

# RUBEN

**RESEARCH UNIT IN BEHAVIOURAL ECONOMICS AND NEUROECONOMICS**



# The National Longitudinal Study of Gambling Behaviour (NLSGB): Preliminary Results

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# The NLSGB

- The NLSGB tracked 300 gamblers over a 15-month period.
- A comprehensive survey instrument was compiled to analyse factors that might influence changes in risk of gambling problems over time.
- The study was conducted in the four major metropolitan areas of South Africa: Johannesburg, Tshwane, Durban and Cape Town.

We will discuss the study's design and implementation and some preliminary results.

# Background

- In 2008 we conducted the National Urban Prevalence Study of Gambling Behaviour (NUPSGB). This aimed to establish baseline prevalence rates for gambling and problem gambling in the country and to identify factors associated with risk for pathological gambling (PG) at the population level.
- A sample of 3000 people was randomly drawn from the four major metropolitan areas of the country. From them we gathered demographic and economic (household) data, and self-reports of recent and lifetime gambling behavior, alcohol and substance abuse history, and scores on the Beck's Depression Inventory, the Beck's Anxiety Inventory, and the Barratt's impulsivity Scale. Participants completed two gambling screens.

# NUPSGB result highlights

- PG prevalence in most sub-populations was found to be comparable to rates observed in previous studies in other countries. However, it was far higher (5-6 %) in one (large) sub-population: inhabitants of current and former residential areas for mineworkers.
- Almost all of the gambling in these areas went on in informal (illegal) bars and on the street. Most PGs have never participated in any legal gambling except the lottery.
- Three independent variables are positively associated with PGSI scores with much higher coefficients and confidence than any others: living in mining areas, a history of alcohol problems, and being male.

While crucial for establishing baseline prevalence rates, the NUPSGB could (of course) not identify factors that may influence changes in gambling behavior over time.

# NLSGB Study Design

- Unlike other panel studies that typically have long gaps between waves of data collection – the norm being one year – we decided to focus on the short run determinants of gambling behaviour by visiting a sample of 300 gamblers every three months.
- With 6 visits in total over a period of 15 months, we could collect a wealth of data on each person while minimising sample attrition.

# Questionnaire Design

- An extensive literature review was conducted to guide selection of survey questions.
- This culminated in a questionnaire that included 26 questions on personal and household demographics, and 29 questions on gambling participation, expenditure and attitudes.
- We also included 12 questions focusing on people's expectations about the future.
- In addition, a number of psychological screens (previously validated in SA) were included to assess gambling behaviour and other factors.
- The list includes, but is not limited to: the PGSI, the BDI-II, the BAI, the BIS-11 and the WHO ASSIST.

# Experiments and fieldworker fraud

- Rewarded lottery choice and time preference experiments were conducted with each participant on each visit. This was so that changes in utility functions at the aggregate level could be estimated, using joint estimation of risk and time preferences and mixture modeling.
- The experiments were ruined by fieldworker fraud (rigging lotteries to increase payouts), resulting in a legal challenge by UCT against the research company. (This was one of two studies destroyed by such fraud, on the part of the two largest international firms. It is now necessary to re-examine national demographic data from a range of studies.)

# Diary Intervention

- We also designed a simple randomised control trial (RCT) that took place during the final two waves of the study.
- This “diary intervention” randomly allocated research subjects in each category of risk severity, based on their scores on the PGSI, to treatment and control groups.
- The treatment group received a weekly telephone call that gathered information on their gambling behaviour during the past week. The control group were not contacted.
- The rationale for this intervention was to test whether people who monitored and reported their gambling behaviour on a weekly basis would be significantly different on measures of gambling behaviour and risk severity at follow-up to those who were not contacted.

# Translation

- SA has 11 official languages but the research instruments were only translated into the five languages with high prevalence rates in the survey areas: Afrikaans, IsiZulu, IsiXhosa, Sesotho and Setswana.
- Extensive back-translation and validation through pilots were conducted.

# Sampling

- Using the PGSI classification of severity of risk for PG, we aimed to recruit 100 people in the no and low risk categories, 100 people in the moderate risk category and 100 people in the problem gambler category.
- The NUPSGB provided a large pool of gamblers from which to draw. However it did not provide enough gamblers in each category of severity so in December 2009 and February 2010 advertisements were placed in local newspapers in the Johannesburg and Cape Town areas to recruit more participants.

# Sampling contd.

- Given the 14-month lag between the NUPSGB and the start of the panel study we expected some people's PG risk severity to have changed over that time. This was assessed during the first wave of fieldwork.
- To bolster the credibility of the researchers and to prevent attrition between recruitment and commencement of the study, people who agreed to participate were paid R14.50 two days after they were recruited; this money was delivered to their houses.
- As with any longitudinal study there was sample attrition over time. It may have helped that the subjects were gambling – and winning! – in our experiments.
- Specifically, our sample of 298 people in wave 1 dropped to 291 by wave 2, 281 by wave 3, 270 by wave 4, 258 by wave 5 and 248 by wave 6. Almost all attrition was due to death, serious illness or people leaving their city.

# Summary Statistics

TABLE I  
SUMMARY STATISTICS OF NLSGB DATA - WAVE 1

Variable	Mean	Std Deviation
Female	0.479	0.500
African	0.674	0.469
White	0.144	0.352
Coloured <sup>1</sup>	0.107	0.310
Asian/Indian	0.074	0.262
Education	12.323	2.359
Cape Town	0.186	0.389
Durban	0.162	0.369
Johannesburg <sup>2</sup>	0.588	0.493
Pretoria/Tshwane	0.065	0.247
Employed <sup>3</sup>	0.601	0.491
Age	38.188	12.201
Number of dependents	3.507	2.422
LSM score <sup>4</sup>	6.842	1.693
Gamble (last month)	0.862	0.345
Amount spent gambling (last month)	999.166	3064.523
Drink alcohol	0.534	0.499
Smoke tobacco	0.366	0.482
Depression score	11.507	11.056
Anxiety score	9.128	10.035
Impulsivity score	61.960	9.862

## Notes

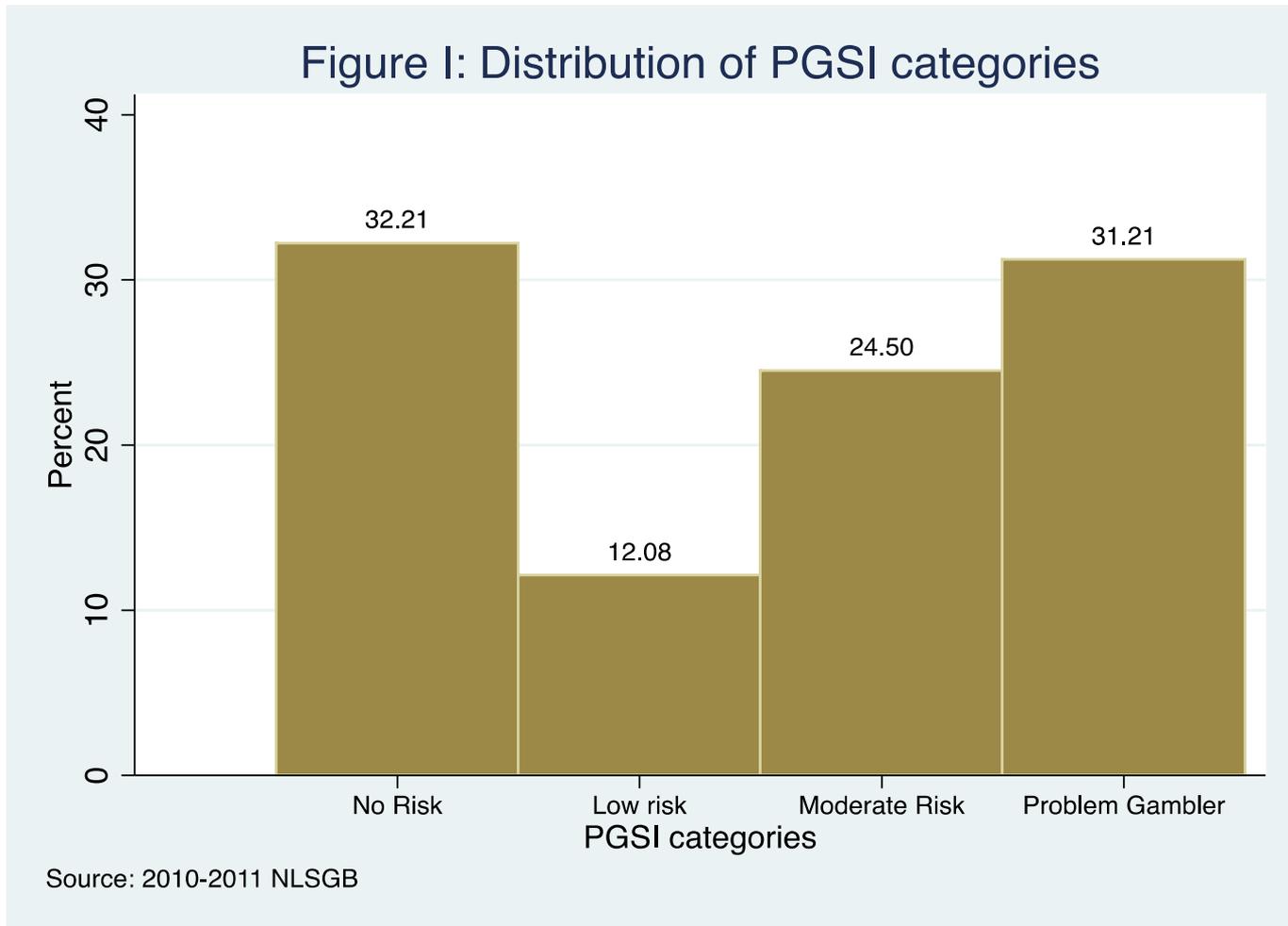
<sup>1</sup> 'Coloured' refers to people of mixed-race origin

<sup>2</sup> Johannesburg includes Soweto, the East Rand and the West Rand

<sup>3</sup> Employment includes full-time, part-time and seasonal employment

<sup>4</sup> Score on the Living Standards Measure (Range 0 - 10)

# Distribution of PG Risk Severity, Wave 1



# Gambling Activity Participation

TABLE II  
PROPORTION OF SAMPLE PLAYING EACH ACTIVITY ACROSS WAVES

<b>Activity</b>	<b>Wave 1</b>	<b>Wave 2</b>	<b>Wave 3</b>	<b>Wave 4</b>	<b>Wave 5</b>	<b>Wave 6</b>
Lucky draws excluding lottery	12.42%	9.62%	4.27%	3.70%	1.56%	4.03%
Scratch cards	23.15%	18.21%	19.22%	15.56%	14.34%	17.34%
Fafi / iChina	11.74%	7.56%	8.19%	8.52%	7.36%	8.87%
Lotteries (e.g. Lotto, Powerball)	73.49%	71.82%	74.02%	67.78%	65.50%	70.56%
Bingo	3.36%	2.06%	1.42%	2.22%	0.39%	1.21%
Dice games for money	6.38%	6.87%	4.27%	5.56%	5.04%	3.63%
Roulette	7.72%	6.53%	7.47%	9.26%	4.26%	6.45%
Card games for money	13.09%	11.34%	7.83%	9.26%	3.88%	5.24%
Slot machines	28.86%	23.02%	21.35%	22.22%	17.44%	18.15%
Animal betting	8.72%	6.19%	4.98%	5.56%	5.81%	6.45%
Sport betting	13.76%	8.93%	6.41%	7.04%	6.59%	11.69%
Electronic gaming machines	9.06%	5.15%	2.85%	5.93%	3.10%	2.42%
Other	1.34%	0.69%	0.36%	0.74%	0.39%	1.21%

# Frequency of Gambling Activity Participation

TABLE III  
AVERAGE NUMBER OF TIMES EACH ACTIVITY WAS PLAYED LAST MONTH

Activity	Wave 1	Wave 2	Wave 3	Wave 4	Wave 5	Wave 6
Lucky draws excluding lottery	6.38 (4.57)	4.32 (2.47)	6.58 (4.54)	6.30 (3.02)	3.75 (2.06)	5.40 (2.80)
Scratch cards	8.23 (10.14)	6.55 (6.07)	6.22 (3.82)	6.50 (6.60)	7.54 (7.52)	7.60 (9.52)
Fafi / iChina	19.00 (20.15)	11.09 (7.30)	15.61 (13.19)	16.74 (13.61)	14.47 (12.06)	14.27 (11.61)
Lotteries (e.g. Lotto, Powerball)	7.79 (6.99)	6.05 (3.47)	6.72 (4.00)	7.40 (6.40)	6.07 (3.33)	5.75 (3.78)
Bingo	5.60 (3.53)	5.50 (3.89)	4.75 (4.99)	5.17 (4.12)	4.00 (0.00)	3.67 (0.58)
Dice games for money	10.21 (8.40)	7.45 (3.50)	8.42 (5.32)	9.00 (6.74)	9.31 (10.55)	7.56 (5.43)
Roulette	5.04 (4.59)	5.53 (4.68)	4.52 (3.16)	5.72 (3.77)	6.55 (3.98)	5.50 (5.87)
Card games for money	7.72 (7.44)	6.52 (6.49)	8.77 (6.33)	6.80 (7.31)	8.10 (6.84)	10.54 (13.36)
Slot machines	4.86 (3.94)	4.34 (3.75)	4.42 (4.16)	5.02 (4.48)	5.16 (8.34)	3.89 (3.71)
Animal betting	9.31 (8.87)	8.17 (7.15)	6.07 (5.83)	4.80 (2.91)	6.64 (7.38)	9.81 (10.03)
Sport betting	7.41 (7.82)	7.65 (9.47)	7.33 (6.16)	6.68 (4.66)	8.88 (9.43)	11.07 (16.92)
Electronic gaming machines	5.19 (3.60)	4.93 (3.33)	6.38 (5.21)	5.50 (4.10)	5.25 (5.23)	5.83 (3.82)
Other	11.25 (12.09)	2.50 (2.12)	4.00 (0.00)	1.00 (0.00)	6.00 (0.00)	10.67 (15.04)

Standard deviation in parentheses

# Money Spent on Gambling Activities

TABLE IV  
AVERAGE AMOUNT SPENT ON EACH ACTIVITY IN LAST MONTH ACROSS WAVES

Activity	Wave 1	Wave 2	Wave 3	Wave 4	Wave 5	Wave 6
Lucky draws excluding lottery	R144.22 (255.49)	R89.46 (98.37)	R195.42 (253.07)	R259.50 (444.41)	R242.50 (245.27)	R105.00 (145.30)
Scratch cards	R72.99 (101.51)	R117.49 (411.56)	R58.85 (62.53)	R73.55 (102.03)	R71.03 (97.95)	R92.57 (165.45)
Fafi / iChina	R76.91 (65.37)	R82.09 (97.77)	R101.65 (131.15)	R91.52 (138.93)	R121.26 (160.13)	R171.48 (260.89)
Lotteries (e.g. Lotto, Powerball)	R115.28 (201.49)	R153.37 (391.91)	R111.11 (194.45)	R167.99 (611.73)	R152.70 (351.47)	R123.23 (198.02)
Bingo	R353.00 (319.38)	R52.00 (42.24)	R102.50 (133.01)	R781.67 (1578.99)	R15.00 (0.00)	R123.33 (25.17)
Dice games for money	R364.11 (608.29)	R408.75 (615.76)	R262.50 (366.49)	R294.00 (279.48)	R705.38 (1045.81)	R303.89 (386.02)
Roulette	R1 590.00 (2448.10)	R1 444.74 (1847.14)	R1 426.19 (2723.63)	R1 153.00 (1626.91)	R1 803.64 (2243.60)	R1 218.13 (2367.35)
Card games for money	R856.28 (2439.40)	R492.73 (665.52)	R939.09 (2012.30)	R1 391.12 (4121.44)	R1 405.50 (3729.18)	R147.31 (141.74)
Slot machines	R1 068.69 (1984.38)	R1 056.49 (1774.50)	R1 287.67 (2428.52)	R1 312.50 (2319.82)	R1 104.00 (1868.24)	R1 228.57 (2202.16)
Animal betting	R1 467.27 (4010.34)	R1 365.94 (4664.14)	R1 550.86 (4459.40)	R2 866.53 (10274.15)	R3 190.71 (10606.69)	R3 443.75 (12419.04)
Sport betting	R464.46 (1588.78)	R696.00 (1944.87)	R216.72 (255.78)	R692.74 (2267.01)	R601.76 (1140.91)	R705.72 (1956.06)
Electronic gaming machines	R1 168.89 (2284.96)	R974.00 (1215.80)	R2 531.25 (5155.28)	R1 086.88 (1604.50)	R717.50 (988.02)	R2 350.00 (3980.33)
Other	R27.25 (16.88)	R504.00 (701.45)	R200.00 (0.00)	R30.00 (28.28)	R1 000.00 (0.00)	R87.33 (140.93)

Standard deviation in parentheses

# Tabulation of PGSI categories

- Table V tabulates PGSI scores across all 6 waves and decomposes counts into between and within components.
- The table shows the instability of PG risk severity classification over the short intervals of the study.

TABLE V  
TABULATION OF PGSI CATEGORIES

Category	Overall		Between		Within
	Frequency	Percent	Frequency	Percent	Percent
No Risk	653	39.67	227	76.17	51.37
Low Risk	264	16.04	161	54.03	28.95
Moderate Risk	330	20.05	182	61.07	34.73
Problem Gambler	399	24.24	177	59.40	40.44
Total	1646	100	747	250.67	39.89

# Transition Probabilities of PGSI Categories

- Table VI shows the transition probabilities of PG risk severity categories across waves of the study.
- The principal diagonal of the table shows the likelihood that people who were classified in a particular PG risk severity category in one wave would remain there by the next.

TABLE VI

TRANSITION PROBABILITIES OF PGSI CATEGORIES

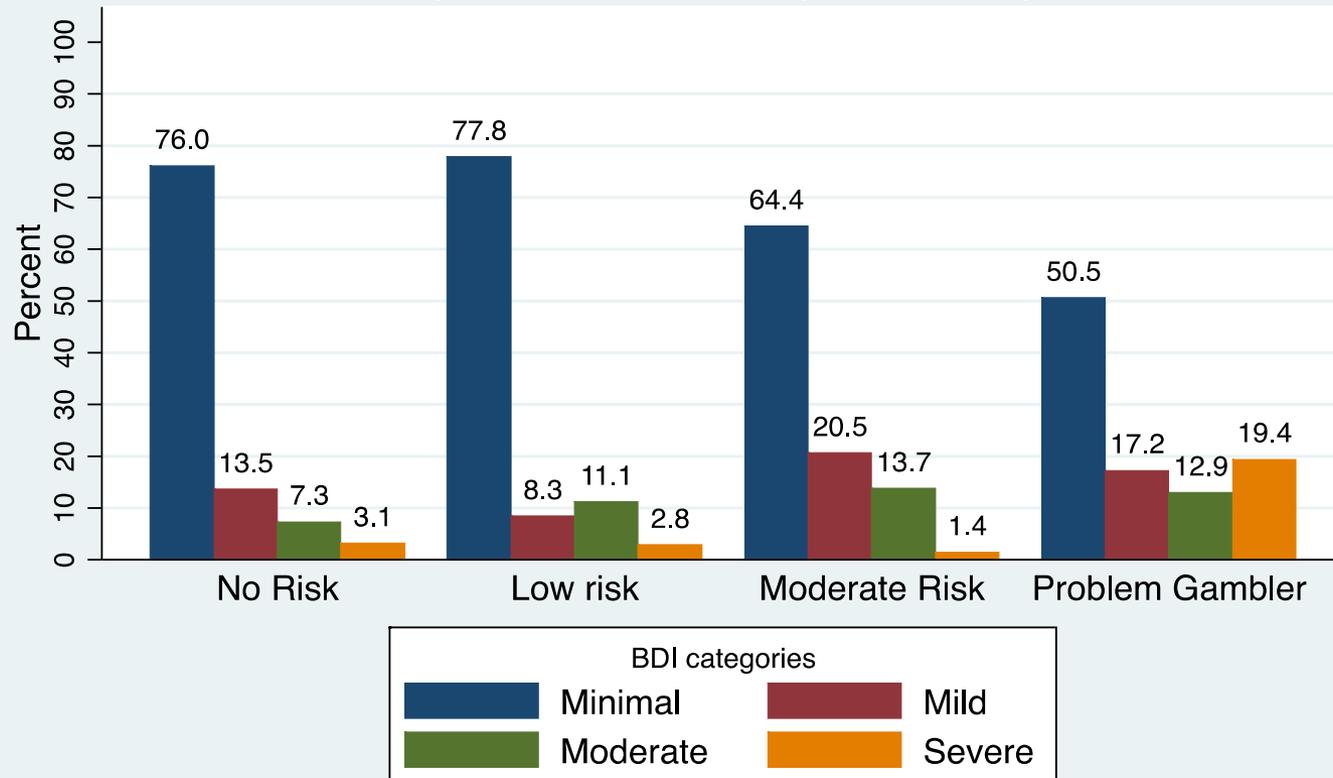
PGSI Category (Initial Values)	PGSI Category (Final Values)				
	No Risk	Low Risk	Moderate Risk	Problem Gambler	Total
No Risk	61.50	15.89	9.91	12.71	100
Low Risk	42.92	25.94	17.92	13.21	100
Moderate Risk	23.59	17.25	34.51	24.65	100
Problem Gambler	22.08	12.30	21.45	44.16	100
Total	41.32	16.91	19.07	22.70	100

# Co-occurring Conditions

- Numerous studies have found that people with gambling problems also tend to suffer from anxiety, depression, other impulse control disorders and substance use disorders.
- The NLSGB's survey instrument included a number of modules to assess intertemporal movements among these potentially co-occurring conditions.
- I'll provide some very preliminary back-of-the-envelope probes of these data.

# Gambling and Depression

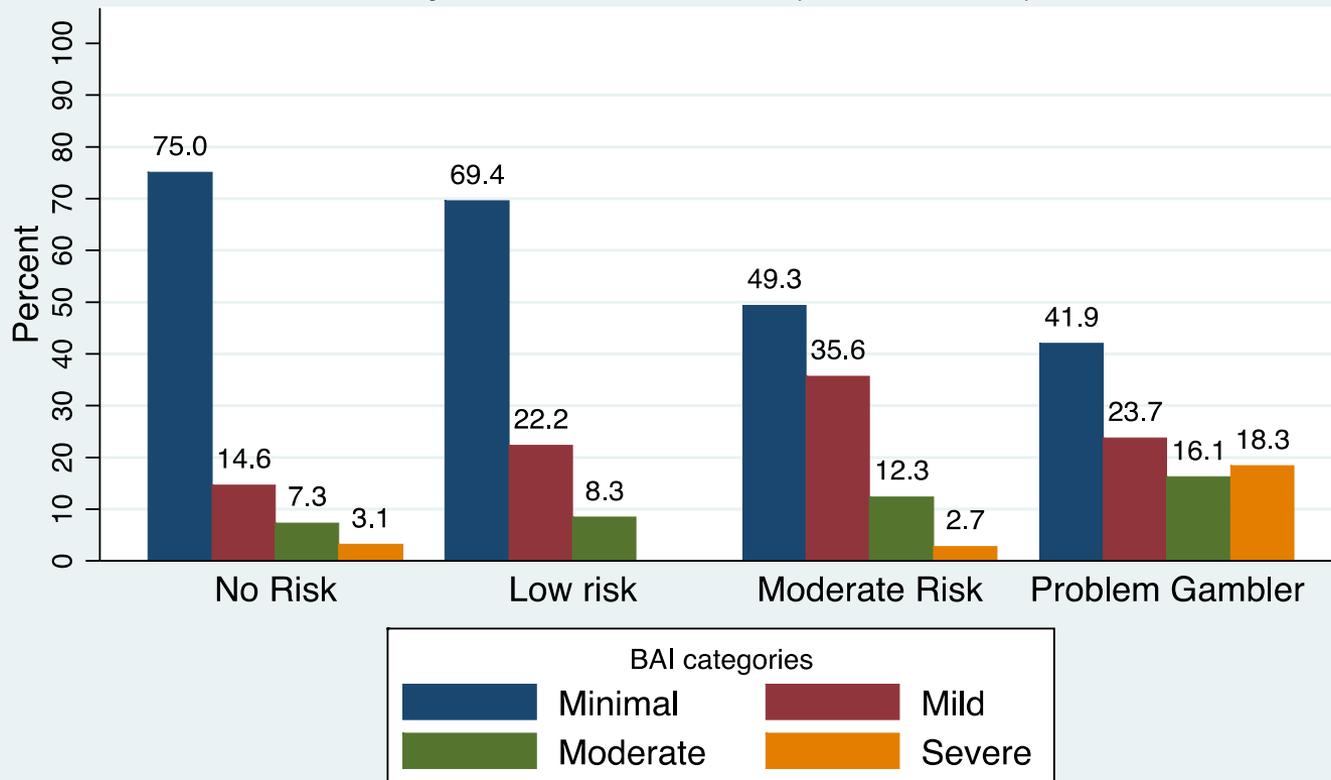
Figure II: Percentage of subjects in 4 BDI categories by PGSI classification (Wave 1 data)



Source: 2010-2011 NLSGB

# Gambling and Anxiety

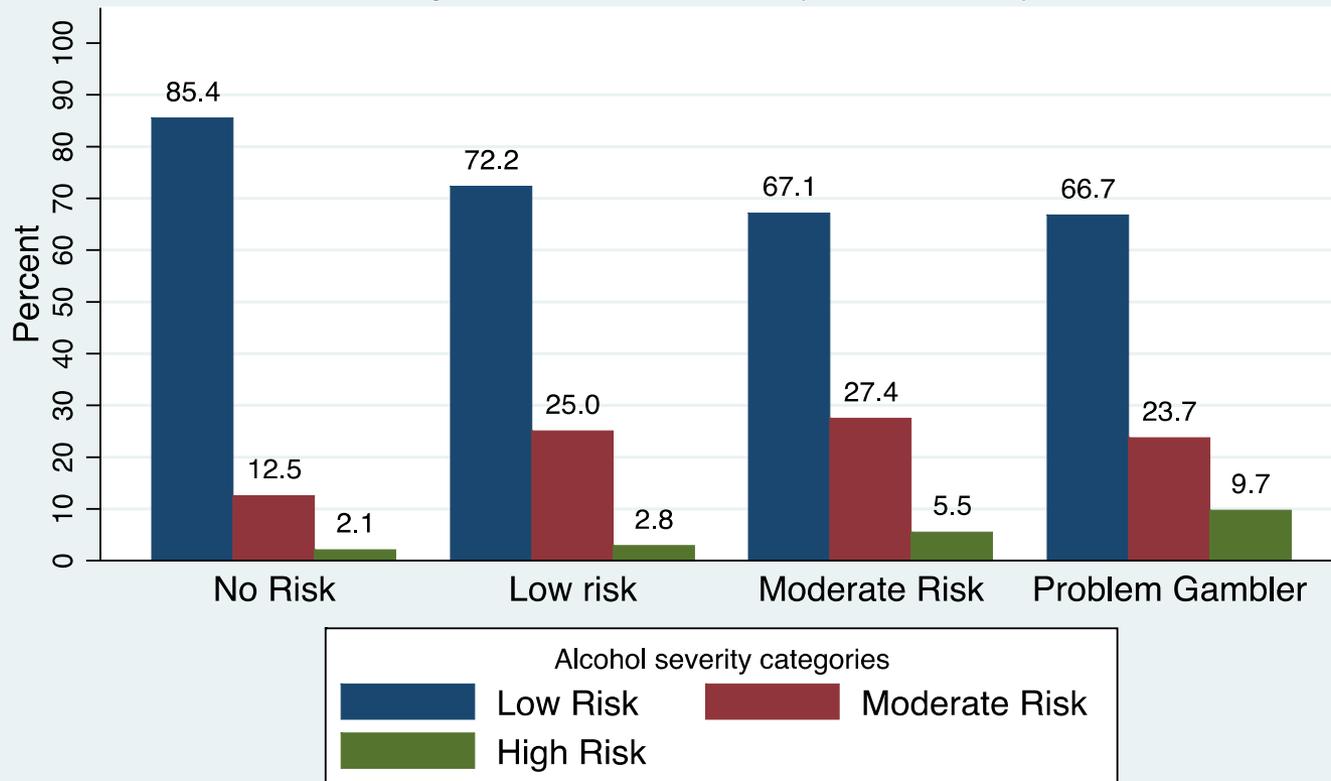
Figure III: Percentage of subjects in 4 BAI categories by PGSI classification (Wave 1 Data)



Source: 2010-2011 NLSGB

# Gambling and Alcohol Use

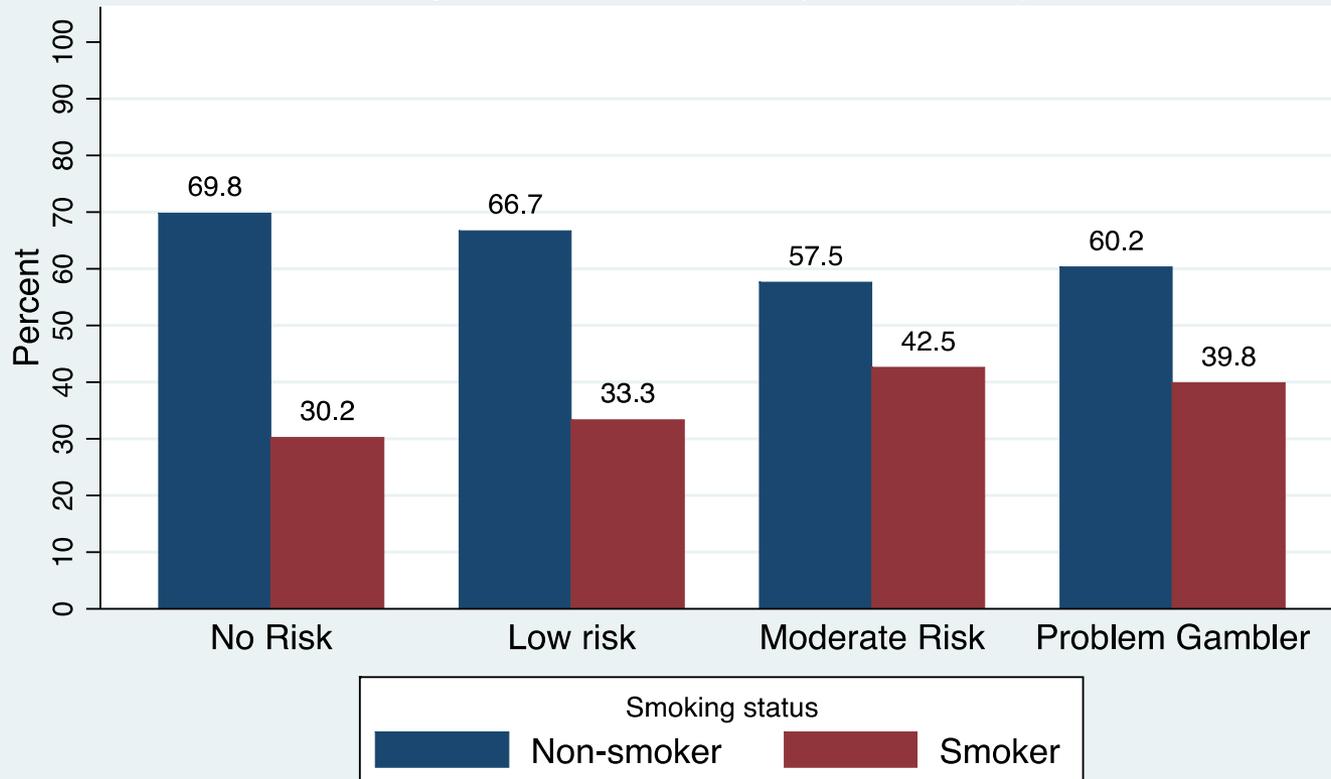
Figure IV: Percentage of subjects in ASSIST alcohol categories by PGSI classification (Wave 1 data)



Source: 2010-2011 NLSGB

# Gambling and Smoking

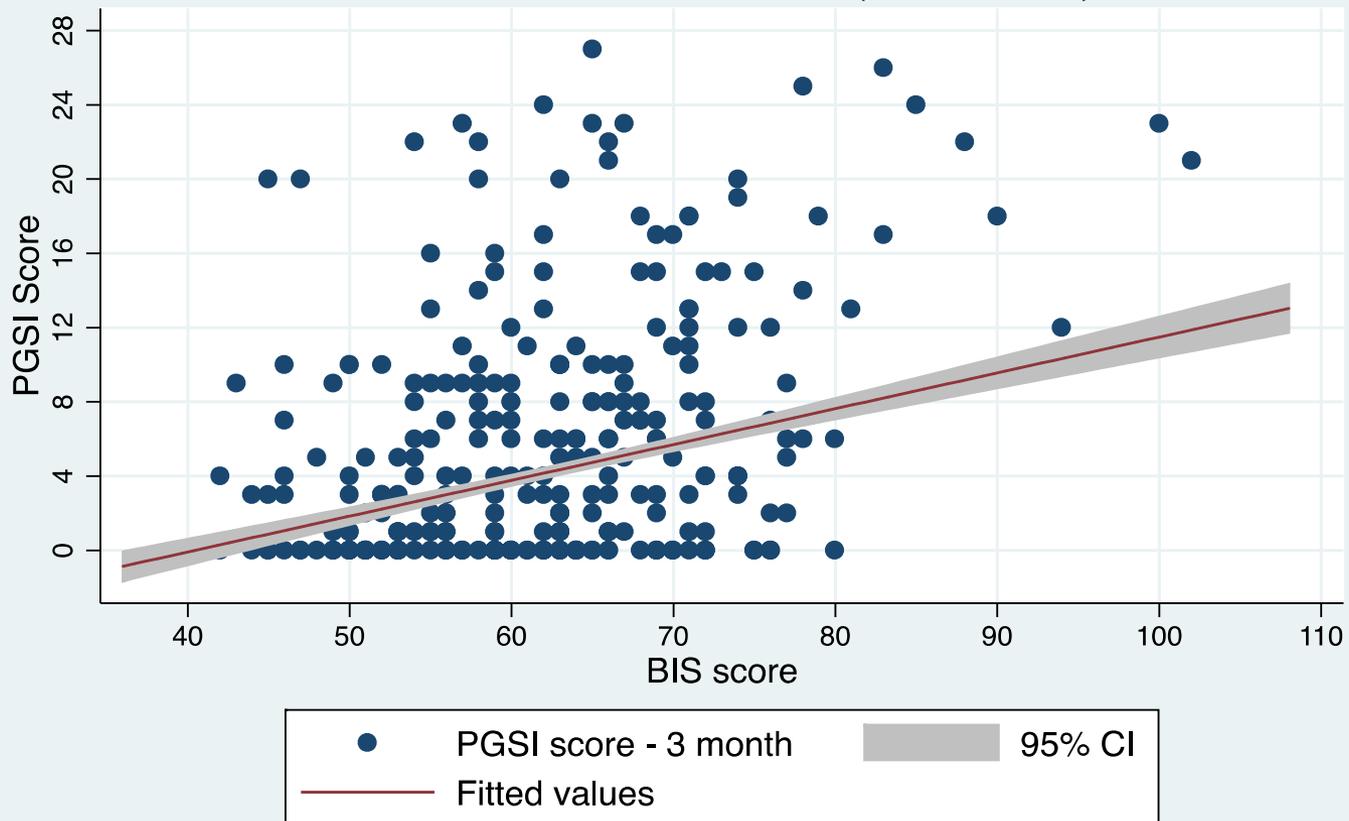
Figure V: Percentage of smokers and non-smokers by PGSI classification (Wave 1 data)



Source: 2010-2011 SAGPS

# Gambling and Impulsivity

Figure VI: Scatterplot with Linear Prediction of PGSI score and BIS score (Wave 1 data)



# Factors Affecting PG Risk Severity Over Time

- We now focus on the factors that affect PG risk severity over time, using three preliminary models intended only to give us a glance at panel effects.
- The first model, Pooled OLS, fits an ordinary least squares (OLS) line to the data but does not specifically take into account the panel structure of the dataset.
- The second set of estimates is based on a Random Effects model which takes into account the panel structure of the data but assumes that the variation across people is random and uncorrelated with the independent variables in the model.
- The final set of estimates is based on a Fixed Effects model which incorporates the panel structure of the data and removes the impact of any time-invariant characteristics of a person (for example, a genetic predisposition to gambling problems).

TABLE VII  
FACTORS AFFECTING PG RISK SEVERITY OVER TIME

	Pooled OLS	Random Effects	Fixed Effects
Education	0.148 (0.10)	0.207** (0.10)	-0.149 (0.28)
Employed	0.675 (0.42)	0.02 (0.35)	-0.661 (0.41)
Age	0.02 (0.02)	0.024 (0.02)	-0.081 (0.31)
LSM score	0.176 (0.13)	-0.014 (0.11)	-0.262* (0.15)
ASSIST - alcohol score	0.015 (0.03)	0.024 (0.02)	0.026 (0.02)
Smoke	-0.123 (0.46)	0.008 (0.40)	0.036 (0.58)
BDI score	0.104** (0.05)	0.061** (0.03)	0.038* (0.02)
BAI score	0.069** (0.03)	0.071*** (0.02)	0.069*** (0.02)
BIS score	0.152*** (0.02)	0.130*** (0.02)	0.118*** (0.02)
Wave 2	-1.426*** (0.35)	-1.541*** (0.34)	-1.585*** (0.35)
Wave 3	-1.148*** (0.40)	-1.274*** (0.36)	-1.271*** (0.37)
Wave 4	-0.479 (0.43)	-0.622 (0.39)	-0.595 (0.46)
Wave 5	-2.027*** (0.39)	-2.175*** (0.37)	-2.094*** (0.50)
Wave 6	-0.883** (0.42)	-0.875** (0.41)	-0.683 (0.61)
Constant	-9.745*** (2.15)	-7.268*** (1.87)	4.255 (12.47)
N	1638	1638	1638
F-stat / $\chi^2$	13.61	206.05	12.96
Prob > F	0.00	0.00	0.00

Results are robust to heteroskedasticity

Standard errors in parentheses

\* p<0.10, \*\* p<0.05, \*\*\* p<0.01

# Factors Affecting PG Risk Severity Over Time

- A robust finding across all models is that depression, anxiety and impulsivity are positively associated with severity of risk for problem gambling.
- Similarly, in all models we find that PGSI scores tended to decline across waves of the study.
- However, the bivariate relationship between PG risk severity and alcohol use is not confirmed in the multivariate models.

# Conclusions

- PG risk severity classification is highly unstable over short time spans.
- Scores on screens for some co-occurring conditions (depression, anxiety, impulsivity) may move across time with PG scores. Too much of our sample population drinks too heavily all the time for our probes to be able to see any possible similar relationship between gambling and drinking.