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# Demographic Risk Factors and Gambling Preference May Not Explain the High Prevalence of Gambling Problems Among the Population with Migration Background: Results from a German Nationwide Survey

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**Abstract** There are high proportions of problem gamblers among individuals who themselves or whose parents immigrated to Germany. This study aimed to examine whether demographic risk factors and gambling preference may explain the higher prevalence of gambling problems among those with migration background (MB). Data was obtained from a nationwide telephone survey which was part of the project "Pathological Gambling and Epidemiology" (PAGE). The sample comprised 15,023 study participants aged 14–64 years living in Germany. Participants who had reported gambling within their lifetime (n = 6,406) were defined as gamblers and categorized according to their MB (n = 1,209 with MB), additional demographic characteristics (sex, age, marital status, household size, education, occupation), preferred types of gambling (21 categories covering the gambling types available in Germany), and the count of lifetime gambling problem symptoms (0–10 criteria of the fourth Diagnostic and Statistical Manual of Mental Disorders). Estimates from a negative binomial regression revealed that there is a 146.2 % increase in the expected count of gambling problem symptoms for gamblers with MB compared to those without MB. The percentage decreased to 102.5 and 97.6 % after adjustment for demographic characteristics and further adjustment for preferred types of gambling, respectively. Demographic risk factors and gambling preference may partially mediate but not completely explain the higher prevalence of gambling problems among the population with MB. Having an MB may be considered as an independent risk factor for gambling problems, which indicates a need for culturally sensitive prevention and treatment measures.

**Keywords** Pathological gambling · Disordered gambling · Gambler · Migrants · Immigrants

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## Introduction

An overview of the 202 published and unpublished adult prevalence studies of problem gambling by Williams et al. (2012) revealed that there is a higher proportion of current problem gamblers among individuals who themselves or whose antecedents immigrated to a country than among individuals who did not have an immigration event (IE) within their own or family biography. For historical reasons, an IE is defined very differently within international gambling research. The population in America, Africa, Asia and Australia/Oceania is usually divided according to their ethnicity and race such as white, black, Hispanic, non-Hispanic white, Asian and Native American (Alegria et al. 2009), black, white, colored, and Indian Africans (Collins and Barr 2006), Chinese, Malay, Indian, and other Singaporeans (Arthur et al. 2008) or New Zealand European, New Zealand Maori, Pacific Islanders, Asian, and other New Zealanders (Volberg and Abbott 1994). European studies usually refer to a foreign country of birth (Bakken et al. 2009), a foreign nationality (Sassen et al. 2011) or to individuals with and without migration background (MB; Hass et al. 2012). With the exception of white Americans, white Africans, and New Zealand Europeans, the population with IE usually belongs to an ethnic minority in the destination country and is confronted with several social disadvantages (Hummer et al. 2004; OECD 2013; Orpen 1978; Rahim 2001; European Union Agency for Fundamental Rights 2009; Safi 2009). According to the findings summarized by Williams et al. (2012), there is broad evidence suggesting a positive association between having an IE and gambling problems.

One important question is whether other demographic risk factors might explain the findings according to IE. In addition to an IE, younger age, male sex, being unmarried, less formal education, and unemployment have been found as risk factors for gambling problems (Abbott et al. 2004; Johansson et al. 2009; NAS 1999). Several studies confirm that a lower socioeconomic status (SES), including level of education and occupational status, is a risk factor for gambling problems (Orford 2004; Pasternak and Fleming 1999; Welte et al. 2004b). For low SES subpopulations, gambling might appear as an option to improve their poor financial situation. This might motivate low SES individuals to maintain gambling despite negative consequences (Fong 2005). Data from Germany suggests that individuals with an IE are younger, and fewer of them are single, separated or divorced or live alone than those without an IE (Galster and Haustein 2012). Additionally, individuals with an IE may achieve lower levels of formal education (Liebig 2007). Therefore, correlates between an IE and gambling problems might be explained by these demographic risk factors.

Large scale general population studies assessing the impact of an IE as a risk factor for gambling problems by controlling for potentially mediating demographic factors included two U.S. American, two Swedish, and two German telephone surveys. In the U.S. State of Texas, Wallisch (1996) examined the impact of race/ethnicity on past year gambling problems assessed by the South Oaks Gambling Screen (SOGS; Lesieur and Blume 1987). Multivariate data analyses adjusted for additional demographic risk factors revealed that the odds of problem gambling (SOGS score 3–20) were one and a half times as high among African Americans compared to Anglos and others, primarily Asians. In contrast, the higher prevalence of problem gambling among Hispanics could be explained by their lower average age, education and income. Three studies by Welte et al. (2001, 2004a, b) based on one survey from across the U.S. examined the impact of race on past year's problem and pathological gambling and past year's count of symptoms (0–13) assessed by the Diagnostic Interview Schedule (DIS; Robins et al. 1981) as well as past year's count of symptoms (0–33) assessed by the sum of the 13 DIS and 20 SOGS items. The DIS allows

to assess gambling criteria according to the fourth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV; APA 2000). Multivariate data analyses adjusted for additional demographic risk factors revealed that the odds of problem gambling (DIS score 3–10) and pathological gambling (DIS score 5–10) were at least three times and six times as high among the Black, Hispanic, Asian and Native American study participants compared to Whites (Welte et al. 2001). Multivariate data analyses adjusted for additional demographic risk factors, gambling (including times gambled per week, average win/loss in USD 100 units, number of types of gambling in year) as well as alcohol and drug consumption revealed that the odds of having more DIS symptoms were two to five times as high among African Americans, Hispanics, Asians and others compared to Whites (Welte et al. 2004b). The count of DIS symptoms among American Indians could be explained by their SES as well as their gambling and alcohol consumption. Classification tree analysis revealed that Blacks and American Indians as well as Hispanics, Asians and others reported the threefold count of DIS and SOGS symptoms as Whites (Welte et al. 2004a). Among the demographic risk factors gender, age, martial status, race, SES, employment status, religion, fundamentalist or evangelical in religious beliefs, and region of the country, race was the most powerful predictor for the count of DIS and SOGS symptoms. However, race was not a significant predictor for the prevalence of past year's gambling. The Swedish surveys (2001, 2013) revealed consistent population estimates with respect to the relation of problem gambling and having been born abroad. Multivariate data analyses adjusted for additional demographic risk factors revealed that the odds of past year's problem gambling (SOGS score 3–20) were twofold among those born abroad compared to the population born in Sweden (Abbott et al. 2013; Volberg et al. 2001). In contrast, a reverse association was also found with respect to the prevalence of gambling, which was smaller among those born abroad. A multivariate multinomial regression analysis of data from Germany was adjusted for additional demographic risk factors and revealed a positive association of foreign nationality with past year subthreshold gambling (1–4 DSM-IV-criteria) and pathological gambling (5–10 DSM-IV-criteria; Sassen et al. 2011). A multivariate data analysis by Hass et al. (2012) adjusted for additional demographic risk factors and gambling preference revealed that the odds of past year problem gambling (SOGS score 3–20) were four-fold among individuals with MB compared to those without. These studies vary a lot with respect to the definition and assessment of gambling problems. Accordingly, the strength of the relationships could not be directly compared. Nevertheless, the direction of the association is consistent across all studies, indicating that there is a positive association between having an IE and gambling problems even when controlling for demographic risk factors.

In addition to demographic risk factors, individuals with an IE may differ from those without according to gambling preference (Paton-Simpson et al. 2004; Raylu and Oei 2004). There are plausible reasons to suggest that specific types of gambling might advance the development of gambling problems (Abbott et al. 2004; Fong 2005). Participation in specific types of gambling, such as sports betting, casino table games, casino slot machines, poker, bingo, gaming machines, TV quiz channel gambling or instant lotteries have been found to be of higher risk for gambling problems compared to lotto 6/49, national class lotteries, and national television lotteries (Abbott et al. 2013; Bakken et al. 2009; Chóliz 2010; Fong 2005; Hass et al. 2012; Hodgins et al. 2012; Meyer et al. 2010). In particular, machine gambling has been found to be related with a more rapid onset of gambling problems than other gambling types (Breen and Zimmerman 2002). Correlates between an IE and gambling problems might be explained by the participation in more addictive gambling types. To date, only Hass et al. (2012) have considered these

relationships and confirmed a positive association between having an IE and gambling problems even when additionally controlling for gambling preference.

In conclusion, an IE is a potential risk for gambling problems. A yet unknown proportion of this relationship may be explained by demographic characteristics and the preferred types of gambling. So far, no study has provided data quantifying the proportion of explanatory power that is shared with demographic risk factors and gambling preference. Furthermore, results of previous research summarized by Williams et al. (2012) are limited in two ways. First, studies usually relate to current gambling problems and, therefore, neglect the importance of an IE over the entire life span of the affected individuals. Second, most studies use brief screening instruments and define pathological gambling as a relevant outcome. This makes it impossible to relate an IE to a more complex measure of gambling problems by taking into account its continuous nature.

Based on data from a general population survey from Germany, the present study aimed to examine the extent to which demographic risk factors and gambling preference may explain the higher lifetime prevalence of gambling problems among the population with an IE.

## Methods

The present study was part of the "Pathological Gambling and Epidemiology" (PAGE) project. The local ethics committees of the Universities of Greifswald and Lübeck approved PAGE (Reg.-No. BB 95/09; Reg.-No.10-068). A detailed description of the PAGE study design and fieldwork may be found elsewhere (Meyer, C., et al. The "Pathological Gambling and Epidemiology" (PAGE) Study Program: Design and Fieldwork. International Journal of Methods in Psychiatric Research, in revision). Data used in this study are from the nationwide PAGE telephone survey that was conducted to assess prevalence of gambling and related problems in the general population.

### Sampling and Data Collection

To generate a random sample of the general population, a random digital dialing procedure was applied in two sampling frames. The first one was based on landline telephone numbers and followed a stratified and clustered sampling design. The second one was based on mobile-phone numbers to include the population who was accessible via cellular phones but not via landline phones. Data was collected between June 2010 and February 2011. In total, 15,023 study participants (landline sample n = 14,022; mobile-phone sample n = 1,001) aged 14–64 years completed the computer assisted telephone interviews. To avoid systematic dropout during recruitment, the study was described to the target persons as a survey about leisure time activities such as social activities, Internet use and gambling. Among the eligible individuals, 52.7 % (15,023/28,491) participated in the study. All individuals gave their informed consent prior to their inclusion in the study. The most frequent reasons for non-participation were refusal (82.8 %), not reached (14.4 %), and inability to take part due to disease or cognitive impairment (2.8 %). Mean duration of the interview in the landline and mobile telephone sample was 14.8 (SD = 6.8) and 18.4 min (SD = 8.3) respectively.

## Measures

### *Migration Background*

The nationality, country of birth, and MB of individuals are established characteristics that indicate the presence of an IE among the population in Germany. As recently recommended by the government, we decided to assess the MB that quantifies how many of the people in Germany immigrated themselves or have a parent who immigrated to Germany (Federal Ministry of Labour and Social Affairs 2010). To date, an MB was present in 18.9 % of the population in Germany (Census 2011). Due to the increasing number of naturalizations in the past decades, the nationality of an individual can no longer be considered as standard to identify the presence of an IE—by now, more than half of the population with IE has become German nationals (Minister of State in the Federal Chancellery and Federal Government Commissioner for Migration 2012). Assessing the country of birth has the disadvantage that only the first generation of immigrants is included in the definition. The assessment of the MB also includes the second generation of immigrants that promotes a better understanding of integration processes. For the purpose of this study, therefore, we identify the population with an IE by the presence of an MB. Our study participants were classified as having an MB if they themselves or at least one of their parents was born at a place that was not located within the present borders of the German Federal Republic. This was true for 3,247 of 14,885 study participants with valid information.

### *Demographic Variables*

We assessed sex, age, marital status, and household size. Age was grouped into 14–30 years, 31–47 years, and 48–64 years. Marital status included married, single, and separated/widowed. Household size included the categories 1, 2, 3–4, and five and more individuals. Study participants were asked for highest degree of school education and highest degree of professional qualification for assigning a comprehensive educational level according to the International Standard Classification of Education 1997 (ISCED-97, UNESCO 1997) and its application to the German education system (OECD 1999; Schneider 2008). ISCED level 0 and 1 were assigned to study participants without any formal qualification, level 2 to study participants with secondary school certificate (corresponding to a maximum of 10 years of school education) but without a professional education. ISCED level 3 was assigned to study participants with vocational education and training (corresponding to a maximum of 3 years of professional education) or a university of applied sciences entrance qualification and university entrance qualification without a professional education, respectively. ISCED level 4 referred to study participants with vocational education and training plus a university of applied sciences entrance qualification or university entrance qualification. ISCED level 5 included study participants with a master's degree as well as university of applied sciences degree and a university degree. ISCED level 6 would be assigned to study participants with doctorate. Categories were grouped into low (ISCED level 0–2), middle (ISCED level 3–4), and high (ISCED level 5–6) educational level (Schroedter et al. 2006). Study participants were asked for their current occupational status: full time or part time employed (including women in maternity protection and parents in parental leave), unemployed (including homemakers), and others (including pupils and apprentices, retirees, conscientious objectors performing community service, and conscripts in basic military service).

*Gambling Participation*

Gambling or betting was assessed by asking for the number of days within lifetime the study participants spent money on a specific type of gambling. We included 21 categories covering the range of gambling types available in Germany. Initially, we assessed the participation in the state-run lotteries, such as lotto 6/49, Spiel 77 and/or Super 6 (additional lottery that can be played only in connection with participation in the lotteries lotto 6/49, TOTO, BINGO! and GlücksSpirale), KENO, Quicky, class lotteries, German television lottery, other lotteries (e.g. GlücksSpirale, social lotteries and premium raffle ticket as well as Lotterie-Sparen and Gewinnsparen which are offered by several German financial institutions), and the participation in instant lotteries (e.g. scratch cards) and bingo that are usually offered only for commercial reasons. Furthermore, we assessed participation in television quiz channel gambling, high-risk trading on the stock exchange (e.g. day trading, futures, options, warrants), and poker. The participation in state-run gambling at the casino, such as table games (e.g. roulette, baccarat, black jack) and slot machines were assessed as well as participation in gaming machines ('amusement machines with prizes' at gaming halls, pubs or the Internet) and gaming machines with token (only included if the study participants reported, that there was the possibility to change token back into cash money) that are legally offered by licensed commercial operators. We also assessed the participation in state-run sports betting on the one hand, such as ODDSET and TOTO, and state-licensed or illicitly offered sports betting on the other hand, such as horse race betting and other sports betting (excluding horse race betting). The participation in private and/or illicit gambling was explicitly covered. Additionally, an item assessed the total number of days in lifetime with participation in any of the above mentioned gambling types. Study participants who affirmed any gambling but negated all of the earlier questions on the 21 specific gambling types were categorized as gamblers without a preference of a specific gambling type. For data analysis, response categories were grouped into no or marginal gambling (0: never, 1–10 days within lifetime) and into substantial gambling (1: 11–50 days, 51–100 days, 101–500 days, 501–1,000 days, more than 1,000 days within lifetime). Study participants were defined as lifetime gamblers if they reported more than ten days of gambling in a lifetime either for any specific gambling type and/or overall gambling. The number of different specific gambling types with substantial gambling were summed up and classified as 0, 1, 2–3, 4–6, and 7 or more gambling types.

*Gambling Problems*

Gambling problems were assessed with the gambling section of the World Mental Health (WMH) Composite International Diagnostic Interview (CIDI) Version 3.0 published by the World Health Organization (WHO 2009). The instrument included 16 questions that assessed the presence of the following 10 symptoms defined by Criterion A for pathological gambling in DSM-IV (APA 2000): preoccupation, tolerance, loss of control, withdrawal, escape, chasing, lying, illegal acts, risked significant relationships, and bailout by others. All items refer to the occurrence of symptoms in previous life to allow for comparisons across the entire life span. According to results from Strong and Kahler (2007) the 10 gambling problem symptoms were summed up to create an additive index of problem severity ranging from 0 to 10. Furthermore, study participants' count of gambling problem symptoms were grouped into pathological gambling (PG, 5–10 DSM-IV-L criteria

fulfilled), subthreshold PG (SPG, 1–4 DSM-IV-L criteria fulfilled), and no gambling criteria (NGC, 0 DSM-IV criteria fulfilled; Brodbeck et al. 2009) within lifetime.

## Data Analysis

All analyses were conducted with Stata 10.1 (StataCorp 2007) and based on weighted data. The sample weight corrected for different inclusion probabilities due to design and differential participation proportions in different subgroups. Post stratification was based on data of official statistics on the German general population regarding the distribution of sex, age, federal state, household size, education, unemployment, and migration experience.

Study participants with and without MB were compared with respect to PG, SPG, and NGC as well as demographic characteristics and gambling participation by Rao/Scott corrected $Chi^2$-tests (Rao and Scott 1984). Count data regression analyses were used to test the association between MB and the count of gambling problem symptoms taking into account relevant demographic characteristics and gambling participation. These analyses were restricted to 6,406 lifetime gamblers (42.6 % of the total sample). The distribution of the dependent variable, i.e. the count of gambling problem symptoms, was characterized by a skewness of 4.21, a mean of 0.38 and a variance of 1.20. Furthermore, an additional zero clustering of the dependent variable was present (gamblers with zero gambling problem symptoms: n = 5,298, gamblers with non-zero gambling problem symptoms: n = 1,108). In conclusion, a negative binominal regression model (NBRM) was considered to be most appropriate. In contrast to the Poisson regression (PR), which is an alternative model for left-tailed non-linear count data, NBRM allows for overdispersed data which violate the Poisson restriction that the variance should not exceed its mean (Greene 1994). Zero-inflated variants of both models, which may account for an additional zero clustering, were not considered because we had no hypothesis suggesting that zero observations could be attributed to two different latent groups (Lambert 1992; Ridout et al. 1998).

To test an association of MB and the count of gambling problem symptoms we built three NBRM: First, MB was included (NBRM 1). Second, the additional demographic characteristics were added to MB (NBRM 2). Third, the 21 specific types of gambling were added to MB and demographic characteristics (NBRM 3). Each model was fitted by stepwise backward deletion and subsequent forward selection of predictors to identify significant predictors in the multivariate NBRM. $p$ values $<.05$ were considered as significant associations. To allow for appropriate comparisons of the models, the gamblers sample was reduced to the interviews with complete data (6,168 among 6,406) on all covariates included in NBRM1, NBRM2, and NBRM3, respectively (Long and Freese 2006a). We report percentage change derived from the exponential regression coefficient, which can be interpreted as expected change in the dependent variable (count of gambling problem symptoms) by one unit change in the respective independent variable, holding all other variables constant (Long and Freese 2006b). The overall effect of the demographic parameters (age, marital status, education, and occupation) in NBRM2 and NBRM3 was tested. The post estimation command FITSTAT (Long and Freese 2006a) was used to compute appropriate model fit indices for weighted data, i.e. Akaike information criterion (AIC) and Bayesian information criterion (BIC). NBRMs with smaller AIC and smaller BIC are considered the better-fitting models (Long and Freese 2006a). The Raftery (1995) guidelines for the strength of evidence suggested favoring a model when difference between BICs is bigger: 0–2 = weak evidence, 2–6 = positive evidence, 6–10 = strong evidence and more than 10 = very strong evidence.

## Results

### Gambling Problems

More study participants with MB fulfilled criteria for PG and SPG than study participants without MB (Rao/Scott corrected $Chi^2$-test based on 2 by 3 contingency table: $p < .001$). Among study participants with MB, 1.8 % fulfilled criteria for PG (n = 51), 9.2 % for SPG (n = 296) and 89.1 % had NGC (n = 2,900). Among study participants without MB, 0.7 % fulfilled criteria for PG (n = 64), 6.1 % for SPG (n = 709) and 93.2 % had NGC (n = 10,865).

Analyses based on the 6,406 gamblers among the sample revealed that 2.2 % fulfilled criteria for PG (n = 116), 15.8 % for SPG (n = 992) and 82.0 % (n = 5,298) had NGC. More gamblers with MB fulfilled criteria for PG (4.7 %, n = 51) and SPG (24.1 %, n = 287) than gamblers without MB (1.6 % PG, n = 64; 13.4 % SPG, n = 697; Rao/Scott corrected $Chi^2$-test based on 2 by 3 contingency table: $p < .001$).

### Demographic Variables

Among the 6,406 gamblers, an MB was present in 1,209 study participants. Gamblers with MB were younger, more likely to live in a multiple persons' household, and less educated compared to gamblers without MB (Table 1). No differences were found with respect to sex, marital status, and occupational status.

### Gambling Participation

The prevalence of lifetime gambling was lower among study participants with MB than among study participants without MB (37.2 vs. 45.0 %, Rao/Scott corrected $Chi^2$-test: $p < .001$). The prevalence of gambling exceeded 10 % for three types of state-run lotteries as well as instant lotteries and gambling machines (Table 2).

Among gamblers with MB, more reported participation in state-run ODDSET, casino table games and casino slot machines as well as poker, other sports betting, and gaming machines than among gamblers without MB. Gamblers with MB were less likely to report participation in state-run lotto 6/49, Spiel 77/Super 6, and German television lottery than gamblers without MB. Among all gamblers, 83.1 % participated in 1–3 different specific gambling types within lifetime. No differences were found with respect to the number of specific types of gambling study participants with and without MB were engaged in.

### MB and Gambling Problems

Based on the unadjusted NBRM (model 1) displayed in Table 3, the expected count of gambling problem symptoms was estimated to increase by 146 % if an MB is present compared to no MB. This estimated increase was 103 % after controlling for demographic characteristics in model 2. In addition to MB, male sex, younger age, being single or separated/widowed, lower educational level and being unemployed were associated with a higher expected count of gambling problem symptoms in model 2. Household size did not contribute to the models and thus was not included in the final NBRM 2 and not considered for modeling NBRM 3. After including the preferred types of gambling in model 3, the expected increase of the count of gambling problem symptoms for MB turned out to be 98 %. In addition to MB, the final model 3 included demographic characteristics (sex, age,

**Table 1** Demographic characteristics of all gamblers and gamblers with and without MB

| | Total N = 6.406 | | MB present N = 1.209 | MB not present N = 5.151 | *p* |
|---|---|---|---|---|---|
| | N | % | % | % | |
| Sex | | | | | ns |
| Female | 2.889 | 38.3 | 35.7 | 39.2 | |
| Male | 3.517 | 61.7 | 64.3 | 60.9 | |
| Age | | | | | *** |
| 14–30 | 1.331 | 18.4 | 26.8 | 16.1 | |
| 31–47 | 2.531 | 41.1 | 41.8 | 41.0 | |
| 48–64 | 2.530 | 40.5 | 31.4 | 42.9 | |
| Marital status | | | | | ns |
| Married | 2.957 | 55.7 | 54.5 | 56.1 | |
| Single | 12.354 | 30.6 | 32.7 | 29.9 | |
| Separated/widowed | 1.056 | 13.8 | 12.8 | 14.0 | |
| Household size | | | | | *** |
| 1 person | 1.536 | 15.3 | 14.3 | 15.4 | |
| 2 persons | 2.079 | 29.3 | 22.4 | 31.4 | |
| 3–4 persons | 2.340 | 46.3 | 51.3 | 44.9 | |
| ≥5 persons | 412 | 9.1 | 12.0 | 8.3 | |
| Educational level | | | | | *** |
| Low (ISCED level 0–2) | 437 | 9.7 | 17.1 | 7.5 | |
| Medium (ISCED level 3–4) | 3.540 | 62.9 | 60.4 | 63.8 | |
| High (ISCED level 5–6) | 2.401 | 27.4 | 22.5 | 28.7 | |
| Occupation | | | | | ns |
| Employed | 4.895 | 75.8 | 76.4 | 75.7 | |
| Unemployed | 532 | 10.6 | 10.3 | 10.6 | |
| Others | 938 | 13.6 | 13.3 | 13.7 | |

Absolute frequencies calculated from unweighted data, relative frequencies calculated from weighted data; gamblers are defined as individuals who gambled at least on any game more than ten times within their lifetime; N = number; MB = migration background; $p = p$ value of Rao/Scott corrected $Chi^2$-test

* $p < .05$; ** $p < .01$; *** $p < .001$; ns = not significant ($p \geq .05$)

marital status, and education), and participation in Quicky, gaming machines, casino table games, trading on the stock exchange, TV quiz channel gambling, poker, other sports betting, class lotteries, and instant lotteries. These nine types of gambling were associated with an increased expected count of gambling problem symptoms. Horse race betting, German TV lottery, Spiel 77/Super 6, bingo, gaming machines with token, other lotteries, occupation, ODDSET, TOTO, lotto 6/49, private/illicit gambling, casino slot machines, and KENO did not reach the significance criterion ($p < .05$), and were thus not included in the final NBRM 3.

The model fit indices AIC and BIC clearly supported the superiority of NBRM 3 which included MB, demographic characteristics, and the preferred types of gambling. The BIC difference of 391 (BIC NBRM 1–BIC NBRM 2) and 327 (BIC NBRM 2–BIC NBRM 3) provided very strong evidence for favoring NBRM 3 over NBRM 2 and NBRM 1 (Raftery 1995).

**Table 2** Lifetime participation in different types of gambling among all gamblers and gamblers with and without MB

| | Total N = 6.406 | | MB present N = 1.209 | MB not present N = 5.151 | *p* |
|---|---|---|---|---|---|
| | N | % | % | % | |
| Lotto 6/49 | 3.555 | 59.3 | 56.4 | 60.1 | * |
| Spiel 77/Super 6 | 2.329 | 40.3 | 37.8 | 41.0 | * |
| KENO | 303 | 5.0 | 6.2 | 4.6 | ns |
| Quicky | 19 | 0.4 | 0.5 | 0.3 | ns |
| Class lotteries | 483 | 7.4 | 6.5 | 7.7 | ns |
| German TV lottery | 486 | 6.8 | 4.0 | 7.6 | ** |
| Other lotteries | 945 | 14.9 | 10.3 | 16.3 | *** |
| Instant lotteries | 1.296 | 20.1 | 19.5 | 20.3 | ns |
| Bingo | 123 | 2.2 | 2.3 | 2.1 | ns |
| TV quiz channel gambling | 101 | 1.8 | 2.0 | 1.7 | ns |
| Trading on the stock exchange | 193 | 2.3 | 2.0 | 2.4 | ns |
| Poker | 423 | 5.9 | 9.1 | 4.9 | *** |
| Casino table games | 197 | 2.9 | 4.7 | 2.5 | *** |
| Casino slot machines | 150 | 2.4 | 4.6 | 1.8 | *** |
| Gaming machines | 653 | 11.9 | 14.1 | 11.2 | * |
| Gaming machines with token | 62 | 1.0 | 1.3 | 0.9 | ns |
| ODDSET | 294 | 4.9 | 7.9 | 4.2 | *** |
| TOTO | 128 | 2.0 | 2.7 | 1.8 | ns |
| Horse race betting | 122 | 1.7 | 1.4 | 1.8 | ns |
| Other sports betting | 213 | 3.0 | 5.3 | 2.3 | *** |
| Private/illicit gambling | 223 | 3.1 | 3.1 | 3.1 | ns |
| Without preference of a specific gambling type | 1.012 | 14.2 | 15.1 | 14.0 | ns |
| N of specific gambling types | | | | | ns |
| 1 | 1.951 | 34.6 | 32.9 | 35.0 | |
| 2–3 | 2.560 | 48.5 | 50.3 | 47.9 | |
| 4–6 | 783 | 15.2 | 14.1 | 15.5 | |
| 7–13 | 100 | 1.8 | 2.7 | 1.6 | |

Absolute frequencies calculated from unweighted data, relative frequencies calculated from weighted data; gamblers are defined as individuals who gambled more than ten times within their lifetime; N of specific gambling types does not include the category *Without preference of a specific gambling type*; N = number; MB = migration background; $p = p$ value of Rao/Scott corrected $Chi^2$-test

* $p < .05$; ** $p < .01$; *** $p < .001$; ns = not significant ($p \geq .05$)

## Discussion

Our data confirmed a strong association of MB with gambling problems for the general population in Germany. Part of this association was mediated by demographic characteristics and the preferred types of gambling. Both reduced the direct association of MB on gambling problems and thus may be seen as partial mediators. However, the extent of mediation by demographic characteristics and the preferred types of gambling appeared to be limited. Therefore, demographic risk factors and gambling preference do not appear to

**Table 3** NBRM predicting the count of gambling problem symptoms within lifetime (0–10 DSM-IV-L criteria) among lifetime gamblers (N = 6.168)

| | NBRM 1 | | NBRM 2 | | NBRM 3 | |
|---|---|---|---|---|---|---|
| | %Ch | *p* | %Ch | *p* | %Ch | *p* |
| MB | | *** | | *** | | *** |
| Not present | *Ref* | | *Ref* | | *Ref* | |
| Present | 146.2 | | 102.5 | | 97.6 | |
| Sex | | | | *** | | *** |
| Female | – | | *Ref* | | *Ref* | |
| Male | – | | 195.1 | | 100.2 | |
| Age | | | | *** | | *** |
| 14–30 | – | | *Ref* | | *Ref* | |
| 31–47 | – | | −34.9 | | −29.4 | |
| 48–64 | – | | −57.3 | | −49.3 | |
| Marital status | | | | *** | | ** |
| Married | – | | *Ref* | | *Ref* | |
| Single | – | | 81.7 | | 68.4 | |
| Separated/widowed | – | | 51.0 | | 47.2 | |
| Educational level | | | | ** | | * |
| Low (ISCED level 0–2) | – | | *Ref* | | *Ref* | |
| Medium (ISCED level 3–4) | – | | −21.8 | | −32.9 | |
| High (ISCED level 5–6) | – | | −45.3 | | −45.0 | |
| Occupation | | | | *** | | ns |
| Employed | – | | *Ref* | | – | |
| Unemployed | – | | 68.7 | | – | |
| Others | – | | 1.6 | | – | |
| Quicky | – | | – | | 321.0 | *** |
| Gaming machines | – | | – | | 189.8 | *** |
| Casino table games | – | | – | | 181.7 | *** |
| Trading on the stock exchange | – | | – | | 157.0 | *** |
| TV quiz channel gambling | – | | – | | 141.7 | ** |
| Poker | – | | – | | 96.1 | *** |
| Other sports betting | – | | – | | 82.3 | *** |
| Class lotteries | – | | – | | 47.4 | ** |
| Instant lotteries | – | | – | | 27.2 | ** |
| AIC | 9,234 | | 8,782 | | 8,408 | |
| BIC | −109 | | −500 | | −827 | |

Multivariate regression analyses with hierarchical block by block inclusion of candidate predictors (NBRM 1: MB, NBRM 2: MB plus demographic variables, NBRM 3: MB and demographic variables plus preferred types of gambling); stepwise backward deletion and forward selection of candidate predictors with $p \geq .05$ within the blocks of NBRM 2 (household size) and NBRM 3 (horse race betting, German TV lottery, Spiel 77/Super 6, bingo, gaming machines with token, other lotteries, occupation, ODDSET, TOTO, lotto 6/49, private/illicit gambling, casino slot machines, KENO); gamblers are defined as individuals who gambled more than ten times within their lifetime; PG = pathological gambling; N = number; %Ch = change in percent; *p* = *p* value: *** $p < .001$, ** $p < .01$, * $p < .05$; MB = migration background; Ref = reference category; – = candidate predictor not included in NBRM; AIC = Akaike information criterion; BIC = Bayesian information criterion

fully explain the higher prevalence of gambling problems among the population with an MB.

In line with previous findings presented in the overview by Williams et al. (2012), study participants with an MB reported gambling problems more often. They were twice as likely to fulfill criteria for PG in a lifetime as those study participants without MB. These differences were even higher when restricting the sample to lifetime gamblers. Gamblers with MB were three times as likely to fulfill the criteria for PG in a lifetime as gamblers without MB. Moreover, our data revealed corresponding differences with respect to the prevalence of SPG.

In most prevalence of gambling studies, SOGS was used to assess past year's gambling problems, followed by DSM-IV based measures and the Canadian Problem Gambling Index (CPGI; Ferris and Wynne 2001, Williams et al. 2012). We decided on the diagnostic standard, the DSM-IV criterion based assessment of gambling problem symptoms (Stinchfield 2002; Tang et al. 2010) and considered the lifetime perspective on gambling problems that allows for comparisons across the entire life span of the study participants. Among the population-based prevalence studies on problem gambling summarized by Williams et al. (2012), there are two similar studies. However, Kessler et al. (2008) do not report the *prevalence* of gambling problems among the population with and without IE and Bakken et al. (2009) only report the prevalence of *problematic gambling* (3 and more DSM-IV-L criteria) according to the country of birth (Norway: 1.6 %, other Western country: 2.5 %, non-Western country: 4.6 %; $p < .05$) of the study participants. In contrast, we decided to assess the MB, as recommended by the German government (Federal Ministry of Labour and Social Affairs 2010), and not their country of birth or nationality. Our study confirmed a positive association between having an IE and gambling problems. Unfortunately, however, we could not compare the strength of the current association to those found in past studies because of differences in the definition and assessment of gambling problems.

The expected differences in demographic risk factors and gambling preference between the population with and without an MB were partly confirmed for the gamblers among study participants. They differed in their age, household size and educational level. No differences appeared between the gamblers with respect to the number of different gambling types they participated in. This is important in view of the number of gambling types that have been identified as a risk factor (Welte et al. 2004b). However, gamblers with MB were more likely to participate in gambling types which were found to be associated with a higher risk of gambling problems due to their structural characteristics (such as high event frequency, involved element of perceived or real skill, low accessibility and costs threshold, frequent near wins, and short-payout intervals; Abbott et al. 2013; Côté et al. 2003; Fong 2005; Gosselt et al. 2012; Meyer and Bachmann 2011). These characteristics increase erroneous and irrational beliefs related to probabilities of winning that are considered to be important factors contributing to persistence of gambling and consequently, the development of harmful consequences (Blaszczynski et al. 2013). Overall, the lifetime prevalence of gambling was lower among study participants with MB—but those that gamble prefer the more risky types of gambling in comparison to gamblers without MB. This is in line with the findings from Welte et al. (2002), which revealed that although the prevalence of gambling among Blacks is lower than that of Whites, Blacks show riskier gambling behavior with respect to gambling frequency and extent of gambling involvement (sum of the absolute value of wins and losses) in U.S. dollars.

The significance of demographic characteristics and the preferred types of gambling for the link between an MB and lifetime gambling problems has been confirmed through multivariate analysis. In addition, our results confirmed a positive association between having an IE and gambling problems even when controlling for demographic risk factors

and gambling preference. This is in line with previous research by Hass et al. (2012), who showed with a multivariate analysis that an MB is independently associated with past year's problem gambling (SOGS score 3–20). According to results from Strong and Kahler (2007), we considered the problem severity assessed by the count of gambling problem symptoms based on the DSM-IV. By taking into account lifetime gambling problem severity, we were able to identify previously neglected risk factors for gambling problems, such as participation in high-risk trading on the stock exchange and class lotteries. None of the previous studies quantified the proportion of explanatory power from IE history that is shared with demographic risk factors and gambling preference. By using a blockwise approach to build our prediction model, we were able to show that demographic risk factors and gambling preference may partially mediate but not completely explain the higher prevalence of gambling problems among the population with MB. This study extended previous research in two further aspects. First, we considered the lifetime perspective of a broad set of covariates including demographic risk factors and gambling preference among a large general population sample. Second, by using the diagnostic standard of a valid interview-based assessment of DSM-IV criteria, a high diagnostic precision was provided, and we were able to relate an MB to a more complex measure of gambling problems by taking into account its continuous nature.

Some other aspects and mechanisms not measured in our study may explain the higher risks for gambling problems associated with an MB and IE, respectively. Cultural differences have been found with respect to the acceptability and accessibility of gambling. On the one hand, gambling is an established part of the tradition, history, and lifestyle of some cultures, and on the other hand, the growing number of gambling opportunities in public spaces that are preferred by the population with an IE increases gambling activity, leading to a higher risk for gambling problems among the population with an IE than among the population without an IE (Alegria et al. 2009). Variables that may also play a role in initiating and maintaining gambling are cultural beliefs and values that determine the permitted and prohibited types of gambling, effects of acculturation (either successfully adapting to a gambling accepting culture or difficulties in adapting to the mainstream culture that lead to isolation, boredom, loneliness, stress, depression, shame, self-doubt), and less supportive attitudes within some cultures that consider gambling problems more as result of a personal deficit (Raylu and Oei 2004). Furthermore, there are factors regarding emotional vulnerability that are often associated with the process of migration such as mood disturbance, poor coping, cultural stressors (i.e. xenophobia, Currie et al. 2013), and lack of cultural codes (i.e. language, symbols, manners, humor, and social systems) as well as social networks that could take influence on gambling problems (Blaszczynski and Nower 2002; Fong 2005).

Migration has been considered an important risk factor in the development of mental disorders in general (Haasen et al. 2001). However, several protective factors associated with an IE have been discussed as well: the strong cohesion of ethnic subcultures, a strong religious or political conviction, and the impact of family (Haasen et al. 2001). To date, there is no evidence for the effectiveness of these protective factors in the prevention of gambling problems. Furthermore, it might be suggested that these factors are unfavorable. Rigorous, normative moralities, strong orientation to each other and clear separation from mainstream society can even increase the risk for gambling problems.

Several limitations of this study have to be considered when interpreting our results. First, we only included individuals with sufficient German language abilities. Therefore, our results cannot be generalized to the population with an MB and low knowledge of German language. As language capabilities are a major determinant of the assimilation process, it might be expected that this group may face very different living conditions and

risk profiles regarding gambling problems. Second, we included only non-institutional individuals aged between 14 and 64 years who can be reached via landline or mobile-phone. We cannot provide information on the older and younger population, on the population without a landline or mobile-phone as well as on the population living in jail or other institutions. Third, only 52.7 % of the eligible individuals participated in our study. Our response rate is thus equal to the average response rate of 52.5 % for telephone interviews of prevalence of gambling problems studies (Williams et al. 2012). Although, we weighted for different inclusion probabilities due to differential participation proportions in different subgroups, we cannot exclude a selection bias. Fourth, our study results are based on self-reported data. Social desirability or other factors related to reporting bias may have distorted our findings, although there is evidence supporting the validity of self-reported gambling behavior (Hodgins and Makarchuk 2003). Fifth, the cross-sectional study design precludes any causal interpretation of the associations found in our study. Sixth, MB may refer either to an IE of the study participants or their parents, which may have different effects. The first generation migrants, i.e. individuals with an IE in their own biography, may feel cultural contradictions unlike the second generation migrants, i.e. individuals with an IE experienced by their parents. Seventh, the population with an MB represents a heterogeneous group consisting of individuals migrating from very different cultures under different conditions as was pointed out in the discussion section above.

## Conclusions

Despite these limitations, our data suggest that demographic risk factors and gambling preference do not fully explain the higher prevalence of gambling problems among the population with an IE history. Having an IE may be considered as an independent risk factor for gambling problems. Culturally sensitive research and health care is needed to identify and examine the underlying causal reasons for the higher susceptibility to gambling problems among the population with IE.

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**Conflict of interest** The authors declare that they have no conflict of interest.

**Ethical standard** The local ethics committees of the Universities of Greifswald and Lübeck approved this study, which was part of the project PAGE (Reg.-No. BB 95/09; Reg.-No.10-068). All individuals gave their informed consent prior to their inclusion in the study.

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