

# Pre-Analysis Plan: Online Wagering

Version 2 (3 July 2020): Following pilot testing and a number of changes to the design, a range of changes were made to the following sections: Framed field experiment, Data sources, Interventions, Outcome measures, Hypotheses, Sample size and power calculations, Sample selection, Randomisation, Trial threats, Main analyses, Exploratory and Subgroup Analyses and Pre-analysis plan commitments.

## Policy Problem, Trial Aims and Research Question

Rapid growth in the use of the internet and digital technologies since 2000 has led to correspondingly rapid growth in online wagering in Australia (DSS, 2017). This is of concern for policy because certain features of online wagering may increase the risk of problem gambling: specifically, it is highly accessible, convenient and anonymous, and provides the reduced salience of electronic funds and the ability to place large bets (DSS, 2017).

Commonwealth, state and territory governments have recently taken steps to address the regulatory regime for online wagering in Australia, including agreement to the consumer protection measures in the *National Consumer Protection Framework for Online Wagering in Australia – National Policy Statement* (National Framework). In particular, *Measure 7: Activity statements* sets out principles underlying the provision of regular activity statements from online wagering service providers to their customers. The principles provide guidance on the content of activity statements and emphasise the importance of providing online wagering customers with information that is clear and easily understood.

This study aims to test the effectiveness of two different designs of customer activity statements in a simulated online wagering environment and to assess post-intervention financial literacy, gambling habits and beliefs along with comprehension and responses to the activity statements.

The activity statements contain key elements such as the number of bets placed, summary account information including how much money online wagerers have placed into their betting account, the total amount lost and gained during the reporting period, and betting trend over time for the individual. These elements are hypothesised to help participants make more informed decisions.

The main research question is: does viewing a gambling activity statement affect gambling behaviour (amount bet, number of bets) compared with the condition where no activity statement is provided?

## Framed field experiment

We will conduct a framed field online experiment to test the effect of the two designs of activity statements. The experiment will take place in a simulated online wagering environment.

We estimate that it will take about 45 minutes in total to complete the experiment (including survey questions before and after and the simulated game). Participants will be advised that they will not be able to pause and return to the platform later, and will be encouraged to give their full attention to the experiment (e.g., to close other browsers, background TV, etc. that may be distracting).

The control group will not see any activity statements. There will be two treatment groups (summary page A & B). The detailed statements that sit behind the two summary pages will be the same for both treatment groups.

Upon accessing the online platform, participants will be provided with instructions on how to complete the task. Each participant will be endowed with \$1,000 lab dollars which they can use to bet each round. The animation for each round lasts 10 seconds so each bet would last about 15 seconds. Each round will feature a different bet (e.g. different horse, different race).

The first part of the experiment is the practice round where participants will be asked to gamble for four rounds. This is just to get them comfortable with the platform and placing bets on the platform. The wins and losses during these four rounds will not count towards their account balance.

The second part of the experiment (main experiment) will have 64 gambles in total. If you envisage activity statements being sent out quarterly, eight gambles is equated to one quarter. Activity statements will be shown after 8, 16, 24, 32, 40, 48, 56 and 64 gambles. We can show full data on the activity statements (i.e. data for all four quarters) for the last four times the statements are shown.

In the treatment groups, we will show each activity statement for 10 seconds before participants can proceed to the next gamble. Participants can choose to view it for longer if they wish to.

In the control group, we will also have a pause (equivalent to 'mandatory' viewing times for the activity statements) at the same periods in the experiment. This is to ensure that any changes that are observed are due to viewing activity statements rather than having time to pause and reflect on their gambling behaviour. We will display this statement "Take a small break. You can proceed to next round in 10 seconds". The "Next" button will be on the screen but will only work after the 'mandatory' pause period.

## Data sources

The project will collect data from participants in three ways:

1. Recruitment screening questionnaire
2. Online simulated gambling experiment, and
3. Post-experiment survey.

We will collect data on age, gender, education, gambling risk (PGSI score) and frequency of gambling in the recruitment screening questionnaire.

The bulk of data for this project will be obtained from the online simulated gambling platform including the amount bet for each gamble, whether or not a bet is placed at each round, viewing time for activity statements and time taken to place a bet.

The post-experiment survey will collect information on comprehension of key concepts in the activity statements, intention to use information on activity statements, gambling beliefs and financial literacy.

Data from incomplete records will also be collected to investigate any systematic differences between people who leave the study, and those who continue.

## Interventions

The two interventions that are being tested are two different designs of online wagering activity statements. The two designs are very similar but one contains betting trends over time in a graph format and the other contains similar information but in a table format.

Participants in treatment 1 and treatment 2 will be shown an activity statement at regular intervals (every 8 gambles). There will be three experimental arms: Two treatment groups and one control.

*Control:* Respondents will not see any activity statements but they get their betting results after each round and have an enforced 'pause' every 8 gambles (8 times).

*Treatment 1:* Respondents will see Summary page A with a detailed activity statement for a minimum viewing time after every 8 gambles (8 times) in addition to seeing their betting results after each round.

*Treatment 2:* Respondents see Summary page B with a detailed activity statement for a minimum viewing time after every 8 gambles in addition to seeing their betting results after each round.

## Outcome measures

The primary outcome measure is the total amount bet (\$) over 56 gambles (gamble 9 to gamble 64) by each individual, averaged within each experimental group. The range of this variable will be \$0 to \$840.

The secondary outcome measure is the number of bets placed over 56 gambles (gamble 9 to gamble 64) by each individual, averaged within each experimental group. The range for this variable will be 0 to 56.

Data for the primary and secondary outcome measures will be collected on the online experimental platform.

We will also collect additional data using a post-experiment survey. The data from the survey will be used to answer supplementary research questions and to undertake exploratory analyses.

## Hypotheses

We have designed the activity statements with the aim of influencing betting behaviour to reduce the size and number of bets. Consequently, we have made directional hypotheses about the effect of the activity statements relative to control.

H1. The amount bet (\$) by participants who received behaviourally informed activity statements is lower than the control group (no statements).

*This will involve comparison of the pooled treatment sample (Treatment 1 and 2) against the control, and a comparison of each treatment individually against the control. We will examine this outcome as an average across all 56 gambles using a one-sided test.*

*This is the most important test in terms of policy perspective.*

H2. The number of bets placed by participants who received behaviourally informed activity statements is lower than the mean number of bets placed in the control group.

*This will involve comparison of the pooled treatment sample (Treatment 1 and 2) against the control and a comparison of each treatment individually against the control. We will examine this outcome as an average across all 56 gambles using a one-sided test.*

H3. The amount bet and the number of bets will be different between the two behaviourally informed activity statements.

*This will involve comparison of Treatment 1 against Treatment 2. Since we do not have a directional hypothesis, we will use a two-sided test.*

We also have supplementary research questions as set out below. These are considered supplementary because the questions will be answered using self-reported post-experimental survey data or because our trial is not powered adequately for sub-group differences.

1. Which components of the activity statements are valued by participants? (survey data)
2. Are there differences in comprehension of key concepts between the two activity statements? (survey data)
3. Are there differences in viewing time between the two activity statements? (experimental data)
4. Is the effect on gambling behaviour immediate or cumulative? (experimental data)
5. Does viewing a gambling activity statement affect participants' self-reported intentions to use activity statements to make decisions about gambling activity in the future? (survey data)
6. Are there differences between the moderate-risk gamblers and the non/low-risk gamblers in the effect the activity statements have on gambling behaviour? (experimental data)

### **Sample size and power calculations**

Since we are using a new online platform for this study, we have no prior information on standard gambling behaviours on the platform. We also do not know the expected effect size of an activity statement intervention on gambling behaviours.

With no existing information available to inform sample size calculations, we based our estimates on the number of participants (which was determined by the available resources for the project), the number of experimental arms, and a small effect size. There will be three experimental arms with a one-third probability of assignment to each experimental arm.

Power calculations are for alpha of 0.05, power 80% and a two-sided test on our primary hypothesis. We calculated power for a two-sided test because that will give us the most conservative figure and forms the basis of H3. We are aiming to recruit 1,500 participants for the trial. With 500 participants for each arm with three arms, we will be able to detect a small standardized effect size (Cohen's  $d$ ) of 0.25 for both the mean amount bet and the mean number of bets made.

If we are unable to recruit as many participants, we will only be able to detect larger effect sizes (e.g. Cohen's  $d > 0.25$ ) if such an effect exists.

Power calculations were conducted in Stata SE version 15.1.

## Trial design

As shown in Figure 1, this is a three-arm framed-field experiment. Randomisation will be at the individual level with a one-third probability of assignment to each experimental arm (more details on this in the 'Randomisation Section' below). We expect to continue recruiting participants until our desired sample size of 1,500 is reached (spread roughly equally across each condition). Participants will be randomised into the experiment as they are recruited into the study.

Data on gambling behaviours will be collected in the online experimental platform. We will also conduct a post-experimental survey where participants will answer questions about comprehension and usefulness of activity statements, gambling fallacies, and financial literacy.

## Sample selection

Participants will be included in the study if they are Australian residents aged 18 years and over who have:

- gambled online at least once in the last 6 months (e.g., sports betting, horse race betting)
- Have a Problem Gambling Severity Index (PGSI)  $\leq 7$  (non-problem, low risk, or moderate risk).

People identified as high-risk gamblers when completing the PGSI (with a score higher than 7) will be excluded from the study. They will be provided with Gambling Helpline numbers.

## Randomisation

The unit for randomisation will be at the individual participant level.

The aim is to randomise participants to one of the three experimental conditions when they log on.

Randomisation will take place on the online platform once an individual progresses through the screener.

If people drop out (i.e., never log on to the platform or do not complete the full experiment), we will replace these participants to ensure we get 1,500 participants.

### *Balance checks*

We will conduct balance checks once all data has been collected. We will check for balance by performing a multinomial regression where treatment status will be regressed on the baseline covariate. A p-value of 0.01 or less will prompt a review of the random assignment procedure and possible data-handling mistakes. If the review finds no errors, we will report the imbalance test and proceed on the

assumption that the imbalance is due to chance, and report our primary analysis as defined in 'Analysis'.

## **Trial threats**

*Blinding:* Individuals enrolled in the experiment will be aware that they are participating in an experiment. However, they will not be told that the purpose of the experiment is to examine the effect of activity statements on gambling behaviour. They will be told we are trying to understand people's decision making and risk taking behaviour and they will be asked to gamble on an online game and answer questions about their gambling behaviour. They will be debriefed at the end of the experiment and informed of the actual aim of the trial which is about the effect of activity statements on gambling behaviour.

*Attrition:* We think the rate of attrition will be low once participants log on to the online platform because the flat rate incentive of \$25 is paid only upon completion of the experiment and the post-experiment survey. Also, participants will only be eligible to be one of three selected to receive their account balance (paid at out at \$1AUD for every \$20 lab dollars) if they complete the full study. If people drop out before completion, we will replace them wherever possible. We will assume that data is missing independent of treatment (orthogonal to treatment) but will nonetheless test for differential attrition by treatment arm (i.e. compare attrition rate by experimental arm). Further, we will analyse data from respondents who do not complete the experiment (i.e., drop-outs) to investigate potential attrition bias.

*Spillovers:* We think the chance of spillover is extremely low as the experiment will take place online and participants cannot share or save the activity statements shown in the experiment.

*Trial adherence:* While we are showing activity statements to the two treatment arms and the statements will be on the screen for a specified amount of time (e.g. 10 seconds) before participants proceed to the next gamble, we cannot be confident about whether participants are actually viewing the activity statements or are distracted and doing something else before they are able to proceed to the next gamble. We also do not know whether people refrain from placing bets because they are not engaged and not taking the game seriously and skipping placing bets to get to the end of the game or whether they are refraining from betting because that is the rational thing to do. To address these, we have designed the game so that they have to press the 'Next' button to proceed after the activity statements are shown. We will also ask them about their reasons for not placing a bet during the game.

## **Main analyses**

We will undertake intention to treat (ITT) analyses using a linear regression model for our primary and secondary outcomes, as per the equation below:

$$y_i = \alpha + \tau T_i + \beta X_i + \gamma X_i T_i + \varepsilon_i$$

where  $y$  is one of the primary and secondary outcomes (see Outcome Measures above),  $\alpha$  is the intercept,  $T_i$  is a vector of indicators for treatment group membership, and  $\varepsilon$  is an error term which picks up variance not explainable by other variables in the model.  $X_i$  is the mean-centred covariate and  $X_i T_i$  is an interaction between treatment group indicator and the mean-centred covariate.

The covariate that will be included is the total amount bet over the first 8 gambles. Using data from the pilot test, we found this substantially reduced the standard error on the treatment effect; additional covariates did not add further precision.

Exact p-values and confidence intervals will be reported for the listed hypotheses. Our analyses will not adjust for multiple comparisons. However, we will exercise caution interpreting the results of the primary analysis in light of the number of comparisons.

We expect that there will be very little missing data for primary and secondary outcomes as the data will be obtained from the experimental platform and participants are incentivised to complete both the experiment and post-experiment survey.

### Exploratory and subgroup analyses

Exploratory analyses will include examining outcome measures at different time points. While our main hypothesis tests will use average data across 56 gambles, as exploratory analysis we will look at the outcomes at two other time points: the average amount bet at gamble 9 and the average amount bet at gamble 57 for immediate effects.

We will also undertake time series analysis by taking an average amount bet and the number of bets placed over every four gambles (16 groups in total).

For our main outcome measures, we will undertake sub-group analyses by gambling risk (non-problem/low-risk vs. moderate-risk), financial literacy, gambling beliefs and type of device they used to participate in the online experiment (e.g., mobile, desktop). These are treated as exploratory analyses because we have not powered the study for sub-group analyses. Depending on the results of our main analyses and sample size, we may only conduct these with pooled data (Treatment 1+ Treatment 2 vs Control).

We will compare by treatment groups and then by gambling risk level (no or low risk vs. moderate risk):

- components of statements valued by participants (self-reported data from the post experiment survey)



- understanding of key concepts in the statements (self-reported data from the post experiment survey)
- differences in understanding of key concepts in the statement (self-reported data from the post experiment survey)
- intention to use activity statements in the future when making gambling decisions (self-reported data from the post experiment survey)
- viewing time between the two activity statements (online experimental data)
- differences between the non-problem/low-risk gamblers and the moderate-risk gamblers in gambling behaviours and treatment effect (online experimental data and self-reported data from the post experiment survey), and
- the size of effect on gambling behaviour between Activity Statement A and Activity Statement B.

We will examine unintended consequences of the activity statements by examining:

- whether the total amount gambled and the number of times bet is higher in the two treatment groups compared to the control group (descriptive data from the online experiment)
- whether participants are more likely to place a bet or higher bets right after they have been shown losses (loss chasing, online experimental data), and
- Looking at survey questions about loss chasing in relation to information presented in the activity statements (post-experiment survey).

We will investigate potential attrition bias through examining:

- Whether participants who did not complete the online gambling experiment systematically differ to those who did complete the online gambling experiment as a function of demographic variables within the screening questionnaire.
- Whether there are differences in attrition rates between treatment arms.

## Interpretation of results

We conduct statistical tests both for public reporting purposes and to inform future government decision making. For public reporting, we will be guided by the effect size and by the conventional threshold for 'statistical significance' used in the social sciences ( $p < 0.05$ ). This means that, over many studies where there is, in fact, no effect, we will only incorrectly conclude that there is an effect in five per cent of cases.

For decisions about whether to recommend the use of activity statements and components of activity statements, we will make a judgement about the likelihood of an effect (of a certain size) from the activity statement and weigh this against any

unintended consequences. We believe that the cost of providing activity statements for online wagering providers is low so cost will not be factored in to our recommendation. In practice, this could mean we recommend the use of activity statements if the possible effect size is large even if the p-value is larger than 0.05. Alternatively, if the effect size is small (e.g., Cohen's d is less than 0.1), we may not recommend using the activity statement even if that effect is 'statistically significant'.

### **Pre-analysis plan commitments**

- Pilot data was collected prior to the completion of this pre-analysis plan but no trial data was collected beforehand.
- We will be transparent about, and provide justification for, any deviations (additions or omissions) from this plan.