



Kansspelautoriteit

# Markers of Risk

**How gambling data can be used  
to assist effective supervision**

# 1 Introduction

Online gambling in The Netherlands was regulated in 2021. One of the requirements for licensed operators is to put playing data in a digital vault (remote gambling data safe). The data are rich and include information on transactions (deposits, withdrawals, stakes and winnings), type of games played, changes in set player limits and interventions carried out by operators. The data also include pseudonymised player codes, information on the player's age and player status with the given operator, but no other personal information. In principle, the data may only legally be accessed by the Netherlands Gambling Authority (*Kansspelautoriteit*, Ksa) for supervision purposes, in order to oversee and ensure compliance with applicable rules and regulations.

The aim of this project was to utilise these data for the benefit of effective supervision in order to prevent gambling addiction. The main goal was to develop a tool that can be used (i) to compare operators in terms of risky behaviour among their players, (ii) to evaluate the extent to which operators intervene, and (iii) whether the interventions are effective.<sup>1</sup> The goal was not to assess risk at the level of individual players, but rather behavior at operator level.

Our aim was to expand our approach away from focusing on cases involving extreme losses because players who suffer such losses are an atypical group. Some of them are from the high end of the wealth distribution and some do extraordinary things to finance their gambling (Focal Research, 2022). Although gambling costs and gambling problems are related, this does not mean that gambling problems are necessarily characterised by high costs. In fact, the majority of problem gamblers does not lose excessive amounts of money (Kesaite, Wardle, & Rossow, 2024). In this project we therefore developed a tool to compare operators across a wide range of indicators for riskiness of play – including, but not limited to losses.

This paper explains the steps we have taken and the main observations so far. The main questions relating to supervision and monitoring are constantly changing due to new insights as well as the introduction of new regulations. As a result, our tool and methodology are constantly evolving as well. For this reason this paper focuses more on the general approach and insights from our exploratory analyses, rather than summing up exact specifications that may be refined sometime in the future.

This report is structured as follows. In section 2 we briefly summarise the literature and explain how a series of workshops were organized with Focal Research and the lessons we learned. In section 3 we present various observations from our exploratory analyses centred on the themes of intensity, loss of control, increase in

---

<sup>1</sup>This project benefitted from comments and remarks made by many colleagues at Ksa as well as by research partners Dr Joost Poort, Prof. Karin van Wingerde, Prof. Johan Wolswinkel, Dr Gert-Jan Meerkerk as well as Bas Brons, who is a gambling addiction expert and a member of the advisory board for non-voluntary exclusion at Cruks, the Dutch exclusion register. Furthermore we would like to thank Prof. Tony Schellinck and Tracy Schrans from Focal Research for insightful workshops.

gambling, distinguishing between game types and interventions. Finally, we conclude with some final notes on how to improve methodology and use insights to facilitate meaningful norms for both the industry and the regulators.

## 2 Lessons learned from the literature and workshops

Our starting point was the existing literature on markers of risky behaviour, followed by a series of workshops.

### 2.1 Literature

A review by Delfabbro, Parke and Catania (2023) provides an overview of 58 published studies from the last fifteen years. The main lesson based on the papers reviewed is that higher risk gamblers are often associated with higher levels of gambling intensity, more frequent and larger deposits, more reversed withdrawals<sup>2</sup> and a higher frequency of gambling late at night. At-risk gamblers typically use a combination of multiple gambling products (e.g. sports betting and slots) and often engage in faster, more continuous games. These are quite general observations and, at the same time, there is no consensus on the relative importance of these indicators. There are a number of reasons for this and each of them provides an important lesson for our project.

First, every study includes a different set of indicators. As a result, some indicators have been studied extensively, while others have only been studied a few times. Examples of indicators that are included in many studies are losses, number of playing days and the number of deposits. Examples of indicators that were investigated less often are participation in live betting and the variation in stake size. As a result, for some indicators there is substantial evidence that they are related to problem gambling, while for other indicators evidence is limited. These differences do not necessarily reflect differences in the strength of the relation between the indicator and problem gambling, but rather differences in inclusion in studies. Even when indicators were studied multiple times, they were often operationalised in different ways and that makes comparisons difficult.

The lesson we learned for our project is that it is reasonable to start with a set of indicators that are found to be relevant in the literature, but that examining new indicators should be an ongoing process. Another lesson is that we have to think carefully about how to operationalise indicators.

The second problem with the existing literature is that only few of the studies combine objective playing behaviour with independent validations of player risk status. Although some studies use screener questions in surveys, based on, for example, the

---

<sup>2</sup>When players withdraw money from their gambling account, it may take some time for the money to be transferred to their bank account. When a player 'reverses a withdrawal', the player cancels the withdrawal before the money is transferred.

Problem Gambling Severity Index (PGSI), risk status is often measured using proxies such as self-exclusion. However, not all players who self-exclude are at-risk gamblers and many players who are at risk do not self-exclude (Lischer, 2016). As far as we are concerned, therefore, self-exclusion is not our preferred measure of risk status.

Although our data is an extensive source of information on objective playing behaviour, our data lacks an independent validator of the risk status of players, as is the case in many other projects. Nevertheless, we can describe patterns and compare operators or signal (sudden) changes over time.

The third reason why there is no consensus in the literature is that much of the research used data from a single operator and from a single jurisdiction. Variations in the type of products offered, differences in regulations and cultural differences make it difficult to apply findings from one operator and country to another.

The differences in results underscore the need to analyse data from several operators that offer a range of products and this is exactly what our project does. The techniques used may be interesting for other regulators, while the exact findings may only be relevant in the Dutch regulatory and cultural context.

The last limitation is that studies that use playing data can only be conducted with data supplied by operators. No infrastructures exist that allow researchers to access those data without being dependent on operators. For regulators it is difficult to assess the impact that operators have on the research questions, selected sample and decision to publish the results. Furthermore, some of the researchers that work with operator data have conflicts of interest, because they receive funding from the gambling industry.

The existence of the data vault puts Ksa in the position to conduct our own analyses for the purpose of supervision.

## 2.2 Workshops

In order to continue increasing our understanding of identifying risky play, we sought assistance from gambling data scientists who had previously worked extensively with playing data enriched with survey data. A series of insightful workshops and consultations led by Prof. Dr Tony Schellinck and Tracy Schrans at Focal Research Consultants helped us improve our understanding of what constitutes risky play.

The workshops focused on understanding risky play and the consequences of different methodological choices based on previously published work by both Focal Research and other researchers. Because of legal limitations, Ksa did not share any data or (preliminary) results with Focal Research. Similarly, Focal Research did also not share any datasets with us. The discussions were purely methodological using simulated data sets for explanatory purposes and hypothesis testing.

A wide range of topics were covered during the workshops. For instance, we learned that we should not focus on markers of harm, but rather on markers of risk. When

harm occurs, it is too late. We talked extensively about how to think about risky play and how to detect telltale signs that somebody is losing control, which can happen in a myriad of different ways. This will consequently result in a long list of indicators which are relevant to chasing losses or risky or changing behaviour.

Second, we discussed the goal of our model. Rather than calculating the risk for individual players, we decided to focus on indicators that allow us to compare the extent of risky play across operators. All indicators were therefore aggregated per operator and our aim was not to calculate risk scores for individual players.

The markers of risky behaviour may also be very different for different sub-groups. One example is the distinction between overspenders and high rollers. According to Focals Affordability Indices research, overspenders have a limited budget and spend more than they can afford. They are typically not at the high end of the loss distribution, but have distinct properties in that they play less frequently but with high stakes, usually at moments when they lack resources, for example on days preceding their payday (Focal Research, 2022). Similarly, the markers may be different for different types of games. Play duration or in-session behaviour are relevant indicators in the case of slots. However, when we look at sports betting, we should consider a different set of indicators such as betting on long odds, combined bets, or betting on unusual games.

A final lesson was that mean values are not very helpful. Problematic gambling is often characterised by outliers on certain days, not by the behaviour on an average day. Maximums are therefore also useful measures for the purpose of this project. In section 3.2, for example, we discuss the maximum number of deposits that players make on a single day.

## 3 Key insights from gambling data analyses

Based on the literature and the workshop we made an initial selection of indicators that can be grouped into different categories:

- Intensity
- Loss of control
- Increase in gambling
- Operator behaviour
- Features of the games

In this paragraph, we illustrate our approach using data from October 2023 until September 2024 for twenty-five operators with a total of 2.624.676 unique player accounts (on average 218.723 per month).<sup>3</sup> Appendix A contains a list of definitions of all indicators mentioned in the text and figures.

In this report all graphs are aggregated over all operators and calendar months. For supervisory purposes we calculate indicators per operator. This allows us to make a comparison across operators.

In most sections we exclude players who have a low probability of being an at-risk player, in other words incidental players. We define incidental players as players who gamble less than five days in a month and who lose less than 300 euros in a month. Incidental players account for 49 percent of all players. Excluding this group of players makes operators more comparable. An operator with a large number of incidental players would score much better on some of the indicators, regardless of the operator's efforts to prevent gambling harm. Because our definition of incidental players is based on losses and number of playing days, we report figures for those two indicators for the entire player population.

### 3.1 Intensity

Intensity indicators measure the volume of gambling. Examples of indicators in this category are losses, number of playing days and sum of stakes. Gambling intensity is one of the most studied aspects of gambling. The media also regularly report of players who have lost huge amounts of money, spent extreme amounts of time and who experience problems, such as debts.

---

<sup>3</sup>Players can create one account per operator. The number of accounts is therefore higher than the number of players.

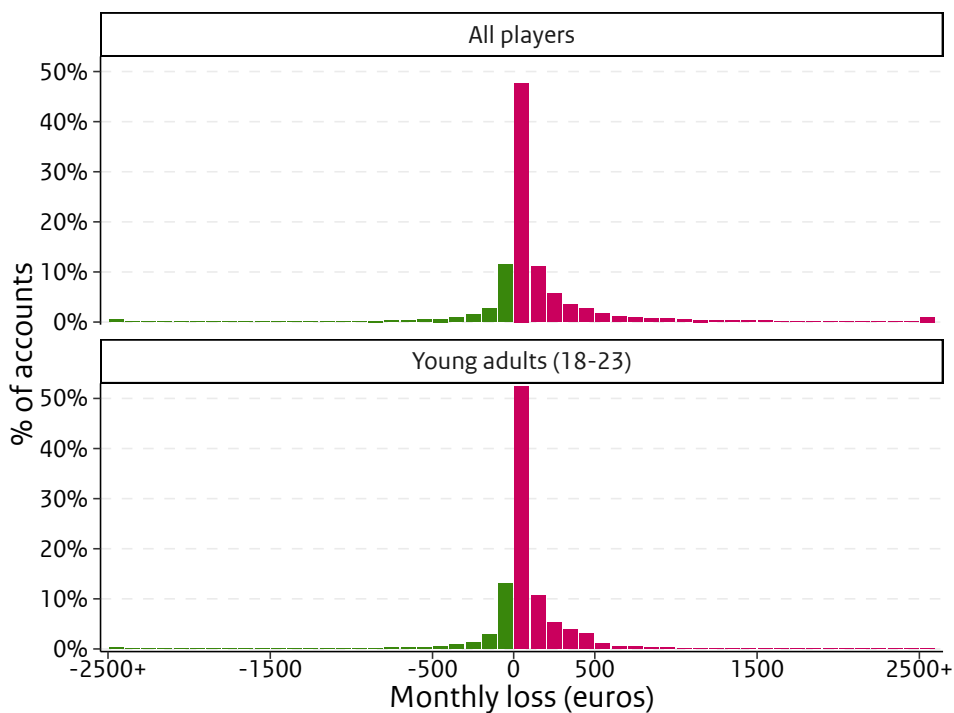
### 3.1.1 Losses

Our playing data analyses show that the majority of players do not lose large amounts of money. The median loss per account per month was 35 euros. This means that the loss is higher than 35 euros for half of the accounts, and lower for the other half of the accounts.

However, figure 3.1 shows that there is a large spread in losses. The distribution is also right-skewed, given that more players lose money than win money, and the amounts lost are larger than the amounts won. As a consequence the average loss is much higher than the median loss, namely 137 euros. For young adults the median (29 euros) and mean (63 euros) are much lower than for older players.

Gamblers win money via about 20 percent of the accounts. In the case of 68 percent of accounts (about 700.000 per month) 100 euros or less is lost per month. In the case of 6.4 percent of accounts (about 66.000 accounts per month) more than 700 euros is lost. More than 2500 euros was lost from 1 percent of accounts. This is approximately the median monthly net income in the Netherlands (CBS, 2023) and represents more than 10.000 player accounts per month.

Figure 3.1: Distribution of monthly losses



Based on data from the remote gambling data safe (CDB)  
Incidental and non-incidental players.

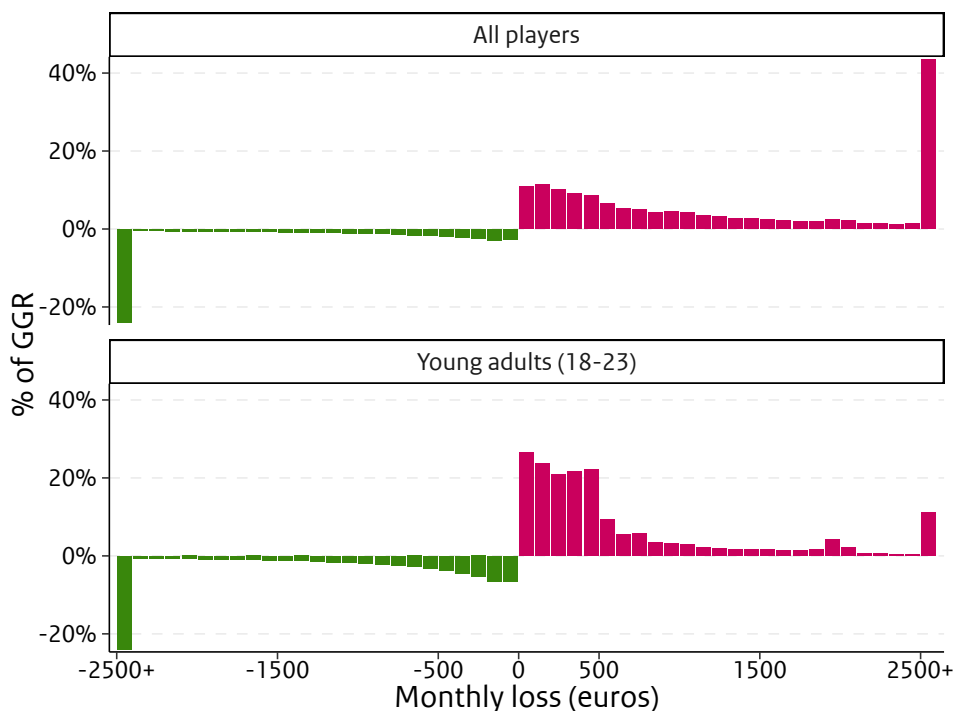
■ Player won ■ Player lost

An alternative way to view the distribution of losses is to look at the contribution to gross gaming revenue (GGR, the total amount of money lost) per loss category. This is shown in figure 3.2. Although only 1 percent of players lose 2500 euros or more



per month, their losses account for 43 percent of the GGR. Players who lost between 0 and 100 euros per month account for 11 percent of the GGR, while they account for 48 percent of the players. One percent of young adult players are responsible for 33 percent of GGR by young adults. This implies that operator earnings are highly dependent on a small proportion of their players.

Figure 3.2: Percentage of GGR accounted for by players with different losses



Based on data from the remote gambling data safe (CDB)  
Incidental and non-incidental players

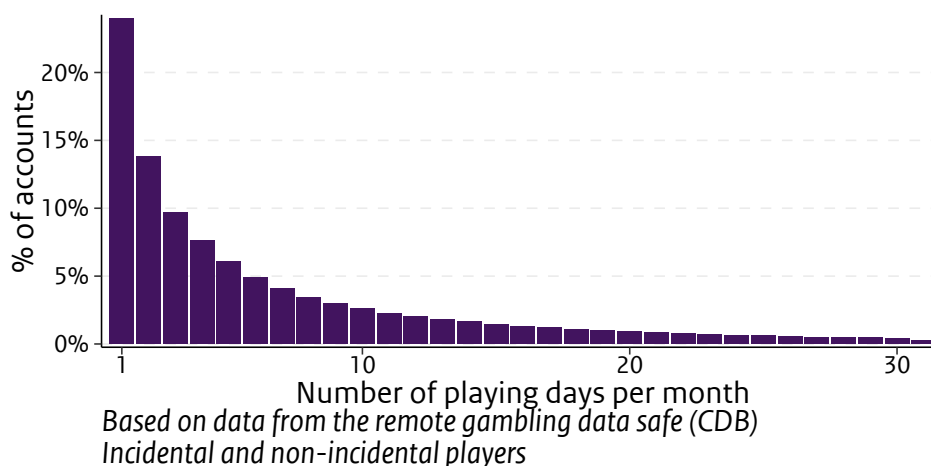
■ Player won ■ Player lost

The distribution of losses as discussed here may change as a result of the new policy rules that have been in force since the 1 October 2024. In principle, the Ksa considers net deposits of more than 700 euros (300 euros for young adults) to be a signal of risky behaviour. In such situations, the Ksa regards a temporary deposit block to be an appropriate intervention, unless the play can prove that their financial situation allows them to deposit more.

### 3.1.2 Gambling frequency

Another indicator of gambling intensity is gambling frequency. Figure 3.3 shows the distribution of number of playing days per month for all players. All days with at least one stake are included. The median number of playing days was 4 and the average was 7.

Figure 3.3: Distribution number of playing days per month



### 3.2 Loss of control

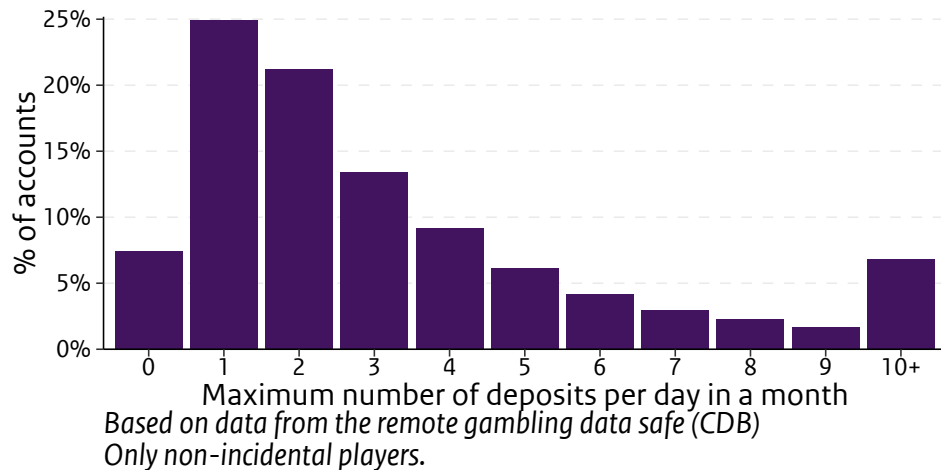
A second category is loss of control. Certain behaviours may indicate that players are no longer able to control their urge to gamble and that is one of the characteristics of risky play. Gamblers who have less control over their gambling may deposit more frequently, play more often at night and may repeatedly increase their limits.

As an example, figure 3.4 shows the distribution of the number of deposits per day for non-incidental players.<sup>4</sup> Gamblers are advised to decide in advance how much money they want to spend on gambling. Frequent depositing on the same day may suggest that a player did not make this decision in advance, or that players have difficulties sticking to their budget. For each player the day with the highest number of deposits in a month was selected for the figure. When players gamble multiple months, they are included multiple times in the figure.

The median was 2 deposits a day and the average was 3.6. In the case of 32 percent of the non-incidental accounts no more than one deposit per day was made in a single month. Ten or more deposits were made on a single day in the case of 7 percent of the accounts.

<sup>4</sup>In the remainder of the report we exclude players who only play incidentally or who do not lose a substantial amount of money. This applies to 51 percent of all players.

Figure 3.4: Distribution of maximum number of deposits per day

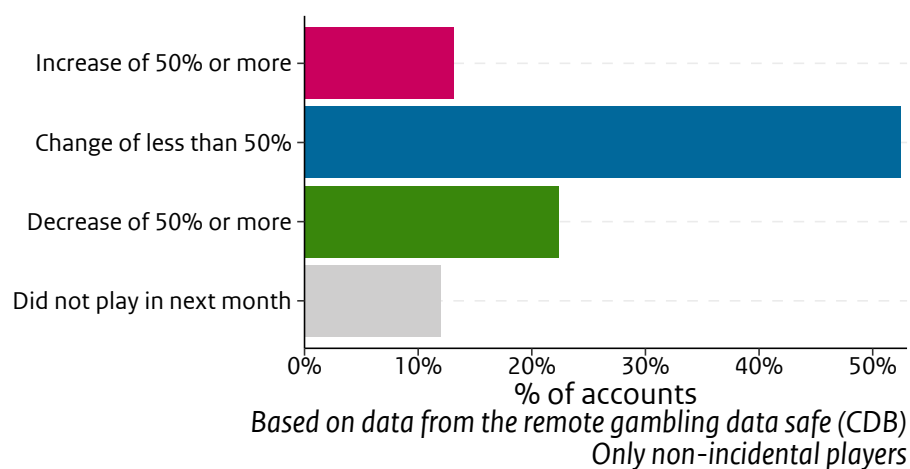


### 3.3 Increased gambling over time

Increased gambling is the third category of indicators. Gambling problems often develop over time. Changes in behaviour, and especially increases in gambling intensity, may indicate that a person is developing a problem. Examples of indicators are an increase in the number of deposits and a high variability in the size of the stakes.

Figure 3.5 shows the percentage of non-incidental players that increase the number of playing days for two months in a row. Again, all days with at least one stake are included. Of the non-incidental players who play in the next month, most do not change their number of playing days by more than 50 percent. There are more players with a significant decrease in the number of playing days than players with a significant increase.

Figure 3.5: Change in number of playing days compared to previous month - percentage of non-incidental players.

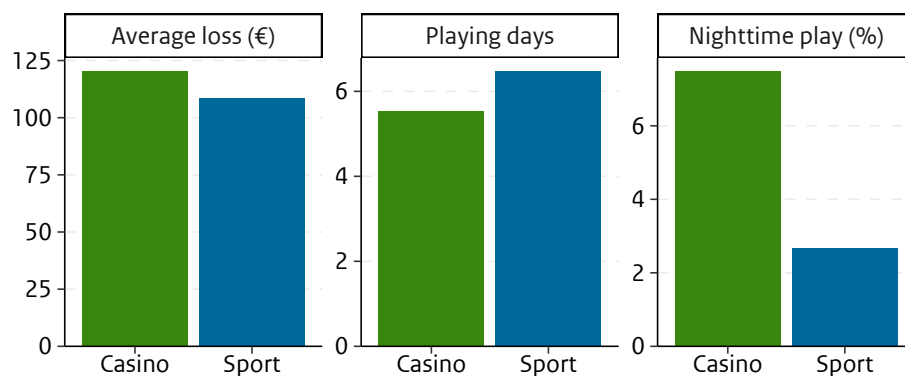


### 3.4 Game types

As pointed out earlier, markers of risky behaviour may be very different for different types of games, both in frequency of occurrence and in relevance. To illustrate this, figure 3.6 shows the difference between casino games and sports betting with respect to average losses, number of playing days and percentage of players who regularly play at night. Because these are all intensity indicators, the figure reports numbers for the entire player population (incidental and non-incidental players).

Nighttime play is widely accepted as a good indicator of risky behaviour in the literature. In figure 3.6 nighttime play is defined as the percentage of players who played five or more nights or who lost more than 300 euros at night. Although casino players typically show a higher incidence of nighttime play, an interesting point needs to be made, namely that betting at night is quite unusual and, at the level of the individual, it may therefore be a stronger risk indicator than playing casino games at night. We will explore this topic in more detail in future projects.

*Figure 3.6: Playing behaviour in casino games and sports betting*



*Based on data from the remote gambling data safe (CDB)  
Incidental and non-incidental players.*

Besides the rough distinction between casino games and sport betting, several more refined classifications of games are possible. The data allow for a distinction between casino games played against the house versus games played against other players. The data also allow for even more detailed distinctions, such as between roulette, blackjack and different types of slots games. Similarly, in addition to the main distinction between horse racing and sports betting one could look at betting on different types of sports, competitions or even bets. Questions that we plan to address in the future include:

- What kind of games are played by players with different risk profiles?
- What games do new gamblers play and do the types of games played change as players gamble for a longer period of time?
- What game types do high rollers play?

### 3.5 Operator behaviour

According to Dutch law gambling operators have to react with appropriate interventions when signs of excessive gambling or risk of gambling addiction call for action. Operators also have to report on those interventions in the data vault. However, there are currently major differences in the way operators report interventions. Some operators report lower level interventions in their data vault, while other operators may only report higher level interventions. That makes it difficult to interpret the thresholds at which operators intervene. Because we plan to address this issue in the future we do not report real numbers in this section. Instead, we focus on the methodologies we use to assess whether operators intervene in a timely and adequate manner.

To assess the *timeliness* of interventions we can, for example, calculate the total loss until an initial intervention is carried out with respect to a certain player, if any intervention took place at all. We can then compare the average total loss until the initial intervention across operators. This approach can be extended to other indicators, such as the number of playing days, or the number of deposits until the first intervention.

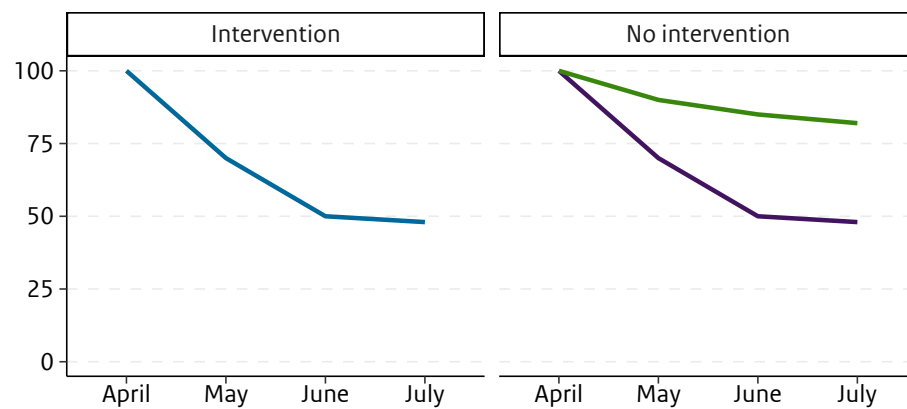
In order to assess the *effectiveness* of interventions we compare the monthly loss in the month of intervention with that of the months after the intervention. This is illustrated with synthetic data in the left panel of figure 3.7. The blue line shows the average loss of players who were subject to an initial intervention in the month of the intervention (April) and the months after (May - July). In the month following the intervention their loss decreased. At first glance the intervention seems to have been effective. However, we learned from figure 3.5 that many players gamble less or even quit gambling in the following month. In order to draw conclusions about the effectiveness of interventions, we need to compare the decrease to that of a control group, in other words a group of players with a similar level of losses who were not subject to an intervention.

To do so we need to match players with an intervention to players who had similar characteristics but who were not subject to an intervention. The lines in the right panel of figure 3.7 show different hypothetical scenarios. The lines represent players who were not subject to an intervention, but who had a similar loss in April as the players in the left panel. The green line shows a decrease in losses after April, but the decrease is less strong than for players who were subject to an intervention. Experiencing a large loss may motivate players to adjust their behaviour, even when the operator does not intervene. The same may also occur due to regression to the mean. In other words, random fluctuations in losses may mean that players with high losses in April are likely to have a lower level of losses even if they do not change their playing behaviour. To evaluate the effectiveness of interventions, we would therefore compare the decrease in losses in the group with an intervention to the decrease in losses in the group without an intervention. The green line represents a scenario in which interventions lead to a decrease in losses. However, the

purple line illustrates a scenario in which the decrease in losses is equally strong in the situation with and without an intervention. The conclusion of this second scenario would be that the intervention is ineffective.

In order to assess the effectiveness of interventions we compare the differences between the players with and without interventions for each operator. To construct comparable groups we not only match players based on losses, but also on a wider set of indicators.

*Figure 3.7: Loss in month of first intervention and the following months. For players with intervention and matched players without intervention.*



*Synthetic data. Colours indicate different hypothetical scenarios.*

Here we gave an illustration of how we compare the timeliness and effectiveness of operators' interventions in terms of losses. This approach can, of course, be extended to any other indicators than losses.

## 4 Future plans

The goal of the project was to develop a method to monitor operators in terms of risky behaviour among their players. As a result of this project we are now able to compare operators on the basis of a wide range of indicators, identify extremes among operators, flag sudden changes and generally explore the impact of interventions.

Our approach which entailed working at the level of operators is relevant for supervision because it helps us prioritise the operators we should focus on in our in-depth investigations. Rather than flagging individual players as being at risk, we developed a set of indicators to assess the extent of risky play among all (non-incident) players associated with one particular operator. We are currently exploring how we can best use this tool in practice and new insights from this process will be used to refine our methods. We are also expanding our focus to the level of individual players in order to identify players who are at risk. This will allow us to evaluate whether operators effectively use Responsible Gambling tools when at risk.

The tools we have developed are also useful for policy assessment. One of our current projects involves monitoring the effects of the new Dutch responsible gambling regulations introduced earlier this year.

There are several opportunities for further improvement. First, the Ksa plans to revise the data model in which we specify the data that operators have to submit and the format<sup>5</sup>, especially with regard to interventions. The current definitions do not capture what operators do in practice and that causes differences in reporting between operators. In the update we will provide more elaborate categories which will be a better reflection of how interventions are performed in practice.

Second, being able to track players across operators would lead to improved insights. At the moment we can only track players within operators. However, we have estimated that half of the players use more than one account in a period of six months (see [Monitoringsrapportage Online Kansspelen najaar 2024](#)). Any results presented above must be assessed and interpreted in the specific context of player accounts rather than players.

Third, the inclusion of some independent measure of problem gambling (like a PGSI score) in the data vault would allow us to test the explanatory power of indicators and improve the way models are tested and norms are formulated.

---

<sup>5</sup><https://kansspelautoriteit.nl/voor-zakelijke-aanbieders/online-kansspel/inrichten-beheren-controledatabank/>

## 5 References

CBS (2023). *Verdeling gestandaardiseerd inkomen*. <https://www.cbs.nl/nl-nl/visualisaties/inkomensverdeling>

Delfabbro, P., Parke, J., & Catania, M. (2024). Behavioural tracking and profiling studies involving objective data derived from online operators: A review of the evidence. *Journal of Gambling Studies*, 40(2), 639-671.

Focal Research (2022). *The Focal ALeRT Affordability Index: Finding Overspenders Among Regular EGM Gamblers. The Invisible At-risk Player – Identifying customers spending beyond affordable limits.*

Kesaite, V., Wardle, H., & Rossow, I. (2024). Gambling consumption and harm: a systematic review of the evidence. *Addiction Research & Theory*, 32(3), 194-203.



## 6 Appendix A: Definitions

Table 6.1

Indicator	Definition
Gross Gaming Revenue (GGR)	Sum of losses.
Incidental player	A player who gambled on fewer than five days and who lost 300 euros or less in one month.
Intervention	Responsible gambling intervention as registered in the data vault.
Losses	Sum of stakes minus sum of prizes won.
Maximum number of deposits per day	Highest number of deposits on a single day within a month.
Month	Calendar month.
Nighttime play	Play on five or more nights or losing more than 300 euros at night in a single month. 'Night' is defined as the hours between 00:00 and 06:00.
Non-incident player	A player who gambled on five days or more or who lost more than 300 euros in one month.
Number of playing days	Number of days with at least one stake
Young adult	A player aged 23 or under.



*Afzendinggegevens*

**Kansspelautoriteit**

Anna van Buerenplein 45A

2595 DA Den Haag

Postbus 298

2501 CG Den Haag

[www.kansspelautoriteit.nl](http://www.kansspelautoriteit.nl)