AUT GAMBLING & ADDICTIONS RESEARCH CENTRE

# UNDERSTANDING GAMBLING RELAPSE AND ASSOCIATED FACTORS: A LONGITUDINAL APPROACH

## FINAL REPORT

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# 1 EXECUTIVE SUMMARY

## Background

Gambling relapse has not been well studied in New Zealand. Therefore, this research was conducted to understand what constitutes gambling relapse and to identify factors that are associated with relapse. The definition of relapse used in this study was a decrease in Problem Gambling Severity Index (PGSI) risk level category to a lower category followed by a subsequent increase to a higher category.

The **aims** of the research were to understand:

1. How changes in PGSI scores relate to relapse.
2. How changes in individual items of the PGSI relate to relapse.
3. Whether changes in PGSI categories are the most appropriate for identifying relapse.
4. Prevalence of relapse in a New Zealand nationally representative population over time.
5. Factors associated with risk of relapse.
6. Differences for Māori, Pacific and Asian people, and people of low socio-economic status.

## Literature review

A review of New Zealand and international literature on gambling relapse found that:

- Relapse is defined in different ways by different researchers.
- Social and environmental determinants of relapse have often been overlooked.
- Professional and self-help interventions have mixed results in preventing relapse.
- Policy initiatives which target gambling environments may be effective in reducing relapse; however, further research is required to establish this.
- Future research could explore the interplay between individual, social and environmental factors in gambling relapse, to refine and develop policies and interventions to better support those at risk.

## Methods

The study was a secondary (desktop) analysis of existing National Gambling Study (NGS) data from a total of 388 selected participants. Only participants who scored as a risky gambler on the PGSI in 2012, 2013, 2014 or 2015, or who scored as a problem gambler/probable pathological gambler on the SOGS-R in 2012, were invited to complete the final survey in 2020. The last survey, whilst similar to previous NGS questionnaires, included additional questions on increased, decreased and stopped gambling behaviours and the reasons why; online gambling; gambling-like elements in gaming; Internet Gaming Disorder and gambling harm. The final numbers included in analyses from each year were: 388 (2012), 354 (2013), 337 (2014), 324 (2015), and 388 (2020).

## Results

### *How changes in PGSI scores relate to relapse*

A decrease in PGSI risk level (i.e. from a low risk, moderate risk or problem gambling category to a category lower than the current level including the non-problem gambling category)

followed by an increase in risk level to a higher category within in the study period, was found to be a useful way to identify relapse.

### *How changes in individual items of the PGSI relate to relapse*

For five of the nine PGSI questions (items), a one unit increase in severity[1] over time was significantly associated with relapse. An increase in severity in the question "Have people criticised your betting or told you that you had a gambling problem, regardless of whether or not you thought it was true" was the most consistently associated with relapse. This was followed by increases in severity for the question "Have you felt guilty about the way you gamble or what happens when you do gamble". Increases in severity of three PGSI questions related to gambling behaviour ("Have you bet more than could really afford to lose", "Have you needed to gamble with larger amounts of money to get the same feeling of excitement", and "When you gambled, did you go back another day to try to win back money you lost") were also associated with relapse, though not as consistently as the other two questions.

### *Whether changes in PGSI categories are the most appropriate for identifying relapse*

Our analysis indicated that changes in PGSI risk level categories and changes in PGSI scores over time might be a useful method to identify relapse. Changes in other factors, whilst not being sufficient to identify relapse on their own, could provide useful supplementary information to assess a person's risk for relapse. These include increased gambling frequency and increased expenditure on gambling after a decrease or an increase after stopping gambling, and/or seeking help for problematic gambling. An increase in the severity of the individual PGSI questions detailed above could also provide valuable supplementary risk assessment information.

### *Prevalence of relapse in a New Zealand nationally representative population over time*

This study assessed 388 New Zealand adults over an eight-year period, from 2012 to 2020. The prevalence of relapse[2] was 24%, equating to one-in-four risky gamblers experiencing relapse. Although most risky gamblers (70.3%) appeared to 'recover' by decreasing their PGSI risk level and maintaining the decrease, 5.7% of risky gamblers remained at risk over the eight years[3].

### *Factors associated with risk of relapse*

There were indications that ethnicity was associated with risk of relapse, particularly for Pacific ethnicity, in comparison with European/Other ethnicity. Conversely, having a higher quality of life appeared protective, being associated with a decreased risk of relapse. Experiencing a little

[1] Severity measured as: Never, Sometimes, Most of the time, Almost always.

[2] Defined as adults who were classified as at-risk on the PGSI (low risk, moderate risk or problem gambler) or the SOGS-R (problem gambler/probable pathological gambler), who at a subsequent time point were not at risk (non-gambler or non-problem gambler) and who then increased to a risky level again by the final 2020 time point.

[3] Due to the relatively small sample of participants (n = 103) classified as Relapse compared with the full NGS sample of 6,251 participants, these estimates should be considered with caution.

to moderate gambling in the childhood home also decreased the odds for risk of relapse, compared with having no gambling in the childhood home.

The strongest predictor for relapse was being identified as a previous problem/pathological gambler. Increased expenditure on gambling and using methods to stop gambling were also both associated with risk of relapse.

### *Differences for Māori, Pacific and Asian people, and people of low socio-economic status*

As mentioned previously, ethnicity was associated with risk of relapse, particularly for Pacific ethnicity, in comparison with European/Other ethnicity. Experiencing deprivation was not associated with risk of relapse.

## Conclusion and implications

The prevalence of gambling relapse amongst risky gamblers in New Zealand is relatively high at 24% based on the data from the New Zealand National Gambling Study (2012 - 2020). This has implications for policy and public health approaches to reduce and prevent gamblers from relapsing into risky behaviours. Gambling providers should also ensure that the products they offer are provided safely to prevent risk of relapse.

An increase in PGSI risk level after a decrease is a valid way to ascertain relapse risk (though other methods are also likely to be valid), with several other factors useful as supplementary indicators of potential for relapse. These include increased gambling frequency and expenditure after a decrease or after stopping gambling, seeking help for problematic gambling, endorsing specific questions on the PGSI (especially being criticised and feeling guilty about gambling, as well as betting more than could afford to lose, gambling with larger amounts of money, and chasing losses). Counsellors in treatment services could create a composite picture of a client's risk for relapse considering these factors in conjunction with PGSI results. Gambling providers who collect gambling-related data from their patrons (e.g. via carded gambling or via online membership) could also monitor for signs indicative of potential gambling relapse behaviours and act accordingly.

Being of Pacific ethnicity, compared with European/Other ethnicity, appeared to be the only demographic factor that is potentially associated with relapse in the current study. Further research is urgently required to understand why and whether this applies to all, or only some, Pacific ethnicities.

## 2 BACKGROUND

The New Zealand National Gambling Study (NGS) was a nationally representative longitudinal survey of 6,251 adults aged 18 years and older, conducted annually from 2012 to 2015. The data were collected via computer-assisted personal interviews conducted face-to-face in participants' homes. In 2020, a further survey of selected participants took place via telephone interviews and included questions relating to increased, decreased and stopped gambling behaviours and the reasons why.

The NGS found that from 2012 to 2015, overall gambling participation declined while prevalence of risky gambling behaviour (low risk, moderate risk and problem gambling categories via the Problem Gambling Severity Index [PGSI]) remained stable (Abbott et al., 2018), potentially due to high relapse rates. Sixteen percent of NGS moderate risk/problem gamblers in 2012 relapsed during 2014 or 2015[4]. The percentage of relapse was 26% when compared with gambling behaviour further in the past when assessed using the South Oaks Gambling Screen-Revised (SOGS-R; Abbott et al., 2015). This suggested that relapse may occur in a general population of gamblers at any time, both in the relatively short-term and over longer time periods. Similar findings were noted in two Canadian longitudinal population level gambling studies, with relapse rates of about one-third in the short-term, though the authors of both studies speculated that longer term relapse rates are likely to be much higher (el-Guebaly et al., 2015; Williams et al., 2015). However, detailed understanding of reasons for relapse, and protective factors remains unclear. It is possible that problematic gambling is a chronically relapsing disorder, described by Oakes et al. (2019) as a "'Merry-Go-Round' of habitual relapse". The Canadian studies found that many problematic gamblers experience cyclic patterns of relapse and remission while others have more stable, chronic problems (el-Guebaly et al., 2015; Williams et al., 2015). Apart from these longitudinal studies, research on relapse is limited and has mostly been conducted with treatment-seeking samples or with small sample sizes.

Nearly two decades ago, Ledgerwood and Petry (2006) identified that: a) A common definition of relapse does not exist, b) Very few studies have examined gambling relapse, and c) Predictors of relapse may include psychological, psychobiological, and social and environmental factors; the inter-relationships of which remain to be examined. They concluded that longitudinal and retrospective studies could help define a model of relapse for problematic gambling, and that the role of the environment and social supports in relapse prevention requires study. Some studies have since been conducted, as described above, and have identified high rates of relapse but our understanding of predictors of relapse, remain elusive. A Delphi Study involving 22 experts from various countries concluded that relapse occurred at behavioural, cognitive and interpersonal levels and defined it as "more than one episode of gambling after a period of abstinence or controlled gambling" (Battersby et al., 2010). Yet, ideal measures for relapse have still to be identified.

The NGS found that moderate risk/problem gamblers were more likely to use a method to try to control their gambling, such as separating money for betting and stopping when the money was used, setting a money limit for gambling, leaving credit and bank cards at home, and avoiding gambling venues (Abbott et al., 2018). If these techniques are useful in controlling gambling behaviour and reducing relapse risk, there may be potential for such methods to be used in public health and education programmes, and community, social and treatment settings, to aid relapse prevention.

[4] These were participants who were categorised as moderate risk/problem gamblers in 2012, transitioned to non-problem or non-gambling categories in 2013, and subsequently transitioned back to moderate risk/problem gambling in 2013 or 2014.

Therefore, this study was conducted to increase the limited understanding of what constitutes relapse, and to identify factors that are associated with relapse. A limitation of most gambling studies is that they are cross-sectional snapshots, meaning that changes over time are not, and cannot, be quantitatively assessed. Longitudinal studies are required for this purpose. As mentioned, limited research has identified high rates of relapse but our understanding of how to measure relapse, and the predictors of relapse, remain unknown. This study is innovative in that it is the first longitudinal study worldwide (to our knowledge), where a data collection wave was included that had specific questions on increased, decreased and stopped gambling behaviours over time and the reasons why, and associated factors.

# 3 BRIEF LITERATURE REVIEW

## 3.1 Introduction

Despite a plethora of intervention approaches for treating people who experience harms from gambling, only a few studies have estimated the incidence or causes of gambling relapse, with varied results among those studies (Aragay et al., 2015; Battersby et al., 2010; Ledgerwood & Petry, 2006). This review of relevant literature first identifies the methodological discrepancies between those studies. Critically, each has used a different definition of what constitutes gambling relapse. Few measures of relapse in the literature have accounted for broad social and environmental predictors and protective factors. Though evidence suggests this might be appropriate, research on this topic is currently nascent and has informed treatment processes that are not necessarily the most appropriate for people at risk of relapsing in their gambling behaviours. Though a small number of policy measures have been implemented, this review suggests these may be insufficient. Further research is, therefore, required to shape policies to best support those who gamble, particularly in New Zealand, where little is known regarding relapse incidence, or how relapse prevalence varies in different populations.

Relevant literature was searched for using public and university accessible databases. Studies were included if they pertained to gambling relapse and associated factors. The search was not limited to a particular time frame; foundational studies were considered due to their continued influence on how relapse is understood, while newer studies provided updated empirical insights. Google Scholar, MEDLINE and Scopus were searched for academic publications; grey literature (e.g. research reports) was included through citation mining. Thirty-nine studies were included in this review and are indicated with an asterisk in the *References* section.

## 3.2 Review

Risky or harmful gambling is generally identified via one of two broad conceptual approaches. The first relies on psychometric assessment tools developed for identifying gambling risk in general populations, such as the PGSI which classifies individuals through questionnaire items assessing gambling behaviours. Individuals are categorised as ‘non-problem, ‘low-risk’, ‘moderate-risk’ or ‘problem gambler’ based on their responses (Ferris & Wynne, 2001). The second approach is used in clinical settings and identifies ‘gambling disorder’ as a psychiatric diagnosis. As outlined in the DSM-5-TR, if an individual meets a minimum of four of nine possible criteria within a 12-month period, a diagnosis is conferred, indicating ‘mild’, ‘moderate’ or ‘severe’ gambling disorder (American Psychiatric Association, 2022).

The differences between these conceptual approaches influences how relapse is measured. In a psychometric approach, recovery is a reduction in severity below a cut-off threshold; relapse may, therefore, be indicated by a subsequent increase in risk level. In a diagnostic framework, recovery is a reduction in severity below a diagnostic threshold, thus making relapse the re-emergence of symptoms that meet sufficient clinical criteria for gambling disorder. This variation has contributed to difficulties in determining the international incidence of gambling relapse (Ledgerwood & Petry, 2006). Several studies have also shown that risk of relapse may vary over time; hence, estimates depend on the type and length of the study (Aragay et al., 2015; Battersby et al., 2010). The few studies that have reported gambling relapse rates have, therefore, yielded varying estimates. Even fewer studies have examined the role of psychological, social, and environmental factors in encouraging or mitigating relapse onset (Hodgins & El-Guebaly, 2004; Ledgerwood & Petry, 2006).

For example, the Victorian Gambling Study 2008-2012 was Australia's first, large, prospective study that reported on this topic. Data were collected yearly. By comparing Wave 1 (2008) with Wave 2 (2009), a 12-month incidence rate of problem gambling was generated. After one year, only one-third of participants categorised as problem gamblers were 'new' problem gamblers; the remaining two-thirds were thought to be past problem gamblers who had relapsed during this period (Billi et al., 2014). The study employed Lesieur and Blume's (1987) definition of relapse, which is the re-emergence of harmful gambling after a period of abstinence or 'controlled gambling'. However, Battersby et al.'s (2010) Delphi study concluded that a person only ought to be considered in a state of relapse after more than one episode of returning to gambling. It is perhaps unsurprising then, that studies measuring relapse incidence have varied results. While, in an otherwise comparable study, Walker (1993) found a 71% relapse rate after 12 months, Hodgins and el-Guebaly (2004) instead observed that within 12 months of commencing their research with 'recovering problem gamblers', as many as 92% had relapsed. As in studies of illicit substance use (which have reported relapse rates of between 40% and 60%), where some studies distinguish between a lapse [a brief return to use] and relapse [sustained return to previous harmful levels of use], variations in gambling behaviours over time have been categorised differently between studies, contributing to variation in estimates of relapse rates (Marlatt & Donovan, 2005; McLellan et al., 2000).

Two other studies also reported variations in the likelihood of relapse across time. In a South Australian prospective cohort study, Battersby et al. (2010) assessed 158 participants seeking treatment for their gambling. After baseline measures were collected, participants were assessed each month for up to one year; for each month that passed, participants' odds of relapsing, rather than undergoing remission, increased by an average of 26%. In a sample of 566 outpatients diagnosed with gambling disorder, Aragay et al. (2015) also found that the chance of relapse was highest during the first six months, but then decreased over time.

Studies of gambling relapse in New Zealand are limited. To date, only the longitudinal National Gambling Study has investigated relapse. Sixteen percent of moderate risk/problem gamblers (categorised via the PGSI) in 2012 were found to have relapsed during 2014 or 2015 (Abbott, Bellringer, & Garrett, 2018). However, research has not yet considered the predictors and protective factors for gambling relapse in New Zealand.

Studies have also seldom explored whether individuals from different demographic groups are more or less likely to experience gambling relapse. Given the disproportionate burden of gambling-related harms experienced by indigenous people, migrant groups, people on low income, and those who are unemployed, studies should consider whether sociodemographic factors (or other factors) are relevant (Lloyd et al., 2016; Nilsson et al., 2024; Skaal et al., 2016). In one of the few international studies on this topic, Baño et al. (2021) found that divorced women, people who consumed illicit substances, and those with low educational attainment were more likely to experience gambling relapse. Further work is required to validate such findings, particularly in the New Zealand context. Māori, Pacific people and Asian people have a higher risk of incurring gambling-related harms compared to European/Other populations; however, the experiences of relapse amongst these populations remains unexplored (Te Hiringa Hauora, 2019).

To resolve this, further research must first establish what constitutes gambling relapse. Ledgerwood and Petry (2006) cited differences in relapse definitions as creating the disparity between reported gambling relapse rates. Blaszczynski et al. (1991), for example, posited that returning to gambling must be accompanied by a feeling of loss of control to be considered a relapse, whereas Hodgins and El-Guebaly (2004) considered relapse to be a return to gambling after more than a two-week period of abstinence. To handle the variance that broader definitions introduced, Hodgins and El-Guebaly (2004) also distinguished between 'major' and 'minor'

relapses based on the severity of the consequences to the individual; however, the use of these (and other) subcategories was out of the scope of the current research described in this report.

As is typical in gambling relapse literature, each definition was made with reference to discourses of gambling 'responsibly' (meaning no loss of control), in relation to the fact that the primary goal in most gambling treatment interventions is abstinence (Livingstone & Rintoul, 2020; Slutske et al., 2010). According to Theodoropoulou (2020), this has led to the production of treatment 'tools' (such as behavioural techniques and other resources) to prevent relapse, which in turn puts the onus of responsibility on individuals who gamble. Treatment initiatives provide these tools, and an individual's 'recovery' then depends on their successful use of them. This manner of thinking is argued to reproduce discourses of blame, and of recovery as becoming self-responsible (Theodoropoulou, 2020). Through 50 interviews with people who gambled in a socially deprived region of Scotland, Reith and Dobbie (2012) noted that as participants progressed through treatment, they described their recovery as processes of becoming self-responsible. By spending less on gambling, and more on "haircuts and gym memberships, and on mortgages and bills", individuals were remade in culturally appropriate ways. As they gave up gambling, their growing sense of autonomy corresponded with a reshaping of their physical selves (p. 511). This reshaping was in keeping with what is expected of 'self-responsible' adults: to maintain one's health and appearance through exercise and haircuts, and through being financially responsible by managing one's own bills.

This discourse centres on individuals and their supposed failures to gamble 'responsibly' and, therefore, discourages discussions of predictors and protective factors (Oakes et al., 2019). While future investigations might account for how environmental, political, and social determinants (such as economic deprivation) make a person more likely to re-engage in gambling, generally literature attributes risk of relapse to individual psychological deficiencies and issues of willpower. For example, Grall-Bronnec et al. (2021) reported that after five years of data from a sample of people who gambled, participants with a low level of 'self-directedness' at the previous follow-up visit were more likely to have relapsed. Similarly, Smith et al. (2015) positioned risk of relapse as a product of low social functionality, and high urges to gamble. Though their review was not specific to gambling, Battersby et al. (2010) also identified co-existing psychiatric disorders, urge to gamble and self-efficacy as predictors of relapse. Similarly, Ronzitti et al. (2017) identified several neurocognitive protective factors, such as being able to distract oneself from gambling urges, having a motivation to change, and reminding oneself of the negative consequences of one's previous gambling. Challet-Bouju et al. (2017) argued that evidence of the significance of neurocognitive factors was limited. They cited a lack of long-term longitudinal studies, small sample sizes, male dominated samples, and that inclusion criteria and relapse definitions varied greatly.

Generally, interventions targeting gambling relapse have aimed to affect neurocognitive predictors. For example, in their study of various German gambling treatment services, Müller et al. (2017) found that though there was no treatment manual consistently adhered to by all services, treatment was always informed by a psychotherapeutic approach that aimed for abstinence amongst those diagnosed with a gambling disorder. Interventions involved behavioural analyses and cognitive restructuring. Over 12 months, treatment participants were, on average, described as experiencing fewer functional impairments and symptoms of neuroticism (Müller et al., 2017). However, 58.4% of those individuals continued to gamble during that time.

Several international studies have also targeted neurocognitive predictors of relapse through non-clinical means. Hodgins et al. (2007), for example, provided a low-cost bibliotherapy programme to 169 Canadian individuals who had recently quit gambling. Participants were assigned to two groups: the first received relapse prevention booklets at regular intervals over

one year, whereas the second group received only one booklet at the beginning of the study. Those texts advised participants about self-management strategies to reduce their risk of gambling relapse. Findings from the study were mixed. Participants in each group were similarly likely to meet their goal, with both groups slightly more likely to have abstained from gambling during the study period. Also in Canada, Chen and Jindani (2021) advocated for a mindfulness-based programme which utilised cognitive behavioural therapy techniques. Clients of gambling treatment services were taught mindfulness procedures so that they could develop a greater awareness of their triggers and urges to gamble. To justify this programme, the authors cited Toneatto et al. (2007) that "improving gambler's mindfulness can help them overcome the erroneous beliefs and automatic behaviours associated with problem gambling" (p. 94). However, the efficacy in reducing the risk of gambling relapse was not reported.

Several studies have, however, identified methods to prevent relapse which are not enacted in clinical settings, and do not centre on an individual's gambling cognitions. As most people who gamble do not seek formal treatment, it is critical to understand whether these are effective (Kushnir et al., 2018). However, of those which are detailed in this review, few studies have assessed the effectiveness of such methods through prospective research. For example, in their analysis of gambling self-help communities on Reddit[5], Hopfgartner et al. (2022) found that users who engaged in regular discussions supporting others were less likely to self-report their own relapse. Also, users who received positive encouragement from 'Redditors' going through their own recovery processes had prolonged "survival times" between gambling relapses (p. 314). Involving oneself in a community of others also seeking recovery appeared beneficial. The study's authors suggested that senior members of these communities should be encouraged to support newcomers when they post their first submission. However, most Reddit users are younger than 40 years old, male, and live in the United States, so the generalisability of these findings is not known.

Studies have also assessed self-management strategies that people have employed to limit their own gambling, and any harms incurred (Abbott et al., 2018; Pyle, 2017). Through 25 interviews with self-identified gamblers, Pyle (2017) noted that participants routinely described using the gambling settings they found themselves in to reduce their spending. While some strategies were found to be useful (such as 'bankroll management', whereby one allocates a set amount of money to gamble, and does not spend beyond this), other strategies, such as chasing losses, and the 'Martingale strategy' (doubling one's bet after a loss) were not, as they further encouraged excessive gambling. Abbott et al. (2018) identified similar methods to bankroll management being used in New Zealand. The authors speculated that such strategies might inform future public health and education programmes to aid relapse prevention.

However, whether relapse prevention methods began at treatment services, or were enacted by individuals, literature has cast doubt on the sufficiency of self-management techniques in preventing relapse, notwithstanding that they may be of some use (Pickering et al., 2020). While interviewing people who had been diagnosed with a gambling disorder, Pickering et al. (2020) assessed their perceptions of the usefulness of these methods. Though some wanted to understand the psychological processes of gambling, participants generally described the requisites of their recovery as being much broader than just becoming self-managing; fostering social relationships and building a meaningful life outside of gambling were both discussed. In a comparable study, participants similarly noted the importance of maintaining supportive relationships and engaging in other leisure activities while avoiding relapse (Samuelsson et al., 2018). Importantly, participants identified other external factors such as gambling advertising being a significant threat to this. They described advertising as aggressive and triggering, while advocating for harsher restrictions to reduce advertising.

[5] An online forum with user-driven content.

Through a study of relapse at two gambling recovery services (in Athens, Greece, and Liverpool, England respectively), Theodoropoulou (2020) observed that, generally, it was through these (and other) external forces that recovery was interrupted. They argued that the policies which governed these services are often disconnected from the realities of those who use them; hostile social environments were recognised as being a greater threat to recovery than neurocognitive factors. Policy initiatives might then instead target gambling environments, rather than putting the onus of responsibility on those who gamble. Neuroimaging studies have corroborated this, suggesting that gambling advertising may awaken curiosity, produce cravings and, eventually, precipitate relapse (García Castro et al., 2022).

Some initiatives in this vein have been implemented internationally. However, it is noted that these generally target gambling environments at a national level, with little emphasis on other socioeconomic determinants of relapse. For example, in Sweden, the national gambling authority offers a free service called Spelpaus (Håkansson & Åkesson, 2022). Translating to 'gambling break', this service allows citizens to self-exclude from all real-money gambling (online and in-person) offered by licensed gambling companies. By limiting access to gambling, the service allows for individuals to influence their gambling environment, to reduce potential triggers for relapse. In their study of a gambling treatment service in Skåne Region, Håkansson & Åkesson (2022) found that 81% of participants had self-excluded through Spelpaus; as of 2023, there were 100,000 registered users nationwide. However, they acknowledged that exposure to the unlicenced international online gambling market was cause for concern, as this falls outside the remit of the programme. There are no known initiatives which have yet targeted this international market. Research which assesses risks posed by unregulated online gambling providers might facilitate such a global response.

In New Zealand, while there is a multi-venue exclusion system, this only relates to land-based venues; however, legislation has targeted the gambling environment through other means. For example, councils may enforce a per capita cap on electronic gaming machine (EGM) numbers, or a 'sinking lid policy'. In the latter case, once a Class 4 venue (non-casino EGM venue) closes, a new licence is not issued for a replacement venue (Samuel et al., 2020). Reviewing the effectiveness of these policies, Turcu (2021) reported an average reduction in EGM expenditure of around 14% since the implementation of sinking lid policies. However, the author acknowledged that causation could not be established, due to confounding variables. Also, they could not estimate whether 'casual gamblers' or 'problem gamblers' contributed more to this decrease. The usefulness of this measure in reducing risk of relapse is, therefore, unknown. National policies do not specifically target reduction in gambling relapses. Further research could assess the usefulness of such measures and develop our understanding of other commercial and social determinants of relapse, and how best to target these with additional interventions or initiatives.

## 3.3 Summary

This review first outlined the difficulties ascertaining the international incidence and prevalence of gambling relapse. Though a small number of prospective studies have assessed this, they have varying results, as studies have employed different conceptual and methodological approaches. Studies of gambling relapse in New Zealand are particularly limited. There is a dearth of information regarding predictive and protective factors, and how rates of relapse differ between demographic groups. It was then shown that studies of relapse and relevant treatment options largely put the onus of responsibility on people who gamble. Though a variety of commercial and broader social determinants might affect the likelihood of relapse, this is rarely reflected in solutions to prevent gambling relapse, and these are not well understood, particularly in the New Zealand context. A small number of existing regulatory measures was

then detailed, though it was acknowledged that further research is necessary before these can be refined to properly support those at risk of gambling relapse.

The key findings of this review include:

- There is no consensus on how to define gambling relapse, leading to varied relapse incidence and prevalence estimates across studies.
- Clinical (e.g. cognitive-behavioural therapy) and non-clinical (e.g. self-help communities and mindfulness-based programmes) interventions may reduce gambling behaviours, but there is insufficient evidence to indicate whether they specifically reduce relapse.
- Much of the literature and treatment approaches emphasise individual psychological factors and self-management, often overlooking broader social and environmental determinants of relapse.
- While there are some policy measures in place (e.g. 'Spelpaus' in Sweden and 'sinking lid' policy in New Zealand), their effectiveness in reducing relapse rates is uncertain and requires further research.
- Future research could explore the interplay between individual, social, and environmental factors in gambling relapse, to refine and develop policies and interventions to better support those at risk (particularly in under-researched contexts, such as in New Zealand).

# 4 RESEARCH METHODS

## 4.1 Research aims

The **aims** of the research were to understand:

1. How changes in PGSI scores relate to relapse.
2. How changes in individual items of the PGSI relate to relapse.
3. Whether changes in PGSI categories are the most appropriate for identifying relapse.
4. The prevalence of relapse in a New Zealand nationally representative population over time.
5. Factors associated with risk of relapse.
6. Differences for Māori, Pacific and Asian peoples, and people of low socio-economic status.

## 4.2 Research design

This study was a secondary analysis of existing National Gambling Study (NGS) data. Additional to the four waves of data collection in 2012, 2013, 2014 and 2015, a fifth data collection wave with selected NGS participants occurred in 2020. This final survey was modelled on the baseline NGS questionnaire but also included specific individual questions on increased, decreased and stopped gambling behaviours and the reasons why, and questions on online gambling, gambling-like elements in gaming, Internet Gaming Disorder and gambling harm. The complete 2020 questionnaire included questions on: gambling participation (e.g. activity; frequency; expenditure; methods to control gambling; increased, decreased and stopped gambling behaviour), problem gambling (PGSI) and gambling harm (Short Gambling Harm Screen; SGHS), help-seeking, participation in gambling-type games not for money, Internet Gaming Disorder, major life events, mental health, substance use/misuse, health conditions, deprivation, and demographics. The 2020 NGS questionnaire and the questionnaires from previous NGS waves, are available on the AUT Gambling and Addictions Research Centre website[6].

Baseline data were collected in 2012 from 6,251 participants nationally, including gamblers and non-gamblers. The same cohort was surveyed in 2013, 2014, 2015 and 2020, although some participants did not complete all survey waves. Three hundred and eight-eight participants met at least one of the following criteria: scoring as a risky gambler on the PGSI (score of 1+) in any of the years 2012, 2013, 2014 or 2015, or scoring as a problem gambler/probable pathological gambler on the SOGS-R (score of 3+) in 2012 (the only year SOGS-R data were collected). These 388 participants[7] also completed the survey in 2020 and only their data were included in the current analysis.

Ethical approval for this research was not required as the study was a secondary analysis of existing de-identified data.

[6] https://garc.aut.ac.nz/our-research/nz-national-gambling-study

[7] The initial dataset included 390 participants. Data from two participants were removed as no PGSI responses were recorded for them in any year and neither was a SOGS-R score recorded in 2012.

## 4.3 Data analysis

To investigate associations between relapse and factors of interest, the primary analyses utilised unweighted data. The number of participants who completed the survey each year from the same cohort of 388 participants, was: 2012 (n = 388), 2013 (n = 354), 2014 (n = 337), 2015 (n = 324) and 2020 (n = 388).

PGSI scores were categorised by increasing levels of risky behaviour: no risk (non-problem gambling; 0), low risk (1), moderate risk (2), and problem gambling (3). In previous NGS reports, relapse had been defined as a decrease in PGSI risk category followed by an increase in risk category, from one year to another. In this study, to initially identify relapse, participants were classified into one of three gambling risk groups based on their PGSI risk levels (levels 1 to 3) over the five time points (in the years 2012, 2013, 2014, 2015 and 2020):

1) ***Continue at risk***: Participants were categorised in this group if:
   - They maintained the same risk level (level 1 or above) at all five time points, or
   - They showed stable risk levels at the last three or four time points.
2) ***Decreased risk and maintained***: Participants were categorised in this group if:
   - They showed a decrease in their risk level at any time point and their risk level remained lower without increasing again, or
   - If a participant gambled without risk at all five time points but scored three or more on the SOGS-R in 2012 (n = 28).
3) ***Relapse***: Participants were categorised in this group if:
   - They initially decreased their risk level, but it increased at any of the subsequent time points. Even if their risk level decreased again by 2020, they were still categorised as having relapsed, provided there was an initial decline followed by a subsequent increase at any stage during the study.

As identified above, all eligible participants had PGSI scores in 2012 and 2020; however, there were many that had missing data for at least one time point. The missing data for PGSI scores were handled as follows:

- If a participant was at risk at the first and final time points, and any intermediate years, it was assumed they *continued to be at risk* throughout.
- If a participant was initially at risk in 2012 or earlier (via SOGS-R), and was no risk in intermediate years, and was still no risk in 2020, they were classified as *Decreased risk and maintained*.
- If a participant's risk level increased at any intermediate time point (e.g. between 2012 and 2020) after initially being no risk, they were classified as *Relapse*, even if the final risk level decreased again.

Missing values for PGSI items were imputed using the median of the observed values. A sensitivity analysis was performed to assess the robustness of results and evaluate potential impact of imputing missing values. Generally, findings were consistent across both approaches, indicating that imputation of missing values did not introduce substantial bias or significantly alter the key findings of the study.

To further examine the sensitivity of the relapse measure, the PGSI risk level *Relapse* definition (Group 3 above) was compared to changes in PGSI scores over time; incorporation of baseline SOGS-R lifetime problem gambling/pathological gambling score (score 3+); increased, decreased or stopped gambling behaviour; current gambling harm (SGHS); gambling participation over time; and help seeking behaviour (Appendix 1). Analysis and results of this sensitivity analysis are detailed in Appendix 2.

Prevalence of relapse was estimated using the NGS sampling strata and weights[8], with frequencies, percentages and 95% confidence intervals reported. Due to the relatively small sample of participants (n = 103) classified as *Relapse* compared with the full NGS sample of 6,251 participants, these estimates should be considered with caution. Differences in PGSI risk levels between relapse groups were tested using Mann-Whitney tests, while changes over time were analysed with Friedman's tests. Differences in mean scores were assessed using one-way ANOVA, followed by post-hoc tests for pairwise comparisons. Graphical presentations were used to illustrate relationships between relapse groups and other factors. To investigate risk and protective factors associated with relapse, logistic regressions were conducted. Factors of interest included:

- Baseline factors (e.g. age, gender, ethnicity, country of birth).
- Time-varying measures (e.g. mental health, substance use/abuse, economic situation, life events, and gambling participation).

Bivariate associations between these factors and the outcome were first analysed using univariate logistic regression. A multiple variable model was built up from the factors that had p-values of 0.20 or less. The final multiple variable model selected the subset of factors that best helped to explain relapse.

[8] See *Section 3.5.1 Weighting* (p. 33) in Abbott et al., 2018.

# 5 RESULTS

## 5.1 Participant demographics

Table 1 details participant demographics that were unlikely to change over time and that were only collected at the baseline survey in 2012. There were slightly more females (55.4%) than males. Māori, Pacific and Asian people were over-represented compared with population percentages (due to over-sampling of these groups at the baseline survey), with European/Other participants comprising half of the 388 participants. Participants' ages spanned adulthood from 18 years to 65+ years, though by 2020, participants would all have been eight years older than they were when the data were initially collected. Slightly less than one-third of participants were born outside New Zealand.

**Table 1: Participant demographics in 2012**

| Demographic variable | N | % |
|---|---|---|
| **Gender** | | |
| Male | 173 | 40.6 |
| Female | 215 | 55.4 |
| | | |
| **Ethnicity** | | |
| Māori | 96 | 24.7 |
| Pacific | 56 | 14.4 |
| Asian | 41 | 10.6 |
| European/Other | 195 | 50.3 |
| | | |
| **Age (years)** | | |
| 18-24 | 29 | 7.5 |
| 25-34 | 73 | 18.8 |
| 35-44 | 85 | 21.9 |
| 45-54 | 93 | 24.0 |
| 55-64 | 64 | 16.5 |
| 65+ | 44 | 11.3 |
| | | |
| **Country of birth** | | |
| Overseas | 120 | 30.9 |
| New Zealand | 268 | 69.1 |

N = 388

For demographic variables that could change over time, data are presented for 2012 and 2020 (Table 2). The largest proportions of participants lived with their spouse/partner and/or children, followed by living alone. The percentage of participants who lived alone increased by 2.7% from 2012 to 2020. The largest changes in employment status were a six percent decrease in participants who were in paid employment and a six percent increase in participants who were in the retired/homemaker/student category. Some of this change is likely to be due to the natural process of aging (i.e. people retire at an older age), but this change could also partly have been caused by the economic stresses of the COVID-19 pandemic in 2020. There was an 8.6% increase in educational attainment at degree level or higher with corresponding decreases of highest qualification of school level or certificate/diploma. Both annual personal and household incomes generally increased from 2012 to 2020, with fewer participants earning the

lower levels, as would be expected with inflation and salary/wage increases during this period. There was a small four percent decrease in participants who had gambled in the prior year from 2012 to 2020.

**Table 2: Participant demographics in 2012 and 2020**

| | 2012 | | 2020 | | % |
|---|---|---|---|---|---|
| **Demographic variable** | **N** | **%** | **N** | **%** | **change** |
| **Living arrangements** | | | | | |
| Live alone | 58 | 9.2 | 75 | 12.4 | 2.7 |
| Spouse/partner/boyfriend/girlfriend | 239 | 40.2 | 242 | 40.0 | -0.2 |
| Parent/s | 29 | 4.9 | 24 | 4.0 | -0.9 |
| Children | 187 | 31.4 | 190 | 31.3 | -0.1 |
| Siblings | 22 | 3.7 | 18 | 3.0 | -0.7 |
| Other relatives | 37 | 6.2 | 40 | 6.6 | 0.4 |
| Friends/flatmates | 23 | 3.9 | 18 | 3.0 | -0.9 |
| | | | | | |
| **Employment status** | | | | | |
| Paid: Full or part time | 259 | 66.8 | 236 | 60.8 | -6.0 |
| Unemployed | 50 | 12.9 | 48 | 12.4 | -0.5 |
| Retired/homemaker/student | 79 | 20.4 | 103 | 26.5 | 6.1 |
| Other | - | - | 1 | 0.3 | 0.3 |
| | | | | | |
| **Highest educational qualification** | | | | | |
| Secondary school | 169 | 43.6 | 152 | 39.0 | -4.6 |
| Certificate or diploma | 140 | 36.1 | 123 | 31.5 | -4.6 |
| Degree level or higher | 79 | 20.4 | 113 | 29.0 | 8.6 |
| | | | | | |
| **Annual personal income ($)** | | | | | |
| ≤ 20,000 | 114 | 30.4 | 83 | 23.6 | -6.8 |
| 20,001 to 40,000 | 123 | 32.8 | 91 | 25.9 | -6.9 |
| 40,001 to 60,000 | 72 | 19.2 | 69 | 19.7 | 0.4 |
| 60,001 to 80,000 | 37 | 9.9 | 51 | 14.5 | 4.6 |
| 80,001 to 100,000 | 17 | 4.5 | 31 | 8.8 | 4.3 |
| 100,001+ | 12 | 3.2 | 26 | 7.4 | 4.2 |
| *Missing* | *13* | *3.4* | *37* | *9.5* | |
| | | | | | |
| **Annual household income ($)** | | | | | |
| ≤ 20,000 | 79 | 21.6 | 11 | 4.2 | -17.4 |
| 20,001 to 40,000 | 68 | 18.6 | 29 | 11.2 | -7.4 |
| 40,001 to 60,000 | 51 | 14.0 | 37 | 14.2 | 0.2 |
| 60,001 to 80,000 | 47 | 12.9 | 41 | 15.8 | 2.9 |
| 80,001 to 100,000 | 45 | 12.3 | 45 | 17.3 | 5.0 |
| 100,001+ | 75 | 20.5 | 97 | 37.3 | 16.8 |
| *Missing*[#] | *23* | *5.9* | *128* | *33.0* | |

N = 388

[#] An MCAR test shows that the missing data are not missing at random ($\chi^2(2) = 36.3$, $p < 0.001$). Therefore, the differences in missing data proportions between 2012 (5.9%) and 2020 (33%) may bias the observed income distribution comparisons and should be interpreted with caution. Income variables typically have large proportions of missing data in surveys, especially for total household income, as respondents often do not know or are reluctant to disclose such financial information.

## 5.2 Gambling behaviour

Gambling activities undertaken in the prior year by participants in 2012 and 2020 are detailed in Table 3. There was a slight decrease (-4%) in the percentage of participants who had gambled from 96.8% in 2012 to 92.8% in 2020. Lotto remained the most common activity over time with most participants buying tickets either in store or online. This was followed by Instant Kiwi purchases and raffles, though the percentage of participants reporting these activities decreased from 2012 to 2020, particularly for raffles (-21.4%). Gambling on electronic gaming machines (EGMs) in pubs, track (horse and dog) racing and gambling at a New Zealand casino were the next most common activities, remaining at similar levels over time. Increased participation in 2020 compared with 2012 was noted for keno and overseas online gambling[9].

**Table 3: Gambling activities undertaken in the past 12 months in 2012 and 2020**

| | 2012 (n=364[#]) | | 2020 (n=361[#]) | | % |
|---|---|---|---|---|---|
| **Gambling** | **n** | **%** | **n** | **%** | **change** |
| **Gambling participation** | | | | | |
| Yes | 364 | 96.8 | 360 | 92.8 | -4.0 |
| | | | | | |
| **Gambling activities** | | | | | |
| Lotto[†] | 321 | 88.2 | 325 | 90.0 | 1.8 |
| Instant Kiwi[†] | 188 | 51.6 | 179 | 49.6 | -2.0 |
| Raffles | 231 | 63.5 | 152 | 42.1 | -21.4 |
| Pub EGMs | 107 | 29.4 | 104 | 28.8 | -0.6 |
| Track (horse and dog) racing[†] | 79 | 21.7 | 81 | 22.4 | 0.7 |
| NZ casino (EGMs, table games) | 74 | 20.3 | 74 | 20.5 | 0.2 |
| Bets with family or friends | 87 | 23.9 | 56 | 15.5 | -8.4 |
| Keno | 36 | 9.9 | 53 | 14.7 | 4.8 |
| Club EGMs | 41 | 11.3 | 47 | 13.0 | 1.7 |
| Sports betting[†] | 31 | 8.5 | 30 | 8.3 | -0.2 |
| Cards | 31 | 8.5 | 23 | 6.4 | -2.1 |
| Housie/bingo | 16 | 4.4 | 18 | 5.0 | 0.6 |
| Overseas online gambling | 8 | 2.2 | 18 | 5.0 | 2.8 |
| Text (mobile) games | 17 | 4.7 | 13 | 3.6 | -1.1 |
| Overseas casino (EGMs, table games) | 22 | 6.0 | 10 | 2.8 | -3.2 |
| ***Total*** | *1289* | *354.1* | *1183* | *327.7* | |

Note: Participants could select multiple activities

[#] Sample sizes do not add to 388 due to missing data as not all participants engaged in a gambling activity in 2012 and/or 2020

[†] Online and land-based

The mean number of gambling activities participated in was just over three at all time points, though the rage was zero to 13. There was a small but steady decrease in mean number of gambling activities over time from 3.47 in 2.12 to 3.04 in 2020 (Table 4).

[9] Excluded gambling online with New Zealand based providers (i.e. excluded online Lotto, Keno, Instant Kiwi, and sports and track betting via the New Zealand Totalisator Agency Board [TAB]).

**Table 4: Number of activities participated in by year**

| Year | Mean | Mode | SD | Min | Max |
|---|---|---|---|---|---|
| 2012 | 3.47 | 2 | 2.30 | 0 | 13 |
| 2013 | 3.21 | 2 | 2.12 | 0 | 11 |
| 2014 | 3.12 | 2 | 2.02 | 0 | 10 |
| 2015 | 3.07 | 2 | 2.19 | 0 | 11 |
| 2020 | 3.04 | 2 | 2.11 | 0 | 11 |

Figure 1 graphically details expenditure on the different gambling activities in 2012 and 2020. Table 5 shows the same information in tabular form.

In 2012 and 2020, for most gambling activities, participants typically spent between $1 and $10, or between $11 and $50 per month. This was particularly the case for text game gambling, Instant Kiwi scratch card purchases, informal betting with family and friends, participating in raffles, and keno. For other gambling activities, a minority of participants typically spent in the higher ranges of $51 or more per month.

It is noticeable that for all gambling activities, the proportion of participants who typically spent between $1 and $10 per month reduced from 2012 to 2020, with the largest reductions occurring for card gambling, pub EGM gambling and NZ casino gambling. For these activities, substantially larger proportions of participants gambled higher amounts of money ($51 to $100, and $101+) per month.

Also of note is that the proportion of participants spending $51 or more per month on overseas online gambling substantially increased from 30.5% in 2012 to 50% in 2020. To a lesser extent, the same pattern was noted for track gambling (28.8% to 40.3%) and Lotto (13% to 31.1%). These activities had a much greater online presence/availability in 2020 compared with 2012, which could, at least in part, account for the increased expenditure.

**Figure 1: Typical monthly expenditure by gambling activity in 2012 and 2020**

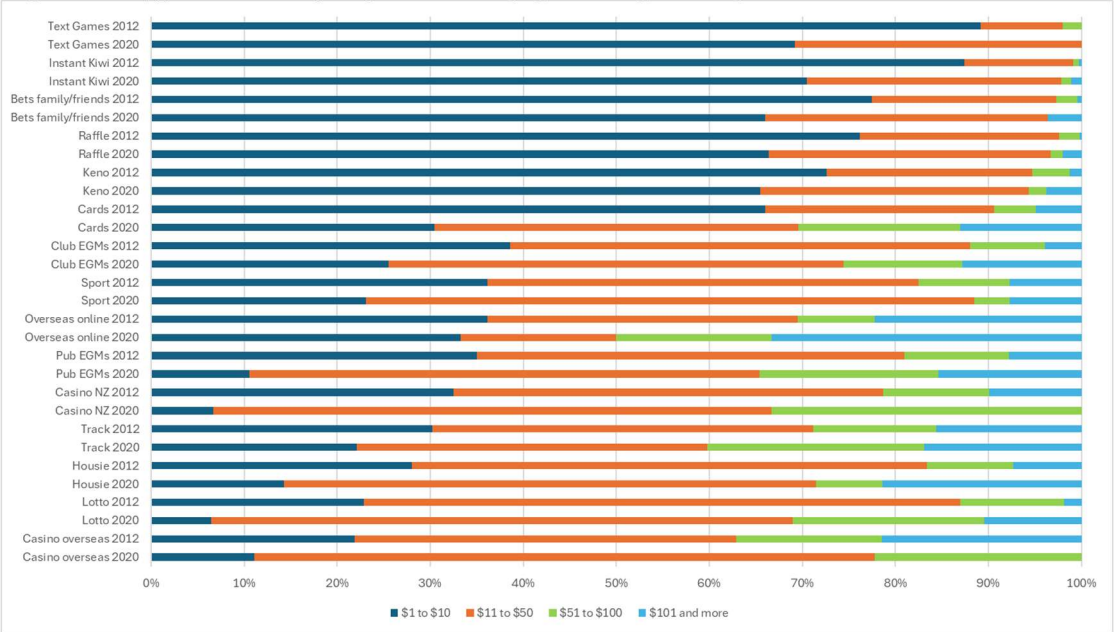


**Table 5: Typical monthly expenditure by gambling activity in 2012 and 2020**

| | | Low expenditure gambling activities | | | |
|---|---|---|---|---|---|
| **Gambling activity** | **Year** | **$1 - $10** | **$11 - $50** | **$51- $100** | **$101 +** |
| Text Games | 2012 | 89.2 | 8.8 | 2 | 0 |
| Text Games | 2020 | 69.2 | 30.8 | 0 | 0 |
| Instant Kiwi | 2012 | 87.5 | 11.7 | 0.6 | 0.3 |
| Instant Kiwi | 2020 | 70.5 | 27.3 | 1.1 | 1.1 |
| Raffle | 2012 | 76.2 | 21.4 | 2.2 | 0.2 |
| Raffle | 2020 | 66.4 | 30.3 | 1.3 | 2 |
| Bets family/friends | 2012 | 77.4 | 19.8 | 2.3 | 0.4 |
| Bets family/friends | 2020 | 66.1 | 30.4 | 0 | 3.6 |
| Keno | 2012 | 72.6 | 22.1 | 4 | 1.3 |
| Keno | 2020 | 65.4 | 28.8 | 1.9 | 3.8 |
| | | **Moderate expenditure gambling activities** | | | |
| **Gambling activity** | **Year** | **$1 - $10** | **$11 - $50** | **$51- $100** | **$101 +** |
| Lotto | 2012 | 22.9 | 64.1 | 11.1 | 1.9 |
| Lotto | 2020 | 6.5 | 62.5 | 20.6 | 10.5 |
| Sports betting | 2012 | 36.2 | 46.4 | 9.8 | 7.7 |
| Sports betting | 2020 | 23.1 | 65.4 | 3.8 | 7.7 |
| Cards | 2012 | 66 | 24.6 | 4.5 | 4.9 |
| Cards | 2020 | 30.4 | 39.1 | 17.4 | 13 |
| Housie | 2012 | 28 | 55.3 | 9.3 | 7.3 |
| Housie | 2020 | 14.3 | 57.1 | 7.1 | 21.4 |
| Pub EGMs | 2012 | 35 | 45.9 | 11.2 | 7.8 |
| Pub EGMs | 2020 | 10.6 | 54.8 | 19.2 | 15.4 |
| Club EGMs | 2012 | 38.6 | 49.4 | 8.1 | 3.9 |
| Club EGMs | 2020 | 25.5 | 48.9 | 12.8 | 12.8 |
| | | **Higher expenditure gambling activities** | | | |
| **Gambling activity** | **Year** | **$1 - $10** | **$11 - $50** | **$51- $100** | **$101 +** |
| Track | 2012 | 30.2 | 41 | 13.2 | 15.6 |
| Track | 2020 | 22.1 | 37.7 | 23.4 | 16.9 |
| Casino NZ | 2012 | 32.5 | 46.1 | 11.4 | 9.9 |
| Casino NZ | 2020 | 6.7 | 60 | 33.3 | 0 |
| Casino overseas | 2012 | 21.9 | 41 | 15.6 | 21.5 |
| Casino overseas | 2020 | 11.1 | 66.7 | 22.2 | 0 |
| Overseas online | 2012 | 36.1 | 33.3 | 8.3 | 22.2 |
| Overseas online | 2020 | 33.3 | 16.7 | 16.7 | 33.3 |

Examination of overall monthly expenditure (reported via free text responses) by gambling activity showed that in 2012, the highest median value of $60 was noted for New Zealand casino gambling. The next highest median value of $40 was noted for overseas casino gambling and overseas online gambling, then $30 for pub EGMs. These remained the highest in 2020, though for New Zealand casino gambling the median value decreased to $50 and for overseas online gambling increased to $65. Median monthly expenditure on Lotto increased to $40 in 2020 compared with $16 in 2012. The lowest median monthly expenditure in both 2012 and 2020 was for text game gambling, raffles, betting with family and friends, Instant Kiwi and

keno. Mean values were more varied due to skewed data including some high maximum expenditure (Table 6).

**Table 6: Overall monthly expenditure by gambling activity in 2012 and 2020**

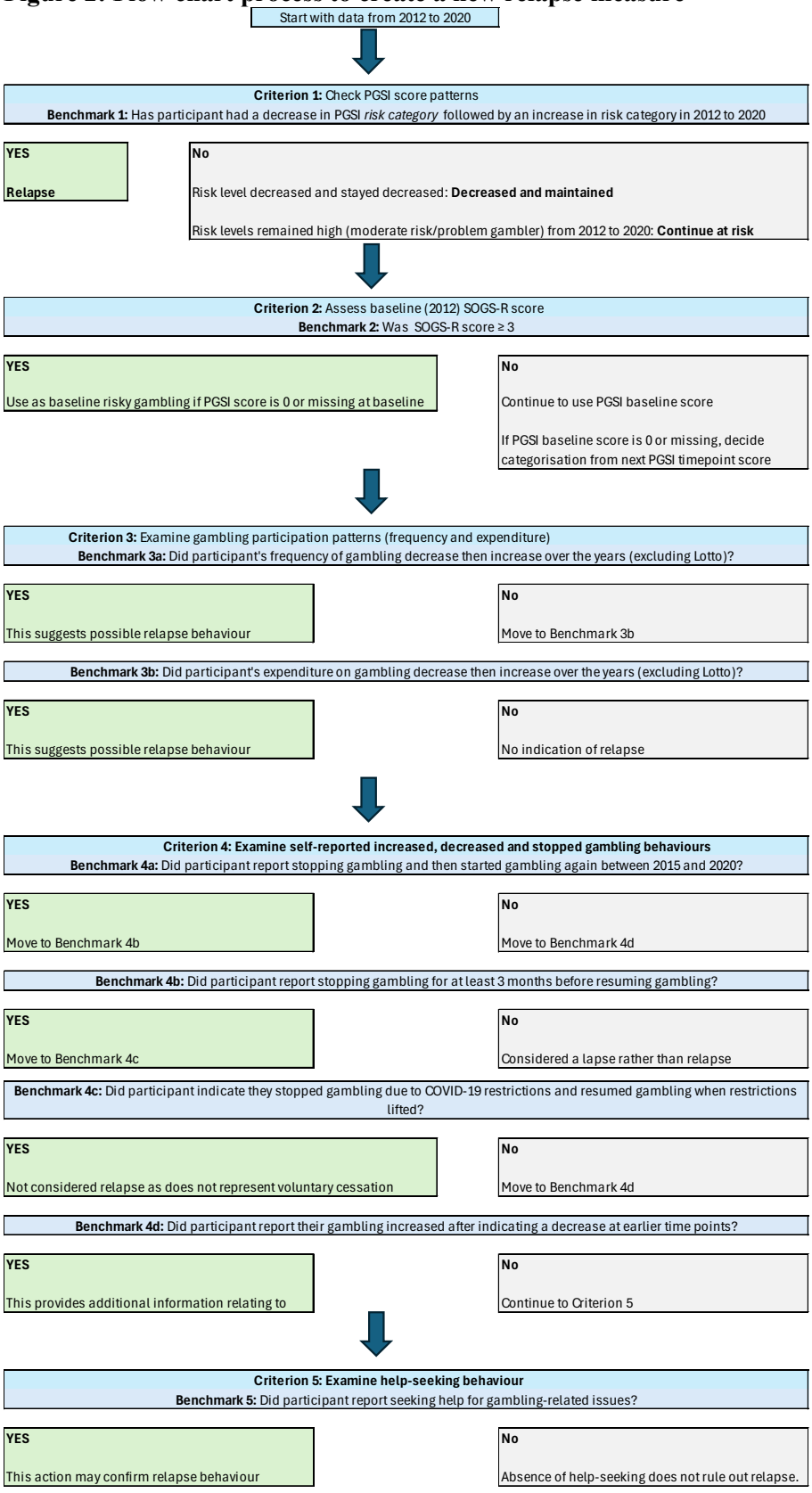
| | Mean ($) | | SD | | Median ($) | | Min ($) | | Max ($) | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Gambling activity** | **2012** | **2020** | **2012** | **2020** | **2012** | **2020** | **2012** | **2020** | **2012** | **2020** |
| Casino NZ | 82.3 | 54.9 | 142.8 | 35.4 | 60 | 50 | 10 | 4 | 1,200 | 100 |
| Overseas online | 150.8 | 597.5 | 203.5 | 1,452.1 | 40 | 65 | 5 | 2 | 500 | 5,075 |
| Casino overseas | 95.3 | 58.8 | 209.5 | 37.8 | 40 | 40 | 1 | 4 | 500 | 100 |
| Pub EGMs | 71.7 | 136.3 | 69.4 | 596.6 | 30 | 40 | 10 | 2 | 600 | 6,000 |
| Cards | 95.9 | 126.0 | 330.5 | 4,10.4 | 27.5 | 32 | 1 | 1 | 3,845 | 2,000 |
| Track | 71.2 | 83.3 | 160.8 | 142.8 | 24.5 | 30 | 1 | 1 | 1,800 | 1,000 |
| Housie | 38.9 | 105.7 | 55.1 | 208.6 | 24 | 27 | 1 | 2 | 480 | 800 |
| Sport | 56.1 | 36.4 | 182.3 | 46.4 | 20 | 20 | 1 | 8 | 2,200 | 200 |
| Lotto | 26.6 | 56.2 | 35.5 | 75.0 | 16 | 40 | 1 | 1 | 1,200 | 960 |
| Club EGMs | 97.0 | 65.0 | 197.9 | 110.4 | 15 | 24 | 2 | 1 | 500 | 560 |
| Keno | 12.9 | 16.9 | 20.7 | 24.4 | 6 | 10 | 1 | 1 | 160 | 120 |
| Raffle | 11.3 | 15.7 | 40.0 | 27.4 | 5 | 10 | 1 | 1 | 1,610 | 240 |
| Bets family/friends | 12.0 | 18.1 | 19.8 | 31.1 | 5 | 10 | 1 | 1 | 200 | 200 |
| Instant Kiwi | 7.4 | 13.0 | 16.1 | 17.9 | 5 | 9.5 | 1 | 1 | 410 | 150 |
| Text Games | 5.4 | 10.3 | 13.7 | 13.3 | 1 | 2 | 1 | 1 | 100 | 40 |

Note: For each activity, data refer only to respondents taking part in that activity in each year.

## 5.3 Examination of a new composite measure of relapse

As the gambling risk groups of *Relapse*, *Decreased risk and maintained*, and *Continue at risk* were created based only on changes in PGSI risk levels, and as this may not have been the optimal method for defining risk of relapse, we conducted some analyses to identify if there could be a more appropriate measure for defining relapse. We evaluated the effects of incorporating other collected information in an alternative, potentially more useful, composite measure of relapse. *Relapse* identified by a decreased PGSI risk level followed by an increased risk level at any subsequent time point was compared to changes in PGSI scores over time; incorporation of baseline SOGS-R lifetime problem gambling/probable pathological gambling score (score 3+); gambling participation frequency and expenditure patterns; self-reported perceptions of increased, decreased and stopped gambling behaviours; and help seeking behaviour (see Appendix 1 for further details on these measures). Figure 2 details the flow process for examination of the new composite relapse measure, which is described in detail in the rest of this Section.

## Figure 2: Flow chart process to create a new relapse measure



***Criterion 1: Check PGSI score patterns***

Examination of PGSI risk levels over time in each gambling risk group of *Continue at risk*, *Decreased risk and maintained*, and *Relapse* showed distinct expected patterns (Figure 3). The figure also details percentages of participants classified at each risk level by year.

For the *Relapse* group there was a fluctuating pattern that matched expected relapse behaviour:

- The proportion of participants at no and low risk decreased from 2012 to 2014 then increased in subsequent years.
- The percentage of participants in the moderate risk group increased from 2012 to 2013, followed by a gradual decrease in 2014 and 2015, and then a marked increase in 2020.
- For participants who scored as problem gambler, the proportions varied over time. There was a decrease from 2012 to 2013, then increases in 2014 and 2015, and then a decrease in 2020.

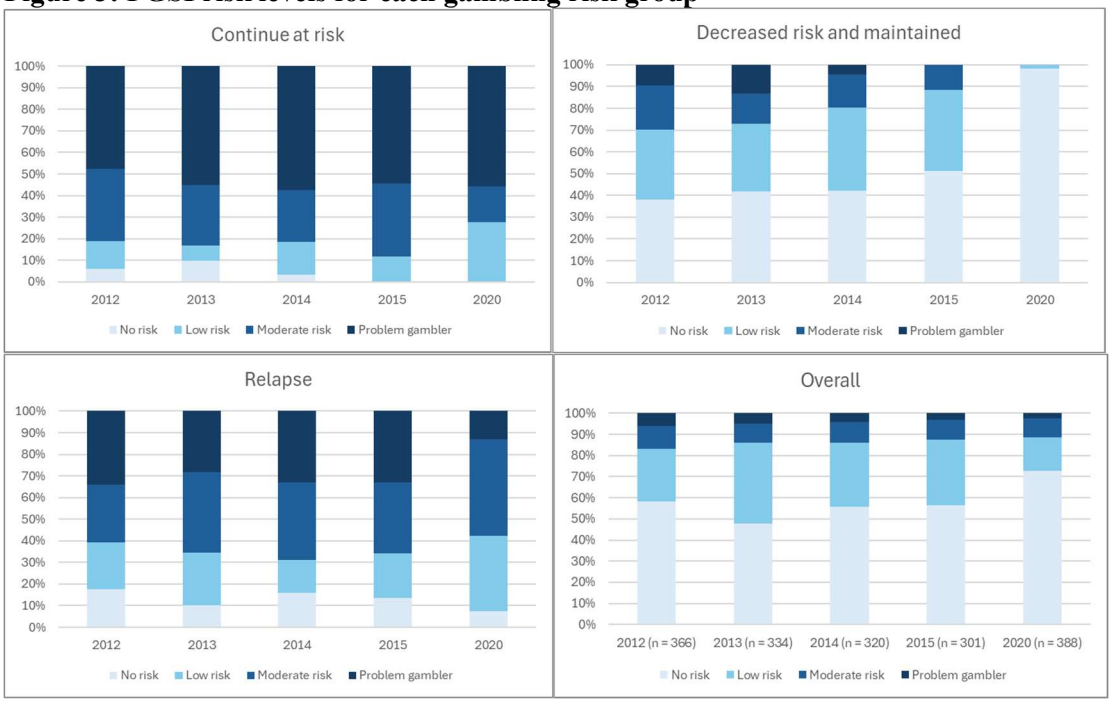
These changes in percentages across risk levels reflect expected relapse dynamics, where a temporary reduction in risk level is followed by an increase. Note that some participants may have scored as low risk in 2012 but been identified via SOGS-R in the problem gambler/ probable pathological gambler category before 2012.

Participants in the *Continue at risk* group showed a more stable pattern. The proportion in the low risk and problem gambler categories increased over time, with no sustained improvement. Participants in the moderate risk group showed a fluctuating trend, decreasing, then rising, and decreasing again, indicating unstable risk levels without a clear trend toward improvement.

For participants in the *Decreased risk and maintained* group, there was a consistent decrease in the proportion of participants at all risk levels (low, moderate and problem gambler) up to 2020. This pattern supports their classification as individuals who reduced their risk level and maintain the lower risk over time.

Overall, these trends confirm the initial categorisation criteria by PGSI risk level alone, with the *Relapse* group showing fluctuations that aligned with relapse patterns, the *Continue at risk* group remaining mostly stable or increasing risk, and the *Decreased risk and maintained* group demonstrating consistent reduction in PGSI risk level.

**Figure 3: PGSI risk levels for each gambling risk group**



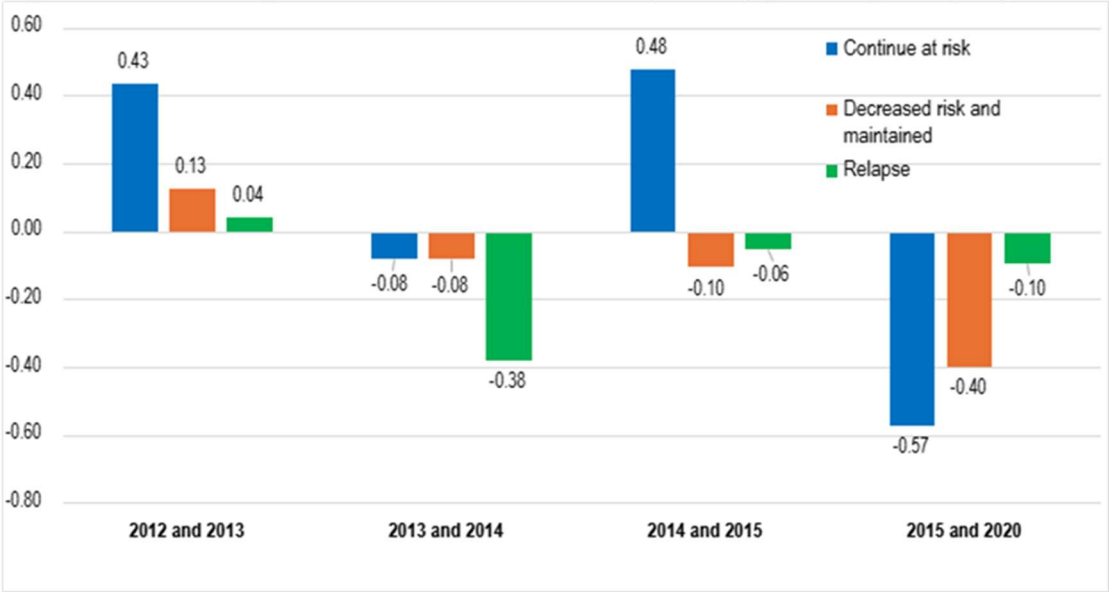

There were significant differences in PGSI risk levels between the *Continue at risk* and *Relapse* groups at each time point ($p \leq 0.01$) except in 2013 ($p = 0.66$). Significant differences in PGSI risk levels were also found between the *Decreased risk and maintained* and *Relapse* groups at each time point ($p \leq 0.001$).

Examination of changes in PGSI risk levels within each gambling risk group across time found significant differences for the *Relapse* group ($p \leq 0.04$). Both the *Continue at risk* and *Decreased risk and maintained* groups also found significant differences ($p \leq 0.05$ and $p \leq 0.001$, respectively).

An examination of changes in mean PGSI scores over consecutive time points (2012-2013, 2013-2014, 2014-2015, and 2015-2020) was made in the three gambling risk groups of *Continue at risk*, *Decreased risk and maintained*, and *Relapse*. For each time point, the mean difference in PGSI scores was calculated by subtracting the earlier year's score from the later year's score. A positive value means PGSI scores increased, and a negative value means they decreased; therefore, an increase is a negative outcome, and a decrease a positive (as it shows improvement or reduced risk). This approach allowed observation of how each group's gambling risk shifted year by year. By examining these mean changes, trends such as whether participants in the *Relapse* group showed consistent improvement or signs of relapse over time are visible (Figure 4). The results of a one-way analysis of variance showed that there were no significant differences in mean changes between the three groups at any of the time points.

For the *Relapse* group, the results show a small positive difference (+0.04) between 2012 and 2013, indicating a small increase in gambling risk. Between 2013 and 2014 there is a negative difference (-0.38) suggesting a decrease in gambling risk. Between 2014 and 2015 there is a small negative difference (-0.06), and between 2015 and 2020 again a slight decrease in gambling risk (-0.10). Overall, the *Relapse* group initially shows a minor increase in gambling severity from 2012 to 2013, followed by a large improvement from 2013 to 2014. However, from 2014 onward, there are only small decreases, suggesting that while there was some improvement, it was not sustained at the same level as the initial decrease. The *Relapse* group's overall trend is one of mild improvement, but the changes are minimal in recent years.

**Figure 4: Mean changes in total PGSI scores across years by gambling risk groups**

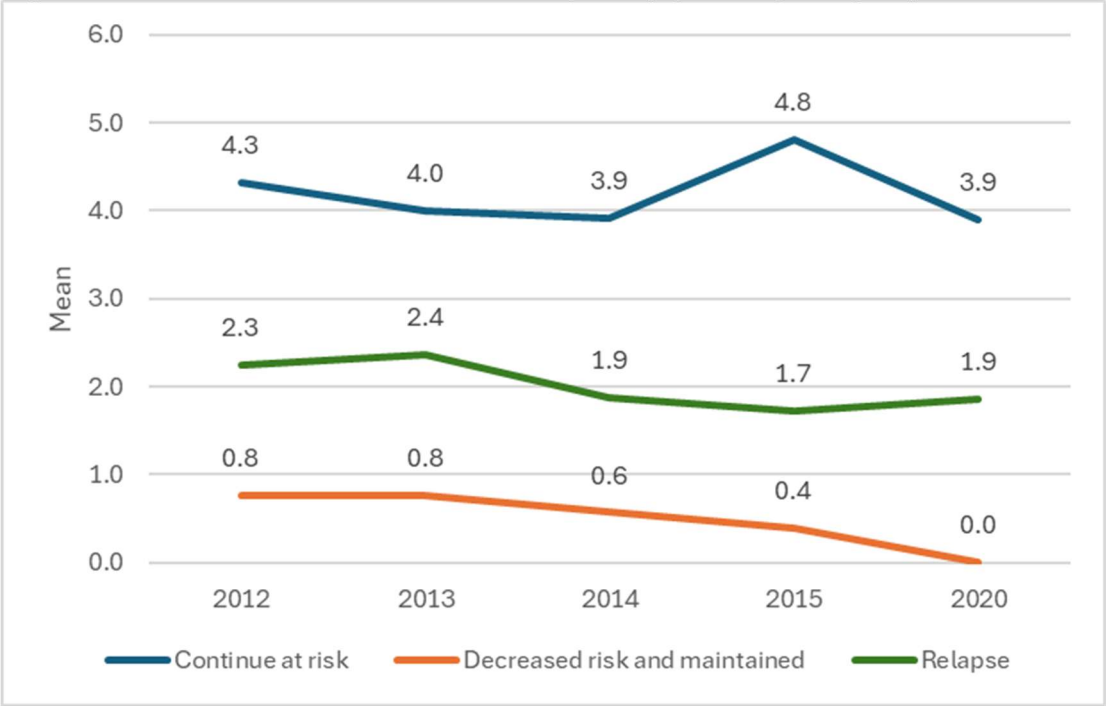



For participants in the *Relapse* group, mean PGSI total scores showed a distinct pattern. There was a slight increase in mean score from 2012 to 2013, followed by a decrease in 2014 and again in 2015, with a slight increase in 2020 (Figure 5). This pattern suggests that participants in this group experienced some improvement initially but later returned to higher PGSI scores, consistent with our relapse definition of an initial decrease in PGSI risk followed by a subsequent increase.

In contrast, participants in the *Decreased risk and maintained* group showed a continuous decrease in mean PGSI scores from 2013 to 2020, with no increase. This steady decline supports their grouping as individuals who successfully reduced and maintained lower PGSI risk levels.

Participants in the *Continue at risk* group showed consistently higher mean PGSI scores over time, as would be expected.

**Figure 5: Mean of total PGSI scores for each year by gambling risk group**




There were no significant differences in the means between the different time points within each group ($F(4, 278) = 1.76$, $p = 0.14$), but there were significant differences in the means between the groups ($F(2, 281) = 60.0$, $p \leq 0.001$).

Results of pairwise comparisons indicated that at every time point there were significant differences in mean PGSI scores between the *Relapse* and *Continue at risk* groups, and between the *Relapse* and *Decreased risk and maintained* groups (Table 7).

**Table 7: Pairwise comparisons between gambling risk groups by time point**

| Year | Relapse | versus | Mean difference | p-value | 95% CI |
|---|---|---|---|---|---|
| 2012 | Relapse | Continue at risk | -2.1 | 0.01 | -3.8, -0.4 |
| | | Decreased risk and maintained | 1.8 | ≤0.001 | 0.9, 2.7 |
| 2013 | Relapse | Continue at risk | -2.7 | ≤0.001 | -4.1, -1.4 |
| | | Decreased risk and maintained | 1.5 | ≤0.001 | 0.8, 2.2 |
| 2014 | Relapse | Continue at risk | -2.6 | ≤0.001 | -4.0, -1.2 |
| | | Decreased risk and maintained | 1.4 | ≤0.001 | 0.7, 2.1 |
| 2015 | Relapse | Continue at risk | -3.2 | ≤0.001 | -4.4, -2.0 |
| | | Decreased risk and maintained | 1.4 | ≤0.001 | 0.7, 2.0 |
| 2020 | Relapse | Continue at risk | -2.8 | ≤0.001 | -4.0, -1.5 |
| | | Decreased risk and maintained | 1.6 | ≤0.001 | 0.9, 2.2 |

These analyses indicate distinct patterns in PGSI risk levels and PGSI scores that align with the initial relapse categorisation (initially decreased risk level then increased risk level at any of the subsequent time points).

***Criterion 2: Assess baseline (2012) SOGS-R score***

If a participant was classified as 'no risk' based on their PGSI score in 2012 (n = 213; 54.9%) but had a SOGS-R score of 3 or higher (n = 103; 28%) indicating problem gambler/pathological gambler, this was taken into consideration. A Spearman's rank correlation found a moderately strong significant association between SOGS-R and PGSI levels measured in 2012 (rho = 0.43, $p \leq 0.001$, 95% CI [33, 51]).

There were 36 participants (9.3%) who scored as no risk on the PGSI in 2012 but had a SOGS-R score ≥3. Five participants had scored as at risk on the PGSI and had a SOGS score ≥3. These 41 (10.5%) participants' SOGS-R scores were taken as the benchmark scores for problem gambling when categorising participants into gambling risk groups.

***Criterion 3: Examine gambling participation patterns (frequency and expenditure)***

*Benchmark 3a: Did participant's frequency of gambling decrease then increase over the years (excluding Lotto)?*

Participants' gambling frequency patterns (combining all gambling activities except Lotto[10]) from 2012 to 2020 were studied. If a participant's gambling frequency initially decreased then increased, they were classified as 'possible relapse'. There were four categories of gambling frequency: (1) Less frequently than once a year, (2) At least once in the last year, (3) At least once a month, and (4) At least once a week.

A significant association ($p \leq 0.001$) between PGSI risk levels and gambling frequency was found in each year. Correlation coefficients ranged from 0.20 to 0.40.

Sixty participants (15.5%) had a gambling frequency pattern that decreased then increased over time, which potentially indicated gambling relapse. A cross-tabulation showed that 26 of these participants (43.3%) were originally categorised into the *Relapse* group that was created after Criterion 1. The rest (n = 31; 51.7%) had been originally categorised into the *Decreased risk and maintained* group. This pattern suggests that changes in frequency of gambling alone is not a complete indicator for relapse and does not consistently align with relapse as defined by PGSI risk level patterns. Thus, changes in gambling frequency might highlight potential relapse risk but do not fully identify relapse behaviour without consideration of additional factors such as changes in PGSI risk levels, gambling expenditure, and other contextual indicators (e.g. self-reported relapse).

*Benchmark 3b: Did participant's expenditure on gambling decrease then increase over the years (excluding Lotto)?*

Participants' gambling expenditure patterns (combining all gambling activities except Lotto) from 2012 to 2020 were studied. If a participant's gambling expenditure initially decreased then increased, they were classified as 'possible relapse'. Participants were asked how much they spend on gambling in a typical month. Expenditure was categorised into: (0) Nothing, (1) $1 to $20, (2) $21 to $50, (3) $51 to $100, and (4) $101 or more.

A significant association ($p \leq 0.001$) between PGSI risk levels and gambling expenditure was found for each year, with correlation coefficients ranging from 0.20 to 0.40.

Sixty-three participants (16%) reported an expenditure pattern that decreased then increased over time, which potentially indicated gambling relapse. A cross-tabulation showed that 33 of these participants (52.4%) were originally categorised into the *Relapse* group that was created

[10] Most participants purchased Lotto tickets. As a non-continuous activity with draws of a maximum of twice per week, Lotto was unlikely to be a major contributor to relapse and was excluded from analyses as this resulted in less skewed data.

after Criterion 1. Twenty-seven participants (42.9%) were originally categorised into the *Decreased risk and maintained* group.

As with frequency of gambling engagement, these results suggest that changes in expenditure on gambling alone is not a complete indicator for relapse and does not consistently align with relapse as defined by PGSI risk level patterns. The significant association between gambling expenditure and PGSI risk levels indicates that as expenditure increases so does the risk level, but it is important to consider the strength of the associations, which were found to be moderate (ranging between 0.2 and 0.4) in the current study.

***Criterion 4: Examine self-reported increased, decreased and stopped gambling behaviours***
*Benchmark 4a: Did participant report stopping gambling and then started again between 2015 and 2020?*
*Benchmark 4b: Did participant report stopping gambling for at least 3 months before resuming gambling?*
*Benchmark 4c: Did participant indicate they stopped gambling due to COVID-19 restrictions and resumed gambling when restrictions lifted?*
Two hundred and twenty-seven participants (58.5%) reported stopping gambling then starting again between 2015 and 2020 (Benchmark 4a). Of these participants, 112 (49.3%) stopped gambling for three months or longer (Benchmark 4b), but nine (4%) indicated that their reason for stopping was related to COVID-19 lockdowns (Benchmark 4c). Therefore, the total number of participants who stopped gambling for at least three months and resumed gambling for reasons other than the removal of COVID-19 restrictions is 103 (45.4%).

Cross-tabulation showed that 29 of the 103 participants (28.2%) were originally categorised into the *Relapse* group that was created after Criterion 1. Most of the participants (n = 63; 61.2%) were categorised in the *Decreased risk and maintained* category as their PGSI risk levels decreased and did not increase again until 2020.

*Benchmark 4d: Did participant report their gambling increased after indicating a decrease at earlier time points?*
Only 56 participants (14.4%) reported a gambling increase between 2015 and 2020 after a previous decrease. Twenty-two (n = 39.3%) were categorised as *Relapse*, while 29 were in the *Decreased risk and maintained* group (51.8%).

There was a weak but significant association between this benchmark and PGSI risk levels measured in 2020 (rho = 0.11, p = 0.04, 95% CI [0.0, 0.2]).

A relatively substantial proportion of participants (39.3%) who reported that their gambling increased after previously indicating a decrease, were originally categorised as *Relapse* based on fluctuations in their PGSI risk levels. This suggests that asking participants about increases or decreases in their gambling behaviour may provide a more reliable indicator of relapse than asking if they stopped gambling and started again after a three-month period.

However, on its own, self-reported increase in gambling after a decrease is not a definitive indicator of relapse, as many participants with this pattern were in the *Decreased risk and maintained* or *Continue at risk* groups. Overall, self-reported questions about gambling behaviour may have limited reliability in identifying relapse, particularly when compared with PGSI risk level fluctuations, which might provide more objectivity for determining relapse.

***Criterion 5: Examine help-seeking behaviour***

*Benchmark 5: Did participant report seeking help for gambling-related issues?*

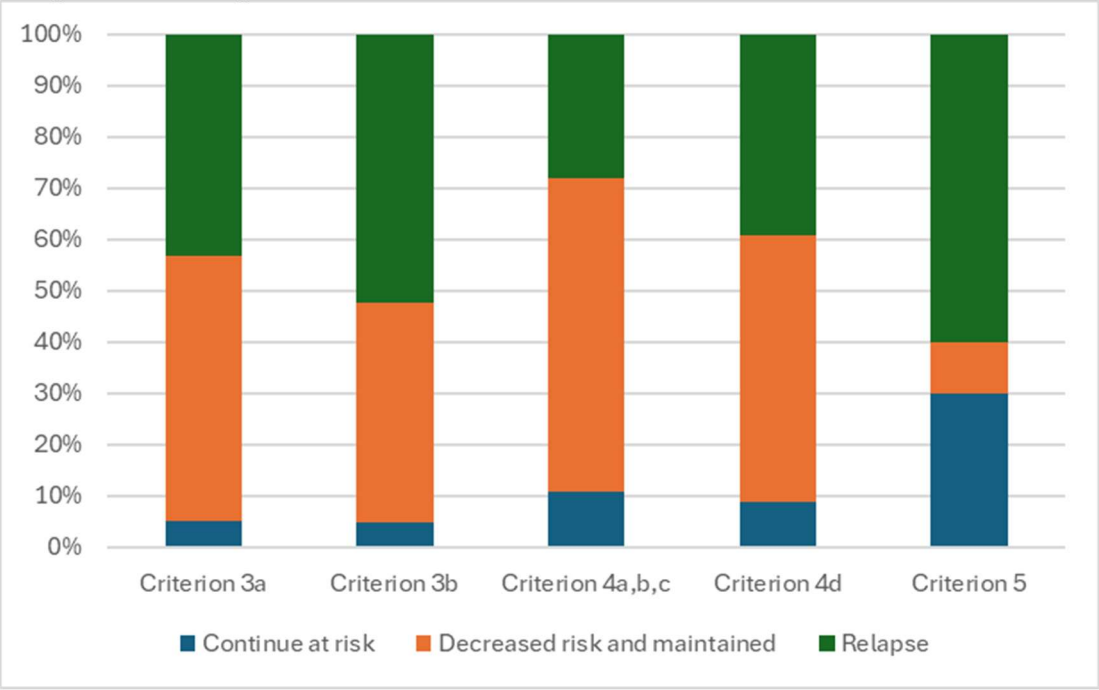
A very small number of participants indicated that they sought help at any of the time points:

- 2012: n = 7 (1 categorised in the *Relapse* group)
- 2013: n = 8 (4 categorised in the *Relapse* group)
- 2014: n = 6 (3 categorised in the *Relapse* group)
- 2015: n = 6 (2 categorised in the *Relapse* group)
- 2020 (last 5 years): n = 10 (6 categorised in the *Relapse* group)
- 2020 (last 12 months): n = 6 (4 categorised in the *Relapse* group)

Overall, slightly less than half of the participants who sought help for their gambling were categorised in the *Relapse* group (Criterion 1). While the sample size was very limited, this suggests a potential relationship could exist between seeking help and experiencing fluctuating PGSI risk levels, possibly indicating that who relapse may seek support. Therefore, help-seeking behaviour offers an additional layer of insight, although it is not a definitive indicator of relapse.

Figure 6 shows the previous text relating to the different criteria in graphical format. It is clear from the figure that Criterion 5 (help-seeking behaviour) and Criterion 3 (gambling frequency and expenditure) are the most likely to align with *Relapse* as identified by changing PGSI risk levels. Criterion 4 (self-reported relapse) was less likely to align with the *Relapse* category.

**Figure 6: Percentage meeting each criterion of composite relapse measure by original categorisation using PGSI risk levels**




After examination of all the above factors, it was determined that although they provided valuable additional insights into relapse, the findings were not sufficiently robust enough to be able to differentiate between the *Relapse* group and the *Decreased risk and maintained* group. Thus, the original relapse measure using PGSI risk levels continued to be the most effective way to classify relapse behaviour in this study and this original relapse measure was used for

all analyses. In other words, in this study, the primary categorisation of relapse has been based on participants' PGSI risk levels over the study period.

## 5.4 Prevalence of relapse

Table 8 shows that in 2012, overall, 41.8% of participants were classified as risky gamblers (low risk, moderate risk or problem gambler). In 2020, the proportion had reduced to 27.3%.

**Table 8: PGSI risk level - number and percentage in 2012 and 2020**

| | 2012 | | 2020 | |
|---|---|---|---|---|
| **Risk level** | **n** | **%** | **n** | **%** |
| No risk | 213 | 58.2 | 282 | 72.7 |
| Low risk gambler | 92 | 25.1 | 62 | 16.0 |
| Moderate risk gambler | 39 | 10.7 | 35 | 9.0 |
| Problem gambler | 22 | 6.0 | 9 | 2.3 |
| Missing | 22 | | - | |
| *Total* | *366* | *100* | *388* | *100* |

Using PGSI risk levels to identify relapse, of our sample of 388 participants who had scored at risk using PGSI on at least one time point in any of the years 2012, 2013, 2014 or 2015, or who scored at risk using SOGS-R in 2012, slightly more than one-quarter were categorised as having relapsed (i.e. decreased risk level followed by increased risk level). One in ten were continually at risk and almost two-thirds decreased their gambling risk and maintained the reduced risk (Table 9).

When the data were weighted to enable nationally representative prevalence estimates, 24% of the New Zealand adult population of risky gamblers were categorised as having relapsed, 5.7% were continually at risk and 70.3% decreased gambling risk and maintained the reduced risk[11] (Table 9).

**Table 9: Prevalence of *Relapse*, *Continue at risk*, and *Decreased risk and maintained***

| **Category** | **n** | **%** | **(weighted %)** | **95% CI** |
|---|---|---|---|---|
| Continue at risk | 39 | 10.1 | (5.7) | 0.6, 19.6 |
| Decreased risk and maintained | 246 | 63.4 | (70.3) | 57.4, 69.4 |
| Relapse | 103 | 26.5 | (24.0) | 18.0, 35.0 |
| ***Total*** | *388* | *100* | *(100)* | |

## 5.5 Relationship between changes in individual PGSI items and relapse

Multivariate logistic regressions were conducted, using the gambling risk groups of *Relapse* and *Continue at risk*, in comparison with *Decreased risk and maintained*, including the nine PGSI items from each time point as predictors for each analysis. Although the overall PGSI score is used to categorise gambling risk groups, examination of individual items separately provides the opportunity to see if some items are more strongly linked to relapse than others.

[11] Due to the relatively small sample of participants (n = 103) classified as *Relapse* compared with the full NGS sample of 6,251 participants, these estimates should be considered with caution.

Five of the nine PGSI items were significantly related to gambling relapse (Table 10). The item 'Have people criticised your betting or told you that you had a gambling problem, whether or not you thought it was true' was consistently significantly associated with higher odds of being in the *Relapse* group. Participants who scored one unit higher on this item from 2013 to 2015 had three times the odds of belonging to the *Relapse* group compared to the *Decreased risk and maintained* group, with odds ratios of 3.0, 3.1, and 3.7 per year respectively, whilst in 2020 the odds ratio was 2.46. This item was not associated with the *Continue at risk* group.

A one unit increase in the item 'Have you gone back another day to try to win back the money you lost' significantly increased odds of being in the *Relapse* group by more than three times in 2013, and by more than five times in 2015. This item was also significantly associated with being in the *Continue at risk* group in 2012, 2013 and 2015.

Two other PGSI items were significantly associated with greater odds of being in the *Relapse* group, though each item was linked to relapse at only one or two time points. They were: 'Have you bet more than you could really afford to lose' in 2013, and 'How often have you felt guilty about the way you gamble, or what happens when you gamble?' in 2015 and 2020. Both items were also associated with being in the *Continue at risk* group, at certain time points.

Although the item 'Have you needed to gamble with larger amounts of money to get the same feeling of excitement' in 2012, was significantly associated with *Relapse*, as there was subsequently no association, this item was not included in the final model. This item was not associated with being in the *Continue at risk* group.

**Table 10: PGSI items associated with *Relapse* and *Continue at risk* in comparison with *Decreased risk and maintained***

| | | Relapse[†] | | | Continue at risk[†] | | |
|---|---|---|---|---|---|---|---|
| **Item** | **Year** | **Odds ratio** | **95% CI** | **p-value** | **Odds ratio** | **95% CI** | **p-value** |
| Have you bet more than you could really afford to lose? | 2012 | 1.41 | 0.8, 2.5 | 0.24 | 2.86 | 1.5, 5.5 | **0.02** |
| | 2013 | 2.03 | 1.2, 3.3 | **≤0.01** | 0.79 | 0.3, 2.0 | 0.63 |
| Have you needed to gamble with larger amounts of money to get the same feeling of excitement? | 2012 | 5.10 | 1.4, 18.6 | **0.01** | 0.95 | 0.2, 4.7 | 0.95 |
| | 2013 | 1.10 | 0.4, 2.8 | 0.85 | 2.58 | 0.9, 7.0 | 0.06 |
| Have you gone back another day to try to win back the money you lost?[§] | 2012 | 1.04 | 0.4, 2.5 | 0.93 | 3.45 | 1.5, 7.7 | **0.01** |
| | 2013 | 3.40 | 1.3, 8.9 | **0.01** | 2.85 | 84, 9.7 | **0.09** |
| | 2015 | 5.27 | 1.8, 15.6 | **≤0.01** | 11.9 | 3.6, 39.3 | **≤0.001** |
| Have people criticised your betting or told you that you had a gambling problem, whether or not you thought it was true? | 2012 | 1.50 | 0.6, 3.5 | 0.34 | 2.07 | 0.7, 5.6 | 0.16 |
| | 2013 | 3.00 | 1.3, 6.8 | **≤0.01** | 1.83 | 0.4, 6.8 | 0.37 |
| | 2014 | 3.15 | 1.3, 7.5 | **0.01** | 2.39 | 0.8, 7.6 | 0.13 |
| | 2015 | 3.70 | 1.8, 7.5 | **0.01** | 1.24 | 0.2, 6.9 | 0.81 |
| | 2020[#] | 2.46 | 1.2, 4.9 | **0.01** | - | - | - |
| Have you felt guilty about the way you gamble, or what happens when you gamble? [§] | 2015 | 3.70 | 1.8, 7.5 | **≤0.001** | 4.83 | 2.0, 11.6 | **≤0.001** |
| | 2020[#] | 5.49 | 2.6, 11.5 | **≤0.001** | - | - | - |

[†] Reference group was *Decreased risk and maintained* except in 2020

[#] Reference group was a combined group of *Decreased risk and maintained* and *Continue at risk* due to lack of variation in PGSI items in 2020

[§] Results for the *Continue at risk* group should be interpreted cautiously due to wide confidence intervals, possibly due to small sample size and/or lack of variability between the PGSI item and the different categories.

## 5.6 Population differences in prevalence of relapse

### *5.6.1 Gambling risk groups and selected demographic variables*

As previously mentioned, overall prevalence of *Relapse* in the study was 26.5%. When examined by different demographics, a slightly higher proportion of Pacific people were in the *Relapse* group compared with other ethnicities (Table 11). Other differences noted in Table 11 are likely to be artefacts due to small sample sizes.

**Table 11: Frequencies and percentages of gambling risk groups by demographic variables**

| | Continue at risk | | Decreased risk and maintained | | Relapse | | Total |
|---|---|---|---|---|---|---|---|
| | n | % | n | % | n | % | n |
| **Gender** | | | | | | | |
| Male | 15 | 8.7 | 113 | 65.3 | 45 | 26.0 | 173 |
| Female | 24 | 11.2 | 133 | 61.9 | 58 | 27.0 | 215 |
| **Ethnicity** | | | | | | | |
| Māori | 14 | 14.6 | 55 | 57.3 | 27 | 28.1 | 96 |
| Pacific | 6 | 10.7 | 29 | 51.8 | 21 | 37.5 | 56 |
| Asian | 4 | 9.8 | 24 | 58.5 | 13 | 31.7 | 41 |
| European/Other | 15 | 7.7 | 138 | 70.8 | 42 | 21.5 | 195 |
| **Age (years)** | | | | | | | |
| 18 to 24 | 3 | 10.3 | 19 | 65.5 | 7 | 24.1 | 29 |
| 25 to 34 | 11 | 15.1 | 45 | 61.6 | 17 | 23.3 | 73 |
| 35 to 44 | 9 | 10.6 | 51 | 60.0 | 25 | 29.4 | 85 |
| 45 to 54 | 9 | 9.7 | 58 | 62.4 | 26 | 28.0 | 93 |
| 55 to 64 | 4 | 6.3 | 44 | 68.8 | 16 | 25.0 | 64 |
| 65+ | 3 | 6.8 | 29 | 65.9 | 12 | 27.3 | 44 |
| **2012 Deprivation (score)** | | | | | | | |
| No deprivation (< 1) | 10 | 6.0 | 117 | 69.6 | 41 | 24.4 | 168 |
| Lower deprivation (1 to 3) | 23 | 13.8 | 97 | 58.1 | 47 | 28.1 | 167 |
| Higher deprivation (≥ 4) | 6 | 11.3 | 32 | 60.4 | 15 | 28.3 | 53 |
| **2020 Deprivation (score)** | | | | | | | |
| No deprivation (< 1) | 16 | 7.5 | 137 | 64.0 | 61 | 28.5 | 214 |
| Lower deprivation (1 to 3) | 16 | 11.3 | 94 | 66.2 | 32 | 22.5 | 142 |
| Higher deprivation (≥ 4) | 7 | 21.9 | 15 | 46.9 | 10 | 31.3 | 32 |
| **2020 Employment status** | | | | | | | |
| Full and part time | 23 | 9.7 | 153 | 64.8 | 60 | 25.4 | 236 |
| Unemployed | 9 | 18.8 | 24 | 50.0 | 15 | 31.3 | 48 |
| Retired/Homemaker/Student | 7 | 6.8 | 69 | 67.0 | 27 | 26.2 | 103 |
| Other | 0 | - | 0 | - | 1 | 100 | 1 |
| **2012 Living arrangement** | | | | | | | |
| Live alone | 4 | 6.9 | 39 | 67.2 | 15 | 25.9 | 58 |
| Spouse/partner/boyfriend/girlfriend | 23 | 9.6 | 158 | 66.1 | 58 | 24.3 | 239 |
| Parent(s) | 5 | 17.2 | 17 | 58.6 | 7 | 24.2 | 29 |
| Sibling(s) | 0 | - | 15 | 68.2 | 7 | 31.8 | 22 |
| Children | 20 | 10.7 | 109 | 58.3 | 58 | 31.0 | 187 |
| Other relatives | 3 | 8.1 | 18 | 48.7 | 16 | 43.2 | 37 |
| Friend(s)/Flatmate(s) | 3 | 13.0 | 13 | 56.5 | 7 | 30.5 | 23 |

| | Continue at risk | | Decreased risk and maintained | | Relapse | | Total |
|---|---|---|---|---|---|---|---|
| | n | % | n | % | n | % | n |
| **2020 Living arrangement** | | | | | | | |
| Live alone | 4 | 5.3 | 50 | 66.7 | 21 | 28.0 | 75 |
| Spouse/partner/boyfriend/girlfriend | 22 | 9.1 | 157 | 64.9 | 63 | 26.0 | 242 |
| Parent(s) | 6 | 25.0 | 14 | 58.3 | 4 | 16.7 | 24 |
| Sibling(s) | 3 | 16.7 | 8 | 44.4 | 7 | 38.9 | 18 |
| Children | 23 | 12.1 | 110 | 57.9 | 57 | 30.0 | 190 |
| Other relatives | 5 | 12.5 | 21 | 52.5 | 14 | 35.0 | 40 |
| Friend(s)/Flatmate(s) | 3 | 16.7 | 12 | 66.7 | 3 | 16.7 | 18 |

N=388

A multivariate logistic regression investigating age, gender and ethnicity in relation to *Relapse* found that the global effects of age and gender were not significant. Ethnicity was marginally associated (though not significantly) indicating some differences by ethnicity in relation to *Relapse*. This was particularly noted for Pacific ethnicity, in comparison with European/Other ethnicity. Pacific people had more than twice the odds (odds ratio = 2.50) of being in the *Relapse* group compared with European/Other people (Table 12). This finding was not noted for the *Continue at risk* group.

**Table 12: Multivariate logistic regression: Age, gender and ethnicity and relationship with *Relapse* and *Continue at risk* in comparison with *Decreased risk and maintained***

| | Relapse† | | | | Continue at risk† | | | |
|---|---|---|---|---|---|---|---|---|
| **Predictors** | **%** | **Odds ratio** | **95% CI** | **p-value** | **%** | **Odds ratio** | **95% CI** | **p-value** |
| **Age** (p = 0.83) | | | | | | | | |
| Age 18 to 24 years | 24.1 | 1.00 | | | 10.3 | 1.00 | | |
| Age 25 to 34 years | 23.3 | 1.07 | 0.4, 3.0 | 0.90 | 15.1 | 1.62 | 0.4, 6.5 | 0.50 |
| Age 35 to 54 years | 28.7 | 1.44 | 0.6, 3.7 | 0.45 | 10.1 | 1.21 | 0.3, 4.6 | 0.78 |
| Age 55 to 64 years | 25.0 | 1.14 | 0.4, 3.3 | 0.80 | 6.3 | 0.65 | 0.1, 3.3 | 0.60 |
| Age 65+ years | 27.3 | 1.59 | 0.5, 5.0 | 0.42 | 6.8 | 0.89 | 0.2, 5.1 | 0.89 |
| **Gender** (p = 0.86) | | | | | | | | |
| Female | 27.0 | 1.00 | | | 11.2 | 1.00 | | |
| Male | 26.0 | 0.93 | 0.6. 1.5 | 0.77 | 8.7 | 0.82 | 0.4, 1.7 | 0.60 |
| **Ethnicity** (p = 0.08) | | | | | | | | |
| European/Other | 21.5 | 1.00 | | | 7.7 | 1.00 | | |
| Māori | 28.1 | 1.70 | 0.9, 3.1 | 0.08 | 14.6 | 2.15 | 0.9, 4.9 | 0.07 |
| Pacific | 37.5 | 2.50 | 1.3, 4.9 | **0.01** | 10.7 | 1.77 | 0.6, 5.0 | 0.29 |
| Asian | 31.7 | 1.94 | 0.9, 4.3 | 0.10 | 9.8 | 1.41 | 0.4, 4.8 | 0.58 |

†Reference group was *Decreased risk and maintained*

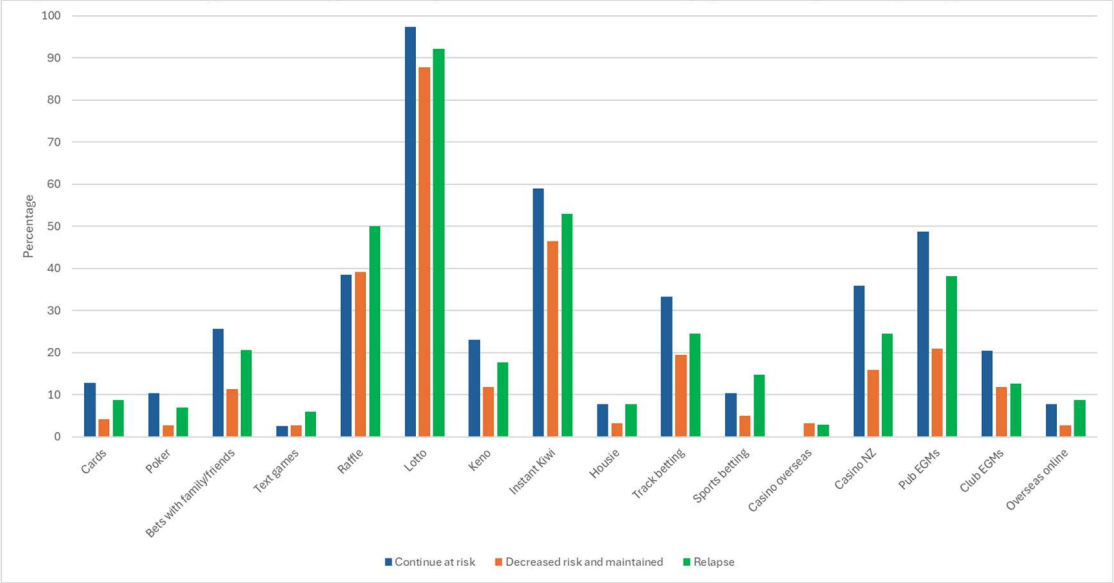
### *5.6.2 Gambling risk groups and gambling participation*

Gambling activities

Gambling activities participated in by the different gambling risk groups in 2020 are shown in Figure 7. As expected, a lower percentage of participants in the *Decreased risk and maintained* group participated in each activity, than in the other groups. Generally, a higher percentage of

participants in the *Continue at risk* group gambled on each activity than participants in the *Relapse* group, except for sports betting, overseas online gambling, and participation in raffles.

**Figure 7: Participation in gambling activities in 2020 by gambling risk groups**




Number of gambling activities

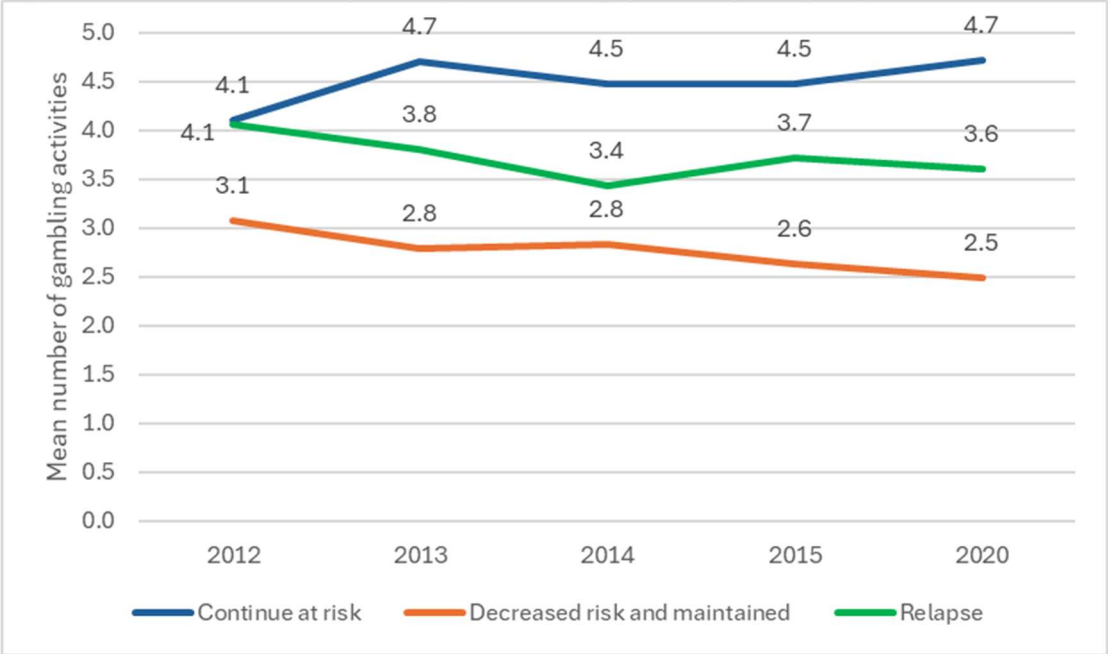
Overall, over time, participants in the *Continue at risk* group gambled on the most activities (mean range 4.1 to 4.7), and participants in the *decreased risk and maintained* group gambled on the least number of activities (mean range 2.5 to 3.1). The mean number of activities that participants in the *Relapse* group gambled on was between the mean number for the other two groups (mean range 3.6 to 4.1; Figure 8).

The total number of different gambling activities that participants engaged in did not *change much over time* (irrespective of gambling risk group). This means that being in, for example, the relapse group did not affect the number of gambling activities participants engaged in ($F(3.5, 1150.4) = 0.58$, $p = 0.66$). Investigating how this changed over time, the patterns were relatively similar across the risk categories; that is, *no category showed a significantly different trend compared to the others* as the interaction between time points and gambling risk groups was also was not significant ($F(7.2, 1150.4) = 1.72$, $p = 0.10$).

However, comparing the different gambling risk groups overall, results of the between-subjects effect was significant ($F(2, 321) = 17.63$, $p \leq 0.001$), meaning that there were significant differences in how many activities were engaged in. In particular, post hoc tests confirmed that participants in the *Relapse* group were involved in more gambling activities than those in the *Decreased risk and maintained* group. The differences in means were noted at specific time points:

- In 2012, mean difference = 0.99, $p = 0.02$
- In 2013, mean difference = 1.01, $p \leq 0.001$
- In 2015, mean difference = 1.08, $p \leq 0.001$
- In 2020, mean difference = 1.12, $p \leq 0.001$.

**Figure 8: Mean number of gambling activities by gambling risk group, 2012-2020**




Gambling expenditure

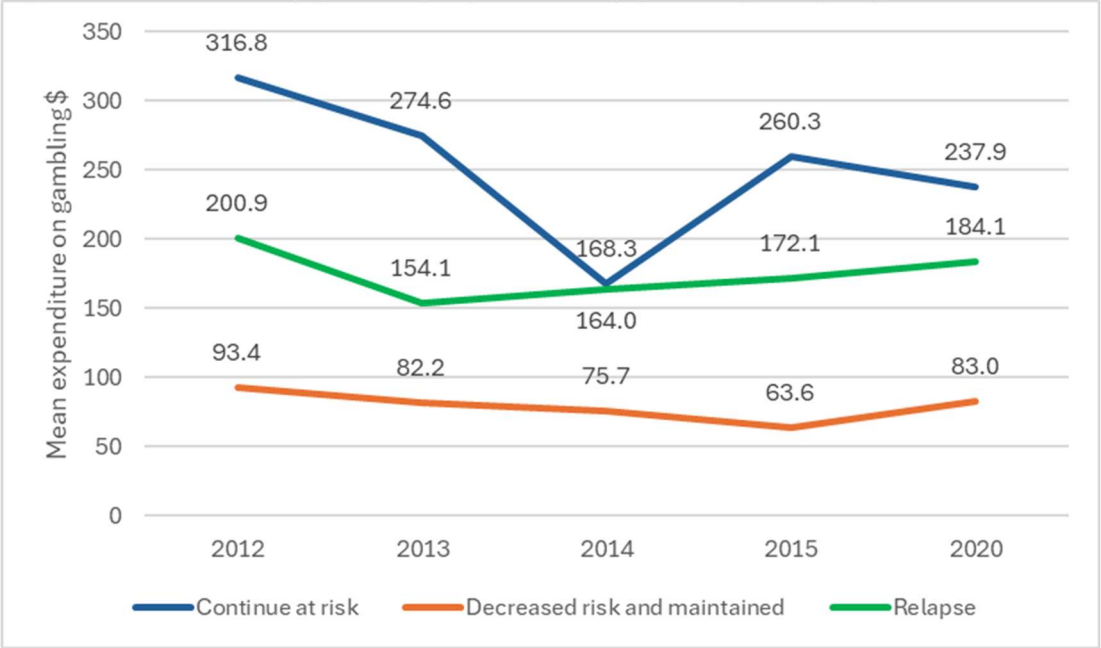
Overall, over time, participants in the *Continue at risk* group had the highest mean monthly gambling expenditure, whilst participants in the *Decreased risk and maintained* group had the lowest mean monthly gambling expenditure. The mean monthly gambling expenditure of participants in the *Relapse* group was between the mean expenditure for the other two groups (Figure 9).

On average, participants' monthly gambling expenditure significantly changed over time (irrespective of gambling risk group) ($F(3.5, 1126.4) = 2.50$, $p = 0.05$). These changes occurred in a similar way across all gambling risk categories; no category had a significantly different spending pattern over time ($F(7.1, 1126.4) = 1.00$, $p = 0.44$).

However, when comparing the categories overall, participants in the *Relapse* group consistently spent significantly more money on gambling than those in the *Decreased risk and maintained group*, particularly at the following specific time points:

- In 2012, mean difference = 107.5, $p \leq 0.001$
- In 2013, mean difference = 71.9, $p = 0.02$
- In 2014, mean difference = 88.3, $p \leq 0.001$
- In 2015, mean difference = 108.5, $p \leq 0.001$
- In 2020, mean difference = 101.1, $p \leq 0.001$.

**Figure 9: Mean monthly gambling expenditure by gambling risk group, 2012-2020**



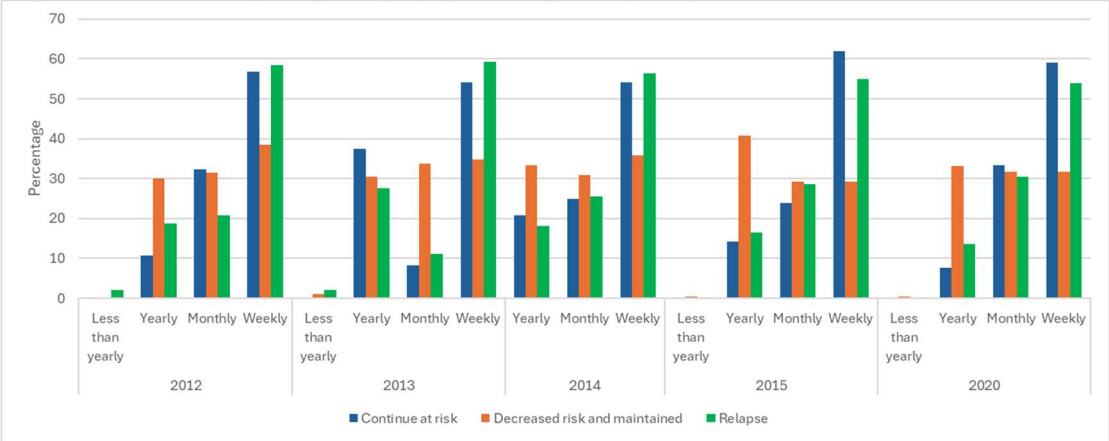

Frequency of gambling engagement

Across the different time points, the largest proportions of participants in both the *Relapse* and *Continue at risk* groups gambled at least weekly, whilst participants in the *Decreased risk and maintained* group had a more even spread of participants who gambled at least weekly, at least monthly or at least annually (Figure 10).

There were significant differences in frequency of gambling engagement across the time points only for the *Decreased risk and maintained group* ($\chi^2(4, 160) = 15.0$, $p = \leq 0.01$). For both the *Relapse* and *Continue at risk* groups, gambling frequency remained relatively stable with no significant changes over time ($p < 0.80$ and $p = 0.86$, respectively). However, at each time point, participants in the *Relapse* group gambled significantly more frequently than those in the *Decreased risk and maintained* group ($p \leq 0.001$). There were no significant differences in gambling frequency between the *Relapse* and *Continue at risk* groups at any time point (p value ranged from 0.4 to 0.9).

These findings suggest a positive association between gambling frequency and gambling risk level, with more frequent gambling linked to higher risk groups (i.e. *Relapse* and *Continue at risk* groups).

**Figure 10: Gambling frequency by gambling risk groups, 2012-2020**




### *5.6.3 Gambling risk groups and co-existing psychological distress and hazardous alcohol consumption*

Psychological distress

Using the Kessler-10 questionnaire[12], higher scores indicate a higher level of psychological distress. Overall, over time, participants in the *Continue at risk* group had the highest levels of psychological distress (i.e. highest mean scores; range 8.0 to 9.9), whilst participants in the *Decreased risk and maintained* group had the lowest levels of psychological distress (range 5.1 to 6.1). The psychological distress level of participants in the *Relapse* group was between the levels for the other two groups (range 5.9 to 6.9; Figure 11).

Total psychological distress scores did not significantly change across time points, irrespective of gambling risk group ($F(3.7, 22903.6) = 1.33$, $p = 0.26$). The interaction between time points and gambling risk groups was also not significant ($F(7.5, 22903.6) = 0.70$, $p = 0.68$), meaning that changes in psychological distress over time were not significantly different between the gambling risk groups.

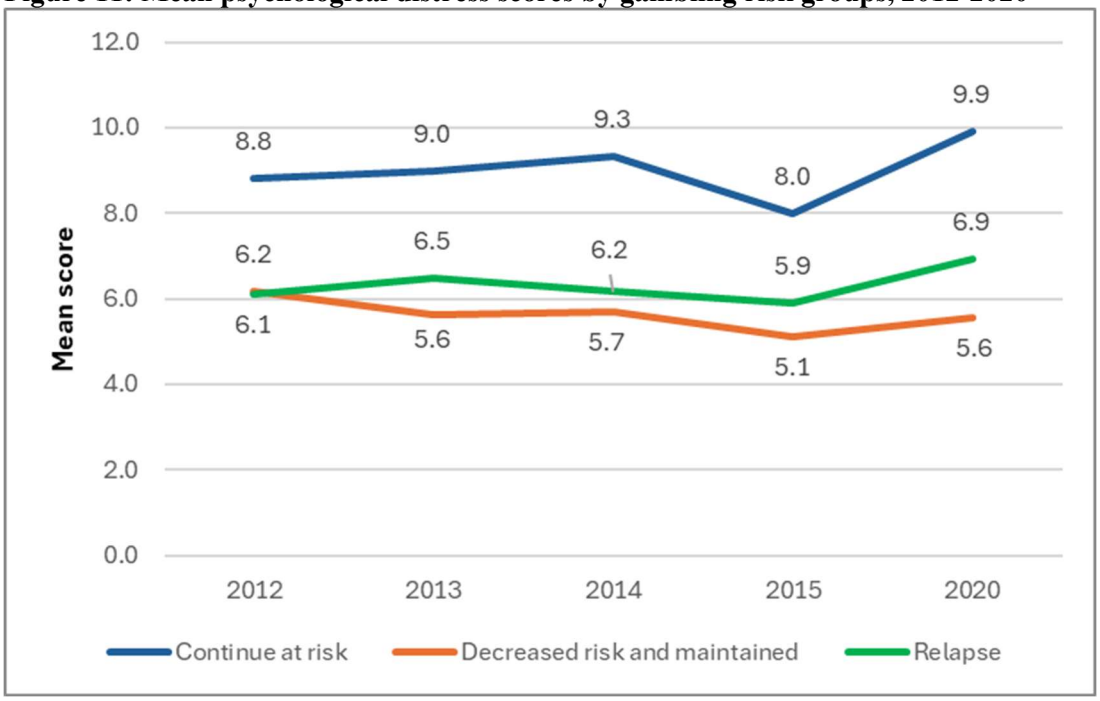
However, results of the between-subjects effect were significant ($F(2, 321) = 5.19$, $p \leq 0.01$), indicating that when comparing the groups directly, there were significant overall differences in psychological distress. Specifically, post hoc tests confirmed that the *Continue at risk* group showed higher distress than the *Decreased risk and Maintained* group at some time points:

- In 2013, mean difference = -3.4, $p = 0.04$
- In 2014, mean difference = -3.6, $p = 0.02$
- In 2020, mean difference = -4.3, $p \leq 0.01$.

There were no clear differences between the *Relapse* group and the other two groups.

[12] The Kessler-10 questionnaire is a 10-item measure of general psychological distress (Kessler & Mroczek, 1994).

**Figure 11: Mean psychological distress scores by gambling risk groups, 2012-2020**




Hazardous alcohol consumption

There was a significant effect of time on hazardous alcohol consumption[13], $F(3.3, 1081.8) = 5.21$, $p \leq 0.001$. That is, overall total AUDIT-C scores changed significantly across time points, irrespective of gambling risk group. However, the interaction between time points and gambling risk groups was not significant, $F(6.7, 1081.8) = 0.60$, $p = 0.78$, meaning that changes in AUDIT-C total scores over time were not significantly different between the gambling risk groups. In other words, variations in hazardous alcohol consumption over the time points were not related to relapse, decreasing risk or continuing at risk.

The results of the between-subjects effect were not significant $F(2, 320) = 0.43$, $p = 0.65$, indicating no overall significant differences in AUDIT-C scores between the gambling risk groups. Post hoc tests further confirmed that there were no significant differences in AUDIT-C scores between the *Relapse* group and the other two groups, at any individual time point ($p > 0.05$ for all comparisons).

### *5.6.4 Risk and protective factors for Relapse*

Factors measured in 2020

A multivariate logistic regression analysis indicated that in 2020, after adjusting for all significant factors[14] in the univariate models, only number of gambling activities participated in the past 12 months, and experiencing gambling harm[15] were significantly associated with

[13] Hazardous alcohol consumption was measured using the 3-item AUDIT-C, a short version of the 10-item Alcohol Use Disorders Identification Test (AUDIT; Saunders et al., 1993).

[14] Significant factors in the univariate models were: Number of gambling activities participated in, participation in overseas online gambling, number of online gambling activities participated in, gambling harm, continuous/non-continuous gambling, participating in free-to-play gambling-like activities, quality of life, deprivation, using methods to stop gambling too much, and smoking tobacco.

[15] Gambling harm was measured using the 10-item Short Gambling Harm Screen (Browne et al., 2018).

risk of *Relapse* and with being in the *Continue at risk* group, whilst increased quality of life[16] was associated with decreased risk of *Relapse* (Table 13).

- Each additional gambling activity participated in the past year increased the odds of being in the *Relapse* group by 30% (odds ratio = 1.3), and the odds of being in the *Continue at risk group* by 40% (odds ratio = 1.4).
- Each additional item of gambling harm experienced in the past year increased the odds of *Relapse* by 74% (odds ratio = 1.74), and the odds of being in the *Continue at risk* group by 87% (odds ratio = 1.87).
- For every one-point increase in perceived quality of life, the odds of *Relapse* decreased by 8% (odds ratio = 0.92).

The following factors were also investigated in the univariate models and had no significant association with *Relapse* in 2020: Gambling expenditure, frequency of gambling participation, employment status, annual personal income, participation in internet gaming, Internet Gaming Disorder, overall health, change in gambling behaviour due to COVID-19 lockdowns, general psychological distress, hazardous alcohol consumption.

**Table 13: Multivariate logistic regression: Factors measured in 2020 and relationship with *Relapse* and *Continue at risk* in comparison with *Decreased risk and maintained***

| Predictive factors | Relapse† | | | | Continue at risk† | | | |
|---|---|---|---|---|---|---|---|---|
| | % | Odds ratio | (95% CI) | p-value | % | Odds ratio | (95% CI) | p-value |
| **Number of gambling activities participated in past year in 2020** | 26.5 | 1.30 | 1.3, 1.5 | **0.01** | 10.0 | 1.40 | 1.1, 1.8 | **≤0.01** |
| **Gambling harm (total SGHS score)** | 26.5 | 1.74 | 1.2, 2.5 | **≤0.01** | 10.0 | 1.87 | 1.3, 2.8 | **≤0.01** |
| **Quality of life** | 26.5 | 0.92 | 0.8,1.0 | **0.01** | 10.0 | 0.91 | 0.8, 1.0 | 0.07 |

†Reference group was *Decreased risk and maintained*

Factors measured in 2012, 2013, 2014 and 2015

A multivariate logistic regression analysis indicated that, after adjusting for all significant factors[17] in the univariate models, total expenditure on gambling activities in the past year ($p = 0.04$) and using a method to stop spending too much money on gambling ($p = 0.04$) were significantly associated with *Relapse* and being in the *Continue at risk group*. Having previously been classified as a problem/pathological gambler ($p \leq 0.001$) was also significantly associated with *Relapse*. Having experienced a little to a moderate amount of gambling in the childhood home ($p = 0.05$ and $p = 0.03$), were significantly associated with decreased odds of *Relapse* (Table 14). Experiencing deprivation was only associated with being in the *Continue at risk* group ($p = 0.01$), and increased quality of life was associated with decreased odds of being in the *Continue at risk* group ($p = 0.01$).

- Total expenditure on gambling activities in 2015 increased the odds of *Relapse* by 31% (odds ratio = 1.31), and the odds of being in the *Continue at risk group* by more than double (odds ratio = 2.10).

[16] Quality of life was measured using the eight-item EUROHIS-QOL (Schmidt et al., 2005).

[17] Significant factors in the univariate models were: Frequency of gambling, gambling expenditure, continuous/non-continuous gambling, participating in free-to-play gambling-like activities, using methods to stop gambling too much, if there was gambling in the childhood home, knowing someone with a gambling problem, deprivation, problem/pathological gambler via SOGS-R, quality of life, general psychological distress, and smoking cannabis.

- Participants who used a method to stop spending too much money on gambling in 2013 had twice the odds of *Relapse*, and almost five times the odds of being in the *Continue at risk group* (odds ratio = 4.55), compared to those who did not use a method to stop themselves from spending too much money on gambling.
- Participants who had previously (before 2012) been classified as problem/pathological gamblers via the SOGS-R had five times the odds for *Relapse*, compared with participants who had not previously gambled at these levels.
- Experiencing a little to a moderate amount of gambling in the childhood home in 2012 decreased odds for relapse (odds ratio = 0.47 and 0.31, respectively), compared with participants who had no gambling in their childhood home.
- Each one-point increase in deprivation in 2015, increased odds for being in the *Continue at risk* group (odds ratio = 1.70). There was no association with *Relapse*.
- Each one-point increase in quality of life in 2014 decreased likelihood of being in the *Continue at risk* group (odds ratio = 0.81). There was no association with *Relapse*.

The following factors were also investigated in the univariate models and had no significant association with *Relapse* in 2012, 2013, 2014 or 2015: age of first gambling, other gamblers in the current household, hazardous alcohol consumption, smoking tobacco, annual personal income, employment status, experiencing at least one major life event in the past year, general health, experienced hardships in the past, had a disability, were able to access help when needed from family/friends or neighbours, belonged to an organised group.

**Table 14: Multivariate logistic regression: Factors measured in 2012, 2013, 2014 and 2015 and relationship with *Relapse* and *Continue at risk* in comparison with *Decreased risk and maintained***

| | Relapse† | | | | Continue at risk† | | | |
|---|---|---|---|---|---|---|---|---|
| **Predictive factors** | **%** | **Odds ratio** | **(95% CI)** | **p-value** | **%** | **Odds ratio** | **(95% CI)** | **p-value** |
| **Total expenditure on gambling** | | | | | | | | |
| **2012** | 26.5 | 1.15 | 0.9, 1.5 | 0.27 | 10.1 | 0.84 | 0.5, 1.4 | 0.47 |
| **2013** | 28.2 | 1.25 | 1.0, 1.6 | 0.07 | 7.1 | 1.58 | 0.9, 2.9 | 0.15 |
| **2014** | 29.4 | 0.95 | 0.8, 1.2 | 0.66 | 7.1 | 1.12 | 0.7, 1.9 | 0.68 |
| **2015** | 29.3 | 1.31 | 1.0, 1.7 | **0.04** | 6.5 | 2.10 | 1.1, 3.8 | **0.02** |
| **Used methods to stop gambling too much** | | | | | | | | |
| **2013** | 38.7 | 2.00 | 1.0, 4.0 | **0.04** | 12.0 | 4.55 | 1.1, 19.7 | **0.04** |
| **2015** | 36.3 | 1.10 | 0.6, 2.2 | 0.80 | 10.6 | 2.10 | 0.5, 8.1 | 0.28 |
| **Experienced gambling in childhood home (2012)** | | | | | | | | |
| **Not at all** | 30.3 | 1.00 | | | 10.3 | | | |
| **A little** | 20.3 | 0.47 | 0.2, 1.0 | **0.05** | 6.1 | 0.51 | 0.1, 2.8 | 0.44 |
| **A moderate amount** | 21.8 | 0.31 | 0.1, 0.9 | **0.03** | 18.2 | 0.72 | 0.1, 6.7 | 0.76 |
| **A lot** | 43.6 | 0.94 | 0.2, 3.0 | 0.91 | 12.8 | 1.27 | 0.2, 6.8 | 0.77 |
| **Problem/pathological gambling** | | | | | | | | |
| **Before 2012** | 36.7 | 5.10 | 2.2, 12.0 | **≤0.001** | 15.6 | 3.75 | 0.7, 18.2 | 0.10 |
| **Deprivation** | | | | | | | | |
| **2015** | 29.3 | 1.24 | 0.9, 1.6 | 0.10 | 6.5 | 1.70 | 1.1, 2.5 | **0.01** |
| **Quality of life** | | | | | | | | |
| **2012** | 26.5 | 1.03 | 0.9, 1.1 | 0.46 | 10.0 | 0.98 | 0.9, 1.1 | 0.80 |
| **2014** | 29.3 | 0.94 | 0.9, 1.0 | 0.15 | 7.1 | 0.81 | 0.6, 1.0 | **0.01** |

†Reference group was *Decreased risk and maintained*

# 6 DISCUSSION AND CONCLUSION

This study was the first in New Zealand to specifically investigate gambling relapse at a population level. A major issue with identifying and understanding relapse, as noted in the literature, is lack of a standardised definition of what constitutes gambling relapse and how to measure it. Previous National Gambling Study (NGS) reports defined relapse as a decrease in Problem Gambling Severity Index (PGSI) risk category followed by an increase in risk category.

In this study, relapse was investigated via secondary analysis of previously collected NGS data from 2012, 2013, 2014, 2015 and 2020. The first three aims of the study were to understand: 1) How changes in PGSI scores relate to relapse, 2) How individual items of the PGSI relate to relapse, and 3) Whether changes in PGSI categories are the most appropriate for identifying relapse.

The PGSI directly measures gambling risk and problem severity. Our analysis indicated that changes in PGSI risk levels and changes in PGSI scores over time were useful in identifying relapse, which we initially defined as a decrease in PGSI risk level followed by an increase at any subsequent time, as had been used in previous NGS reports. To check the accuracy of this definition, we examined additional factors to see if they could improve identification of relapse. However, although increased gambling frequency after a decrease, increased expenditure on gambling after a decrease, and other criteria (such as changes in gambling behaviour indicative of relapse, and/or seeking help for problematic gambling) provided valuable context, they could only be considered secondary (or supplementary) indicators of potential for relapse. The relatively moderate overlap found between relapse defined by changes in PGSI risk levels and other indicators (i.e. gambling frequency, expenditure, self-reported behaviour, and help-seeking) suggested that these criteria cannot independently identify relapse as effectively as changes in PGSI risk levels. Nonetheless, in clinical situations, it could be useful for counsellors to integrate these multiple sources of information to subjectively enhance confidence in identifying a client's potential for future relapse. These findings also have potential utility for gambling providers who have a duty under the Gambling Act 2003 to assist problem gamblers if ongoing concerns exist (Section 309A), especially in physical venues where carded gambling captures gambling frequency and expenditure, or with online gambling where gamblers have an account with the provider. Since people can relapse into risky gambling after any length of time, unexpected increased frequency or expenditure could be a red flag for potential relapse behaviour, or even a short lapse in behaviour. In particular, the onus is on gambling providers as most people who experience gambling-related problems do not seek professional treatment. It is acknowledged, though, that this could be difficult for any given gambling provider as many people engage in multiple gambling activities. The current study identified a mean number of gambling activities of two, with a maximum of 13. Previously, from the NGS, most 'new' problem gamblers were found to be people who had experienced problems in the past and were relapsing (Abbott et al., 2015). This could be one of the reasons for the apparent stability in the percentage of people with gambling risk over time, despite the proportion of people who gamble gradually declining over time. If this is the case, any information that could guide gambling providers and gambling treatment services to identify possible/potential relapse cases could be an important harm minimisation measure. However, as identified in the literature, environmental factors should also be considered as part of a public health approach, and reducing potential for gambling harm in the first place should be a focus of policy and education programmes.

Gambling treatment services could also use the findings from a client's responses to individual PGSI questions as a guide to potential future relapse. Unit increases in five of the nine items were found to be significantly associated with relapse, with the item of *being criticised/told you*

*have a gambling problem* being the most consistent predictor over time. *Feeling guilty about gambling* was strongly associated, though not at every time point. Both these PGSI items relate to gambling emotions and harm. Three items reflecting gambling behaviour also predicted relapse (*betting more than could afford to lose, gambling with larger amounts of money, and chasing losses*). Whilst these associations were not noted at every time point, they could also be used by counsellors to build a picture of an individual client's potential for relapse in cases where PGSI scores are collected over time, for example, at follow-up interviews after treatment has ceased.

The fourth study aim was to identify the prevalence of relapse in a New Zealand nationally representative population over time; 26.5% of participants in this study were classified as gamblers who had experienced relapse. On conversion to nationally representative percentages, this equates to a relapse rate of 24% amongst adults who gamble in a risky manner[18]. Most risky gamblers (70.3%) decreased their risk level and maintained the decrease over the eight years of the study, though 5.7% continued to gamble in a risky manner over time. Few participants (between 1% and 3% at each wave) had sought professional help for their gambling. That most participants were able to decrease their gambling risk confirms the findings of a New Zealand nationally representative gambling study conducted more than two decades ago in which problematic participation in non-casino EGMS, in particular, was transitory with a majority not gambling in a risky manner seven years later despite only a small percentage seeking professional help (Abbott, Williams and Volberg; 2004). Whilst this 'natural' recovery for most risky gamblers is encouraging, the fact that almost one-quarter of risky gamblers are prone to relapse means that there is no room for complacency. Policy and public health measures must be implemented to minimise progress into risky gambling in the first place, and to reduce risk of relapse for those people who initially move away from risky gambling.

The final two study aims were to identify factors associated with risk of relapse, and differences by ethnicity and socio-economic status. There was an indication that Pacific ethnicity, in comparison with European/Other ethnicity, was potentially associated with increased risk of relapse, though this requires further investigation to confirm. Although the reason for this higher risk cannot be identified from this study, the finding complements evidence that has repeatedly shown that Pacific people (along with Māori) have the highest risk for developing moderate risk/problem gambling compared with European/Other populations (Te Hiringa Hauora & Kupe, 2018). Further research is required to understand why Pacific people have elevated risk, not only for developing risky gambling behaviours but also for relapsing into those behaviours, and if some Pacific ethnicities have a higher risk than others.

Other socio-demographic factors such as gender, age and deprivation were not statistically independently associated with risk of relapse. It is well known that such demographic variables are highly associated with risky gambling behaviours, which suggests that some different mechanisms are in place in relation to risk for relapse.

Increased quality of life was associated with *reduced* risk of relapse, which correlates with previous research that identified an association between lower quality of life and problem gambling (e.g. Browne et al., 2017). In other words, a higher quality of life is a protective factor against risk of relapse. Participants who had experienced a little to a moderate amount of gambling in their childhood home also had a *reduced* risk of relapse. It could be that growing up with some gambling in the house sets a good example for children to follow in later life, whilst it is well-documented that parental problem gambling is a risk factor for a person developing future gambling problems (see Dowling et al., 2016 for a review). However, relapse

[18] Due to the relatively small sample of participants (n = 103) classified as *Relapse* compared with the full NGS sample of 6,251 participants, these estimates should be considered with caution.

may be mediated by different factors from those that lead to the development of risky gambling behaviours and further research investigating this finding is necessary.

The strongest predictor for relapse was being identified as a previous problem/pathological gambler. This is to be expected given our definition of relapse as an initial decrease in PGSI risk level that increased at any subsequent time point. Other gambling-related variables were also associated with relapse including increased expenditure on gambling and using methods to stop gambling. We discuss later in this chapter that increased gambling expenditure could be a useful 'flag' for potential relapse alongside other changes in gambling behaviours and PGSI risk level monitoring. A counterintuitive finding was that using methods to stop gambling too much was associated with gambling relapse. However, associations do not imply causality and a reason for this finding could be that the people at highest risk or relapse, and who may be aware of this risk, are the ones who try to control their gambling via various methods or strategies. It is of note, though, that associations with relapse in the current study were only observed at specific time points and, as speculated by Battersby et al. (2010), could merely be a description of relapse at that point in the cycle. A longitudinal study of gamblers specifically designed to investigate relapse, and which does not rely on previously collected data, would provide more nuanced results than the current study and many other international studies of relapse.

Our findings indicate that many socio-demographic and gambling-related predictors of risky gambling behaviours are not the same predictors for relapse. The question then remains as to what are the factors that increase risk of relapse? An Australian prospective cohort study of 158 problem gamblers who were seeking treatment or support for their gambling, identified intrinsic factors predictive of relapse including urge to gamble and gambling-related cognitions (Smith et al., 2013). A French study of 87 participants who had received treatment identified that self-directedness was protective for preventing relapse (Grall-Bronnec et al., 2021). Data from intrinsic factors, including neurocognitive factors, were not collected as part of the NGS and so were not examined in the present study. They should be investigated in future New Zealand based research on relapse.

Similarly, other factors suggested in the literature as predictors of gambling relapse should be investigated in future studies. These include environmental factors such as gambling advertising, push marking, use of paid influencers, and location/availability of gambling opportunities, along with availability and accessibility of treatment services and other public health initiatives such as multi-venue self-exclusion systems including online gambling.

A strength of the current study has been the ability to analyse eight years of data from the same participants, with the final questionnaire updated to reflect the changed gambling environment including perceptions of changes in gambling behaviours over time. Having a time series of data meant that analyses of relapse were possible. Conversely, this also meant that the analyses were limited to the existing data and, had other information been available, more nuanced findings may have been revealed. In the current study, the sample was too small to allow analyses of relapse among participants experiencing the severest harms from gambling (i.e. moderate risk and problem gamblers), meaning that analyses had to be conducted on risky gamblers (i.e. including low risk gamblers as well as moderate risk and problem gamblers). Harms experienced by low risk gamblers are generally of a mild nature and potentially of short duration. This means that relapse as defined in the current study might only be considered a lapse for those gamblers unless it was prolonged and the increase in PGSI risk level was large. Ideally, a different study with a larger sample of moderate risk and problem gamblers is required to identify relapse risk, prevalence and associated factors. Nonetheless, the current study identified that monitoring changes in PGSI gambling risk level categories appears to be a valid way to ascertain risk of relapse, with other factors useful as supplementary indicators of

potential relapse. In New Zealand, the PGSI is widely used to measure gambling risk in clinical settings as well as in research and population level studies. It is of note, however, that whilst a common screen, the PGSI is not universally utilised, with different jurisdictions having different preferences. Thus, other measures for risk of relapse are likely but were outside the scope of the current study. Furthermore, some researchers have advocated for different cut scores for the risk levels (e.g. Williams & Volberg, 2013), and analyses with those data might has yielded different results from those in the current study. Future longitudinal research designed specifically to understand relapse and identify indicators for ascertaining risk of relapse should include specific questions on behaviour changes and consequences of those changes such as seeking professional help for gambling-related issues, and participant perceptions of relapse alongside potential triggers for relapse such as inducements to gamble by gambling industries.

## 6.1 Conclusion

The prevalence of gambling relapse amongst previously risky gamblers in New Zealand is relatively high at 24%[19] based on the data from the New Zealand National Gambling Study (2012 - 2020). This has implications for policy and public health approaches not only to minimise gambling harms from occurring in the first instance, but also to reduce and prevent gamblers from relapsing into risky behaviours. The onus also falls on gambling providers to ensure that the products they offer are provided in a safe manner and are safe to engage with.

Using changes in PGSI risk level categories is a valid way to ascertain relapse risk, specifically via an increase in PGSI risk level after a decrease, although it is unlikely to be the only way. Several other factors are useful as supplementary indicators of potential for relapse. These include increased gambling frequency and expenditure after a decrease or after stopping gambling, seeking help for problematic gambling, and endorsing specific questions on the PGSI (especially being criticised and feeling guilty about gambling, as well as betting more than could afford to lose, gambling with larger amounts of money, and chasing losses). For gamblers who access treatment services, counsellors could create a composite picture of a client's risk for relapse considering these factors in conjunction with PGSI results. However, as most people who experience gambling problems do not seek professional help, gambling providers who collect gambling-related data from their patrons (e.g. via carded gambling or via online membership) could also significantly contribute to reducing harm by monitoring for signs that could be indicative of potential gambling relapse behaviours and acting accordingly.

Being of Pacific ethnicity, compared with European/Other ethnicity, appeared to be the only demographic factor that is potentially associated with relapse in the current study. As the inequitable burden of gambling-related harms consistently appears to be the highest for Pacific people in New Zealand, further research is urgently required to confirm this finding and to understand the cause of the elevated risk and whether it applies to all, or only some, Pacific ethnicities.

[19] Due to the relatively small sample of participants (n = 103) classified as *Relapse* compared with the full NGS sample of 6,251 participants, this estimate should be considered with caution.

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## APPENDIX 1: VARIABLES INVESTIGATED TO UNDERSTAND RELAPSE

To examine and refine our categorisation of relapse, additional data other than PGSI risk levels were examined. These included:

**South Oaks Gambling Screen - Revised (SOGS-R) score, measured in 2012**
This measure provided baseline information on participants' lifetime gambling problems and was included to help understand the initial severity and history of gambling issues. Relying solely on PGSI scores at one point in time (e.g. 2012) could underestimate risk for individuals with a gambling history. Including the SOGS-R score allowed for a holistic view of participants' gambling patterns, incorporating both past behaviour and present risk levels.

**Gambling participation patterns for frequency and expenditure**
To further evaluate relapse behaviour, patterns in gambling frequency and expenditure were explored.

Lotto was excluded from the gambling participation assessment as participants could potentially participate in Lotto twice a week, yet being a non-continuous activity (delay between ticket purchase and draw), Lotto is less likely to be associated with risky gambling compared with continuous gambling activities (i.e. when a bet is made and the outcome rapidly known, with the behaviour able to be immediately repeated in quick succession) (Abbott et al., 2014).

An increase in gambling expenditure from one time point to the next was assessed as it was considered that when someone relapses, they are likely to re-engage in gambling or to gamble more heavily, which could lead to higher expenditure compared to previous, lower-risk or non-gambling periods. Lotto was also excluded when evaluating expenditure on gambling activities.

**Participants' current perceptions of relapse measured in 2020**
By gathering participants' self-reported views on increased, decreased and stopped gambling behaviour, and the reasons why, between 2015 and 2020, the subjective aspect of their gambling behaviour can be better understood. This can provide context for interpreting risk level patterns and enhance understanding of relapse beyond quantitative risk scores.

While PGSI scores reveal patterns of risk, they do not capture personal awareness and context around a participant's behaviour. If a participant indicated in 2020 that they had 'stopped gambling in the last five years (either once, twice, or three times), and they indicated that they stopped for three months or longer before starting to gamble again, then it might be assumed that they did not maintain a reduced risk between 2015 and 2020, or that they did not continue to be at risk.

Participants were asked to provide reasons why they stopped and resumed gambling. If they reported stopping due to COVID-19 lockdowns and resumed only when restrictions were lifted and gambling venues reopened, those participants were not classified as *Relapse* in 2020. Instead, their behaviour was deemed to be situational rather than indicative of a relapse.

Additionally, participants were asked in 2020 if their gambling had increased or decreased over the last year. If a participant reported an increase at a recent time point after previously indicating a decrease at earlier time points, this pattern provided additional evidence supporting relapse.

**Help-seeking behaviour**

Help seeking behaviour was also considered as this could indicate a level of gambling-related issues significant enough to prompt a participant to seek help. It provided additional context because, even if other indicators (such as the PGSI) showed a reduction in risk level, actively seeking help was a clear sign that an individual perceived their gambling as problematic.