School for Social and Policy Research
Report

Northern Territory 2005 Gambling Prevalence Survey: An Extended Analysis

Martin Young
Matthew Stevens
William Tyler

COMMUNITY BENEFIT FUND
Helping Build Better Communities

Charles Darwin UNIVERSITY

Northern Territory 2005 Gambling Prevalence Survey: An Extended Analysis

Report prepared for the Community Benefit Committee,
Department of Justice, Northern Territory Government

Authored by:

Martin Young
Matthew Stevens
William Tyler

School for Social and Policy Research,
Charles Darwin University

September 2008

Northern Territory 2005 Gambling Prevalence Survey: An Extended Analysis

ISBN 978-0-9804578-6-5

© 2008 School for Social and Policy Research, Charles Darwin University.

Printed by Uniprint NT, Charles Darwin University

Preface

This report presents an extended analysis of the gambling prevalence dataset collected as part of the *NT Gambling Prevalence Survey 2005*. Each Chapter builds upon the initial analyses conducted as part of the original prevalence report that was presented to the CBF in 2006. As agreed in the terms of funding, the Charles Darwin University (CDU) research team has been publishing its research findings as the research has progressed during 2007 and 2008. As of September 2008, the team has published, or submitted for review, a total of five manuscripts that were funded in total, or in part, by the CBF. Abstracts of each paper are provided as a series of appendices (see Appendix B to F). The current report combines the key findings from the CDU team's further analysis of the 2005 prevalence dataset in a single document. Its purpose is to present a plain-language description of each project along with key implications for research and harm minimisation.

The Research Team

Dr Martin Young (Chief Investigator), Senior Research Fellow (SSPR)
Mr Matthew Stevens, Research Fellow (SSPR)
Dr Bill Tyler, Adjunct Principal Research Fellow (SSPR)
Ms Waimei Lee, Research Associate (SSPR)

Acknowledgement

The authors wish to thank the Community Benefit Fund of the Northern Territory Department of Justice, for funding the research, and Waimei Lee (CDU) for assistance with report formatting and production.

Contents

Executive Summary

Chapter 2. How Well do the South Oaks Gambling Screen (SOGS) and Canadian Problem Gambling Index (CPGI) Measure Problem Gambling?

As applied in the NT prevalence survey, the CPGI is more psychometrically sound than the SOGS, and is recommended for further use at the population level.

The CPGI displayed a clearly interpretable uni-dimensional factor structure in the dimensionality analysis, better internal consistency (i.e. higher Alpha coefficients and inter-item co-variance); more significant correlation coefficients with the correlates of problem gambling (i.e. external validity); and produced lower proportions of false-positives (i.e. classification validity).

While there were limitations to the criteria used to identify false-positives in this analysis, the CPGI produced lower rates of false-positives relative to the SOGS for all external criteria. The SOGS classified approximately 40% more regular gamblers as problem gamblers than the CPGI. This translated to an approximate 30% reduction in the estimated prevalence of problem gambling amongst regular gamblers when the CPGI was used.

Significant differences were also observed in the psychometric properties of the SOGS and CPGI on the basis of gender. Both screens displayed better internal validity, dimensionality, external validity, and classification validity for females. In short, the psychometric properties of the screens were more stable for females compared with males in both the SOGS and CPGI.

The psychometric analyses revealed that the results produced by the respective gambling screens are heavily context dependent, both in terms of methods of application and the characteristics of target populations. Post-hoc psychometric testing of gambling screens is essential in understanding the limitations of problem gambling prevalence estimates and to qualify and guide their interpretation when applied in general population surveys.

Chapter 3. Which Groups of People in the Northern Territory Population do the Different Screens Classify?

A key finding concerned the differences in the socio-demographic characteristics of the problem gambler groups classified by the respective screens. In particular, the SOGS category was significantly associated with:

- Indigenous status
- main language other than English
- primary or below education
- home duties
- low income

The CPGI category, on the other hand, was significantly associated with:

- place of residence (i.e. Darwin)
- language other than English
- household structure (i.e. lone parent households, couple without children, and group households)
- age (i.e. above 55 years).

In other words, the SOGS problem gambler group appears to be more associated with low socioeconomic status than the CPGI group, who are more associated with location, demographic, and household structure variables.

The large number of SOGS items related to money issues may cause selective over-representation among low socioeconomic groups, including Indigenous people, who exist in relatively high proportions in the NT.

For both screens, female problem gamblers were associated with household level variables (i.e. employment status, household type and marital status), while males were associated with socio-economic variables including language, education, and income.

It is evident that the socio-demographic pattern of problem gambling constructed by both screens is heavily gender-specific, and that an analysis conducted on all persons inevitably confounds and obscures these differences.

Further research is required to validate the use of problem gambling screens within the Indigenous population and to understand the role of gender in the experience and categorization of problem gambling.

Chapter 4. What are the Risk Factors for Problem Gambling as Measured by the CPGI?

Multivariate modelling revealed that the independent risk factors associated with *regular gambling* were grouped in four categories: gender, household structure, language and education:

- Males were more than twice as likely as females to be regular gamblers.
- Couples without children and those living in group households were more likely to be regular gamblers than couples with children.
- People with lower than university education were more likely to be regular gamblers compared with university-educated respondents.
- People with a household language other than English were less likely to gamble regularly.

Only two categories of variable, household type and level of education, were risk factors for problem gambling:

- Those living in a group residence were over three times likely to be problem gamblers compared with couples with children.
- People educated to secondary level having were 4.3 times more likely to be problem gamblers compared with those with a university education.

Players of three gambling modes showed significant odds (95% CI) of being a problem gambler. They were:

- frequent players of electronic gaming machines (EGMs)
- keno players
- casino table game players

EGM play was extraordinarily associated with problem gambling with 100% of CPGI problem gamblers having played EGMs in 12 months before the survey.

A more comprehensive understanding of risk factors for problem gambling in the NT would require a broader approach than a telephone survey, one that meaningfully extends beyond the non-Indigenous population.

Chapter 5. What are the Relationships between Gambling Activities and Problem Gambling?

In terms of the structure of gambling activities, the analysis revealed a basic distinction between skill- and chance- based gambling. In other words, the different individual activities correlated with each other on these underlying dimensions.

Games more associated with chance (i.e. EGMs, instant lotteries, and weekly lotteries) comprised one dimension of participation, while games more closely associated with skill comprised another (i.e. casino table games, race betting, and sports betting).

Chance-based gambling is associated with residential remoteness, with older people, with females, and being either a single parent, separated or widowed. In contrast, skill - based gambling is associated with urban location, male gender, full-time employment, lone-person households and single status. Thus, participation in chance and skill is socially patterned, where different groups in society relate to gambling in different ways.

No association was found between chance, skill and CPGI scores, suggesting that it is the manifestation of chance in specific activities, rather the broad structure of activities, that constitute problem gambling risk.

While EGMs were by far the most risky (followed by keno and casino table games), the more activities engaged in per week the higher the greater the risk of problem gambling. Similarly, the more activities engaged in per year the higher the level of problem gambling risk.

Chapter 6. Can Cut-Points be Developed for the SOG and CPGI Appropriate to the Northern Territory Context?

The final Chapter of the report takes a conceptual step back from the preceding analyses to ask: “what would be the implications for our estimation of the levels of problem gambling in the NT, as well as the composition of the problem gambler categories, should the cut-points for the respective gambling screens be modified?”

This exploratory analysis argues that problem gambling may be usefully defined through a detailed investigation of the actual distribution of screen scores, rather than from the pre-existing cut-points. This argument is particularly relevant to the NT, where the population is particularly diverse and may produce distinctive response patterns, ones that were not evident in the contexts in which the screens were developed.

The comparison of the effects of alternative and recommended cut-points showed that estimates of problem gambling converge at 5+ for the SOGS and a lowering of the CPGI to 6+. A CPGI cut-point of 6+ yielded an overall problem gambling estimate of 1.06%, the same figure estimated by the SOGS 5+ cut-point.

Socio-demographic and gambling mode profiles under the alternative and recommended cut-points are very similar, with non-English speaking households and frequent EGM play constituting the most powerful risk factors.

In terms of harm-minimisation in the NT context, Chapters 2 and 3 found the CPGI to be the most appropriate screen to use for the NT population. This final Chapter refines this assessment by introducing an empirical case to reduce the CPGI cut-point from 8+ to 6+ for policy and harm minimisation purposes.

The analysis demonstrates the importance of applying empirically justifiable cut-points for the identification of problem gambling. Since the internationally-recommended benchmarks are not absolute, their application must be informed by the features of the subject population.

Chapter 1. Introduction – Further Analysis of the 2005 NT Prevalence Survey

1.1 Purpose of the report

This report presents an extended analysis of the gambling prevalence dataset collected as part of the *NT Gambling Prevalence Survey 2005*. Each Chapter builds upon the initial analyses conducted as part of the original prevalence report that was presented to the CBF in 2006. As agreed in the terms of funding, the Charles Darwin University (CDU) research team has been publishing its research findings as the research has progressed during 2007 and 2008. As of September 2008, the team has published, or submitted for review, a total of five manuscripts that were funded in total, or in part, by the CBF. Full copies of each paper are provided as a series of appendices (see Appendix B - F). This approach serves several purposes. It allows the team to communicate their findings to a wide audience. It also establishes national and international credibility for the research program funded by the CBF. Finally, it makes intelligent use of the anonymous peer review process associated with academic journals to help produce work of the highest quality. The current report combines the key findings from the CDU team's further analysis of the 2005 prevalence dataset in a single document. Its purpose is to present a plain-English description of each project along with key implications for research and harm minimisation.

1.2 Scope of the report

The report is divided into six Chapters.

Chapter 2 presents a parallel psychometric analysis of the SOGS and CPGI in the context of the NT. Put simply, these analyses test how well the screens measure what they are designed to measure, in this case problem gambling. This is achieved by testing particular qualities of the screens including *screen content, dimensionality, internal consistency, external validity* and *classification validity.*

Chapter 3 explores how the SOGS and CPGI perform when applied in parallel to the diverse sub-populations of the NT. In contrast to Chapter 2, this Chapter presents a parallel comparison of the respective screens with particular reference to gender, region, and the socio-demographic characteristics of respondents. We specifically examine the groups that the different screens classify, the socio-demographic characteristics of these groups, and the screens items that may be responsible for any differential discrimination observed.

Chapter 4 presents an analysis of the risk factors associated with problem gambling as measured by the CPGI. To achieve this we estimate problem gambling in the non-Indigenous population using the CPGI, describe the socio-demographic characteristics of problem gamblers in comparison to regular gamblers and non-regular gamblers, describe gambling participation by gambling mode for problem gamblers, regular gamblers, and non-regular gamblers, and use multivariate analysis to identify the socio-demographic and gambling activity variables associated with regular and problem gambling.

Chapter 5 examines the relationship between different gambling activities, the patterns of participation in those activities, and problem gambling. To achieve this we examine if different types of gamblers (i.e., non-regular, regular, and problem gamblers) have preferences for particular gambling activities, and profile the socio-demographic characteristics of players of each gambling type. We also test the relationship between different types of gambling activities and problem gambling (i.e. which gambling activities, or groups of activities, are most closely associated with problem gambling?).

Chapter 6 takes a conceptual step back from the preceding analyses to ask: "what would be the implications for our estimation of the levels of problem gambling in the NT, as well as the composition of the problem gambler categories, should the cut-points for the respective gambling screens be modified?" This exploratory analysis argues that problem gambling may be usefully defined through a detailed investigation of the actual distribution of screen scores, rather than from the pre-existing cut-points. This argument is particularly relevant to the NT, where the population is particularly diverse and may produce distinctive response patterns, ones that were not evident in the contexts in which the screens were developed.

1.3 Methods used in the 2005 NT Prevalence Survey

The *2005 NT Gambling Prevalence Survey* was the first comprehensive effort to provide a reliable baseline measure of gambling participation and problem gambling amongst the adult population of the NT (Young et al., 2006). To enable comparisons with the national survey conducted by the Productivity Commission (1999), as well as more recent problem gambling estimates from other jurisdictions, each respondent was administered two problem gambling screens, the SOGS and the CPGI. This enabled direct comparison of the screens based on responses by the same group of individuals (i.e. a sample of 376 regular gamblers), a procedure not previously conducted in Australia. Previous screen comparisons have used different samples of respondents, a procedure that limits the direct comparability of screens (McMillen, Marshall, Ahmed, & Wenzel, 2004). In contrast, a parallel screen assessment is able to determine the extent to which two different screens classify the *same set of respondents* and to identify the characteristics of the screens (i.e. individual items) that are responsible for the classification of problem gambler groups. It is the CDU parallel comparison of screens that provides the basis for Chapters 2 and 3 of the current report. Chapters 4 and 5 select the CPGI as the basis for an examination of problem gambling risk factors and tests associations between gambling activities and problem gambling. Finally, Chapter 6 revisits the question of screen cut-points to explore the implications of using revised cut-points that are more sensitive to the diverse characteristics of the NT's population.

Before the individual Chapters are presented it is worth refreshing the reader about the survey protocols used in the *2005 NT Gambling Prevalence Survey* (for full detail refer to Young *et al.* 2006 & Young, Stevens, & Morris 2008). A telephone survey was employed in a manner that replicated the methods of the Productivity Commission's (1999) nationwide survey of gambling and problem gambling. This involved a two-stage population sampling technique (Productivity Commission, 1999; Volberg, 2002). The first stage screened respondents to identify gamblers and non-gamblers. The second stage identified regular and non-regular gamblers. Regular gamblers were defined as those who gambled at least once per week on any of the following activities: electronic gaming machines (EGMs); betting on the races (i.e. horses and greyhounds); keno (a

type of continuous lottery); casino table games (e.g. blackjack or roulette); bingo; sports betting (on events like football, cricket, or tennis); casino games on the internet; private games for money (like cards or mah-jong); and any other gambling activity excluding raffles, sweeps, lotteries or instant scratch tickets. Socio-demographic, socioeconomic and attitudinal data was also collected for all respondents. Data was collected about gambling activity and frequency of play for all gamblers. Regular gamblers were asked an additional set of questions which included both the SOGS and the CPGI (with the order of screen administration randomised by gender). The final unweighted counts for the survey were: $n_{screened}$ = 5,381; $n_{completed}$ = 1,893 ($n_{regular\ gamblers}$ = 376; $n_{non\text{-}regular\ gamblers}$ = 850; $n_{non\text{-}gamblers}$ = 667). All results presented in this report pertain to the subset of respondents who received the two gambling screens (i.e. regular gamblers).

Chapter 2: How Well Do the South Oaks Gambling Screen (SOGS) and Canadian Problem Gambling Index (CPGI) Measure Problem Gambling?

2.1 Scope of the Chapter

Following the lead of the Productivity Commission's 1999 national gambling prevalence survey, most Australian states have conducted their own prevalence surveys of problem gambling (AC Nielsen, 2007; Gill, Dal Grande, & Taylor, 2006; McMillen et al., 2004; Productivity Commission, 1999; Queensland Government, 2005; Roy Morgan Research, 2006; Schofield, Mummery, Wang, & Dickson, 2004). However, although the CPGI has been recommended at the national level (Neal, Delfabbro, & O'Neil, 2005), consensus on the best way to measure problem gambling at the population level in Australia had not been reached (Battersby, Thomas, Tolchard, & Esterman, 2002; McMillen & Wenzel, 2006).

While several problem gambling screens have been employed, the two that have received the most recent attention are the SOGS and the CPGI. In order to determine the most appropriate screen to use in the NT, a direct comparison of these screens is required. However, with the exception of the Tasmanian prevalence survey (Roy Morgan Research, 2006), no previous Australian research had asked the SOGS and the CPGI questions of the same sample of respondents, a technique referred to as 'parallel assessment'. This is important shortfall because parallel assessment of screens is able to determine the extent to which two different screens classify the same set of respondents as problem gamblers. It also enables an identification of the characteristics of the screens (i.e. individual items) that are responsible for the classification of problem gambler groups. This analytical process allows us to determine how well each screen measures a desired construct (i.e. problem gambling). Based on this analysis we are able to choose the superior screen for a given context.

The current Chapter conducts a parallel analysis of the SOGS and CPGI in the context of the NT. It specifically tests the psychometric properties of the respective screens. Simply put, these analyses test how well the screens measure what they are designed to measure, in this case problem gambling. This is achieved by testing particular qualities of the screens including *screen content, dimensionality, internal consistency, external validity* and *classification validity.* As screen performance may vary according to gender, all analyses, with the exception of the content analysis, are completed for males, females and all persons.

2.2 Parallel comparison of gambling screens

Few large-scale population studies have compared two or more problem gambling screens in parallel fashion. While the administration of two screens in a single survey is potentially problematic due to the length of the instruments and the associated respondent load) it has the important advantage of enabling direct comparison of screens based on the same sample of respondents (Delfabbro, Lahn, & Grabosky, 2006). Specifically, parallel assessment of screens is able to determine the extent to which two different screens classify the same set of respondents as problem gamblers. This is not achievable when screens are administered to different samples. Other benefits of parallel comparison include the ability to understand differential classification of respondents, avoidance of potential bias in sample selection, and the ability to analyse a larger sample as opposed to dividing the sample into two or more parts for analysis. Five types of analyses were carried out on the sample of regular gamblers. They were *content analysis, dimensionality, internal consistency, external validity,* and *classification validity.*

2.3 Content analysis

Tables 2.1 and 2.2 present the screen items classified according to content for the SOGS and CPGI respectively. Also presented (in the right-hand column) are several content domains. These are the broad areas the items measure and are derived from a previous study by McMillen *et al.* (2004). Eight content domains are presented. These include chasing, lying and self-deception, problem recognition, loss of control, social consequences, personal consequences, money issues, and serious money issues. It is worth noting that the domains are unlikely to be mutually exclusive ways of categorising items. For example, "chasing" could quite easily be conceived as a "loss of control" in not sticking to gambling limits.

Of these domains, seven are represented by the twenty SOGS items while six domains by the nine CPGI items. The only domain uniquely represented by the CPGI is "tolerance", while "loss of control" and "lying and self-deception" are unique to the SOGS. Overall, there are no major differences between the screens in terms of the domains that they sample, although the percentage of items relating to "money issues" was considerably higher for the SOGS.

Table 2.1. SOGS items and content analysis

Screen item	Content domain
1 When you gambled, how often did you go back another day to win back money you lost? [1]	Chasing
2 Have you claimed to be winning money from gambling when in fact you lost? [1] **7** In the last 12 months, have you hidden betting slips, lottery tickets, gambling money or other signs of gambling from your spouse/partner, children, or other important people in your life?	Lying & self-deception
5 In the last 12 months, have you felt guilty about the way you gamble or what happens when you gamble? **20** Do you feel you have had a problem with your gambling? [2]	Problem recognition
3 In the last 12 months, have you gambled more than you intended to? **6** In the last 12 months, have you felt that you would like to stop gambling, but didn't think you could?	Loss of control
4 In the last 12 months, have people criticised your gambling or told you that you have a gambling problem, regardless of whether or not you thought it was true? **8** In the last 12 months, have you argued with people you live with over how you handle money?	Social consequences
10 In the last 12 months, have you lost time from work or study because of your gambling?	Personal consequences
9 In the last 12 months, have you borrowed from someone and not paid them back as a result of your gambling? **11** In the last 12 months, have you borrowed from household money to gamble or to pay gambling debts? **12** In the last 12 months, have you borrowed from your spouse or partner to gamble or to pay gambling debts? **13** In the last 12 months, have you borrowed from other relatives or in-laws to gamble or to pay gambling debts?	Money issues
14 In the last 12 months, have you obtained cash advances using your credit cards to gamble or to pay gambling debts? **15** In the last 12 months, have you borrowed from banks, finance companies or credit unions to gamble or to pay gambling debts? **16** In the last 12 months, have you borrowed from loan sharks to gamble or to pay gambling debts? **17** In the last 12 months, have you cashed in shares, bonds or other securities to gamble or to pay gambling debts? **18** In the last 12 months, have you sold personal or family property to gamble or to pay gambling debts? **19** In the last 12 months, have you written a cheque knowing there was no money in your account, to gamble or to pay gambling debts?	Serious money issues

[1] 'Sometimes', 'often' and 'always' coded to 1, and 'never' and 'rarely' coded to 0
[2] 'Yes, in the past, but not that way now', and 'yes, I feel this way now' coded to 1, and 'no' coded to 0

Table 2.2. CPGI items and content analysis

Screen item		Content domain
3	In the last 12 months, when you gambled, how often did you go back another day to try to win back the money you lost?	Chasing
5	In the last 12 months, how often have you felt that you might have a problem with gambling?	Problem recognition
9	In the last 12 months, how often have you felt guilty about the way you gamble or what happens when you gamble?	
2	In the last 12 months, how often have you needed to gamble with larger amounts of money to get the same feeling of excitement?	Tolerance
6	In the last 12 months, how often has gambling caused you any health problems, including stress or anxiety?	Personal consequences
7	In the last 12 months, how often have people criticized your betting or told you that you had a gambling problem, regardless of whether or not you thought it was true?	Social consequences
1	In the last 12 months, how often have you bet more than you could really afford to lose?	Money issues
4	In the last 12 months, how often have you borrowed money or sold anything to get money to gamble?	
8	In the last 12 months, how often has your gambling caused any financial problems for you or your household?	

2.4 Internal consistency

Internal consistency refers to the consistency with which the screen items measure the desired construct from person to person. That is, the same sets of items should correlate in the same direction for different respondents. High internal consistency generally indicates that there is little measurement error (e.g. misunderstanding of items). As a measure of consistency, Cronbach's Alpha coefficient was calculated for the two screens. This coefficient measures the degree of inter-correlations between all items on the scale. It ranges between 0 and 1, with 1 indicating perfect inter-correlation (i.e. perfect internal consistency) between the items on the screen and zero indicating no correlation. The inter-item covariance for each screen is also presented, which enables an assessment of absolute covariance of screen items between the screens. Results of the internal consistency analyses are presented in Tables 2.3 and 2.4.

Table 2.3. SOGS internal consistency statistics by gender: Item total correlation coefficients and standardised Alpha coefficients by gender

	Correlation coefficients[¶]		
Screen item[§]	**Males**	**Females**	**All persons**
Item 1	0.59	0.62	0.61
Item 2	0.40	0.42	0.40
Item 3	0.49	0.61	0.54
Item 4	0.52	0.72	0.59
Item 5	0.70	0.73	0.72
Item 6	0.69	0.79	0.74
Item 7	0.45	0.59	0.51
Item 8	0.61	0.62	0.62
Item 9	0.40	0.47	0.44
Item 10	0.63	0.61	0.61
Item 11	0.61	0.75	0.68
Item 12	0.43	0.44	0.42
Item 13	0.50	0.65	0.57
Item 14	0.43	0.67	0.52
Item 15	0.20	0.60	0.45
Item 16	0.24	0.51	0.36
Item 17	0.03	-	0.02
Item 18	0.50	0.49	0.50
Item 19	0.43	-	0.30
Item 20	0.57	0.79	0.67
Std Alpha[¥]	0.81	0.90	0.85
Mean inter-item covariance	0.014	0.032	0.018

§ See Table 2.1 for written descriptions of items and coding of measurement scales
¶ Pearson's correlation coefficient between item and overall screen score (SOGS 0 to 20)
¥ Standardised Cronbach's Alpha coefficient

Table 2.4. CPGI internal consistency statistics by gender: Item total correlation coefficients and standardised Alpha coefficients by gender

	Correlation coefficient[¶]		
Screen Item[§]	**Males**	**Females**	**All persons**
Item 1	0.70	0.83	0.76
Item 2	0.73	0.78	0.74
Item 3	0.80	0.75	0.78
Item 4	0.71	0.73	0.72
Item 5	0.84	0.89	0.86
Item 6	0.72	0.83	0.77
Item 7	0.73	0.65	0.68
Item 8	0.71	0.84	0.77
Item 9	0.84	0.86	0.85
Std Alpha[¥]	0.90	0.93	0.91
Mean inter-item covariance	0.184	0.237	0.204

§ See Table 2.2 for written descriptions of items and coding of measurement scales
¶ Pearson's correlation coefficient between item and overall screen score (CPGI 0 to 27)
¥ Standardised Cronbach's Alpha coefficient

Cronbach's Alpha coefficients indicated that the CPGI (0.91) had marginally better internal consistency than the SOGS (0.85) (Tables 2.3 and 2.4). Alpha coefficients for females were marginally higher than males and all persons for both screens. Item-total coefficients were consistently higher for female SOGS respondents except for item 10. For the CPGI, items 3 (chasing) and 7 (social consequences) for the binary and 4-point scale were lower for females. All item-total coefficients were significant ($p<0.001$) for both screens, except SOGS item 17 for males ($p=0.71$), and items 17 and 19 for females, which could not be estimated because no females answered these items in the affirmative. Mean inter-item covariance for the CPGI was significantly higher than that observed in the SOGS. In general, both screens had good internal reliability, although this was slightly higher for the CPGI. In addition, internal consistency was slightly higher for females for both screens, with the CPGI again slightly higher.

2.5 Dimensionality

Dimensionality refers to the underlying structure of the scale items as reflected in the loadings of individual screen items on identified dimensions (called factors or components) produced by a principal components analysis (PCA). A PCA takes a number of variables (i.e. screen items) and looks for correlation between them to produce a simpler, underlying set of explanatory variables. A uni-dimensional screen will usually produce a single factor solution (i.e. a single component or factor). This indicates all the items that comprise the scale correlate highly with each other and measure a single construct. A multidimensional scale produces two or more components, which may be desirable where the screen is attempting to measure a complex, multidimensional construct.

Box 1 summarises the all person solution for the SOGS, a three-factor solution which summarised 45% of the variation in the twenty SOGS items. The three factors described in Box 1 use the labelling from the content analysis presented in Table 2.1. Factor 1 included six of the seven represented sub-domains for the SOGS. Factors 2 and 3 represent similar constructs (i.e. money issues and associated social and personal consequences and behaviours), but indicate a clustering of different sets of screen items within these domains. These results indicate that the SOGS is a multi-dimensional measure of problem gambling.

Box 1 Summary of principal component analysis for the SOGS varimax rotated 3-factor solution for all persons: Component description (rotated Eigen-value and % variance explained) and SOGS items with loadings $\lambda \geq 0.40$ (items listed in descending order of importance on component).

Factor 1: *Social and personal consequences, money issues* (3.59, 18%): Items (6) couldn't stop gambling, (5) felt guilty about gambling, (20) feel has problem with gambling, (3) gambled more than intended, (4) people criticised your gambling, (1) go back to try and win loses, (2) claim to win when lost, and (11) borrowed household money to gamble/pay debts

Factor 2: *Money issues, social and personal consequences* (2.99, 15%): Items (18) sold personal/ family property to gamble/pay debts, (19) overdrawn account to gamble/pay debts, (16) borrowed from loan sharks to gamble/debts, (10) Lost time from work/study because of gambling, and (13) borrowed from relatives to gamble/debts, and (8) argued with people over money

Factor 3: *Money issues* (2.48, 12%): Items (15) borrowed from financial institution to gamble/pay debts, (14) cash advance on credit card to gamble/pay debts, (7) hidden betting evidence from important people, (11) borrowed household money to gamble/pay debts, (9) borrowed from someone and not paid back

Table 2.5 presents the SOGS factor analysis for males and females. The solution for males produced four factors while the solution for females produced two. The first four factors for males explained 49% of the item variation, while the first two factors for females explained 51% of the item variation. The first factor for males accounted for 17% of the variation in the twenty SOGS items and represented all content domains identified in the content analysis (see Tables 2.1 and 2.5). The second factor for males explained a further 15% of the variation. Five of the ten money related items, as well as the social consequences item (item 8), loaded on this factor. Two items (9 and 12) relating to money issues loaded above 0.4 on factor 3 as did item 2 in the lying and self-deception domain. The final factor in the four-factor solution for males contained the remaining items associated with money issues (items 14, 15 and 17), which represent more extreme forms of raising money.

Table 2.5. SOGS principal component analysis varimax rotated solutions by gender

	Males 4-factor varimax rotated PCA solution				**Females 2-factor varimax rotated PCA solution**	
Screen item§	**Factor 1**	**Factor 2**	**Factor 3**	**Factor 4**	**Factor 1**	**Factor 2**
Item 11	**0.72**	0.28	-0.12	0.01	**0.52**	**0.57**
Item 5	**0.69**	0.09	0.28	0.00	**0.72**	0.19
Item 6	**0.62**	0.22	0.31	0.00	**0.85**	0.19
Item 1	**0.58**	0.19	0.10	0.00	**0.60**	0.17
Item 3	**0.50**	-0.03	-0.01	0.10	**0.67**	0.03
Item 4	**0.49**	0.01	0.31	-0.05	**0.73**	0.23
Item 7	**0.49**	-0.02	0.12	0.27	0.35	**0.54**
Item 20	**0.48**	0.20	0.16	0.12	**0.83**	0.21
Item 18	0.15	**0.89**	0.05	0.05	0.09	**0.76**
Item 19	0.03	**0.88**	0.12	0.04	-	-
Item 10	**0.52**	**0.58**	-0.05	0.17	0.35	**0.61**
Item 13	0.27	**0.55**	0.23	-0.11	**0.47**	**0.51**
Item 16	-0.03	**0.52**	0.05	-0.08	0.07	**0.83**
Item 8	0.39	**0.41**	0.35	0.10	0.38	**0.54**
Item 12	0.14	0.08	**0.70**	0.12	0.08	**0.65**
Item 2	0.16	0.10	**0.58**	-0.05	**0.56**	-0.09
Item 9	0.04	0.37	**0.59**	0.19	0.17	**0.57**
Item 14	0.17	0.14	0.17	**0.72**	**0.45**	**0.55**
Item 17	-0.17	0.00	0.02	**0.66**	-	-
Item 15	0.40	-0.01	-0.39	**0.42**	0.40	**0.52**
Cumulative % variance	17%	32%	42%	49%	27%	51%

Note: Bold font indicates loading greater than 0.4
§ See Table 2.1 for written descriptions of items and coding of measurement scales

Only two rotated factors were required to produce an interpretable solution for females with the first and second rotated factors explaining 27% and 24% of the variation in all items respectively. The first factor represented all content domains except personal consequences (i.e. item 10 losing time from work or study because of gambling). It contained only one item from the content domain for money issues. The second factor for females contained the remaining items from the money issues content domain, and also includes items about personal (item 10) and social (item 8) consequences of gambling, as well as one item from the lying and self-deception domain (item 7).

Table 2.6 presents the factor loadings for the CPGI by gender. In contrast to the SOGS, the CPGI scale produced a single factor solution that explained 57% and 64% of the variation for males and females respectively. These results confirm that the CPGI is uni-dimensional for males, females, and all persons. This means that the CPGI measures a single construct that comprises all nine items.

Table 2.6. CPGI dimensionality statistics by gender: Un-rotated component loadings and percentage of variation explained

	4-point Likert scale		
	1st component item loadings		
Screen Item§	**Males**	**Females**	**All persons**
Item 1	0.66	0.83	0.73
Item 2	0.71	0.78	0.73
Item 3	0.80	0.73	0.77
Item 4	0.74	0.75	0.75
Item 5	0.83	0.88	0.85
Item 6	0.74	0.84	0.78
Item 7	0.73	0.66	0.69
Item 8	0.74	0.85	0.79
Item 9	0.83	0.85	0.84
Eigen value	5.14	5.76	5.37
% of variance£	*57%*	*64%*	*60%*
Eigen values > 1	1	1	1

§ See Table 2.2 for written descriptions of items and coding of measurement scales
£ Percent of variance explained on the first principal component

2.6 External validity

External validity refers to the extent to which a screen measures the desired construct (i.e. problem gambling). External validity is demonstrated by strong positive associations with known correlates of problem gambling. For example, gambling expenditure, self-rated problem gambling, depression, stress and suicidal tendencies are known problem gambling correlates that may be used as measures of external validity (Gill *et al.,* 2006). In the current context, screen scores were correlated with total gambling expenditure, gambling expenditure as a percentage of income, gambling frequency, and with each other.

Table 2.7 presents the correlation coefficients for the SOGS and CPGI against each other, and four external criteria (i.e. total gambling expenditure, gambling expenditure as a percentage of income, and frequency of gambling with and without lotto and instant scratch tickets). All correlation coefficients were significant, although slightly higher levels of significance were obtained for the CPGI score compared with the SOGS in the all persons analysis. In addition, higher significance levels were evident for females compared with males for most of the external measures. The two expenditure-related measures displayed the highest correlations with the screens (between 0.41 and 0.49). A higher correlation was obtained for total gambling expenditure for females (0.49) compared with males (0.44), while the opposite was true of gambling expenditure as a percentage of income. A higher correlation coefficient

(and more significant) was observed between the two screens for females compared with males (0.88 *cf.* 0.79).

Table 2.7. External validity: Pearson's correlation coefficients between SOGS and CPGI scores, and gambling expenditure, gambling expenditure as a percentage of income and gambling frequency by gender

	SOGS			CPGI		
	Males	**Females**	**All persons**	**Males**	**Females**	**All persons**
Total gambling expenditure	0.44***	0.49***	0.45***	0.43***	0.48***	0.45***
% Gambling $ of total income	0.45***	0.41***	0.43***	0.50***	0.41***	0.46***
Gambling frequency [1]	0.13*	0.21*	0.15**	0.19**	0.18*	0.18***
Gambling frequency [2]	0.16*	0.20*	0.15**	0.19**	0.24**	0.19***
SOGS score	-	-	-	0.79***	0.88***	0.83***
CPGI score	0.79***	0.88***	0.83***	-	-	-

Note: *** $p \leq 0.001$, ** $p \leq 0.01$, * $p \leq 0.05$
[1] Includes lotto and instant scratch tickets
[2] Excludes lotto and instant scratch tickets

2.7 Classification validity

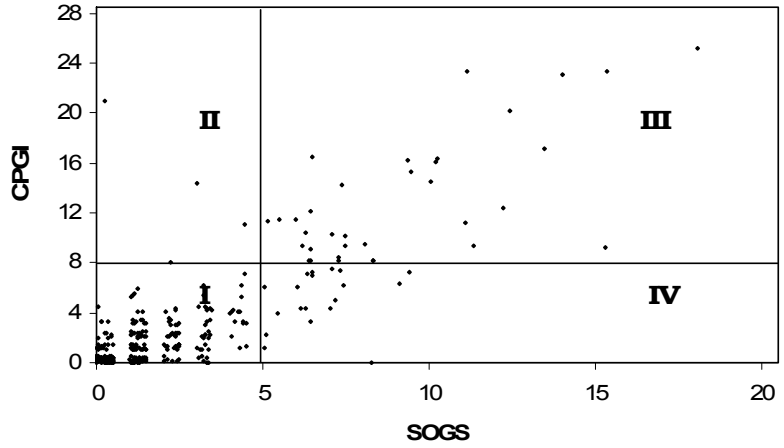
Classification validity determines the extent to which the screens correctly classify individuals as problem gamblers. Ideally, there needs to be a 'gold standard' measure of problem gambling (i.e. a true problem gambling measure) that is usually provided through interviews with respondents by a trained counsellor or psychologist. Given the absence of such a gold standard, and the current purpose of comparative analysis of the screens, three relative measures were used to determine differences between screens on the basis of gender. The three criteria for the SOGS are:

a) CPGI problem gamblers
b) gambling expenditure 15% or more of individual income
c) fourth quartile of total gambling expenditure for regular gamblers ($\geq$ $102 per week)

The same three criteria were used for the CPGI, with the exception that the SOGS problem gambler category was substituted for CPGI problem gambler category. For each of the criteria the percentage false-positives and false-negatives are presented. False positives describe cases (i.e. individuals) that are spuriously classified as problem gamblers. False negatives refer to problem gamblers that are misclassified as non-problem gamblers.

Classification validity was further assessed through the use of a scatter plot representing SOGS and CPGI scores, along with the cross-tabulation of SOGS by CPGI problem gamblers. Problem gambling prevalence estimates are also presented for each screen. Figure 2.1 graphs the cross-tabulation of problem gamblers classified by the SOGS and CPGI respectively. Five groups of problem gamblers can be described:

1) Quadrants III and IV: SOGS problem gambler (n=53)
2) Quadrants II and III: CPGI problem gambler (n=38)
3) Quadrant IV: SOGS problem gambler, but not a CPGI problem gambler (n=19)
4) Quadrant II: CPGI problem gambler, but not a SOGS problem gambler (n=4)
5) Quadrant III: both SOGS and CPGI problem gambler (n=34)



SOGS (5+) (no.)	CPGI (8+) Problem gambler		
Problem gambler	**No**	**Yes**	**Total**
No	304	4	**308**
Yes	19	34	**53**
Total	**323**	**38**	**361**
SOGS (5+) %			
Problem gambler	**No**	**Yes**	**Total**
No %	98.7	1.3	**100.0**
Yes %	35.9	64.2	**100.0**
Total %	89.5	10.5	**100.0**
SOGS (5+) %	**No**	**Yes**	**Total**
Problem gambler	**%**	**%**	**%**
No	94.1	10.5	85.3
Yes	5.9	89.5	14.7
Total	**100.0**	**100.0**	**100.0**

Figure 2.1. Scatter plot and cross-tabulation of SOGS by CPGI scores for regular gamblers.

The SOGS (quadrants III and IV combined) classified 14.7% (53/361) of regular gamblers as problem gamblers, while the CPGI (quadrants II and III combined) classified 10.5% (38/361) of regular gamblers as problem gamblers. The CPGI classified 64.2% (34 from 53) of the gamblers identified by the SOGS as problem gamblers, while the SOGS classified 92.1% (34 from 38) of the gamblers identified by the CPGI as problem gamblers (quadrant III). Therefore, the SOGS classified approximately 40% more regular gamblers as problem gamblers compared with the CPGI. This translated to an approximate 30% reduction in the estimated prevalence of problem gambling amongst regular gamblers when the CPGI is used.

Table 2.8 presents false-negatives and false-positives for the SOGS and CPGI by gender according to three external criteria (i.e. CPGI problem gamblers, gambling expenditure 15% of more of individual income, and the fourth quartile of total gambling expenditure for regular gamblers (≥$102 per week)). For all persons and for all criterions, the SOGS produced higher proportions of false-positives and lower rates of false-negatives than the CPGI. When analysed by gender, the SOGS produced higher rates of false-positives (and lower rates of false negatives) for males compared with females. This pattern also occurred with the CPGI, which produced higher rates of false-positives for males.

Table 2.8. Classification validity of problem gambling screens against external criteria: False-positives and false-negatives by gender

	SOGS problem gamblers			CPGI problem gamblers		
	Males	**Females**	**Persons**	**Males**	**Females**	**Persons**
	(n=27)	**(n=26)**	**(n=53)**	**(n=20)**	**(n=18)**	**(n=38)**
False-positives	**%**	**%**	**%**	**%**	**%**	**%**
SOGS Problem gambler	-	-	-	20.0	0.0	10.5
CPGI problem gambler	40.7	30.8	35.9	-	-	-
Expenditure 15% or more of income	48.2	30.8	39.6	40.0	27.8	34.2
4th quartile total gambling expenditure§	33.3	30.8	32.1	35.0	27.8	31.6
	(n=198)	**(n=110)**	**(n=308)**	**(n=205)**	**(n=118)**	**(n=323)**
False-negatives	**%**	**%**	**%**	**%**	**%**	**%**
SOGS Problem gambler	-	-	-	5.4	6.8	5.9
CPGI problem gambler	2.0	0.0	1.3	-	-	-
Expenditure 15% or more of income	13.6	20.9	16.2	14.2	23.7	17.7
4th quartile total gambling expenditure§	17.7	17.3	17.5	19.5	20.3	19.8

§ Total gambling expenditure quartiles calculated for regular gamblers (4th quartile ≥ $102 per week)

Figure 2.2 presents the prevalence estimates for problem gambling within the sample of regular gamblers. The CPGI prevalence estimate for problem gamblers was significantly lower than the SOGS for females (9.9% *cf.* 18.7%) and all persons (8.8% *cf.* 14.2%), but not for males (8.3% *cf.* 12.3%). There was no significant difference in problem gambling prevalence between males and females for either screen. This indicates that there is a significant difference between classification of problem gamblers by the two screens for females and all persons, but not males.

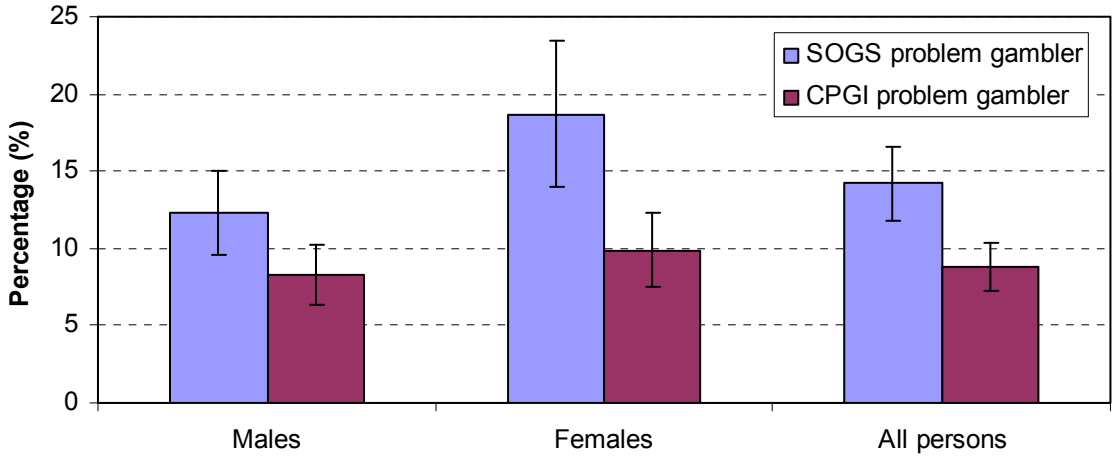


Figure 2.2. Problem gamblers as a proportion of regular gamblers for the SOGS and CPGI by gender

2.8 Summary of screen psychometric properties

Table 2.9 summarises the findings from the psychometric analyses comparing the performance of the SOGS and CPGI. The results indicate that as applied in the NT prevalence survey, the CPGI is the more psychometrically sound instrument (McMillen & Wenzel, 2006; Neal et al., 2005). The CPGI displayed a clearly interpretable uni-

dimensional factor structure in the dimensionality analysis, better internal consistency (i.e. higher Alpha coefficients and inter-item co-variance); more significant correlation coefficients with the correlates of problem gambling (i.e. external validity); and produced lower proportions of false-positives (i.e. classification validity). The prevalence estimates (within regular gamblers) were statistically different between the screens, with the CPGI problem gambling estimates significantly lower than the SOGS for females and all persons, but not for males. These results support the view that the SOGS produces higher problem gambling prevalence estimates than the CPGI in population surveys (Abbott & Volberg, 2006; Battersby et al., 2002; McMillen & Wenzel, 2006; Shaffer, Hall, & Bilt, 1999; Stinchfield, 2002; Thompson, Walker, Milton, & Djukic, 2005). While there were limitations to the criteria used to identify false-positives in this analysis, the CPGI produced lower rates of false-positives relative to the SOGS for all external criteria. The high rates of false-positives are consistent with the cross-tabulation of the problem gambler categories produced by each screen, which illustrated that the SOGS classified approximately 40% more regular gamblers as problem gamblers than the CPGI.

Significant differences were also observed in the psychometric properties of the SOGS and CPGI on the basis of gender (Delfabbro, 2000; Delfabbro et al., 2006; Delfabbro & LeCouteur, 2006; Poulin, 2002). Specifically, both screens displayed better internal validity (i.e. higher Alpha coefficients), dimensionality (i.e. fewer dimensions in the PCA and higher loadings on the first principal component), external validity (i.e. higher correlation coefficients with external criteria), and classification validity (i.e. fewer false-positives) for females. In short, the psychometric properties of the screens were more stable for females compared with males in both the SOGS and CPGI.

Table 2.9. Summary of psychometrics comparing the SOGS and CPGI for all persons

Psychometric analysis	**SOGS**	**CPGI**
Content analysis	▪ Good representation of content domains ▪ High representation of money related items	▪ Good representation of content domains
Dimensionality	▪ Multidimensional with no clear interpretable factor structure	▪ Uni-dimensional
Internal consistency	▪ Acceptable alpha coefficient – eight items with correlation coefficients ≤ 0.50 against total score, and three ≤ 0.40	▪ Acceptable alpha coefficient – all items (binary and Likert scale) with correlation coefficients ≥ 0.56 against total score
External validity	▪ Score showed significant (slightly lower than CPGI) associations with all external criterion	▪ Score showed significant (slightly higher than SOGS) associations with all external criterion
Classification validity	▪ Higher rates of false-positives ▪ Slightly lower rates of false-negatives	▪ Lower rates of false-positives ▪ Slightly higher rates of false-negatives
Prevalence estimates[1]	▪ Significantly higher than CPGI	▪ Significantly lower than SOGS

[1] Prevalence estimates of problem gambling for regular gamblers

2.9 Implications for research

It is evident from the psychometric assessment presented here that the CPGI is the preferred instrument for use in general population surveys. The CPGI also has the practical advantage of having fewer items which will minimise response burden (Neal *et al.,* 2005). Therefore, if the purpose is an efficient and comparable measure of problem gambling then the CPGI is the screen of choice. However, more research is required to validate the CPGI in a population context. In particular, studies that assess the classification and construct validity of the CPGI with sound external criteria would be welcome.

In terms of the SOGS, further understanding of its performance in population surveys is needed, particularly in terms of its complex factor structure. This complexity may indicate that this screen has some potential in identifying particular subgroups of problem gamblers (LaPlante, Nelson, LaBrie, & Shaffer, 2006). However, the lack of ease with which a readily interpretable factor solution was generated is a cause for concern. This issue is further explored in Chapter 3.

Gender proved to exert a significant effect on screen responses, and hence, in respective prevalence estimates of problem gambling produced by the screens. More research on the differences in gambling patterns and experiences of problem gambling on the basis of gender is called for, as is the effect of these differences on problem gambling measurement procedures. Given the gender differences, comparisons of problem gambling estimates need to be conducted with some caution and, at the very least, age-gender standardisation may be necessary for such comparisons to be validly drawn. Unfortunately, this is rarely done, and comparisons between jurisdictions remain fraught.

2.10 Implications for harm minimisation

Our analysis has supported the recommendation by Neal *et al*. (2005) of the use of the CPGI as the preferred measure within the general population. We recommend that it be re-employed in any future NT prevalence surveys or in any future NT-level studies that seek to identify problem gamblers. That said, we caution that prevalence estimates are imperfect measures of problem gambling. Depending on the screen and methods used, they may not represent accurate measures of problem gambling level across jurisdictions nor reliable measures time in a single jurisdiction. Therefore, direct comparisons between the NT and other jurisdiction are likely to be misleading. We recommend that prevalence estimates not be used as a comparative measure of social harm with which to assess the effectiveness of harm minimisation measures unless stringent criteria are adhered to including:

a) age-sex standardisation,
b) application of the same screen, preferably the CPGI,
c) presentation of the screen(s) in the same order or position in the survey instrument, and
d) use of similar sampling frames

Prevalence estimates and the screens on which they are based are most useful in defining the characteristics of problem gamblers and associated risk factors of problem gambling. This is the concern of Chapter 4. Finally, the gender differences make clear

the fact that problem gamblers are a heterogeneous group, something that is easily overlooked in the interpretation of problem gambler categories produced by screening instruments. Harm minimisation strategies may need to consider separate strategies for males and females.

Chapter 3: Which Groups of People in the NT Population Do the Different Screens Classify?

3.1 Rationale and scope

The SOGS was produced in a clinical setting for diagnostic purposes. In contrast, the CPGI was developed for population-level identification of problem gambling. Because of these different origins the screens produce different estimates of problem gambling and classify different groups of individuals as problem gamblers. In particular, questions have been raised about the applicability of the SOGS to different cultural groups, particularly given the number of questions relating to money issues (Battersby et al., 2002; Duvarci, Varan, Coskunol, & Ersoy, 1997; Stinchfield, 2002; Walker & Dickerson, 1996). However, given that different subgroups respond differently to the screens, analyses that either evaluate a single screen or compare screen performance across different samples are unable to provide a direct comparison of the relative operating characteristics of the instruments. As a consequence, the practical implications of screen choice in demographically and culturally distinct jurisdictions, such as the NT, are poorly understood. No studies have examined how these instruments perform in diverse population contexts. Therefore, the current Chapter explores how the SOGS and CPGI perform when applied in parallel to the diverse subpopulations of the NT. It specifically asks:

a) which groups do the screens classify?
b) are these groups different?
c) if so, which items in the screens are responsible for any differential discrimination?

These questions are answered through an analysis of the *differential discriminatory properties* of the screens. These refer to the reasons why particular population groups are classified as problem gamblers in relation to particular screen items. Differential discriminatory properties were explored using a three-stage process.

1) Regional and socio-demographic variables that displayed a significant association with the problem gambler category for each screen were identified.
2) Significant associations between screen items and the significant regional and socio-demographic variables from step 1 were identified.
3) Screen items showing the strongest association with the problem gambler category for each screen were identified.

Differential discrimination was determined by following the chain of significant associations between regional/socio-demographic variables, screen items and problem gambler categories.

3.2 Associations between problem gambler categories and regional and socio-demographic variables

Table 3.1 presents the significant bivariate associations between regional and socio-demographic variables, and the SOGS and CPGI problem gambler categories. The primary feature of Table 3.1 is the lack of overlap between the significant characteristics of the problem gambler category produced by the respective screens. Only one item, 'main language spoken at home not English', showed a significant association with both categories of problem gambler. In addition, Indigenous status was significantly associated with the SOGS problem gambler category. The SOGS largely identified respondents with low socioeconomic status, while the CPGI predominantly identified household-level characteristics.

Table 3.1. Significant unadjusted regional and socio-demographic associations with SOGS and CPGI problem gamblers: All persons

SOGS	CPGI
-	Darwin resident*
-	Age 55 or more years* n
Indigenous**	-
Language not English**	Language not English*
Primary or below*	-
Home duties**	-
Personal income <$20K*	-
-	Lone parent house*
-	Couple no children* n
-	Group house*

NOTE: Chi Squared Test: ** $p \leq <0.01$, * $p \leq 0.05$
n Negative association with the problem gambler category

Repetition of this analysis by gender revealed a greater complexity in the number of respondent characteristics that were significantly associated with SOGS and CPGI problem gambler categories (Table 3.2). It is evident that, in contrast to the analysis for all persons, there were more differences in associations within screens than between them, and these differences were gender-specific. Both screens tended to classify females with a particular household structure and relationship status (i.e. group household and not married/single). The male problem gambler category for both screens was more commonly associated with language (i.e. main language not English), employment (i.e. part-time worker) and income variables (i.e. personal income below $20,000). Also of note in Table 3.2 is the presence of characteristics that show opposite effects between males and females in associations with problem gambler categories; namely part-time workers and married respondents (positive association for males and negative association for females). Indeed, 'Indigenous status' was the only variable to display a consistent (positive) association with problem gamblers for males and females, although this was only significant for the SOGS problem gambler category. As with the all-persons analysis, age and location characteristics were associated with the CPGI problem gambler category, although rather than older respondents exhibiting a negative association, younger respondents showed a significant positive association for males only. Residence in Darwin displayed a positive association for females only for CPGI problem gamblers.

Table 3.2. Significant unadjusted regional and socio-demographic associations with problem gamblers for the SOGS and the CPGI by gender

SOGS		CPGI	
Males	**Females**	**Males**	**Females**
-	-	-	Darwin resident*
-	-	Age 18 - 24 years**	-
Indigenous*	Indigenous*	-	-
Language not English**	-	Language not English*	-
Primary or below**	-	-	-
-	-	Full-time worker* n	-
Part-time worker*	Part-time worker** n	Part-time worker**	Part-time worker* n
-	Home duties**	-	-
-	Student (FT)*	-	Student (FT)*
-	-	Unemployed*	-
Personal income <$20K*	-	Personal income <$20K*	-
-	House income $40-59K*	-	-
-	Lone parent house**	-	Lone parent house*
-	-	Couple no children* n	-
-	Group house**	-	Group house**
Married*	Married* n	-	Married* n
-	Single (not married)*	-	Single (not married)*

NOTE: Chi Squared Test: ** $p \leq <0.01$, * $p \leq 0.05$
n Negative association with the problem gambler category

3.3 Significant associations between screen items and significant regional and socio-demographic variables

Tables 3.3-3.5 present the results of steps two and three of the differential discriminatory analysis. Table 3.3 presents the results of this analysis for all persons. The lines of items adjacent to the regional and socio-demographic variable column were all significantly associated ($p \leq 0.05$) with these variables respectively. The items are listed in order of significance from left to right. Items with a bold font indicate the regional or socio-demographic variables were associated with problem gamblers.

The bolded SOGS items indicate that the socio-demographic variables with the most significant item associations were Indigenous status (10 items), main language spoken at home not English (10 items), and highest level of education primary or below (9 items). Most of these items (at least 4) were concerned with "money issues". Indigenous respondents had the most (4 items) items showing an association with the SOGS problem gambler category, followed by 'main language spoken at home not English' and 'highest education primary or below' (3 items), 'personal income less than $20,000 per annum' (2 items) and 'home duties' (1 item).

For the CPGI items, 'older respondents' (6 items), 'main language spoken at home' (6 items), and 'respondents living in group households' (4 items) had the most number of significantly associated items. Of the socio-demographic variables that were significantly associated with the CPGI problem gamblers category, two, 'age 55 or more' and 'group households', were significantly associated with three of the four most important CPGI items.

Table 3.3. Associations between regional and socio-demographic variables, screen items, and SOGS and CPGI problem gamblers: persons

Regional and socio-demographic variables	SOGS problem gamblers: Significant items[1,2]	# (%) items	CPGI problem gamblers: Significant items[1,2]	# (%) items
Darwin resident	16	1 (5)	**8, 4**	**2 (22)**
Aged 55+ yrs [n]	11[n]	1 (5)	**7, 4, 9, 2, 8, 6**	**6 (67)**
Indigenous	**13, 6, 12, 5, 2, 20, 18, 19, 4, 7**	**10 (50)**	1, 8, 3, 9, 2	5 (56)
Language not English	**2, 6, 19, 8, 9, 5, 12, 1, 13, 18**	**10 (50)**	**5, 6, 3, 2, 1, 9**	**6 (67)**
Primary or below	**13, 19, 5, 9, 12, 10, 6, 1, 18**	**9 (45)**	3, 1, 9, 2	4 (44)
Home duties	**8, 9, 13, 16**	**4 (20)**	2, 9, 8	3 (33)
Personal income <$20K	**16, 13, 8, 18, 3, 20**	**6 (30)**	2, 8	2 (22)
Lone parent	13, 18, 11, 20, 9, 10	6 (30)	**8, 4**	**2 (22)**
Couple no children [n]	13	1 (5)	**8, 4**	**2 (22)**
Group house	8, 6	2 (10)	**5, 3, 6, 4**	**4 (44)**
Six most significant[3] items	6, 20, 5, 11, 8, 4		-	
Four most significant[3] items	-		4, 6, 8, 5	

1 Chi Squared Test: Significant association ($p \leq 0.05$) between regional & socio-demographic variable, & SOGS/CPGI items

2 Bold font: Chi Squared Test: Significant association ($p \leq 0.05$) between regional & socio-demographic variable, & SOGS/CPGI problem gambler category - see Table 4.5

3 Chi Squared Test: Significant association ($p \leq <0.0001$) between screen item & SOGS/CPGI problem gambler category

n Negative association between regional & socio-demographic variable, and SOGS/CPGI item

Table 3.4 presents similar information to Table 3.3 for the SOGS stratified by gender. The most distinctive feature of Table 3.4 is the differences between males and females in the item associations by socio-demographic category. The bulk of the items for males were associated with education, language, employment status, Indigenous status, and income, all of which are indicators of socioeconomic status. For females, the items were more evenly spread across the range of available variables. Females had fewer items than males associated with socioeconomic status, and more with labour force status (i.e. 'home duties' and 'student'), household structure (i.e. 'lone parent' and 'group households') and marital status. In short, the items are distributed quite differently according to gender. For females the socio-demographic items, with the exception of Indigenous status and full-time students, reflect household and family characteristics rather than individual characteristics, as was the case for males.

This difference is also reflected in the order and importance of the screen items (Table 3.4). The six items most significantly associated with the SOGS problem gamblers category for males (in order if significance) were items 6 (could not stop gambling), 5 (feeling guilty), 11 (borrowing household money), 8 (arguing with people), 1 (chasing money lost) and 20 (self-identification of gambling problem). Four of the top six items (items 20, 6, 11, and 5) associated with the male SOGS problem category were in the top six most significant items for females, though the female category also included items 4 (being criticised for their gambling) and 13 (borrowing from relatives) and did not include 8 (arguing with people) or 1 (chasing money lost). Where the socio-demographic variable was associated with several items for both genders, specifically 'Indigenous status', a different set of screen items emerged. Indeed, the money related item, 13 (borrowing from relatives), was the only shared screen item showing a significant association with both males and females.

Table 3.5 presents the same analysis by gender for the CPGI. The distribution of items once again displays a marked gender-based variation. In a broad sense, the items for males were most commonly associated with socioeconomic variables (i.e. language, education and income). Items for females were most commonly associated with employment status (i.e. 'part-time worker', 'home duties' or 'student'), household structure, and marital status. In this sense, the gender association displayed a similar pattern to those evident within the SOGS. The four most significant items are common to males and females, although are in a different order of importance.

Table 3.4. Associations between regional and socio-demographic variables, screen items and SOGS problem gamblers by gender

	SOGS		**SOGS**	
Regional and socio-demographic variables	**Males: Significant items[1, 2]**	**# (%) items**	**Females: Significant items[1, 2]**	**# (%) items**
Darwin resident	9[n]	1 (5)	-	0 (0)
Age 18 - 24 years	-	0 (0)	-	0 (0)
Indigenous	**9, 12, 13, 19, 8, 7, 18**	**7 (35)**	**6, 4, 20, 13, 5, 10, 2**	**7 (35)**
Language not English	**9, 8, 2, 13, 19, 12, 6, 18, 1, 5, 14**	**11 (55)**	2, 4, 5	3 (15)
Primary or below	**9, 13, 5, 19, 12, 6, 10, 18, 16, 1, 11**	**11 (55)**	-	0 (0)
Full-time worker	13[n], 16[n], 19[n], 9[n], 18[n]	5 (25)	5	1 (5)
Part-time worker	**19, 9, 18, 14, 13, 20, 8, 6**	**8 (40)**	**20[n], 6[n], 5[n]**	**3 (15)**
Home duties	-	0 (0)	**8, 9, 13, 4, 16, 1**	**6 (30)**
Full-time student	16, 8, 10	3 (15)	**16, 18, 10, 12, 13, 14, 7, 8, 11, 4, 6, 20**	**12 (60)**
Unemployed	9, 13	2 (10)	-	0 (0)
Personal income <$20K	**13, 16, 8, 3, 6, 2**	**6 (30)**	16	1 (5)
House income $40-59K	-	0 (0)	**20**	**1 (5)**
Lone parent house	-	0 (0)	**13, 10, 20, 18, 11, 1, 5, 4, 9**	**8 (40)**
Couple no children	-	0 (0)	-	0 (0)
Group house	13	1 (5)	**5, 8, 2, 6, 20, 3, 1**	**7 (35)**
Married	**7, 4**	**2 (10)**	**20[n], 6[n], 14[n], 5[n], 11[n], 13[n], 1[n]**	**7 (35)**
Single (not married)	-	0 (0)	**20, 2, 5**	**3 (15)**
Six most significant[3] items	6, 5, 11, 8, 1, 20		20, 6, 4, 11, 5, 13	

1 Chi Squared Test: Significant association ($p \leq 0.05$) between regional & socio-demographic variable, & SOGS items

2 Bold font: Chi Squared Test: Significant association ($p \leq 0.05$) between regional & socio-demographic variable, & SOGS problem gambler category - see Table 2

3 Chi Squared Test: Significant association ($p \leq <0.0001$) between screen item & SOGS problem gambler category

n Negative association between regional & socio-demographic variable, and SOGS item

Table 3.5. Associations between regional and socio-demographic variables, screen items and CPGI problem gamblers by gender

Regional and socio-demographic variables	CPGI Males: Significant items[1, 2,]	# (%) items	CPGI Females: Significant items[1, 2]	# (%) items
Darwin resident	-	0 (0)	**5**	**1 (11)**
Age 18 - 24 years	**4, 5, 3, 7, 1**	**5 (56)**	-	0 (0)
Indigenous	1, 3	2 (22)	9, 8, 7, 1	4 (44)
Language not English	**2, 5, 1, 6, 3, 9**	**6 (67)**	7	1 (11)
Primary or below	3, 1, 8, 9, 4	5 (56)	-	0 (0)
Full-time worker	**8**[n]	**1 (11)**	5, 4, 6	3 (33)
Part-time worker	**-**	**0 (0)**	**5, 6, 4**	**3 (33)**
Home duties	2	1 (11)	7, 2	2 (22)
Student (FT)	-	0 (0)	**4, 7, 8, 6**	**4 (44)**
Unemployed	**-**	**0 (0)**	-	0 (0)
Personal income <$20K	**9, 5, 8, 2, 4, 6**	**6 (67)**	-	0 (0)
House income $40-59K	-	0 (0)	2	1 (11)
Lone parent house	-	0 (0)	**8, 7, 4, 5, 9**	**5 (56)**
Couple no children	**4**[n]	**1 (11)**	8[n], 3[n]	2 (22)
Group house	3	1 (11)	**5, 6, 8, 9, 1, 2**	**6 (67)**
Married	-	0 (0)	**8**[n], **5**[n], **4**[n]	**3 (33)**
Single (not married)	-	0 (0)	**8, 5, 6**	**3 (33)**
Four most significant[3] items	4, 6, 5, 8		5, 6, 8, 4	

1 Chi Squared Test: Significant association ($p \leq 0.05$) between regional & socio-demographic variable, & CPGI items

2 Bold font: Chi Squared Test: Significant association ($p \leq 0.05$) between regional & socio-demographic variable, & CPGI problem gambler category - see Table 2

3 Chi Squared Test: Significant association ($p \leq <0.0001$) between screen item & CPGI problem gambler category

n Negative association between regional & socio-demographic variable, and CPGI item

3.4 Summary of screen classification differences

A key finding concerned the differences in the socio-demographic characteristics of the problem gambler groups classified by the respective screens. In particular, the SOGS category was significantly associated with:

- Indigenous status
- main language other than English
- primary or below education
- home duties
- low income

The CPGI category, on the other hand, was significantly associated with:

- place of residence (i.e. Darwin)
- language other than English
- household structure (i.e. lone parent households, couple without children, and group households)
- age (i.e. above 55 years)

In other words, the SOGS problem gambler group appear to be more associated with low socioeconomic status than the CPGI group, who are more associated with location, demographic, and household structure variables. Thus, the group classified by the

SOGS is located at the lower end of the socioeconomic spectrum in the NT. These groups are more likely to borrow money from a range of sources for group social outings and general living needs than are more affluent individuals. Indeed, the inclusive nature of many sporting clubs in the NT (who are major providers of gambling opportunities), and the two available casinos, means that gambling venues are often meeting places for otherwise socially marginalised groups of people, particularly for the Indigenous population (Young *et al*., 2007). Consequently, with its emphasis on money issues and borrowing, it is possible that the SOGS measures the social relations between people rather than problem gambling *per se*. Therefore, the SOGS may over-represent problem gambling among the Indigenous population.

The all person pattern of association between problem gambler category and socio-demographic variables became more complex when gender was introduced into the analysis. There existed more similarities between screens in terms of socio-demographic associations with gender than were evident within each screen. These differences appear closely related to gender-specific social roles and relations, with predictors for females more to do with time and social constraints compared to the predictors for males, which were more associated with socioeconomic position. One could speculate that female problem gambling may be more closely aligned with factors including time and opportunity, while for males the factors may include competition and economic advancement. Regardless, it is evident that the socio-demographic pattern of problem gambling constructed by both screens is heavily gender-specific, and that an analysis conducted on all persons inevitably confounds and obscures these differences.

3.5 Implications for research

In terms of the relationship between the screens and different socio-demographic groups, it appears that the large number of SOGS items related to *money issues* may cause selective over-representation of low socioeconomic groups, including the majority of the NT's Indigenous population. Further investigation is needed to determine whether the SOGS identifies different types of problem gamblers (e.g. based on gambling activity, frequency, and spending patterns), or if it is simply classifies certain population groups notably associated with different subgroups of problem gamblers.

The analysis by gender revealed major differences between screens that were masked at the all person level. Therefore, some caution needs to be attributed to aggregate representations of problem gambling because the SOGS and CPGI perform quite differently on the basis of gender. The fact that gender distinctions tended to override the difference between screens points to a strong case for the development of gender-specific problem gambling screens. This is particularly important in applications in diverse population contexts, such as the NT, that may present gender imbalances, particularly at the regional level.

3.6 Implications for harm minimisation

The estimates and description of problem gambler groups is very much dependent on the screen used. The SOGS and CPGI classify significantly different groups of problem gamblers. The SOGS categorises on the basis of socioeconomic status while the CPGI categorises on the basis of location, demographic and household structure variables. The SOGS appears biased towards the measurement of low income groups (including students and Indigenous people). No single screen should be considered as the 'true'

measure. However, the CPGI would appear to be more appropriate in the context of the NT's diverse population. Indeed, neither gambling screen is likely to be particularly effective as a measure of social harm within the Indigenous population. Other measures would need to be devised for this context (the concern of Part A of the CDU gambling research program that is reported on separately).

The similarity of gender-profiles between the screens suggests that males and females problem gamblers have distinct profiles. Male problem gamblers were identified on the basis of income and education, while females were identified on the basis of household structure and employment. This suggests that female problem gambling is associated with time and social opportunities while male problem gambling is more related to socioeconomic status. This means that if we are to measure the success of harm-minimisation strategies we need to do so separately for males and females as the reasons men and women gamble to excess differ, as does the experience and consequences of problem gambling.

Chapter 4: What are the Risk Factors for Problem Gambling as Measured by the CPGI?

4.1 Rationale and scope

At the national and international scales, problem gambling has been routinely associated with low socioeconomic status, male gender and membership of ethnic minority groups (Abbott, Volberg, Bellringer, & Reith, 2004; Clarke et al., 2006; Currie et al., 2006; Volberg, Abbott, Rönnberg, & Munck, 2001; Welte, Barnes, Wieczorek, Tidwell, & Parker, 2002, 2004). A second commonly identified set of risk factors are associated with the type of gambling undertaken (Currie et al., 2006; Welte, Barnes et al., 2004; Welte, Wieczorek, Barnes, Tidwell, & Hoffman, 2004). Several studies have demonstrated a specific association between problem gambling and gambling modes that are continuous and feature rapid cycles of play and outcome, particularly EGMs (Abbott, Volberg, & Rönnberg, 2004; Clarke et al., 2006; Welte, Barnes et al., 2004).

The extent to which these risk factors apply to particular jurisdictions at the smaller geographic scale is less clear. Jurisdictions vary in terms of their population composition and distribution, socio-economic structure, policy regimes, industry composition and structure, gambling access, gambling history, as well as the culture within which gambling is contextualised and given meaning. As a consequence the risk factors for problem gambling may vary at the regional level, particularly where the local population is diverse, as is the case in the NT.

Given the preceding Chapters (i.e. Chapters 2 and 3) have established the CPGI as the preferential instrument for population-level estimation of problem gambling in the NT, this Chapter presents an analysis of the risk factors associated with problem gambling as measured by the CPGI. To achieve this we:

a) Estimate problem gambling in the non-Indigenous population using the CPGI.
b) Describe the socio-demographic characteristics of problem gamblers in comparison to regular gamblers and non-regular gamblers.
c) Describe gambling participation by gambling mode for problem gamblers, regular gamblers, and non-regular gamblers.
d) Use multivariate analysis to identify the socio-demographic and gambling activity variables associated with regular and problem gambling.

Only 126 respondents (6.7% of the survey sample) identified themselves as Indigenous, a significant under-representation in the survey sample. As inclusion of these individuals would introduce considerable sample bias, the analysis was conducted for the non-Indigenous population only. The Indigenous population is considered separately by Part A of the overall CDU gambling research program and is reported in a companion volume (see also (Morris, Young, Barnes, & Stevens, 2006; Young, Barnes, Stevens, Paterson, & Morris, 2007).

4.2 Prevalence of problem gambling

The prevalence of problem gambling in the non-Indigenous population of the NT, as defined by the CPGI 8+ threshold, is 0.64% with an upper and lower bound for the standard error between 0.52% and 0.76% (95% confidence interval of 0.44% to 0.95%).

This translates to an estimated 800 problem gamblers with an approximate lower bound of 500 and higher bound of 1,100. Figure 4.1 presents the prevalence estimates for the CPGI ranges disaggregated by gender as a proportion of regular gamblers (Ferris & Wynne, 2001).

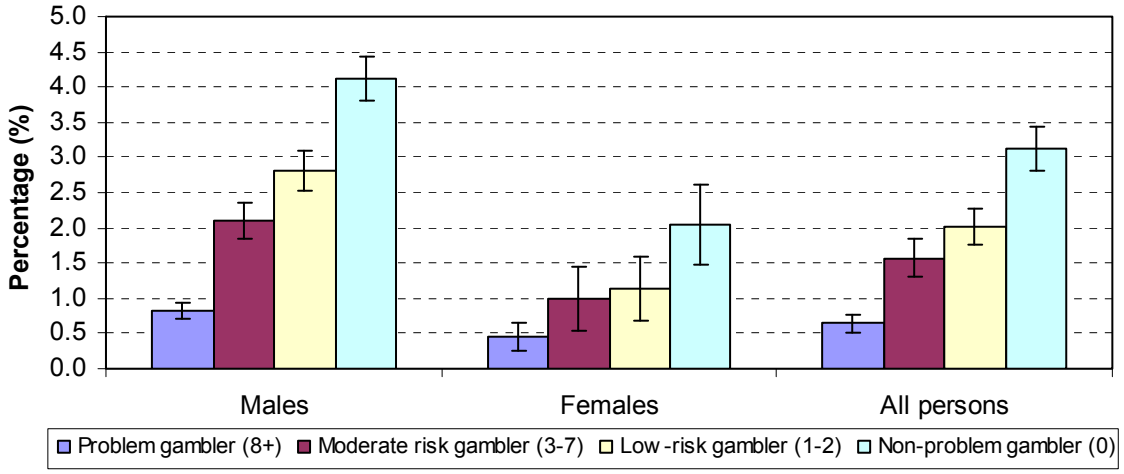


Figure 4.1. CPGI range by gender for regular gamblers

The prevalence of problem gambling among the non-Indigenous population of the NT as measured by the CPGI is not significantly different from the general prevalence levels among other general populations within Australia. However, it is likely that the prevalence estimate for the general NT population would be higher when the Indigenous population is taken into account, as problematic gambling is likely to be more widespread among this group (Morris et al., 2006; Young et al., 2007). However, problem gambling prevalence and its associated risk factors among the Indigenous population was not accurately assessable by the current analysis due to methodological limitations associated with a telephone survey. It is unlikely that any significant expansion of a prevalence approach will be viable in the future due to the high cost involved in travelling to remote locations to complete surveys. Such work would not, in any case, be viable until the problem gambling screens had been cross-culturally tested and modified as appropriate. Therefore, prevalence survey methodology is limited in its application to the NT. Future research would need to adopt a range of alternative strategies, including maximising the use of existing data collected by the Australian Bureau of Statistics and potentially broadening its surveys to include more gambling-related items, as well as employing a range of qualitative studies in selected locations in the NT. Both strategies are being employed by the Indigenous gambling component (Part A) of the CDU research program.

4.3 Socio-demographic characteristics of gamblers and problem gamblers

Table 4.1 presents the prevalence of problem gamblers, non-problem regular gamblers, non-regular gamblers, and non-gamblers within the adult NT non-Indigenous population. Percentage estimates are reported for each group (including standard errors). Bold numerals, representative of socio-demographic subgroup prevalence estimates that

are significantly different from the entire NT adult population at the 95% confidence level (Fisher's Exact test), are used as the basis for interpretation. The data indicate that the NT non-Indigenous population consists of between 6.4% and 7.4% regular gamblers, between 64.5% and 67.3% non-regular gamblers, and between 25.3% and 27.9% non-gamblers. In terms of socio-demographic composition:

Non-gamblers tended to be more educated and to attract higher incomes than the average non-Indigenous NT resident.

Non-regular gamblers were underrepresented in group households while overrepresented among primary-educated people and those in the $80,000 - $99,999 per annum income bracket.

Regular gamblers, who for the purposes of the analysis did not include problem gamblers, were significantly different from the NT average in terms of:

- gender (men were twice as likely to be regular gamblers compared to women);
- age (people aged above 55 years were more likely to be regular gamblers)
- ethnicity (those with a main language other than English were less likely to be regular gamblers)
- household type (regular gamblers were underrepresented among couples with children)
- education (regular gamblers were overrepresented among those educated to secondary level and underrepresented among those educated to tertiary level)
- labour force status (people working part time and students were less likely to gamble regularly)

Problem gamblers displayed less variation according to socio-demographic characteristic than regular gamblers. They were underrepresented among 25-34 year olds, couples without children, university educated people, and higher income earners.

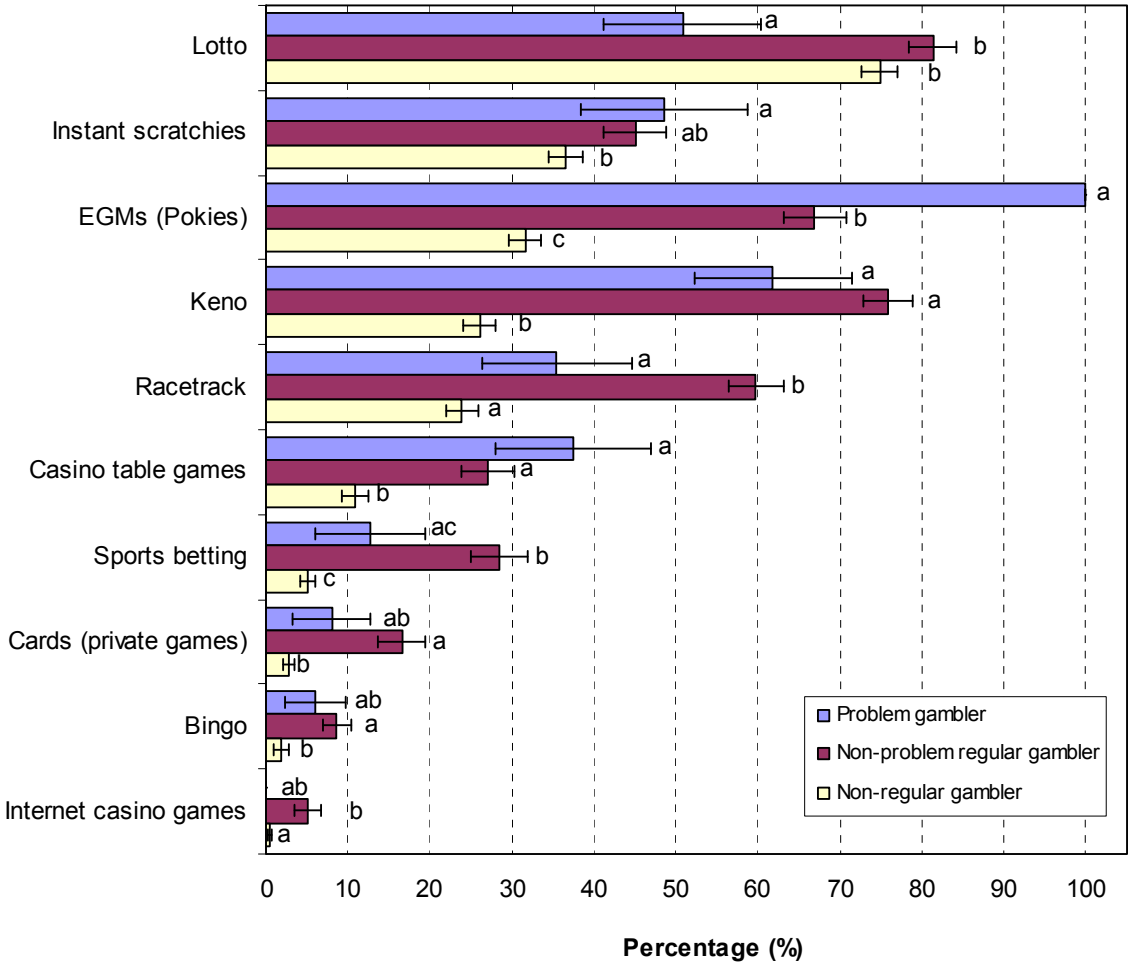
Table 4.1. Socio-demographic characteristics by gambler type

	CPGI Problem gambler	Regular non-problem gambler	Non-regular gambler	Non-gambler	
	% (+/- SE)	**% (+/- SE)**	**% (+/- SE)**	**% (+/- SE)**	**N**
NT	0.65 (+/- 0.1)	6.85 (+/- 0.5)	65.87 (+/- 1.4)	26.63 (+/- 1.3)	122,404
Gender					
Male	0.85 (+/- 0.2)	**9.35 (+/- 0.9)**	62.47 (+/- 2.1)	27.33 (+/- 1.9)	63,243
Female	0.43 (+/- 0.1)	**4.19 (+/- 0.5)**	69.50 (+/- 1.9)	25.88 (+/- 1.8)	59,161
Age					
18-24 yrs	1.70 (+/- 0.7)	7.33 (+/- 2.2)	65.11 (+/- 5.0)	25.86 (+/- 4.9)	15,369
25-34 yrs	**0.24 (+/- 0.1)**	5.74 (+/- 1.2)	66.60 (+/- 3.2)	27.41 (+/- 2.9)	29,542
35-44 yrs	0.39 (+/- 0.2)	5.49 (+/- 0.8)	65.61 (+/- 2.4)	28.52 (+/- 2.3)	25,610
45-54 yrs	0.89 (+/- 0.3)	6.23 (+/- 0.8)	68.61 (+/- 2.6)	24.28 (+/- 2.4)	29,536
55+ yrs	0.46 (+/- 0.2)	**10.38 (+/- 1.4)**	62.09 (+/- 3.1)	27.07 (+/- 2.7)	22,347
Country of birth					
Australia	0.63 (+/- 0.1)	6.90 (+/- 0.6)	67.09 (+/- 1.6)	25.39 (+/- 1.5)	97,306
Other country	0.75 (+/- 0.3)	6.69 (+/- 1.0)	61.13 (+/- 3.0)	31.44 (+/- 2.8)	25,098
Main language spoken at home					
English	0.65 (+/- 0.1)	7.06 (+/- 0.6)	65.96 (+/- 1.4)	26.33 (+/- 1.3)	117,995
Non-English	0.55 (+/- 0.6)	**1.41 (+/- 0.9)**	63.43 (+/- 8.5)	34.6 (+/- 8.4)	4,409
Marital status					
Married or defacto	0.49 (+/- 0.1)	6.94 (+/- 0.7)	66.01 (+/- 1.7)	26.56 (+/- 1.6)	83,109
Separated or divorced	0.91 (+/- 0.4)	7.78 (+/- 1.7)	69.41 (+/- 3.7)	21.91 (+/- 3.3)	8,647
Widowed	0.57 (+/- 0.6)	9.06 (+/- 3.2)	66.85 (+/- 7.1)	23.53 (+/- 6.1)	2,073
Single	1.06 (+/- 0.4)	6.22 (+/- 1.1)	64.58 (+/- 3.4)	28.15 (+/- 3.1)	28,253
Household type					
Couple with children	0.52 (+/- 0.2)	**4.99 (+/- 0.6)**	66.14 (+/- 2.0)	28.36 (+/- 1.9)	48,884
Single parent	1.40 (+/- 0.9)	4.18 (+/- 1.4)	73.79 (+/- 5.7)	20.63 (+/- 4.9)	6,716
Single person	0.73 (+/- 0.3)	7.31 (+/- 1.4)	67.10 (+/- 3.1)	24.85 (+/- 2.8)	16,421
Couple without children	**0.28 (+/- 0.1)**	8.39 (+/- 1.1)	68.11 (+/- 2.8)	23.22 (+/- 2.5)	35,486
Group	1.59 (+/- 0.8)	10.82 (+/- 3.0)	**51.48 (+/- 6.0)**	36.12 (+/- 6.1)	10,834
Highest level of education					
Primary & below	0.77 (+/- 0.3)	6.70 (+/- 1.2)	**72.49 (+/- 2.9)**	**20.04 (+/- 2.5)**	26,603
Some secondary	1.13 (+/- 0.3)	**9.37 (+/- 1.2)**	67.79 (+/- 2.4)	21.71 (+/- 2.4)	37,779
Some tertiary (not uni)	0.33 (+/- 0.2)	7.69 (+/- 1.3)	62.06 (+/- 3.4)	29.92 (+/- 3.1)	16,543
Some university	**0.27 (+/- 0.1)**	**4.37 (+/- 0.7)**	61.90 (+/- 2.6)	**33.46 (+/- 2.5)**	40,693
Household income					
Less than $20,000	1.64 (+/- 1.0)	6.91 (+/- 2.2)	70.99 (+/- 5.9)	20.47 (+/- 5.0)	3,683
$20,000-$39,999	0.84 (+/- 0.8)	9.40 (+/- 2.9)	65.74 (+/- 5.4)	24.02 (+/- 4.2)	7,056
$40,000-$59,999	0.64 (+/- 0.3)	6.37 (+/- 1.7)	63.98 (+/- 4.1)	29.02 (+/- 3.8)	14,632
$60,000-$79,999	**0.16 (+/- 0.2)**	6.56 (+/- 1.2)	67.73 (+/- 3.4)	25.56 (+/- 3.1)	13,499
$80,000-$99,999	**0.14 (+/- 0.1)**	6.79 (+/- 1.6)	**75.87 (+/- 3.3)**	**17.20 (+/- 2.7)**	16,390
$100,000 or more	0.84 (+/- 0.3)	8.14 (+/- 1.0)	68.59 (+/- 2.5)	22.43 (+/- 2.2)	40,137
Labour force status					
Working full-time	0.65 (+/- 0.2)	7.48 (+/- 0.7)	66.12 (+/- 1.7)	25.75 (+/- 1.6)	85,615
Working part-time	0.32 (+/- 0.2)	**4.45 (+/- 1.0)**	66.04 (+/- 3.8)	29.19 (+/- 3.6)	15,427
Home duties	0.49 (+/- 0.4)	5.04 (+/- 2.1)	66.36 (+/- 4.9)	28.11 (+/- 4.5)	6,705
Student	0.48 (+/- 0.5)	**1.93 (+/- 2.0)**	74.29 (+/- 8.1)	23.30 (+/- 7.7)	3,315
Retired (Self-supporting)	0.51 (+/- 0.5)	9.91 (+/- 2.5)	**53.41 (+/- 5.9)**	36.17 (+/- 5.7)	5,000
Pensioner	1.02 (+/- 0.8)	6.23 (+/- 1.9)	71.41 (+/- 6.2)	21.34 (+/- 5.4)	3,684
Unemployed	4.72 (+/- 3.8)	4.28 (+/- 2.5)	67.97 (+/- 10.7)	23.03 (+/- 8.9)	1,681

Note: Bold estimates indicate a significant difference ($p<0.05$) with the NT estimate (1st row).

4.4 Gambling activities and problem gambling

Figure 4.2 sets out the participation in various gambling modes by problem, regular (non-problem) and non-regular gamblers. Problem gamblers had significantly higher participation than non-problem regular gamblers in EGMs (100% compared to 66.9% $p<0.01$) and significantly lower participation in lotto (50.8% compared to 81.3% $p<0.01$) and betting on races (35.5% compared to 59.8% $p<0.05$). Problem gamblers had significantly higher participation compared with non-regular gamblers for EGMs ($p<0.01$), keno ($p<0.01$) and casino table games ($p<0.01$) and significantly lower participation for lotto ($p<0.01$). Regular gamblers had significantly higher participation than non-regular gamblers in all gambling activities except lotto and other non-defined gambling activities, where no significant differences occurred. More than twice as many males (4.92%) than females (2.14%) scored between 1 and 7 on the CPGI. In other words, men were more likely to engage in risky, but not necessarily problematic, gambling as defined by the CPGI.



NOTE: For each activity different letters indicate a significant difference (e.g. for cards (private) there was no difference in annual participation between problem and both non-problem regular gamblers and non-regular gamblers, but there is a significant difference between non-problem regular gamblers and non-regular gamblers).

Figure 4.2 Gambler type and gambling participation within the last 12 months.

4.5 Multivariate socio-demographic profile of regular and problem gamblers

The results of two separate multivariate logistic regression models are presented in Table 4.2. These models show the socio-demographic variables that were significantly and independently associated with regular gamblers and problem gamblers. That is, they present the effects attributed to a particular variable when other variables are held equal. Multivariate models thus eliminate confusion caused by spurious correlations. Model 1 indicates that the independent risk factors associated with the regular gambler profile were grouped in four categories: gender, household structure, language and education. Two univariate predictors of the regular gambler group, age and income, were removed in the backward stepwise elimination process. The odds for males being regular gamblers were 2.3 times that of females. Couples without children and those living in group households were more likely to be regular gamblers than couples with children. People with lower than university education were more likely to be regular gamblers compared with university educated respondents. People with a household language other than English were less likely to gamble regularly.

This bucks the trends of other studies that have associated ethnic minorities with problem gambling (Abbott, Volberg, & Rönnberg, 2004; Clarke et al., 2006; Currie et al., 2006; Gill et al., 2006; Volberg et al., 2001). However, the current finding is far from conclusive. The current survey only sampled a relatively small number of people from non-English speaking backgrounds and the results are not necessary representative, particularly when weighted. This finding does highlight the notion that gambling is culturally constructed, and its investigation would benefit from a more complex cultural division than the Indigenous versus non-Indigenous dualism routinely adopted in social research and policy in the NT.

Model 2 indicates that only two categories of variable, *household type* and *educational attainment*, were risk factors for problem gambling. In the contexts of households, those living in a group residence were over three times likely to be problem gamblers compared with couples with children. Education level was also a clear risk factor for problem gambling with those educated to secondary level having an odds ratio of 4.3 compared to those with a university education.

The modest explanatory power of models 1 and 2 indicate that gambling risk profiles are the result of many more factors than the socio-demographic variables used in these models. Therefore, models were further adjusted for the gambling modes that were significantly associated with regular and problem gambling (Table 4.3). In the context of predictive power, the most salient aspect of the introduction of gambling mode is the marked improvement in explanatory power from 5.6% in both regular and problem gambler profiles without the gambling activity variables to 17.2% for problem gamblers and 41.7% for regular gamblers. This indicates that gambling preferences were generally more significant predictors of gambler type than the socio-demographic variables.

For regular gamblers, the socio-demographic predictive pattern remained similar with the exception of the language variable which was eliminated from the model. However, male gender, household type and highest education attainment all retained independent effects. Odds ratios (95% CI) for gambling activities that predicted regular gambler membership included betting on sporting events (5.80 (2.88-11.69)), keno (5.58 (3.49-8.89)), playing EGMs (3.40 (2.08-5.57)) and betting on the races (2.90 (1.80-4.66)).

In contrast, the predictive profile for problem gamblers changed substantially when gambling mode was introduced into the model. In terms of the socio-demographic variables, the only resilient variable was household type, while educational attainment

became non-significant with the introduction of gambling activity. Because all problem gamblers participated in EGM playing in the previous 12 months, this variable was changed to reflect respondents who played EGMs four or more times per week. The reference category for frequent EGM play is people who played three times or less per week, while for the other gambling modes it is people who had not played in the previous 12 months. Players of three gambling modes showed significant odds (95% CI) of being a problem gambler. They were frequent players of EGMs (362 (6.51-20,059)), keno players (4.43 (1.59-12.35)) and casino table game players (3.92 (1.12-13.68)). EGM play was extraordinarily associated with problem gambling, with 100% of problem gamblers having played EGMs in 12 months before the survey. Frequent (four or more times per week) EGM players were more than 360 times more likely to be problem gamblers than non-frequent EGM players. This clearly indicates that EGMs are powerfully associated with problem gambling in the NT. This finding corresponds with other studies that have found a strong link between problem gambling and EGMs (Abbott, 2006; Breen & Zimmerman, 2002; Lund, 2006)). Although, as Young and Tyler (2008) point out, the relationship between EGMs and problem gambling is by no means direct or linear. It is variable and complex, particularly at the population level.

Table 4.2. Multivariate logistic regression for regular and problem gamblers

	Regular gamblers[1]: Model 1	**Problem gamblers[2]: Model 2**
	Odds Ratio (95% CI) (Pseudo R^2=5.6%)	**Odds Ratio (95% CI) (Pseudo R^2=5.6%)**
Gender		
Male	2.32 (1.65 - 3.25)	ns
Female	1.00	ns
Main language spoken at home		
English	1.00	ns
Other language	0.19 (0.06 - 0.63)	ns
Household type		
Single person	1.35 (0.83 - 2.19)	1.50 (0.47 - 4.76)
Single parent	1.03 (0.46 - 2.27)	2.58 (0.63 - 10.64)
Couple with children	1.00	1.00
Couple with no children	1.68 (1.15 - 2.46)	0.55 (0.18 - 1.69)
Group	2.51 (1.31 - 4.79)	3.28 (0.98 - 10.97)
Highest education qualification		
Some primary	1.64 (0.98 - 2.74)	2.70 (0.75 - 9.64)
Some secondary	2.39 (1.55 - 3.70)	4.30 (1.41 - 13.13)
Some tertiary (not uni)	1.71 (1.04 - 2.81)	1.30 (0.28 - 6.06)
Some university	1.00	1.00

[1] $N_{weighted}$ regular gamblers = 9,172 ($n_{unweighted}$ regular gamblers = 339).
[2] $N_{weighted}$ problem gamblers = 796 (+/- 153) representing 0.66% (+/- 0.13) of 121,618; $n_{unweighted}$ problem gamblers = 33 representing 1.94% of 1,732.
ns - Not significant (dropped in backward stepwise elimination)

Table 4.3. Multivariate logistic regression for regular and problem gamblers with the addition of gambling activities

	Regular gamblers[1]: Model 3	Problem gamblers[2]: Model 4
	Odds Ratio (95% CI) (Pseudo R^2=41.7%)	Odds Ratio (95% CI) (Pseudo R^2=17.2%)
Gambling mode: last 12 months		
EGMs[§]	3.40 (2.08 - 5.57)	361.38 (6.51 - 20,059)
Races	2.90 (1.80 - 4.66)	ns
Keno	5.58 (3.49 - 8.89)	4.43 (1.59 - 12.35)
Casino table games	ns	3.92 (1.12 - 13.68)
Sporting event	5.80 (2.88- 11.69)	ns
Gender		
Male	1.82 (1.16- 2.87)	ns
Female	1.00	ns
Household type		
Single person	1.50 (0.84 - 2.68)	1.52 (0.43 - 5.42)
Single parent	1.46 (0.70 - 3.04)	3.52 (0.82 - 15.17)
Couple with children	1.00	1.00
Couple with no children	1.71 (0.99 - 2.96)	0.47 (0.14 - 1.53)
Group	3.39 (1.48 - 7.75)	3.47 (1.00 - 12.08)
Highest education qualification		
Some primary	1.07 (0.51 - 2.22)	ns
Some secondary	2.03 (1.06 - 3.91)	ns
Some tertiary (not uni)	1.25 (0.58 - 2.69)	ns
Some university	1.00	ns

[1] $N_{weighted}$ regular gamblers = 9,172 ($n_{unweighted}$ regular gamblers = 339)
[2] $N_{weighted}$ problem gamblers = 796 (+/- 153) representing 0.66% (+/- 0.13) of 121,618;
$n_{unweighted}$ problem gamblers = 33 representing 1.94% of 1,732.
ns - Not significant (dropped in backward stepwise elimination)
§ - Played EGMs 4 or more times per week used in the model 4 (all problem gamblers had played EGMs)

4.6 Implications for research

Standard gambling prevalence surveys are not inclusive of the entire population of the NT, nor are they likely to be in the future. This is more problematic in the NT than in any other Australian jurisdiction due to the substantial Indigenous population. Strategies to understand the phenomenon and dynamics and gambling within the Indigenous population require a reorientation of traditional gambling research methods and the CDU team is attempting this as Part A (Indigenous gambling) part of the program (Young, Lee, Morrison, & Wolgemuth, 2008).

As far as the current prevalence results go, the NT does have a different pattern of risk factors to those commonly identified by national studies in Australia and other countries. In particular, low socio-economic status and male gender were not independent predictors of problem gambling using the CPGI. Household type and education were the main socio-demographic predictors of problem gambling, while these in addition to male gender and non-Anglo ethnicity were also predictors of the regular gambler profile. In the case of the NT, the social environment (measured by household type) and the cultural environment (measured by language other than English spoken at home) appear to be important in affecting gambling outcomes and hence would usefully inform social policy and research (Turner, Zangeneh, & Littman-Sharp, 2006).

Gambling activities proved to be of greater predictive power than socio-demographic variables in explaining problem gambling for non-Indigenous problem

gamblers in the NT, in particular EGMs. Current knowledge suggests this relationship is complex and various accepted discourses, such as 'exposure theory' require closer scrutiny (Abbott, 2006; Young & Tyler, 2008). The reasons why EGMs are an attractive form of consumption within a broader societal context is also deserving of greater attention (Bauman, 2007; Livingstone, 2005; Livingstone & Woolley, 2007).

More nuanced analysis of gambling participation patterns would also be valuable. The measure used by this study (i.e. participation in the previous 12 months), while appropriate for current purposes, masked the variations between the activity profiles of different types of gamblers. The significant increase in the explanatory power of the regression models with the addition of gambling mode indicates that gambling activities may be more important in affecting problem gambling than socio-demographics, or the characteristics of market *per se*. Therefore, attention is turned to gambling activities in the next Chapter.

4.7 Implications for harm minimisation

Two socio-demographic variables, household type and education, were predictors of both the regular and problem gambler profiles. While explanations of the effect of household type would necessarily be speculative at this stage, in a broader sense it suggests that the social structures at the household level are important and should be afforded more attention than purely individualistic explanations of gambling behaviour.

The notion of an 'at risk' household broadens the scope of investigation beyond the individual and may prove a useful unit of analysis in the policy context of family service provision. Therefore, the use of the household as a unit of analysis in gambling research may link problem gambling more readily than individual gambler characteristics to existing policy and treatment frameworks concerned with families and well-being.

The current results did not find independent effects associated with income or labour force status, suggesting that it is education rather than low socio-economic status *per se* that is predicting gambling behaviour. Given both regular and problem gambling were most closely associated with low educational attainment, there is certainly a case for considering intervention and awareness programs in early school years.

Given the powerful relationship between EGM play and problem gambling, policy and service providers in the NT would need to consider users of EGMs as a first base in accessing problem gamblers and designing harm-minimisation and intervention strategies. A relevant policy of harm minimisation would focus on EGM regulation within the context of particular venues. These issues are explored in depth in the companion report on gambling venues in the NT.

Chapter 5: What are the Relationships Between Gambling Activities and Problem Gambling?

5.1 Rationale and scope

In support of the powerful association between EGM gambling and problem gambling in the NT (Chapter 4), several other studies have demonstrated a specific association between problem gambling and gambling modes that are continuous and feature rapid cycles of play and outcome (Abbott, Volberg, & Rönnberg, 2004; Clarke et al., 2006; Welte, Barnes et al., 2004). In general, then, an association has been established between continuous gambling forms, principally EGMs, and problem gambling. However, while it is clear that EGMs are linked to problem gambling, it is equally clear that different gambling activities attract different groups of gamblers and produce different social outcomes. It is likely that different gamblers have different activity-profiles, and that these will be translated into different levels of problem gambling risk. Therefore, the current Chapter explores the link between gambler type, gambling activities, and problem gambling more fully. The analysis presented in this Chapter:

- Examines if different types of gamblers (non-regular; regular; and problem gamblers) have preferences for particular gambling activities (section 5.2),
- Profiles the socio-demographic characteristics of players of each gambling type (section 5.3),
- Examines the relationships between the number and frequency of activities engaged in and problem gambling (section 5.4), and
- Tests the relationship between different types of gambling activities (section 5.5) and problem gambling (i.e. which gambling activities, or groups of activities, are most closely associated with problem gambling) (section 5.6).

5.2 Socio-demographic description of participants by activity

Previous analyses conducted by the CDU team examined yearly gambling participation (Young et al., 2006). The purpose of the current section is to examine the characteristics of more frequent gamblers on an activity by activity basis. To do this Table 5.1 (a & b) presents the socioeconomic characteristics of gamblers based on monthly participation in 10 gambling activities. Statistically significant differences between the all gamblers and the particular socio-demographic group are bolded. The tables below provide the details and absolute proportions for these socio-demographic activity profiles. To avoid interpretation errors, it is important to emphasise the difference between representation in a particular activity and absolute participation levels. A group may be over-represented in a particular activity type (e.g. visitors to the NT and monthly EGM play) but comprise a very small percentage of total EGM players (in this case 3.4%). Therefore, over or under representation refers to the likelihood of a particular group participating in a particular activity compared to all gamblers. It indicates proclivity rather than a population proportion. To summarise tables 5.1 a & b:

Monthly **EGM** players were *over-represented* in the following categories:

- Visitor to the NT (*cf.* NT resident)
- Born in Australia (*cf.* overseas)
- Group households

Monthly **EGM** players were *under-represented* in the following categories:

- NT resident (cf. visitor to the NT)
- Born overseas (cf. Australia)
- Couple with children

Monthly **lotto** players were *over-represented* in the following categories:

- Aged 45 years and older
- Born overseas cf. Australia
- Individual income $40k-$59,999 pa
- Couple with children
- Married or Widowed

Monthly **lotto** players were *under-represented* in the following categories:

- Less than 25 years
- Born in Australia cf. overseas
- Attended university
- Labour force status home duties
- Individual income less than $20k pa
- Lone parent
- Single person

Weekly **keno** players were *over-represented* in the following categories

- Living in Tennant Ck/Nhulunbuy
- Male
- Visitor to the NT (*cf*. NT resident)
- Full-time worker
- Household income $125k plus pa
- Couple with no children

Weekly **keno** players were *under-represented* in the following categories:

- Female
- NT resident (*cf*. visitor to the NT)
- Attended university
- Individual income less than $20k pa
- Household income $100k-$124,999 pa
- Couple with children

Monthly **instant scratch ticket** players were *over-represented* in the following categories:

- Living in Alice Springs
- Female

Monthly **instant scratch ticket** players were *under-represented* in the following categories:

- Male
- Household income $40k-$60k pa

Monthly **bingo** players were *over-represented* in the following categories:

- Female
- 55 years or more
- Primary or lower education
- Labour force status home duties
- Pensioner
- Individual income less $40k pa
- Separated or widowed

Monthly **bingo** players were *under-represented* in the following categories:

- Male
- 25-34 years
- Attended university
- Full-time worker
- Individual income $60k plus pa
- Household income $125k plus pa

Monthly **racetrack** players were *over-represented* in the following categories:

- Living in Tennant Ck/Nhulunbuy
- Male
- Visitor to the NT (*cf*. NT resident)
- Full-time worker
- Individual income $60k-$79,999 pa
- Group households

Monthly **racetrack** players were *under-represented* in the following categories:

- Female
- NT resident (*cf*. visitor to the NT)
- Attended university
- Part-time worker
- Couple with children

Monthly **casino table game** players were *over-represented* in the following categories:

- Living in Alice Springs
- Male
- Aged 18-24 years
- Visitor to the NT (*cf*. NT resident)
- Some secondary schooling
- Group households
- Single person

Monthly **casino table game** players were *under-represented* in the following categories:

- Living in Tennant Ck/Nhulunbuy or outside of main towns in NT
- Female
- Aged 55 years or more
- NT resident (*cf*. visitor to the NT)
- Attended university

- Couple with children
- Single parent
- Married

Monthly **sports bet** players were *over-represented* in the following categories:

- Male
- Aged 25-34 years
- Household income $125k plus pa
- Group households

Monthly **sports bet** players were *under-represented* in the following categories:

- Female
- Individual income less $20k pa
- Household income less $80k pa

Monthly **internet casino (table) game** players were *over-represented* in the following categories:

- Living in Alice Springs
- Male
- Visitor to the NT (*cf*. NT resident)

Monthly **internet casino (table) game** players were *under-represented* in the following categories:

- Female
- NT resident (*cf*. visitor to the NT)

Monthly **private game** players were *over-represented* in the following categories:

- Aged 35-44 years
- Indigenous
- Born in Australia
- Primary or below education
- Household income less $40k pa
- Group households

Monthly **private game players** were *under-represented* in the following categories:

- Living in Darwin
- Aged 55 years or more
- Non-Indigenous
- Born overseas
- Both parents born overseas
- Household income $40k-$59,999 pa
- Household income $100k-$124,999 pa
- Lone person household

Table 5.1a Monthly participation in gambling activity by regional, socio-demographic and socioeconomic characteristics

	All Gamblers % (SE)	Monthly EGMs % (SE)	Monthly Lotto % (SE)	Monthly Keno % (SE)	Monthly Scratchies % (SE)	Monthly Bingo % (SE)
Location						
Darwin	53.5 (1.2)	50.6 (4.8)	57.7 (2.3)	54.6 (4.7)	55.3 (4.8)	41.3 (9.4)
Alice Springs	11.3 (0.6)	15.7 (2.9)	11.2 (1.1)	7.9 (2.1)	**19.9 (3.2)**	13.0 (5.0)
Katherine	4.7 (0.3)	5.8 (1.5)	4.4 (0.6)	6.8 (1.8)	4.2 (1.1)	10.1 (4.6)
Tennant Ck/Nhulunbuy	4.7 (0.5)	4.8 (1.3)	4.7 (0.6)	**13.6 (4.8)**	3.0 (0.9)	9.2 (4.7)
Rest of NT	25.8 (1.3)	23.1 (5.8)	22.1 (2.5)	17.2 (3.5)	17.5 (5.0)	26.4 (10)
Gender						
Female	47.6 (1.1)	45.8 (4.7)	46.4 (2.2)	**31.5 (4.0)**	**58.8 (4.6)**	**85.8 (5.7)**
Male	52.4 (1.1)	54.2 (4.7)	53.6 (2.2)	**68.5 (4.0)**	**41.2 (4.6)**	**14.2 (5.7)**
Age in years						
18-24	14.9 (1.2)	15.7 (3.2)	**5.0 (1.2)**	12.5 (3.2)	15.4 (3.5)	7.5 (4.4)
25-34	23.2 (1.1)	25.5 (5.4)	**18.2 (2.1)**	23.6 (5.3)	21.7 (4.1)	**7.1 (4.1)**
35-44	21.3 (1.1)	15.6 (3.0)	24.3 (2.0)	21.5 (3.4)	19.6 (3.2)	35.9 (9.4)
45-54	23.2 (1.4)	22.1 (3.4)	**28.2 (2.4)**	23.9 (3.6)	28.1 (4.7)	13.4 (5.4)
55 or more	17.4 (1.1)	21.0 (3.5)	**24.3 (2.0)**	18.4 (2.9)	15.3 (2.9)	**36.2 (9.8)**
Northern Territory resident						
Visitor	0.9 (0.3)	**3.4 (1.5)**	1.3 (0.5)	**3.8 (2.0)**	2.0 (1.1)	0.0 (0.0)
NT resident	99.1 (0.3)	**96.6 (1.5)**	98.7 (0.5)	**96.2 (2.0)**	98.0 (1.1)	100.0 (0.0)
Indigenous status						
Non-Indigenous	89.9 (1.5)	83.9 (4)	92.4 (2.0)	92.7 (2.4)	88 (3.5)	81.8 (7.9)
Indigenous	10.1 (1.5)	16.1 (4)	7.6 (2.0)	7.3 (2.4)	12 (3.5)	18.2 (7.9)
Language spoken at home						
English	95.8 (0.9)	97.2 (1.4)	95.2 (1.4)	96.1 (1.9)	94.6 (2.3)	92.5 (4.3)
Other language	4.2 (0.9)	2.8 (1.4)	4.8 (1.4)	3.9 (1.9)	5.4 (2.3)	7.5 (4.3)
Birthplace						
Australia	82.5 (1.3)	**88.6 (2.1)**	**78.8 (2.1)**	84.9 (2.9)	85.3 (3.1)	70.1 (9.7)
Overseas	17.5 (1.3)	**11.4 (2.1)**	**21.2 (2.1)**	15.1 (2.9)	14.7 (3.1)	29.9 (9.7)
Birthplace parents						
Both Australia	62.1 (1.8)	69.7 (3.9)	58.7 (2.6)	64.8 (4.4)	65.6 (4.6)	60.9 (9.6)
Father only overseas	8.5 (1.0)	8.5 (2.1)	9.5 (1.6)	6.8 (2.2)	6.7 (2.9)	3.7 (2.8)
Mother only overseas	5.3 (0.8)	4.0 (1.3)	5.1 (1.1)	4.4 (1.8)	4.6 (1.7)	1.4 (1.4)
Both parents overseas	24.1 (1.6)	17.9 (3.0)	26.6 (2.2)	24 (3.7)	23.1 (4.0)	34.0 (9.6)
Highest education						
Some university	29.2 (1.8)	18.8 (5.3)	**24.6 (2.4)**	**16.0 (3.2)**	26.1 (4.6)	**10.7 (5.4)**
Some tertiary	12.3 (1.2)	13.3 (2.8)	14.0 (1.7)	18.5 (5.2)	11.2 (2.5)	2.4 (2.4)
Some secondary	56.7 (2.0)	65.3 (5.2)	59.5 (2.7)	64.1 (5.2)	61.1 (4.9)	73.3 (8.1)
Some primary	1.8 (0.6)	2.6 (1.2)	1.9 (0.9)	1.5 (0.7)	1.6 (0.9)	**13.6 (6.3)**
Labour force status						
Full-time	69.9 (1.8)	66.5 (4.7)	71.6 (2.5)	**78.2 (3.4)**	67.0 (4.9)	**38.5 (9.3)**
Part-time	12.3 (1.2)	18.2 (4.0)	13.0 (2.0)	8.7 (2.1)	16.9 (4.3)	22.1 (7.3)
Home duties	5.0 (0.7)	4.1 (1.6)	**2.7 (0.7)**	2.0 (1.1)	4.6 (2.0)	**16.4 (9.5)**
Student	3.1 (0.7)	2.0 (1.1)	1.7 (0.8)	1.5 (1.2)	3.8 (2.2)	0.0 (0.0)
Retired	3.8 (0.6)	3.2 (1.2)	4.9 (0.9)	4.2 (1.2)	2.3 (0.9)	2.2 (1.6)
Pensioner	3.3 (0.7)	2.1 (1.0)	3.6 (1.0)	1.9 (0.7)	3.2 (1.2)	**20.8 (8.4)**
Unemployed looking	2.6 (1.1)	4.0 (2.3)	2.6 (1.1)	3.6 (1.9)	2.2 (1.7)	0.0 (0.0)
Individual income pa						
Less than $20,000	17.3 (1.6)	20.1 (3.8)	**13.6 (2.0)**	**9.6 (2.3)**	21.1 (4.1)	**44.4 (10.2)**
$20,000 - $39,999	22.9 (1.8)	26.2 (4.5)	21.0 (2.2)	20.7 (3.5)	27.3 (4.6)	**38.9 (9.0)**
$40,000 - $59,999	29.8 (1.9)	26.3 (3.7)	**34.2 (2.6)**	27.4 (4.1)	27.1 (4.2)	14.3 (6.3)
$60,000 - $79,999	16.4 (1.2)	12.6 (2.7)	16.1 (1.8)	19.9 (3.8)	13.2 (3.6)	**2.4 (2.4)**
$80,000 - $99,999	6.7 (1.3)	4.5 (1.3)	6.6 (1.1)	9.9 (2.7)	5.7 (1.8)	0.0 (0.0)
$100,000 or more	6.9 (1.1)	10.3 (5.4)	8.5 (1.3)	12.5 (5.2)	5.7 (1.8)	0.0 (0.0)
Household income pa						
Less than $40,000	10.9 (1.4)	10.1 (2.3)	9.3 (1.5)	9.2 (2.3)	9.5 (2.5)	19.5 (6.7)
$40,000 - $59,999	12.6 (1.2)	13.2 (3.0)	14.2 (2)	11.2 (2.3)	**19.4 (4.6)**	23.2 (9.4)
$60,000 - $79,999	16.7 (1.6)	19.5 (4.3)	15 (1.9)	12.2 (2.8)	16.7 (3.5)	26.7 (8.1)
$80,000 - $99,999	21.6 (1.7)	21.4 (3.5)	21.2 (2.4)	27.8 (4.4)	16.2 (3.4)	20.6 (8.3)
$100,000 - $124,999	19.4 (1.5)	13.8 (2.8)	19.3 (2.0)	**11.8 (2.6)**	20.6 (3.9)	8.1 (5.5)
$125,000 or more	18.8 (1.8)	22.0 (5.4)	21.0 (2.2)	**27.8 (5.3)**	17.6 (3.9)	**1.9 (1.9)**
Household type						

	All Gamblers % (SE)	Monthly EGMs % (SE)	Monthly Lotto % (SE)	Monthly Keno % (SE)	Monthly Scratchies % (SE)	Monthly Bingo % (SE)
Couple with children	39.1 (1.9)	**28.3 (4.3)**	**44.8 (2.7)**	**27.6 (3.8)**	47.8 (5.0)	37.4 (9.1)
Single parent	7.0 (1.5)	5.0 (1.6)	**4.1 (0.9)**	4.8 (1.3)	4.5 (1.5)	3.7 (2.7)
Lone person	13.5 (1.4)	11.5 (2.5)	11.8 (1.5)	13.9 (2.9)	11.1 (3.1)	22.7 (7.7)
Couple with no children	28.6 (1.8)	33.6 (5.3)	29.8 (2.4)	**40.5 (5.2)**	24.9 (4.0)	20.8 (9.6)
Group household	8.2 (1.1)	**15.9 (3.6)**	6.5 (1.3)	10.2 (2.8)	10.1 (2.7)	4.9 (3.5)
Other	3.6 (0.8)	5.6 (2.5)	3.0 (0.9)	2.9 (1.6)	1.5 (0.9)	10.5 (7.1)
Marital status						
Married	66.2 (1.9)	62.5 (4.7)	**74.0 (2.3)**	70.5 (4.1)	68.8 (4.5)	58.2 (9.7)
Separated	7.4 (0.8)	7.0 (1.7)	7.4 (1.2)	8.1 (1.9)	7.2 (1.9)	**18.8 (8.6)**
Widowed	1.6 (0.3)	2.0 (0.7)	**2.5 (0.7)**	1.3 (0.5)	1.2 (0.6)	**11.1 (4.1)**
Single	24.7 (1.9)	28.5 (4.4)	**16.1 (1.9)**	20.1 (3.6)	22.8 (4.4)	11.9 (5.9)
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
Northern Territory (N)	98,408	11,886	43,311	9,041	13,407	816

Table 5.1b Monthly participation in gambling activity by regional, socio-demographic and socioeconomic characteristics

	All Gamblers % (SE)	Monthly Racetrack % (SE)	Monthly Casino % (SE)	Monthly Sports bet % (SE)	Monthly Internet % (SE)	Monthly Private % (SE)
Location						
Darwin	53.5 (1.2)	49.3 (5.5)	56.5 (10.5)	48.7 (8.0)	49.6 (18.3)	**30.2 (9.4)**
Alice Springs	11.3 (0.6)	12.0 (3.4)	**40.9 (10.6)**	14.7 (5.5)	**50.4 (18.3)**	10.1 (6.0)
Katherine	4.7 (0.3)	4.9 (1.6)	0.0 (0.0)	6.0 (2.8)	0.0 (0.0)	4.0 (2.5)
Tennant Ck/Nhulunbuy	4.7 (0.5)	**9.5 (3.1)**	**1.2 (0.9)**	9.4 (5.0)	0.0 (0.0)	8.9 (7.2)
Rest of NT	25.8 (1.3)	24.2 (5.3)	**1.4 (1.4)**	21.2 (8.3)	0.0 (0.0)	46.9 (13.4)
Gender						
Female	47.6 (1.1)	**15.4 (3.6)**	**7.0 (3.0)**	**25.4 (8.1)**	**6.2 (6.2)**	35.8 (12.9)
Male	52.4 (1.1)	**84.6 (3.6)**	**93.0 (3.0)**	**74.6 (8.1)**	**93.8 (6.2)**	64.2 (12.9)
Age in years						
18-24	14.9 (1.2)	15.4 (4.7)	**52.0 (10.2)**	15.9 (6.6)	28.2 (18.9)	23.2 (8.8)
25-34	23.2 (1.1)	28.2 (5.0)	16.7 (6.7)	**44.0 (8.2)**	53.6 (18.5)	21.2 (9.6)
35-44	21.3 (1.1)	16.0 (3.5)	13.8 (4.6)	15.1 (6.4)	18.2 (11.0)	**45.6 (13.3)**
45-54	23.2 (1.4)	21.9 (5.0)	12.8 (6.1)	15.5 (4.8)	0.0 (0.0)	**2.2 (2.2)**
55 or more	17.4 (1.1)	18.5 (3.6)	**4.8 (2.5)**	9.5 (3.3)	0.0 (0.0)	7.8 (7.5)
Northern Territory resident						
Visitor	0.9 (0.3)	**4.3 (2.4)**	**14.5 (7.6)**	3.4 (3.3)	**23.4 (19.1)**	5.0 (5.0)
NT resident	99.1 (0.3)	**95.7 (2.4)**	**85.5 (7.6)**	96.6 (3.3)	**76.6 (19.1)**	95.0 (5.0)
Indigenous status						
Non-Indigenous	89.9 (1.5)	90.1 (3.9)	78.6 (12.2)	94.8 (3.9)	100.0 (0.0)	**50.6 (13.1)**
Indigenous	10.1 (1.5)	9.9 (3.9)	21.4 (12.2)	5.2 (3.9)	0.0 (0.0)	**49.4 (13.1)**
Language spoken at home						
English	95.8 (0.9)	94.3 (3.6)	97.3 (2.0)	100.0 (0.0)	100.0 (0.0)	89.1 (7.7)
Other than English	4.2 (0.9)	5.7 (3.6)	2.7 (2.0)	0.0 (0.0)	0.0 (0.0)	10.9 (7.7)
Birthplace						
Australia	82.5 (1.3)	85.5 (3.5)	91.4 (4.2)	81.5 (6.0)	85.9 (10.0)	**98.9 (1.2)**
Overseas	17.5 (1.3)	14.5 (3.5)	8.6 (4.2)	18.5 (6.0)	14.1 (10.0)	**1.1 (1.2)**
Birthplace parents						
Both Australia	62.1 (1.8)	67.9 (5.1)	71.4 (8.3)	65.6 (7.4)	73 (13.9)	72.1 (10.5)
Father only overseas	8.5 (1.0)	6.3 (2.8)	4.6 (3.7)	9.4 (5.3)	9.4 (9.2)	14.1 (8.5)
Mother only overseas	5.3 (0.8)	3.4 (1.4)	9.7 (4.7)	8.3 (3.5)	0.0 (0.0)	8.9 (6.3)
Both parents overseas	24.1 (1.6)	22.4 (4.4)	14.2 (5.4)	16.6 (5.1)	17.5 (10.7)	**4.8 (3.0)**
Highest education						
Some university	29.2 (1.8)	**19.0 (4.4)**	**5.5 (2.5)**	27.9 (7.5)	10.9 (8.0)	21.8 (12.5)
Some tertiary	12.3 (1.2)	15.6 (3.8)	9.2 (3.8)	15.4 (6.4)	7.9 (7.8)	4.6 (3.5)
Some secondary	56.7 (2.0)	64.0 (5.3)	**83.9 (5.0)**	56.7 (8.3)	81.2 (11.2)	64.2 (13.1)
Some primary	1.8 (0.6)	1.4 (0.9)	1.4 (1.4)	0.0 (0.0)	0.0 (0.0)	**9.4 (7.6)**
Labour force status						
Full-time	69.9 (1.8)	**80.6 (4.7)**	73.9 (10.3)	76.8 (7.7)	100.0 (0.0)	66.2 (13.3)

	All Gamblers % (SE)	Monthly Racetrack % (SE)	Monthly Casino % (SE)	Monthly Sports bet % (SE)	Monthly Internet % (SE)	Monthly Private % (SE)
Part-time	12.3 (1.2)	**6.3 (2.2)**	14.4 (9.8)	18.6 (7.7)	0.0 (0.0)	15.4 (12.2)
Home duties	5.0 (0.7)	1.0 (1.0)	1.1 (1.1)	0.0 (0.0)	0.0 (0.0)	10.6 (7.3)
Student	3.1 (0.7)	2.1 (1.9)	4.0 (3.5)	0.7 (0.7)	0.0 (0.0)	0.0 (0.0)
Retired	3.8 (0.6)	4.5 (1.7)	2.0 (1.5)	1.7 (1.3)	0.0 (0.0)	7.8 (7.5)
Pensioner	3.3 (0.7)	1.6 (0.7)	0.8 (0.8)	2.2 (1.1)	0.0 (0.0)	0.0 (0.0)
Unemployed looking	2.6 (1.1)	3.8 (3.5)	3.8 (3.3)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
Individual income pa						
Less than $20,000	17.3 (1.6)	9.6 (4.2)	22.5 (10.3)	**2.9 (1.3)**	0.0 (0.0)	32.2 (13.4)
$20,000 - $39,999	22.9 (1.8)	16.6 (4.0)	33.1 (11.9)	26.5 (8.0)	23.8 (12.8)	22.9 (12.5)
$40,000 - $59,999	29.8 (1.9)	31.9 (5.6)	24.3 (7.8)	30.6 (7.8)	18.9 (12.6)	24.2 (9.3)
$60,000 - $79,999	16.4 (1.2)	**24.8 (5.0)**	15.6 (7.2)	22.1 (6.1)	42.5 (19.5)	12.5 (6.2)
$80,000 - $99,999	6.7 (1.3)	7.2 (3.1)	2.5 (1.8)	10.9 (5.8)	14.8 (10.3)	2.8 (2.2)
$100,000 or more	6.9 (1.1)	9.8 (3.1)	2.0 (1.5)	7.0 (3.0)	0.0 (0.0)	5.5 (4.0)
Household income pa						
Less than $40,000	10.9 (1.4)	15.1 (4.8)	7.4 (3.9)	**3.6 (1.8)**	8.2 (6.1)	**40.2 (14.1)**
$40,000 - $59,999	12.6 (1.2)	10.0 (4.0)	14.3 (6.7)	8.5 (4.2)	6.2 (6.2)	**2.7 (2.0)**
$60,000 - $79,999	16.7 (1.6)	14.5 (4.0)	13.0 (9.8)	**6.1 (2.5)**	9.4 (9.2)	10.7 (7.7)
$80,000 - $99,999	21.6 (1.7)	18.1 (4.5)	22.3 (9.6)	28.3 (8.4)	0.0 (0.0)	16.8 (8.4)
$100,000 - $124,999	19.4 (1.5)	15.1 (3.6)	8.4 (4.4)	19.4 (6.5)	33.7 (15.8)	**7.0 (3.5)**
$125,000 or more	18.8 (1.8)	27.2 (5.0)	34.7 (12.0)	**34.1 (7.6)**	42.5 (19.5)	22.7 (8.5)
Household type						
Couple with children	39.1 (1.9)	**27.8 (5.1)**	**13.1 (5.1)**	29.7 (7.7)	16.3 (11.4)	49.3 (13.1)
Single parent	7.0 (1.5)	5.9 (3.6)	**0.6 (0.6)**	1.9 (1.4)	0.0 (0.0)	7.6 (5.4)
Lone person	13.5 (1.4)	15.6 (3.7)	20.1 (9.9)	20.4 (6.7)	8.2 (6.1)	**3.5 (2.3)**
Couple with no children	28.6 (1.8)	28.5 (4.8)	24.4 (7.7)	30.4 (7.8)	52.1 (18.5)	16.9 (8.3)
Group household	8.2 (1.1)	**18.4 (4.9)**	**37.7 (11.4)**	**17.6 (5.7)**	23.4 (19.1)	**21.7 (8.8)**
Other	3.6 (0.8)	3.7 (2.6)	4.0 (3.4)	0.0 (0.0)	0.0 (0.0)	1.0 (1.0)
Marital status						
Married	66.2 (1.9)	63.9 (5.7)	**34.8 (9.0)**	59.0 (8.0)	68.4 (18.7)	69.0 (10.0)
Separated	7.4 (0.8)	7.4 (2.2)	9.6 (5.0)	7.7 (3.7)	23.4 (19.1)	6.7 (5.2)
Widowed	1.6 (0.3)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
Single	24.7 (1.9)	28.8 (5.7)	**55.6 (10.6)**	33.3 (7.6)	8.2 (6.1)	24.3 (8.5)
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
Northern Territory (N)	98,408	5,914	1,873	2,317	338	1,569

5.3 Number of activities engaged in and problem gambling

This section directs attention towards the number and frequency of gambling and problem gambling. While EGM is play displays the strongest relationship with problem gambling, it is evident that gamblers engage in a range of activities which may affect their risk profile. Table 5.2 broadly shows that the more activities engaged in per week the higher the greater the risk of problem gambling. Similarly, Table 5.3 indicates that the more activities engages in per hear the higher the level of gambling risk. Figure 5.1 graphs this relationship for problem gamblers. This analysis makes clear that it is not just the type of gambling, but also the range and frequency of gambling that is associated with risk.

Table 5.2. Percentage gambler type by number of different activities played each week

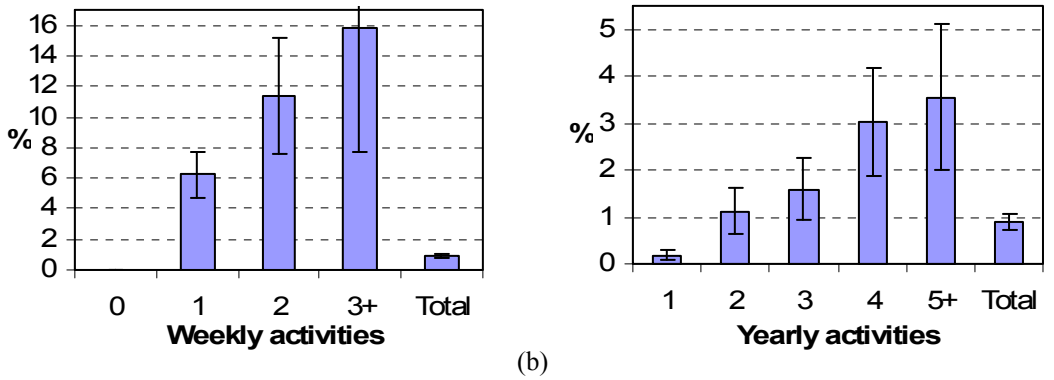
	CPGI score for regular gamblers					
No. of weekly activities[1]	**8-27 Problem gambler**	**3-7 Moderate risk**	**1-2 Low-risk**	**0 Non-problem**	**Non-regular**	**All gamblers**
0 % (SE)	0.0 (0.0)	0.3 (0.1)	0.4 (0.1)	0.6 (0.2)	98.7 (0.3)	**100.0**
1 % (SE)	6.3 (1.5)	16.0 (3.3)	19.8 (3.2)	29.9 (3.6)	28.1 (4.9)	**100.0**
2 % (SE)	11.4 (3.8)	22.2 (6.3)	20.4 (5.0)	45.9 (6.9)	0.0 (0.0)	**100.0**
3+ % (SE)	15.8 (8.1)	12.8 (8.3)	40.2 (14.6)	31.2 (11.4)	0.0 (0.0)	**100.0**
Total % (SE)	**0.9 (0.2)**	**2.2 (0.4)**	**2.8 (0.4)**	**4.3 (0.5)**	**89.8 (0.8)**	**100.0**

Note: Refer to previous tables for population denominator
1 Number of activities played weekly: Excludes lotto and raffles in count of number of activities

Table 5.3. Percentage gambler type by number of different activities played in one year

	CPGI score for regular gamblers					
No. of activities over year[1]	**8-27 Problem gambler**	**3-7 Moderate risk**	**1-2 Low-risk**	**0 Non-problem**	**Non-regular**	**All gamblers**
One % (SE)	0.2 (0.1)	0.4 (0.2)	0.4 (0.1)	0.8 (0.2)	98.2 (0.4)	**100.0**
Two % (SE)	1.1 (0.5)	4.0 (1.4)	2.3 (0.7)	5.9 (1.3)	86.6 (2.1)	**100.0**
Three % (SE)	1.6 (0.7)	2.6 (0.8)	6.1 (1.6)	10.6 (2.0)	79.2 (3.1)	**100.0**
Four % (SE)	3.0 (1.1)	5.9 (2.0)	5.4 (1.8)	6.8 (2.0)	78.9 (4.1)	**100.0**
5+ % (SE)	3.6 (1.6)	10.5 (3.5)	22.1 (6.5)	20.6 (5.6)	43.3 (11.4)	**100.0**
Total % (SE)	**0.9 (0.2)**	**2.2 (0.4)**	**2.8 (0.4)**	**4.3 (0.5)**	**89.8 (0.8)**	**100.0**

Note: Refer to previous tables for population denominator
1 Number of activities played yearly: Excludes lotto and raffles in count of number of activities



(a) (b)

Figure 5.1. Percentage problem gamblers by number of activities played excluding lotto and raffles: (a) weekly and (b) yearly

5.4 Skill and chance as fundamental orientations towards gambling

PCA (see Chapter 2) was used to identify the structure of gambling participation based on frequency of play for eight gambling activities. Activities included EGMs, instant scratch lotteries, regular lotteries, keno (a type of continuous electronic lottery), racetrack betting, table games played at casinos, betting on sporting events, and private card games (Young et al., 2006).

Loadings and variation explained for the two factor solutions are provided in Table 5.4. This solution explained 36% of the variation in the eight gambling activities. Factor 1 (19% of the variation) included lotto (0.72), instant scratchies (0.71), and EGMs (0.55), all of which displayed high positive loadings on this factor. It is evident that these three activities are all lottery-, and hence chance-, based. The outcome of the game is determined independently of the player in an absolute sense, and little or no skill is involved in play. Therefore, this factor represents chance-based activities. Private games displayed a moderate negative loading (-0.28) on this factor.

The second factor represented skill-based games with table games (0.73), racetrack betting (0.64) and sports betting (0.53) all having high positive loadings. All other activities (including private games) had low loadings on factor 2. These games tend to involve a certain degree of skill where the player may use her or his ability to influence or predict the outcome of the game. Exceptions to this generalization are some casino table games such as roulette where the outcome is purely chance based. However, other table games such as blackjack do require skill, and are more popular within casinos in the NT. Therefore, this factor represented gamblers with preferences for skill-based gambling activities. This factor solution suggests a basic distinction between chance and skill.

Thus there appears to be a fundamental distinction between skill and chance. As revealed by the two-factor solution, these categories explain the basic structure of gambling participation (Table 5.4). Games more associated with chance (i.e. EGMs, instant lotteries, and weekly lotteries) comprised one dimension of participation, while games more closely associated with skill comprised another (i.e. casino table games, race betting, and sports betting).

Table 5.4. Factor analysis and loadings for frequency of play per week for eight gambling activities (N = 9,627)

Gambling	**2-factor solution**	
Activity	**Factor 1**	**Factor 2**
EGMs	**0.55**	0.08
Instant lotteries	**0.71**	0.00
Lotto	**0.72**	0.01
Keno	0.16	**-0.34**
Racetrack	-0.02	**0.64**
Table games	0.14	**0.73**
Sports betting	-0.24	**0.53**
Private games	-0.28	0.07
Variance	1.51	1.35
% variation	*18.8%*	*16.9%*
Cumulative %[c]	*18.8%*	*35.8%*

[a] Weighted data used

[b] Bold font indicates loadings ≥ 0.30 or ≤ -0.30 for gambling activity

[c] Percent variance may not add to cumulative % due to rounding

However, this classification of gambling activities as either chance or skill, or an interaction of both, requires some refinement. In the current study, activities were allocated to either category based on an assessment by the researchers of the ability of the player to effect or predict the outcome. Further investigation is required into how players themselves conceive of the game as well as the play strategies they use. It is equally clear that skill and chance do interrelate at the site of the specific activity. As a result any game may include a varying degree of skill and chance, depending both on

the structure of the individual game and the orientation of the player. Therefore, some games may present unique configurations that do not easily fit into either category.

5.5 Socio-demographic categories and gambling orientation

Table 5.5 presents mean factor scores from the two factor solution for each significant socio-demographic variable. Within each socio-demographic variable, means with different individual letters indicate a significant difference ($p \leq 0.05$) between categories.

For factor 1 (chance), five socio-demographic variables displayed significant differences in factor scores:

a) Respondents from remote areas of the NT (rest of NT) had a significantly lower mean score than all other locations in the NT.
b) Older respondents (≥ 35 years) had significantly higher mean scores than younger respondents.
c) Females had significantly higher mean scores than males.
d) Single parent households had significantly higher mean scores than lone person, group and other household types.
e) Group households had significantly lower mean scores than couples with children, single parents and couples with no children household types.
f) Separated respondents had a significantly higher mean score than single persons.

For factor 2 (skill) six socio-demographic variables displayed significant differences in factor scores:

a) Alice Springs respondents had a significantly higher mean score than all other locations except Darwin.
b) Darwin respondents had a significantly higher mean score than respondents from Katherine and Tennant Creek/Nhulunbuy.
c) Females had a significantly lower mean score than males.
d) Full-time workers had a significantly higher mean score than part-time workers, home duties, retired and unemployed respondents.
e) Single person households had a significantly lower mean score than all household types except other households.
f) Widowed respondents had a significantly lower mean score than all other marital status groups.

From these associations it is evident that residential location (i.e. urban versus remote), age, gender, and position in the social structure are social variables that affect the degree of engagement with skill or chance based gambling.

Table 5.5. Mean factor scores[a] from the 2-factor solution for socio-demographic variables (N_{RG} =9,627)

	Factor 1: Chance Mean (SE)	Factor 2: Skill Mean (SE)
Location		
Darwin	0.08 (0.07)[a]	0.05 (0.09)[ab]
Alice Springs	0.33 (0.18)[a]	0.30 (0.15)[a]
Katherine	0.09 (0.12)[a]	-0.24 (0.07)[c]
Tennant Ck/Nhulunbuy	-0.11 (0.18)[ab]	-0.21 (0.08)[c]
Rest of NT	-0.31 (0.13)[b]	-0.11 (0.09)[bc]
Age in years		
18-24	-0.35 (0.12)[a]	NS
25-34	-0.43 (0.07)[a]	NS
35-44	0.17 (0.12)[b]	NS
44-54	0.19 (0.09)[b]	NS
55+	0.25 (0.17)[b]	NS
Gender		
Female	0.19 (0.08)[a]	-0.24 (0.06)[a]
Male	-0.08 (0.07)[b]	0.11 (0.08)[b]
Labor force status		
Full-time	NS	0.07 (0.07)[a]
Part-time	NS	-0.21 (0.10)[b]
Home duties	NS	-0.35 (0.08)[b]
Student	NS	-0.06 (0.16)[ab]
Retired	NS	-0.21 (0.10)[b]
Pensioner	NS	-0.03 (0.15)[ab]
Unemployed looking	NS	-0.51 (0.25)[b]
Household type		
Couple with children	0.12 (0.14)[ac]	-0.01 (0.13)[a]
Single parent	0.37 (0.20)[a]	-0.30 (0.08)[b]
Lone person	-0.19 (0.12)[b]	0.16 (0.14)[a]
Couple with no children	0.07 (0.10)[a]	-0.07 (0.07)[a]
Group household	-0.32 (0.13)[b]	0.12 (0.17)[a]
Other	-0.08 (0.10)[bc]	0.05 (0.21)[ab]
Marital status		
Married	0.02 (0.08)[ab]	-0.03 (0.07)[a]
Separated	0.33 (0.18)[a]	0.08 (0.22)[a]
Widowed	0.46 (0.33)[ab]	-0.43 (0.08)[b]
Single	-0.21 (0.08)[b]	0.11 (0.13)[a]

[a] Mean factor scores annotated with different individual letters indicate significant difference ($p \leq 0.05$) in the category of each socio-demographic variable; NS = not significant ($p>0.05$)

These results indicate that chance-based gambling is associated with residential remoteness, with older people, with females, and being either a single parent, separated or widowed. In contrast, skill-based gambling is associated with urban location, male gender, full-time employment, lone-person households and single status. Thus, participation in chance and skill is socially patterned, where different groups in society relate to chance in different ways. In terms of remoteness, there are only two casinos in the NT, one in Darwin and the other in Alice Springs. Casinos consist of a range of chance-based (e.g. EGMs and keno) and skill-based opportunities (e.g. table games such as blackjack and poker). In Katherine, opportunities for skill-based opportunities are more limited. Therefore, the association between residential remoteness and chance – based gambling may be a consequence of supply-structures rather than of the demand for chance-based opportunities. In a context such as the NT, a vast region characterized

by a small population, large distances between population settlements, a high Indigenous population, high population mobility, and uneven distribution of gambling activities, the supply-side issues of availability and accessibility to particular social groups inevitably affects gambling participation and its social outcomes. Indeed, a range of factors (e.g. accessibility; culture; promotion) may explain the participation by particular groups rather than a purely an individual desire for skill-based or chance-based engagement.

The relationship between chance and age may be related to the fact that people tend to go through attitudinal changes as they move through the lifecycle, becoming more reflective as they grow older. Recent analysis by Welte et al. (2007) found a similar result in the context of problem gambling in the United States, with younger people more likely to experience problems with cards and casinos, the skill-based forms. Older people were more likely to experience problems with casinos, lotteries, and gaming machines, a more chance-based disposition. As an extension of this finding it may be expected that as the population ages, the demand for chance – based gambling, which in the NT is the dominant form (see Table 5.5) will continue to increase (Productivity Commission, 2004).

The fact that gambling orientation displayed a gender bias corresponded with previous research that has consistently found a relationship between men and skill-based gambling forms, particularly casino gambling and race betting, and women and chance-based forms such as EGMs and bingo (Griffiths & Delfabbro, 2001; Hing & Breen, 2001; LaPlante et al., 2006; Petry, 2003). However, it appears that this distinction extends beyond the particular activity to a basic chance-based or skill-based orientation towards the game. In terms of explanation, there may once again be an interaction between supply and demand. On one hand, it may be that women have different motivations for gambling, motivations that are reflective of gendered social and economic structures. On the other hand, particular gambling venues, such as betting shops, are heavily gendered spaces, which may act to exclude women from skill-based participation. The explanation is likely to involve an interaction of the two, located at the site of the individual venue.

5.6 Skill, chance and problem gambling

Table 5.6 presents results from the unadjusted negative binomial regression models that assess the association between problem gambling risk (i.e. CPGI score) and factor scores (columns one and two); as well as between the CPGI score and frequency of play for individual activities (columns three and four). On the other hand, three of the eight gambling activities showed a significant positive association with the CPGI. They were weekly frequency of play for EGMs (β = 0.50 (0.29, 0.71)), casino table games (β = 0.83 (0.02, 1.63)), and private games (β = 0.45 (0.17, 0.72)). Thus, while chance and skill were not directly associated with problem gambling risk as measured by the CPGI, individual activities were, and these were of both chance-based (i.e. EGMs) and skill-based forms (i.e. table games and private card playing).

Table 5.6. Unadjusted negative binomial regression models for CPGI score (N_{RG} = 9,627).

Gambling factor score	CPGI score β (95% CI)[a]	Weekly gambling activity frequency	CPGI score β (95% CI)[a]
2-factor solution		EGMS	**0.50 (0.29, 0.71)**
Factor score 1	0.09 (-0.06, 0.24)	Instant lotteries	0.14 (-0.20, 0.48)
Factor score 2	0.13 (-0.08, 0.34)	Lotto	-0.08 (-0.33, 0.16)
		Keno	0.02 (-0.13, 0.16)
		Racetrack	0.02 (-0.13, 0.16)
		Table games	**0.83 (0.02, 1.63)**
		Sports betting	-0.24 (-0.58, 0.10)
		Private games	**0.45 (0.17, 0.72)**

[a] Bold font indicates significant association ($p \leq 0.05$) with CPGI score

No relationship was found between gambling orientation and risk as measured by the CPGI. However, individual activities (EGM play, casino table games and private games) were associated with the CPGI. When combined in a multivariate model, EGM play retained an independent association with the CPGI score. Thus, it appears that it is the particular activity, rather than the fundamental orientation, which is significant. This lends support to previous studies that have found an association between problem gambling and particular gambling activities (Blanco, Hasin, Petry, Stinson, & Grant, 2006; Bonnaire, Bungener, & Varescon, 2006; Fabian, 1995; Fisher, 2000; Oliveira & Silva, 2001; Welte et al., 2007). There appears to be a clear distinction between the categories of skill and chance, and the manifestation of these categories in the configuration of particular activities.

5.7 Implications for research

5.7.1 Profile of participants by activities. There is considerable diversity in the socio-demographic participants for each gambling activity. It is clear that different groups of people prefer different types of gambling. More research on why particular forms appeal to different groups is warranted (i.e. the demand side). However, participation also reflects access and availability. The fact that Alice Springs residents are more likely to play casino table games than the sample overall may have more to do with proximity to a casino rather than any unique desire by residents. The research question from here is to understand how supply and demand interact in the context of the NT, a direction the CDU program will explicitly explore from 2008 onwards particularly through the proposed surveys of gambling venue patrons.

The fact that the number of activities is important suggests that problem gamblers have participation profiles that, while dominated by one activity (i.e. EGMs) cross over into a higher level of gambling intensity across gambling modes. More research on the participation profile of problem gamblers that explore the reasons for participating in each type would also be valuable.

5.7.2 Structure of activities and risk. The fact that residential location (i.e. urban versus remote), age, gender, and position in the social structure are social variables that affect the degree of engagement with skill- or chance- based gambling indicates that different groups of people have different motivations for, and experience of gambling. However, we have little information about the reasons for particular preferences by social group. Areas for further investigation of the social contexts of consumption

include the relationship between male gender and skill-based gambling as well as the relationship between increasing age and chance–based gambling.

While chance versus skill is a useful distinction between different types of games, particularly in its ability to integrate sociological with psychological explanations of gambling behaviour, it is clear that the forces of chance or skill interact at the site of specific games and this requires more investigation. These categories represent a continuum within which the logic of the game is configured. Further research is required on the experience of the different gambling forms, particularly work in the experiential or qualitative vein that may complement, and expand, the quantitative or empirical understanding of activity types (Livingstone, 2005). Given that chance and skill interact within games, an examination of the motivations for gambling may be instructive in uncovering the orientations that individual players, or groups of players, bring to the game. This may go some way to explaining the reasons why chance and skill are associated with particular social structures such as age and gender.

While the associations between age, gender and gambling participation are indicative of important social differences in gambling orientations, these patterns do not appear to be purely related to notions of social inequality. Chance-based activities are not only engaged in by those who wish to change their social fortune (i.e. a compensation function). In this case, socioeconomic status, particularly the income and education of individuals, would be closely related to gambling orientation. However, categories of income and education were not associated with significant differences in mean factor scores. The pattern of associations between gambling orientation and social categories appear to be explained by clear preferences by particular groups mediated by the accessibility of opportunities. It is this interaction between preference and accessibility that requires further research attention, particular where supply configurations are uneven and therefore influential on mobility as in the NT.

However, while the chance-skill distinction does appear to explain the factor loadings of the activities, this does not suggest they are the only dimensions by which games may be categorised. Reith (1999, p.93-73) makes the point that gambling landscape may be delineated by various additional categories including the rate of play of a game, the player's relation to a game, the spatial organization and the social integration of the site, and the socioeconomic characteristics of players. As such, the chance-skill distinction offers opportunities for further empirical testing, as well as potential expansion to include a range of other activity-specific domains.

The relationship between gambling orientation and risk depends very much on the definition and operationalisation of 'risk'. As pointed out above, the social harm associated with chance- and skill-based gambling is likely to be expressed in different forms. The player who abandons dramatically to fate does so for different reasons to the one that becomes obsessed with self-determination. A gambling screen, such as the CPGI, may be biased towards the measurement of the pathologies of chance, rather than those of skill-based gambling. With the latter, the problems may be measured in a longer-term, less evident, form, effects that may not be measured by screens, but may be manifest in other more insidious forms of individual and social problems based around the promotion of the self. Given that many activities combine skill and chance, it is entirely possible that gambling screens may measure and conflate symptoms of different impulses. What is required here are less crude, more sophisticated measures of risk that decompose the problem gambler category. The CPGI, being a uni-dimensional scale, may not be the best suited to this task (Ferris & Wynne, 2001; Stevens & Young, 2006). More research on the components of 'problem gambling' may allow us to deconstruct the category to examine the relationship between risk and participation in a fashion that

is more sensitive to variations within the population of problem gamblers (Blaszczynski & Nower, 2002).

5.8 Implications for harm minimisation

5.8.1 Profile of participants by activities. The analysis presented in this Chapter has identified some significant socio-demographic differences between gamblers who engage in different activities. These profiles may go some way towards identifying markets for education or awareness campaigns. For example, one could draw a stark contrast between the profile of monthly private card players (i.e. aged 55-44, Indigenous, born in Australia, primary or below education, household income 40k or less, group household) and monthly bingo players (i.e. female, 55 years or more, primary or lower education, home duties, pensioner, individual income less then 40k, separated or widowed). These results suggest that different groups may be targeted for consumer control based on their preferred form of gambling.

In addition, it is clear that problem gamblers engage in a range of activities. Those people who gambled on three or more different activities per week (or four to five different activities per year) were far more likely to be problem gamblers than those who gambler on fewer activities. This indicates that while a particular gambling form (i.e. EGMs) is by far the most risky, this may be part of combination of gambling activities that problem gamblers engage in. In term of harm minimisation then, reducing the range of activities that people gamble on may have a positive effect. This finding may also suggest that increasing the range of gambling activities through the introduction and/or expansion of new products will significantly increase the overall risk of gambling to the population.

5.8.2 Structure of activities and risk. This research has indicated that there is a basic orientation to gambling (i.e. skill versus chance based gambling), one that may simplify the number of gambling activities to a two-dimensional structure, but also one that enables us to discriminate between gamblers on the basis of this orientation. This provides a new way to conceive of gamblers beyond the recreational/non-recreational dichotomy commonly employed.

However the basic orientation of chance versus skill was not associated with problem gambling, at least not as measured by the CPGI. This suggests that, until further research is conducted, the use of skill versus chance as a harm-minimisation tool *per se* is limited. What does appear to be important is the orientations that players bring to the game. In the case of EGMs, that are powerfully and uniquely associated with problem gambling, the skill versus chance dichotomy is blurred. Some players use strategy (albeit a false one) while other adopt the perspective of pure chance. The machines are designed to give the illusion of skill and non-randomness. It is where skill and chance are conflated at the site of consumption that there is room for some harm minimisation practices. In the case of problem gambling in the NT we need to focus on EGMs and those that play them regularly.

It remains clear that EGMs, keno and table games are the most problematic. These are provided as a tripartite combination in the casinos. EGMs and keno are widely available as a combination in pubs and clubs (i.e. community venues). This availability suggests that accessibility is an important factor in explaining or predicting problem gambling. Harm minimisation measures that directly relate to these forms of gambling need to be explored (a purpose of Part B Policy of the CDU program). In a broader sense, the availability of these can be affected through licensing, providing both supply

and demand focussed areas for intervention. Harm reduction strategies may include the reconfiguration of supply, limiting further increases on the number of machines, and providing consumer information at the site of play. Specific harm minimisation practices have been summarised in a previous CDU report, from which Table 5.7 is reproduced (Fogarty & Young, 2008). There are a range of harm-minimisation measures throughout Australia in the categories of informed choice, consumer control, venue restrictions, and EGM restrictions. The task remains to develop a framework that is appropriate to the NT, and based on evaluated effectiveness of chosen measures. This in essence, is the purpose of the ongoing CDU Project Part B 'The applicability of other gambling regulatory frameworks to the NT (Young, Lee et al., 2008).

Table 5.7. Summary of a selection of harm minimisation measures in the states and territories.

	NT	Qld	NSW	ACT	Vic	Tas	SA	WA
Informed Choice								
Warning Statements & Signage	√	√	√	√	√	√	√	√
Education (Schools)	-	√	√	√	-	-	√	-
Consumer Control								
Self-exclusion	√	√	√	√	√	√	√	√
Alcohol/Gaming Restrictions	√	√	√	√	√	√	√	√
Venue Restrictions								
Machine Caps	√	√	√	√	√	√	√	n/a
ATM/Eftpos Restrictions	√ $250	√$250	√	√$250	√$200	√	√$200	√
Impact Assessment	√	√	√	√	√	-	√	n/a
Shutdown	4am-10am	Approx 10 hours	Variable	3 hours	No 24hr venues except the casino	-	6 Hours	n/a
Cheque Payments	$250	$250	-	$1,000	*			n/a
Credit (EGMs)	Not Allowed	Not Allowed	Not Allowed	Not Allowed	Not Allowed	Not Allowed	Not Allowed	Not Allowed
Game(Machine) Restrictions								
Autoplay	Not Allowed	Not Allowed	Not Allowed	Not Allowed	Not Allowed	Not Allowed	Not Allowed	Not Allowed
Technical Requirements	√	√	√(min)	√	√	√	√	√
EGM Max Bet Limit	$5	$5	$10	$10	$10	$10	$10	$5
Note Acceptors	Not in Clubs/ Hotels	$20 max of 5	Up to $100	<$50	<$50*	Not in Clubs/ Hotels	No	N/A

* Currently under review
Source: Fogarty and Young (2008, p.39)

Chapter 6: Can Cut-Points be Developed for the SOGS and CPGI Appropriate to the Northern Territory Context?

6.1 Scope and rationale

Whether devised originally for medical diagnostic purposes (i.e. SOGS) or for public health policy (i.e. CPGI), both screens use pre-defined cut-points for individual scores in order to estimate the prevalence of problem gambling in a given jurisdiction (McMillen & Wenzel, 2006). In line with these cut-points, the other Chapters in the current report examine problem gambling as a clear-cut category. The final Chapter of this report takes a conceptual step back from the preceding analyses to ask: "What would be the implications for our estimation of the levels of problem gambling in the NT, as well as the composition of the problem gambler categories, should the cut-points for the respective gambling screens be modified?" In other words, we explore whether there is a valid case for adjusting the cut-points in the case of the NT given it has a diverse population structure, one that translates to estimates of problem gambling that may not be best measured by pre-existing cut-points developed elsewhere. To date the analyses presented have used existing internationally-based recommendations for choice of cut-points, 5+ in the case of the SOGS and 8+ in the case of the CPGI. While these analyses are entirely valid, and indeed mandatory, if we are to compare the NT with the rest of Australia and the other countries, the analyses presented in this final Chapter seek to comprehensively explore the results of the prevalence survey to suggest some methods for refining the cut-points to make them more suitable to the NT context.

Therefore, an alternative approach is explored by the current Chapter, one that examines the consequences for public health policy in adapting different cut-points. Our aim is to suggest cut-points that may be considered specifically for policy and harm-minimisation use in the NT, as well as to develop cut-points that are comparable between scales. More specifically, the SOGS produces a considerably higher estimate than the CPGI. We seek to determine the extent to which particular levels of the CPGI scale equate to particular levels of the SOGS scale. In other words, to what extent can the scales be aligned, and what might the implications of such a re-alignment be for the measurement of problem gambling in the NT? Therefore, rather than examining the content of the score used to define a problem gambler (see Chapter 2), this final Chapter will explore the implications of varying the number of items that are sampled in making this classification. It explores whether a different set of cut-points may prove to be more relevant to the conditions of the NT as well as the implications for harm minimization strategies should the alternative cut-off points be applied.

6.2 Determining post-hoc cut-points for the SOGS and CPGI

6.2.1. Analytical procedure. The following two hypotheses will be tested:

> **Hypothesis I**: Variations in selected cut-points for the estimation of problem gambling in the NT sample will be insensitive to the influences both of socio-demographic characteristics of the respondents sampled, and to their modes of gambling.

Should hypothesis I be rejected, then the following alternative hypothesis will be explored:

Hypothesis II: Alternative cut-points will result in significant variations in the composition or mix of respondents identified as problem gamblers on the basis of their socio-demographic characteristics and their modes of gambling.

These hypotheses generate two phases of analysis. The first phase will statistically test the hypothesis that the various predictors of problem gambling (i.e. age, gender, region, family situation, income, gambling mode etc) will not differ in predicting problem gambler categories across a range of cut-points for each gambling screen. Should the hypothesis be rejected then the socio-demographic composition of the problem gambler groups identified by the new cut-points becomes a source of interest for social and public health policy, including the cross-identification of the problem gambler category for both screens (a technical description of this method is provided in Appendix A).

Should this hypothesis be rejected, phase two will involve a separate logistic regression of the new cut-points identified in phase one. This procedure will be identical to the comparative logistic regression analysis used for the NT Gambling Prevalence Survey Report 2005 (Section 3.5) used to predict both regular and SOGS problem gambler profiles. In addition, a data-mining procedure, often called segmentation analysis (explained in detail in Appendix A) will be used to identify the combinations predictor variables in the form of "segments" or classes of respondents according their probability of being classified as problem gamblers. This will be carried out for both screens in order to compare the mix of categories that contribute to all cut-points, both within and between screen types. In effect, this second phase of analysis will determine whether the respondent profiles of problem gambler groups under new cut-points differ from those of the original prevalence survey estimates.

6.2.2. Determining cut-points for the SOGS. As shown in Figure 2.1, the proportion of regular gamblers classed as problem gamblers is 14.7%, based on a cut-off point of 5+ of positive responses on the 20 item scale[1]. The first Prevalence Survey Report supports this decision on the basis of the shape of the curve at the cut-point but notes that, "…the curve does then bulge again significantly before levelling out into a sustained shall decline". Just how much attention then, should we give to the "bulge" in determining the cut-point? Does it represent the beginning of a bimodal distribution, clearly separating regular from problem gamblers, or does it merely signal a statistic "blip" in the downward decline to a score of 8 or, possibly 9? With such small numbers, the significance of the bulge eludes statistical certainty. However, the logic of choosing the point where the curve flattens out the 8th interval (i.e. between 7 points and 8) for this population is at least an arguable position for drawing an alternative cut-point.

Such a move of the cut-point for SOGS has a dramatic effect on prevalence rates. A cut-point of 8+ would reduce the prevalence estimates by about a third, from 14.7 to 4.9 for problem gamblers and from 1.06% to 0.03% for the population as a whole. A cut-point of a score of 7 would approximately half the original estimates. Clearly these estimates are heavily affected by minor alterations of two or three points on a twenty point scale. Though either measure would be unacceptable, unless the other jurisdictions were to make the same change, the exploration of moving these for the purposes of

comparison and prediction may prove to be a useful exercise, at least for exploratory purposes. In this case, the cut-point of 8 will be allowed to stand as an alternative for comparison with variations to the CPGI cut-point. The score of 8+ has the advantage of falling midway between the small plateau at the end of the decline and the beginning of second small bulge at the score of 10, the recommended cut-point for identifying severe gambling. We can therefore identify three levels of SOGS scores (i.e. 1 = SOGS 0-4, 2 = SOGS 5-7, 3 = SOGS 8+).

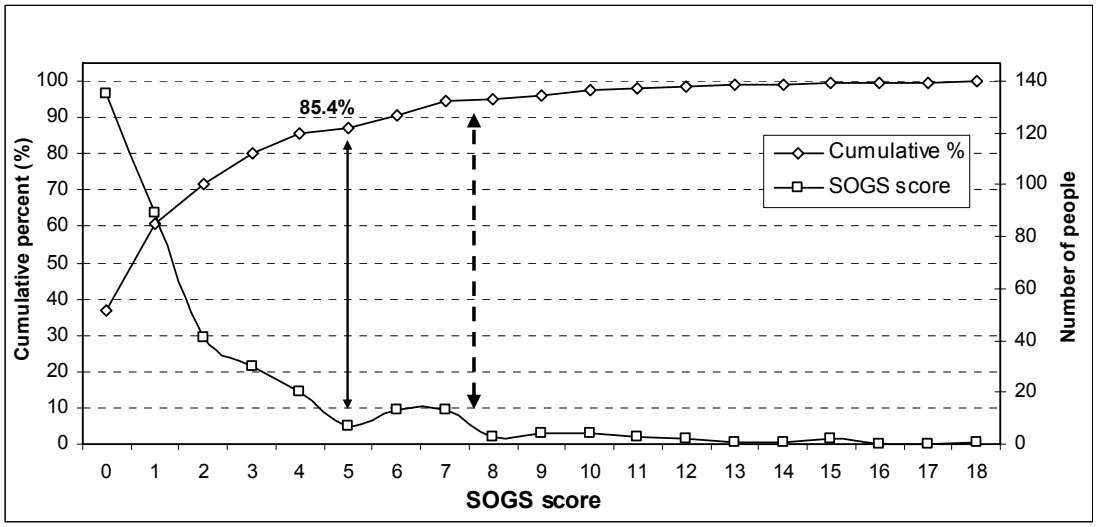


Figure 6.1. Distribution of SOGS scores for regular gamblers (n=369)

6.2.3. Determining cut-points for the CPGI. The CPGI distribution for regular gamblers is shown in Figure 6.2. This figure contrasts with the comparable SOGS figure in that the decline of the curve has levelled out before, rather than after, the recommended cut-point. The curve has in fact levelled out a score of 6, describing a plateau until it reaches a score of 9. In this distribution, the cut-point of 8 appears to be quite arbitrary, lacking even a clear point separating the bottom of the decline from either "bulges" or "plateaux" at the higher-scoring end of the distribution. The apparent arbitrariness in the choice of 8+ for this distribution is not without estimation consequences. As the Prevalence Survey 2005 Report comments: "This [pattern] indicates the CPGI is classifying fewer regular gamblers than the SOGS as problem gamblers" (Young et al., 2006, p.36). We might add that it apparently only identifies as problem gamblers those who fall at the extreme end of the curve.

In terms of an alternative cut-point that corresponds with the score distribution, the obvious point would be at 5+, though 9+ has some appeal because it falls at the end of the plateau. For the present purposes the less conservative cut-point of 6+ would seem a reasonable compromise between these two positions. In addition, a CPGI score of 6+ converges with the SOGS problem gambling estimate for regular gamblers of 14.1%, compared with the far lower rate of 10.3% with a cut-off point of 8+. A CPGI cut-point of 6+ also yields an overall rate of 1.06% for the population prevalence estimate, the same figure found for a cut-point for SOGS 5+ in the NT (Young et al., 2006, p.20). The cut-points for ordinal categorization of the CPGI scores may therefore be defined as 1 = CPGI 0-5, 2 = CPGI 6-7, 3 = CPGI 8+.

In summary, rather than adopting the recommended cut-points as the only criteria for estimating prevalence levels, a judicious adoption of cut-points based on the shape of score distributions may be a preferable strategy. The implications of this insight for the NT will be explored in the following sections.

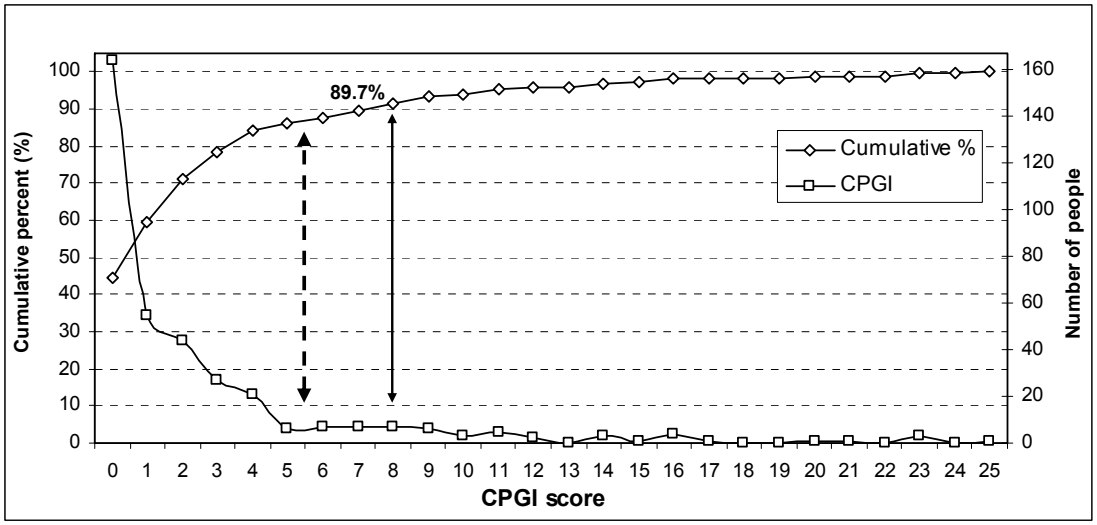


Figure 6.2. Distribution of CPGI scores for regular gamblers (n=369)

6.2.4. Predictor variables: Socio-demographic factors and gambling mode. The NT Gambling Prevalence Report 2005 identified a range of socio-demographic characteristics and gambling activities that were associated with both regular and SOGS problem gamblers. These included EGM play, Indigenous status, non-English speaking background (NESB), education level, household income, and household type. The present analysis extends this first investigation by exploring the effects of these factors over a range of cut-points for both screens. In order to build on the first analysis, the following predictors have been chosen: (a) EGM play in the last 12 months; (b) gender; (c) age over 55 years; (d) language other than English spoken in household; (e) highest education levels (up to some secondary schooling); (f) household income over $80,000 per year; (g) household type (two categories including couples with no children and group/share); and (h) Indigenous status. Region was omitted, partly because it had weak or non-significant effects in the NT Gambling Prevalence Report 2005 and because region would be more appropriately treated as a contextual variable. An unweighted sample will be used throughout the following analyses, following the methodology used in Section 3.5 of the 2006 report.

6.2.5. Predicting problem gambling ranges. The results of the ordinal regression are shown in Table 6.1. It appears that the first part of hypothesis 1 is supported, in that the transition from an initial high threshold to the mid-range cut-points has significant cumulative effect on the prediction of problem gambling when the covariates or predictor variables are held constant. In this case, the differential between the estimates for the two levels is not great, but it does indicate that the change of cut-point will identify an additional section of the population. The second part of the first hypothesis, that the effects of eight socio-demographic predictor variables were invariant (within statistically acceptable limits) when the cut-points were changed, is supported in the

case of the SOGS screen, with a probability of 0.16, but rejected in the case of the CPGI screen, with a very low level of probability ($p < 0.001$).

Table 6.1 Ordinal Regression Results (logit link function): Predicting Problem Gambling Ranges for the SOGS and CPGI (n = 1,100[#])

	SOGS		CPGI	
	Estimate (β)*	**p-value**	**Estimate (β)***	**p-value**
Cut-off Ranges (Dependent Variable)				
High 8+ (SOGS n= 18; CPGI n=38)	**8.60**	**0.00**	**3.25**	**0.00**
Mid-level (SOGS 5-7 n=36; CPGI 6=7 n=14)	**7.53**	**0.00**	**3.08**	**0.00**
Covariates (Independent Variables)				
Age 55+ yrs	0.41	0.38	-0.14	0.60
Some secondary education	0.21	0.73	0.04	0.91
Household income $80k +	0.29	0.47	0.00	0.98
Household type couple no children or group/share	0.02	0.95	0.08	0.65
Non-English speaking household	**1.61**	**0.03**	**0.96**	**0.01**
Indigenous identifier	**1.32**	**0.01**	0.34	0.28
Female gender	0.16	0.66	-0.17	0.37
Played EGM at least once in past 12 months	**3.79**	**0.00**	**1.58**	**0.00**
Adjusted R^2 (McFadden)	*23%*		*21%*	
Parallel Slopes (null hypothesis)		0.16		**0.00**

NOTE: Non-gamblers excluded from analysis and non-regular gamblers assumed to have a SOGS and CPGI score of zero

* Estimate signs have been reversed to denote increased probability of problem gambling

[#] This sample excludes 664 non-gamblers (scored 0 for SOGS analyses in Section 3.5 of the NT Gambling Survey Prevalence Report 2005, 2006).

However, the screens share the same significant socio-demographic and gambling mode predictors (i.e. playing an EGM during the past twelve months and speaking a language other than English in the household). The exception is Indigenous status for the SOGS, which appears to retain an effect on problem gambling behaviours across the two cut-points. These results appear to support those of the separate regressions of the first *NT Gambling Prevalence Survey 2005 Report* (Young et al., 2006), in that the effect of playing an EGM tends to dominate the effects of the socio-demographic and other gambling mode variables, while increasing the overall predictive power of the model (in this case the McFadden R-squared estimate for SOGS at 23%, is very close to the 25% estimate produced by the earlier report.

Given that the effects of the socio-demographic and gambling mode covariates are not to be considered equal across the two CPGI cut-off points, we turn attention to the ways in which their patterns of prediction vary. The results of two logistic regressions (similar in method to that of the comparison of prediction of problem and regular gambler profiles in Young et al., (2006)) are presented in Table 6.2. The regression results for the two CPGI cut-points show a difference in degree in strength of effect rather than in the covariate profile of problem gambling. The influence of EGM playing is obviously stronger for the 8+ scores, as one might expect, yet this influence still yields an odds ratio of 40 compared to the average of 1 in the surveyed sample (which included both non-gamblers and non-problem gamblers). The influence of the only other significant effect, non-English speaking household, is roughly equivalent over the two cut-points. All in all, the two problem gambler socio-demographic and gambling

mode profiles are so similar that the choice of either for targeting purposes (as in public health prevention strategies) would be of only marginal importance.

Table 6.2. Logistic regression results: Comparison two CPGI cut-off points (n = 1,100)

	CPGI 6+			CPGI 8+		
	β	OR[1]	p-value	β	OR[1]	p-value
Age 55+ yrs	-0.21	0.81	0.69	-0.43	0.65	0.51
Some secondary education	0.01	1.01	0.99	0.44	1.54	0.54
Household income $80k +	-0.01	0.99	0.98	0.10	1.10	0.84
Household: Couple no children & group/share	0.16	1.18	0.67	-0.12	0.89	0.79
Non-English speaking household	**1.87**	**6.46**	**0.01**	**1.77**	**5.84**	**0.04**
Indigenous identifier	0.62	1.86	0.32	0.66	1.93	0.34
Female gender	-0.27	0.77	0.49	-0.43	0.65	0.33
EGM at least once in past 12 months	**3.71**	**40.81**	**0.00**	**4.08**	**59.36**	**0.00**
Constant	-6.39	0.00	0.00	-6.84	0.00	0.00

NOTE: Non-gamblers excluded from analysis and non-regular gamblers assumed to have a SOGS and CPGI score of zero

1 OR=Odds Ratio = exponential (β)

6.3 A segmentation analysis of problem gambler screens

6.3.1. Combining SOGS and CPGI categories. The analysis so far has revealed a convergence between the two screens in terms of identifying the socio-demographic and gambling profiles of problem gamblers, as well as in the group of individual respondents themselves. In the case of the latter, the most important overlap appears to be between the group identified by the existing SOGS 5+ cut-point and the revised CPGI cut-point of 6+. The convergence here is substantial in that the 45 individuals co-identified by the screens account for 83.3% of the SOGS and 86.5% of the CPGI problem gambler groups (Table 6.3). The former figure signifies a much higher rate of CPGI to SOGS co-identification (64.8%) with only a small decrease of the SOGS to CPGI rate (92.1%) (Young et al., 2006, p.36).

Table 6.3. Classification by SOGS 5+ and CPGI 6+ problem gambler groups (n=1,873[§])

		CPGI score		
		0 to 5	**6 or more**	**Total**
SOGS score	0 to 4	1,812	7	1,819
	5 or more	9	**45**	54
	Total	**1,821**	**52**	**1,873**

§ Unweighted data and 20 observations excluded due to missing data for SOGS and CPGI

NOTE: Non-regular and non-gamblers assumed to have a SOGS and CPGI score of zero

In light of this convergence under the new CPGI cut-point of 6+, the most profitable application of segmentation analysis would be to compare the factors that discriminate between problem and non-problem regular gamblers for both screens. Such an analysis would reveal any differences in the mix of predictors for problem gambling between the two screens and provide some possible insight into the pathways to problem gambling. Although the SOGS 5+ classification does not represent a different cut-point, the composition of its segments is explored here to compare with those derived from the new CPGI cut-point of 6+.

6.3.2. Segmenting SOGS 5+. The results of the segmentation analysis based on the SOGS 5+ cut-point are presented in the form of a "gains chart" which mixes categories across predictor variables according to the percentages of respondents identified as problem gamblers (Table 6.4) (see Appendix A for a full description of this procedure). The far right column of Table 6.4 shows the under- or over-representation of the segment in the problem gambler category. Although all eight predictors from Tables 6.2 and 6.3 were included in the segmentation procedure, only five were represented in the gains chart (i.e. playing EGMs at least once in the past twelve months, non-English speaking household, household structure, age 55 years and over and some secondary education). As for the logistic regression analyses, the most pervasive elements in all segments were non-English language and EGM play. Indigenous status, gender and household income were not identified by this procedure.

Table 6.4. Gains Chart of Problem Gambler Segments based on SOGS Score 5+ (weighted NT Prevalence Survey Sample n=138,225)

Segment Composition	No. in segment	No. scoring 5+	% of Total 5+	% scoring 5+	Rep. Ratio*
Over-represented segments (Rep. ratio >1)[1]					
Secondary / NESB/ No EGMs in past 12 mths	493	123	8.2	24.9	22.95
Single person, single parent or couple with children/NESB/ EGMs	424	91	6.1	21.4	19.76
Couple no children or group or share/ NESB/ Played EGMs	657	50	3.3	7.6	7.05
Age 55+ yrs/Non NESB/ Played EGMs	4,634	303	20.2	6.5	6.04
Age under 55 yrs/non-NESB/Played EGMs	31,200	881	58.9	2.8	2.60
Under-represented segments					
Above some secondary/NESB/No EGMs	4,854	24	1.6	0.5	0.44
Couple no children or group HH/non-NESB/ No EGMs	35,686	26	1.7	0.1	0.06
Single person, single parent, couple children/non-NESB/No EGMs	59,884	0	0.0	0.0	0.00
Language not specified/ non-NESB/ No EGMs	393	0	0.0	0.0	0.00
Totals	**138,225**	**1,498**	**100.0**	**1.08**	**-**

* Representation ratio = % segment scoring 5+ divided by percent of total sample scoring 5+

Despite the pervasiveness of EGM play in the higher risk categories, the representation ratio indicates that the segment with the highest proportion of problem gamblers (i.e. secondary/NESB/no EGMs in past 12 mths) excludes this factor. This is surprising, given the importance of EGM play in the regression analyses above (Tables 6.2 and 6.3). However, it does demonstrate the power of interactions to sometimes over-ride individual effect estimates of additive and linear modelling. The other highly represented group includes single parents and couples with children, as well as the two salient risk factors of EGM play and non-English speaking households.

One important feature of the column distributions in Table 6.4 is the rapid decline in representation ratios between the two topmost segments and those below, as well as a similar decline between the middle and the bottom-most rows in both prevalence estimates and representation ratios. The fact that these lower risk groups are the most populous presents policy-makers with a dilemma in the choice of harm minimisation

strategies, to either approach it a community or population level, or specifically target risk factors on a clinical and industry-focused basis. The mid-most segment (i.e. age under 55 yrs/ non-NESB/ played EGMs) encapsulates the nature of this dilemma. This segment is the most common in the population in an absolute sense, yet is considerably under-represented within the population of problem gamblers.

6.3.3. Segmenting CPGI 6+. Despite the high level of agreement in the identification of problem gamblers (Table 6.3), the mix of categories differs markedly between the gains charts for the two screens. Indigenous status, absent from the SOGS chart, assumes importance here for the CPGI, while the reverse was true for the regression analyses. It follows from this contrasting outcome that Indigenous status as a variable would appear to be a deeply embedded category for the CPGI, one that only emerges as a factor when it is combined with one or more other variables. However, it appears that its absence, rather than its presence, that contributes to risk, a reversal to the effect of increased risk found in the regression analysis for SOGS. A similar exception to the rule of EGM play found by the SOGS segmentation is found here in terms of the high over-representation ratio of an older, NESB group, that do not play EGMs. A further investigation of the gambling mode that characterises this group would repay efforts, as it appears to be eluding the policy focus on the impact of EGM exposure. Again, it appears that the most populous groups have on the whole the lowest rates of prevalence and representation.

Table 6.5. Gains chart of problem gambler segments based on CPGI Score 6+ (weighted NT Prevalence Survey sample n=138,225)

Segment Composition	No. in segment	No. scoring 6+	% of Total 6+	% Scoring 6+	Rep. Ratio*
Over-represented segments (Rep. ratio >1)[1]					
Age 55 + yrs/NESB/No EGMs	789	148	10.1	18.8	17.71
Household structure "merged"/NESB/ EGMs	686	89	6.1	13.0	12.30
Non-Indigenous/non-NESB / EGMs	31,648	1146	78	3.6	3.42
Under-represented segments					
Indigenous/ non-NESB/EGMs	4,185	37	2.5	0.9	0.82
Age under 55 yrs/NESB/ no EGMs	4,558	24	1.6	0.5	0.49
Couple no children or group, share/non-NESB/no EGMs	35,686	26	1.7	0.1	0.07
Single, single parent, couple children/non-NESB/ no EGMs	59,884	0	0	0.0	0.00
Couple no children or group, share/NESB/ no EGMs	395	0	0	0.0	0.00
NESB not known/ EGMs	393	0	0	0.0	0.00
Totals	**138,225**	**1,470**	**100.0**	**1.06**	**-**

* Representation ratio = % segment scoring 5+ divided by percent of total sample scoring 5+

6.4 Implications for research

A close examination of the distribution of the SOGS and the CPGI scores for regular gamblers indicates that alternative cut-points may better reflect the patterns of gambling behaviours in the NT. One option would be to raise the SOGS cut-point (5+ may overestimate problem gambling) and lower the CPGI cut-point (8+ may underestimate problem gambling). However, a comparison of the effects of alternative and recommended cut-points showed that estimates of problem gambling converge at 5+ for

the SOGS and a lowering of the CPGI to 6+. A series of regression analyses confirmed that the socio-demographic and gambling mode profiles under the alternative and recommended cut-points are very similar, although the SOGS predictors are more stable, with EGM play and non-English speaking household comprising the most powerful risk factors for problem gambling.

The decision about appropriate cut-points exposes the permeability of the boundary between gradients of risk and the diagnosis of a pathological condition. In the case of the NT, the diversity and size of the population may justify the use of alternative cut-points. In addition, the diversity and variety among the problem gambler group has demonstrated that much more research is needed at the household, community and venue level to identify the pathways to problem gambling as well as the triggers of self-awareness among regular gamblers that their behaviours and practices are placing them at greater risk.

This Chapter has therefore shown that two screens used for the *NT Gambling Prevalence Survey 2005* have provided useful prevalence estimates of problem gambling for comparison with other jurisdictions and identified the most salient risk factors in terms of socio-demographics and gambling activities. However, the analysis has also demonstrated the importance of applying empirically-justifiable cut-points to the interpretation of these data. Since the internationally-recommended benchmarks are not absolute, their application must be informed by the characteristics of the subject population.

6.5 Implications for harm minimisation

The application of appropriate cut-points for the identification of problem gambler profiles is critical to the correct estimation of prevalence levels. These estimates have important diagnostic and epidemiological implications for public health responses to the introduction of new forms of gambling. The estimates, both across and within populations, are the main source of the comparable, replicable and internationally-recognised benchmarks that underpin all effective strategies of harm minimisation and their evaluative components. While the revised cut-points agree (over 80% in both directions) on the identification of problem gamblers, the segmentation analysis revealed that the categories so defined are identified by different combination of socio-demographic and gambling mode variables. As for the regression analyses, EGM exposure and a NESB household are dominant and pervasive elements among the higher problem gambling scores. However, a surprising exception is the finding of an older, NESB segment with no EGM exposure with the highest level of over-representation in the problem gambler category for both screens.

References

Abbott, M. (2006). Do EGMs and problem gambling go together like a horse and carriage? *Gambling Research, 18*(1), 7-38.

Abbott, M., Volberg, R. A., Bellringer, M., & Reith, G. (2004). *A review of research on aspects of problem gambling: summary, conclusions and recommendations*. Auckland: Auckland University of Technology Gambling Research Centre.

Abbott, M., Volberg, R. A., & Rönnberg, S. (2004). Comparing the New Zealand and Swedish national surveys of gambling and problem gambling. *Journal of Gambling Studies, 20*(3), 237-258.

Abbott, M. W., & Volberg, R. A. (2006). The measurement of adult problem and pathological gambling. *International Gambling Studies, 6*(2), 175–200.

AC Nielsen. (2007). *Prevalence of Gambling and Problem Gambling in NSW – A Community Survey 2006*. Sydney: NSW Office of Liquor, Gaming and Racing, Department of the Arts, Sport and Recreation.

Battersby, M. W., Thomas, L. J., Tolchard, B., & Esterman, A. (2002). The South Oaks Gambling screen: a review with reference to Australian use. *Journal of Gambling Studies, 18*(3), 257-271.

Bauman, Z. (2007). Collateral Casualties of Consumerism. *Journal of Consumer Culture, 7*(1), 25-56.

Blanco, C., Hasin, D. S., Petry, N., Stinson, F. S., & Grant, B. F. (2006). Sex differences in subclinical and DSM-IV pathological gambling: results from the National Epidemiologic Survey on Alcohol and Related Conditions. *Psychological Medicine, 36*, 943–953.

Blaszczynski, A., & Nower, L. (2002). A pathways model of problem and pathological gambling. *Addiction, 97*(5), 487-499.

Bonnaire, C., Bungener, C., & Varescon, I. (2006). Pathological gambling and sensation seeking - How do gamblers playing games of chance in cafes differ from those who bet on horses at the racetrack? *Addiction Research and Theory, 14*(6), 619-629.

Breen, R. B., & Zimmerman, M. (2002). Rapid Onset of Pathological Gambling in Machine Gamblers. *Journal of Gambling Studies, 18*(1), 31-43.

Clarke, D., Abbott, M., Tse, S., Townsend, S., Kingi, P., & Manaia, W. (2006). Gender, age, ethnic and occupational associations with pathological gambling in a New Zealand urban sample. *New Zealand Journal of Psychology, 35*(2), 84-91.

Currie, S. R., Hodgins, D. C., Wang, J., el-Guebaly, N., Wynne, H., & Chen, S. (2006). Risk of harm among gamblers in the general population as a function of level of participation in gambling activities. *Addiction, 101*(4), 570-580.

Delfabbro, P. (2000). Gender differences in Australian gambling : a critical summary of sociological and psychological research. *Australian Journal of Social Issues, 35*(2), 145-158.

Delfabbro, P., Lahn, J., & Grabosky, P. (2006). Psychosocial correlates of problem gambling in Australian students. *Australian and New Zealand Journal of Psychiatry, 40*, 587-595.

Delfabbro, P., & LeCouteur, A. (2006). *Australasian Gambling Review*. Adelaide: Report Prepared for the Independent Gambling Authority of South Australia.

Duvarci, I., Varan, A., Coskunol, H., & Ersoy, M. A. (1997). DSM-IV and the South Oaks Gambling Screen: Diagnosing and assessing pathological gambling in Turkey. *Journal of Gambling Studies, 13*(3), 193-206.

Fabian, T. (1995). Pathological gambling: A comparison of gambling at German-style slot machines and "Classical" gambling. *Journal of Gambling Studies, 11*(3), 249-263.

Ferris, J., & Wynne, H. (2001). *The Canadian Problem Gambling Index: Final Report*: Canadian Centre on Substance Abuse.

Fisher, S. (2000). Measuring the prevalence of sector-specific problem gambling: a study of casino patrons. *Journal of Gambling Studies, 16*(1), 25-51.

Fogarty, C., & Young, M. (2008). *Gambling harm-minimisation measures post 1999: An Australian overview with particular reference to the Northern Territory*. Darwin: School for Social and Policy Research, Charles Darwin University.

Gill, T., Dal Grande, E., & Taylor, A. W. (2006). Factors associated with gamblers: a population-based cross-sectional study of South Australian adults. *Journal of Gambling Studies, 22*(2), 143-164.

Griffiths, M., & Delfabbro, P. (2001). The biopsychosocial approach to gambling: Contextual factors in research and clinical Interventions. *eGambling, 5*, 1-34.

Hing, N., & Breen, H. (2001). An empirical study of sex differnces in gaming machine play among club members. *International Gambling Studies, 1*, 67-86.

LaPlante, D. A., Nelson, S. E., LaBrie, R. A., & Shaffer, H. J. (2006). Men & Women Playing Games: Gender and the Gambling Preferences of Iowa Gambling Treatment Program Participants. *Journal of Gambling Studies, 22*(1), 65-80.

Livingstone, C. (2005). Desire and the consumption of danger: Electronic gaming machines and the commodification of interiority. *Addiction Research and Theory, 13*(6), 523-534.

Livingstone, C., & Woolley, R. (2007). Risky business: A few provocations on the regulation of electronic gambling machines. *International Gambling Studies, 7*(3), 361-376.

Lund, I. (2006). Gambling and problem gambling in Norway: What part does the gambling machine play? *Addiction Research & Theory, 14*(5), 475-491.

McMillen, J., Marshall, D., Ahmed, E., & Wenzel, M. (2004). *2003 Victorian Longitudinal Communities Attitudes Survey*. Canberra: The Centre for Gambling Research, Australian National University.

McMillen, J., & Wenzel, M. (2006). Measuring Problem Gambling: Assessment of Three Prevalence Screens. *International Gambling Studies, 6*(2), 147–174.

Morris, M., Young, M., Barnes, T., & Stevens, M. (2006). *Indigenous Gambling Scoping Study: A Summary*. Darwin: School for Social and Policy Research, Charles Darwin University.

Neal, P., Delfabbro, P. H., & O'Neil, M. (2005). *Problem Gambling and Harm: Towards a National Definition*. Melbourne: Report prepared for the National Gambling Research Program Working Party.

Oliveira, M. P. M. T., & Silva, M. T. A. (2001). A Comparison of Horse-Race, Bingo, and Video Poker Gamblers in Brazilian Gambling Settings. *Journal of Gambling Studies, 17*(2), 137-149.

Petry, N. M. (2003). A comparison of treatment-seeking pathological gamblers based on preferred gambling activity. *Addiction, 58*(3), 645-655.

Poulin, C. (2002). An assessment of the validity and reliability of the SOGS-RA. *Journal of Gambling Studies, 18*(1), 67-93.

Productivity Commission. (1999). *Australia's Gambling Industries: Inquiry Report No.10*. Melbourne: Productivity Commission.

Productivity Commission. (2004). *Economic Implications of an Ageing Australia: Draft Report*. Melbourne: Commonwealth of Australia.

Queensland Government. (2005). *Queensland Household Gambling Survey 2003/04*. Brisbane: Queensland Treasury.

Reith, G. (1999). *The Age of* Chance*: Gambling in Western Culture*. London: Routledge.

Roy Morgan Research. (2006). *The Fourth Study into the Extent and Impact of Gambling in Tasmania with Particular Reference to Problem Gambling*. Hobart: Tasmanian Government.

Schofield, G., Mummery, K., Wang, W., & Dickson, G. (2004). Epidemiological study of gambling in the non-metropolitan region of Central Queensland. *Australian Journal of Rural Health, 12*(1), 6-10.

Shaffer, H. J., Hall, M. N., & Bilt, J. V. (1999). Estimating the prevalence of disordered gambling behavior in the United States and Canada: A research synthesis. *American Journal of Public Health, 89*(9), 1369-1375.

Stevens, M., & Young, M. (2006). *Which Gambling Screen to use for the Northern Territory: SOGS or CPGI?* Paper presented at the 'Gambling: The Future Now' the National Association for Gambling Studies 16th Annual Conference,.

Stinchfield, R. (2002). Reliability, validity, and classification accuracy of the South Oaks Gambling Screen (SOGS). *Addictive Behaviors, 27*(1), 1–19.

Thompson, A., Walker, M., Milton, S., & Djukic, E. (2005). Explaining the high false positives rate of the South Oaks Gambling Screen. *International Gambling Studies, 5*(1), 45-56.

Turner, N., Zangeneh, M., & Littman-Sharp, N. (2006). The experience of gambling and its role in problem gambling. *International Gambling Studies, 6*(2), 237–266.

Volberg, R. A. (2002). *Gambling and problem gambling in Nevada*. Northampton: Gemini Research.

Volberg, R. A., Abbott, M. W., Rönnberg, S., & Munck, I. M. E. (2001). Prevalence and risks of pathological gambling in Sweden. *Acta Psychiatrica Scandinavica, 104*(4), 250-256.

Walker, M. B., & Dickerson, M. G. (1996). The prevalence of problem and pathological gambling: A critical analysis., *Journal of Gambling Studies* (Vol. 12, pp. 233).

Welte, J. W., Barnes, G. M., Wieczorek, W. F., Tidwell, M.-C. O., & Hoffman, J. H. (2007). Type of gambling and availability of risk factors for problem gambling: A tobit regression analysis by age and gender. *International Gambling Studies, 7*(2), 183-198.

Welte, J. W., Barnes, G. M., Wieczorek, W. F., Tidwell, M.-C. O., & Parker, J. C. (2002). Gambling participation in the U.S: Results from a national survey. *Journal of Gambling Studies, 18*(4), 313-337.

Welte, J. W., Barnes, G. M., Wieczorek, W. F., Tidwell, M.-C. O., & Parker, J. C. (2004). Risk factors for pathological gambling. *Addictive Behaviours, 29*(2), 323-335.

Welte, J. W., Wieczorek, W. F., Barnes, G. M., Tidwell, M.-C. O., & Hoffman, J. H. (2004). The relationship of ecological and geographic factors to gambling behavior and pathology. *Journal of Gambling Studies, 20*(4), 405-423.

Young, M., Abu-Duhou, I., Barnes, T., Creed, E., Morris, M., Stevens, M., et al. (2006). *Northern Territory Gambling Prevalence Survey 2005*. Darwin: School for Social and Policy Research, Charles Darwin University.

Young, M., Barnes, T., Stevens, M., Paterson, M., & Morris, M. (2007). The changing landscape of Indigenous gambling in Northern Australia: current knowledge and future directions. *International Gambling Studies, 7*(3), 327-347.

Young, M., Lee, W., Morrison, P., & Wolgemuth, J. (2008). *Charles Darwin University Gambling Research programme 2009: A Proposal for New Projects*. Darwin: School for Social and Policy Research, Charles Darwin University.

Young, M., Stevens, M., & Morris, M. (2008). Problem gambling within the non-Indigenous population of the Northern Territory of Australia: A multivariate analysis of risk factors. *International Gambling Studies, 8*(1), 77 - 93

Young, M., & Tyler, W. (2008). Mediating markets: Gambling venues, communities and social harm. *Gambling Research, 20*(1), In press.

Appendix A. Explanation of Methods for Chapter 6

A.1 Ordinal Regression (Section 6.2.1)

In technical terms, the analysis involves a proportional odds (i.e. parallel lines or equal slopes) test using a multinomial logistic regression procedure for an ordinal dependent variable (using the SPSS Advanced Statistics Module) for the full completed survey sample (i.e. gamblers and non-gamblers, n=1,873). This procedure, which has been widely used in similar studies, estimates the significance of the threshold levels for each point in the ordinal gradient but estimates only one regression coefficient for each of the independent variables, on the assumption that they are of equal value over the whole ordinal range. This assumption (the model of our hypothesis) is then tested by a goodness of fit estimate shown by the significance of the parallel lines test. If the probability of fit value is less than 0.05, then the assumption should be rejected. However, since this equal slopes test is quite rigorous, a rejection of the model goodness of fit would be sensitive to the location and number of cut-off points for grouping the screen scores (i.e. how the original categories are collapsed to provide workable categories in the outcome variable).

A.2 Segmentation Analysis (Section 6.3)

Segmentation analysis is an exhaustive procedure which has the advantage of avoiding the simplistic assumption of linear regression models that each variable (e.g. age, gender, Indigenous status) has a single, independent, effect on the outcome. As for market research, in which this technique is widely used, segmentation analysis uses a combination of values to define each segment (e.g. Darwin-resident, English-speaking single males over 55yrs with incomes under $30k per year) according their probabilities of falling into the outcome category (in this case the problem gambler profile). The probabilities (percentages of the segment in outcome category) are ranked in the form of a "gains chart" which established the profile for problem gambler under each cut-off point regime.

The method used here employs the program known as Chi-Square Automatic Interaction Detector (CHAID), available with the SPSS package. The following extract from the SPSS CHAID manual describes its operation in identifying the clusters or segments which it generates:

> CHAID divides a population into two or more distinct groups based on categories of the "best" predictor of a dependent variable. It then splits each of the groups into smaller groups based on other predictor variables. This splitting process continues until no more statistically significant predictors can be found (or until some other stopping rule is met). CHAID displays the final subgroups (**segments**) on an easy-to-understand tree diagram.
>
> The segments that CHAID derives are **mutually exclusive** and **exhaustive**. That is, segments do not overlap, and each population unit (case) is contained in exactly one segment. In addition, since segments

> are defined by combinations of predictor variables, you can easily classify each case into its appropriate segment simply by knowing the categories of the predictors (SPSS 1993, p.3).

The segments so generated are then each ranked in the order of the extent to which they fulfil the criterion of the dependent variable. This procedure is carried out automatically and produces a hierarchy of segments which can be useful for targeting groups that are seen to be problematic. The "splits" that are not significant at the 0.05 level (using a logistic regression procedure) are dropped from the analysis, so that not every predictor will necessarily feature in the one of more of the final rankings of combined values. There was a very liberal limit selected for the depth of the "tree" or succession of splits (e.g. to a maximum of 5 possible levels).

Note: The version of CHAID used here is SI-CHAID Version 4.0.4.07303 (2005) Belmont MA, USA

References:

Bender, A. (2000). Calculating Ordinal Regression Models in SAS and S-Plus. *Biometrical Journal*, 42(6): 677-699.

SPSS (1993) *Users Manual: Chi-Square Automatic Interaction Detector (CHAID).* Chicago, Illinois

Appendix B. Article in Press: Gambling Screens and Problem Gambling

Stevens, M. and Young, M. 2008. Gambling screens and problem gambling: A parallel psychometric comparison of two gambling screens. *Gambling Research*, 20(1), in press.

Abstract

In 2005 the Northern Territory of Australia conducted its first population-based gambling and problem-gambling prevalence survey, administering both the SOGS and the CPGI to the same sample of respondents. Using a sub-sample of regular gamblers (n=361), the respective problem gambling screens were subject to psychometric testing that included dimensionality, internal consistency, external validity, classification validity and screen order effects. Analyses were conducted for all regular gamblers stratified by gender. The CPGI produced a significantly lower prevalence estimate than the SOGS as well as lower rates of false-positives as measured against external criteria. Consistent with other studies, dimensionality analysis revealed a multi-dimensional factor structure for the SOGS and a single dimension for the CPGI. The CPGI displayed stronger correlations with external criteria and stronger internal consistency than the SOGS. A gender effect was observed, with both screens performing better for females. In addition, screen order significantly affected problem gambling prevalence estimates, although only for males and all persons. As a group, the psychometric analyses revealed that the results produced by the respective gambling screens are heavily context dependent, both in terms of methods of application and the characteristics of target populations. The key message of the paper is that *post-hoc* psychometric testing of gambling screens is essential in understanding the limitations of problem gambling prevalence estimates and to qualify and guide their interpretation when applied in general population surveys.

Appendix C. Published Article Abstract: SOGS and CPGI

Young, M. and Stevens, M. 2008. SOGS and CPGI: Parallel comparison in a diverse population with particular reference to gender. *Journal of Gambling Studies,* 24(3), 337-356.

Abstract
The Northern Territory of Australia, one of the most demographically and socially diverse jurisdictions in the country, conducted its first population-based gambling and problem gambling prevalence survey in 2005. Both the South Oaks Gambling Screen (SOGS) and the Canadian Problem Gambling Index (CPGI) were administered to the same sample of respondents. Using data from this survey, the current paper presents a parallel comparison of the respective screens with particular reference to gender, region, and the socio-demographic characteristics of respondents. The respective screens produced significantly different groups of problem gamblers as measured by their association with a range of socio-demographic variables. Specifically, the large number of SOGS items related to money issues may cause selective overrepresentation among low socioeconomic groups, including Indigenous people, who exist in relatively high proportions in the Northern Territory. In addition, there existed substantial gender-based differences within screens. Identified female problem gamblers were associated with household level variables (i.e. employment status, household type and marital status), while males were associated with socio-economic variables including language, education, and income. Further research is required to validate the use of problem gambling screens within the Indigenous population and to understand the role of gender in the experience and categorisation of problem gambling.

Appendix D. Published Article Abstract: Problem Gambling Within the Non-Indigenous Population of the NT of Australia

Young, M., Stevens, M. and M. Morris. 2008. Problem gambling within the non-Indigenous population of the NT of Australia: A multivariate analysis of risk factors. *International Gambling Studies* 8(1), 77-93.

Abstract
This paper estimates, through the use of a telephone survey and the Canadian Problem Gambling Index (CPGI), the prevalence of gambling and problem gambling among the nonindigenous population of the Northern Territory, Australia. Multivariate predictive models of regular and problem gambling group membership were constructed using socio-demographic and gambling mode variables. Of the socio-demographic variables, household type (particularly being single or living in a group household) was a predictor for both gambler types. In addition, male gender and formal education below tertiary level were associated with regular gambling. Gambling mode proved to be of greater explanatory power for both groups. In particular, electronic gaming machines (EGMs) were strongly associated with problem gambling. While these results provide a necessary knowledge base, the gaps they highlight are as valuable as the empirical results they provide. Any comprehensive understanding of risk factors in demographically distinctive jurisdictions such as the Northern Territory requires a broader approach; one that meaningfully extends beyond the non-indigenous population.

Appendix E. Submitted Article Abstract: Creating Desire

Young, M. & Stevens, M. (submitted manuscript). Creating desire: The *agônistic* production of *alea* in contemporary society. *Journal of Consumer Culture*.

Abstract
This paper concerns itself with the societal forces that influence gambling participation, particularly the type of gambling activities that people engage in. It explores the ways in which these participation patterns may be shaped by the processes intrinsic to a consumer society. As an investigative framework, it employs the typology of games devised by French sociologist Roger Callois to determine its explanatory relevance in a technologically-changing world. Specifically, the paper examines Callois's fundamental distinction between competitive or *agônistic* games (the ancient Greek word meaning contest or challenge) and those based on chance or *alea* (the ancient Greek for playing at a game of chance of any kind). This typology is empirically tested through a principal components analysis of gambling activities in the Northern Territory of Australia. Subsequently, re-examines the contemporary configuration of the *alea-agôn* relationship, arguing that changes in gambling technologies, married to neoliberal socioeconomic structures, result in a move from a parallel and complimentary relationship towards the explicit *agônistic* reproduction of the *aleatory* principle, one that maintains and enhances *alea* as a discursive social practice. This relationship is central to our understanding of the relationships between gambling participation, society, and technology.

Appendix F. Submitted Article Abstract: "The games people play"

Young, M. & Stevens, M. (submitted manuscript). "The games people play": An analysis of the relationships between social context, gambling participation and risk. *International Journal of Mental Health & Addiction*.

Abstract

In order to explore the structure of gambling participation and its associated risk, the current paper draws upon Roger Caillois's distinction between games based on competition (i.e. *agôn*) and those based on chance (i.e. *alea*). These ideal types are employed as an interpretative framework with which to examine the structure of gambling participation in the Northern Territory of Australia. The idea that *alea* and *agôn* constitute quite different forms of gambling consumption, ones that are both socially patterned and associated with differing degrees of risk, as measured by the Canadian Problem Gambling Index (CPGI), was empirically explored. The analysis supported Caillois's basic distinction between *agôn* and *alea* and found that frequency of each type of gambling was associated with socio-demographic variables including geographic remoteness, age, gender, and household type. No association was found between *alea*, *agôn* and the CPGI, suggesting that it is the manifestation of chance in specific activities, rather the broad structure of activities, that constitute problem gambling risk.