RESEARCH REPORT

doi:10.1111/add.13929

The relationship between gambling expenditure, socio-demographics, health-related correlates and gambling behaviour—a cross-sectional population-based survey in Finland

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ABSTRACT

Aims To investigate gambling expenditure and its relationship with socio-demographics, health-related correlates and past-year gambling behaviour. **Design** Cross-sectional population survey. **Setting** Population-based survey in Finland. **Participants** Finnish people aged 15–74 years drawn randomly from the Population Information System. The participants in this study were past-year gamblers with gambling expenditure data available (n = 3251, 1418 women and 1833 men). **Measurements** Expenditure shares, means of weekly gambling expenditure (WGE, €) and monthly gambling expenditure as a percentage of net income (MGE/NI, %) were calculated. The correlates used were perceived health, smoking, mental health [Mental Health Inventory (MHI)-5], alcohol use [Alcohol Use Disorders Identification Test (AUDIT)-C], game types, gambling frequency, gambling mode and gambling severity [South Oaks Gambling Screen (SOGS)]. **Findings** Gender (men versus women) was found to be associated significantly with gambling expenditure, with exp(β) = 1.40, 95% confidence interval (CI) = 1.29, 1.52 and $P < 0.005$ for WGE, and exp(β) = 1.39, 95% CI = 1.27, 1.51 and $P < 0.005$ for MGE/NI. All gambling behaviour correlates were associated significantly with WGE and MGE/NI: gambling frequency (several times a week versus once a month/less than monthly, exp(β) = 30.75, 95% CI = 26.89, 35.17 and $P < 0.005$ for WGE, and exp(β) = 31.43, 95% CI = 27.41, 36.03 and $P < 0.005$ for MGE/NI), gambling severity (probable pathological gamblers versus non-problem gamblers, exp(β) = 2.83, 95% CI = 2.12, 3.77 and $P < 0.005$ for WGE, and exp(β) = 2.67, 95% CI = 2.00, 3.57 and $P < 0.005$ for MGE/NI) and on-line gambling (on-line and land-based versus land-based only, exp(β) = 1.35, 95% CI = 1.24, 1.47 and $P < 0.005$ for WGE, and exp(β) = 1.35, 95% CI = 1.24, 1.47 and $P < 0.005$ for MGE/NI). **Conclusions** In Finland, male gender is associated significantly with both weekly gambling expenditure and monthly gambling expenditure related to net income. People in Finland with lower incomes contribute proportionally more of their income to gambling compared with middle- and high-income groups.

Keywords Alcohol use, gambling expenditure, health, mental health, population survey, problem gambling, socio-demographics.

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Submitted 19 November 2016; initial review completed 25 January 2017; final version accepted 26 June 2017

INTRODUCTION

Gambling opportunities are expanding rapidly world-wide, and gambling has become increasingly normalized with the continuing growth of advertising and development of new platforms [1,2]. At the same time, it is known that individuals, families and communities are affected by gambling-related harms [3,4]. It is important in this situation to know how much of government gaming revenue is generated by certain groups of individuals. In particular, an ethically and socially responsible gambling policy requires a clear picture of the breakdown of expenditure by

individuals in different age groups, from different socio-economic backgrounds and particularly by individuals with gambling problems. Expenditure is interchangeable with gaming revenue or the gaming operator's gross profit: it is the amount of money that players spend or lose. The theory of total consumption implies that gambling expenditure is associated positively with gambling-related harm, as pointed out in studies from Nordic countries [5,6] and elsewhere [7,8]. From this it is possible to draw the further inference that problem gambling is a public health issue [5,9].

Finland has one of the highest rates of gambling expenditure in the European Union (EU) [10]. Most of the gambling revenue generated in the country goes to good purposes: profits and tax revenue are channelled via public and private organizations to support the arts and sciences, youth work, health and wellbeing, social and veteran programmes as well as horse breeding and designated research projects.

In Finland, the prevalence of past-year problem gambling in 2015 was 3.3% while evaluated using the South Oaks Gambling Screen (SOGS $\geq$ 3). From 2011 to 2015, this rate showed a tendency to increase among women, and at the same time attitudes towards gambling became more permissive [11].

Socio-demographics

On average, women spend less on gambling than do men [12,13]. Overall, it seems that gambling expenditure tends to increase with age [14,15], although it starts to drop after 44 years of age [16]. Furthermore, lower educational level, blue-collar status and unemployment are associated with a higher level of gambling participation and thus with higher gambling expenditure [14,17]. Giroux and colleagues [18] reported that problem gamblers have a lower annual income than non-problem gamblers. Conversely, being married or cohabiting seems to have a protective effect against high gambling expenditure [14]. Higher net incomes have been found to increase gambling expenditure [15,19], but it has also been shown that lower income receivers gamble more [17,20–22]. Among the socio-demographic factors reported to correlate with problem gambling are male gender, lower education, younger age, being single or divorced, being unemployed or laid off from work, sick leave, retirement on pension for health reasons and lower income [11,17,23–27]. Some of these undesirable societal outcomes may be linked to income inequality, which may put individuals at risk of problem gambling if they decide try to get ahead in society by gambling. This may spill over into excessive expenditure on gambling and cause even more anxiety and stress among poorer individuals which, in turn, may increase gambling as a relief or escape, as discussed by Bol and colleagues [22].

Health-related factors

Comorbidities of problem gambling, such as mental illness and substance abuse, are common in both men and women [28,29]. There is a scarcity of research on the association between gambling expenditure and perceived health and comorbid problems. Problematic gambling behaviour is known to have an impact upon health determinants that contribute to negative health outcomes [3]. Furthermore, it is known that mental health and addiction problems and various associated harms tend to cluster in individuals who are already socio-economically vulnerable [30–32], thus contributing to an accumulation of social inequality. It is therefore important to investigate how different health-related factors are related to gambling expenditure.

Gambling behaviour

A high frequency of gambling, gambling several different games and problem gambling are correlated with higher overall gambling expenditure [33–36]. Overall expenditure in on-line gambling is higher than expenditure in land-based gambling [37,38]. Women spend less on on-line gambling than men [13]. High gambling expenditure is associated clearly with problem gambling [26,34,39], as is high gambling frequency and increased experienced harms [24,40]. Many aspects of women's and men's gambling behaviour appear to differ considerably [41]. Two recently published Finnish register-based studies also indicate that on-line gambling expenditure differs significantly between Finnish men and women [42,43]. Edgren and colleagues [44] found that female on-line gambling may be related to higher relative expenditure and at-risk and problem gambling. It is possible that females experience a greater stigma attached to gambling than males [45,46]. There is as yet only limited research into gender-specific gambling expenditure and its correlates. Therefore, in this study we have chosen to analyse men and women separately [47–49].

Excessive gambling has many potentially serious adverse effects, including financial, relationship, emotional and psychological, health, work/study, cultural, criminal activity and life-course harms [3,9,50,51]. All these undesirable outcomes cause inequality in society. It is important, therefore, to create greater awareness of the associations of socio-demographic and socio-economic factors with excessive gambling. We hope that our analysis will contribute to these efforts and increase awareness among policymakers and gambling providers of gambling-related problems, and ultimately provide them with tools for more effective and better-targeted gambling-related harm minimization, prevention and intervention strategies.

Our study explores gambling expenditure among Finnish women and men. This study aims to examine (1) the socio-demographic correlates of gambling expenditure by gender; (2) the health correlates of gambling expenditure by gender; and (3) the gambling behaviour correlates of gambling expenditure by gender.

METHODS

Design and participants

The data were drawn from the nationally representative cross-sectional Finnish Gambling 2015 survey [4,11]. A total of 7400 Finns were selected randomly from the Population Information System. The inclusion criteria were: (1) age 15–74 years; (2) mother tongue Finnish or Swedish; and (3) residence in mainland Finland.

Data collection

The Finnish Gambling 2015 survey was designed by researchers from the National Institute for Health and Welfare. The data were collected by Statistics Finland between 3 March and 8 June 2015 by computer-assisted telephone interview [4,11]. Potential participants were informed that the survey concerned their 'opinions and attitudes towards gambling'. They received written information about the study, including the principles of confidentiality and voluntary participation. On average, each interview lasted 18 minutes.

In the gross sample, 103 people were non-eligible [2,9]. A total of 4515 interviews were conducted, giving a response rate of 62% of eligible participants (n = 7297). Reasons for respondent attrition were established for 1594 people (22%): no telephone number (n = 1125) and failure to contact respondent (n = 469). Furthermore, 275 people were unwilling to respond to the interviewer's call, 896 declined to participate and 17 represented other net loss. The male response rate was somewhat higher than the female response rate in all age groups. Similarly, the older participants' response rate was higher than that from younger participants. People living in rural areas participated more actively than those living in urban and densely populated areas. In order to count as a past-year gambler (n = 3617) and to be included into the study, respondents were to have gambled on at least one type of game during the past year.

Measures

Gambling expenditure

Gambling expenditure (GE) was measured with only one question inquiring the overall expenditure: 'Roughly how much money do you spend on gambling in a typical week (€)?'. In cases where the respondent did not gamble weekly, the interviewer was instructed to encourage the respondent to give an estimate of their spending when they did gamble. Net income (NI) was assessed with the question: 'What is your monthly income after tax (i.e. disposable income). Please take into account all your sources of income (e.g. wages or salary, property income, pension and other social benefits)'. Past-year weekly gambling expenditure (WGE), yearly gambling expenditure (YGE) and monthly gambling expenditure as a percentage of net income (MGE/NI) were derived based on past-year (including 365.25 days) gambling frequency (F), as follows: (1) WGE, if past-year gambling frequency was at least once a week, WGE = GE. If past-year gambling frequency was less than once a week, WGE = F × GE/365.25 × 7, where (a) F = 30, if past-year gambling frequency was two to three times a month, (b) F = 12, if past-year gambling frequency was once a month and (c) F = 6, if past-year gambling frequency was less than monthly; (2) YGE = WGE/7 × 365.25; and (3) MGE/NI = 100 × YGE/12 × NI, when NI > 0.

The highest WGE in the data set (€50 000) was replaced by the second highest WGE (€1500): it was more than 10 times the corresponding reported weekly net income and considered to be an outlier. Gambling expenditure was examined from three perspectives: expenditure share (in %), WGE (in €) and MGE/NI (in %).

Socio-demographic variables

Socio-demographic variables including age, marital status and education were derived from the population register, while data on employment status and net income were obtained from the participants (Table 1).

Health-related correlates

Perceived general health was assessed with the question: 'How is your general health at present?'. Five response options were recoded into three groups: (1) good or rather good, (2) average and (3) poor or rather poor (Table 2). Mental health was assessed using the five-item Mental Health Inventory [52]. MHI-5 measures nervousness, downheartedness and feeling sad, jollity, calmness and happiness using a Likert scale (range 1–6). Total MHI-5 scores were calculated by summing up the scores for each item. Total scores (range 4–30) were rescaled to 0–100, with a score of 52 or less indicating clinically significant mental health problems [53]. Cronbach's alpha for MHI-5 was 0.786. Loneliness was measured with the question: 'Do you feel lonely?', with five response options collapsed into two categories: (1) never or very rarely and (2) sometimes, often or all the time.

Smoking was determined with the question: 'Have you smoked cigarettes, a pipe or cigars during the past 12 months?'. The three response options were dichotomized

Table 1 Relationship between gambling expenditure and socio-demographics by gender.

	Females					*Males*				
	n	*P%*	*Expenditure share (CI)*	*Mean WGE (CI)*	*Mean MGE/NI (CI)*	*n*	*P%*	*Expenditure share (CI)*	*Mean WGE (CI)*	*Mean MGE/NI (CI)*
Age (years)										
15–17	16	1	0.3 (0.2, 0.4)	1.06 (0.48, 1.76)	0.98 (0.27, 1.88)	33	2	0.3 (0.3, 0.4)	2.29 (1.07, 4.16)	**17.32 (4.63, 34.70)**
18–24	95	9	4.4 (2.9, 5.9)	2.47 (1.59, 3.65)	1.60 (1.01, 2.47)	177	12	**7.3 (6.1, 8.8)**	**7.94 (5.77, 10.41)**	**5.54 (3.68, 7.68)**
25–34	204	15	7.5 (5.0, 10.1)	2.60 (1.97, 3.35)	0.93 (0.71, 1.17)	255	17	**26.9 (22.3, 32.3)**	**19.88 (10.00, 34.58)**	**4.41 (2.33, 7.27)**
35–44	191	16	12.1 (8.0, 16.3)	4.14 (3.00, 5.38)	1.47 (0.89, 2.29)	314	17	12.5 (10.4, 15.0)	**9.35 (7.03, 12.04)**	1.95 (1.42, 2.53)
45–54	243	17	12.6 (8.3, 16.9)	3.85 (3.23, 4.55)	1.01 (0.82, 1.24)	344	18	16.1 (13.3, 19.3)	**11.36 (9.17, 14.10)**	**2.53 (2.01, 3.20)**
55–64	357	23	**43.8 (28.9, 58.8)**	10.18 (4.76, 20.66)	2.66 (1.42, 4.86)	387	19	22.6 (18.7, 27.1)	14.77 (12.70, 17.01)	3.44 (2.89, 4.10)
65–74	312	18	19.3 (12.7, 25.9)	5.84 (5.04, 6.72)	2.08 (1.71, 2.46)	323	14	14.2 (11.8, 17.1)	**12.59 (10.55, 15.01)**	**3.07 (2.62, 3.59)**
Marital status										
Single/not in a registered relationship	434	35	43.6 (28.8, 58.5)	6.75 (3.15, 15.05)	2.02 (1.15, 3.56)	696	42	51.0 (42.2, 61.2)	15.57 (10.82, 21.23)	**4.88 (3.74, 6.31)**
Married	703	47	40.6 (26.8, 54.5)	4.58 (4.07, 5.13)	1.55 (1.27, 1.89)	934	48	38.0 (31.4, 45.5)	**10.07 (8.92, 11.41)**	**2.26 (1.91, 2.67)**
Separated/divorced	198	13	9.7 (6.4, 13.0)	3.94 (3.28, 4.67)	1.15 (0.94, 1.40)	187	9	10.3 (8.6, 12.4)	**14.02 (10.98, 17.42)**	**3.33 (2.59, 4.26)**
Widow	83	5	**6.1 (4.0, 8.2)**	6.56 (4.22, 9.98)	2.21 (1.30, 3.46)	16	1	0.7 (0.6, 0.8)	11.67 (6.81, 17.09)	3.19 (1.65, 5.05)
Education										
Master's or equivalent	160	12	4.0 (2.6, 5.3)	1.82 (1.38, 2.34)	0.39 (0.28, 0.50)	178	10	4.6 (3.8, 5.5)	**5.99 (3.25, 9.55)**	**1.04 (0.48, 1.93)**
Bachelor's or equivalent	253	19	11.0 (7.3, 14.8)	3.17 (2.57, 3.83)	0.84 (0.65, 1.04)	206	12	7.6 (6.3, 9.2)	**8.32 (5.93, 11.76)**	**1.79 (1.22, 2.54)**
Short cycle tertiary education	263	18	**37.4 (24.7, 50.2)**	11.14 (4.36, 23.99)	2.92 (1.24, 6.26)	273	14	21.8 (18.0, 26.1)	19.42 (10.62, 34.61)	3.02 (2.14, 4.21)
Upper secondary	86	7	3.1 (2.1, 4.2)	2.34 (1.45, 3.62)	1.06 (0.60, 1.77)	158	10	**10.9 (9.0, 13.1)**	**13.93 (7.38, 21.77)**	**3.92 (2.51, 5.55)**
Basic vocational qualification	425	30	28.1 (18.5, 37.7)	5.03 (4.39, 5.79)	1.71 (1.46, 1.99)	679	37	38.9 (32.2, 46.7)	**13.52 (11.22, 16.46)**	**4.09 (2.98, 5.57)**
Up to lower secondary education	225	14	16.0 (10.5, 21.4)	5.90 (4.62, 7.37)	2.68 (2.04, 3.37)	329	17	14.9 (12.4, 17.9)	**11.26 (9.40, 13.29)**	**4.84 (3.86, 6.14)**
Other or missing	6	0	0.4 (0.3, 0.6)	5.38 (2.00, 9.67)	1.46 (0.34, 3.56)	10	1	**1.2 (1.0, 1.4)**	**29.21 (11.27, 50.84)**	3.25 (0.40, 6.76)
Employment status										
Working	773	57	64.4 (42.5, 86.3)	6.01 (3.75, 11.07)	1.52 (0.97, 2.44)	1096	62	63.5 (52.5, 76.1)	**13.10 (10.26, 16.68)**	2.10 (1.84, 2.39)
Unemployed or laid off	74	5	5.7 (3.8, 7.6)	5.63 (3.49, 8.85)	2.57 (1.72, 3.75)	117	7	**10.6 (8.8, 12.8)**	**20.53 (10.23, 35.81)**	**12.19 (6.47, 20.53)**
Retired based on age or service years	362	21	22.6 (14.9, 30.3)	5.77 (5.05, 6.60)	2.00 (1.69, 2.33)	385	18	16.7 (13.9, 20.1)	**12.07 (10.25, 14.18)**	**3.08 (2.65, 3.54)**
Student	94	8	1.7 (1.1, 2.3)	1.14 (0.85, 1.47)	1.22 (0.61, 2.12)	142	9	**4.2 (3.5, 5.0)**	**5.95 (3.77, 8.64)**	**7.93 (4.94, 11.74)**
Retired based on illness/ chronic illness	56	4	3.6 (2.4, 4.8)	5.23 (3.69, 6.84)	1.94 (1.32, 2.68)	67	3	3.9 (3.2, 4.6)	**14.58 (10.17, 20.37)**	**5.45 (3.52, 7.48)**
Homemaker, carer	53	4	1.8 (1.2, 2.4)	2.31 (1.41, 3.32)	1.91 (1.09, 2.83)	1	0	0.0 (NA)	1.20 (NA)	0.21 (NA)
Other or missing	6	0	0.2 (0.1, 0.2)	2.25 (1.17, 3.44)	0.92 (0.40, 1.45)	25	1	**1.1 (0.9, 1.3)**	**9.36 (2.59, 18.95)**	2.69 (0.92, 4.72)

(*Continues*)

Table 1. (Continued)

	Females					Males				
	n	*P%*	*Expenditure share (CI)*	*Mean WGE (CI)*	*Mean MGE/NI (CI)*	*n*	*P%*	*Expenditure share (CI)*	*Mean WGE (CI)*	*Mean MGE/NI (CI)*
Net income										
€0	23	2	0.5 (0.3, 0.7)	1.39 (0.81, 2.04)	NA	58	3	**0.9 (0.8, 1.1)**	**3.34 (1.59, 6.13)**	NA
≤ €500	64	5	1.8 (1.2, 2.4)	1.79 (1.22, 2.47)	3.38 (1.64, 6.04)	81	5	**3.1 (2.6, 3.8)**	**7.86 (4.17, 12.36)**	**12.39 (7.66, 17.85)**
€501–1000	202	14	**12.0 (7.9, 16.1)**	4.61 (3.71, 5.63)	2.35 (1.86, 2.87)	147	8	7.5 (6.2, 9.0)	**11.86 (7.74, 17.72)**	**7.09 (4.14, 11.63)**
€1001–1500	317	21	**21.8 (14.4, 29.3)**	5.54 (4.57, 6.71)	1.84 (1.52, 2.21)	208	11	10.1 (8.4, 12.1)	**12.24 (9.85, 14.69)**	**4.03 (3.26, 4.89)**
€1501–2000	411	29	26.9 (17.8, 36.1)	4.95 (4.04, 6.08)	1.19 (0.96, 1.48)	408	22	23.9 (19.8, 28.6)	**13.67 (10.34, 17.58)**	**3.17 (2.42, 4.02)**
€2001–2500	181	13	26.5 (17.5, 35.6)	10.82 (2.48, 33.48)	2.11 (0.47, 6.60)	334	19	18.1 (15.0, 21.7)	12.40 (9.85, 15.57)	2.28 (1.81, 2.86)
> €2500	142	10	6.8 (4.5, 9.1)	3.52 (2.56, 4.56)	0.49 (0.36, 0.65)	487	26	**29.3 (24.3, 35.1)**	**14.23 (8.43, 23.49)**	**1.33 (1.04, 1.67)**
Missing	78	5	3.6 (2.4, 4.8)	3.63 (2.61, 4.74)	NA	110	6	**7.1 (5.9, 8.5)**	**15.86 (9.53, 22.57)**	NA

P% = weighted population proportion; *n* = non-weighted number of participants; CI = 95% confidence interval; WGE = past-year weekly gambling expenditure (€); MGE/NI = monthly gambling expenditure as a percentage of net income; WGE data, *n* = 3251 non-weighted (1418 females and 1833 males); MGE/NI data, *n* = 2982 non-weighted (1317 females and 1665 males); weighted based on gender, age and region of residence; NA = not available. Estimate is shown in bold type if the corresponding estimate for the opposite gender is smaller and the CI of the difference of the estimates do not contain value 0.

in (1) daily smoking and (2) occasionally or not at all. Alcohol consumption was measured using a three-item version of the Alcohol Use Disorders Identification Test (AUDIT-C) [54]. The total AUDIT-C score was counted by summing the points (range 0–3) for each item and using the cut-off points to define risky drinking among males (≥ 6 points) and females (≥ 5 points) [55]. Cronbach's alpha for AUDIT-C was 0.607.

Past-year gambling behaviour

Past-year gambling was defined using a list of 18 game types, including games offered by the Finnish gambling monopoly, gambling with friends, gambling on cruises to Sweden, Estonia and the Åland Islands and non-monopoly on-line gambling overseas. Frequency of gambling was classified as no gambling, less than monthly, once a month, two to three times a month, once a week, several times a week and daily. Gambling mode was a dichotomous variable (land-based only/on-line).

Gambling severity was measured using the South Oaks Gambling Screen (SOGS [56]). A recent problem was defined as one occurring within the past 12 months. Total SOGS scores (range 0–20) were categorized as follows: (1) non-gamblers, (2) SOGS = 0 (non-problem gamblers), (3) SOGS = 1, (4) SOGS = 2, (5) SOGS = 3–4 (problem gamblers) or SOGS ≥ 5 (probable pathological gamblers). Cronbach's alpha for SOGS was 0.857.

Statistical analysis

Statistical analysis was performed for past-year gamblers based on the expenditure data available. Respondents providing no net income information or reporting zero euros were excluded from the MGE/NI analysis. The data were weighted based on gender, age and region of residence.

Ninety-five per cent confidence intervals (CI) of total gambling expenditures, expenditure shares, means and the differences of gender-specific estimates were calculated using an ordinary, non-parametric bootstrap with 1000 replicates using the percentile method [57]. A difference was considered statistically significant if the 95% CI did not contain the value 0.

Total gambling expenditures in Finland in 2015 was calculated using the information that weekly gambling expenditure was available for 84% of women and 94% of men. Otherwise it was assumed that the gambling expenditure was similar between those who reported weekly gambling expenditure and those who had no weekly gambling expenditure available.

Multiple log-linear regression was used to identify the association between gambling expenditure and the correlates. Two separate models were constructed with WGE and MGE/NI as response variables. All correlates were used as predictor variables in the models, except for loneliness

Table 2 Relationship between gambling expenditure and health-related correlates and gambling behaviours by gender.

	Females					*Males*				
	n	*P%*	*Expenditure share (CI)*	*Mean WGE (CI)*	*Mean MGE/NI (CI)*	*n*	*P%*	*Expenditure Share (CI)*	*Mean WGE (CI)*	*Mean MGE/NI (CI)*
Perceived general health										
Good or rather good	1184	85	61.5 (40.5, 82.5)	3.87 (3.45, 4.29)	1.29 (1.11, 1.51)	1472	82	78.5 (65.0, 94.1)	**12.27 (9.92, 15.30)**	**3.00 (2.53, 3.51)**
Average	187	12	**33.5 (22.1, 44.9)**	14.87 (5.24, 32.75)	4.10 (1.85, 8.01)	278	14	13.8 (11.4, 16.5)	12.30 (10.42, 14.41)	3.64 (2.89, 4.55)
Poor or rather poor	45	3	5.0 (3.3, 6.7)	8.98 (4.35, 16.11)	3.40 (1.62, 6.06)	76	4	6.7 (5.5, 8.0)	**22.63 (13.26, 36.30)**	**11.28 (4.80, 21.95)**
Missing	2	0	0.1 (0.1, 0.1)	3.89 (0.11, 8.00)	1.76 (NA)	7	0	**1.1 (0.9, 1.3)**	**36.36 (14.91, 58.78)**	10.03 (NA)
Loneliness										
Never, rarely	1108	78	62.7 (41.3, 84.1)	4.29 (3.81, 4.78)	1.48 (1.27, 1.72)	1525	83	82.8 (68.6, 99.3)	**12.69 (10.31, 15.96)**	**3.14 (2.72, 3.63)**
Sometimes, often, all the time	308	22	**37.2 (24.5, 49.9)**	9.13 (3.73, 19.33)	2.48 (1.24, 4.70)	300	16	16.2 (13.4, 19.4)	12.65 (9.59, 16.28)	4.80 (2.91, 7.62)
Missing	2	0	0.1 (0.1, 0.2)	3.44 (0.69, 6.00)	0.17 (NA)	8	0	**1.0 (0.8, 1.2)**	**29.32 (9.93, 55.61)**	NA
Perceived mental health[a]										
No problems	1376	97	78.1 (51.5, 104.8)	4.30 (3.86, 4.78)	1.47 (1.28, 1.70)	1760	96	95.1 (78.7, 114.0)	**12.62 (10.53, 15.46)**	**3.30 (2.82, 3.90)**
Problems	35	3	**21.7 (14.3, 29.1)**	46.29 (3.43, 135.90)	9.75 (1.19, 27.25)	50	3	3.3 (2.7, 4.0)	15.05 (8.22, 23.38)	7.17 (3.37, 12.18)
Missing	7	1	0.3 (0.2, 0.3)	2.64 (0.85, 4.50)	0.35 (0.13, 0.66)	23	1	**1.6 (1.3, 1.9)**	**18.33 (9.23, 29.59)**	**3.91 (1.78, 6.53)**
Risky alcohol consumption[b]										
No	1239	86	68.2 (45.0, 91.5)	4.23 (3.82, 4.69)	1.45 (1.27, 1.66)	1282	69	66.0 (54.7, 79.2)	**12.26 (9.46, 16.21)**	**3.03 (2.42, 3.89)**
Yes	178	14	31.6 (20.9, 42.4)	12.30 (3.92, 28.45)	3.19 (1.18, 7.66)	540	31	32.9 (27.3, 39.5)	13.64 (11.53, 16.02)	4.29 (3.43, 5.16)
Missing	1	0	0.1 (NA)	6.00 (NA)	NA	11	1	1.0 (0.9, 1.2)	23.33 (7.71, 41.69)	NA
Daily smoking										
No	1181	83	61.9 (40.8, 83.0)	3.98 (3.50, 4.49)	1.33 (1.13, 1.56)	1411	77	69.3 (57.4, 83.1)	**11.52 (9.07, 15.01)**	**2.82 (2.36, 3.36)**
Yes	236	17	38.0 (25.1, 51.0)	11.97 (5.31, 24.56)	3.40 (1.82, 6.32)	415	23	29.7 (24.6, 35.6)	16.52 (13.42, 19.97)	5.43 (3.91, 7.55)
Missing	1	0	0.1 (NA)	6.0 (NA)	NA	7	0	1.0 (0.8, 1.2)	34.73 (13.45, 61.20)	NA
Past-year gambling frequency										
Once a month / less than monthly	620	46	**5.2 (3.4, 7.0)**	0.61 (0.54, 0.68)	0.22 (0.19, 0.27)	504	28	2.0 (1.7, 2.4)	**0.91 (0.79, 1.02)**	0.27 (0.22, 0.35)
2–3 times a month	190	14	8.1 (5.3, 10.9)	3.19 (2.68, 3.79)	1.01 (0.83, 1.22)	334	19	5.5 (4.6, 6.6)	3.67 (3.35, 4.00)	1.00 (0.87, 1.15)
Once a week	487	33	42.1 (27.8, 56.5)	6.91 (6.36, 7.49)	2.33 (1.98, 2.79)	699	37	36.4 (30.2, 43.7)	**12.57 (11.36, 14.02)**	**3.62 (2.98, 4.34)**
Several times a week	121	8	44.6 (29.4, 59.8)	29.35 (13.96, 56.93)	8.33 (4.78, 14.80)	296	16	56.1 (46.4, 67.2)	45.51 (33.74, 61.61)	11.27 (8.85, 14.36)
Game types gambled, past year										
1 game type	413	28	12.1 (8.0, 16.2)	2.29 (1.96, 2.66)	0.71 (0.60, 0.83)	441	23	10.3 (8.5, 12.4)	**5.80 (4.26, 8.29)**	**2.04 (1.03, 3.85)**
2 game types	473	33	**20.8 (13.7, 28.0)**	3.39 (2.97, 3.86)	1.23 (0.94, 1.63)	384	20	9.3 (7.7, 11.1)	**5.77 (5.00, 6.74)**	2.09 (1.30, 3.27)
3 game types	260	19	16.3 (10.7, 21.8)	4.68 (3.87, 5.60)	1.45 (1.15, 1.80)	324	17	13.7 (11.3, 16.4)	**10.00 (8.05, 12.28)**	**2.87 (2.28, 3.57)**
4–5 game types	218	16	**39.8 (26.3, 53.4)**	13.12 (5.67, 29.87)	3.68 (1.89, 7.24)	410	23	24.5 (20.3, 29.4)	13.62 (11.69, 15.60)	3.59 (2.95, 4.37)
≥ 6 game types	54	4	11.0 (7.3, 14.8)	14.11 (9.43, 20.50)	4.89 (3.36, 6.63)	274	16	**42.2 (34.9, 50.6)**	**32.69 (21.74, 49.19)**	7.15 (5.55, 9.00)

(*Continues*)

Table 2. (Continued)

			Females					*Males*		
	n	*P%*	*Expenditure share (CI)*	*Mean WGE (CI)*	*Mean MGE/NI (CI)*	*n*	*P%*	*Expenditure Share (CI)*	*Mean WGE (CI)*	*Mean MGE/NI (CI)*
Gambling mode, past year										
Land-based only	1066	74	**67.2 (44.3, 90.1)**	4.85 (3.20, 7.91)	1.50 (1.05, 2.20)	1181	63	42.3 (35.0, 50.7)	**8.62 (7.59, 9.68)**	**2.48 (2.12, 2.95)**
On-line and land-based	352	26	32.8 (21.6, 44.0)	6.72 (5.48, 8.11)	2.22 (1.81, 2.70)	652	37	**57.7 (47.8, 69.2)**	**19.67 (14.65, 26.48)**	**4.90 (3.77, 6.25)**
Past-year gambling severity										
SOGS = 0	1142	80	51.2 (33.8, 68.7)	3.43 (3.12, 3.77)	1.19 (1.03, 1.40)	1345	72	44.8 (37.1, 53.7)	**7.91 (6.95, 9.13)**	**2.06 (1.80, 2.37)**
SOGS = 1	167	12	13.6 (8.9, 18.2)	5 .99 (4.58, 7.71)	1.89 (1.45, 2.44)	312	18	**26.5 (21.9, 31.8)**	**19.04 (11.54, 33.16)**	**3.78 (2.98, 4.63)**
SOGS = 2	62	5	6.8 (4.5, 9.1)	7.59 (4.96, 10.51)	2.73 (1.68, 3.99)	86	5	8.0 (6.6, 9.6)	**20.70 (15.04, 26.64)**	**9.50 (5.20, 14.99)**
SOGS = 3–4	27	2	5.4 (3.5, 7.2)	15.00 (6.48, 27.73)	4.52 (2.16, 8.01)	56	3	**11.6 (9.6, 13.8)**	**46.22 (24.84, 76.71)**	**15.53 (6.16, 30.38)**
SOGS ≥ 5	20	1	**23.1 (15.3, 31.0)**	82.40 (8.18, 234.38)	19.56 (3.21, 51.32)	33	2	9.2 (7.6, 11.0)	61.06 (40.82, 85.02)	15.91 (9.91, 23.37)
Missing	0	NA	NA	NA	NA	1	0	0.0 (NA)	1.15 (NA)	0.95 (NA)

P% = weighted population proportion; *n* = non-weighted number of participants; CI = 95% confidence interval; WGE = past-year weekly gambling expenditure (€); MGE/NI = monthly gambling expenditure as a percentage of net income. [a]MHI-5 = Mental Health Inventory, scaled 0–100, clinically significant problem ≤52; [b]Alcohol Use Disorders Identification Test (AUDIT-C), score for risk consumption ≥ 5 among females and ≥ 6 among males; WGE data, *n* = 3251 non-weighted (1418 females and 1833 males); MGE/NI data, *n* = 2982 non-weighted (1317 females and 1665 males); weighted based on gender, age and region of residence; SOGS = South Oaks Gambling Screen; NA = not available. Estimate is shown in bold type if the corresponding estimate for the opposite gender is smaller and the CI of the difference of the estimates do not contain value 0.

and past-year game types gambled, which were removed from the models to avoid multi-collinearity. All respondents with at least one correlate subcategory of 'missing' or 'other' were removed from the model. Exponentiations of beta coefficients [exp(β)], along with 95% CIs for each correlate subcategory, were reported, and exp(β) was interpreted as a percentage difference between the mean of a subcategory and the mean of a reference category. *P*-values less than 0.05 were considered statistically significant. The likelihood ratio test was used to assess effect modifications between gender and the correlates. All analyses were performed using R [58], and bootstrapping was conducted using the package 'boot' [59].

RESULTS

Our sample comprised 1418 female and 1833 male gamblers with gambling expenditure available ($n = 3251$) aged 15–74 years. The mean age of women was 47.56 years, 95% CI = 46.70, 48.41 and the mean age of men was 45.10 years, 95% CI = 44.35, 45.81. Women's monthly net income (mean = €1697, 95% CI = 1646, 1751) was lower than men's (mean = €2219, 95% CI = 2120, 2324), representing a difference of 30.7%.

Gambling expenditure

Our estimate of total gambling expenditure in Finland in 2015 for women was €394 million, CI = 293, 565, and for men €1062 million, CI = 891, 1285, totalling €1456 million, CI = 1245, 1733. Women reported lower weekly gambling expenditure (mean = €5.34, 95% CI = 3.99, 7.63) than men (mean = €12.75, CI = 10.75, 15.68). On average, women spent 1.69%, 95% CI = 1.33, 2.34 and men 3.42%, 95% CI = 2.90, 3.98 of their net income on gambling. The mean annual spending for women was €278.70, 95% CI = 208.89, 397.65, and for men €665.37, CI = 558.61, 803.11).

Socio-demographics

Women aged 55–74 years accounted for 63.1% of women's total WGE. The corresponding figure for men aged 55–74 years was 36.8% (Table 1). Women aged 25–34 years accounted for 7.5% of women's total WGE, while the corresponding figure for men was 26.9%. Mean WGE was significantly higher among men than women in all but two age groups, i.e. 15–17 and 55–64 years. Furthermore, women aged 55–74 years had a higher mean MGE/NI than other female age groups. Among men, the highest mean MGE/NI was found for the age group 15–34 years.

Widowed women accounted for 6.1% of women's total WGE, while widowed men accounted for 0.7% of men's total WGE. Mean WGE was significantly higher among married and divorced/separated men than women with the same marital status, and men also had a significantly higher mean MGE/NI than women in all subgroups except for widows/widowers.

Women with short cycle tertiary education accounted for 37.4% of women's total WGE, while the corresponding proportion for men was 21.8%. Men had a significantly higher mean WGE and mean MGE/NI than women in all groups, except for short cycle tertiary education.

Unemployed or laid-off men and male students accounted for significantly larger proportions of men's total WGE than the corresponding employment status groups of women. Mean WGE and mean MGE/NI were significantly higher among men than women in all but one group, i.e. for mean MGE/NI among employed respondents.

Women earning more than €2500/month accounted for 6.8% of women's total WGE. The corresponding figure for men was 29.3%. Furthermore, mean WGE was significantly higher among men than women in all but one income group, i.e. €2001–2500/month. However, mean MGE/NI was highest in the two lowest net income categories among both men and women.

Health-related factors

Women with average perceived health accounted for a significantly larger proportion of women's total WGE than the corresponding proportion among men (Table 2). Also, men had a significantly higher mean MGE and mean MGE/NI than women in the groups reporting good or rather good and poor or rather poor perceived general health; 21.7% of women's total WGE came from gamblers with mental health problems and 37.2% from gamblers who considered themselves lonely at least sometimes. The corresponding figures for men were 3.3 and 16.2%. Mean WGE and mean MGE/NI were significantly higher among men than women with no mental health problems, who reported no experiences of loneliness, who did not have risky alcohol consumption and who did not smoke daily.

Past-year gambling behaviour

Mean WGE was significantly higher among men gambling once a month or less and men gambling once a week compared with women with the same gambling frequencies. By type of gambling, women who gambled four to five different types of games accounted for the largest proportion (39.8%) of women's total WGE. Among men, those who gambled more than five games accounted for the largest proportion (42.2%) of men's total WGE. Furthermore, mean WGE was significantly higher among men who gambled one to three or more than five game types than among women with similar gambling patterns. Again, mean WGE

and mean MGE/NI were significantly higher among men than women in both gambling mode groups, i.e. land-based only and on-line and land-based. Women who only gambled land-based accounted for 67.2% of women's total WGE, while men who gambled on-line and land-based accounted for 57.7% of men's total WGE.

Women who were probable pathological gamblers (PGs; i.e. SOGS ≥ 5 points) accounted for 23.1% of women's total WGE, while male PGs accounted for 9.2%. Men scoring one SOGS point and men identified as problem gamblers (i.e. SOGS 3–4 points) accounted for a significantly larger share of men's total WGE than women with the same status. Nevertheless, mean WGE and mean MGE/NI were significantly higher among men than women at all levels of gambling severity, excluding probable pathological gamblers.

Multiple log-linear regression

Socio-demographic correlates associated significantly with WGE were gender (male versus female), age (45–74 years versus 18–24 years), marital status (single versus married), education (all education categories versus master's or equivalent), employment status (student versus working) and net income (> €2500/month versus ≤ €500/month) (Table 3). Perceived general health (poor or rather poor versus good or rather good), risky alcohol consumption and daily smoking were significant health-related correlates, while all correlates measuring gambling behaviour were also associated significantly with WGE. The combined effect of socio-economic status, health-related correlates and gambling behaviour explained 69% of the variation in WGE. The likelihood ratio test showed significant interactions between gender and employment status, net income, gambling frequency and gambling severity.

In the MGE/NI model, gender (male versus female), age (15–17 and 55–74 years versus 18–24 years), marital status (single versus married), education (all education categories versus master's or equivalent) and net income (all net income categories versus ≤ €500/month) were associated significantly with MGE/NI (Table 3). Health-related correlates perceived general health (poor or rather poor versus good or rather good), risky alcohol consumption and daily smoking as well as all gambling behaviour correlates were also significant correlates in the MGE/NI model. The combined effect of all correlates in the model explained 71% of the variation in MGE/NI. There were no significant interactions between gender and the correlates.

DISCUSSION

In 2015 men in Finland spent more on gambling than women. This finding is consistent with earlier results [12,13,26]. Women aged 55–74 years accounted for 63.1% women's total WGE. The corresponding share for men was approximately one-third. Men aged 25–34 accounted for one-quarter of men's total WGE, compared with just 7.5% among women in this age bracket.

Overall, women's gambling and at-risk and problem gambling (SOGS ≥ 1) have increased in Finland between 2011 and 2015 [11]. It is possible that women's on-line gambling is related to higher relative expenditure [44]. There is no evidence of an increase in women's gambling in the other Nordic countries [46,60–62]. Internationally, there is some evidence of a feminization of gambling: more women are gambling and showing an interest in on-line gambling [43] developing gambling problems and seeking help for gambling-related problems than before [41]. In the Finnish context, the reasons for this particular fashion may lie in women's increasingly lenient attitudes towards gambling in certain age groups [63] and in the launch of on-line games tailored specifically to females.

In our data set, problem and pathological gamblers accounted for 28.5% of women's total gambling expenditure. The corresponding proportion for men was 20.8%. These figures are in line with previous findings [31,32,64]. From a public health viewpoint it is important that we continue to monitor trends in gambling prevalence, particularly with a view to identifying gender-specific harms. Gambling expenditure is significant factor in moderate-risk and problem gambling [36]. Problem and pathological gamblers spend more money than they intend to, lose control over their gambling and take out loans to continue gambling despite the negative consequences [65], and often find themselves in a vicious circle of chasing losses [66–69].

In our model, all gambling behaviours were associated significantly with MGE/NI, which again supports previous findings on gambling expenditure [4,24,33–35,40,70,71]. On-line gambling accounted for almost 60% of men's and for one-third of women's total WGE. It is possible that men's higher spending on gambling is explained by the larger amount they spend on-line. The use of digital money (e.g. credit cards, electronic bank transfers and e-wallets) seems to encourage intensified gambling behaviour and to lead to greater losses, predominantly in the case of problem gamblers, as gamblers seem to feel that they are not spending 'real' money [38]. Men continue to outnumber women in on-line gambling, which is associated furthermore with a higher income [72]. Both non-strategic games (slot machines, bingo, scratch cards) and strategic forms of gambling (blackjack, cards, sports betting, race wagering) are available on-line [11,73,74]. As men tend to prefer strategic games, which are often available 24/7 [75,76], they also spend more money on-line than women.

Significant socio-demographic correlates of MGE/NI among men were aged lower than 18 years and more than 55 years, single marital status, net monthly income of more than €500 and lower than master's education.

Table 3 Combined effect of gambling expenditure and the correlates.

	WGE			*MGE/NI*		
	n	*exp(β) (CI)*	*P-value*	*n*	*exp(β) (CI)*	*P-value*
Gender						
Female	1323	†		1301	†	
Male	1690	**1.40 (1.29, 1.52)**	< 0.005	1636	**1.39 (1.27, 1.51)**	< 0.005
Age (years)						
15–17	45	0.90 (0.63, 1.29)	0.58	13	**1.98 (1.12, 3.49)**	0.02
18–24	248	†		211	†	
25–34	447	1.06 (0.90, 1.26)	0.47	445	1.01 (0.85, 1.20)	0.90
35–44	483	1.18 (0.98, 1.42)	0.08	483	1.12 (0.92, 1.35)	0.25
45–54	544	**1.25 (1.03, 1.50)**	0.02	541	1.13 (0.93, 1.37)	0.21
55–64	677	**1.39 (1.14, 1.68)**	< 0.005	676	**1.25 (1.02, 1.52)**	0.03
65–74	569	**1.53 (1.18, 1.99)**	< 0.005	568	**1.35 (1.04, 1.77)**	0.03
Marital status						
Married	1514	†		1510	†	
Single/not in a registered relationship	1057	**1.11 (1.01, 1.22)**	0.04	986	**1.11 (1.01, 1.23)**	0.03
Separated/divorced	352	0.98 (0.86, 1.11)	0.75	351	0.97 (0.86, 1.11)	0.69
Widow	90	0.95 (0.75, 1.21)	0.69	90	0.94 (0.73, 1.20)	0.60
Education						
Master's or equivalent	320	†		320	†	
Bachelor's or equivalent	442	**1.37 (1.18, 1.59)**	< 0.005	440	**1.44 (1.24, 1.68)**	< 0.005
Short cycle tertiary education	500	**1.41 (1.21, 1.64)**	< 0.005	499	**1.46 (1.26, 1.71)**	< 0.005
Upper secondary	226	**1.41 (1.17, 1.71)**	< 0.005	213	**1.40 (1.16, 1.70)**	< 0.005
Basic vocational qualification	1030	**1.52 (1.31, 1.75)**	< 0.005	1022	**1.61 (1.40, 1.86)**	< 0.005
Up to lower secondary education	495	**1.43 (1.21, 1.70)**	< 0.005	443	**1.55 (1.30, 1.84)**	< 0.005
Employment status						
Working	1765	†		1762	†	
Unemployed or laid off	180	0.94 (0.79, 1.13)	0.54	171	1.03 (0.85, 1.24)	0.75
Retired based on age or service years	669	0.99 (0.82, 1.19)	0.92	668	1.06 (0.88, 1.28)	0.56
Student	227	**0.74 (0.60, 0.91)**	< 0.005	165	0.87 (0.70, 1.09)	0.22
Retired based on illness/chronic illness	118	0.94 (0.75, 1.17)	0.57	118	1.01 (0.81, 1.27)	0.91
Homemaker, carer	54	1.03 (0.77, 1.38)	0.85	53	1.07 (0.79, 1.43)	0.67
Net income						
€0	76	1.20 (0.89, 1.61)	0.24	0	NA	NA
≤ €500	139	†		139	†	
€501–1000	338	1.16 (0.93, 1.44)	0.18	338	**0.46 (0.37, 0.57)**	< 0.005
€1001–1500	514	1.06 (0.84, 1.33)	0.63	514	**0.27 (0.21, 0.34)**	< 0.005
€1501–2000	812	1.17 (0.92, 1.48)	0.20	812	**0.22 (0.18, 0.29)**	< 0.005
€2001–2500	512	1.24 (0.96, 1.59)	0.09	512	**0.19 (0.15, 0.24)**	< 0.005
> €2500	622	**1.33 (1.03, 1.71)**	0.03	622	**0.14 (0.11, 0.18)**	< 0.005
Perceived general health						
Good or rather good	2476	†		2404	†	
Average	430	0.94 (0.84, 1.05)	0.27	427	0.94 (0.84, 1.06)	0.30
Poor or rather poor	107	**1.31 (1.05, 1.64)**	0.02	106	**1.27 (1.01, 1.59)**	0.04
Perceived mental health[a]						
No problems	2931	†		2855	†	
Problems	82	0.82 (0.65, 1.03)	0.09	82	0.84 (0.66, 1.06)	0.14
Risky alcohol consumption[b]						
No	2347	†		2294	†	
Yes	666	**1.14 (1.04, 1.25)**	0.01	643	**1.12 (1.02, 1.23)**	0.02
Daily smoking						
No	2409	†		2345	†	
Yes	604	**1.12 (1.01, 1.23)**	0.03	592	**1.12 (1.01, 1.24)**	0.03
Past-year gambling frequency						
Once a month / less than monthly	1046	†		1008	†	

(***Continues***)

Table 3. (Continued)

	WGE			*MGE/NI*		
	n	*exp(β) (CI)*	*P-value*	*n*	*exp(β) (CI)*	*P-value*
2–3 times a month	494	**5.67 (5.08, 6.33)**	< 0.005	471	**5.80 (5.17, 6.50)**	< 0.005
Once a week	1087	**14.30 (13.02, 15.71)**	< 0.005	1077	**14.74 (13.40, 16.22)**	< 0.005
Several times a week	386	**30.75 (26.89, 35.17)**	< 0.005	381	**31.43 (27.41, 36.03)**	< 0.005
Gambling mode, past year						
Land-based only	2061	†		2002	†	
On-line and land-based	952	**1.35 (1.24, 1.47)**	< 0.005	935	**1.35 (1.24, 1.47)**	< 0.005
Past-year gambling severity						
SOGS = 0	2304	†		2255	†	
SOGS = 1	449	**1.20 (1.08, 1.34)**	< 0.005	431	**1.21 (1.08, 1.34)**	< 0.005
SOGS = 2	134	**1.61 (1.35, 1.92)**	< 0.005	126	**1.58 (1.31, 1.90)**	< 0.005
SOGS = 3–4	76	**1.91 (1.50, 2.42)**	< 0.005	75	**1.75 (1.37, 2.23)**	< 0.005
SOGS ≥ 5	50	**2.83 (2.12, 3.77)**	< 0.005	50	**2.67 (2.00, 3.57)**	< 0.005
R^2		0.69			0.71	

WGE = past-year weekly gambling expenditure (€); MGE/NI = monthly gambling expenditure as a percentage of net income; *n* = non-weighted number of participants; exp(β) = exponentiation of beta coefficient of multiple log-linear regression model; CI = 95% confidence interval; † = reference category; R^2 = the coefficient of multiple determination. [a]MHI-5 = Mental Health Inventory, scaled 0–100, clinically significant problem ≤ 52; [b]Alcohol Use Disorders Identification Test (AUDIT-C), score for risk consumption ≥ 5 among females and ≥ 6 among males; WGE data, *n* = 3013 non-weighted; MGE/NI data, *n* = 2937 non-weighted; weighted based on gender, age and region of residence; NA = not available. Estimate is shown in bold type if the corresponding *P*-value is smaller than 0.05.

Among women, the only significant socio-demographic correlates were education and net income—despite the fact that women aged 55–74 accounted for a high proportion of total WGE. Both women's lower educational level [77,78] and lower income level [41] can be seen as a sign of socio-economic vulnerability for women. In our study, women's income was 30% lower than men's, a much higher figure than the national average of 20% [79]. This experience of being socio-economically disadvantageous may have become a trigger for gambling as a way to level up lower socio-economic status. Increasing numbers of older adults are now gambling [80], which has been linked with life transitions such as retirement, lack of opportunities to socialize and loss of spouse [81]. One particularly vulnerable group may be that of widowed women, as noted in our results. Loneliness, social isolation and disconnectedness may put women in a vulnerable position, as the need to take part in an acceptable activity such as gambling may lead to gambling-related problems [41]. In Finland, the transition into old-age retirement takes place at age 63–68 years [82]. It is assumed, therefore, that people in older age groups are relatively active and still in employment. These age groups may also have more time and money to spend on leisure activities such as gambling. Conversely, it is known that retired women are among the poorest [83,84] (i.e. Sweden, Finland), thus the need for connectedness via gambling, that may sometimes develop somewhat quickly to problematic [85], placing them socio-economically in an even weaker position.

Among men, we found that mean WGE increased with higher net income, lending support to the earlier finding that expenditure seems to intensify as a function of income [32]. However, an increased income led to decreased MGE/NI. Lower education is known to be associated with problem gambling among both men and women [86,87].

Women experiencing loneliness and mental health problems account for a larger proportion of women's total WGE than men. Our model showed that, for men, significant health-related correlates were perceived health and mental health problems, while there were no significant health correlates for women. A few previous studies have found that poor health correlates with problem gambling [88], and perceived mental health problems, most notably depression and anxiety, are well documented among female problem gamblers [23,28,29,88]. We found no evidence of such a significant association.

All in all, the key finding of our study is that lower-income individuals contribute proportionally more of their income to gambling compared to middle- and high-income groups [17,31,32]. It is noteworthy that people who are already in precarious social and financial situations tend to live in neighbourhoods with a high density of gambling opportunities [89–91]. The associated risk of gambling-related problems and experienced harms gives rise to inequality, as pointed out by Selin and colleagues [92]. Based on an Australian study, it has also been reported that proportionally more gambling tax revenue is generated in socio-economically disadvantaged areas [93]. Therefore, more research is needed to explore regional differences

and specific game types, particularly in disadvantaged areas, in order to prevent the accumulation of problems in certain areas.

Strengths and weaknesses

Our estimate of total gambling expenditure in Finland in 2015 at €1456 million is slightly lower than the figure reported by the Finnish monopoly operator. In 2013, the monopoly generated revenue of €1693 million [94]. The coverage rate is 78% which is, in fact, an excellent figure by international standards, as gambling expenditure is typically much underestimated [95–97], or the amount of exact spending is difficult to recall when asked [95–97]. The unusually high coverage rate is one of the strengths of our study, and a reflection of the clearly formulated question on expenditure [95]. The use of a weekly time-frame also has the advantage of reducing response variation and inaccuracy [98].

The response rate in our study (62%) was higher than the international average [99]. The most under-represented age group was 15–34 years and the most over-represented age group 65–74 years [4,11]. Even though we had a very large overall sample size, the results must be interpreted with caution as the age groups are relatively small, which affects CIs particularly in the age group 15–17 years. As this study was based on self-reported data, it is possible that the information collected has been subject to participant biases, especially as far as the expenditure data are concerned [96]. Although the reported expenditure versus revenue coverage rate was excellent, indicating that the measure of expenditure was appropriate [95], the question did not specify whether it concerned net or gross. Our study did not allow us to explore household income, which has important implications for both the distribution of harms and public policy. Overall, some of the group differences observed were statistically significant, but the corresponding effect sizes implied that the magnitudes of these differences were not significant. The current study used previously validated instruments, including MHI-5, AUDIT-C and SOGS [53–56].

CONCLUSIONS

This is one of the few studies [8,100] to examine both gambling expenditure and its relationship to gamblers' net income (NI). Male gender was associated significantly with both WGE and MGE/NI. Overall, it seems that people with a higher mean gambling expenditure related to net income are lower-income individuals. This may have undesirable societal outcomes and may engender many risk-taking behaviours, such as problem and pathological gambling.

Our results indicate that harm prevention at both population and individual levels is important, and thus may reduce inequality. These efforts must include steps to more monitor closely the prevalence of gambling and related harms so that we can identify the occurrence of gambling harm in different population groups, as well as regional differences. In addition, there is a need for secondary prevention (brief and early interventions) and tertiary prevention (specialized interventions). Our findings provide useful guidance for public policies on gambling and debate on sources of funding for the public good.

Ethical approval

The Ethics Committee of the National Institute for Health and Welfare approved the research protocol (Statement: THL/1122/6.02.01/2014). The ethical principles of the Declaration of Helsinki and its amendments or comparable ethical standards were followed.

Declaration of interests

The authors do not hold any position, receive ongoing or significant funding and are not engaged in any business or with any organization that creates a real or perceived conflict of interest in their work on this manuscript. For the last 3 years, senior researchers S.C., A.H.S. and statistician J.K. have worked full-time at the National Institute for Health and Welfare. S.C. and A.H.S. as visiting researchers at the University of Helsinki, Finland and S.C. as an adjunct professor at the University of Turku, Finland. In addition, both S.C. and A.H.S. have received a travel grant from the Finnish Foundation for Gaming Research. For the last 3 years, H.A. has worked full-time at the University of Helsinki and part-time at the National Institute for Health and Welfare, Finland. H.A. and J.K. have not received any additional funding for gambling research.

Acknowledgements

The Ministry of Social Affairs and Health, Helsinki, Finland, funded the study (appropriation under section 52 of the Lotteries Act). However, it had no role in the study design, data analysis, data interpretation or in preparing the manuscript.

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