

The Population Mean and the Proportion of Frequent Gamblers: Is the Theory of Total Consumption Valid for Gambling?

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Abstract The study looks at three representative samples of Norwegians in different age groups with the aim of finding evidence for the validity of the total consumption model for the area of gambling. The results show that gambling was distributed in the population in a way consistent with the predictions of the total consumption theory. Populations with a low mean gambling frequency had a lower proportion of frequent gamblers than populations with a high mean gambling frequency. It was also shown that in a population with a low mean gambling frequency, consumers along the whole consumption continuum gambled less frequently, than in a population with a high mean gambling frequency. It is concluded that the total consumption model seems to be valid for gambling, and that gambling consequently needs to be understood as a public health issue. The actions and behaviours of the normal majority can then not be regarded as irrelevant for the development in problem gambling prevalences.

Keywords Total consumption model · Gambling distribution · Mean gambling frequency · Frequent gamblers

Introduction

Within the field of alcohol research, it has long been acknowledged that there is a general positive association between the population level of consumption of alcohol and the proportion of heavy drinkers in society (Babor et al. 2003; Bruun et al. 1975). This relationship, originally proposed by Lederman (1956), is known by several names, including the total consumption model and the single distribution theory. Previous research has also found that the validity of the single distribution theory is not limited to alcohol. On the contrary, it gives a good description of a variety of different phenomena, ranging from

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obesity and high blood pressure, to birth weight (Kramer 1987; Rose and Day 1990; Rose 2001).

Several studies have found evidence of increased gambling involvement as accessibility increases (Grun and McKeigue 2000; Room et al. 1999; Turner et al. 1999), and this has been taken in support of the validity of the theory of total consumption also for gambling. However, their conclusions have been challenged by some researchers, for example Abbott (2006), who recently suggested that empirical evidence from Australia and New Zealand indicates that the relationship between gambling expenditure and problem levels only applies for populations who are relatively new to gambling. There are therefore good reasons to assert that the question of how gambling is distributed in the population is still unresolved. However, this is not a trivial matter, and more research is needed before this question can be answered. If the theory of total consumption is valid for gambling, its impact on the conceptualization of this area is potentially vast. A strong positive correlation between mean gambling “consumption”¹ and the proportion of heavy gamblers in a society would strengthen the position of a public health approach to gambling, and ultimately make the prevalence of heavy gambling a common responsibility for all.

The Model

The basic assumption of the total consumption theory is that the distribution of consumption is one-parametric, i.e., that there is a fixed relationship between the population mean and the variance of the distribution (Edwards et al. 1995). This property implies that changes in the mean are caused by shifts in consumption levels along the entire consumption continuum. It also implies that the whole distribution of consumption lies lower in a population with a low mean, than in a population where the mean is high. In other words, the theory rejects the notion that changes in the consumption of frequent gamblers alone lie at the bottom of increases or decreases in mean gambling. Likewise, it also rejects the notion that increases in the mean might result from increased gambling involvement only among those who earlier gambled moderately or very moderately, while the heavy gambler group stay unaffected and unchanged in size. This would perhaps seem trivial, but in the case of addictive substances, popular opinion often contradicts these ideas. The notion that heavy users are a special breed, different from moderate users, has had many followers, and among the prevailing ideas we also find one that states that the consumption levels of addicted individuals are not sensitive to changes in external circumstances such as prices, availability or the consumption levels of other people. Instead, it is argued that addicts consume as much as they do because they have no choice. The addiction controls their intake. Depending on the substance in question, these types of arguments might still have some support.

According to the theory, when people along the whole consumption continuum increase their gambling, this will also include individuals who already gamble at a level just below the limit for heavy gambling. When they start to gamble more, these people will become part of the heavy gambler group, which consequently increases in size.

Supported by empirical evidence, other assumptions are that the distribution of consumption is skewed and that it is unimodal. The skewness assumption has been subject to much discussion. When the theory was first formulated in the area of alcohol consumption,

¹ Even though gambling is normally thought of as a behaviour, it is here regarded as a “good” or service that is bought, hence the somewhat unfamiliar use of the word consumption.

it was assumed that the distribution resembled the lognormal distribution (Lederman 1956), although later on other skewed distributions, e.g., the Gamma distribution, were put forward as a better fit (Skog 1980). However, as emphasized by Lemmens (1991), the important aspect is not which, if any, theoretical distribution best fits the empirical consumption data, as long as the distribution is skewed, with a long right-hand tail. This property reflects the fact that there are more people with low and moderate consumption levels than with high levels.

Unimodality implies that the distribution has only one maximum, i.e., that the proportion of consumers gets gradually smaller as the level of consumption increases above the one most common level.

It has been suggested that social interaction plays a crucial role in the process of disseminating consumption changes throughout the population (Skog 1980). This is an idea that fits well with how people's involvement in gambling appears to be shaped. Two examples of studies that suggest that a social component influences gambling behaviour are Welte et al. (2004), where it was shown that problem prevalences differ in different neighbourhoods, and Moodie and Finnigan (2006) where results showed that adolescents with friends who gambled tended to gamble more. In a smaller scale setting, Rockloff and Dyer (2007) showed how the impression of other gamblers playing in adjacent rooms made people gamble more on electronic gambling machines. Additionally, a number of studies have found that the level of gambling among family members and friends is positively associated with a person's own gambling or gambling problems (i.e., Bonke 2007; Ladouceur et al. 1998; Black et al. 2006).

Aims

Since the total consumption model has proved to be useful for so many different areas of consumption, it is relevant to test whether the model also applies for gambling. Therefore, the objective of this study was to see whether Norwegian survey data provide evidence to support the validity of the theory of total consumption for gambling. Furthermore, the relevance and implications of the model are discussed, particularly in relation to the prevalence of gambling problems.

Methods

Data Sources

The analyses reported in this study were based on three different data sets. The first, a national survey of gambling among adults in 2002, was a combined telephone and postal survey, with a gross sample of 10,000 people. The response rate was 55%, the mean age was 42.6 years, and the sample is considered to be representative of the population aged 15–74 years old. Further details about the data are found in Lund (2006). The second, a national omnibus survey among adults in 2005, was a postal survey carried out by a commercial pollster. Approximately 4,000 respondents aged 15–90 had agreed to participate beforehand and 3,849 (96.2%) of the recruited individuals responded. The mean age of the sample was 47.6 years. The sample is considered to be representative of the adult population (MMI Politikk og samfunn 2006). The third was a school-based survey among adolescents in 16 Norwegian municipalities in 2004. All the junior and senior high schools

in the 16 municipalities were covered, and the questionnaire was filled out anonymously and voluntarily by the pupils at school. The gross sample included 25,879 pupils, and the response rate was 80.2%. The sample had an age range of 12–19 years, a mean age of 15.4 years, and is considered to be representative of the age group (Pape et al 2005).

Variables

The focus of the current study was the associations between mean gambling participation and the proportion of heavy gamblers, but the available information on actual gambling volume was limited. Only two of the surveys contained information on gambling volume: The 2002 survey included a question on gambling expenses (how much money have you gambled for over the last 30 days on [type of game]?), while the 2004 survey only had a question on maximum gambling expenses (What is the largest amount of money that you have gambled in one day?). However, results from previous research have shown that gambling expenses tend to be positively correlated with gambling frequency (Rönneberg et al. 1999; Bonke and Borregaard 2006), and this was also the case in the two current data sets. The Pearson (2-tailed) correlation between gambling frequency and gambling expenditure in 2002 was 0.46 ($p < 0.01$), while it was 0.41 ($p < 0.01$) between gambling frequency and largest amount gambled in one day in 2004. According to Cohen (1988) this signifies medium to strong correlations, equivalent to almost 25% explained variance. Furthermore, on average, frequent gamblers in the 2002 sample gambled for approximately eight times more money per month than less frequent gamblers did (Lund and Nordlund 2003).

Gambling frequency thus seems to give a good approximation to gambling volume, particularly on the population level, and this was the variable used in the analysis. Total gambling frequency variables were calculated for all three samples. In the 2002 and 2004 surveys, gambling frequency was measured as pre-given alternatives (daily, several times per week, etc.) for participation in several types of gambling over the last 12 months. The 2002 survey grouped all games into nine different types of gambling, while the 2004 survey grouped them into six types. From these alternatives, semi-continuous last 12 months gambling frequencies were calculated for each type of gambling, and then added together to form a total gambling frequency for each individual. In the 2005 survey, respondents were asked to report how many times they had participated in 15 different types of gambling over the last 3 months, on a scale from 0 to 13. Added together, these frequencies gave a continuous overall last three months gambling frequency for each individual. In all three samples, frequent gamblers were defined as people who had gambled twice a week or more.

To facilitate comparisons between populations with different mean consumptions, the samples were split into several sub-samples. First, to look for associations between mean gambling frequency and the proportion of frequent gamblers, the 2002 and 2005 samples were split by county (i.e., 19 groups), while the 2004 sample was divided into 10 groups of schools based on mean gambling frequency. Schools with mean gambling frequency in the lowest 10% formed one group, and so on up to the highest 10%. Second, the samples were split by gender to investigate whether a higher mean gambling frequency means that people along the entire consumption continuum gamble more. In Norway, as in many other countries, men generally tend to gamble more than women (Lund and Nordlund 2003). The theory therefore predicts that the whole distribution of consumption for men would lie above the distribution of consumption for women.

Analysis

The analysis consists of graphical descriptions of the samples. Histograms show the distribution of gambling and, following Lemmens’ (1991) advice to use the lognormal distribution as the point of departure, probability-plots were used to compare the empirical data with that distribution. Associations between mean gambling consumption and the proportion of frequent gamblers in counties and groups of schools were examined graphically, as was also the distribution of gambling within genders.

Results

As Fig. 1 shows, the three samples share the same expected characteristics in that the distribution of gambling is very skewed, with a majority of people gambling moderately or not at all. The long right-hand tails represent the smaller groups of people who gambled at higher levels. Furthermore, the P–P plots in Fig. 2 show that these distributions resemble the lognormal distribution. The conspicuous discrepancy between expected and observed gambling frequency in the higher end of the curve representing the 2002 sample is probably an effect of the way the frequency question was asked. Compared to the other available games, a large proportion of players of lotto and football pools have answered that they participate 2–3 times per week (39% and 35%, respectively). It is quite common for lotto gamblers to send in the same rack of numbers for each draw, a habit that makes them unwilling to miss a draw. However, it is still likely that some of these regular gamblers have missed the occasional draw, and that in effect we have got an exaggerated number of more than weekly gamblers. The reason why this effect was not seen in the youth material is probably because adolescents do not participate in lotto or football pools to the same degree. Less than 33% of them said they had participated in one of these games over the last 12 months, and only 2.5% said they had played them more than weekly.

Overall it seems that even though these samples were collected at different points in time, include different age groups, and measure gambling frequency in different ways, the empirical data satisfy both the skewness and the unimodality assumptions made in the total consumption model. Furthermore, the empirical distributions are close to the log-normal distribution.

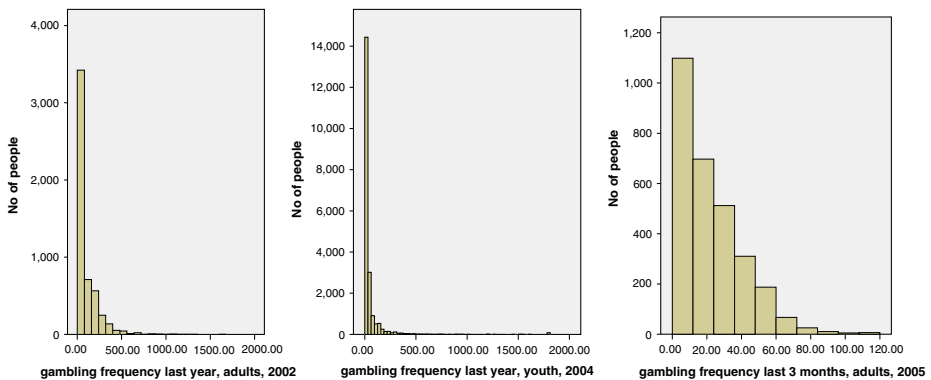


Fig. 1 Distribution of gambling in three different Norwegian samples

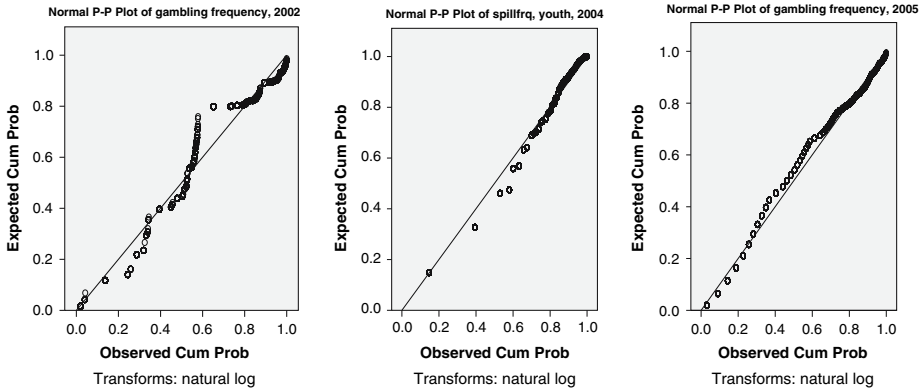


Fig. 2 P–P plots of gambling distribution in three different Norwegian samples

When we turn to the associations between the mean level of gambling and the proportion of frequent gamblers in subgroups of these samples, the results are also in line with the predictions of the total consumption model. As shown in Fig. 3, there was a clear positive relationship between mean gambling frequency and the proportion of frequent gamblers in all three data sets. Counties and schools with a low mean gambling participation also tended to have smaller proportions of frequent gamblers than counties and schools where the mean gambling participation was higher. As could be expected with empirical data, these relationships were not perfect. Variations around the regression exist, and it should be understood that the one-parametric distribution model is an approximation. However, these variations are relatively small. This is also seen by the relative constancy of the proportion of the samples for which the frequency of gambling is at least twice the population mean. For the two adult samples this proportion was 15.3% in 2002, and 13.7% in 2005, while among adolescents in 2004, the proportion was 11.1%. These results are in accordance with findings from alcohol research, as the proportion of the population that drinks more than twice the mean has typically been found to lie between 10 and 15% (Skog 1985).

Figure 4 shows a comparison of the gambling frequencies in 10 percentiles of the three different samples, and in 10 percentiles of men and women (boys and girls) within each

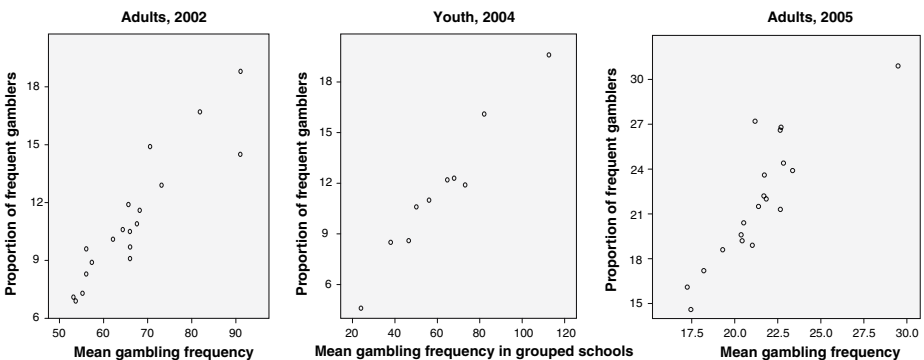


Fig. 3 Associations between mean gambling and frequent gambling

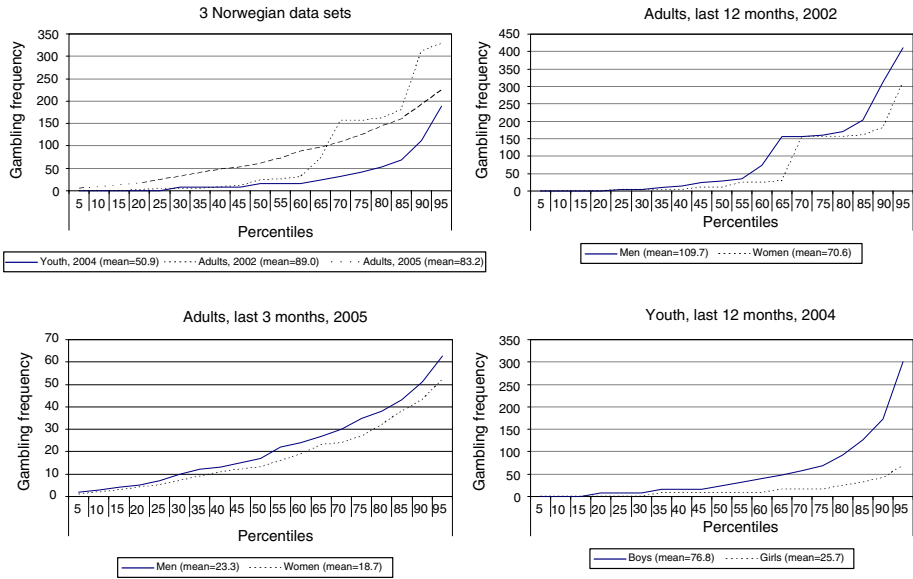


Fig. 4 Comparisons of gambling frequency in different samples

sample. As we see, sub-samples with a higher mean gambling frequency were characterized by more gambling along the whole consumption continuum than sub-samples with a lower mean gambling frequency. This is particularly evident when we look at the situation within each of the three samples. Men and boys (high mean frequency) who gambled moderately, gambled more than women and girls (low mean gambling frequency) who gambled moderately. For example, while the 50th percentile (median) of men in 2005 had gambled 17 times over the last three months, the corresponding figure for women was 13. In other words, the 50th percentile of men gambled about 31% more often than the 50th percentile of women.

These associations became less clear when we compared gambling frequency in percentiles of the three complete samples. Most problematic is that the consumption distributions for the two adult samples cross each other, indicating that there was more gambling in the low and moderate groups in 2005, while people at the top end of the scale gambled more in 2002. However, differences in measurements between the surveys make comparisons difficult. While adults in 2002 and youth in 2004 reported their gambling frequency over the last 12 months, adults in 2005 were asked about the last 3 months, but for a higher number of different types of gambling. This might have led to more reported gambling in the low and moderate groups. Equally important, as the highest possible gambling frequency for each type of gambling in 2005 (13) amounted to little more than weekly gambling, the highest gambling frequencies are likely to be less well represented in the 2005 data than in the other two sets.

Discussion

The results from this study have shown that the Norwegian population gambles in a way that is consistent with the proposals and predictions of the total consumption theory. Not

only does high mean gambling frequency imply a higher proportion of frequent gamblers, but it has also been demonstrated that everyone tends to gamble more in sub-populations with a higher mean gambling frequency, while the opposite is true for sub-populations with a lower mean gambling frequency. In other words, gambling has similar characteristics as for example alcohol consumption, in that changes in the population mean imply changes in the consumption levels of consumers along the entire consumption scale (Skog 1985). These findings are very important, because they show that the idea that high frequency gamblers are an independent entity not influencing, or influenced by, the rest of the population, is false.

What Critics Say

The fact that there is no actual substance involved conveys the impression that gambling is different from, for example, alcohol consumption. The associations between consumption levels and damage seem less clear, an aspect that may have led researchers to question the relevance of the total consumption model in this area. However, as discussed by Ladouceur et al. (1998), some theories propose a common physiological basis for addictive disorders, related to the brain's gratification system. Furthermore, the associations between gambling frequency and gambling problems have been discussed on several earlier occasions. Gambling prevalence studies around the world generally indicate that countries with a high mean gambling involvement also have a higher prevalence of gambling problems (Orford 2005), and gambling frequency has repeatedly been found to be positively associated with gambling problems. It therefore seems relatively straightforward to expect that there would also be a positive association between mean participation and problem levels, although probably not as strong as between mean participation and the proportion of frequent gamblers.

The availability of gambling is another aspect of the gambling landscape sometimes referred to when critique against the total consumption model is voiced, for example when Abbott (2005, 2006) and Shaffer (2005) hypothesize that a process of adaptation makes people gamble less, and develop fewer problems, even though gambling exposure has increased. Whether or not such a process exists remains a matter for discussion and research, but it should be made clear that the theory of total consumption may be applicable even if it does. It is important to realise that the theory in itself makes no predictions related to the availability of gambling. More specifically, if the associations between gambling availability and gambling problems are as sketched out in Fig. 5, the total consumption theory only pertains to steps 2 and 3 in the figure.

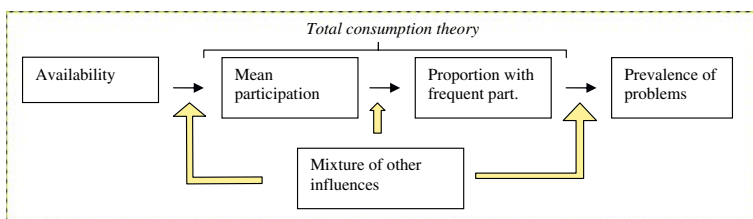


Fig. 5 A simplified model of the links between availability and problems

Implications of the Model

Even though the link between gambling availability and mean gambling involvement lies outside the scope of the total consumption model, it is highly relevant when we turn to the implications of the model, as are also the links between frequent gambling and gambling problems. By making the population mean a key figure, the results of this study provide an argument for treating gambling as a public health issue and implement policy measures designed to reduce average gambling involvement in the population. Although still useful, preventive action focusing only on vulnerable groups may be less effective than previously thought, and instead the actions and behaviours of the normal majority must be addressed in order to improve the situation for the troubled minority. The overwhelming support from research for the gambling-increasing effect of higher availability (e.g., Orford 2005), suggests that a potentially effective action would be to restrict this availability for instance by introducing age limits or closing hours, by controlling the available choice of games, or by restrictions on the maximum bet on existing games.

Another implication of the model is that the population mean can be utilized as an indicator for the development of frequent and problematic gambling. For policymakers and gambling researchers alike this is good news, as it is both cheaper and simpler to find the average gambling volume in a country than to find the prevalence of gambling problems. It also gives a rationale for keeping national records of gambling sales, a practice that is already in place in some countries.

Limitations and Suggestions for Further Study

The three data sets that this study is based on vary in age range, sampling methods and questions asked. However, they are drawn from the same culture, and only a few years apart. As the shape of the consumption distribution is not carved in stone, different countries might have steeper or flatter distributions, and the distribution within a country may even change over time depending on changes in cultural or gambling-related factors. However, according to the theory of total consumption, they should still be one-parametric and skewed. The reliability of the findings could therefore be improved by studying the distribution of gambling in other cultures, or over a longer time span. Furthermore, more research into the nature and extent of the associations between gambling availability and participation on the one hand, and gambling participation and problems on the other would increase our insight of the full implications of the total consumption theory for the gambling area.

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