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## 'Risky Places?': mapping gambling machine density and socio-economic deprivation

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### Abstract

**Aims:** to map the location and density of gambling machines in Britain; to explore whether geographic areas with higher densities of machines exist and to examine the socio-economic characteristics of these areas relative to others. **Design:** Geospatial analysis of premises records. **Measurements:** Machine Zones, representing a 400 meter radius around gambling machine venues, and High Density Machine Zones (HDMZ) with 1 or more gambling machine per hectare. **Findings:** 384 HDMZs were identified. There was a significant correlation between machine density and socio-economic deprivation. HDMZs had greater levels of income deprivation, more economically inactive people and a younger age profile than other areas; 37% of those living in HDMZs were economically inactive compared with 33% of those in non-machine areas. HDMZs were in seaside locations but also New Towns or satellite towns to major urban areas. Area affluence explains some of this pattern; of the New Towns with HDMZs, 78% were in New Towns with a high proportion of low income areas.

**Conclusions:** The distribution of gambling machines in Great Britain, in line with other international jurisdictions, displays a significant association with areas of socio-economic deprivation. The profile of the resident population living in HDMZs mirrors the profile of those most at-risk of experiencing harm from gambling. This spatial pattern has important implications for assessing the relationship between gambling availability and gambling-related harm, and for the future development of policy, harm-prevention and treatment strategies

**Key words:** Great Britain; Gambling; Public Health; GIS analysis; Health and Place; Inequalities

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Ruth Keily and Gaynor Astbury have received funding from the Responsible Gambling Fund as well as other commercial clients not related to the gambling industry.

Gerda Reith has received joint funding from the Responsible Gambling Fund and the ESRC. She is also a member of the Responsible Gambling Strategy Board which advises the Responsible Gambling Fund about research issues.

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4 **'Risky Places?': mapping gambling machine density and socio-economic**  
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6 **deprivation**  
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10  
11 **Abstract**  
12

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14 whether geographic areas with higher densities of machines exist and to examine the  
15 socio-economic characteristics of these areas relative to others. **Design:** Geospatial  
16 analysis of premises records. **Measurements:** Machine Zones, representing a 400  
17 meter radius around gambling machine venues, and High Density Machine Zones  
18 (HDMZ) with 1 or more gambling machine per hectare. **Findings:** 384 HDMZs were  
19 identified. There was a significant correlation between machine density and socio-  
20 economic deprivation. HDMZs had greater levels of income deprivation, more  
21 economically inactive people and a younger age profile than other areas; 37% of those  
22 living in HDMZs were economically inactive compared with 33% of those in non-machine  
23 areas. HDMZs were in seaside locations but also New Towns or satellite towns to major  
24 urban areas. Area affluence explains some of this pattern; of the New Towns with  
25 HDMZs, 78% were in New Towns with a high proportion of low income areas.  
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42 **Conclusions:** The distribution of gambling machines in Great Britain, in line with other  
43 international jurisdictions, displays a significant association with areas of socio-economic  
44 deprivation. The profile of the resident population living in HDMZs mirrors the profile of  
45 those most at-risk of experiencing harm from gambling. This spatial pattern has  
46 important implications for assessing the relationship between gambling availability and  
47 gambling-related harm, and for the future development of policy, harm-prevention and  
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## Introduction

Commercial gambling has proliferated throughout many countries in the world over the last three decades (Shaffer & Hall 2001). Great Britain, arguably, has one the most accessible gambling markets in the world with provisions for gambling ranging from lottery tickets sold in most local shops, to gambling machines located in a variety of venues, to casinos, bookmakers and online gambling. As opportunities for gambling have multiplied, concerns about the public health impacts associated with this behaviour and the impact on rates of problem and pathological gambling have increased.

As with other forms of addictive behaviors, such as tobacco and alcohol consumption, problems associated with gambling have a social and geographical gradient, with those living in areas of greater deprivation, who are economically inactive and with lower incomes being more likely to experience harm (Orford et al. 2010; Wardle et al. 2011). This suggests that there is both a social and geographical patterning of gambling-related harm which is likely to be complex and involve both individual factors (composition) and social factors (context), such as access and availability of gambling, and socio-economic and demographic characteristics and circumstances (Pearce et al. 2008). Although considerable research has been conducted on the individual determinants of problem gambling far less is known about contextual influences (Welte et al. 2006).

Increasing recognition of contextual issues has encouraged focus on the interplay between individuals and environment and, in particular, on the relationship between access to gambling opportunities and impact on behaviour (Korn & Shaffer 1999; Pearce et al. 2008; Orford 2010). Welte (2004; 2007) demonstrated that gambling problems were higher among those who lived in close proximity to a casino, whilst examination of machine density in Australia showed that high machine density accounted for 77% of the

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4 variation in gambling expenditure per adult (Storer & Stubbs, 2007). Many studies have  
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6 focused on the relationship between gambling machine availability and player behaviour.  
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8 Internationally, machines are associated with high rates of at-risk and problem gambling  
9  
10 as well as high rates of help-seeking among players (Storer, Abbott & Stubbs, 2009).  
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12 Research from Australia and Canada has suggested that they are frequently clustered in  
13  
14 areas of high socio-economic deprivation and are associated with higher rates of  
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16 problems among individuals from lower socio-economic groups (Livingstone, 2001;  
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18 Abbott et al, 2004; Wheeler et al, 2006).  
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24 In Britain, there has been no systematic evaluation of the distribution of gambling  
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26 opportunities and their spatial patterning. This is an increasingly glaring omission as  
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28 changes in the way that gambling venues were approved and licensed were introduced  
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30 with the Gambling Act 2005. British policy, directed by the Department for Culture, Media  
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32 and Sport, is now largely based on the principles of consumer choice and market  
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34 competition, albeit with the stipulation that vulnerable people should be protected from  
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36 harm (DCMS, 2005). Free market principles dominate policy relating to supply for  
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38 gambling opportunities, with little consideration of how the geographic distribution of the  
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40 latter may impact upon the prevalence and incidence of problem gambling.  
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46 This has led to increasing debate about the perceived clustering of gambling  
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48 opportunities – particularly machines - in areas of greatest socio-economic deprivation.  
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50 Critics have pointed to the changing profile of some local High Streets to argue that  
51  
52 there is increasing geographical clustering of machine gambling venues and that this  
53  
54 exposes local populations to augmented risk of harm (Light, 2007; Orford, 2010;  
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56 Harman, 2011). The objective of this study was to contribute to this debate by taking an  
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58 important first step and mapping the location and density of gambling machines in Great  
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4 Britain. Put simply, we need to know if and how machines cluster in certain areas before  
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6 we can examine the impact of this.  
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11 Gambling machines are of particular policy interest because of their association with  
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13 gambling-related harm, a clear social gradient of participation and their availability. This  
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15 has led to researchers describing their international distribution as based on principles of  
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17 regressive 'harm production' (Livingstone and Adams 2010). Aside from lottery tickets  
18  
19 and scratchcards, gambling machines are the most accessible form of land based  
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21 gambling in Britain, with around 135,000 gambling machines in the market (Gambling  
22  
23 Commission, 2011). The British Gambling Prevalence Survey 2010 showed that the  
24  
25 prevalence of playing gambling machines was significantly higher among those who  
26  
27 were unemployed, had low personal income and/or were living in areas of greatest  
28  
29 deprivation (Wardle et al, 2011). As noted in other jurisdictions, a majority of those  
30  
31 presenting for treatment for gambling problems are heavily involved in machine play  
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33 (Wheeler et al, 2006; GamCare, 2010).  
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40 The aims of this study were to a) map the location and estimated density of gambling  
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42 machines in Britain, b) identify whether geographic areas with higher densities of  
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44 machines exist and, if so, c) to explore the socio-economic characteristics of those areas  
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46 relative to others.  
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## 51 **Methods**

### 52 ***Identifying the number of gambling machines at different venues***

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55 There is no central register which records the number of gambling machines present at  
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57 different venues in Britain. Therefore, data about the location and density of gambling  
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59 machines were collected in two stages:  
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1) Data showing the location of all regulated British gambling venues as at December 2010 was obtained from the UK's Gambling Commission (GC). This database contained full address and postcode information for licenses issued to venues. This includes all bookmakers, bingo clubs, amusement arcades/family entertainment centres and casinos (i.e., venues where machines may be present). The GC does not regulate gambling machines in pubs and restaurants. Therefore, a separate listing of licensed pub/restaurant premises with gambling machines was purchased from a commercial supplier.

Some gambling venues hold more than one license for gambling machines and 165 licenses had no spatial location record. Taking these into account, analysis was based on 29,711 premise locations.

2) Estimates of the number of machines at each venue type were made based on a) regulatory information about the maximum number of machines allowed per venue, b) consultation with specific industry sectors and c) a field validation process. For example, a pub with gambling machines licensed within its alcohol license is allowed a maximum of two machines per premise. Bookmakers are permitted to have four machines per premise and the Association of British Bookmakers confirmed that, space permitting, most use their full allocation.

The sector for which little information was available was amusement arcades, known as Adult Gaming Centres (AGCs). In AGCs, limits on machine numbers applies only to higher-stake machine categories, whereas lower category machines are unlimited in number. A field validation study was conducted by

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4 NatCen Social Research to obtain a meaningful estimate of machine numbers for  
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6 AGCs.  
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10 NatCen interviewers visited 65 AGCS to count the number of machines at each.  
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12 The venues were purposively selected from the GC's license database.  
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14 Consultation with the GC suggested that the number of machines per venue was  
15  
16 likely to vary based on location. Quotas were set on different AGC types  
17  
18 categorised by geographic location. These were urban/central, periphery or  
19  
20 smaller urban areas, medium or small towns, seaside resorts and transport hub  
21  
22 locations. The number and type of AGCs included in the validation study broadly  
23  
24 reflected the distribution of all licensed AGCs in Great Britain. Data from the field  
25  
26 validation study were collated and the results used in analysis. Estimates of the  
27  
28 average number of machines per venue type are shown in Table 1.<sup>1</sup>  
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35 Information from these two stages were combined to provide estimates of the average  
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37 number of machines in a given location based on venue type (see xxxx for full details).  
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## 42 **Analysis**

### 43 ***Visualising machine density***

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45 The average number of machines per premise license type was assigned to each  
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47 premise. The average number of machines for each Output Area (OA)<sup>2</sup> was calculated  
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49 by aggregating machine number estimates for all venues found within each OA. The  
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55 <sup>1</sup> Full technical details about how the number of machines per venue were estimate are given in xxxx, 2010.  
56 Alternatively, please contact the authors for a copy or further discussion of methods.

57 <sup>2</sup> Output Areas are continuous area units covering the UK, built for and used to represent census-based and  
58 other demographic statistics. They are demographically designed to have similar population sizes and be as  
59 socially homogenous as possible and they allow for finer resolution of data analysis. In 2001 the minimum  
60 threshold population was 100.  
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4 average number of machines per person in each OA was also calculated by dividing the  
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6 average number of machines by the population of the OA using 2001 Census data  
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8 Weighted kernel density estimation techniques were used (using ArcGIS spatial analyst  
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10 tools) to produce continuous data surfaces indicating higher densities of machines per  
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12 resident head of population.  
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### 18 ***Identifying Machine Zones and High Density Machine Zones***

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20 In order to compare the socio-economic characteristics of areas both with and without  
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22 gambling machines, a geographic 'buffer' zone of 400m was drawn around each  
23  
24 machine gambling venue. There is no recognised standard of the distance from a  
25  
26 gambling venue which represents greater or lesser access to gambling. Studies in  
27  
28 Australia, Canada and the USA have used various distances with radii ranging from 300  
29  
30 metres (m) to 16 kilometres (km) (Wilson et al, 2006; Robitaille & Herjean, 2008; Welte &  
31  
32 Barnes, 2007). Given the more compact and densely populated nature of Great Britain,  
33  
34 a distance of 16km was not judged as appropriate. UK Planning Policy Statement 6  
35  
36 states that 300m between facilities within a town centre represents easy walking  
37  
38 distance (ODPM, 2005). Furthermore, a 400m radius was required to be able to include  
39  
40 socio-economic data for Lower Super Output Areas<sup>3</sup> in a nearest-neighbour analysis.  
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43 Therefore, a radius of 400m from any venue with a gambling machine was judged to be  
44  
45 a reasonable definition of a 'machine zone' (MZ). There were 8861 'machine zones' in  
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47 total, with many becoming contiguous with neighbouring zones.  
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59 <sup>3</sup> Lower Super Output Areas (LSOAs) are akin to Output Areas (OAs). They are built from blocks of  
60 Output Areas and have a mean population of 1,500.  
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4 Once MZs were identified, the number of machines per zone was calculated by  
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6 estimating the number of machines at each venue within that zone. These data were  
7  
8 used to calculate the average number of machines per hectare within MZs.  
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12 There is no standard definition of what constitutes a 'high-density' of gambling machines.  
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14 Plotting the distribution of average number of machines per hectare within MZs showed  
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16 that one standard deviation from the mean gave an average density of 1 machine per  
17  
18 hectare. Using this density threshold, 386 MZs were classified as 'high-density' (4.3% of  
19  
20 all MZs). This grouped machine zones into two types: high density machine zones  
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22 (HDMZs), with an average of 1.9 machines per hectare, and non high density MZs (nhd-  
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24 MZs) with a density below this threshold, with an average 0.3 machines per hectare.  
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### 30 31 ***Socio-economic characteristics and statistical testing***

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33 Once nhd-MZs and HDMZs were identified, headline statistical values were calculated  
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35 for income (based on Income Domain scores from the Index of Multiple Deprivation,  
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37 2007), economic inactivity, occupation group, ethnicity and age (using Census data),  
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39 based on the OA/Lower-Super OA population-weighted centroids falling within their  
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41 boundaries.<sup>4</sup> Where no such centroid fell within an nhd-MZ/HDMZ, it was excluded from  
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43 analysis, leaving a total of 7243 MZs. Chi-square tests were computed on variable  
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45 counts within a 5 x 5 matrix, defined by quintiles, of zone density against the various  
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47 indicators.  
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## 53 **Results**

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59 <sup>4</sup> Population-weighted OA centroids are point locations of OA situated towards where the majority of  
60 people within that area live 'on the ground'.  
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4 ***Geographic location of high density machine zones***  
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6 Unsurprisingly, HDMZs tended to be found in seaside locations: a third of HDMZs were  
7 located within one mile of the coastal boundary, reflecting the traditional concentration of  
8 amusement arcades in seaside towns. However, HDMZs were also present in urban  
9 locations and specifically in periphery and satellite towns to major urban centres. For  
10 example, towns like Crawley, Feltham, Luton and Watford around Central London  
11 contained HDMZs, though not Central London itself. This pattern was replicated in  
12 Manchester, Newcastle, Birmingham, Liverpool and Glasgow, whereby the areas  
13 surrounding each city contained some HDMZs but none were evident within the central  
14 urban area of the cities themselves. Adjusting estimates to take into account population  
15 density did not alter the observed distribution; HDMZs are high density relative to both  
16 the geographic space and the resident population in which they are located. HDMZs  
17 were also disproportionately located in New Towns. Of the twenty seven New Towns  
18 created by the 1946 New Town Act, 18 contained HDMZs.  
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38 ***Socio-economic characteristics of HDMZs***  
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40 Areas with gambling machines were likely to have a slightly younger population than  
41 areas outside machines zones; 27.6% of the total population in nhd-MZs were aged 16-  
42 34 compared with 23.4% of those living in non-machine areas. This difference was more  
43 pronounced when looking at HDMZs where 29.9% of the population was in this age  
44 group ( $p < 0.01$ ).  
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53 This pattern was replicated for most of the socio-economic characteristics considered  
54 (see Table 2). Compared with non-machine areas, nhd-MZs had a higher proportion of  
55 non-white ethnic groups, a lesser proportion of residents in managerial/professional  
56 occupations and a greater percentage of economically inactive residents. When looking  
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4 at HDMZs, differences were more pronounced. These areas had the highest proportion  
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6 of economically inactive people (37.0%), higher percentages of residents in elementary  
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8 jobs (14.8%) and, likewise, the lowest proportion of those in managerial/professional  
9  
10 occupations ( $p < 0.01$ ). In England, HDMZs had significantly higher income deprivation  
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12 scores compared with non-machine areas. In Wales, all machine zones, whether high  
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14 density or otherwise, had higher income deprivation scores than non-machine areas  
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16 ( $p < 0.01$ ).  
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22 A clear relationship between income deprivation and HDMZs was evident. By and large,  
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24 HDMZs were located in areas of greatest income deprivation. However, HDMZs tend not  
25  
26 to be present in very central urban areas but are more likely to be found in urban fringe  
27  
28 or suburban locations. This is evident when looking at Greater London (Figure 1), with  
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30 the observed pattern being replicated across Great Britain.  
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35 However, these patterns were not universal. Not all areas with the greatest levels of  
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37 income deprivation had a HDMZ and not all HDMZs were located in the most income  
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39 deprived areas. Some were situated in areas that may be considered relatively affluent  
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41 comparative to the surrounding area. See for example the cluster of HDMZs in South  
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43 West Manchester (Figure 2).  
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### 49 **Seaside resorts, New Towns and income**

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51 HDMZs were disproportionately present in both seaside locations and New Towns<sup>5</sup>,  
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53 though again not universally. Further investigation was undertaken to explore whether  
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59 <sup>5</sup> Defined as the 27 British towns created under the New Towns Act 1946 or rapidly expanded under its  
60 provisions or the replacement 1964 Act.  
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4 income levels may be associated with this distribution. Seaside resorts<sup>6</sup> and New Towns  
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6 were subdivided into two types: those with a HDMZ and those without. A further  
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8 categorisation was made based on whether each settlement had more than half of its  
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10 OAs within the lowest 20% of income areas. These were classified as areas with a 'high'  
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12 percentage of low income areas.  
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17 Results showed that 84% of seaside resorts with a high percentage of low income areas  
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19 had a HDMZ. Of HDMZs in seaside locations 61% were in areas with a higher proportion  
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21 of low income areas. The same pattern was observed for New Towns: 74% of New  
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23 Towns with a high percentage of low income areas also had a HDMZ and HDMZs were  
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25 found disproportionately in this category of New Town (78%).  
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### 31 **Discussion**

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33 Understanding the distribution of gambling machines is an important, but sorely  
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35 neglected, public health issue. International research has shown that a relationship  
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37 between exposure to gambling – especially machines – and risk of harm exists, although  
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39 this relationship is complex and may vary according to regulatory environment.  
40  
41 Gambling machines are one of the most highly accessible forms of gambling available in  
42  
43 Great Britain, and are disproportionately popular among youth and other vulnerable  
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45 groups, such as those who are unemployed or live in deprived areas (Wardle et al,  
46  
47 2011). Analysis demonstrated a strong correlation between machine density and socio-  
48  
49 economic deprivation and highlighted a specific geographic patterning of distribution.  
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51 HDMZs had higher income deprivation, more economically inactive residents and a  
52  
53 younger population profile. However, this pattern was not universal and HDMZs were  
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59 <sup>6</sup> This used the 74 largest resorts in England by population based on Department for Communities and Local  
60 Government benchmarking study; no equivalent listing exists for Wales or Scotland.  
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4 also evident in some relatively affluent areas. This suggests that factors other than those  
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6 related to income deprivation or the socio-demographic profile of residents may be  
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8 relevant when considering gambling machine distribution. Resident population density,  
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10 however, was not one of them. A number of machine hotspots had a disproportionately  
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12 high number of machines per head of resident population. Therefore it does not appear  
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14 that machines are simply clustering proportionately to the size of the resident population;  
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16 other factors must be driving this distribution.  
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22 As expected, seaside resorts had high densities of gambling machines but somewhat  
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24 unexpectedly, so did New Towns and suburban centres of major urban areas. Income  
25  
26 deprivation was clearly correlated with this distribution. However, taking a more  
27  
28 relational approach to understand this spatial patterning may also be fruitful. Our  
29  
30 analysis necessarily took a static approach when analysing the relationship between  
31  
32 place (machine zones) and people (residents within machine zones). However, we  
33  
34 recognise that the relationship between place and people is both relational and dynamic  
35  
36 through space and time (Cummins et al, 2007; Rainham et al, 2010). Given the  
37  
38 centralised location of gambling venues in business, recreational and retail areas, these  
39  
40 dynamic relations are even more pertinent as different groups of people populate these  
41  
42 spaces at different times. Going forward, it will be important to consider how factors such  
43  
44 as local culture and heritage, structure and infrastructure or differing uses of space by  
45  
46 population sub-groups combine to influence the distribution of gambling venues. For  
47  
48 example, pre-existing culture, heritage and tourism are likely to provide explanatory  
49  
50 factors for the distribution of HDMZs in seaside locations, though they do not  
51  
52 comprehensively explain why some seaside resorts have high densities and others do  
53  
54 not. It is likely that local policies and priorities (for example, those related to  
55  
56 regeneration), economic diversification and local norms may provide additional  
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4 explanations, along with the socio-demographic and economic characteristics of the  
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6 local area. With regard to New Towns, these areas are likely to be focal centres for  
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8 work, entertainment and recreation meaning that these spaces are used by a variety of  
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10 people at different points. Greater understanding is needed about who, out of this  
11  
12 broader population base, is actually using the gambling provisions. In short, the impact  
13  
14 of increased gambling machine availability may extend far beyond the local resident  
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16 population living within 400 metres from a venue and reach to transient populations who  
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18 use the same spaces for work and recreation. These patterns need to be investigated  
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20 and understood at a local level.  
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27 Whilst great understanding is needed about factors governing distribution, it is clear that  
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29 these factors are converging to produce areas where the local resident population is  
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31 disproportionately exposed to gambling machines and that the residents of these areas  
32  
33 tend to have poorer socio-economic outcomes. It is broadly accepted that place and  
34  
35 context can influence human behaviour and that geographic and other inequalities can  
36  
37 propagate the risk of experiencing adverse health outcomes. There is a significant  
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39 literature on the associations between lower socio-economic status, neighborhood  
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41 deprivation and the concentration of alcohol, tobacco and fast food outlets (Scribner et  
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43 al, 2000; Chuang et al, 2005; Macdonald, Cummins & Macintyre, 2007; Ellaway et al,  
44  
45 2010). This current research suggests that gambling opportunities display similar  
46  
47 patterning and, related to this, the experience of gambling-related harm - like obesity and  
48  
49 high alcohol consumption - may have a geographical aspect. Such a relationship  
50  
51 encourages that a more holistic perspective be applied to understanding problem  
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53 gambling, one which includes wider policy and regulatory environments along side the  
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55 characteristics and behaviour of individual players.  
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4 To date, such a broad perspective has received relatively little attention, in the UK at  
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6 least, with policy focusing on individual and psycho-social parameters of consumer  
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8 choice and responsibility. Only recently has the role of regulatory and legislative  
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10 changes received broader attention in relation to its (potential) impact upon the unequal  
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12 distribution of gambling opportunities. As Wheeler et al (2006) note, in other areas of  
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14 'addictive' health behaviours policy often trails research and this appears to be the case  
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16 with gambling. Crucially, whilst there is widespread acceptance of problem gambling as  
17  
18 a psychiatric disorder and a recognition its prevalence should be minimised, a public  
19  
20 health based approach to policy in Britain has not been adopted. Finally, further  
21  
22 understanding the geo-spatial patterning of gambling opportunities and the place-  
23  
24 specific drivers of this distribution has a highly practical application. This relates to the  
25  
26 potential development of geographically-targeted interventions relating to both  
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28 prevention and education initiatives and the provision of treatment services, facilitating  
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30 the focus of scarce resources where they are needed most.  
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### 38 **Limitations**

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40 There are a number of issues to consider when reviewing this study. Firstly, machine  
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42 densities were calculated using average weighted estimates per venue type as no  
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44 register which records the number of machines at each venue exists. For certain venue  
45  
46 types (pubs, bookmakers) we can be confident that the average estimate is a close  
47  
48 reflection of reality based on confirmation with the industry sector and statutory  
49  
50 provisions. For some venues, specifically Amusement Arcades there will be greater  
51  
52 variation because the number of machines permissible was linked to the venue size. A  
53  
54 field validation study was conducted to determine what estimates should be used in  
55  
56 analysis. However, it is possible that there is some error around this estimate, which  
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58 should be borne in mind. For example, the field validation study showed that the mean  
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4 number of machines in per AGC was 38.2, with a standard deviation of 26 meaning  
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6 there was a large variation around this figure. However, much of this variance was  
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8 accounted for by large seaside AGCs which tend to have more floor space and therefore  
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10 more machines. Excluding seaside AGCs gives a mean of 34.1 machines per AGC and  
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12 standard deviation of 13.8. We were not able to determine from the venue data available  
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14 to us which venues had greater floor space and therefore more machines and which had  
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16 smaller floor space and therefore fewer machines. As such, we used the mean figure in  
17  
18 our analysis. There may be a few specific examples of areas being incorrectly identified  
19  
20 as high density because of this. However, examination of our methods and use of  
21  
22 different thresholds does not suggest that this alters the overall patterns observed.  
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24 Estimates of the number of machines per venue are one source of error that might be  
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26 evident with our approach. The other source of error relates to geocoding of venue  
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28 postcodes to Output Areas. We are confident that there is limited error relating to this as  
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30 gambling venues are generally found in built-up areas where the spatial extent of a unit  
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32 postcode is small (it will often summarise fewer than 5 buildings with multiple  
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34 occupation) and its centroid will therefore represent the ground truth location of a  
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36 building to a fine degree of accuracy. Therefore, the main source of likely error relates to  
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38 our estimates of the number of machines per venue, though data were checked,  
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40 triangulated against multiple sources and, in the case of AGCs, subject to field validation  
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42 to improve accuracy. Secondly, the definition of what constitutes a high density machine  
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44 zone is an arbitrary threshold; there is no standard definition. Our threshold was  
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46 determined based on examination of the distribution of the average number of machines  
47  
48 per area. It is possible that using a different threshold may give slightly different results  
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50 to those reported here. Finally, around 1600 MZs were excluded from analysis because  
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52 no population-weighted LSOA/OAs fell within their boundary. Inspection of those omitted  
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4 does not suggest that the overall relationships would have been different had these MZs  
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6 been included, though the specific estimates may vary.  
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## 10 **References**

11  
12  
13 Abbott, M., Volberg, R., Bellringer, M., Reith, G. (2004) *A review of research on aspects of*  
14  
15 *problem gambling: Final report*. Auckland: AUT University.

16  
17 Chuang Y C., Cubbin C., Ahn D., Winkleby M.A (2005) Effects of neighbourhood socioeconomic  
18  
19 status and convenience store concentration on individual level smoking *Journal of Epidemiology*  
20  
21 *and Community Health*, doi:10.1136/jech.2004.029041.

22  
23 Cummins S., Curtis S., Diez-Roux A.V, Macintyre S. (2007) Understanding and representing  
24  
25 'place' in health research: A relational approach. *Social Science & Medicine*, 65(9),1825-1838.

26  
27 Department for Culture, Media and Sport (2005) *Gambling Act: 2005*. London

28  
29 Ellaway A. Macdonald L, Forsythe A, Macintyre S (2010). The socio-spatial distribution of alcohol  
30  
31 outlets in Glasgow city. *Health & Place*, 16(1), 167–172.

32  
33 Gambling Commission. *Industry Statistics 2011*. Birmingham: Gambling Commission

34  
35 GamCare (2010). *Statistics 2009/2010*. <http://www.gamcare.org.uk/publications.php>. Accessed  
36  
37 27 March 2012.

38  
39 Harman, H (2011) *The problem of betting shops blighting our high street*.

40  
41 <http://www.harrietharman.org/uploads/d2535bc1-c54e-6114-a910-cce7a3eff966.pdf>. Accessed  
42  
43 25 January 2012.

44  
45 Korn, D. A., Shaffer, H. J. (1999). Gambling and the health of the public: Adopting a public health  
46  
47 perspective. *Journal of Gambling Studies*, 15(4), 289-365.

48  
49 Light R. (2007) The Gambling Act 2005: Regulatory containment and market control: The  
50  
51 Gambling Act 2005. *Modern Law Review*, 70(4), 626-653.

52  
53 Livingstone, C. (2001) The Social Economy of Poker Machine Gambling in Victoria. *International*  
54  
55 *Gambling Studies*, 2001, 1(1), 45-65.  
56  
57  
58  
59  
60  
61  
62  
63  
64  
65

- 1  
2  
3  
4 Livingstone C., Adams A (2010). Harm promotion: observations on the symbiosis between  
5 government and private industries in Australasia for the development of highly accessible  
6 gambling markets. *Addiction*, 106(1), 3-8  
7  
8  
9  
10 Macdonald L., Cummins S., Macintyre S. (2006) Neighbourhood fast food environments and area  
11 deprivation – substitution or concentration? *Appetite*, 49(1), 251-254  
12  
13  
14 Office of the Deputy Prime Minister (2005) *Planning Policy Statement 6: Planning for Town*  
15 *Centres, Annex A*. London  
16  
17  
18 Orford, J., Wardle, H., Griffiths, M.D., Sproston, K., & Erens, B. (2010) The role of social factors in  
19 gambling: Evidence from the 2007 British Gambling Prevalence Survey. *Community, Work and*  
20 *Family*, 13(3), 257-271.  
21  
22  
23  
24 Orford J. (2010) *An unsafe bet: the dangerous rise of gambling and the debate we should be*  
25 *having*. Oxford: Wiley  
26  
27  
28 Pearce J., Mason K., Hiscock R., Day P. (2008) A national study of neighbourhood access to  
29 gambling opportunities and individual gambling behaviour. *Journal of epidemiology and*  
30 *community health*, 62, 862-868.  
31  
32  
33  
34 Rainham D, McDowell I, Krewshi D, Sawada M. (2010) Conceptualising the healthscape:  
35 contributions of time geography, location technologies and spatial ecology to place and health  
36 research. *Social Science and Medicine*, 70(5), 668-676  
37  
38  
39  
40 Robitaille, E., Herjean P (2008) An analysis of the accessibility of Video Lottery Terminals: the  
41 case on Montreal. *International Journal of Health Geographics*, doi: 10.1186/1476-072X-7-2.  
42  
43  
44 Scribner R.A., Cohen D.A., Fisher W. (2000). Evidence of a structural effect for alcohol outlet  
45 density: a multilevel analysis. *Alcohol Clinical Experimental Research*, 24(2), 188-95  
46  
47  
48 Shaffer, H., Hall M.N. (2001) Updating and refining prevalence estimates of disordered gambling  
49 behavior in the U.S and Canada. *Canadian Journal of Public Health*, 92, 168-72.  
50  
51  
52 Storer, J., Stubbs, J. (2007) *Submission to Statutory Review of the Gaming Machines Act 2001*.  
53  
54  
55  
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65

Storer J., Abbott M., Stubbs J. (2009) Access or adaptation? A meta analysis of surveys of problem gambling prevalence in Australia and New Zealand with respect to the concentration of Electronic Gaming Machines. *International Gambling Studies*, 9(3), 225-244.

Wardle, H., Moody, A., Spence S, Orford, J., Volberg R, Griffiths, M., et al. (2011) *British gambling prevalence survey 2010*. London: The Stationery Office

Welte J.W. (2004) The relationship of ecological and geographic factors to gambling behaviour and pathology. *Journal of Gambling Studies*, 20(4), 405

Welte J.W., Wieczoeck W.F., Barnes G.M., Tidwell M.C.O. (2006) Multiple risk factors for frequent and problem gambling: individual, social and ecological *Journal of Applied Social Psychology*, 36, 1548-68

Welte J.W., Barnes G.M (2007) Type of gambling and availability as risk factors for problem gambling: a tobit regression analysis by age and gender. *International Gambling Studies*, 7(2), 183-198.

Wheeler B.W., Rigby J., Huriwai T. (2006) Pokies and poverty: problem gambling risk factor geography in New Zealand *Health and Place*, 12(1), 86-96

Wilson D.H., Derevensky J., Gilliland J., Gupta R., Ross N. (2006) Video Lottery Terminal Access and Gambling Among High School Students in Montréal. *Canadian Journal of Public Health*, 97(3), 202-206

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Figure 1  
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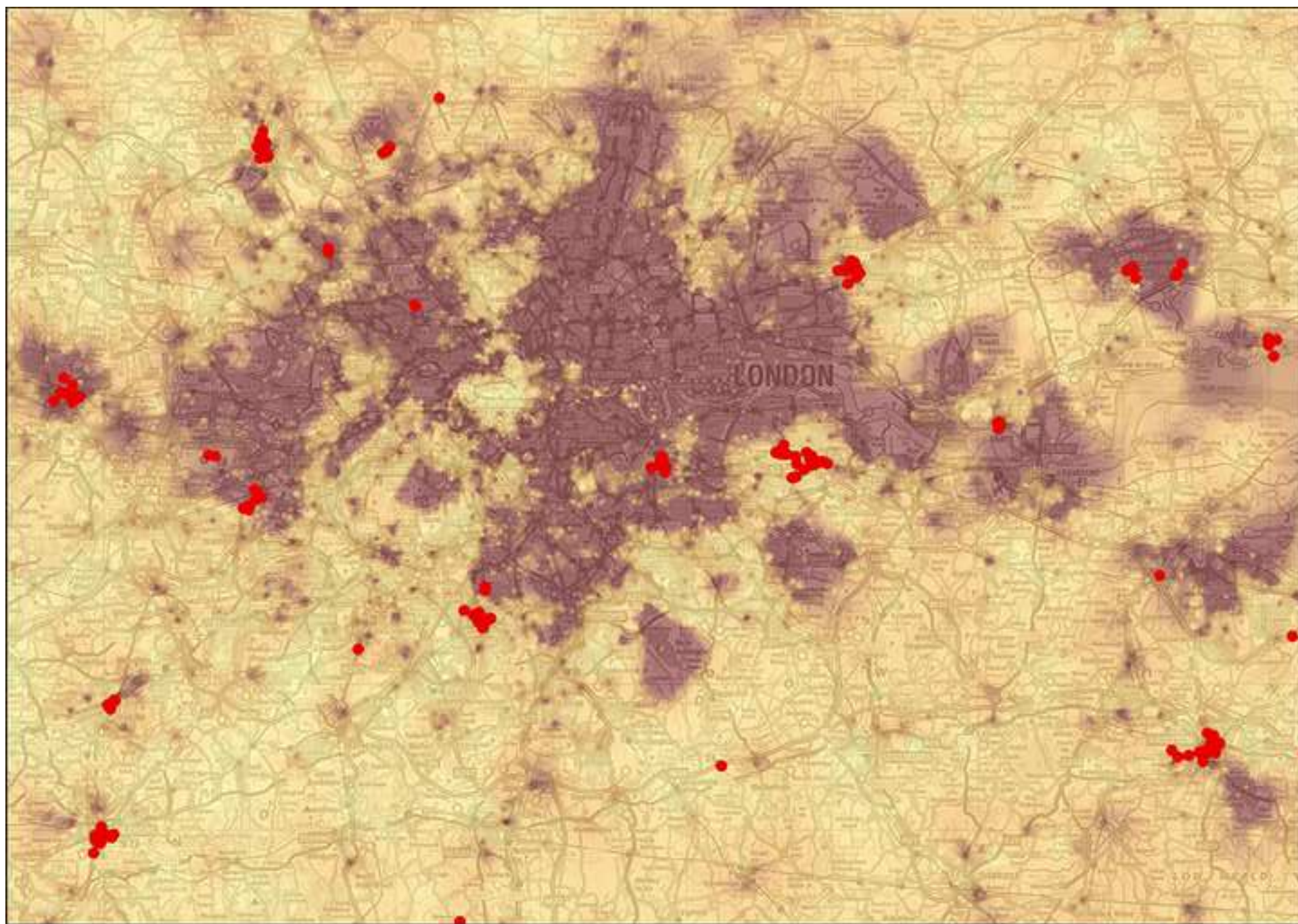
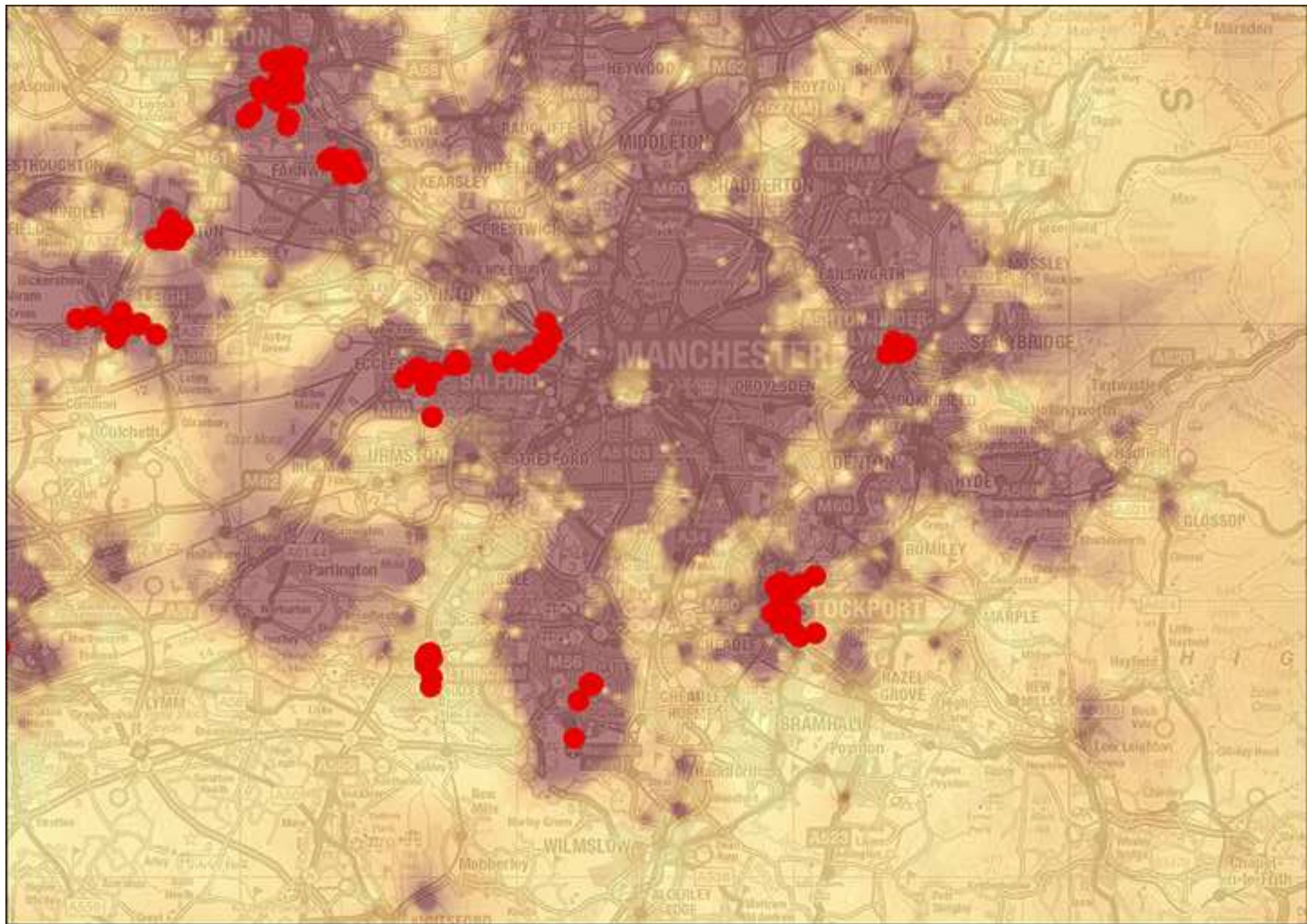




Figure 2  
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**Tables****Table 1 Average number of machines per venue used in density analysis**

	<b>Venue type</b>						
	Bookmakers	Bingo halls	Casinos	Adult Gaming Centres	Family Entertainment Centres	Pubs	Race tracks
Average number of machines per venue type	3.92	43.23	20.53	38.2	66.1	1.53	3.92

**Table 2** Socio-economic characteristics of high density machine zones, non-high density machine zones and other areas

Socio-economic characteristic	Area type			All areas
	High Density Machine Zone	Non-high density Machine Zone	Non-machine zones	
	%	%	%	%
<b>Age group</b>				
0-10	12.6	13.3	13.8	13.6
11-15	5.7	6.2	6.7	6.5
16-24	13.6	11.8	10.3	10.9
25-34	16.3	15.8	13.1	14.2
35-44	14.0	14.8	15.1	14.9
45-54	11.7	12.4	13.9	13.3
55-64	9.3	9.9	11.1	10.6
75+	8.1	8.1	8.6	8.4
<b>Ethnic group*</b>				
White/White British	91.0	87.4	93.2	91.3
Mixed ethnic group	1.4	1.6	1.1	1.3
Asian/Asian British	5.2	6.0	3.5	4.4
Black/Black British	1.5	3.8	1.5	2.2
Chinese/Other	0.9	1.2	0.7	0.9
<b>Occupation</b>				
Managers and senior officials	12.5	14.5	15.2	14.9
Professional occupations	9.4	11.5	11.0	11.1
Associate professional and technical occupations	12.9	14.3	13.6	13.8
Administrative and secretarial occupations	12.3	13.2	13.4	13.3
Skilled trade occupations	11.5	11.0	12.1	11.7
Personal services occupations	7.8	6.9	6.9	6.9
Sales and customer service	9.2	7.9	7.6	7.8
Process, plant and machine operatives	9.7	8.5	8.6	8.6
Elementary occupations	14.8	12.3	11.6	11.9
<b>Economic activity</b>				
% economically inactive	37.0	34.4	33.0	33.7
<b>Income</b>				
Index of multiple deprivation income domain score (England)	0.23	0.19	0.14	0.16
Index of multiple deprivation income domain score (Wales)	43.1	59.9	14.4	21.7

**Figure captions**

Figure 1: High Density Machine Zone and Income Deprivation in Greater London.

Figure 2: High Density Machine Zones and Income Deprivation in Greater Manchester.