Are scratchcards addictive? : two-year cumulative incidence and stability of pathological scratchcard gambling among Dutch scratchcard buyers

de Fuentes-Merillas, L.

Citation for published version (APA):
Chapter 2

ARE SCRATCHCARDS ADDICTIVE? THE PREVALENCE OF PATHOLOGICAL SCRATCHCARD GAMBLING AMONG ADULT SCRATCHCARD BUYERS IN THE NETHERLANDS

ABSTRACT

Aims To determine the prevalence of regular, potential problematic, and pathological scratchcard gambling (PSG) five years after the introduction of scratchcards in the Netherlands.

Design and Participants A non-proportional stratified random sample of 12,222 scratchcard buyers was approached. Regular scratchcard buyers (N = 3,342) were asked to fill out the South Oaks Gambling Screen (SOGS). Those with a SOGS score of 3 or more (N = 340) were interviewed with the gambling section of the DSM-IV Diagnostic Interview Schedule (DIS-T). Weighted data were used to get unbiased prevalence estimates.

Findings The estimated prevalence of regular and potential problematic scratchcard gambling were 28.4% and 2.68% respectively. Only 0.24% met DSM-IV criteria for PSG. Of those, only 0.09% was uniquely addicted to scratchcards. The remaining 0.15% was also addicted to other games of chance. Demographic and gambling characteristics of these "combined" PSG (young men, mainly slot machines players) resembled characteristics of pathological gamblers in general. In contrast to these 'combined' PSG, 'unique' PSG were mainly women between 25 and 34 years who spent relatively small amounts of money on scratchcards (equivalent to one scratchcard a day).

Conclusion Scratchcards have a very low addiction potential among adults in the Netherlands. Given the specific characteristics of the unique PSG and the relatively small amount of money they spent, the appropriateness of DSM criteria for this particular form of gambling can be questioned.

INTRODUCTION

This report describes one of the largest studies in the world regarding the prevalence of problematic and pathological scratchcard gambling (PSG) among adult scratchcard buyers. So far, this relatively new game of chance has been introduced in more than 40 countries, among which are the USA, Canada, Great Britain, Germany, Australia and China. After a long and often heated public debate about their potential negative side-effects in terms of excessive playing, scratchcards were introduced in the Netherlands in 1994. Since the 1950s several authors have noted that the structural characteristics of different games are related to their addictive potential (Royal Commission on Gambling, 1951; Griffiths, 1995). Based on these structural characteristics, the addictive potential of scratchcards is generally considered to be

---

moderate, i.e. higher than the risk of standard lotteries but lower than the risk of slot or fruit machines and casino games. The most important characteristics that may actually facilitate excessive gambling with scratchcards are: (1) “short-payout intervals” referring to the short period of time between the stake and the outcome; (2) “low threshold” in terms of accessibility and costs; and (3) the psychological effect of the “near miss”, i.e. the occurrence of failures that are close to being successful, encouraging future play. As consequence of these and other similarities with fruit machines, scratchcards have been referred to as “paper fruit machines” (Griffiths, 2000).

Empirical evidence of the “addiction potential” of instant lotteries, however, is scarce. Hendriks et al. (1997) found among a sample of Dutch scratchcards buyers, that 4.1% were classified as “at-risk players” who bought at least 25 scratchcards in the previous month and met at least one at-risk or problem indicator. This study was conducted within a year of the introduction of the scratchcards in the Netherlands, and therefore, no conclusions could be drawn with regard to the risk of actual development of PSG, because it takes on average about 3.5 years before excessive gambling is recognised as a problem by the gambler himself or his social environment (Meyer, 1992).

Several British studies suggest a potential addiction risk of scratchcards. In a adult population sample, Shepherd, Ghods & London (1998) found that the number of DSM-IV criteria met (but not the number of pathological gambling diagnoses) had increased 6 months after the introduction of the National Lottery Instants. In a study among 11-15-year-old adolescents, 6% of the scratchcards players were diagnosed as pathological gamblers according to DSM-IV-J criteria (Wood & Griffiths, 1998). In another study among 11-16-year-old boys, 5% of the total sample and 12% of the gamblers (who had bought scratchcards themselves) met DSM-IV criteria for PSG (Griffiths, 2000). However, in Britain the sale of scratchcards to persons under the age of 16 is forbidden, and therefore the latter two studies are likely to address specific subgroups with specific psychological characteristics and lifestyles, which make the generalisation of these findings to a general adult population rather problematic.

In summary, the addictive potential of scratchcard gambling is still unknown. In order to obtain a valid estimate of the addictive potential of scratchcard gambling a large epidemiological study is needed. The current study attempts to establish the prevalence of regular, potential problematic and PSG among a representative sample of adult scratchcard buyers 5 years after their introduction in the Netherlands using standardised assessments procedures.

METHODS

Case definition and assessment instruments
Regular scratchcard gamblers were defined as people who bought their first scratchcard more than 6 months ago and who purchased of 10 or more scratchcards in the month prior to the assessment. Two simple questions were used to obtain this information. Regular scratchcard
gamblers were defined as potential problematic scratchcard gamblers if they had a score of three or more on an adapted Dutch version of the South Oaks Gambling Screen (SOGS, Lesieur & Blume, 1987). The original SOGS was adapted for this study through the replacement of the word “gambling” by “scratchcard gambling” and through the refining of the questions regarding the loss of control by exclusion of an impulsive purchase as an indicator of problematic gambling. The cut-off score of three was chosen to maximise sensitivity and to minimise the number of false negatives. Potential problematic scratchcard gamblers were defined as pathological scratchcard gamblers if they met the adapted criteria of a DSM-IV diagnosis pathological gambling, i.e. presence of at least five of the defining criteria during the year prior to the assessment. An adapted version of the Pathological Gambling Section of the DSM-IV Diagnostic Interview Schedule (DIS-T, Diagnostic and Statistical Manual of Mental Disorders, 1994) was used with separate questions on each item regarding scratchcard gambling and other games of chance excluding scratchcards and with onset and recency questions for each individual item. An example of this adaptation is: “has your scratchcard gambling ever caused you trouble with your partner or a family member?”, and “has your gambling on other games of chance excluding scratchcards ever caused you trouble with your partner, or a family member?”, instead of the original question “has your gambling ever caused you trouble with your partner or a family member?” In order to exclude the presence of a manic episode, a mania screener was developed based on Section F of the DSM-IV Diagnostic Interview Schedule (DIS-F, APA, 1994).

Sample
A non-proportional stratified sample was approached according to the following three steps. In the first step, a random sample of 246 out of the 2,285 sales outlets was drawn, stratified by region (north, south, west and east), urbanisation (urban and rural), and monthly scratchcards sales (< 3,630 €; 3,630 – 7,260 €; and ≥ 7,260 €). For each outlet, opening days and hours were divided into 3-5-hour periods. In the second step, a random sample of these opening periods was drawn. In the third and final step, a random sample of all scratchcard buyers at the selected time period was asked to participate in the study in all selected outlets. For a more efficient data collection, outlets and time periods with relatively high sales were oversampled. In total, 12,222 scratchcard buyers were approached at 246 outlets during a total of 4,379 hours of data collection, divided into 1,072 daily periods.

Of these 12,222 scratchcard buyers, 1.2% (n=148) were not eligible due to the presence of one or more of the following exclusion criteria: younger than 18 years, foreign resident, insufficient command of the Dutch language. Another 23.2% (n = 2839) refused to participate. Of these, 25% (n = 711) were willing to participate in a non-response analysis. The remaining 9,235 scratchcard buyers (75.6%) entered, a three-stage diagnostic procedure. In the first stage, 3,342 respondents fulfilled the criteria for regular scratchcard gambling. In the second stage, 3,111 regular scratchcard gamblers (93.1%) were screened with the SOGS for the presence of potential problematic scratchcard gambling. Of the 340 regular gamblers who fulfilled the criteria for potential problematic scratchcard gambling, 201 (59%) were interviewed with the DIS-IV and the Mania screen of the DIS-F in order to establish the
Are scratchcards addictive?

DSM-IV diagnosis pathological gambling. Non-response analyses were performed for all stages. No statistically significant differences were found between the participants and refusers on demographics or gambling participation.

Statistical analysis
It follows from the description of the sampling procedure that the crude sample is not representative of the Dutch scratchcard buyers for at least two reasons: (1) because scratchcard buyers from outlets with high monthly sales are over-represented in the non-proportional sample, and (2) because sampling at sales points gives regular scratchcard buyers a higher inclusion probability than occasional buyers. In order to get unbiased prevalence estimates weighting procedures were applied. In these procedures, the weight for a specific respondent approached for the study, at a specific time, at a specific outlet, is a function of his or her inclusion probability, which is a combination of (a) the probability of the outlet being in the sample, (b) the probability of the specific time period being in the sample given the outlet, (c) the probability of the specific respondent being in the sample given the outlet and time period, and (d) the frequency of scratchcards purchasing in the last 2 weeks before the assessment. The probability functions and the weighting procedures are further explained in Appendix 2.1 (see end of this chapter).

RESULTS

Regular scratchcard gambling
The estimated prevalence of regular scratchcard gambling among adult scratchcard buyers in the Netherlands is 28.4%. This means, that the vast majority of Dutch scratchcard buyers (71.6%) plays incidentally or has not been playing scratchcards for more than half a year (see Table 2.1).

The prevalence of regular scratchcard gambling is higher among men than women and seems to increase slightly with age. Regular scratchcard gambling is more prevalent in urban areas than in rural areas. A large majority of regular scratchcard players had bought 10-30 scratchcards during the previous month (men 81.6%; women 88.8%) and played scratchcards for more than 49 years.

Potential problematic scratchcard gambling
The prevalence of potential problematic scratchcard gambling among Dutch scratchcard buyers is estimated to be 2.68% (see Table 2.1). Men have a much higher prevalence of scratchcard problems according to the adapted SOGS than women. The prevalence of potential problematic scratchcard gambling seems to be related to age, with the lowest prevalence in the age group between 35 and 50. Again, urban areas have a higher prevalence than rural areas.
<table>
<thead>
<tr>
<th></th>
<th>Regular Scratchcard Gamblers</th>
<th>Potential problematic Scratchcard Gamblers</th>
<th>Combined Pathological Scratchcard Gamblers</th>
<th>Unique Pathological Scratchcard Gamblers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>% Confidence Interval</td>
<td>% Confidence Interval</td>
<td>% Confidence Interval</td>
<td>% Confidence Interval</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>28.4 (27.8 - 29.0)</td>
<td>2.68 (2.50 - 2.88)</td>
<td>0.24 (0.19 - 0.31)</td>
<td>0.09 (0.06 - 0.14)</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>33.0 (32.1 - 33.9)</td>
<td>3.46 (3.16 - 3.77)</td>
<td>0.30 (0.22 - 0.41)</td>
<td>0.05 (0.02 - 0.11)</td>
</tr>
<tr>
<td>Women</td>
<td>23.3 (22.5 - 24.1)</td>
<td>1.85 (1.63 - 3.67)</td>
<td>0.18 (0.11 - 0.26)</td>
<td>0.14 (0.08 - 0.21)</td>
</tr>
<tr>
<td><strong>Age Categories</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18 - 24</td>
<td>22.1 (20.7 - 23.6)</td>
<td>2.67 (2.19 - 3.22)</td>
<td>0.57 (0.36 - 0.86)</td>
<td>0.01 (0.003 - 0.12)</td>
</tr>
<tr>
<td>25 - 34</td>
<td>24.6 (23.3 - 26.0)</td>
<td>3.15 (2.69 - 3.67)</td>
<td>0.56 (0.38 - 0.81)</td>
<td>0.35 (0.21 - 0.56)</td>
</tr>
<tr>
<td>35- 49</td>
<td>28.8 (27.7 - 29.9)</td>
<td>1.84 (1.57 - 2.14)</td>
<td>0.11 (0.05 - 0.20)</td>
<td>0.01 (0.000 - 0.07)</td>
</tr>
<tr>
<td>50&lt; / 50+</td>
<td>32.3 (31.2 - 33.4)</td>
<td>3.17 (2.84 - 3.53)</td>
<td>0.07 (0.03 - 0.14)</td>
<td>0.06 (0.03 - 0.14)</td>
</tr>
<tr>
<td><strong>Urbanisation</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rural</td>
<td>25.5 (24.3 - 26.7)</td>
<td>1.88 (1.57 - 2.24)</td>
<td>0.03 (0.001 - 0.10)</td>
<td>0.03 (0.001 - 0.10)</td>
</tr>
<tr>
<td>Urban</td>
<td>29.2 (28.5 - 29.9)</td>
<td>2.92 (2.70 - 3.16)</td>
<td>0.31 (0.24 - 0.39)</td>
<td>0.11 (0.07 - 0.17)</td>
</tr>
</tbody>
</table>

*Estimates of regular scratchcard players were rounded to 1 decimal place.
Are scratchcards addictive?

Pathological scratchcard gambling
Only 0.24% of the sample met DSM-IV criteria for PSG. Moreover, half of these pathological scratchcard gamblers also met pathological gambling criteria for other games of chance, with an earlier onset of pathological gambling to these other games (slot machines, bingo, casino, etc.). The prevalence of “unique” pathological scratchcard gambling is estimated to be only 0.09%. Prevalence estimates of PSG combined with other forms of pathological gambling and unique PSG are shown in Table 2.1.

Comparison of potential problematic and pathological scratchcard gamblers
For comparison reasons, potential problematic scratchcard gamblers are divided into three groups: (1) problematic non-pathological scratchcard gamblers (SOGS score ≥ 3, but no pathological scratchcard gambling diagnoses; N=3,083), (2) combined pathological scratchcard gamblers (meeting DSM-IV criteria of both PSG and pathological gambling on other games of chance; N=14), and (3) unique pathological scratchcard gamblers (meeting DSM-IV criteria for pathological scratchcard gambling but not for other forms of gambling; N=14). Table 2.2 displays the demographic and gambling characteristics of these three groups.

Table 2.2 Demographics and participation in games of chance for potential problematic scratchcard gamblers (PPSG) and pathological scratchcard gamblers (PSG)

<table>
<thead>
<tr>
<th></th>
<th>PPSP</th>
<th>PPG</th>
<th>Combined</th>
<th>Unique</th>
</tr>
</thead>
<tbody>
<tr>
<td>Men</td>
<td>70.1%</td>
<td>87.2%</td>
<td></td>
<td>28.8%</td>
</tr>
<tr>
<td>Women</td>
<td>29.9%</td>
<td>12.8%</td>
<td></td>
<td>71.2%</td>
</tr>
<tr>
<td>Mean age</td>
<td>43.44</td>
<td>26.95</td>
<td></td>
<td>42.09</td>
</tr>
<tr>
<td>Autochthon</td>
<td>79.6%</td>
<td>66.9%</td>
<td></td>
<td>82.5%</td>
</tr>
<tr>
<td>Participation in Scratchcards in the previous month</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frequency (median)</td>
<td>4</td>
<td>3</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Amount of money spent/median</td>
<td>€22.69</td>
<td>€90.76</td>
<td>€18.15</td>
<td></td>
</tr>
<tr>
<td>Participation in other games of chance in the previous month</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Median games of chance played</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Amount of money spent/median</td>
<td>€36.30</td>
<td>€340.34</td>
<td>€0</td>
<td></td>
</tr>
<tr>
<td>Slot machines</td>
<td>33.8%</td>
<td>83.1%</td>
<td>13.5%</td>
<td></td>
</tr>
<tr>
<td>Frequency (median)</td>
<td>2</td>
<td>10</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Lotto/toto/other sort of lotteries</td>
<td>67.2%</td>
<td>40.5%</td>
<td>28.1%</td>
<td></td>
</tr>
<tr>
<td>Frequency (median)</td>
<td>2</td>
<td>4</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Bingo</td>
<td>6.1%</td>
<td>28.2%</td>
<td>1.2%</td>
<td></td>
</tr>
<tr>
<td>Frequency (median)</td>
<td>6</td>
<td>4</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Cards for money outside of the house, frequency</td>
<td>2.1%</td>
<td>23.1%</td>
<td>13.0%</td>
<td></td>
</tr>
<tr>
<td>(median)</td>
<td>5</td>
<td>1</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Casinos (Excl. Slot machines)</td>
<td>27.2%</td>
<td>23.6%</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Frequency (median)</td>
<td>3</td>
<td>3</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

1None of subjects have participated on internet gambling, bet on horses or other games of chance not included in Table 2.2.
Chapter 2

Unique pathological scratchcard gamblers constitute a rather distinctive group. More than two-thirds (67.2%) were women aged 25-35 years with no more than primary education and only about a quarter (23.4%) were men aged 50 or older. The median frequency of scratchcards purchasing is higher among the unique pathological gamblers than among either problematic non-pathological and combined PSG. However, the amount of money spent on scratchcards was higher among combined PSG. The median amount of money spent on scratchcards in the previous month by the unique pathological gamblers was the equivalent of only one scratchcard per day and very similar to the amount of money spent by problematic non-pathological scratchcard gamblers. Unique pathological gamblers did not seem to be very involved in other forms of gambling. The median amount of money spent on other forms of gambling was zero (min 0 - max. € 192.84) and percentages of participation in other games of chance during the previous month were low, in contrast with the frequency of participation in playing slot machines from the combined PSG (83.1%).

DISCUSSION

The findings of the current study show that pathological scratchcard gambling is a rare phenomenon among adult scratchcard buyers in the Netherlands. More than 12,000 buyers of scratchcards were approached to find 28 pathological scratchcard gamblers. In half of these 28 cases PSG seems to be part of a more general pathological gambling problem, which had developed prior to the start of the problems with scratchcard gambling. This finding suggests that scratchcard gambling is not a stepping-stone towards other forms of pathological gambling. However, a longitudinal study is needed to test this hypothesis adequately.

Unique PSG was even more rare and exceptional. Pathological gambling is generally more prevalent among men, while the group of unique PSG consisted mainly of women players. This finding corroborates Grupita & Deverensky’s (1998) suggestion that women are indeed more attracted to particular games of chance such as scratchcards. With these unique PSG our study might have identified an unknown risk group for pathological gambling. These unique PSG are not found in treatment settings; the only pathological scratchcard gamblers found at treatments settings are the combined group, which make the unique group even more exceptional. This fact was also confirmed in a German study (IPM, 1993).

However, one could also question the appropriateness of the term “pathological” in the case of these gamblers. According to the DSM, the essential feature of pathological gambling is persistent and recurrent maladaptive gambling behaviour that disrupts personal, family or vocational pursuits. A large degree of disruption of these scratchcard gamblers’ lives is improbable. The amount of money that this group spent on scratchcards is relatively small and comparable to the amount of money that non-pathological scratchcard gamblers spent. It is hard to image that these small amounts of money could be the cause of severe financial problems. There are several explanations for this finding. On one hand, there is a growing literature questioning the validity of self-report data on money spent on gambling; the consensus on this issue is that the reported amount underestimates substantially the actual

37
Are scratchcards addictive?

amount of money spent. On the other hand, fulfilling DSM-IV criteria for pathological gambling might not indicate the same level of gambling related problems for a person with scratchcard related gambling problems than for a person with slot machine-related gambling problems. If this is the case, the threshold of these criteria for pathological gambling is lower for scratchcard gamblers than for slot machine gamblers. Further qualitative research is needed to investigate the singularity of this exceptional group of unique pathological scratchcard gamblers and to assess whether their problems justify a DSM-IV diagnosis of PSG.

Although the present study is one of the largest studies in the world regarding the prevalence of regular, potential problematic and PSG among adult scratchcard buyers, the authors would like to acknowledge the following limitations. First excluding under-age buyers and new Dutch residents who are not fully competent in the Dutch language may bias our prevalence rate. However, we do not expect excluding respondents with insufficient command of the Dutch language to have a big impact on the prevalence estimates, as we excluded only those unable to understand the questions. In the Netherlands these are two groups of people: (1) tourists and (2) immigrants not well integrated into the Dutch culture. The first group should be excluded in a Dutch prevalence estimate, the latter is a relatively small fraction of the ethnic minorities in Holland but might be more at risk for PSG. Adding under-age gamblers to our study would increase the denominator of the prevalence estimate but also the numerator. The net effect will be an increase in the prevalence estimate only under the assumption that under-age players are more at risk to develop PSG. Exclusion of persons under 18 year of age also implies that our findings pertain only to adults and cannot be generalised to under-age gamblers.

Second, national differences in gambling opportunities must be taken into account. The addiction potential of a specific game of chance is also a function of the accessibility/availability of other continuous forms of gambling (i.e. slot machines, casinos, bets, bingo, etc.). Thus, scratchcard might be more addictive in a context where, compared with the Netherlands, access to continuous gambling forms is very limited.

Finally, all prevalence estimates pertain to adult scratchcard buyers. However, as the penetration rate of scratchcard in the Dutch general adult population in 1999 was 19%, the prevalence of pathological scratchcard gambling for the general adult population can be estimated to be 0.046% (0.029% combined and 0.017% unique pathological scratchcard players).

REFERENCES


Are scratchcards addictive?

APPENDIX 2.I - A three-stage sampling procedure was used:

A: inclusion probabilities
indexes i = strata, j = outlets, k = time periods, l = transactions.

Sampling was conducted in three steps. Step 1, sample outlet from stratum with \( n_i = \text{number of outlets selected in stratum } i \); \( N_i = \text{number of outlets in stratum } i \), step 2, sample time periods from all time periods in the selected outlet with, \( u_{ij} = \text{number of time periods selected outlet } j \text{ stratum } i \); \( U_{ij} = \text{total number of time periods outlet } j \text{ stratum } i \) and step 3, sample transactions from all transactions in the selected outlet at the selected time period with \( m_{ijk} = \text{number selected transactions period } k, \text{ outlet } j \text{ stratum } i \); \( M_{ijk} = \text{total number of transactions period } k, \text{ outlet } j \text{ stratum } i \). At all three steps a random sampling procedure was used. At step 1 and 2 we used a computer program (SPSS 8, procedure ‘sample’), at step 3 interviewers were instructed to interview the first person buying a scratchcard, when more people were buying a scratchcard simultaneously (for instance a couple) the person who paid for the scratchcard was selected when the interview was finished the procedure was repeated.

First step: \( \pi_{ij} = \text{inclusion probability of outlet } j \text{ from stratum } i \)
\[
\pi_{ij} = \frac{n_i}{N_i}
\]
Second and third step: \( P_{ijkl} = \text{Inclusion probability for a specific person buying a scratchcard at time period } l \text{ in outlet } j \text{ of stratum } i \)
\[
P_{ijkl} = 6f_{ijkl} \frac{u_{ij}}{U_{ij}} \times \frac{m_{ijk}}{M_{ijk}}
\]
The factor \( 6f_{ijkl} \) converts the transaction probability into the probability of the selected respondent by taking into account the frequency with which the person buys scratchcards. \( f_{ijkl} \) is the average number of times a week the selected respondent bought scratchcards, this is multiplied by ‘6’ because we sampled 6 weeks at each outlet.

B: Corrected prevalence estimates
Estimated total number of pathological scratchcard gamblers in the Netherlands
\[
t = \sum_{i=1}^{I} t_i
\]
with \( t_i = \sum_{j=1}^{J_i} t_{ij} \); \( t_{ij} = \sum_{k=1}^{K} \sum_{l=1}^{L} \frac{Y_{ijkl}}{p_{ijkl}} \)
\( Y_{ijkl} \) indicates whether a selected respondent is a pathological scratchcard gambler (1 = yes, 0 = no)

40
Estimated prevalence of pathological scratchcard gamblers in the Netherlands

\[ \text{prev} = 100 \frac{t}{a} \]

where \( a \) = estimated total number of scratch buyers in the Netherlands

\[ a = \sum_{i=1}^{5} a_i \]
\[ a_j = \sum_{i=1}^{n_i} \frac{a_j}{\pi_j} \]
\[ a_j = \sum_{k=1}^{\infty} \sum_{l=1}^{n_j} \frac{1}{p_{ijkl}} \]

C: 95% Confidence interval for estimates.

Due to the complexity of sampling procedure, we used a method that does not give the exact but approximated confidence intervals.

Number of pathological scratchcard gamblers in a specific outlet is assumed to follow a Poisson distribution. Total number of pathological scratchcard gamblers is a weighted sum of the number per outlet. The sum of a Poisson distributed variable also follows a Poisson distribution.

When the total number of scratchcard buyers \( z \) is a stochastic variable that follows a Poisson distribution the lower bound and upper bound for the 95% confidence interval of \( z \) are approximated by \( (\sqrt{z} - 0.98)^2 \) and \( (\sqrt{z} + 1 + 0.98)^2 \), (J.J. Dik, 1977).

A confidence interval for the prevalence can be obtained by dividing the lower and upper bound estimates of the total number of pathological scratchcard gamblers by the estimated total number of scratchcard buyers and multiply this figure by 100.