

Figure 58: View of network plot for simulated dataset; A) network plot without an overlay of additional characteristics, B) network plot with additional characteristics overlaid..... 133

Figure 59: A) Relationship between the forensic intelligence process and the objectives of this research, B) Schematic of the main findings regarding objectives one to four; icons by Icons8 [3] ..... 138

Figure 60: Two examples of polygons (black squares representing postcodes) with a different proximity index..... 142

Figure 63: First half of data relating to the correlation of target variables in GC-MS profiles, this figure should be viewed in combination with Figure 62 ..... 148

Figure 64: Second half of data relating to the correlation of target variables in GC-MS profiles, this figure should be viewed in combination with Figure 61 ..... 149

Figure 61: LR curve for intra-variability and inter-variability calculated via the MCF..... 150

Figure 62: Process of identifying the MCF equivalent of a LR of 1000..... 150

Figure 65: Network plot of the ACT market, produced from ACT ENIPID CCs and seizures confiscated during 2011-16..... 152

Figure 66: Network plot of the NT market, produced from NT ENIPID CCs and seizures confiscated during 2011-16..... 152

Figure 67: Network plot of the SA market, produced from SA ENIPID CCs and seizures confiscated during 2011-16..... 153

Figure 68: Network plot of the VIC market, produced from VIC ENIPID CCs and seizures confiscated during 2011-16..... 153

Figure 69: Network plot of the WA market, produced from WA ENIPID CCs and seizures confiscated during 2011-16..... 154

# List of tables

Table 1: Common analytical methods used in MA profiling .....	15
Table 2: Current articles focusing on physical profiling for drug intelligence purposes.....	17
Table 3: Number of specimens sent through the ENIPID project per state/territory and year, that have had GC-MS, IRMS and CE profiles extracted .....	36
Table 4: Variables targeted in GC-MS profiling method for ENIPID and AIDIP MA specimens	37
Table 5: Most common pre-treatment methods .....	39
Table 6: Verbal scale for likelihood ratios, adapted from [130] .....	48
Table 7: Number of intra-variability and inter-variability scores for each VRR, number is consistent across comparison metric and analytical technique .....	57
Table 8: Area under the ROC curve for combinations of comparison metrics and VRRs applied to ENIPID GC-MS profiles, GC-MS data pre-treated using N+4R .....	58
Table 9: AUC ROC for combinations of pre-treatments, comparison metrics and VRRs applied to ENIPID IRMS profiles.....	60
Table 10: Area under the ROC curve for combinations of pre-treatments, comparison metrics and VRRs applied to ENIPID CE profiles .....	63
Table 11: Respective FN rates and MCF scores to defined FP rates .....	68
Table 12: LR value, verbal scale and respective ranges of MCF scores for this dataset, adapted from [130] .....	69
Table 13: Number of specimens seized at Australian borders through the AIDIP project, that have had GC-MS, IRMS and CE profiles extracted .....	80
Table 14: Type of precursor route possible for each precursor encountered in ENIPID dataset .....	89
Table 15: Data relating to number of global network measures for MA markets.....	93
Table 16: Temporal analysis for domestic market.....	101
Table 17: Frequency of CCs with specified number of NSW postcodes .....	106

List of tables

Table 18: The number of CCs that specimens from each state/territory belong to, the number of CCs that exclusively hold seizures from one state/territory and the number of CCs that only hold one seizure from a given state/territory (2PG)..... 109

Table 19: List of software explored for the purpose of generating and analysing drug networks ..... 126

Table 20: Combinations of comparison metrics and pre-treatments used for drug profiling. .... 147

Table 21: MCF scores for ENIPID subset in the practical example, scores below the threshold value (29.8) are in bold..... 151

Table 22: LRs for ENIPID subset in the practical example ..... 151



# Abbreviations

2PG	2-Path Graph
ACT	Australian Capital Territory
AFP	Australian Federal Police
AIDIP	Australian Illicit Drug Intelligence Program
AM	Amphetamine
ATS	Amphetamine-Type Stimulants
AUC	Area Under the Curve
CA	Clustering Analysis
CAN	Canberra
CC	Chemical Class
CE	Capillary Electrophoresis
CHAMP	Collaborative Harmonisation of Methods for Profiling of Amphetamine-Type Stimulants
CMP	1-(1',4'-cyclohexadienyl)-2-methylaminopropane
CNS	Central Nervous System
DAD	Diode Array Detector
<i>d</i> -MA	<i>d</i> -Methylamphetamine
<i>d</i> -MA-E	<i>d</i> -Methylamphetamine Enriched
DNV	Dynamic Network Visualisation
ELSD	Evaporative Light Scattering Detector
ENIPID	Enhanced National Intelligence Picture on Illicit Drugs
EPH	Ephedrine
EUC	Euclidean
FID	Flame Ionisation Detector
FN	False Negative
FP	False Positive

## Abbreviations

FR	Fruchterman-Reingold
GC	Gas Chromatography
HCA	Hierarchical Clustering Analysis
HS	Headspace
ICP	Inductively Coupled Plasma
IDDR	Illicit Drug Data Report
ILP	Intelligence Led Policing
IRMS	Isotopic Ratio Mass Spectrometry
KK	Kamada-Kawai
L	Logarithm
LC	Liquid Chromatography
LLE	Liquid-Liquid Extraction
/-MA	/-Methylamphetamine
/-MA-E	/-Methylamphetamine Enriched
LPAC	L-Phenylacetylcarbinol
LR	Likelihood Ratio
MA	Methylamphetamine
MAN	Manhattan
MCF	Modified Cosine Function
MDMA	3,4-Methylenedioxymethylamphetamine
MLP	Multi-Profile
MOP	Mono-Profile
MS	Mass spectrometry
N	Normalisation
NA	Not Applicable
NIM	National Intelligence Model
NMI	National Measurement Institute
NSW	New South Wales

NT	Northern Territory
PCA	Principal Component Analysis
PCC	Pearson Correlation Coefficient
PSE	Pseudoephedrine
QLD	Queensland
RAC	Racemic
RIS	Regulation Impact Statement
ROC	Receiver Operating Characteristic
RT	Reingold-Tilford
SA	South Australia
SCF	Squared Cosine Function
SNA	Social Network Analysis
SPME	Solid-Phase Microextraction
TAS	Tasmania
TN	True negative
TP	True positive
VIC	Victoria
VRR	Variability Reduction Rules
WA	Western Australia
WDR	World Drug Report
WH	Working Hypothesis

# Abstract

Decisions by law enforcement agencies regarding crime disruption, prevention and reduction rely on significant volumes of information from various sources. There is a desire to use this information for generating intelligence to support proactive policing rather than reactively responding to crime. Utilising an existing proof of concept, this research explored the application of chemometric techniques to chemical profiles of state-level methylamphetamine seizures, acquired from the Australian Federal Police through the Enhanced National Intelligence Picture on Illicit Drugs capability. The main aim was to create and deliver a methodology that would expand the use of illicit drug profiling for strategic and operational intelligence purposes, to be more effective in the fight against illicit drug trafficking.

The use of comparison metrics and clustering analysis to determine links between illicit drug specimens was evaluated and automated. The scores resulting from comparison metrics were evaluated through two established approaches, i.e. deterministic and Bayesian approaches. Results showed that using the two approaches in combination provided more information about linkages than when either approach was used independently.

Relational, temporal, spatial and quantitative analyses were subsequently used to gain an insight into illicit drug markets. Relational analysis identified clusters of seizures central to the network. Temporal analysis then provided insights into the behaviour of distribution markets, specifically the emergence and extinction of certain groups of seizures over time. Finally, spatial analysis aided the understanding of the inter-jurisdictional nature of illicit drug markets. These analyses allowed for the generation of strategic intelligence relating to when and where the Australian illicit drug market was the most active. Additionally, the strategic level trends identified clusters of seizures which were worth investigating further. These clusters were explored through a case study to provide drug market knowledge at an operational level.

The presentation forensic case data, for intelligence or court purposes, typically involve the preparation of static reports. The final aim of this project was the creation of a visualisation tool, which was created to enhance the way processed data was conveyed. This tool was produced in the form of a web application and was used to aid the exploration of drug markets. It provided an automated way of analysing the forensic case data and producing relevant visualisations in an interactive and timely manner.