



Profiling of Gamblers and Problem Gamblers Among Casino Patrons in Macao SAR

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Abstract

The study is one of the first prevalence studies of gambling and problem gambling among casino patrons in Macao. It aims to identify the demographic profile of gamblers and evaluate the extent of problem gambling among casino patrons. Using a convenience sampling approach, over 6,000 people were intercepted in the proximity of casinos and were invited to answer a structured questionnaire anonymously and voluntarily. Among these people 1,352 respondents indicated that they gambled in casinos at least once in the past 12 months. Over 90% (1,228) of the respondents reported that they gambled in Macao's casinos and slot lounges. The three most popular forms of casino gambling were baccarat, Sic Bo, and slot machines. The monthly median expenditure on gambling was HKD 1,845 with a range from HKD 2 to HKD 375,175. The prevalence rates for problem gambling and pathological gambling were 15.1% and 7.1%, respectively. Implications of the study's findings are given.

Keywords Gambling · Problem Gambling · Casinos · Macao

Introduction

The world's gambling industry has expanded rapidly over the past several decades (Claussen & Miller, 2001; Greer et al., 2022; Huang & To, 2018; Kim et al., 2021; Lock, 2022; Pilling & Barlett, 2012; Zhou 2020). Claussen & Miller (2001) reviewed the development of American gambling industry from 1970 to 1990 s. They reported that revenues from legal gambling including casinos, state-run lotteries, jai alai, horse racing, etc. increased by 15 times while 86% of Americans reported having gambled in 1998, comparing to 63% of

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Americans had done so in 1975. Additionally, 92% of Americans considered casino gambling as an acceptable entertainment. Claussen & Miller (2001) noted that sports gambling and online sports gambling would grow rapidly after the millennium. Pilling and Barlett (2012) suggested that as the Internet technologies become more mature, the growth of the online gambling accelerates. They noted that the world's interactive gambling measured by gross gambling revenue increased from USD 11.7 billion in 2004 to USD 29.31 billion in 2010. Additionally, there were over 2,400 gambling websites offering a wide range of gambling and betting services in 2011 (Pilling and Barlett, 2012). Kim et al., (2021) studied corporate social responsibility reporting among 30 largest US casino companies. They reported that there were 989 casinos and over 16,600 electronic gaming device locations in the US as at the end of 2019, producing USD 43.6 billion revenue. In fact, the world's casino and online gambling industry continuously grew to over USD 227 billion in 2020 (Lock, 2022). However, casinos have faced significant challenges in the past two years due to the Covid-19 outbreak that caused lockdowns in many countries and cities, prohibiting gamblers traveling to their destinations for casino gambling. Yet, lockdowns do not deter esports players, esports spectators, and video gamers to engage in esports betting and skin gambling (Greer et al., 2022).

Huang & To (2018) and Zhou (2020) reviewed the development of Macao's casino industry and Ji & Kale (2022) studied Macao's government policies on casino gambling after the liberalization of the gambling industry in 2002. Huang & To (2018) reported that the gambling industry is an important pillar of the economy and it employs over 20% of Macao's labor force. Macao's gambling revenue increased from USD 2.8 billion in 2002 to USD 38 billion in 2018. The number of Macao's casinos increased from 11 to 2003 to 41 in 2020 while the number of gambling tables increased from 424 to 2003 to 6,080 in 2020 (To & Lam, 2022). Nevertheless, Macao's gambling industry was severely affected by the COVID-19 pandemic and Macao's gambling revenue fell to USD 7.6 billion in 2020 and USD 10.9 billion in 2021, respectively (Macao Gaming Inspection and Coordination Bureau, 2022). Ji & Kale (2022) reviewed Macao's government policies, particularly focusing on responsible gambling initiatives. They reported that the Macao Government focuses on educating the public about the importance of responsible gambling, forming "responsible gambling work group" among several government departments, supporting gambling disorder counseling organizations, and initiating a self-exclusion and a third-party exclusion program.

The gambling industry on one hand contributes to the development of local economy because it generates a huge amount of tax revenue and attracts a significant amount of infrastructure investment (Claussen & Miller, 2001; Delfabbro & King, 2017; Zheng & Hung, 2012). It also attracts tourists and provides a vast amount of job opportunities to local and non-local people (Fong et al., 2011a; Zheng & Hung, 2012). On the other hand, the expansion of the gambling industry is not without side effects such as the rise of living costs, the deterioration of environmental conditions due to the noise and air pollutants emitted from tourism-related activities, increase in gambling-related crimes, and social issues relating to problem gambling (Fong et al., 2011a; Ji & Kale, 2022; Huang, 2011; To & Lam, 2022; Wan, 2012). Specifically, the profiling of gamblers and problem gamblers has been a focus of research worldwide in the past three decades (Asharani et al., 2019; Bastiani et al., 2015; Beaudoin & Cox, 1999; Chan et al., 2015; Delfabbro et al., 2012, 2016; Griffiths, 2019; Lee et al., 2006; Woodside & Zhang, 2012; Zeng et al., 2014, 2021). Some studies were focused

on the behaviors of problem gamblers in gambling venues (Delfabbro et al., 2016; Griffiths, 2019). Some studies were focused on the profile of problem gamblers and their caregivers who seek help (Asharani et al., 2019; Bastiani et al., 2015) while other studies were focused on characterizing casino gamblers who had different motivations (Chan et al., 2015; Lee et al., 2006; Zeng et al., 2014). Although Macao becomes the world's largest casino gambling economy (Manian et al., 2022), the studies of Macao's problem gamblers are sparse and mostly focused on Macao's residents and casino employees (Tong et al., 2018; Zeng et al., 2021). The profiling of Macao's casino gamblers and problem gamblers covering local and nonlocal gamblers has yet to be thoroughly explored in the past few years. Thus, the study aims at characterizing casino patrons and evaluating the extent of problem gambling among those patrons. The findings of the study can contribute to the development of Macao's gambling industry because they can shed light on who Macao's casino patrons are and how frequent they would revisit casinos. Additionally, the study identifies the extent of problem (and pathological) gambling and this information is crucial for the government to develop effective policies and programs to mitigate the negative effects of casino gambling in Macao and its neighboring region.

The rest of the paper is structured as follows. First, a literature review on profiling casino gamblers and problem gamblers is given in the next section. It is followed by the Method and Results sections. The paper ends in the section of Discussion with implications and limitations.

Literature Review on the Profile of Problem Gamblers

Studies about problem gambling prevalence have been carried out across the world in the past several decades (Wiebe & Volberg, 2007; Williams et al., 2012, 2013). Wiebe and Volberg (2007) reviewed over 100 problem gambling prevalence studies during the period of 1988–2007. They reported that severe (i.e. pathological) problem gambling rates were around 1% in Canada and the U.S. while the rates were around 2% in Macao, Hong Kong, and Singapore. Williams et al. (2012) reviewed over 200 studies during the period of 1975–2012 and calculated the standardized problem gambling prevalence rates so that comparisons between jurisdictions and different times could be carried out. Williams et al. (2012) reported that the standardized problem gambling rates based on the past year data were about 2.3%, ranging from 0.5 to 7.6%. The average standardized problem gambling rates were 1.8% in Canada and 3.2% in the U.S., respectively. The average standardized problem gambling rates were 6.0% in Macao, 5.6% in Hong Kong, and 3.8% in Singapore, respectively. In fact, many Asian jurisdictions have tracked problem gambling prevalence rate among their residents periodically such as Macao (Macao Responsible Gambling Promotions Organising Committee, 2021), Hong Kong (The Ping Wo Fund, 2017), and Singapore (The National Council on Problem Gambling, 2021). The Macao Government follows a public health framework to deal with problem gambling in which primary prevention aims at prevent the onset of people's at-risk gambling behavior through education, secondary prevention aims at prevent problem gambling escalating to the pathological stage, and tertiary prevention aims to increase availability of treatments (Korn & Shaffer, 1999; Messerlian et al., 2005). Yet, there is scant literature examining the prevalence of problem and pathological gambling among patrons at or in the proximity of gambling venues in Canada

(Piscitelli et al., 2017), the U.S. (Fong et al., 2011b), Brazil (Paula et al., 2000), and in the U.K. (Fisher, 2000).

Fong et al. (2011b) used a relatively small sample of 176 U.S. casino patrons to fill out a questionnaire survey in a Southern California's casino. Using 10 items from the NORC DSM-IV Screen for Gambling Problems (Gerstein et al., 1999; Fong et al., 2011b), Fong et al. (2011) categorized respondents to non-problem gamblers, at-risk gamblers, problem gamblers, and pathological gamblers. They reported that prevalent lifetime rates for problem and pathological gambling were 10.7%, and 29.8%, much higher than the estimates for pathological gambling among the general public at 0.42–4.0% in North America. Fisher (2000) with the support from the U.K. casino industry successfully conducted 1,105 interviews with casino patrons in 40 casinos. Respondents were screened for problem gambling using DSM-IV-MR. Her findings showed that the prevalence rate of problem and pathological gambling was 7.3% among U.K.'s casino patrons. Nevertheless, Fisher (2000) noted that a high proportion of problem and pathological gambling were the regular casino patrons who visited casinos at least once a week. To put it another way, Fisher (2000) remarked that one might expect to find one out of six or seven casino visitors to be problem gamblers on any one night in any one of U.K.'s casinos. Piscitelli et al. (2017) conducted a survey involving 2,103 casino patrons who were aged 55 years and over in Ontario, Canada. Using the Canadian Problem Gambling Index (CPGI), Piscitelli et al. (2017) reported that 26.4% of casino patrons had problem and pathological gambling issues. Although over 80% of respondents indicated the opening of a new casino nearby would not increase their gambling activities, many older casino patrons with problem gambling symptoms suggested that they would visit casinos more frequently, spend more time, and gamble more because of the opening of the new casino (Piscitelli et al., 2017). Prentice and Woodside (2013) with the support from the Macao Secretariat for Economy and Finance interviewed 348 casino patrons from mainland China in seven Macao's casinos. Using the CPGI, Prentice and Woodside (2013) identified that 32% of respondents were categorized as problem and pathological gamblers while casino membership, annual visitation, and the length of play each day were found as key antecedents of problem gambling. In sum, demographic variables such as gender, age, marital status, religions, etc. were found to associate with problem gambling (Fisher, 2000; William et al., 2013) and other correlates such as family gambling background, big win/loss experience, use of alcohol or drugs, etc. may influence people's gambling behaviors (Ferris & Wynne, 2001). Interestingly, none of the extant literature has reported the prevalence of problem and pathological gambling among local as well as non-local casino patrons in Macao, knowing that Macao is a destination-dependent gambling hub in which a substantial share of gambling revenue is derived from non-local casino patrons (Lim & To, 2022). A general population study on problem gambling will not be able to reveal the prevalence among patrons at or in the proximity of gambling venues.

Method

The study was a part of the Research in Gamblers' Behavior and Responsible Gambling project. The study's methodology and survey questionnaire were approved by the institutional review board of Research Committee, Macao Polytechnic University. Twenty-nine research assistants were recruited and trained to administer the survey. Initially, the project

team approached casino operators for the permission to conduct the survey at casino floors. Unfortunately, no progress was made after a period of six months and research assistants were instructed to collect data in public areas close to six major Macao's casinos – three in Macao Peninsula and three in Cotai at different times on different days of the week. The survey lasted for three months in a summer i.e. from May to July covering the Labor Day and the Dragon Boat Festival holidays before the outbreak of Covid-19. The study employed convenience sampling and research assistants approached potential participants in the proximity of casinos. Potential participants were invited to take part in the survey voluntarily and they were screened whether they had once gambled in the past 12 months for eligibility. Oral informed consent was obtained from each eligible respondent and all respondents were ensured the anonymity and confidentiality of the collected data. As a nominal appreciation, each respondent was given a small gift worth approximately HKD 30 (USD 1=HKD 7.75).

Measures

A structured questionnaire was designed based on DSM-IV screen for gambling problems (Beaudoin & Cox, 1999; Fisher, 2000; Fong & Ozorio, 2005; Wong & So, 2003). It had several sections to collect (i) gamblers' profile and problem gambling information such as gambling involvement in terms of frequency and expenditure on different forms of gambling, years of gambling, etc. (Fong & Ozorio, 2005), (ii) responses of the DSM-IV screen for gambling problems (Beaudoin & Cox, 1999; Fong & Ozorio, 2005), (iii) information about correlates such as family history of gambling problems, alcohol or drug issues, big win/loss experience, physical or emotional issues due to stress, depression, suicide ideation, etc. (Ferris & Wynne, 2001), and (iv) demographics such as gender, age, marital status, income, religion, province of origin, etc. (Fisher, 2000; William et al., 2013). The questionnaire was developed in English. Back-translation approach was used to translate the questionnaire from English to Chinese (both traditional and simplified versions) by a bilingual researcher and back from Chinese to English by another bilingual researcher (Brislin, 1970). As items of the original and back-translated English versions were comparable in meaning, the traditional and simplified Chinese questionnaires were deemed appropriate for the survey.

Specifically, the ninth item of the 10-item DSM-IV (Fong & Ozorio, 2005) "...has jeopardized or lost a significant relationship, job, or educational or career opportunity because of gambling" was rewritten as three sub-items for significant relationship, educational opportunity and job/career opportunity, respectively to improve clarity to respondents. In the analysis, the three sub-items were combined as one (any yes-response to one of them to be counted as yes) to yield the 10-item response result. The Cronbach's alpha value for DSM-IV was 0.843, indicating high internal consistency.

Results

Gamblers' Profile

Research assistants approached 6,248 potential participants. Among these people 1,835 had no gambling experience, 2,884 indicated that they had gambling experience but did not agree to take part in the survey, 160 did not complete the survey, and 17 did not meet the

Table 1 Demographics of respondents ($N=1352$)

Variables	Number	Percent	Variables	Number	Percent
Gender			Marital status		
Male	753	55.7	Never married	580	42.9
Female	591	43.7	Married	720	53.3
Not disclosed	8	0.6	Separated/widowed/divorced	40	3.0
Place of Origin			Education		
Macau	500	37	University degree or above	321	23.7
Guangdong	356	26.3	Higher diploma	231	17.1
Hong Kong	150	11.1	High school	460	34
Others	337	24.9	Less than high school	332	24.6
Not disclosed	9	0.7	Not disclosed	8	0.6
Age			Personal monthly income		
34 years or less	684	50.6	Less than HKD15,000	776	57.4
35 to 54 years	562	41.6	HKD15,000 or more	481	35.6
55 years or more	81	6.0	Not disclosed	95	7.0
Not disclosed	25	1.8	Family monthly income		
Job status			Less than HKD20,000	418	30.9
Employer	54	4.0	Less than HKD40,000	628	46.4
Employed full-time	819	60.6	HKD40,000 or above	169	12.5
Employed part-time	99	7.3	Not disclosed	137	10.1
Self-employed	158	11.7	Family size		
Unemployed/retired	51	3.8	Mean	3.3	
Housewife	60	4.4	Median	3	
Student	104	7.7	Standard Deviation	1.33	
Not disclosed	7	0.5	Size of valid sample	1295	
Occupation			Religion		
Managers	118	8.7	No religion	923	68.3
Professionals	181	13.4	Buddhism	278	20.6
Clerks	198	14.6	Christian	111	8.2
Workers	546	40.4	Others	20	1.5
Not disclosed	309	22.9	Not disclosed	20	1.5

screening criterion i.e. having not gambled in the past 12 months. Therefore, 1,352 respondents who had gambled in the past 12 months took part in the survey.

The demographic characteristics of respondents are shown in Table 1. Among the 1,352 respondents, 55.7% were males and 43.7% were females. Over half of respondents (53.3%) were married. The median size of family was 3. About one-third (37%) were Macao residents, 26.3% were from Guangdong province, 11.1% were from Hong Kong, and 24.9% were from other provinces of mainland China, Taiwan and Malaysia. The majority of respondents (92.2%) were aged 54 years or less. Their education, personal monthly income, family income, job status, and occupations varied. The demographic characteristics of participants confirmed that gamblers were from all walks of life.

With regard to gambling venues the respondents had gambled in casinos at least once in the past 12 months, 1,228 (90.8%) respondents indicated that they gambled in Macao's casinos or slot lounges. 326 (24.1%) respondents indicated that they gambled in regulated casinos outside of Macao. 992 (73.4%) respondents participated in social gambling such

as Mahjong and cards. 628 (46.4%) respondents played lottery, horse racing, greyhound racing, and/or sports betting. 230 (17.0%) respondents indicated that they had participated in underground gambling. 144 (10.7%) respondents indicated that they gambled in online casinos. As respondents were recruited in public areas near Macao's casino, it was not unexpected that they had gambled in casinos. Specifically, 1,255 (92.8%) respondents had gambled in casinos in the past 12 months including Macao's casinos, casinos outside of Macao, and online casinos.

Table 2 presents the frequency and duration of different forms of gambling the respondents had in the past 12 months. The survey listed the following forms of gambling: baccarat, slot machine, Sic Bo, lottery, blackjack, football/basketball betting, horse betting, roulette, 3-card baccarat, Texas Holdem poker, Fantan, Stud poker. Table 2 shows that baccarat was the most popular game. 782 (57.8%) respondents indicated that they played baccarat at least once in the past 12 months. The median frequency was 12 times a year while some respondents reported that they played baccarat 360 or more times in the past 12 months. The duration of gambling each time varied from 10 min to more than 24 h while the median duration was 2 h. The second most popular form of gambling was Sic Bo, followed by slot machine, lottery, and blackjack. Some respondents reported that they went to play Sic Bo, slot machine, and blackjack more than once a day. For example, one respondent indicated that he played slot machines 1,248 times in the past 12 months i.e. 3.4 times a day. Many respondents (219 or 16.2%) reported they participated social gambling such as mahjong, cards, etc.

Table 3 presents the overall statistics of gambling activities such as frequency, duration, monthly expenditure, maximum expenditure ever, and years of gambling. It shows that respondents gambled from only 1 to 1,248 times a year, with the median frequency of 24 times a year. The duration of gambling each time ranged from 5 min to 38 h, with the median duration of 3 h. Monthly expenditure on gambling was from HKD 2 to HKD 375,175 with the median value at HKD 1,845. Maximum expenditure ever for one-time gambling ranged from HKD 8 to HKD 984,000 with the median value at HKD 2,460. The years of gambling ranged from 0.04 i.e. half a month to 41 years with the median value at 5 years. Table 3 also shows that the mean values of frequency, monthly expenditure, maximum expenditure ever, and years of gambling were much greater than their corresponding median values, implying that some respondents were heavy gamblers.

Problem Gambling

Following past research (eg. Fong and Ozorio, 2005; Fong et al., 2011b; Gerstein et al., 1999; National Research Council's (1999), the following taxonomy was used to categorize respondents: 0=non-problem gamblers (NPG); 1 or 2=at-risk gamblers (AR); 3 or 4=problem gamblers (PrG); and 5 or more=pathological gamblers (PaG). In the survey, respondents could choose one of the following four options: "yes", "no", "don't remember", and "refuse to answer". Table 4 shows that the problem gambling, pathological gambling, and problem & pathological gambling prevalence rates based on DSM-IV were 21.3%, 16.4% and 37.7%, respectively (see the "original" sample). In order to explore the impact of the "don't remember" or "refuse to answer" options on the estimated gambling prevalence rates, respondents who chose "don't remember" or "refuse to answer" options for the DSM-IV screen were excluded in the "yes/no" sample. Table 4 shows that the "yes/no sample"

Table 2 Frequency (times per year) and duration (hours each time) of gambling

Frequency (times per year)							
Forms of gambling	Respondents	Percent	Min.	Max.	Median	Mean	Std. Dev.
Baccarat	782	57.8%	1	365	12	30.1	55.25
Sic Bo	682	50.4%	1	520	5	22.7	48.54
Slot machine	644	47.6%	1	1248	10	29.9	70.25
Lottery	512	37.9%	1	364	18	33.7	44.44
Blackjack	504	37.3%	1	416	9	20.7	39.15
Football/basketball betting	314	23.2%	1	520	12	41.8	70.00
Social gambling (mahjong, cards, etc.)	219	16.2%	1	364	24	49.3	64.44
Horse racing	197	14.6%	1	156	12	22.1	27.53
Roulette	192	14.2%	1	208	5	19.4	32.32
3-Card baccarat	173	12.8%	1	260	12	18.2	29.82
Texas Holdem poker	141	10.4%	1	260	4	17.0	34.54
Fantan	83	6.1%	1	364	12	32.1	67.71
Stud poker	54	4.0%	1	208	12	26.9	43.84
Duration (hours each time)							
Forms of gambling	Respondents	Percent	Min.	Max.	Median	Mean	Std. Dev.
Baccarat	723	53.5%	0.16	27	2	2.49	2.25
Sic Bo	625	46.2%	0.16	30	1	1.89	2.00
Slot machine	613	45.3%	0.08	38	2	2.03	2.07
Lottery	347	25.7%	0.02	5	0.5	0.68	0.60
Blackjack	467	34.5%	0.08	30	2	2.26	2.26
Football/basketball betting	207	15.3%	0.08	16	1	1.77	1.89
Social gambling (mahjong, cards, etc.)	215	15.9%	0.5	24	3.5	3.67	2.18
Horse racing	162	12.0%	0.07	24	1	1.58	2.07
Roulette	169	12.5%	0.08	7	1	1.50	1.30
3-Card baccarat	151	11.2%	0.17	14	1.5	2.08	1.87
Texas Holdem poker	124	9.2%	0.16	7	2	1.96	1.36
Fantan	71	5.3%	0.16	20	1	1.90	2.58
Stud poker	45	3.3%	0.3	6	1	1.67	1.37

Table 3 Statistics of gambling activities ($N=1352$)

	Min.	Max.	Median	Mean	Std. Dev.
Frequency (times per year)	1	1,248	24	47.2	75.8
Duration (hours)	0.08	38	3	3.0	2.8
Monthly expense (HKD)	2	375,175	1,845	6,356	22,819
Maximum expense ever (HKD)	8	984,000	2,460	14,539	63,291
Years of gambling	0.04	41	5	7.2	6.7

had 999 respondents and the corresponding problem and pathological gambling prevalence rates were 19.5% and 14.7%, respectively which were lower than that of the “original” sample. Additionally, the at-risk problem gambling prevalence rate was 26.7% which was slightly lower than that of the “original” sample at 27.4%. A series of z-tests were conducted to compare two proportions. Results of z-tests indicated that such differences were not sta-

Table 4 Estimation of problem and pathological gambling prevalence rates

	Original	Yes/no	Weighted
Sample Size	1352	999	1235
NPG (%)	34.9	39.1	49.5
AR (%)	27.4	26.7	28.3
PrG (%)	21.3	19.5	15.1
PaG (%)	16.4	14.7	7.1
Prg+PaG (%)	37.7	34.2	22.2

Notes: NPG stands for non-problem gamblers, AR stands for at-risk gamblers, PrG stands for problem gamblers, and PaG stands for pathological gamblers. "Original" means original sample, "Yes/no" was the sample in which respondents that chose "don't remember" or "refuse to answer" options for the DSM-IV screen tool were excluded. "Weighted" was the sample weighted by the reciprocal of the respondents' gambling frequency, where the respondents without gambling frequency data were excluded.

tistically significant at the 5% level (PaG: $z=1.12$, $p=0.26$; PrG: $z=1.07$, $p=0.29$; AR: $z=0.38$, $p=0.71$). This robustness check indicated that although some respondents chose to use the answers "don't remember" or "refuse to answer", their responses did not statistically significantly affect the estimations of problem and pathological gambling prevalence rates.

The probability that an individual visiting a Macao's casino was recruited to take part in the survey was dependent on the frequency with which the individual visited the casino. Clearly, someone who visited the casino every day had a much greater chance of being recruited than some others who visited the casino just one or twice a year. Following Fisher's (2000) approach, the estimations could be determined based on weighted sample where weight was the reciprocal of the respondents' gambling frequency. In the weighted sample, respondents who did not provide gambling frequency information were excluded, resulting in a usable sample of 1,235 as shown in the "weighted" sample in Table 4. As problem and pathological gamblers tended to gamble more often, the problem and pathological gambling prevalence rates based on weighted sample were 15.1% and 7.1%, respectively, which were lower than the problem and pathological gambling prevalence rates of the "original" sample. A series of z-tests were conducted to compare two proportions. Results of z-tests showed that there were significant differences between the problem and pathological gambling prevalence rates of the "weighted" and "original" samples (PrG: $z=4.07$, $p=0.00$; PaG: $z=7.28$, $p=0.00$). The weighted sample, however, should be considered as a better representation of casino patrons in Macao's gambling setting.

Predictors of Problem and Pathological Gambling

While the weighted sample was a better representation of Macao's casino patrons and should be used to estimate the problem and pathological gambling prevalence rates among casino patrons, the unweighted "original" sample was used to explore whether and how non-problem, at-risk, problem, and pathological gambling were associated with respondents' demographic and background characteristics.

Table 5 shows the demographic and background characteristics of different problem gambling categories. Results of χ^2 tests showed that the differences of problem gambling proportions were significant at the 1% level between the subgroups classified by all demo-

Table 5 Demographics and background characteristics of different problem gambling categories

	NPG		AR		PrG		PaG	
	N	%	N	%	N	%	N	%
Gender								
Male	217	28.8	220	29.2	180	23.9	136	18.1
Female	250	42.3	151	25.5	106	17.9	84	14.2
Marital status								
Never married	243	41.9	154	26.6	99	17.1	84	14.5
Married/Common-law	218	30.3	208	28.9	176	24.4	118	16.4
Separated/Widowed/Divorced	6	15.4	6	15.4	11	28.2	16	41
Family Size								
Living alone	28	26.2	22	20.6	29	27.1	28	26.2
Living with others	422	35.5	336	28.3	249	21	181	15.2
Age								
35–54 years	166	29.5	146	26	138	24.6	112	19.9
other years	294	38.4	222	29	144	18.8	105	13.7
Job Status								
Student	58	55.8	24	23.1	13	12.5	9	8.7
Housewife/retired/unemployed	39	35.1	27	24.3	23	20.7	22	19.8
Employee(full/part time)	319	34.7	271	29.5	185	20.2	143	15.6
Employer/self-employed	50	23.6	49	23.1	67	31.6	46	21.7
Personal Monthly income								
Less than HKD15,000	298	37	236	29.3	168	20.8	104	12.9
HKD15,000 or above	170	31.4	135	24.9	121	22.3	116	21.4
Place of Origin								
Macau	207	41.4	130	26	87	17.4	76	15.2
Others	259	30.7	240	28.5	200	23.7	144	17.1
Religion								
No religion	333	36.1	250	27.1	187	20.3	153	16.6
Buddhism	76	27.3	79	28.4	73	26.3	50	18
Christian	50	45	27	24.3	23	20.7	11	9.9

Notes: NPG stands for non-problem gamblers, AR at-risk gamblers, PrG problem gamblers, and PaG pathological gamblers. The total size of the samples differed from 1,352 due to a small number of missing data.

graphic and background characteristics except religion. The difference between different religion groups among problem and pathological gambling was significant at the 5% level.

Table 6 presents the logistic regression model established in the study. Problem gambling was found to be significantly dependent on whether the gambler was a male, separated/widowed/divorced, living alone, 35–54 years old, and the one having a monthly income HKD15,000 or above, a job status such as employer/self-employed, and a religion such as Buddhism. Specifically, the estimation about “male” showed that male gamblers had 1.42 times (95% CI: 1.097–1.839) higher risk becoming a problem or pathological gambler as compared to female gamblers when all the other predictors were equal. The final prediction equation is given in Eq. (1) as:

$$\log(p/1-p) = -1.868 + 0.351 * \text{male} + 1.109 * (\text{separated/widowed/divorced}) + 0.472 * (\text{living alone}) + 0.214 * (\text{monthly income HKD 15,000 or above}) + 0.399 * (35-54 \text{ years old}) + 0.765 * (\text{employer/self-employed}) + 0.317 * (\text{employed full-time/part-time})$$

Table 6 Logistic Regression Model

Predictors	B	Wald	Sig.	Exp(B)	95% C.I.	Reference group
Male	0.351	7.085	0.008	1.42	1.097–1.839	Female
Separated/widowed/divorced	1.109	7.289	0.007	3.031	1.355–6.781	Married or never married
Living alone	0.472	4.376	0.036	1.603	1.03–2.494	Living with others
Monthly income HKD 15,000 or above	0.214	2.655	0.103	1.239	0.957–1.603	Monthly income less than HKD15,000
35–54 years old	0.399	9.887	0.002	1.49	1.162–1.91	Other years old
Job status		7.993	0.046			
Employer/self-employed	0.765	5.57	0.018	2.148	1.138–4.053	Student
Employed full-time/part-time	0.317	1.358	0.244	1.373	0.806–2.338	Student
Housewife/retired/unemployed	0.498	2.146	0.143	1.646	0.845–3.206	Student
Religion		4.437	0.109			
No Religion	0.362	2.382	0.123	1.436	0.907–2.273	Christian
Buddhism	0.546	4.366	0.037	1.727	1.034–2.883	Christian
Other regions	0.089	0.415	0.519	1.093	0.834–1.432	Macau
Constant	-1.868	30.962	0.000	0.154		

Notes: Nagelkerke R Square=0.078. B was the estimated coefficient for the logistic regression equation for predicting the dependent variable from a predictor. The B value was in log-odds units and Exp(B) was the exponentiation of the coefficient. These were the odds ratios for the predictors. There was no odds ratio for the variables - job status and religion. Therefore, they were not entered into the final logistic regression equation. The 95% C.I. was the 95% confidence interval for the odds ratios. Wald and Sig. were the Wald chi-square value and 2-tailed p-value used in testing the null hypothesis that the coefficient (parameter) was 0. At the 95% confidence level, the following coefficients were significantly different from zero: male, separated/widowed/divorced, living alone, 35–54 years old, employer/self-employed, and Buddhism. Reference group referred to the group that was used as dummy variable in the estimation process.

time)+0.498*(housewife/retired/unemployed)+0.362*(no religion)+0.546*(Buddhism)+0.089*(other regions), (1)

where p is the probability of being a problem or pathological gambler.

Correlates of Problem and Pathological Gambling

Table 7 shows the correlates of problem gambling categories. Results of χ^2 tests showed that the differences between non-problem, at-risk, problem, and pathological gamblers were significant at the 1% level except the suicide thoughts or attempts where the differences were significant at the 5% level.

Table 7 Correlates of problem gambling categories

Correlates	“Yes” Cases		NPG		AR		PrG		PaG	
	N	%	N	%	N	%	N	%	N	%
Big win experience	532	45.9	89	22.4	158	49.2	139	57.4	146	73.7
Big loss experience	427	38.2	44	11.4	123	39.8	132	57.1	128	67.2
Family gambling problem	436	35.2	106	24.1	128	37.2	95	37.4	107	53.5
Family alcohol or drug problem	188	15.1	35	7.8	56	16.2	51	20.3	46	23.2
Gambled while drunk or high	109	8.6	21	4.6	28	8	23	8.9	37	18.6
Alcohol or drug problem	111	8.7	6	1.3	39	11	37	14.1	29	14.1
Urge to gambling due to painful events	229	18.2	26	5.8	37	10.6	64	24.7	102	50.2
Urge to drink due to painful events	456	35.4	91	20.3	136	38.2	127	46.7	102	48.1
Physical or emotional problems	106	8.4	16	3.6	29	8.2	31	12	30	15.3
Depression	435	34.6	103	23.1	122	35.0	107	40.7	103	51.8
Suicide thoughts or attempts	33	2.6	6	1.3	3	0.9	10	3.7	14	7.3
The “original” sample (N=1,352)			472	34.9	370	27.4	288	21.3	222	16.4

Notes: NPG stands for non-problem gamblers, AR at-risk gamblers, PrG problem gamblers, and PaG pathological gamblers. The sizes of samples differed for different correlates because participants who chose “don’t know” or “refuse to answer” were excluded in these analyses.

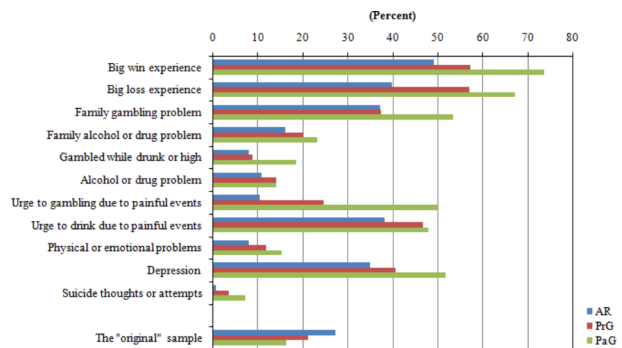
Fig. 1 The effects of correlates on problem and pathological gambling

Figure 1 shows the effects of correlates on problem and pathological gambling. It illustrates that respondents’ big/win experience, family gambling problem, painful events, and depression greatly amplified their problem and pathological gambling tendencies.

Discussion

The survey obtained responses from 1,352 casino patrons in Macao. Results showed that about one-third of the respondents were local residents while 50% of the respondents were from mainland China. Slightly over half of the respondents were males and married, and had high school or less education. Most respondents were in the age groups of 34 years or less (50.6%) and 35–54 years (41.6%). The majority of respondents (over 90%) reported that they had gambled in Macao’s casinos and slot lounges in the past 12 months. The top three popular forms of casino gambling were baccarat, Sic Bo, and slot machines. The findings were consistent with the ones reported by the Macao Gaming Inspection and Coordina-

tion Bureau (2022) in which the top three gross revenues from different types of games of fortune (casino games) were about HKD 253 billion for baccarat, HKD 14.5 billion for slot machines, and HKD 8.4 billion for Sic Bo a year between 2017 and 2019 – the years before the COVID-19 pandemic significantly adversely affected Macao’s hospitality and gambling industries. In terms of the frequency, duration, and monthly expenditure on gambling, the study’s results showed that the median frequency of gambling was 24 times a year, the median duration of each gambling session was 3 h, and the median monthly expenditure on gambling was HKD 1,845. The median monthly expense on gambling was around 3.6 times higher than the mean betting at HKD 400 per month reported in Fong and Ozorio’s (2005) study. Prentice and Woodside (2013) obtained 348 sets of responses from gamblers in Macao’s casinos. Surprisingly, they did not collect the data about the frequency and duration of gambling and the monthly expense on gambling from the respondents. Nevertheless, Prentice and Woodside (2013) reported that there was no significant, positive relationship between average bet size and problem gambling. Prentice and Woodside (2013) reported that problem gamblers in Macao were mainly those playing relatively low-stake table games with an average bet of HKD 100.

The study’s results showed that the problem and pathological gambling prevalence rates of the “original” (i.e. unweighted) sample were 21.3% and 16.4%, respectively. In other words, the overall rate of problem and pathological gambling was 37.4% which was higher than the value of 32% as reported by Prentice and Woodside (2013). However, when the sample was weighted by the reciprocal of the respondents’ gambling frequency as suggested by Fisher (2000), the problem and pathological gambling prevalence rates of the “weighted” sample were 15.1% and 7.1%, respectively, i.e. slightly over one in every five Macao’s casino patrons to be problem gamblers. This finding was similar to what Fisher (2000) and Pistcitelli et al. (2017) reported in their UK and Canadian studies.

Using responses from 2,999 visitors from Hong Kong and 1,204 visitors from mainland China, Zeng et al. (2014) reported that respondents’ gender, education, occupation, and place of origin had significant influences on gambling behaviors in Macao. They also noted that the more active gamblers were males, less educated, self-employed, and living in non-border regions of mainland China. Yet, Zeng et al. (2014) did not present a logistic regression model. The findings from the present study confirmed that problem gambling was significantly dependent on whether the gambler was a male and self-employed (or as an employer). Moreover, the present study found that a respondent’s status including separated/widowed/divorced, living alone, aged between 35 and 54 years, and Buddhism significantly affected their gambling behaviors. Thus, a middle-aged Chinese man who is self-employed, separated/widowed/divorced, and living alone had a high probability of being a problem gambler, probably due to his financial and family’s independent status with some years of casino gambling experience. While the association between Buddhism and problem gambling seems a bit surprising, it can be explained that Chinese men who are influenced by Confucianism and Buddhism see gambling including casino gambling to be a socially reinforced activity and a way of testing one’s luck and fate (Wu et al., 2021). Future research can explore whether and how Macao’s secondary and tertiary prevention measures have effects on local and non-local casino patrons’ problem gambling behaviors.

Practical Implications

The study's findings have a number of important implications. First, public policy on problem gambling in each jurisdiction is to minimize the negative impact of problem gambling on problem gamblers and their social network. Therefore, the study was focused on the identification and characterization of problem and pathological gambling among Macao's casino patrons. Second, the problem and pathological gambling prevalence rates are normally low among the general public. For example, Fong et al. (2011b) reported that the problem and pathological gambling prevalent rates were 10.7% and 29.8% among casino patrons while the pathological gambling prevalence rate in the general public only ranged from 0.42 to 4.0% in North America. As the numbers of problem and pathological cases in the general public are quite limited even if the sample is relatively large, the analysis based on a few cases may not be reliable. Using the 2011 Hong Kong Gambling Survey as another example (Chan et al., 2016), only 38 and 28 of the respondents were identified as possible problem and pathological gamblers among the 2,024 respondents interviewed. Any further analysis on the characterization of these problem and pathological gamblers was not statistically reliable because their gambling behaviors might change dramatically from one case to another case (Chan et al., 2016). Thus, the survey close to or in gambling settings would yield many more cases that help society understand problem and pathological gamblers thoroughly, as what the present study did in Macao. Third, the general population survey may not be able to reveal the effectiveness of problem gambling policy at different prevention levels. Using the situation in New Zealand as an example, the standardized problem gambling prevalence rate among the general public remained largely unchanged between 1999 and 2011 i.e. 1.0% in 1999, 1.0% in 2006, and 0.8% in 2011 (Williams et al., 2012). However, the problem gambling rates among gamblers (but not the general public) in New Zealand had increased even though the gambling participation rate had decreased from 86% to 52% in 2011 (Abbott et al., 2018). Abbott et al. (2018) also reported that the problem gambling prevalence rate in New Zealand dropped further from 0.6% to 0.2% in 2015. Nevertheless, Abbott et al., (2018) noted that some ethnic groups were more prone to have problem gambling and unless specific measures were targeted to those ethnic groups, the decrease in problem gambling prevalence rate among the general public might not be able to reduce harm due to problem gambling. As a whole, the problem gambling policy of New Zealand seems to have successfully prevented non-problem gamblers from gambling but more secondary and tertiary prevention efforts should be spent to reduce problem gambling occurrences among gamblers.

Based on prior work (eg. Fisher, 2000; Fong et al., 2011b; Hodgins et al., 2011; Piscitelli et al., 2017; Shaffer & Martin (2011)), the problem and pathological gambling prevalence rates among casino patrons were found to be much higher than that among the general public. Additionally, individuals with gambling problems were found to have more alcohol use and drug use, higher percentage of family members who also suffer from gambling problems, and lower rating for health status (Abbott et al., 2014; Hodgins et al., 2011; Shaffer & Martin, 2011; Volberg et al., 2018). Additionally, gambling disorder is now considered as an addictive disorder that impairs gamblers' and their families' quality of life (Grant & Chamberlain, 2020). Therefore, the data the present study obtained would increase the understanding of problem gambling among casino patrons in Macao. They should be utilized to fine tune public policy towards responsible gambling in Macao.

Limitations

The study has some limitations. First, it was a cross-sectional study and could only reflect the gambling, and problem and pathological gambling issues at one point in time. Future research should be conducted to monitor whether the frequency, duration, and monthly expenditure on gambling among casino patrons change when time passes. Second, the survey was conducted before the COVID-19 pandemic. As the COVID-19 pandemic has negatively impacted the local, regional, and global economy and caused job insecurity and poor financial well-being (To et al., 2020), gambling behaviors of casino patrons might also be altered. Thus, another gambling survey shall be taken place in order to assess the impact of COVID-19 pandemic on casino patrons in Macao. Finally, the recent crackdown on junket operators has caused many VIP rooms to cease their operation (Yiu, 2022). Future research can explore whether the closing VIP rooms may affect the VIP baccarat activities.

Data Availability Statement The data of the study are available from the authors upon reasonable request.

Declarations

Conflict of Interest The authors declares that there is no conflict of interest.

Ethical Approval The study's methodology and survey questionnaire were approved by the institutional review board of Research Committee, Macao Polytechnic University. All procedures complied with the 1964 Helsinki declaration and its later amendments.

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