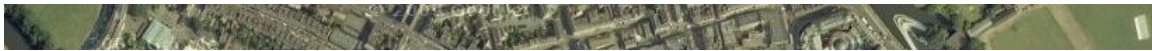


# Geofutures

## Contextualising machine gambling characteristics by location - final report

A spatial investigation of machines in bookmakers using industry data



Prepared by Geofutures for  
The Responsible Gambling Trust

Authors: Gaynor Astbury & Mark Thurstain-Goodwin

Commercial and in confidence  
February 2015

Geofutures Ltd  
39 Powlett Road  
Bath BA2 6QL  
Tel: 01225 471818  
[www.geofutures.com](http://www.geofutures.com)

# Contents

Executive summary.....	2
1. Project background.....	4
1.1 Project details, aims and objectives.....	4
2. The geographic modelling approach.....	7
2.1 Datasets.....	7
2.2 Modelling techniques.....	8
2.3 Error margins.....	13
3. What are the patterns of machine locations?.....	15
3.1 LBO growth in Great Britain.....	15
3.2 LBOs by operator.....	16
3.3 LBOs in relation to residents.....	19
3.4 LBOs in relation to economic centres.....	26
4. What are places with machines like?.....	29
4.1 Age profile.....	29
4.2 Ethnicity.....	32
4.3 Deprivation.....	34
4.4 Economic activity.....	36
4.5 Crime events.....	38
4.6 Westminster representation.....	41
4.7 In or out-of-town.....	42
4.8 Rural or urban areas.....	43
5. Who uses machines and where?.....	46
5.1 Geo-demographic groups.....	46
5.2 Deprivation.....	47
5.3 Economic activity.....	48
5.4 Rural or urban areas.....	50
5.5 LBO and player catchments.....	51
6. Further suggested research.....	58
7. References.....	60

# Executive summary

## Overview

- This research provides a contextual study describing the **characteristics of locations** associated with gambling machine play. We have worked with the outputs of studies from NatCen Social Research and Featurespace Ltd to **contextualise machine play by geography** in Great Britain.
- This project was partly exploratory in nature, **investigating the dimensions of new industry data** available, and how it may be used and limited for analysis. The data used was large in volume and multidimensional, detailing machine sessions from 5 major high street betting shop operators.
- This analysis presents some key **geographic patterns that emerge** relating to differing location characteristics of machines and players, and relationships between the two, and may identify trends on which to develop further research.
- Close investigation revealed the data was not suitable to identify problem gambling trends specifically. This study notes a series of **area comparisons**, but cannot presume **causation** of any measured indicator on the occurrence of gambling prevalence or problem gambling.

## Key findings

### *The spatial patterns of machine locations*

- LBOs with machines were **growing** in number across the country from August 2012 until July 2014 when they saw a notable **decline**, possibly influenced by increased taxation on gambling machine takings announced in the 2014 Budget.
- The spatial occurrence of LBOs with machines is not the result of a simple function of the location of either **resident population density or economic centres**.
- At the national scale we find them situated in urban rather than rural areas, but mapping sub-city and neighbourhood level settlement patterns reveals significant variation and **non-uniform patterns**. Rates of LBOs with machines within town centres also vary.
- The spread of LBOs by operators is not geographically uniform, with a strong presence of independent operators in the North West.
- This initial analysis starts to reveal the **underlying complexity** of the distribution of LBOs and the **need to understand local factors** when assessing this distribution.

### *What are places with LBOs like?*

- Around half of betting shops with machines exist in town centre and major retail core areas, and **half in peripheral and off-centre locations** in England and Wales.

- Areas close to betting shops tend towards **higher levels of crime events, and resident deprivation, unemployment, and ethnic diversity**.
- LBOs do not exclusively serve the resident populations of proximate areas. Statistics about the resident population are a proxy for place typologies, where data on daytime and night time transient populations is unavailable.
- Nevertheless, nationally around 8% of loyalty card players sampled **live within 400m of an LBO** where they have played a machine. 23% live within 1km, and 46% live within 3km.
- There are **significant local variations**, and not all places exhibit these characteristics.

#### *Who uses LBOs and where?*

- Players overall tend to live in neighbourhoods with **higher levels of resident unemployment, multiple deprivation and economic inactivity**, and which are more **ethnically diverse** than the national average.
- Global patterns can be reliably identified. Within them, we find considerable **local variation**, and not all player neighbourhoods exhibit these characteristics.
- There is a variation in the average distances loyalty card players travel to LBOs overall, which is in part a function of the geographic **sphere of influence** and accessibility of centres. **400m** is the modal distance players live to LBOs they use for machine play.
- A small number of players **regularly gamble and/or gamble many sessions**, although this does not necessarily equate to problem gambling. These regular players tend on average to live closer to the LBOs in which they are gambling.
- This analysis reflects the wider research body conclusion that gambling patterns are varied and help to form the **complex matrix of interacting variables** which contributes to the onset of problem gambling and potentially harm at the individual level. Examining local variation and capturing the context of place should be a key element of further analysis to determine these detailed circumstances.

# 1. Project background

This study is funded and commissioned by the Responsible Gambling Trust (RGT). A key task of this research was to assess the potential to use new data made available by the gambling industry, to examine current trends in machine gambling (previously referred to as Fixed Odds Betting Terminals or Machines), in Licensed Betting Offices (LBOs) in Great Britain.

This is a small contextual study to describe the characteristics of locations associated with gambling machine play. We present some key geographic patterns of machine play by the location of LBOs and players, and where the data allows suggest relationships between the two. The results shown are partly driven by the nature and suitability of the data available, including LBO locations and machine session data from 5 major high street operators.

Some of the data used in our analysis are derived from a wider concurrent research body, carried out by NatCen Social Research (Wardle et al, 2014, Collins et al, 2014), Featurespace Ltd (Excell et al, 2014), The University of Lincoln (Parke et al, 2014) and the Responsible Gambling Trust<sup>1</sup>. The reports from these studies give detailed background information on how this secondary data was derived.

These concurrent studies specifically address ‘problem’<sup>2</sup> play patterns, using the same industry data. On close investigation, our research revealed the industry data available was not suitable to identify and segment our results by ‘problem’ gambling trends with the spatial analysis undertaken. The results presented relate to machine gambling prevalence. We aim to describe a series of comparisons, but cannot presume causation of any measured indicator. The results should reveal a series of contextual patterns and provide an evidence base on which to base further detailed research.

## 1.1 Project details, aims and objectives

Gaming machines in bookmakers include several game types, which players can switch between in a session of play.

- B2 games currently allow a maximum prize of £500 and a maximum stake of £100;
- B3 games have a maximum prize of £500 and a maximum stake of £2;
- B4 games have a maximum prize of £400 and a maximum stake of £2; and
- C games have a maximum prize of £100 and a maximum stake of £1.

Throughout the study we refer to LBOs as our places of interest, but the research is explicitly interested in those LBOs which have gaming machines, or machines, which covers most but not all betting shops nationally. The geographic extent of the study is Great Britain.

A quantitative assessment was carried out by Featurespace Ltd of gaming machine data drawing on ten months’ worth of data from the five major operators (Ladbrokes, William Hill, Coral, Betfred and Paddy Power) between 1 September and 30 June 2014 in Great Britain. ‘Sessions’ of play have been determined by both the use of loyalty cards per player, and the generation of proxy sessions, where

<sup>1</sup> The complete set of reports from the gambling machines research programme can be downloaded from <http://www.responsiblegamblingtrust.org.uk>

<sup>2</sup> It is important to note where reference is made to ‘problem’ gambling, this does not necessarily equate to ‘harmful’ gambling at the individual level, rather these are the theoretical markers of harm that may for some people be an indicator of problem gambling.

data is sliced into discrete chunks based on what looks like the beginning and the end of a discrete period of machine play.

A large-scale survey was also conducted from a sample of operator loyalty cards in 2014 to deepen the understanding of player characteristics. The survey is linked to each player's data profile to identify further contextual information about the profile of 'at risk' players. Both datasets have been used in this analysis.



Image © Copyright Inspired Gaming Group Ltd

The role of spatial analysis consultancy Geofutures covers related geographical modelling, exploring other contextual variables around the location of bookmakers and players, the results of which are set out in this report. The populations LBOs serve may influence patterns of behaviour, giving a wider understanding of potential geographical areas of risk.

The spatial relationship between population and LBO locations may also help us to illustrate whether LBOs locate solely and equally to these populations, and how far people travel to access machines.

This report addresses the following key questions:

- What are the patterns of machine locations?

*What is the current national picture of LBOs with machines? Is this a current growth industry, and where are the most significant locations nationally?*

*Is there a link between high concentrations of LBOs with machines (often described as 'clustering' or high 'prevalence') to population density? Is the prevalence of LBOs with machines a function of the location of people and services, or are there places with higher or lower relative numbers of LBOs to people?*

- What are places with LBOs like?

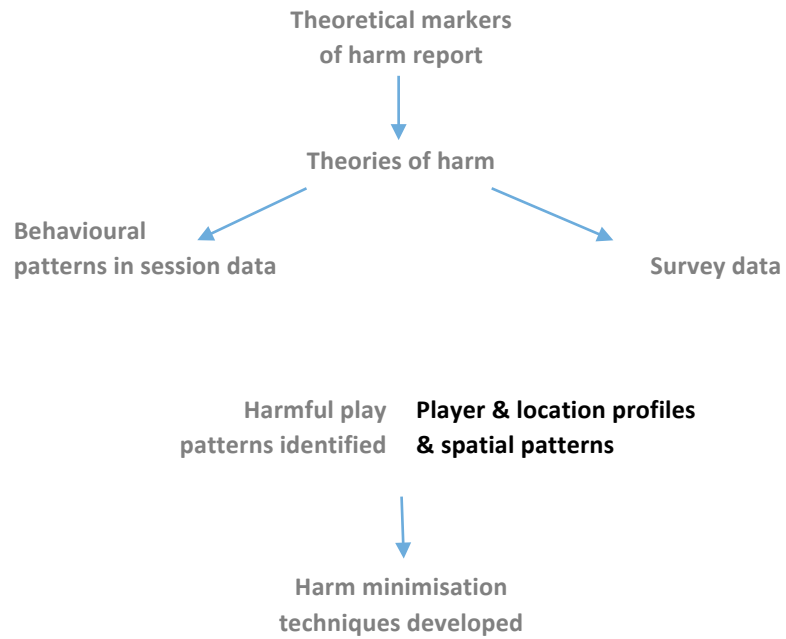
*What are the characteristics of those places with LBOs, and how do they compare to other places? Are LBOs more prevalent in areas of a certain type? We have examined local resident profiles together with more general place characteristics to help determine this.*

- Who uses LBOs and where?

*What are the characteristics of the types of places and geographic patterns in which players live? Where available we have augmented information from the survey and loyalty card data.*

*How close do players live to LBOs with machines?*

*Figure 1: Project context in the wider body of research.*



## 2. The geographic modelling approach

We have applied spatial techniques to the data to uncover geographic patterns. Below we have detailed the general approaches used throughout this study on the datasets available. Part of the study purpose was to assess the data held by machines providers for use in research. This study was partly exploratory in nature without prior knowledge of the dimensions of the datasets, and the results have uncovered many further potential areas or extensions to the research.

### 2.1 Datasets

The key data sources we will utilise for this analysis are:

- **LBO shop locations with machines** provided by the two machines providers, Inspired Gaming and Scientific Gaming.

Opening and closing dates were provided to us by the machines providers and these have been used to define a snapshot representing those LBOs open in October 2014.

- **Player session data** derived from machines of the five major operators, Ladbrokes, William Hill, Coral, Betfred and Paddy Power.

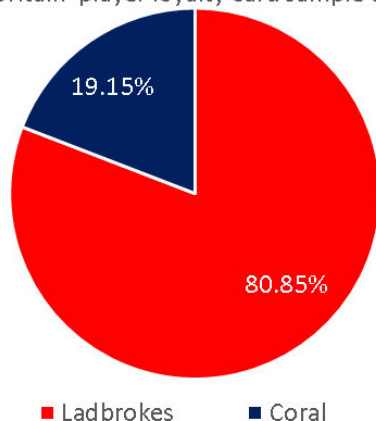
Machine data is downloaded from terminals in LBOs, and has been aggregated by Featurespace Ltd into distinct sessions of play. It covers a period from September 2013 to June 2014.

- **Loyalty card** player information from the major operators Ladbrokes, William Hill, Paddy Power and Coral. Coral and Ladbrokes were the only operators with postcode information by which to geo-locate players.

This data was used as one source to locate where players live. The home postcode is recorded on loyalty cards held by Ladbrokes and Coral, which have then been linked to session data and LBO locations. After data cleaning and geo-coding to determine locations at the unit postcode, the number of loyalty cards included in the analysis were 71,125 Ladbrokes players and 16,843 Coral players. These include active cards between September 2013 and June 2014, but limited to 2014 for Coral who introduced their card scheme earlier that year.

*Figure 2: The sample of loyalty cards used.*

Great Britain player loyalty card sample analysed

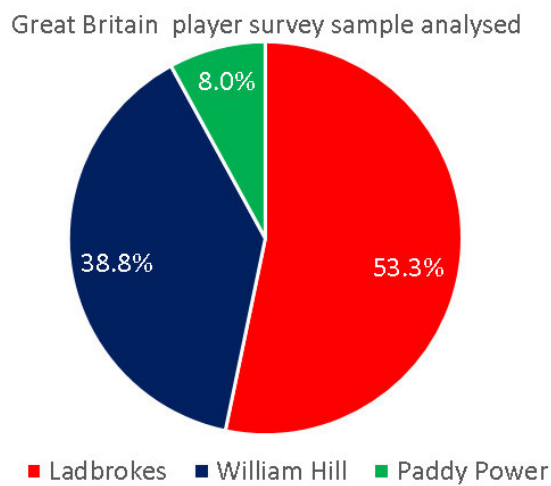




- **Player surveys** as carried out by NatCen Social Research in Phase 2 of this study.

Additional home postcodes were gained from William Hill and Paddy Power via survey respondents where players gave explicit permission for the use of the information gathered for this study. The number of survey respondents geo-coded and included were 1,833 from Ladbrokes, 1,335 from William Hill and 274 from Paddy Power. Player surveys were carried out via telephone interview in summer 2014, sampled from contacts from loyalty card records.

*Figure 3: The survey sample used.*



- The **Gambling Commission Premises Register** of gambling licences provided a resource to cross and sense-check where needed.

This monthly extract is the official source of data for licences held by each venue to legally offer gambling

- **Contextual government statistics** include the Office for National Statistics Postcode Directory (ONSPD), Census 2011 results, statistical town centre boundaries, crime statistics from police.uk, and the Output Area Classification of geo-demographic groups.

## 2.2 Modelling techniques

This is a national extent study, in which we have utilised small-area detailed data to examine local patterns as well as wider-scale trends. Records relating to LBO locations and player residences have been geocoded to the full unit postcode: a location in the centre of, on average, 15 contiguous addresses.

### Using Census data

For contextual socio-economic data we have used small-area Census geographies, including Output Areas (OAs), Lower Super Output Areas (LSOAs) for England and Wales, and Data Zones (DZs) for Scotland. OAs are the smallest area at which Census data is collected, with an average of 309 people in 2011 for England and Wales, and 115 people in Scotland. LSOAs and DZs are slightly larger with an

average of 1500 and 750 people respectively. They are contiguous areas covering the whole country. Census areas vary in physical size but are geo-demographically engineered to be relatively homogenous in terms of their population count and geo-demographic profile, and thus represent similar underlying base populations. Crime statistics are recorded at the centre of a street.

Census areas can be represented by both their polygonal area, and the population-weighted centroid of each area, which locates the optimal point where the majority of residents live within these areas.

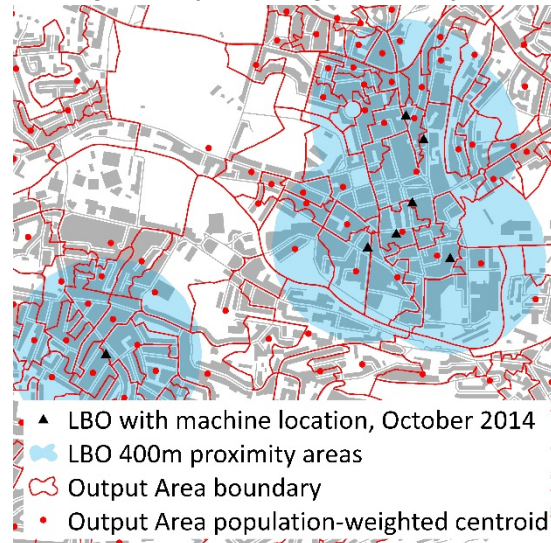
To compare patterns within Great Britain as a whole against those areas close to gaming venues, we need to define a relevant local area. Previously these have been considered to be places within walking accessibility of LBOs, serving a 'local' population. Similarly it is useful to capture the local 'typology' aside from the resident population.

We have used a previously defined distance of 400m from venues in preceding research (Wardle et al, 2012) as a standard walking distance (see figure 4). Chapter 7 also discusses the pertinence of this distance when analysing catchments from resident locations. Future research could carry out sensitivity analysis to the effects of varying this radius.

The coincidence of either population-weighted centroids within these buffer distances, or LBO/player residence locations within Census areas, are aggregated to define these local statistics.

There are many areas associated with more than one LBO, but this approach does not specifically account for the clustering, density and intensity of bookmakers within the areas represented as proximate to LBOs. Previous work by Wardle et al (2012) has addressed this issue, and this more detailed analysis could be extended further to segment these statistics by areas of spatial intensity of LBOs.

Figure 4: Example 400m proximity areas to LBOs, and Census geographies. Data source: Inspired Gaming, Scientific Gaming, ONS, Geofutures.

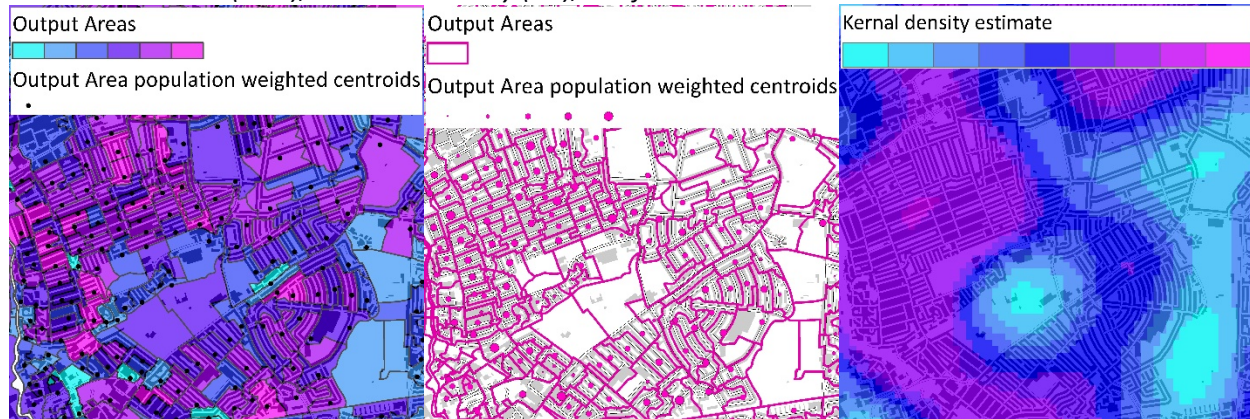


### Surface representations

In some cases, including population density and crime, we have used geostatistical representations of data, or 'surfaces' illustrated in figures 5 to 7. Continuous data surfaces are easier to perceive and understand by eye, and also have statistical analysis benefits.

This approach has been discussed in academic literature, finding that using population-weighted centroids and surface representations of the smallest Census tracts 'seeks to recover some of the underlying distribution' of population (Bracken & Martin, 1989).

Figures 5 to 7: Differing geographic representation of small area Census data. Data sources: Office for National Statistics (ONS), Ordnance Survey (OS), Geofutures.



To justify and interpret the results of techniques used to create data surfaces, an important consideration is the search radius. This is the size of the area around any location which is incorporated into the density estimate. Larger radii tend to return a more generalised pattern, and smaller radii reveal greater detail. Academic research with these data have suggested a minimum search radius of 250m to be effective (Martin, 1996).

Martin, Tate and Langford (2000) establish that between 500m and 1,000m is optimal, with anything over 1,000m tending to over-disperse isolated settlements into the surrounding area. With our own experiments, 750m appears an optimal level to define neighbourhood-level variations in urban areas, and is the search radius we have used for the proceeding detailed modelling, for both the resident population and LBO densities.

Output 'surfaces' or rasters are composed of cells of whose size we can vary. Our modelling uses a 50x50m cell size, allowing for sub-neighbourhood detail, and appropriate to the precision of the unit postcode input points and other modelling parameters.

#### Segmenting the results

We have measured the spatial patterns of betting and contextual socio-economic indicators at these locations, and also segmented the results to compare what the conditions are like at LBO and player residence locations against national averages. We have also compared results to 'urban areas' as LBO machine activity is a largely urban phenomenon, and in some cases segmented the results by a complete rural-urban place typology.

To do this we have used the Rural-Urban Classification of Output Areas (figure 8), which is modelled by the national statistics offices, and defines areas of rural and urban typology at the Output Area level (ONS, 2013).

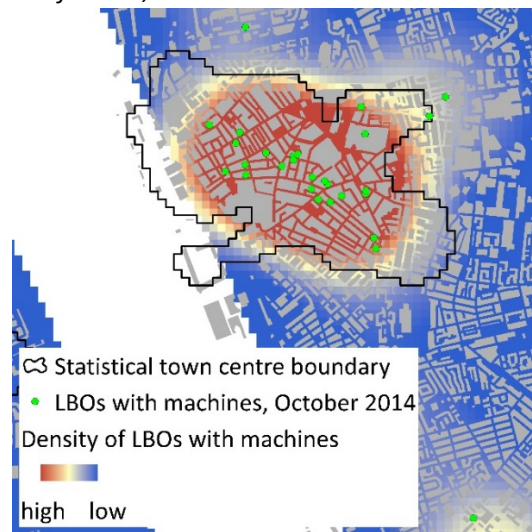
Figure 8: Example of the rural-urban classification 2011. Data source: Office for National Statistics (ONS).



We have also segmented the results by town centre areas where it is useful to capture the conditions in economic centres in addition to urban centres, using the statistical town centre boundaries developed by Geofutures and the Department for Communities and Local Government (DCLG) (Thurstain-Goodwin and Unwin, 2000).

Town centres are defined with a nationally consistent modelling methodology to produce polygonal areas to account for the type, intensity and diversity of economic activities. The unit-postcode level data created a ‘loose fit’ set of boundaries suitable for the scale and accuracy of modelling in this study (figure 9). Out-of-town shopping centre locations have been removed to reflect the context of this study, and areas below 2 hectares in size are represented by a subset of ‘retail cores’ representing centres of retail activity rather than the diverse mix of activities found in town centres. This analysis is limited to England and Wales only, which was the extent of the original study. It is also important to note that these boundaries do not adhere to administrative or political boundaries often used in planning practice.

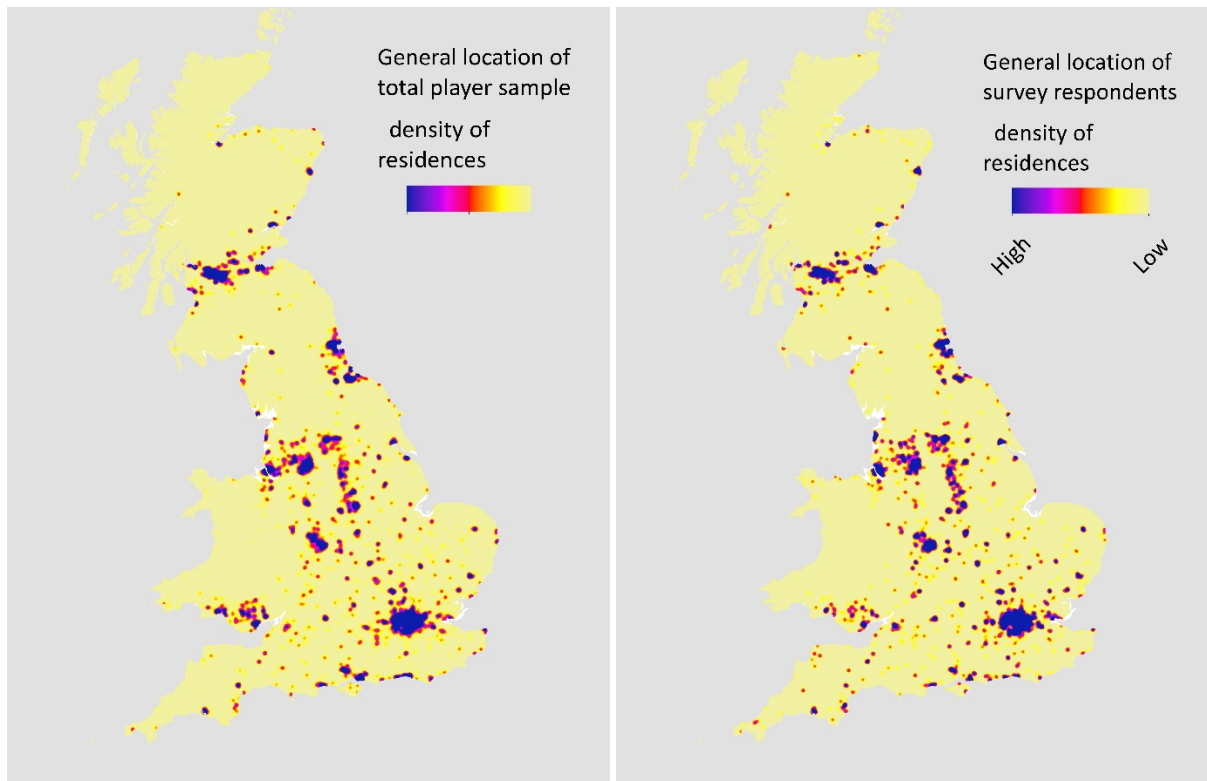
Figure 9: Example statistical town centre boundary in Liverpool. Data sources: Department for Communities and Local Government (DCLG), Geofutures, 2004.



### Identifying players

Wherever possible, we have used the largest combined sample of player residence locations to identify additional neighbourhood statistics that provide extra contextual information in addition to the survey. This includes loyalty card information from Ladbrokes and Coral, combined with additional survey respondents who have given permission to use their resident postcode for this research. They provide a good geographic spread of responses (figures 10 and 11).

*Figures 10 and 11: The geographic spread of player samples.*



### Movement and catchments

To capture journeys between player residences and LBOs visited we drew once again on the two main data sources for which we have player residence locations: loyalty cards from Ladbrokes and Coral, supplemented by William Hill and Paddy Power survey respondents.

This gave a total sample, after data cleansing and geocoding, of 204,813 records representing a unique journey pattern or 'pathway' between a player residence and an LBO. 87.4% of these records had available session data. With the session data, we can determine how many times an LBO has been visited by a player, and the number of sessions played.

Straight line or Euclidean distances have been calculated between venue and player postcodes to derive the distances travelled in any one visit. This is not a detailed network analysis, nor does it account for travel time which would be a more accurate measure of accessibility. Further research may wish to incorporate this modelling, particularly on a case-study area. We have described these Euclidean lines between player residences and LBOs as 'unique pathways' throughout the report, since a line between a player residence and an LBO may represent more than one journey or visit per player.

Because of the sensitive nature of the survey data, we have not included spatial visualisations of player residences, and have only attempted to describe where there are significant trends.

### Problem gambling

Part of the purpose of this study was to assess the suitability of data for various modelling techniques, together with identifying patterns of problem gambling.

Session data could not be aggregated confidently to represent a full problem gambling indicator. The key dataset gathered to measure a full problem gambling score was derived from survey respondents, of which 3,442 were geocoded. When using this number of records at the national extent, we found that for most spatial analyses where data is segmented, the counts became too small to be statistically significant or representative of potential trends. Our trends represent the overall prevalence of gambling.

## 2.3 Error margins

The analysis draws heavily on data derived from machine sessions and loyalty cards. This is the best available data in terms of scope and currency, but as in all studies of this kind, the scope of analysis has to be designed and limited to the dimensions and availability of data. It is important to acknowledge that the primary purpose of this raw data was not analysis of this kind, and that the results are therefore subject to error margins which we have detailed where relevant throughout the report.

### The player sample

Unlike the LBO venue locations for which we can determine a definitive total population of venues with some confidence, it is not possible to derive a full player population for all individual people using machines in LBOs. There is therefore no way of determining the player sample size being represented in our study. This also relates to interpreting the pathways used in travel and catchment analysis.

In addition, it is likely that any person holding a loyalty card has a vested interest in gambling, perhaps contrasting occasional gamblers, creating a self-selecting sample of potentially regular and/or problem gamblers. The headline survey results show participants with significantly higher harm metrics than in previous surveys (Wardle et al, 2014), including the 2010 British Gambling Prevalence Survey (Wardle et al, 2011). Loyalty cards between operators may also be obtained and used in slightly different ways, potentially representing a slightly different type of average player. The following results must be analysed within this sample context.

These records do not include customers of small independent operators. It is unclear whether this would have any significant impact on the overall results.

### Socio-economic data modelling

Ecological fallacy is a statistical problem where the average statistics of a population within a zone are used to infer the conditions of an individual within that population. The modifiable areal unit problem (MAUP) is a related issue where data collected at one spatial scale is aggregated and averaged for another spatial scale within polygons or enclosed geographic areas (Openshaw, 1984).

Both issues are common to all such analyses and interpretation must take them into account: here for example player profiling shows neighbourhood-level extrapolations rather than identifying the conditions of the individual players. This problem is mitigated in this study as far as possible by using the smallest areas where data is available, and by using geo-demographically engineered geographies for more homogenous populations groups.

When aggregating statistics from areas within 400 metres of an LBO or player residence postcode, there are some places where the nearest Census population-weighted centroids did not fall within this buffer, and we have omitted these areas from the average statistics. 0.67% of LBOs have been omitted from the analysis using OA level data, and 12.4% of LBOs have been omitted using LSOA and DZ level data. Similarly, 1.2% of our total player residence sample were omitted from the analysis using OA level data and 9.4% have been omitted using LSOA and DZ level data. These locations are dispersed randomly throughout the study area.

An additional aspect of this error means that predominantly rural locations are omitted from the analysis, as the larger physical size of these census areas make it less likely for a centroid to fall within a proximate location to a residence. The results are therefore a stronger representation of those players living in urban areas.

The statistical town centre boundaries were last modelled in 2004; for the most part these areas are relatively static, but we must assume the error that updated modelling would reveal changes in some places.

Other specific error and uncertainty is discussed through the report.

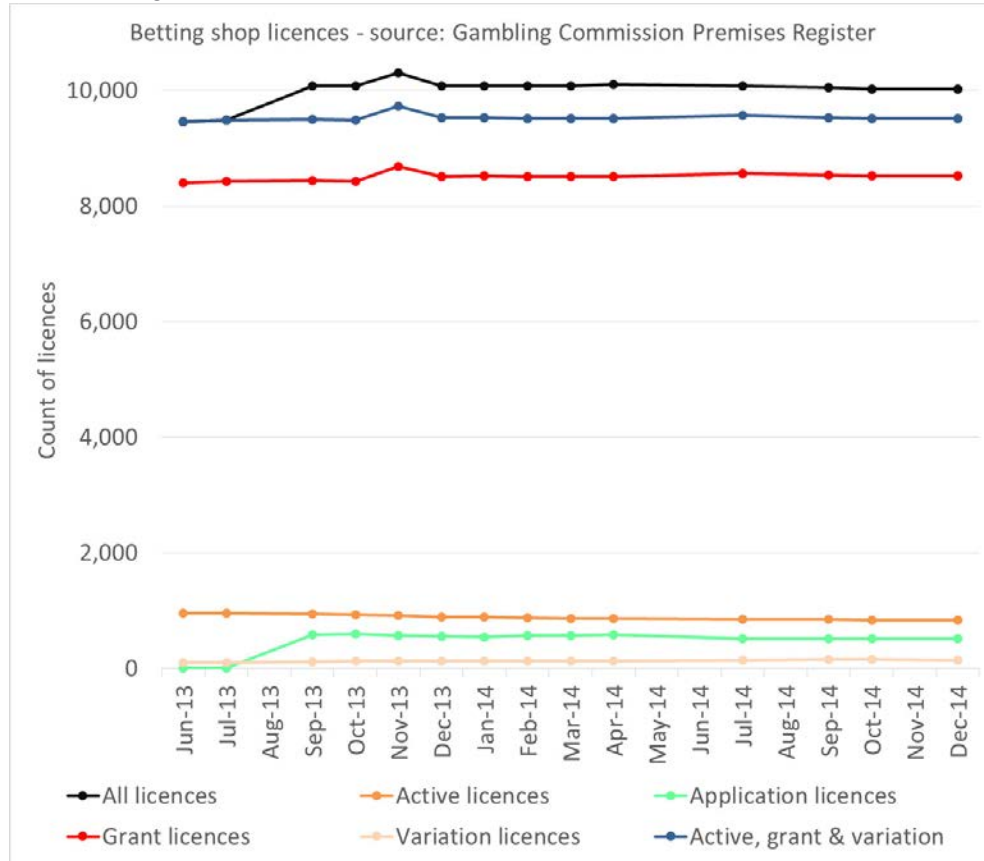
### 3. What are the patterns of machine locations?

In this section we attempt to capture and describe the nature of the locations of LBOs with machines which were open at October 2014, with contextual socio-economic and place data.

#### 3.1 LBO growth in Great Britain

We have used the Gambling Commission Premises Register monthly extract, together with the machines providers' data to track more specifically those LBOs with machines. Both datasets show a growth of LBO venues with machines until July 2014, and since this time venue numbers have declined in Great Britain (figures 12 and 13). This decline may in part reflect anticipated effects of the new 25% Machine Games Duty announced in the 2014 Budget and due to take effect in 2015. This pattern should also be contextualised to conditions in the last 2 years only, rather than longer term growth and decline.

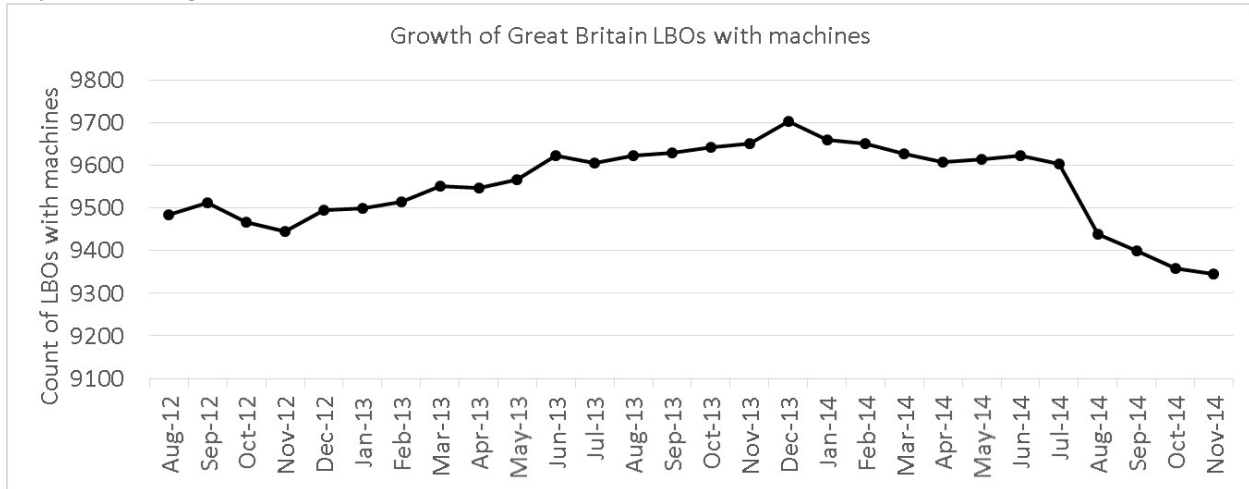
Figure 12: Great Britain betting shop licences 05/2013 - 12/2014. Data source: Gambling Commission Premises Register.



There are several known limitations to the use of the Gambling Commission data. Firstly the use of licence status appears to be loosely applied, with a mixture of 'grant', 'variation' and 'active' licenses all assumed to account for an open venue. For some months data was not released by the Gambling Commission, shown in figure 12 above. In addition, these licences include a number of venues without machines, which is the specific focus of this study.



Figure 13: Open LBO venues in Great Britain 08/2012 - 11/2014. Data sources: Scientific Gaming and Inspired Gaming.



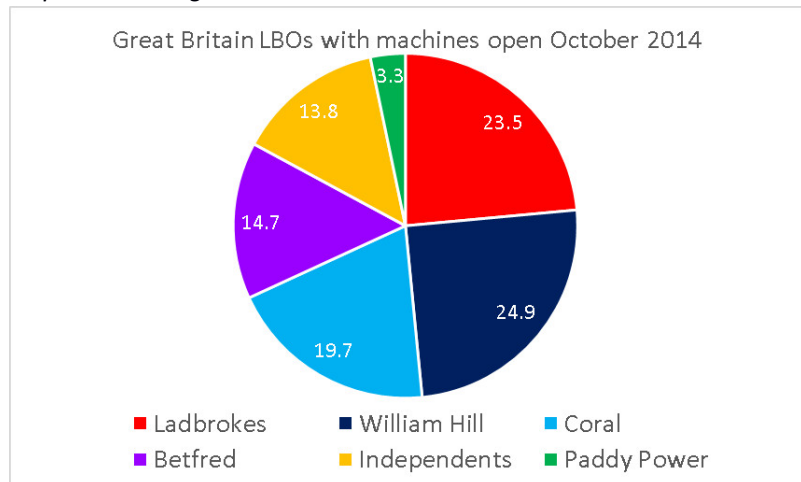
### 3.2 LBOs by operator

Since the first draft of this report, the machines operators provided new data, revising earlier data and providing information up to November 2014. The decline evident in figure 13 was now evident, but time lag in reporting and changes to collection methods may also have altered what appeared to be the picture emerging from the previous data supplied.

To contextualise any statistics derived from LBOs with machines, it is useful to understand the spatial coverage of these venues. As a geographical phenomenon, there may be distinct areas represented within the national study area which the samples represent.

The dominance of the four biggest operators (Ladbrokes, William Hill, Coral and Betfred) makes clear the market share and impact of these companies. There are also a large number of multiple independent operators of different scales making up a significant proportion of these venues (figure 14).

Figure 14: LBO venues with machines in Great Britain open in October 2014, by operator. Data sources: Scientific Gaming and Inspired Gaming.

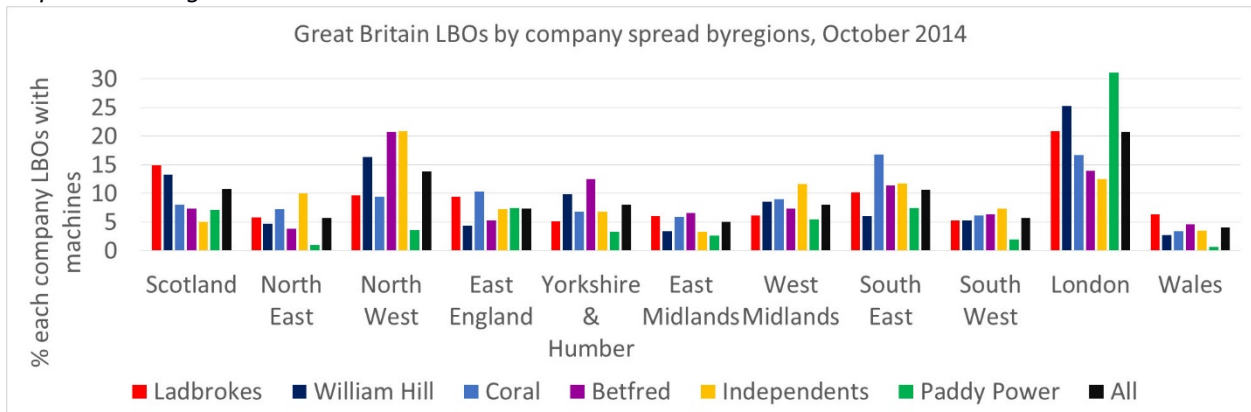


There exists some regional variation in the prevalence of LBOs with machines, and this requires consideration when analysing the report results and in developing potential policy.

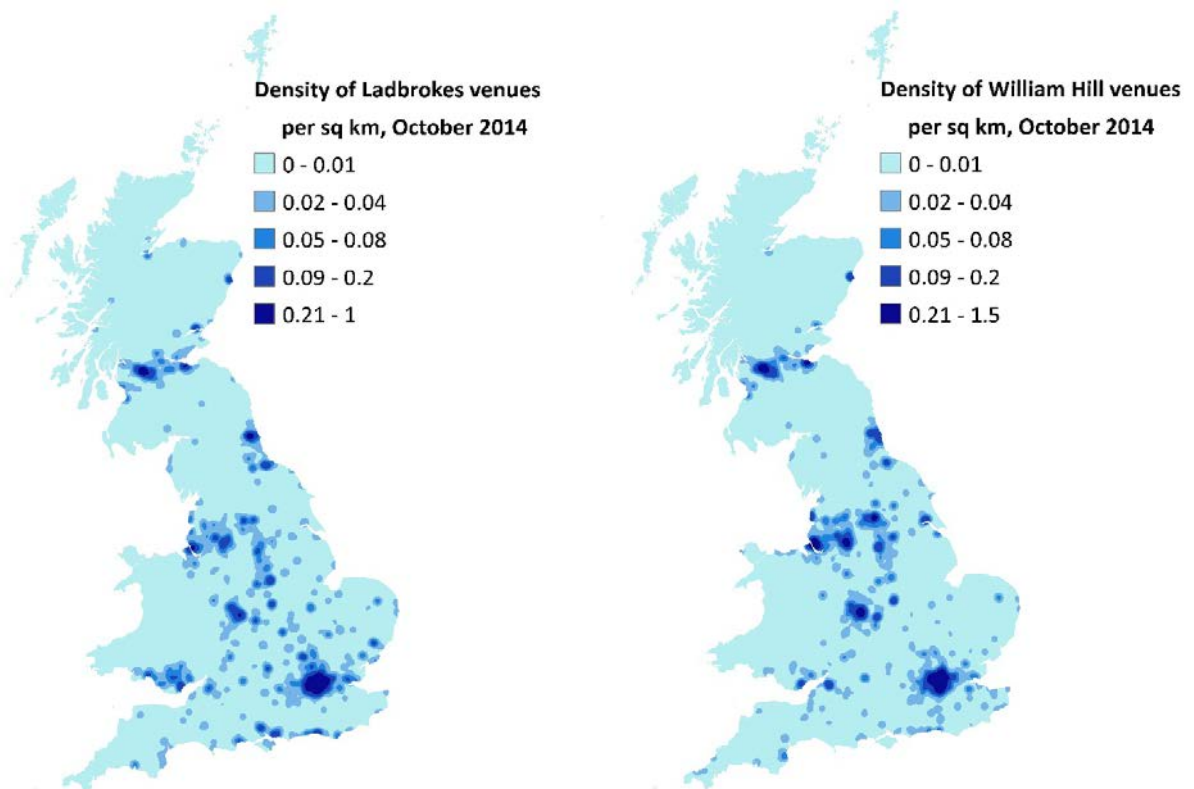
A brief regional analysis of open venue locations (figure 15) shows the variation in spread of companies across the country, with a large representation in London (mostly a function of economic size). This is also illustrated in figures 16 to 22. Some operators have a larger representation in certain areas.

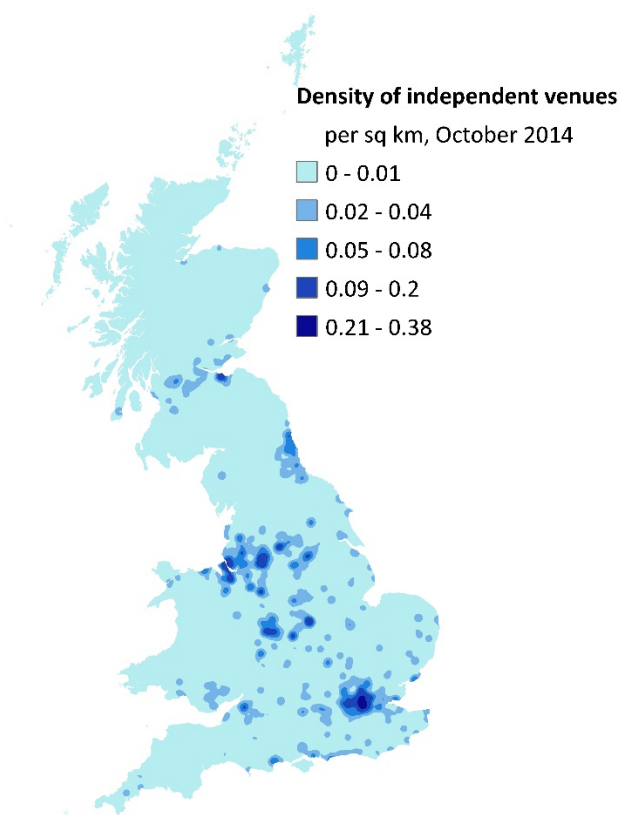
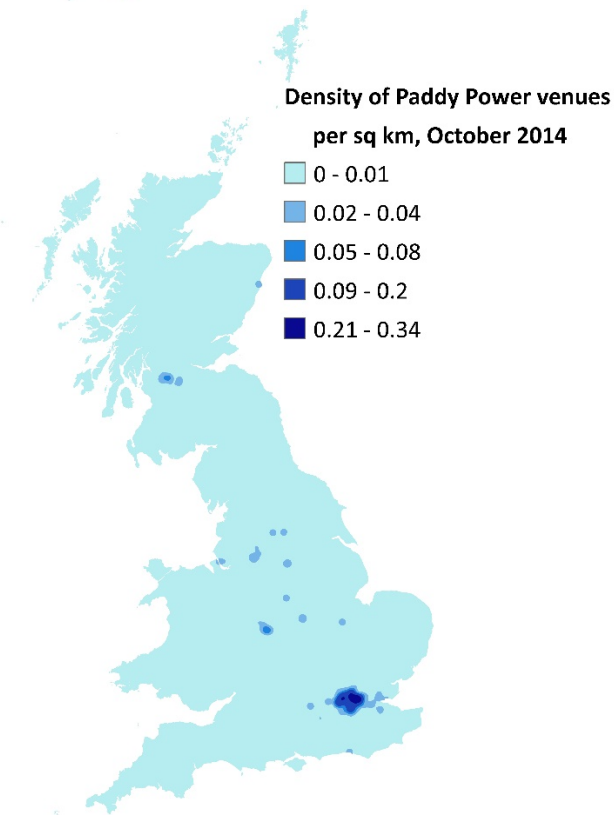
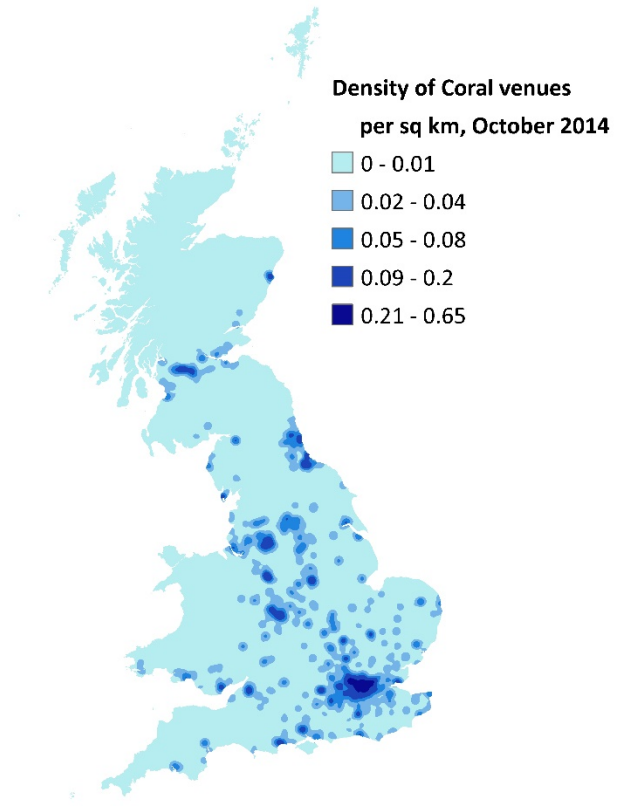
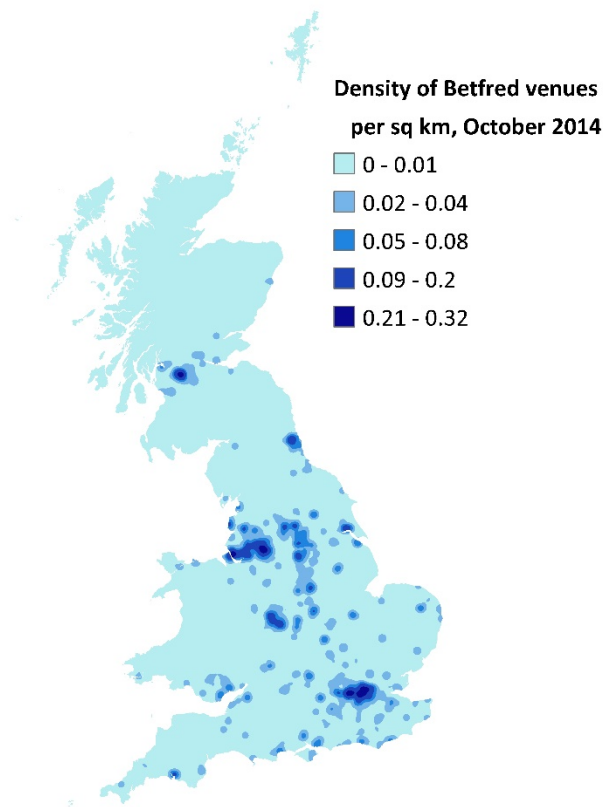
This is significant for our analysis, which focuses on the machine events and detailed results of the five major operators only, excluding independents. Some results include only one or two operators, which may therefore be more representative of certain demographics and economic centres. The inclusion of Ladbrokes data throughout most of the analysis is beneficial, as this operator is both the largest in terms of venues at the time of the study, and geographically spread across the whole of Great Britain.

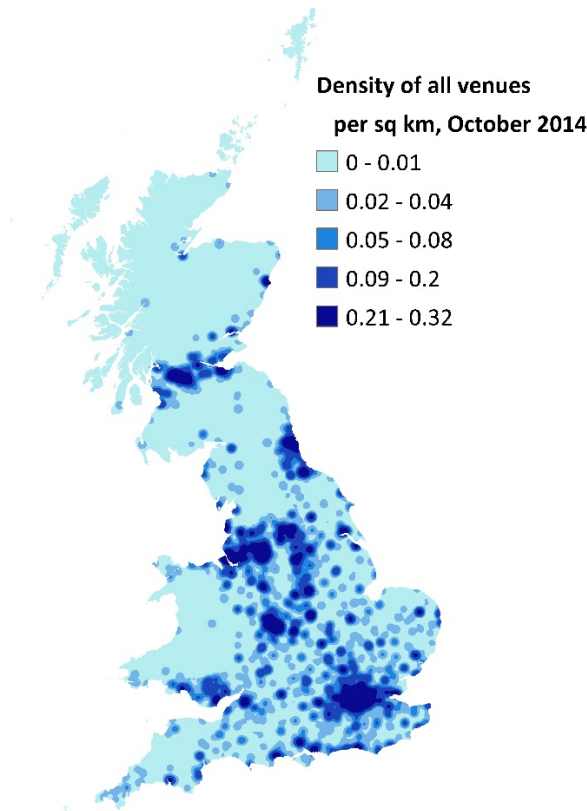
Figure 15: Regional spread of LBO locations in October 2014. Data sources: Scientific Gaming and Inspired Gaming.



Figures 16 to 22: National spread of LBO venues by operator. Data source: Scientific Gaming and Inspired Gaming.







Independent operators are relatively strongly represented in the North West of England, together with Betfred who also have a strong presence here. Paddy Power venues are mostly concentrated in the London area, Coral are prominent in the wider South East area, and Ladbrokes are a key operator in Scotland and Wales.

### 3.3 LBOs in relation to the density of residents

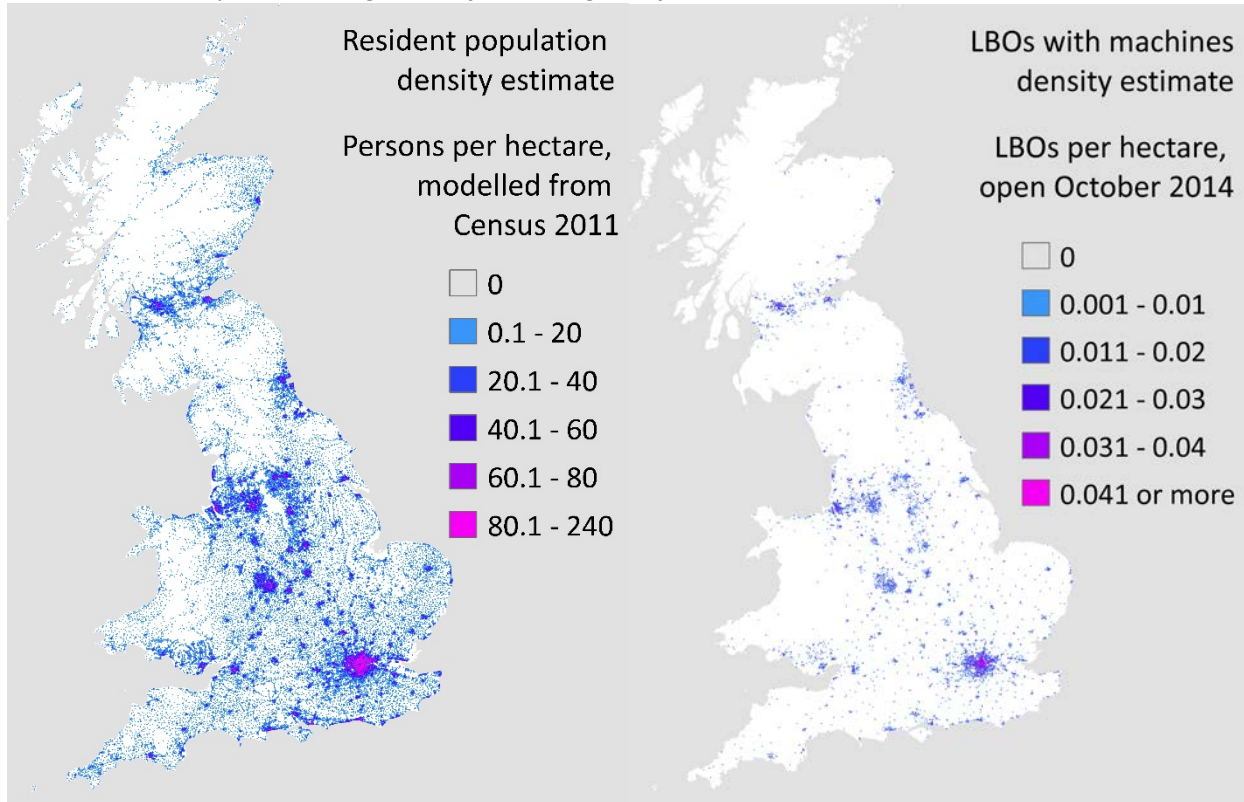
It is important to understand whether LBOs are located simply in proportion with the distribution of the resident population, or whether their distribution reflects other factors and makes some areas disproportionately full of bookmakers. We have examined the national geographic spread of LBOs in relation to the resident population, to ascertain whether the density of LBOs and the density of population coincide spatially, and whether LBOs consistently occur at locations where there is a particular measure of resident population.

We have derived population density using the Census 2011 tables KS101EW and KS101SC to measure the usually resident population on Census day (27/03/2011) by Output Area. Population density has been calculated using the cell values of the national population kernel density estimate (as discussed previously), within certain geographic areas. Areas which are in proximity to more than one LBO are included in calculations only once.

#### The national pattern

A national visualisation of the general patterns of population and LBO density (figures 23 and 24) reveals a largely urban phenomenon, where LBOs broadly follow patterns of population settlement. At this coarse scale, we can also observe a strong occurrence of LBOs in some smaller settlements such as the coastal towns of the south and east of England, and the South Wales valleys. This view initially suggests a non-uniform pattern of LBOs near resident population settlement.

Figures 23 and 24: National population and LBO density comparisons. Data sources: Office for National Statistics (OS), Inspired Gaming, Scientific Gaming, Geofutures.



### Local variations

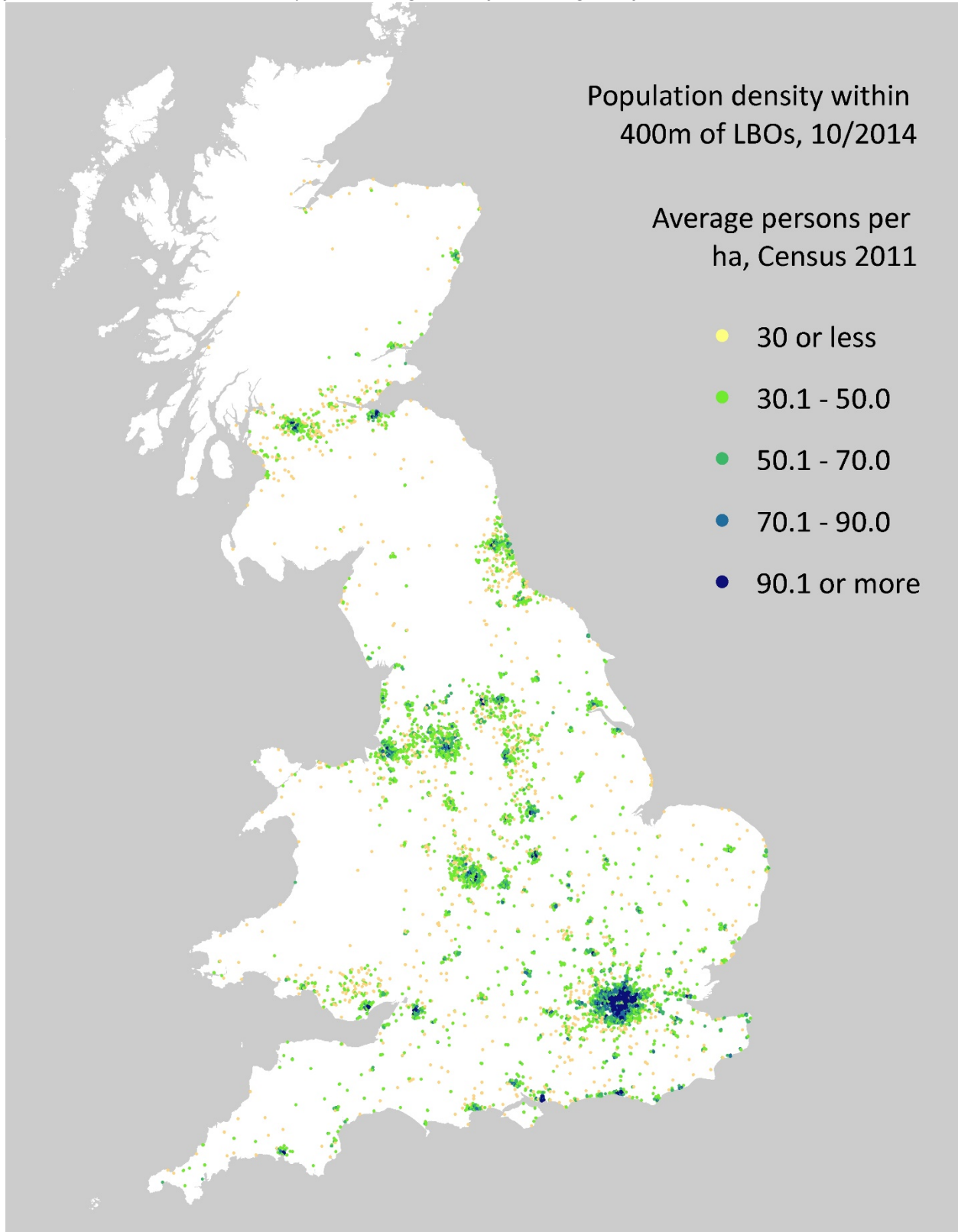
Population density is greater in areas near to LBOs than the whole of Great Britain and urban areas (figure 25). Global statistics often contain significant local variation, which may be of significance for this study to examine the regional and local trends of betting activity. Policy is best developed to suit the needs of local conditions. Figure 26 shows the difference in population density for the hinterland of each LBO. London and the central urban areas of other cities stand out as a function of their more densely populated nature.

Figure 25: Average population densities segmented by GB areas. Data source: Office for National Statistics (ONS), Geofutures.

Average resident population density for whole of Great Britain (persons per hectare)	Average resident population density in urban areas (persons per hectare)	Average resident population density within 400m of an LBO open August 2014 (persons per hectare)
2.53	18.6	49.8

Aside from this it appears LBOs may exist in a variety of locations – some central city areas with a larger local population, and other smaller areas where the potential local customer is more limited. In other words the level of residents near to LBOs with machines is not uniform, and not all venues are located in places of consistently high populated areas.

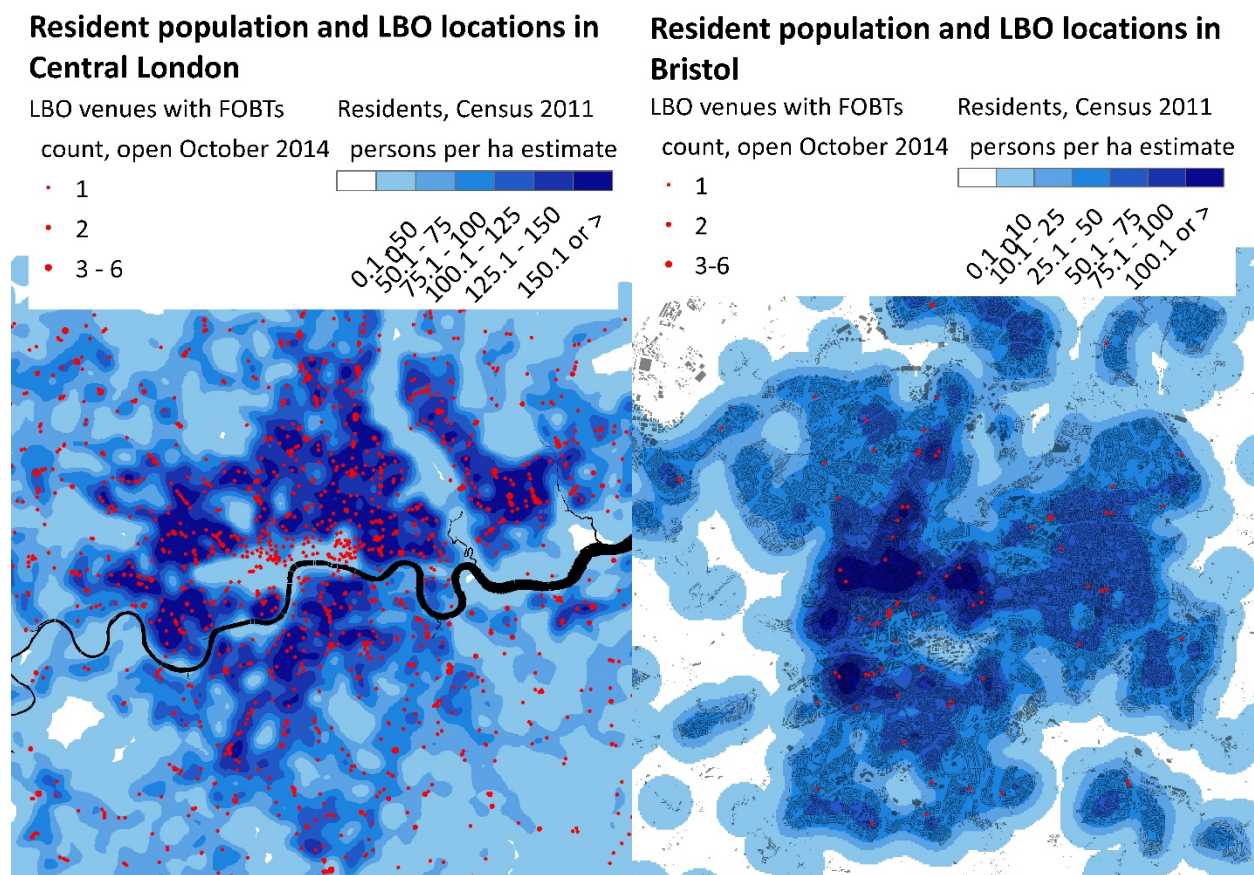
Figure 26: The national pattern of resident population density in proximity to LBOs. Data sources: Office for National Statistics (ONS), Inspired Gaming, Scientific Gaming, Geofutures.



When we look at this national-scale map, we might conclude that population density in proximity to LBOs closely reflects overall population density. However, examining city to neighbourhood-scale trends gives us a more detailed picture of this variation. Figures (27 to 32) suggest a more complicated set of drivers to LBO location than population density alone. Equally, there are areas of higher population density where there exist no or few LBO shops.

Further study may seek to investigate which of these drivers is most powerful in influencing LBO location and might consider accessibility, town centre economies and detailed typologies, together with local demographics of both the resident and daytime population.

Figures 27 to 32: Local variations in population density and LBO locations. Data sources: Office for National Statistics (ONS), Inspired Gaming, Scientific Gaming, Geofutures.



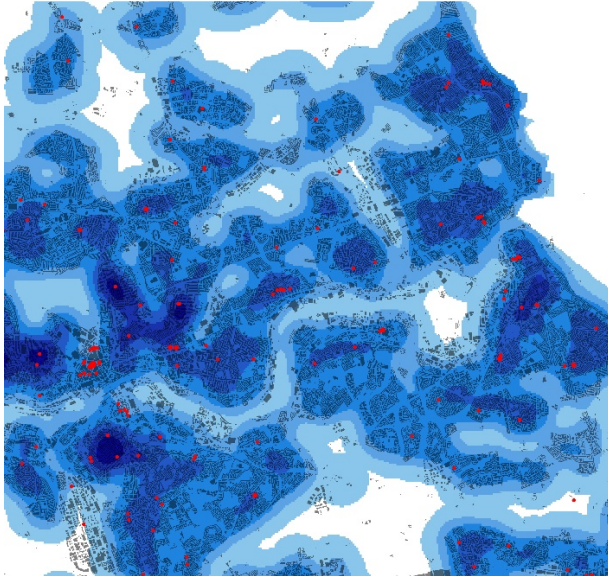
### Resident population and LBO locations in Newcastle

LBO venues with FOBTs  
count, open October 2014

- 1
- 2
- 3 - 6

Residents, Census 2011  
persons per ha estimate

0-10 10-25 25-50 50-75 75-100 100.1 or >



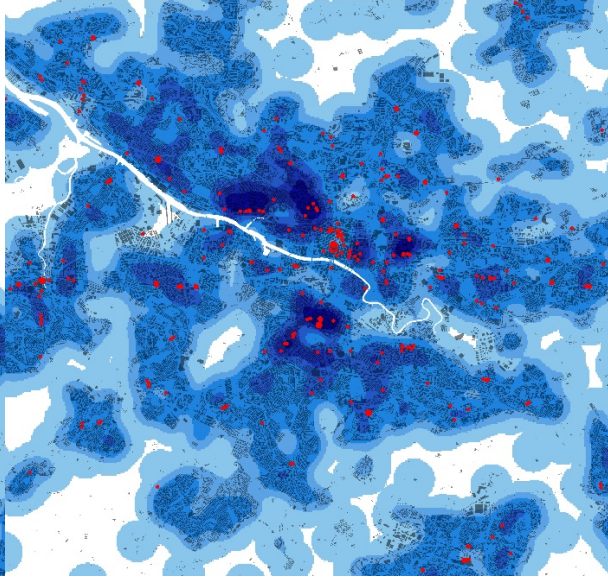
### Resident population and LBO locations in Glasgow

LBO venues with FOBTs  
count, open October 2014

- 1
- 2
- 3 - 6

Residents, Census 2011  
persons per ha estimate

0-10 10-25 25-50 50-75 75-100 100.1 or >



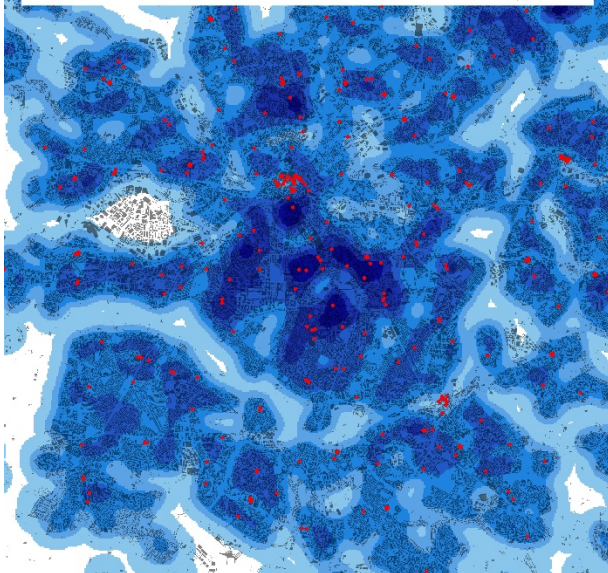
### Resident population and LBO locations in Manchester

LBO venues with FOBTs  
count, open October 2014

- 1
- 2
- 3 - 6

Residents, Census 2011  
persons per ha estimate

0-10 10-25 25-50 50-75 75-100 100.1 or >



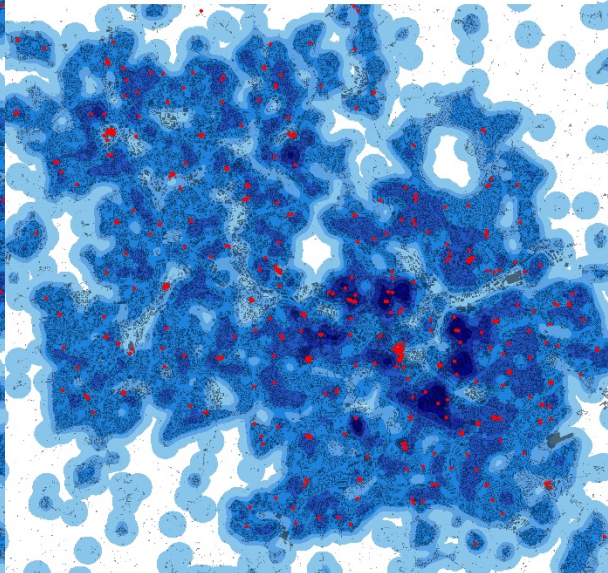
### Resident population and LBO locations in the West Midlands

LBO venues with FOBTs  
count, open October 2014

- 1
- 2
- 3 - 6

Residents, Census 2011  
persons per ha estimate

0-10 10-25 25-50 50-75 75-100 100.1 or >





When examining the distributions of these densities, for areas above 0 persons per hectare (where residents exist) the profile of Great Britain as a whole compared to urban areas varies as we would expect, as urban areas are denser by nature (figures 33 and 34).

Compare this to the profile of proximate areas to LBOs (figure 35) and a further difference can be seen. These areas are markedly denser in population than urban areas as a whole, suggesting again that LBOs are not occurring uniformly in urban areas in relation to residents.

A further comparison in figure 36 highlights the significance of town centre locations. Here the use of town centre boundaries to calculate population density, (discussed in the following section) shows a similar distribution to proximate areas to LBOs, suggesting the analysis should best be framed in the context of economic centres.

*Figure 33: The resident population density estimate of Great Britain distribution. Data sources: Office for National Statistics (ONS), Geofutures.*

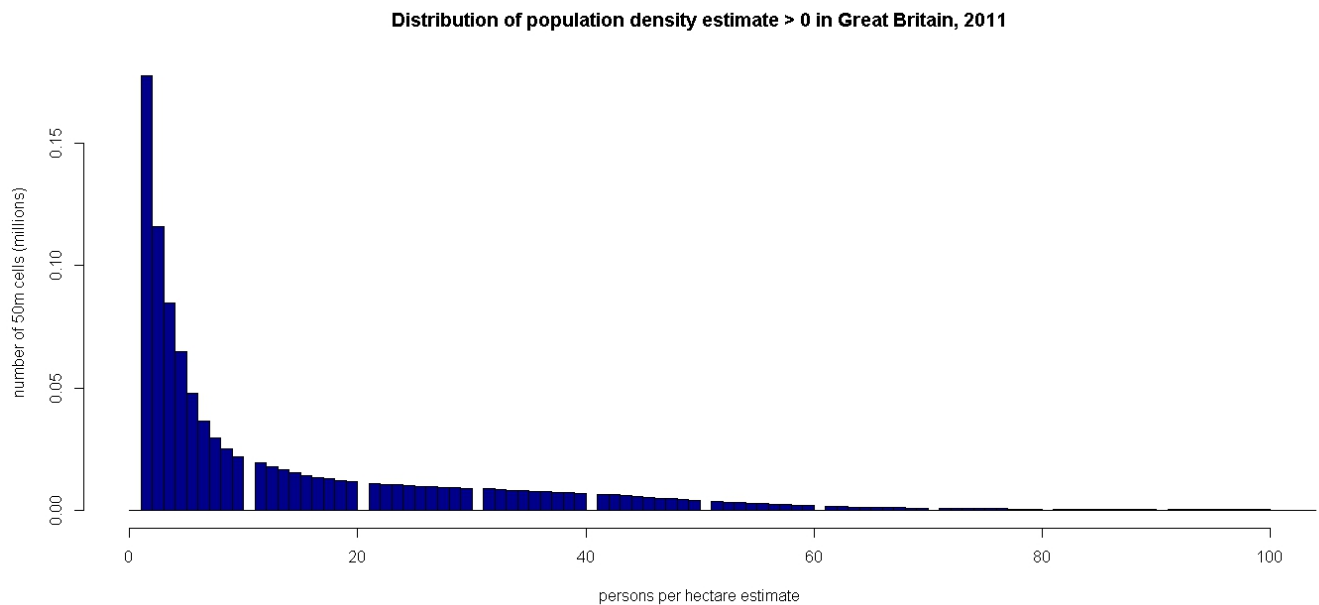


Figure 34: The resident population density estimate of Great Britain urban areas distribution. Data sources: Office for National Statistics (ONS), Geofutures.

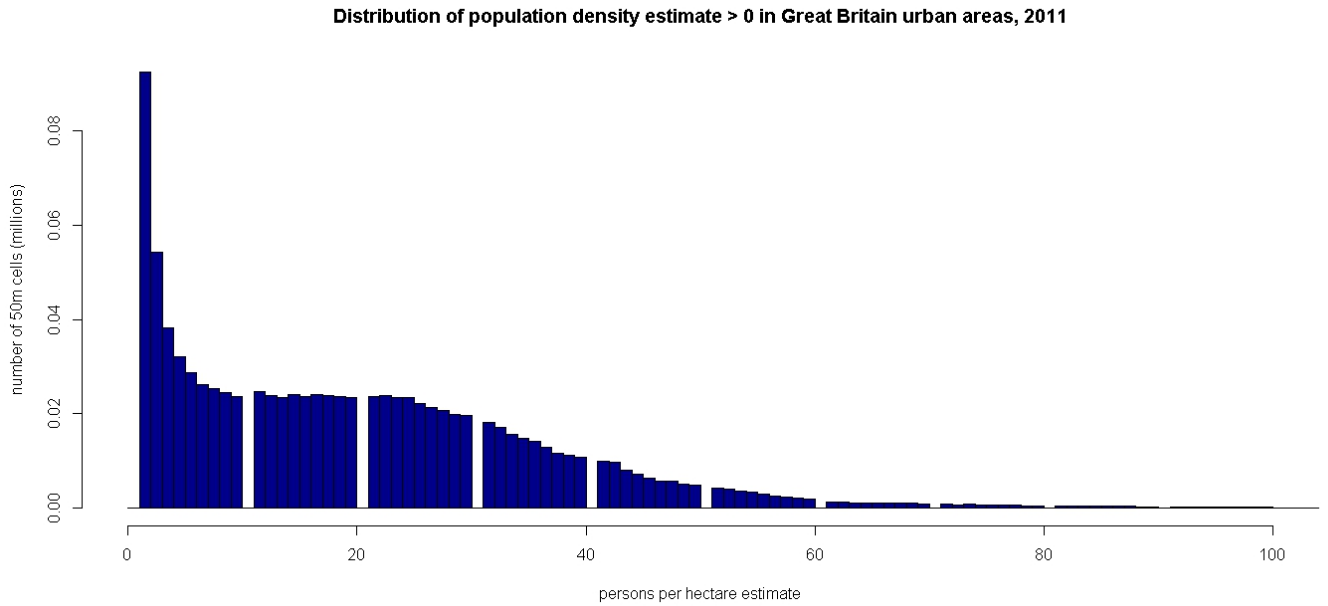


Figure 35: The resident population density estimate of areas in proximity to Great Britain LBOs distribution. Data sources: Office for National Statistics (ONS), Geofutures.

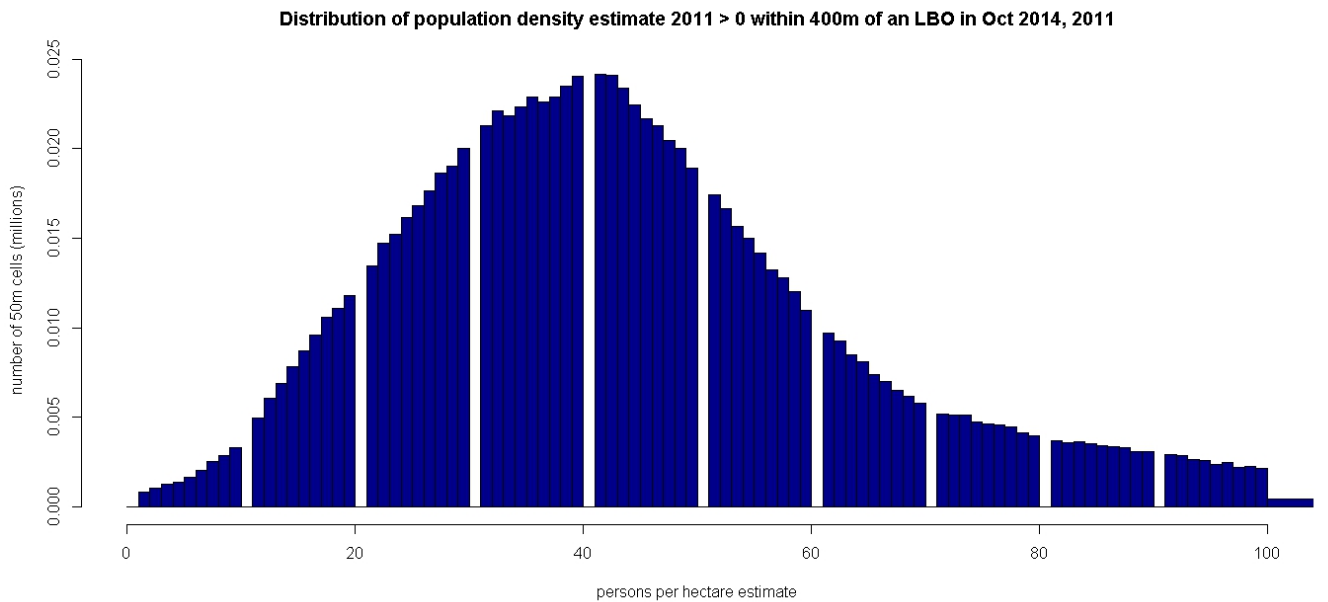
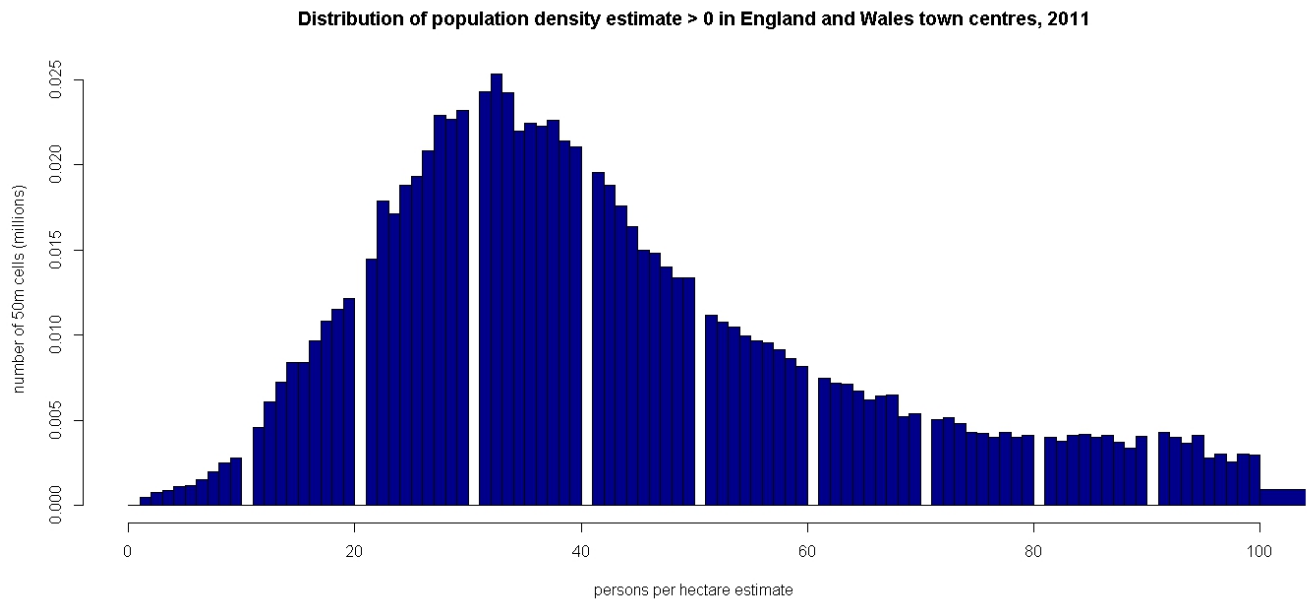


Figure 36: The resident population density estimate of statistical town centre boundaries in England and Wales distribution. Data sources: Office for National Statistics (ONS), Geofutures.

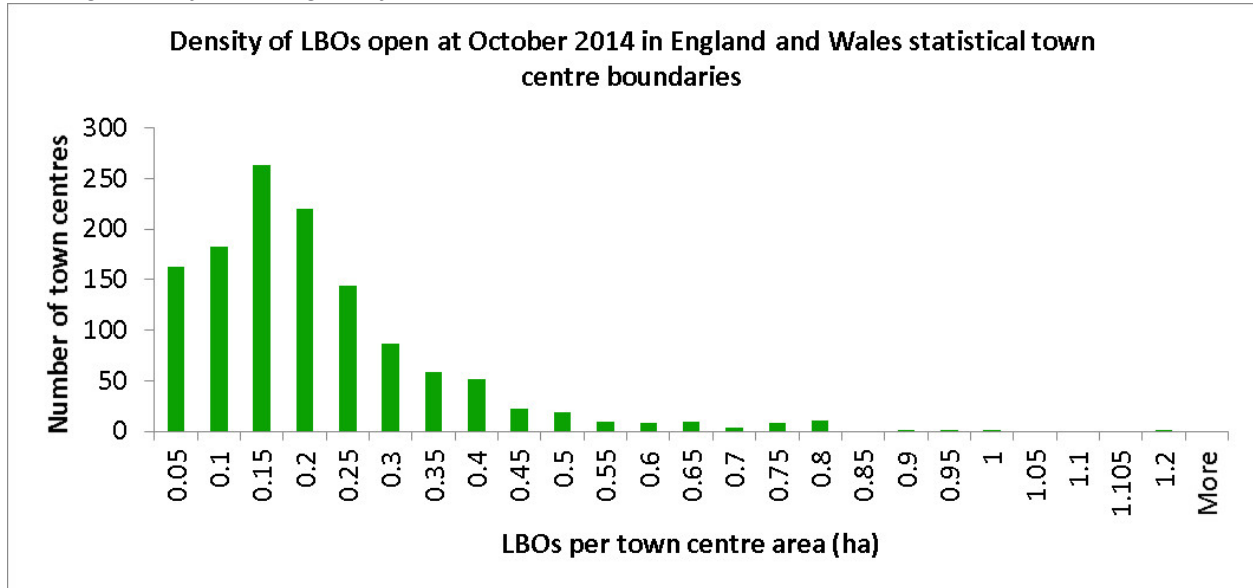


### 3.4 LBOs in relation to economic centres

The initial research question - to examine the distribution of LBOs compared to home locations - poses problems. Whilst an urban area may have resident populations throughout most of its town or city limits, shops and services by their nature tend to exist in town centres and high streets. This may account for much of the variation shown between the resident population density and corresponding LBO density at large. An alternative analysis can examine the density of shops compared to the geographic scale of town centres and high streets.

This provides another angle on the analysis, and we may expect to see a steadily and consistently increasing number of betting shops by town centre size, reflecting the size of the economic centre as the key driver to opening a venue. However, the distribution of the rate of LBOs per town centre area shows significant variation, with a positive skew where a few town centres have very high rates (figure 37).

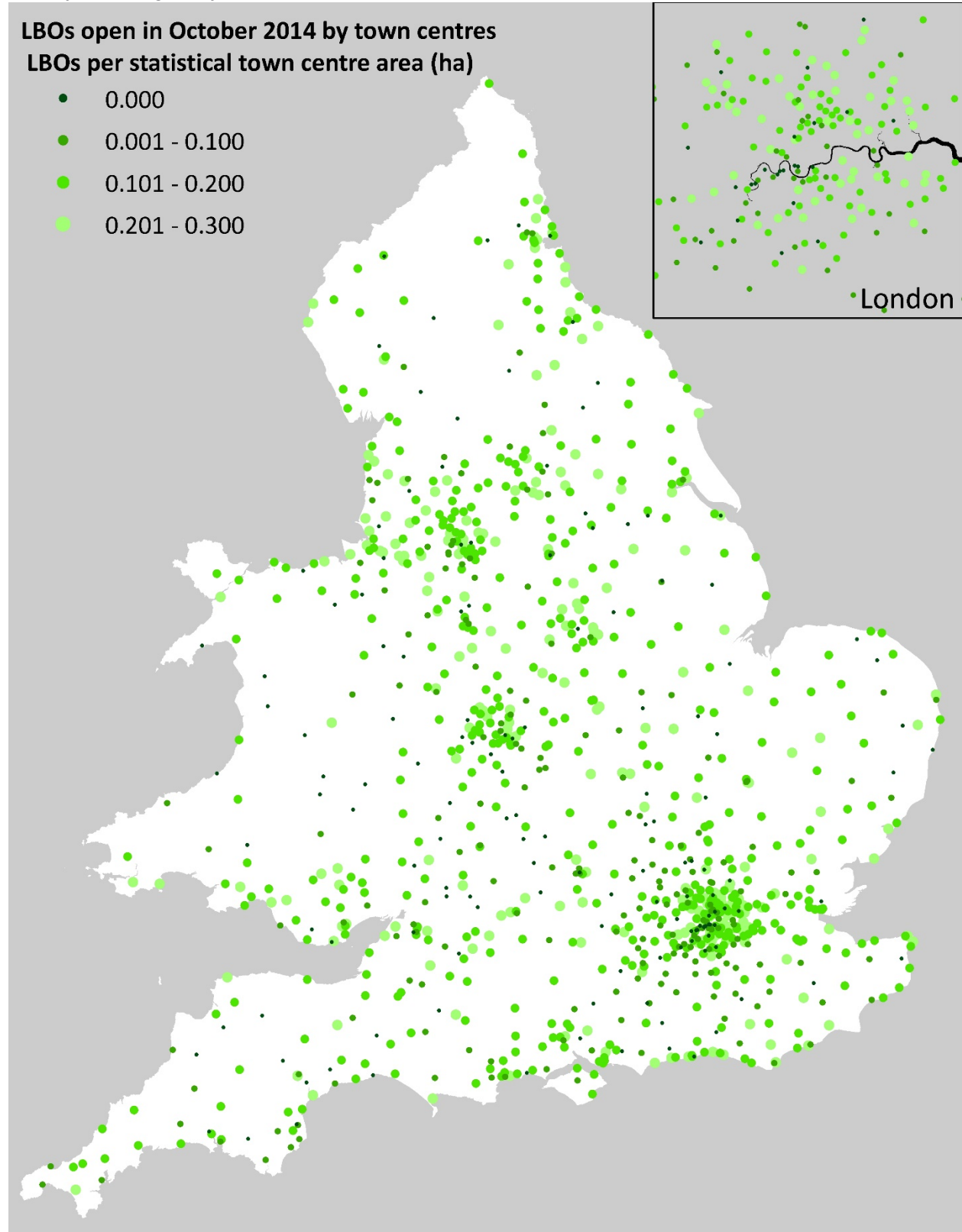
Figure 37: The rates of LBOs by England and Wales town centre area. Data Sources: DCLG, Inspired Gaming, Scientific Gaming, Geofutures.



Again, we see that national scale results need further examination to reveal significant local variation. Figure 38 shows the dispersed nature of these centres with high rates of LBOs per hectare. A further investigation might valuably examine what types of centres these locations are, which may incorporate other highly localised data such as business densities, footfall, business turnover, access, functional hierarchy, size, economic diversity and public realm investment.

A limitation in analysing economic centres in this way is the assumption that the area of the centre is proportional to the size of its economy. Whilst this is a useful general guideline, it cannot account for a myriad of other factors which attract both a daytime and nighttime population into these areas, including functional hierarchy, accessibility, tourism and visitor levels, and workplaces.

Figure 38: National variation of LBOs by town centre areas (ha). Data sources: DCLG, Inspired Gaming, Scientific Gaming, Geofutures.



## 4. What are places with machines like?

In order to describe, understand and mitigate gambling related harm we need to achieve a wider understanding of potential risk areas. In this section we contextualise the location of LBOs, illustrating variables which may influence patterns of behaviour. Within this analysis we incorporate resident geodemographic groups, age, ethnicity, deprivation and economic activity, together with a place profile of crime events, Westminster political representation, rural or urban typology and in- or out-of-town locations. Many of these statistics represent resident profiles, and we must note that LBOs are not exclusively served by their local resident population, however national extent daytime statistics at the small area are scant, and these data therefore act as a proxy.

### 4.1 Age profile

We have captured the resident age profile at the small Output Area from the 2011 Census. We have compared the national and 'urban' age profile against those proximate areas to LBOs in figures 39 to 42, which shows a predominance of residents aged in their 20s, and a much diminished teenage population. Again, this is mostly a facet of the profile of central areas of shops and services, but also highlights a local population with access to machines where people in their 20's may be heavily represented.

Figure 39: Age profile of resident population in Great Britain, 2011. Data source: Office for National Statistics (ONS), Geofutures.

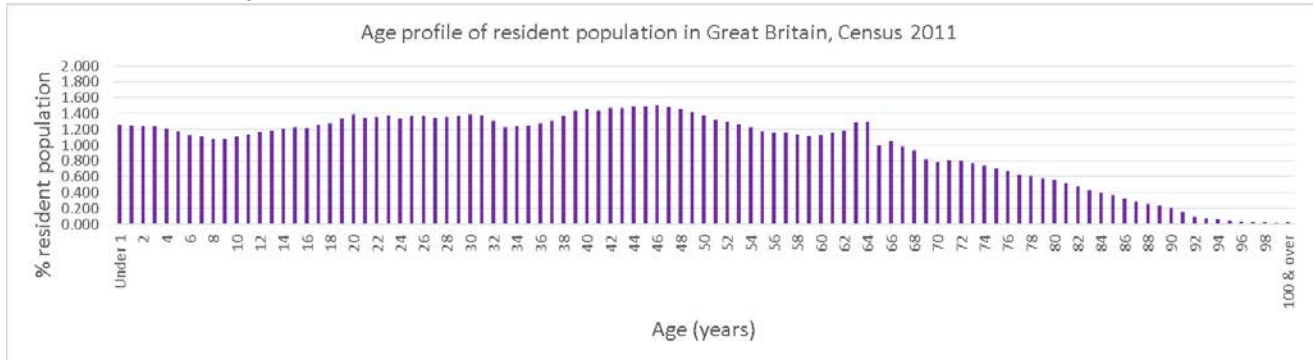


Figure 40: Age profile of resident population 2011, in Great Britain urban areas. Data source: Office for National Statistics (ONS), Inspired Gaming, Scientific Gaming, Geofutures.

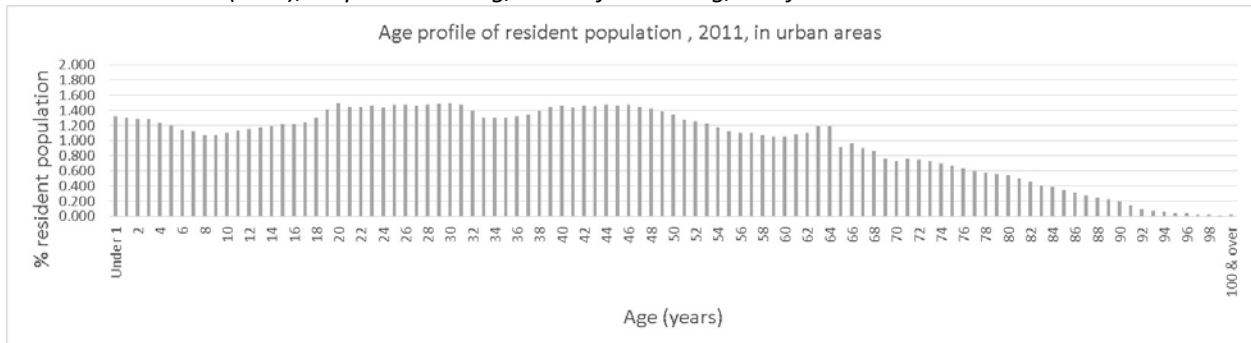


Figure 41: Age profile of resident population 2011, within 400m of LBOs. Data source: Office for National Statistics (ONS), Inspired Gaming, Scientific Gaming, Geofutures.

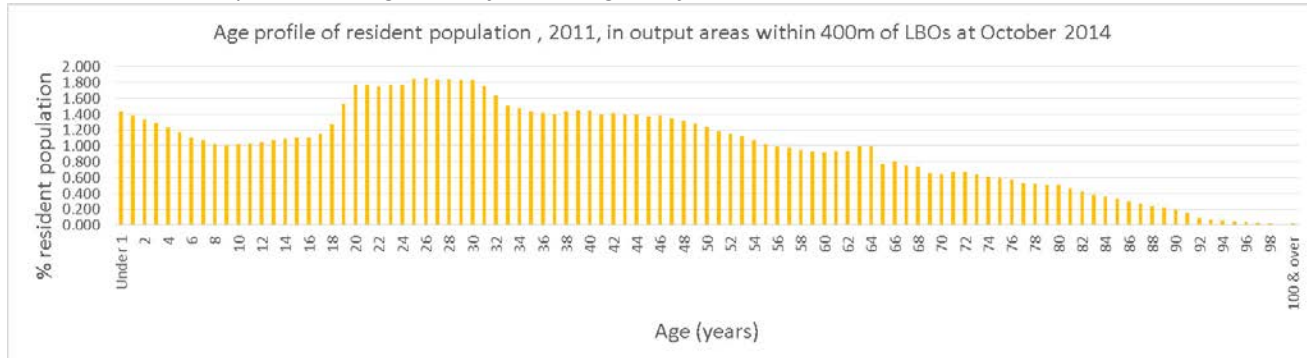
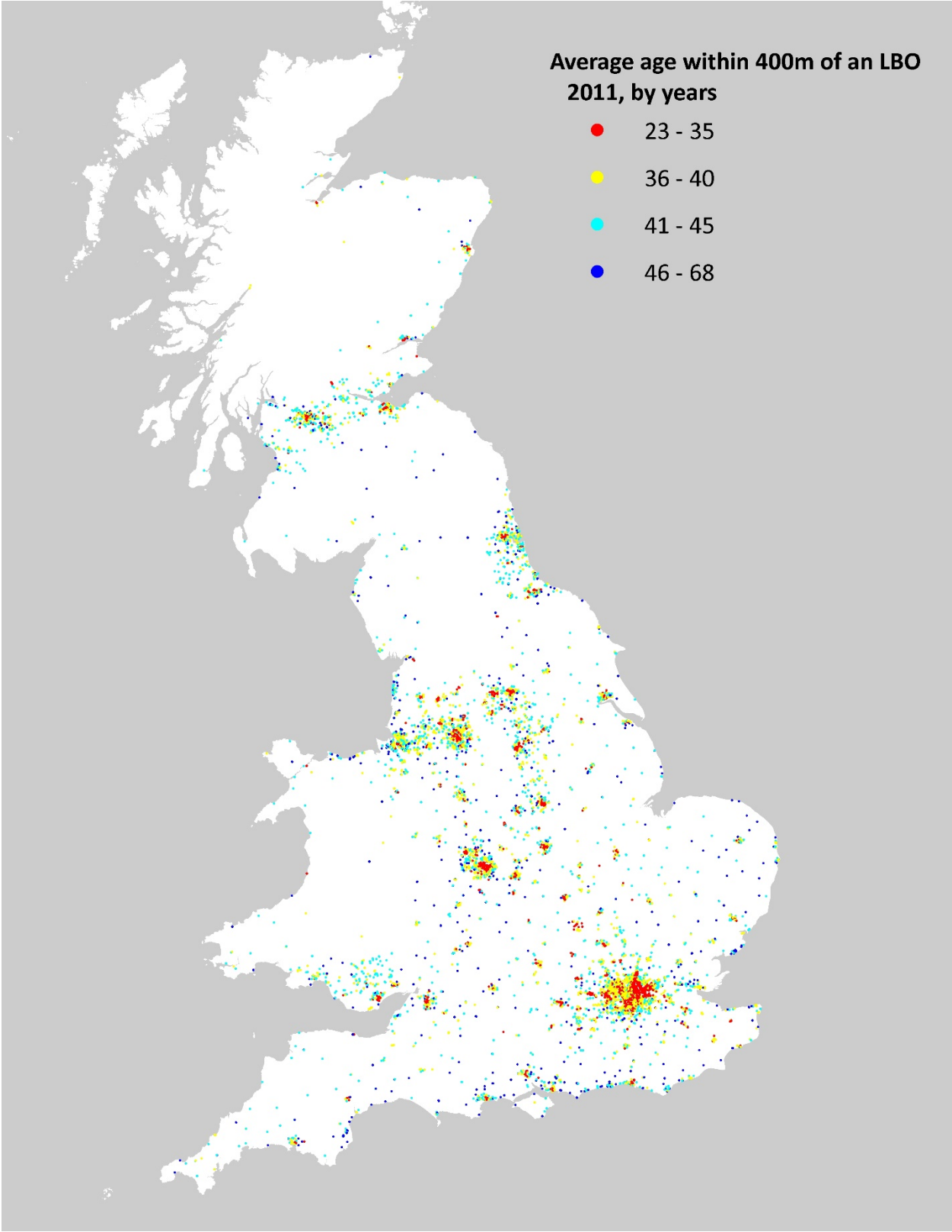


Figure 42: Comparison of age profile, 2011. Data sources: Office for National Statistics (ONS), Inspired Gaming, Scientific Gaming, Geofutures.

Age range, Census 2011	% residents in Great Britain	% residents in urban Output Areas	% residents in Output Areas in 400m proximity of an LBO
Under 18s	21.2	21.5	20.7
18 - 25	10.8	11.5	13.5
26 - 35	13.2	14.2	17.0
36 - 45	14.2	14.3	14.1
46 - 55	13.5	13.1	12.1
56 - 65	11.6	10.9	9.4
65 and over	16.5	15.5	14.0
Average age	40	40	38

The national average age is slightly lower in proximate areas to LBOs; we may expect this since central city areas in which LBOs are located, often house younger and more transient communities, as reflected in figure 43. This figure also highlights other anomalies to the overall trend; seaside towns tend to have older populations, and the South Wales valleys and other peripheral city areas are predominantly middle aged. Where policy is designed to tackle harmful gambling in the younger population for example, it should be mindful that the younger local populations tend to be in central areas.

Figure 43: National pattern of LBO locations by age profile, 2011. Data sources: Office for National Statistics (ONS), Inspired Gaming, Scientific Gaming, Geofutures.





## 4.2 Ethnicity

Ethnic groups have been captured from the 2011 Census at the small Output Area. There is a strong prevalence of non-white minority ethnic groups in close proximity to LBO locations (figure 44). Because of the size of population, the Asian or Asian British group is particularly significant, although still a percentage minority overall. This ethnic diversity is found most in London, the Midlands and Northern England by nature of the regional populations at large (figure 45).

Figure 44: Distribution of ethnic mix in proximity to LBOs. Data sources: Office for National Statistics (ONS), Geofutures.

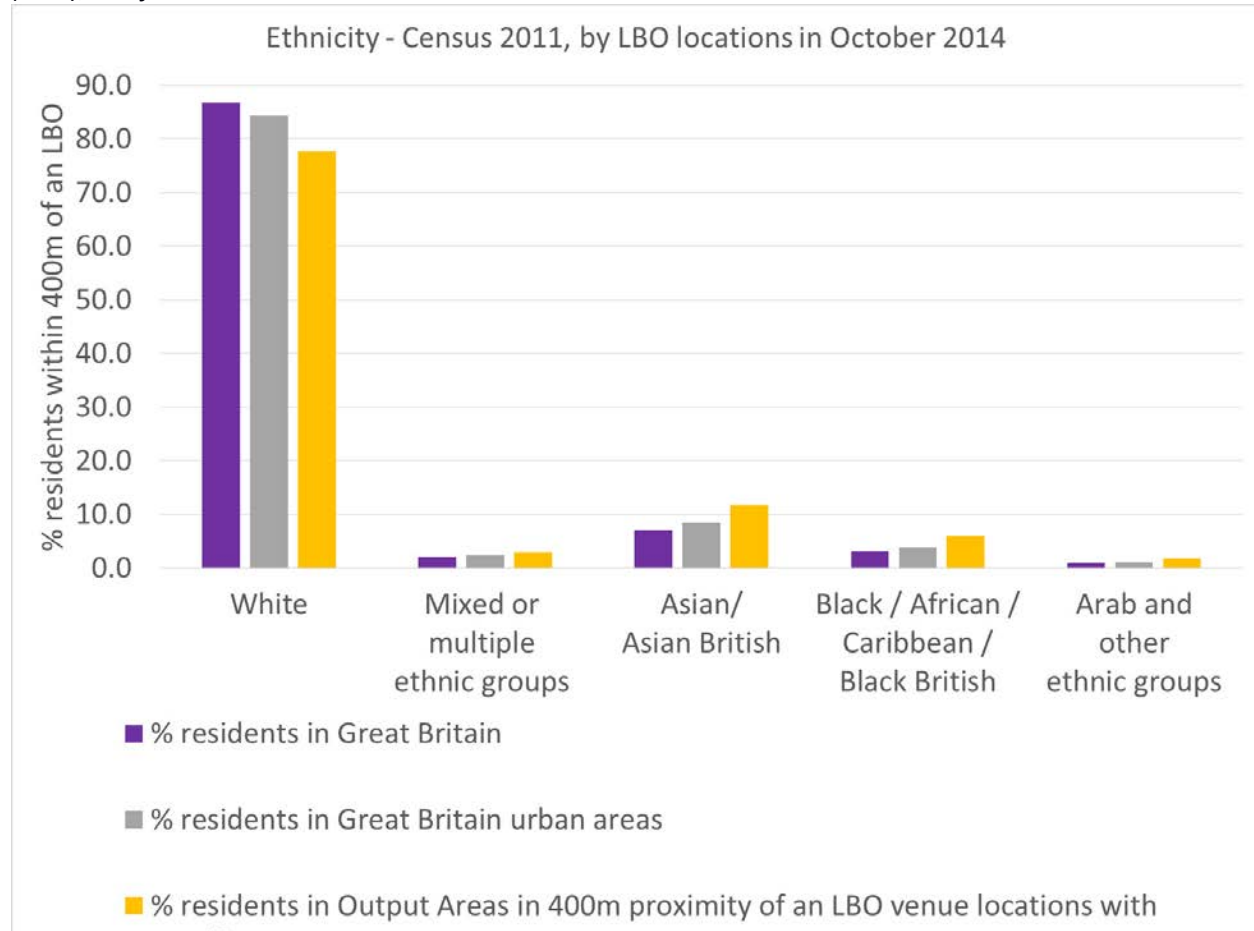
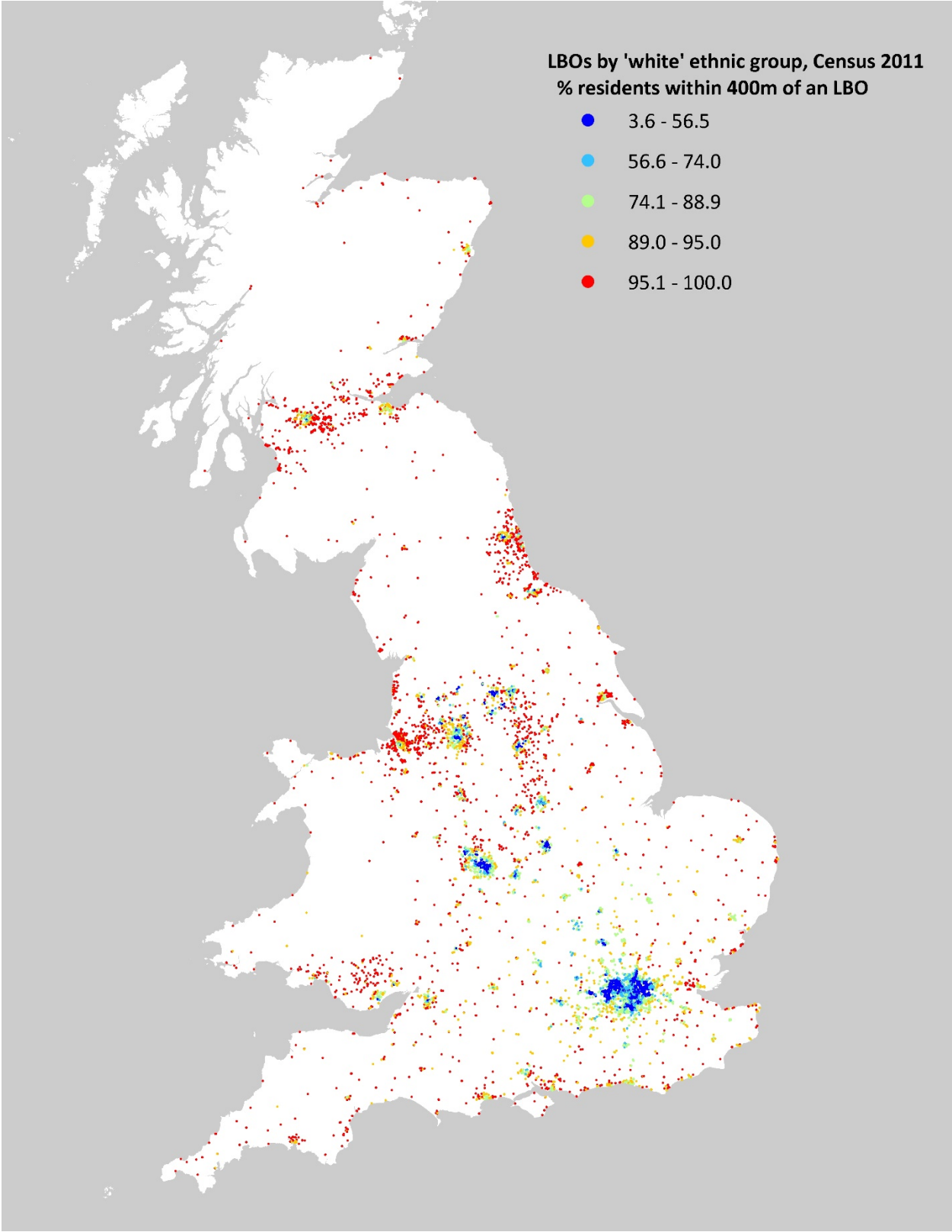


Figure 45: National pattern of LBO locations by ethnic groups. Data sources: Office for National Statistics (ONS), Inspired Gaming, Scientific Gaming, Geofutures.



### 4.3 Deprivation

A broad examination of resident deprivation uses the national indexes of multiple deprivation, which derive measures incorporating health, education, crime, children, and the living environment. The individual nations and their urban areas have again been used to segment and compare the results. This data is modelled at the slightly larger Census Lower Super Output Area (LSOA) in England and Wales and Data Zone (DZ) in Scotland.

Higher scores represent more deprived areas, and in all three nations the LBO-proximate average score is higher than the national and urban averages (figure 46). An extension to this analysis may begin to sample urban areas to investigate this significance further.

Figure 46: Comparison of multiple deprivation scores. Data sources: Office for National Statistics (ONS), Welsh Government, Scottish Government, Geofutures.

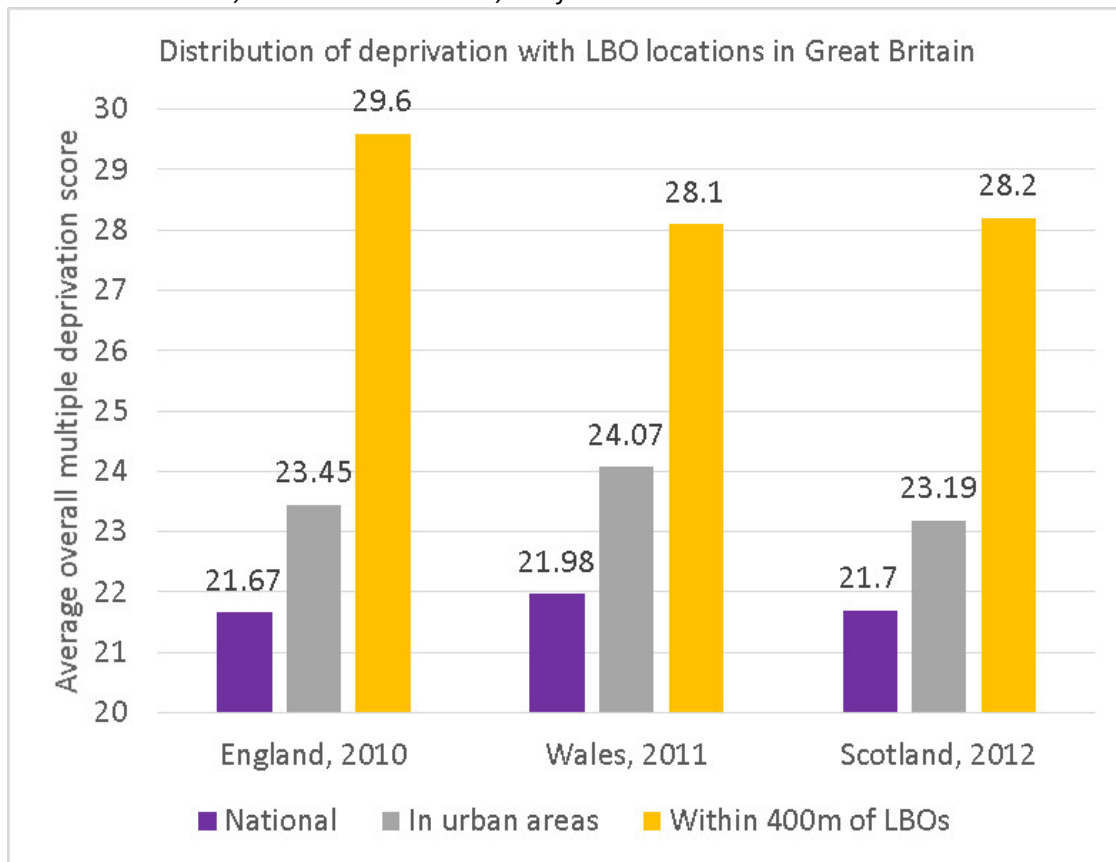
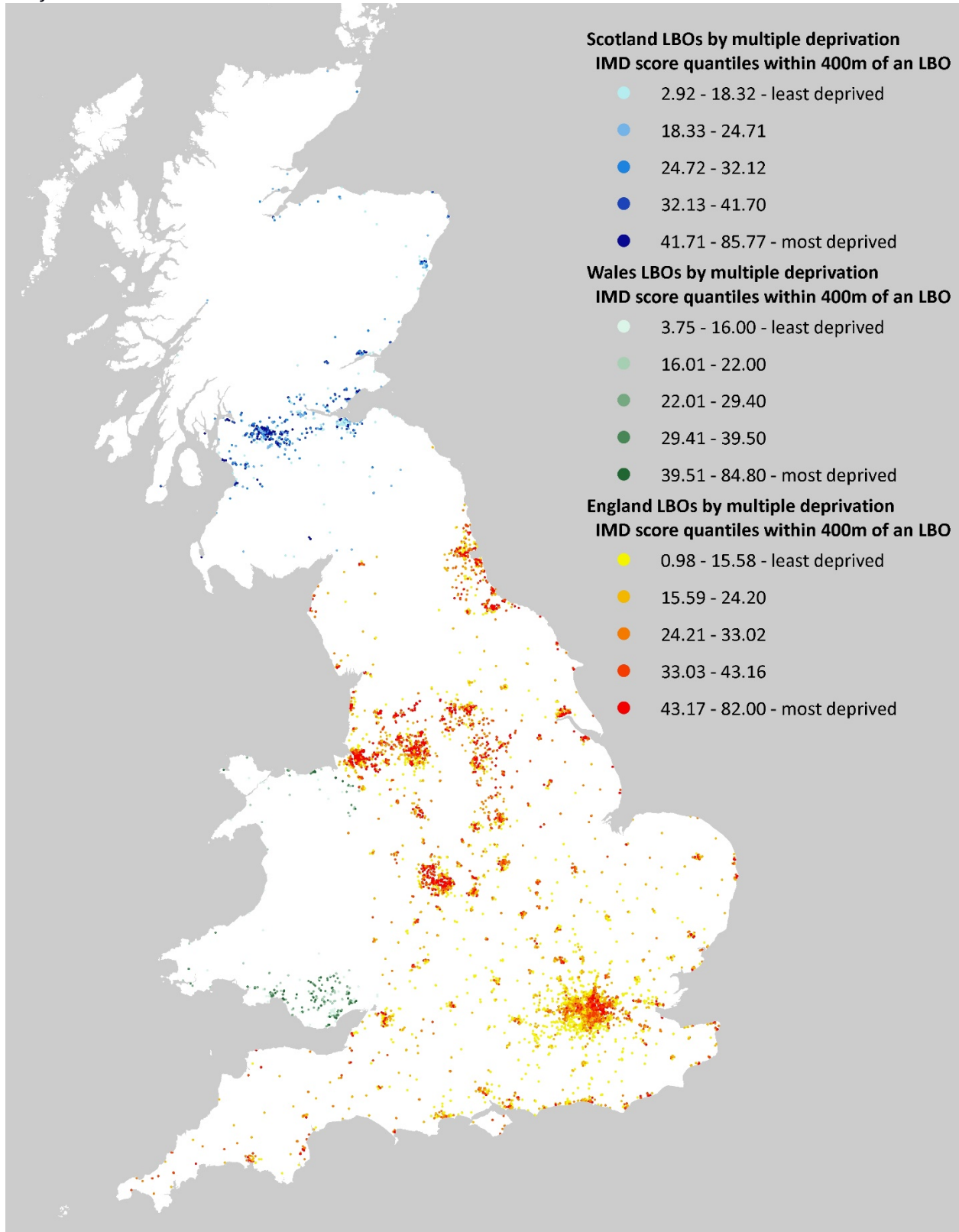


Figure 47: National pattern of LBO locations by multiple deprivation score, 2011. Data sources: Office for National Statistics (ONS), Welsh Government, Scottish Government, Inspired Gaming, Scientific Gaming, Geofutures.



#### 4.4 Economic activity

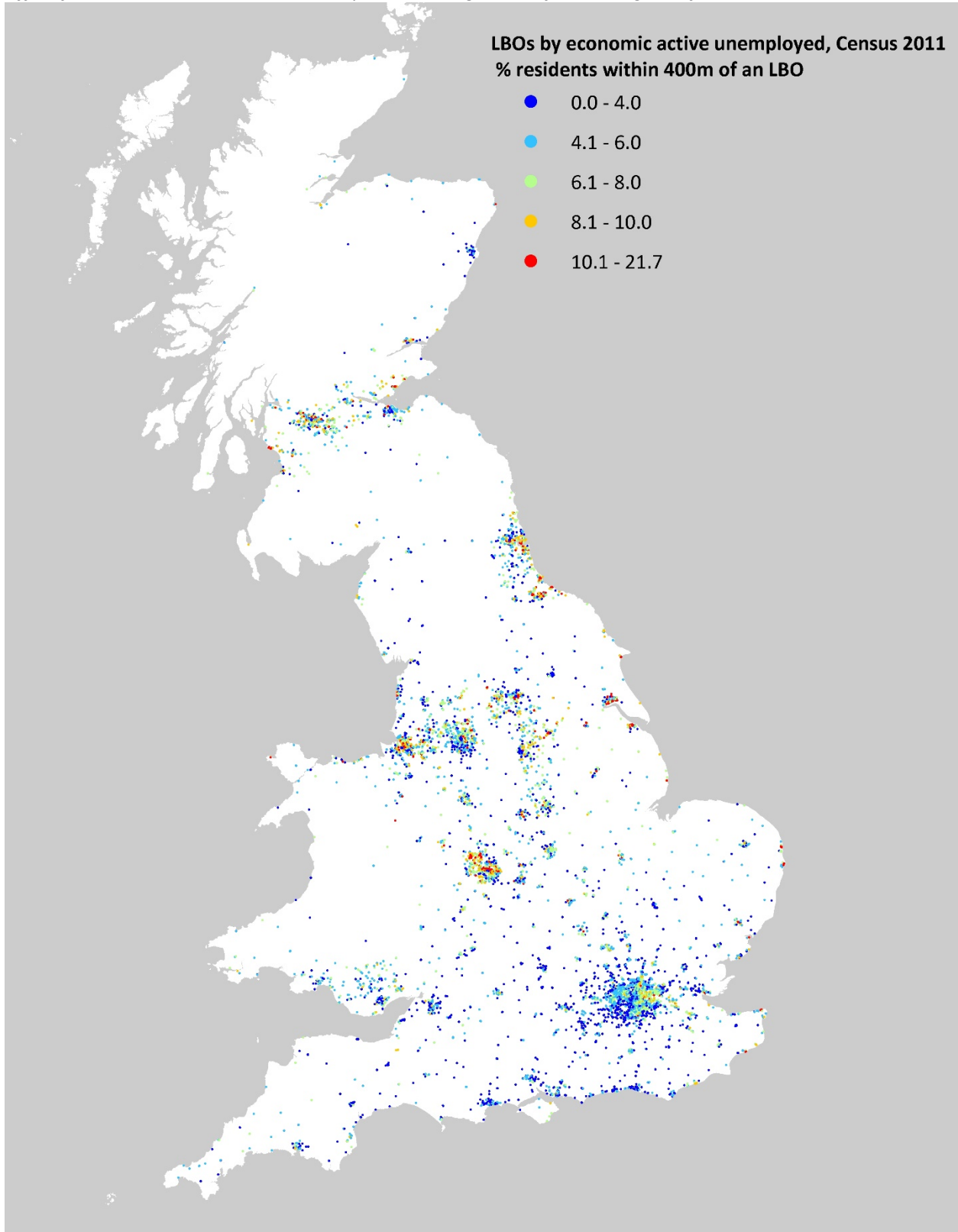
The economic activity levels of the local resident population may have a significant influence on available gambling funds, and disposable time when considering unemployment. We have included both the Census 2011 measure of economic activity at the small Output Area, and as an illustration of the lowest incomes, those claiming unemployment benefits. These were analysed at the Lower Super Output Area and Data Zone level.

Areas in proximity to LBOs tend to have a marginally higher rate of economic inactivity and unemployed residents, compared to both the national average and urban areas (figure 48). The highest 2011 rates of unemployment near LBO locations are prevalent in the Midlands, North England and Scottish Central Belt. For the larger cities e.g. Glasgow, Manchester, Liverpool and Newcastle, these tend to be off-centre areas (figure 49).

*Figure 48: Comparison of economic activity, 2011. Data sources: Office for National Statistics (ONS), Geofutures.*

<b>Census 2011 table QS601 economic activity measure</b>	<b>% residents in Great Britain</b>	<b>% residents in urban areas</b>	<b>% residents in Output Areas in 400m proximity of an LBO</b>
All usual residents aged 16-74, economically inactive	30.4	30.4	31.1
All usual residents aged 16-74, economically active: unemployed	4.4	4.8	5.6

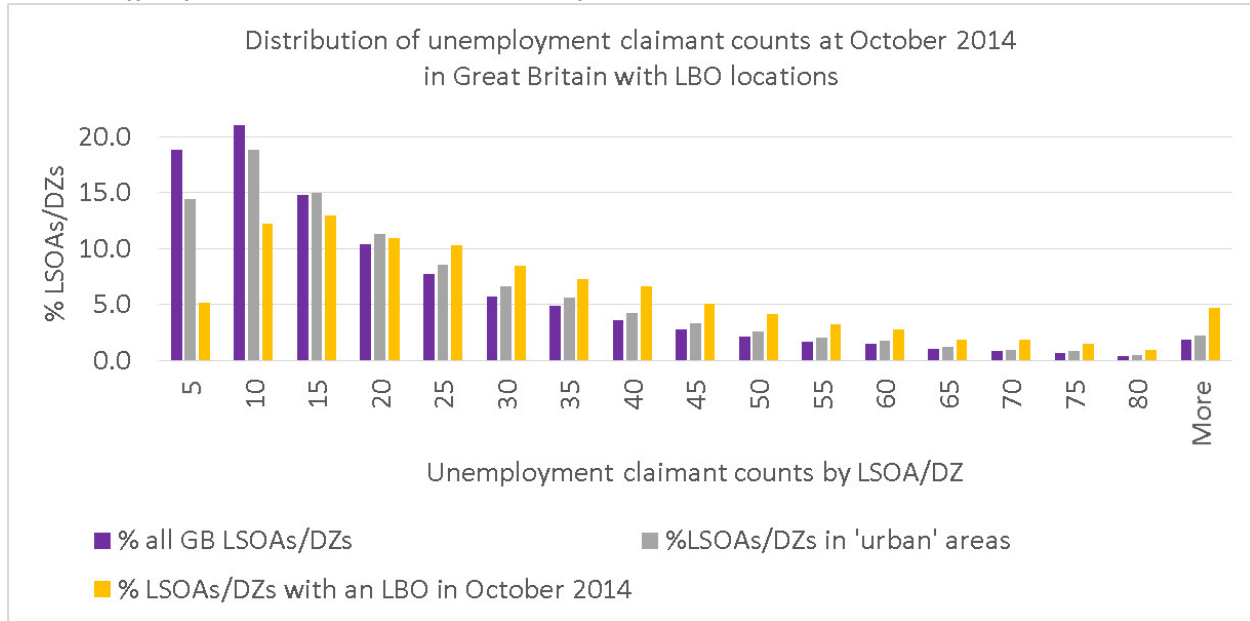
Figure 49: National pattern of LBO locations by economically active unemployed, 2011. Data sources: Office for National Statistics (ONS), Inspired Gaming, Scientific Gaming, Geofutures.



Claimant counts capture those claiming Job Seekers Allowance (JSA) and National Insurance credits at Jobcentre Plus local offices. Though not a strict measure of unemployment, it is often used as a proxy by decision makers for areas smaller than local authorities. These results appear as non-normalised counts per area, although the base population of LSOAs and DZs are designed to have similar populations.

A significant national pattern emerges of higher numbers of claimants in proximity to LBOs compared to urban and national areas on the whole (figure 50).

Figure 50: Distribution of unemployment claimant counts where an LBO is present in Great Britain. Data sources: Office for National Statistics (ONS), Geofutures.



#### 4.5 Crime events

Crime rates are significantly greater in town centres and about half of LBOs are located in these areas, so we have segmented the results by in or out-of-town locations. Crime density is higher in proximity to LBOs, particularly in off-centre locations (figure 51), which is true for most crime types (figure 52).

We need to be aware that crime will affect a local resident population, but may or may not be perpetrated by local residents. Crime data will therefore reflect both the daytime and night-time transitory population of each location. This analysis only includes England and Wales, where comparable crime data is available. The events are those recorded to the police within the past six months and whilst they are likely to give a strong indication, they do not necessarily guarantee a complete coverage of crime in the area.

Figure 51: Comparison of all crime levels in England and Wales urban areas. Data sources: Police.uk, DCLG, Geofutures.

Density estimates of crime events per hectare, March-August 2014			
Within town centres	Within town centres - within 400m of LBOs	Urban areas outside of town centres	Urban areas outside of town centres - within 400m of LBOs
10.09	10.48	1.00	3.54

Figure 52: Comparison of crime levels by type. Data sources: Police.uk, DCLG, Geofutures.

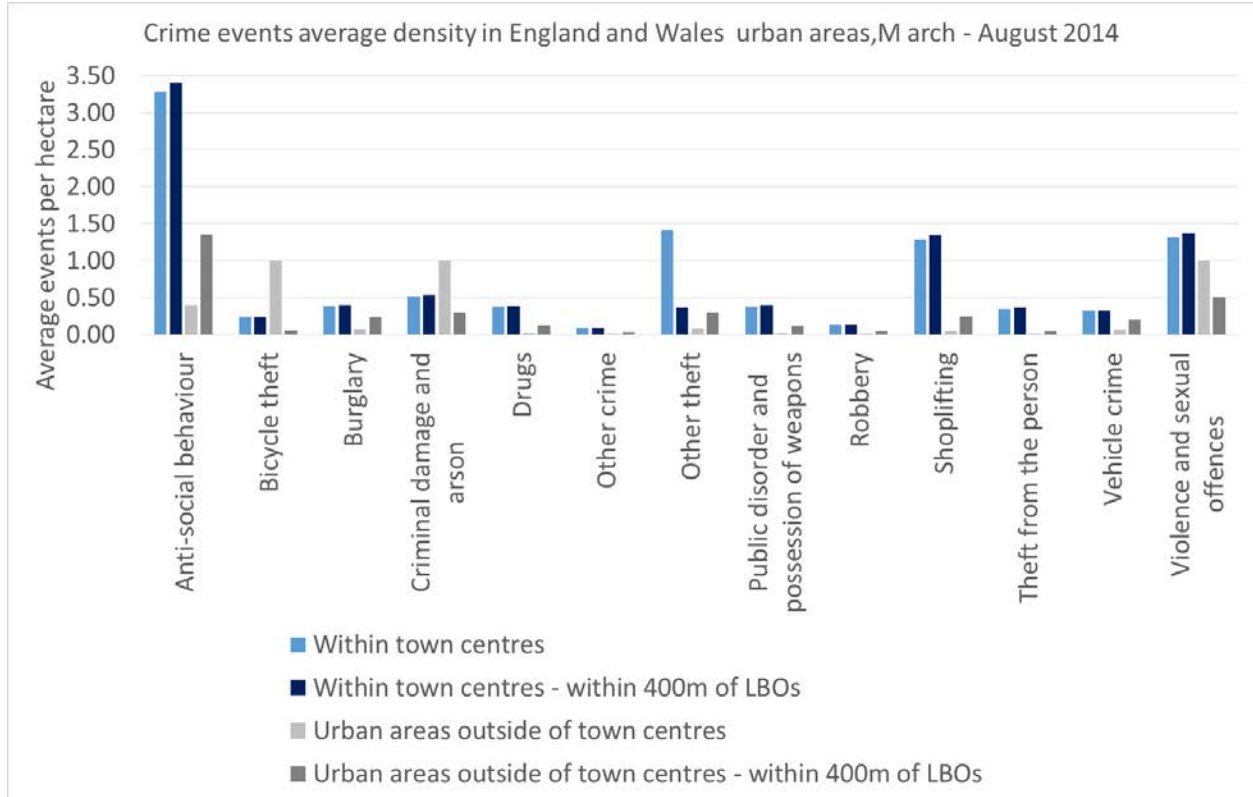
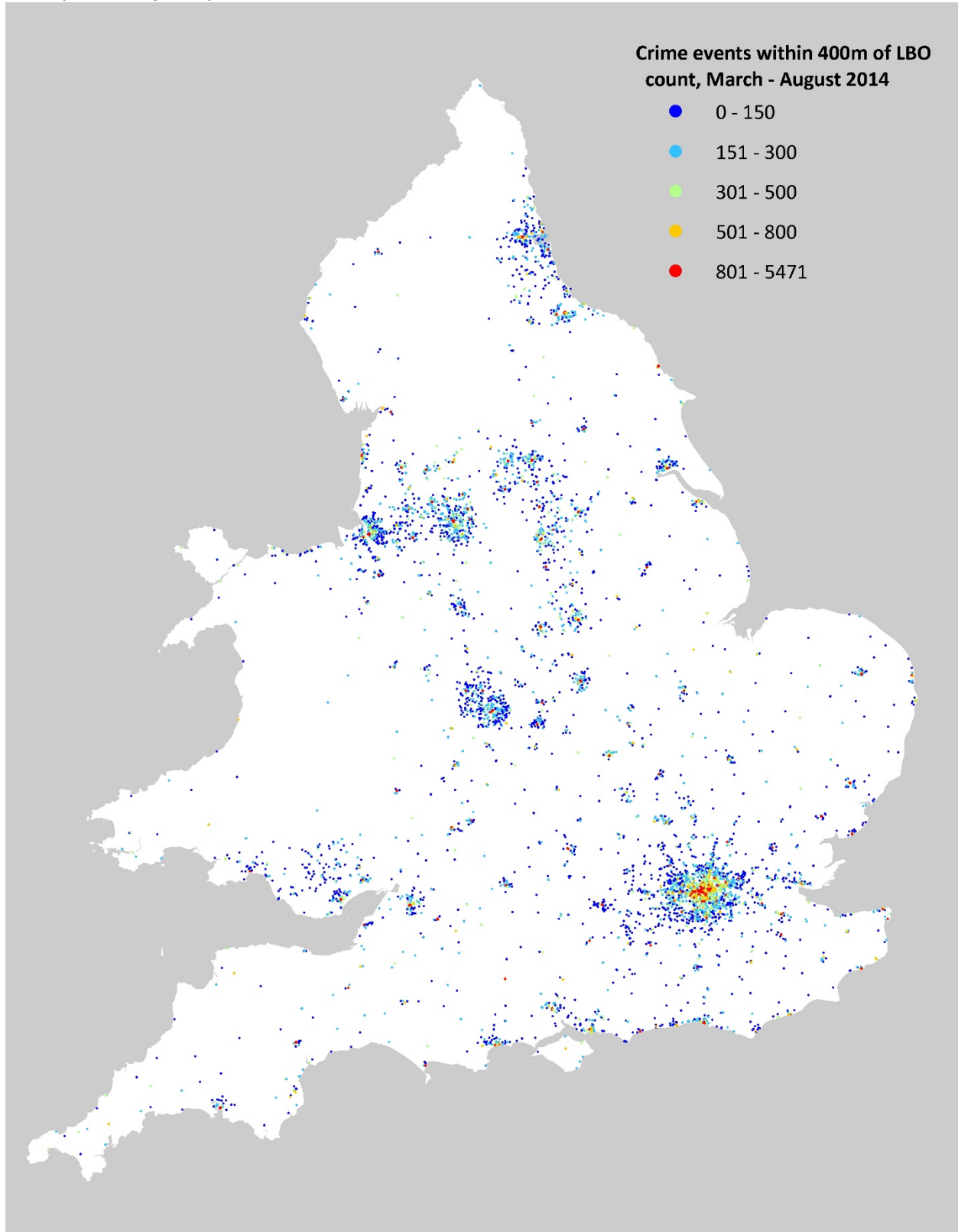




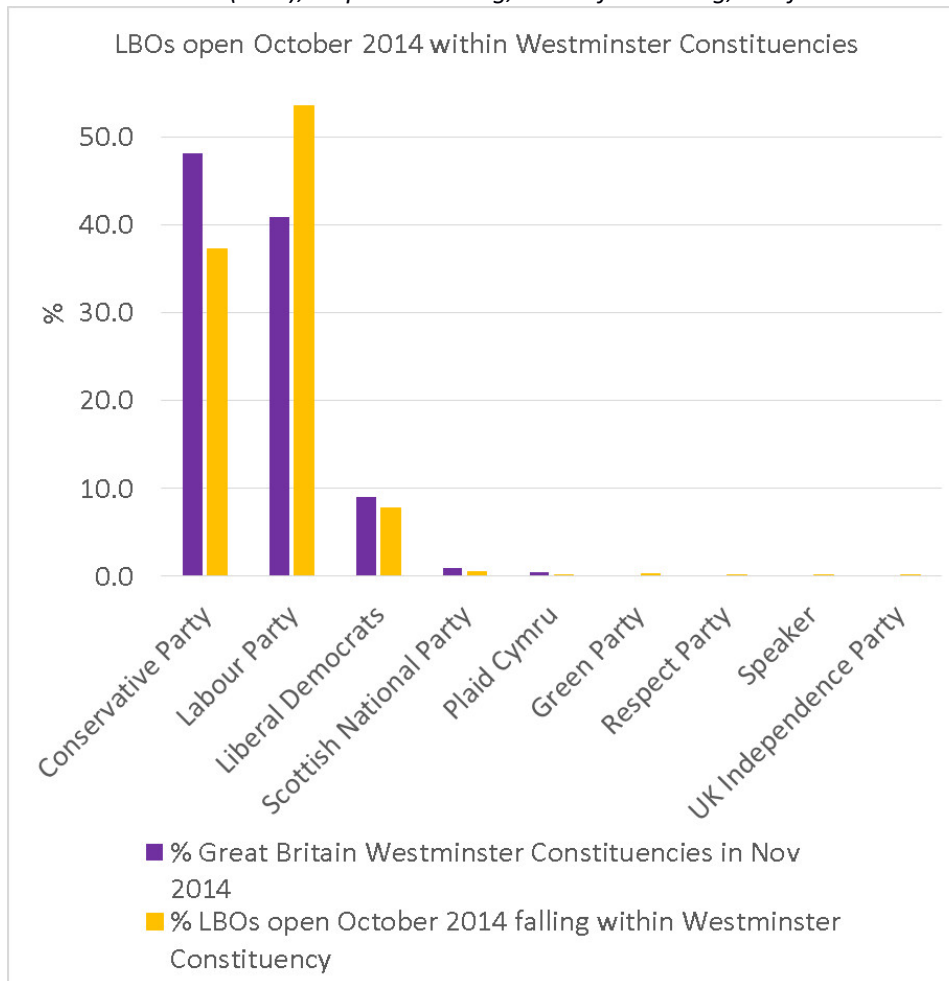
Figure 53: National pattern of LBO locations by crime events. Data sources: Police.uk, Inspired Gaming, Scientific Gaming, Geofutures.



## 4.6 Westminster representation

As a guide to the political flavour of areas in which LBOs fall, we have analysed LBO locations by the Westminster constituency they fall within. The distribution of LBOs compared to constituencies contrasts the split of parties, with a strong representation by Labour MPs (figure 54). The national pattern of these LBO locations, follows national political patterns, and highlights the prominence of Labour representation in urban areas.

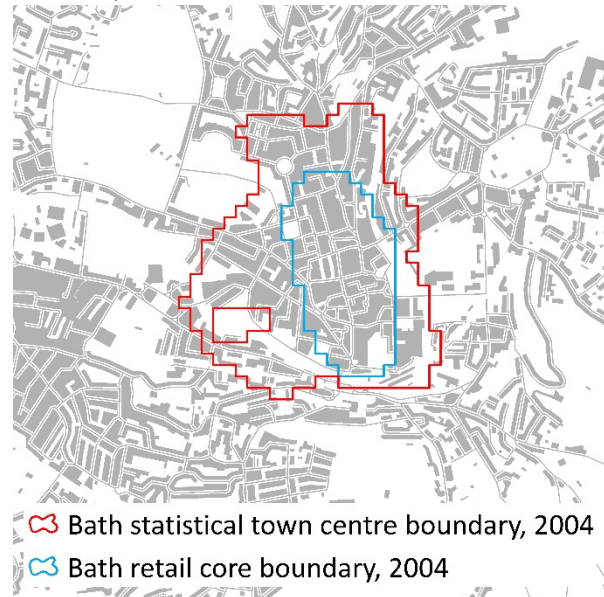
Figure 54: Comparison of political party representation, 2014. Data sources: UK Parliament, Office for National Statistics (ONS), Inspired Gaming, Scientific Gaming, Geofutures.



## 4.7 In or out-of-town

Whilst we assume LBOs will cluster with other services in economic centres, it may be useful to more closely examine these settlement patterns to assess the prevalence of LBOs in slightly off-centre locations. This analysis is for England and Wales only, to define those central areas 'in-town' or otherwise 'out-of-town'.

Figure 55: Example statistical town centre boundary. Data source: DCLG.

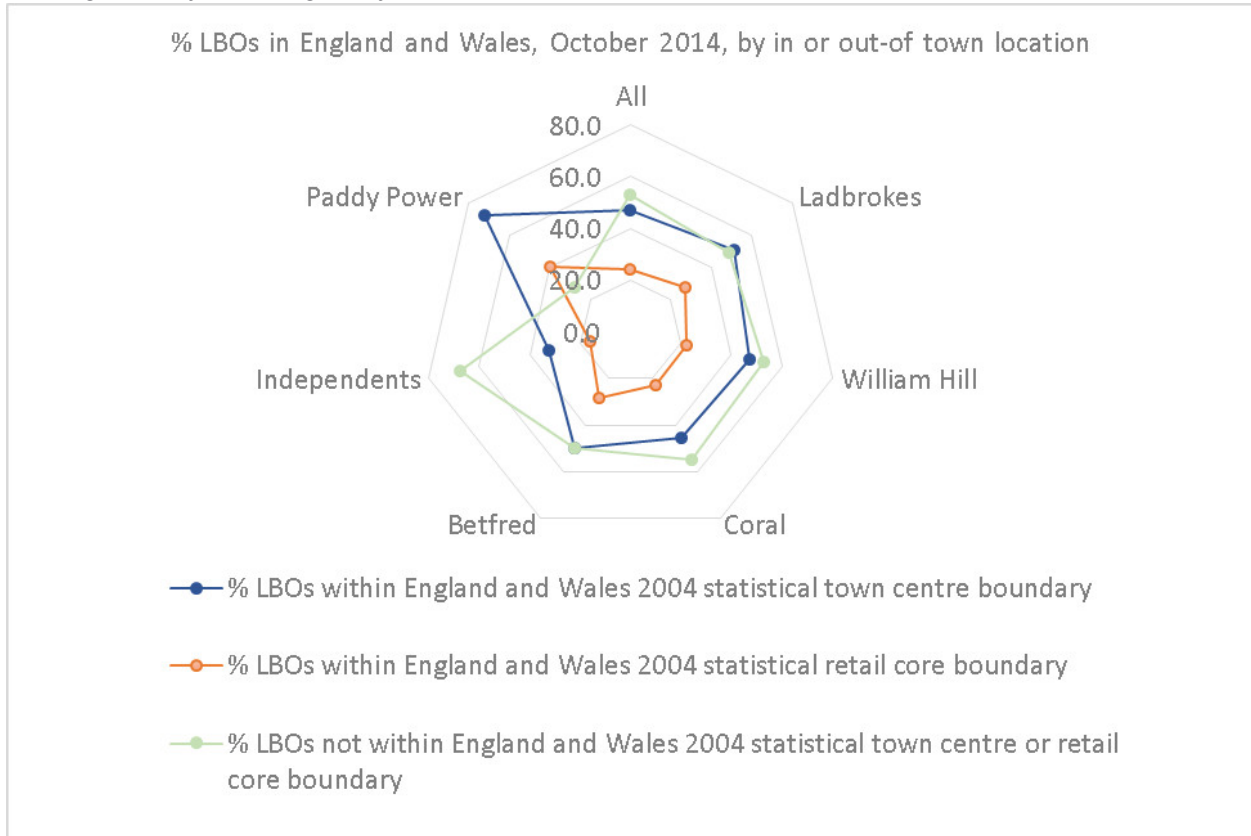


53.2% of LBOs are calculated to be in off-centre locations, and this pattern is dispersed throughout the country. Some of these LBOs exist slightly on the periphery of these major centre boundaries and are not picked up by the spatial modelling.

A considerable number exist in dispersed locations in either stand-alone suburban locations, or in very small arcades of only a few shops, not defined as big enough to appear in the town centre and retail core modelling. This is significant for the divide in the types of people who may be accessing LBOs; we may expect more peripheral and isolated locations to primarily serve a resident population and be more relevant to this audience.

LBOs in central areas are likely to have exposure to a much larger population. Independents tend to be more focused in off-centre locations, and conversely the smallest chain operator, Paddy Power, is strongly focused in central areas (figure 56). Any policy developed by the major chain operators may therefore have more impact and relevance to custom in central areas.

Figure 56: Comparison of in or out of town LBO locations by operator. Data sources: DCLG, Inspired Gaming, Scientific Gaming, Geofutures.



#### 4.8 Rural or urban areas

A range of factors characterise places, significant among them being whether a location is urban or rural. Our examination of LBOs relative to an urban / rural classification helps illustrate this.

The distribution of Output Areas including LBOs highlights the strong representation of major conurbations (figures 57 and 58). As discussed in section 3, London and the urbanised North West England regions have significant concentrations of LBOs, which reinforces this skew.

Figure 57: Distribution of the Rural-Urban Classification where an LBO is present in England and Wales. Data sources: Office for National Statistics (ONS), Geofutures.

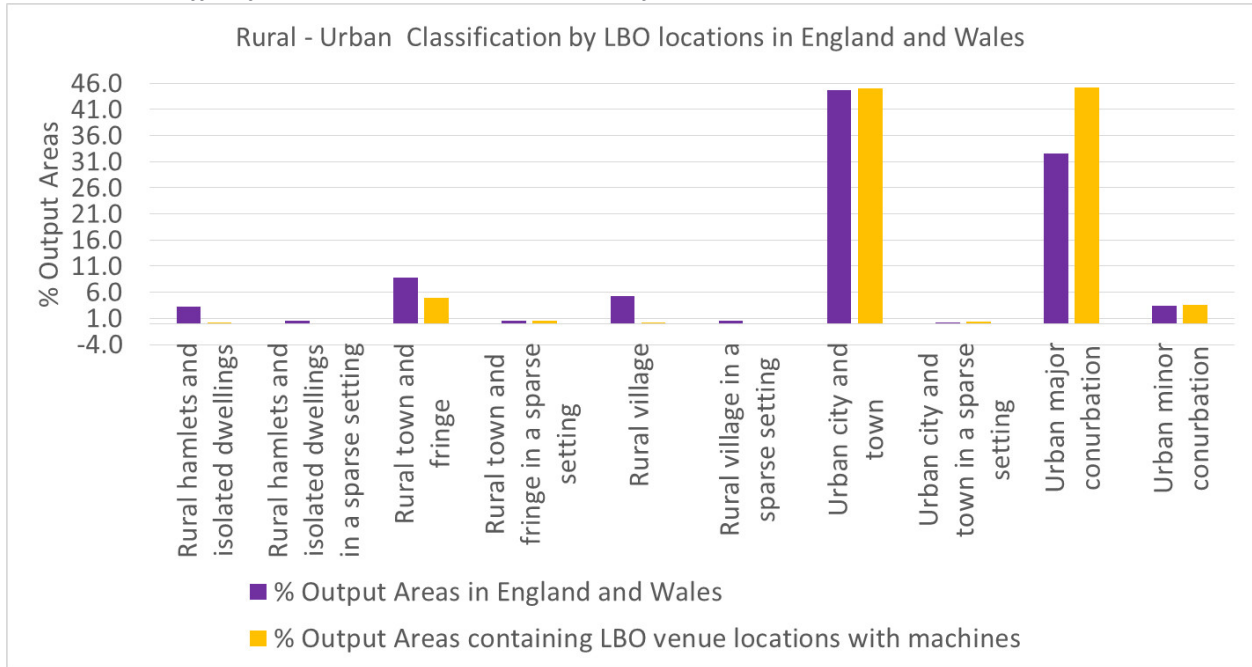
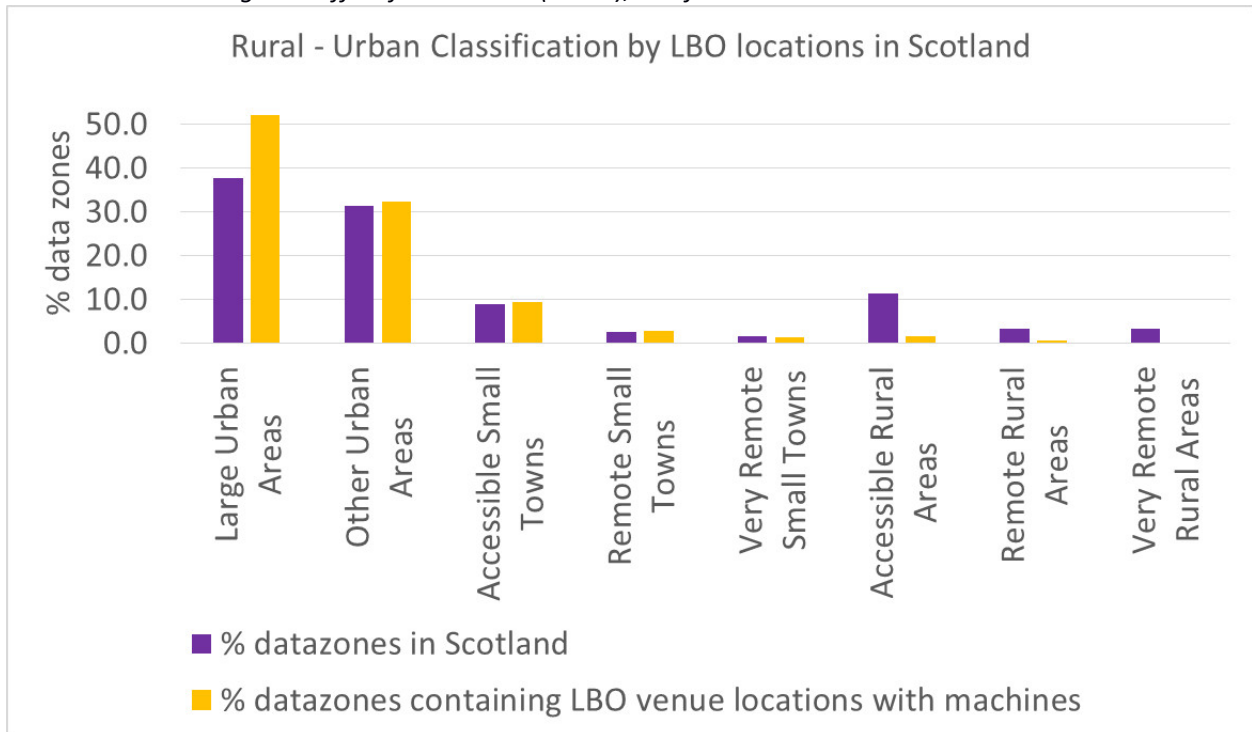


Figure 58: Distribution of the Rural-Urban Classification where an LBO is present in Scotland. Data sources: General Register Office for Scotland (GROS), Geofutures.



Building on the analysis outlined in section 3, we analysed the rural-urban split of economic centres in England and Wales against the rate of LBOs in these centres. We have assigned a typology where the town centre centroid falls within an Output Area.

The rate of LBOs in England and Wales town centres is greatest in conurbations and smallest in smaller towns (figure 59). Larger rural settlements are not unrepresented, however: whilst incidence is lower, local rural populations are also served by gambling machines.

*Figure 59: Rate of LBOs in town centres by Rural-Urban Classification 2011. Data sources: DCLG, Inspired Gaming, Scientific Gaming, ONS, Geofutures.*

<b>Centres falling within England and Wales rural-urban classification 2011 typology areas</b>	<b>Average rate of LBOs per town centre area (ha)</b>	<b>Example centres</b>
Urban major conurbation	0.224	Oldham, Wolverhampton, Sunderland
Urban minor conurbation	0.215	Doncaster, Rotherham, Barnsley
Urban city and town	0.181	Peterborough, Carlisle, York, Gloucester
Urban city and town in a sparse setting	0.181	Holyhead, Aberystwyth, Berwick-upon-Tweed
Rural town and fringe	0.134	Hebden Bridge, Towcester, Axminster
Rural town and fringe in a sparse setting	0.081	Bude, Windermere, Porthmadog
NB. Where the above typologies refer to 'in a sparse setting', this reflects where the wider area is remotely populated. They are classified rural when they fall outside settlements with more than 100,000 residents.		

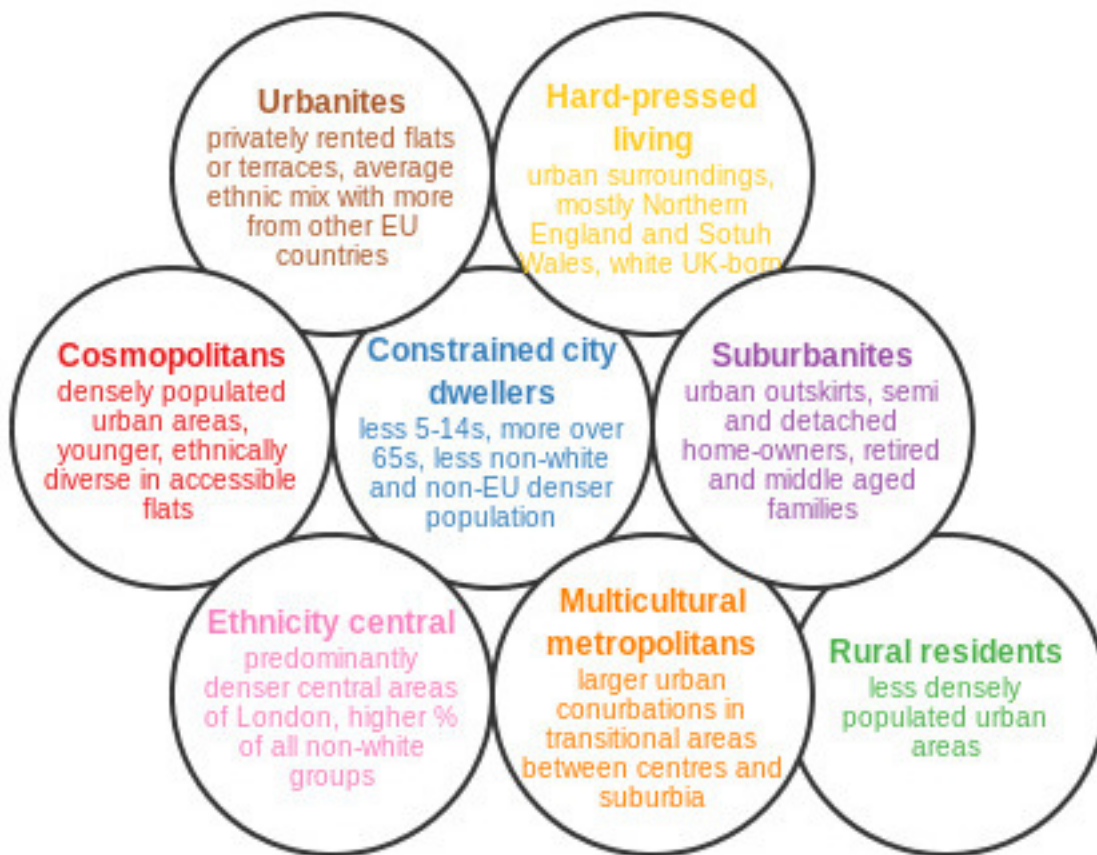
## 5. Who uses machines and where?

In this section we attempt to capture the characteristics of player resident neighbourhoods, with contextual socio-economic and place data.

### 5.1 Geo-demographic groups

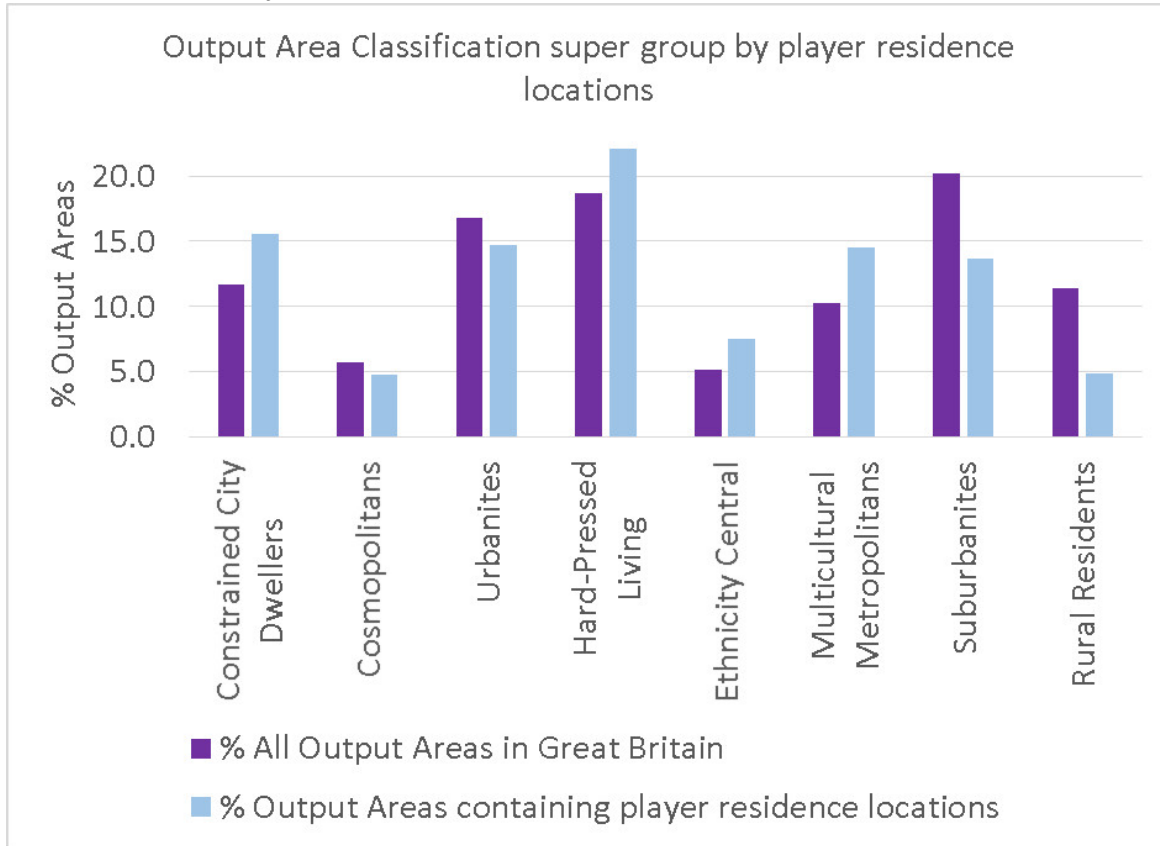
Using geo-demographic groups from the small-area Output Area Classification (ONS, 2014), we did a broad assessment of player neighbourhoods in the super-groups below (figure 60).

Figure 60: Brief description of the OAC 'super groups'.



On average, players tend to live in urban neighbourhoods in denser central locations, with greater ethnic diversity, compared to all neighbourhoods nationally (figure 61). This does not account for all personal circumstance, and there is significant variation in characteristics within these groups, but it does reflect some findings from the survey results, including the prevalence of ethnic diversity.

Figure 61: Player residence neighbourhoods by OAC supergroups. Data sources: Office for National Statistics (ONS), Geofutures.



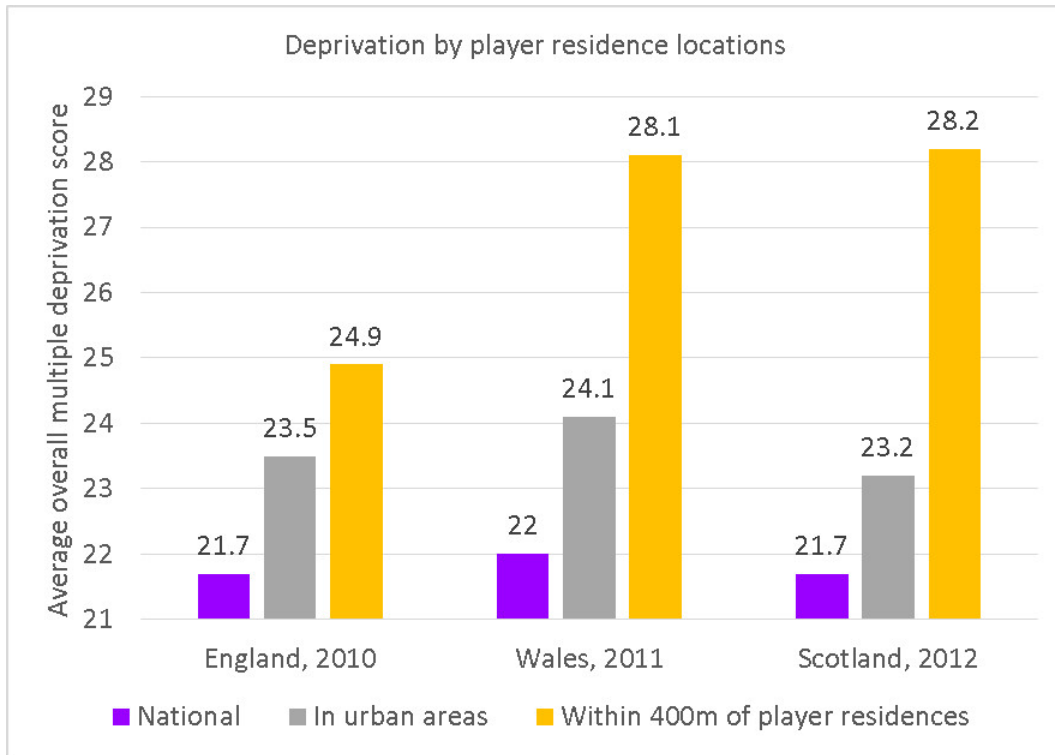
## 5.2 Deprivation

To assess the income characteristics of player neighbourhoods, we have used the national indices of multiple deprivation at LSOA/DZ level, with higher scores representing more deprived locations. Players tend to live in neighbourhoods with significantly higher deprivation levels than the national averages, and urban areas of all countries, (figure 62).

It is likely that for all statistics, deprivation measures in player neighbourhoods are slightly skewed towards higher levels due to the omission of some player residences without an identified LSOA, which tend to be in rural areas.



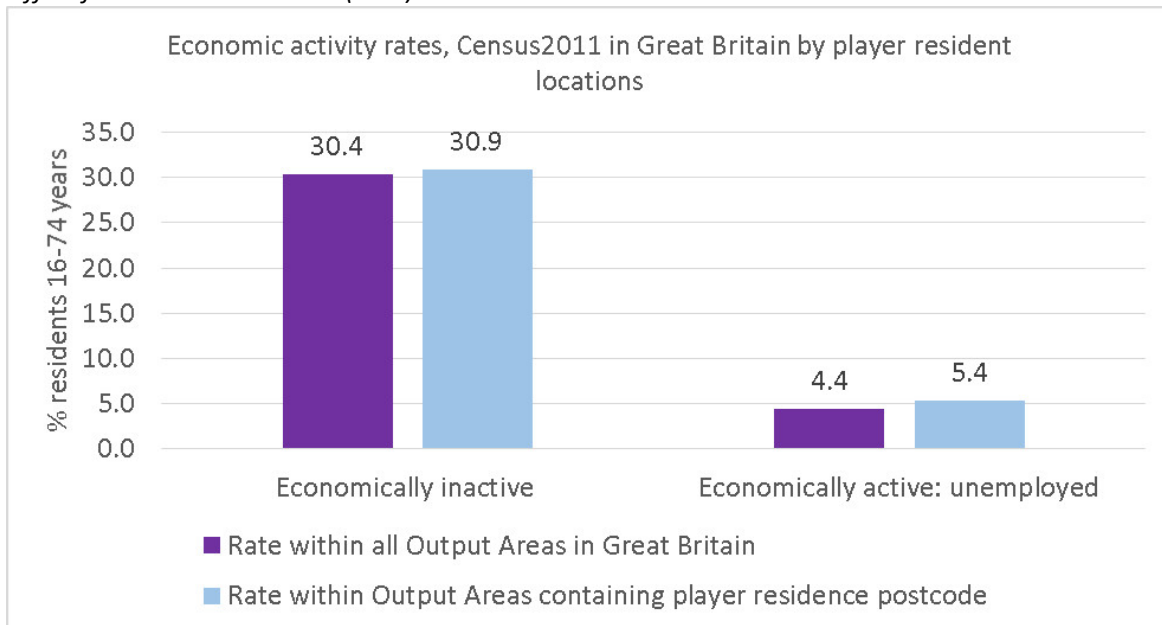
Figure 62: Player residence neighbourhoods by multiple deprivation. Data sources: Office for National Statistics (ONS), Welsh Government, Scottish Government, Geofutures.



### 5.3 Economic activity

Players tend to live in neighbourhoods with slightly higher economic activity, and unemployment levels, measured by Census Output Areas (figure 63).

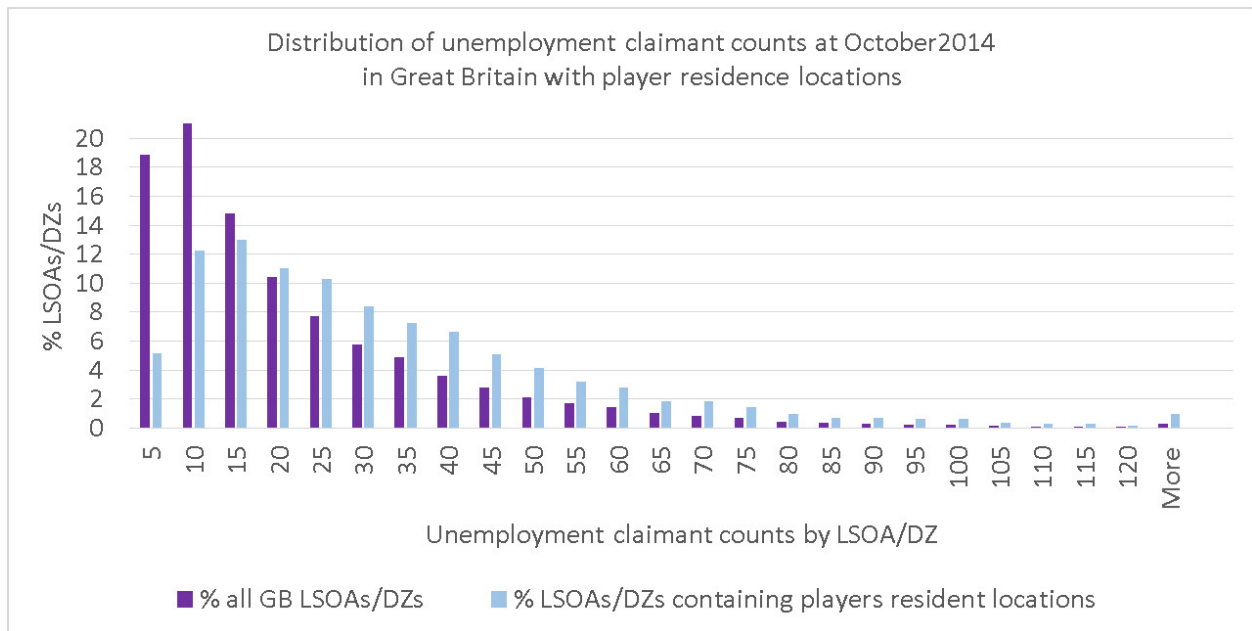
Figure 63: Player residence neighbourhoods by economic activity rates, Census 2011. Data sources: Office for National Statistics (ONS).



The distribution LSOAs/DZs near player residences by unemployment claimant counts shows a contrasting pattern to the national average (figure 64). A small number of player neighbourhoods have a greater level of claimants per LSOA/DZ, and these player neighbourhoods do not reflect the national pattern of LSOAs/DZs where the majority exhibit very low claimant counts.

We may conclude that player residences tend not to exist in the wealthiest income areas, are over-represented in the small number of lowest income area, but also exist in a wide number of middle-income areas. This distribution also highlights the strength of investigating more detailed patterns than national averages alone can show us.

Figure 64: Player residence neighbourhoods by unemployment claimant counts. Data sources: Department for Work and Pensions (DWP).



## 5.4 Rural or urban areas

A broad place typology of player neighbourhoods has been investigated, using the Rural-Urban Classification of Output Areas (figures 65 and 66). Players tend to live in urban neighbourhoods in large urban centres compared to the national averages.

Figure 65: Player residence neighbourhoods by Rural-Urban Classification. Data sources: General Register Office for Scotland (GROS).

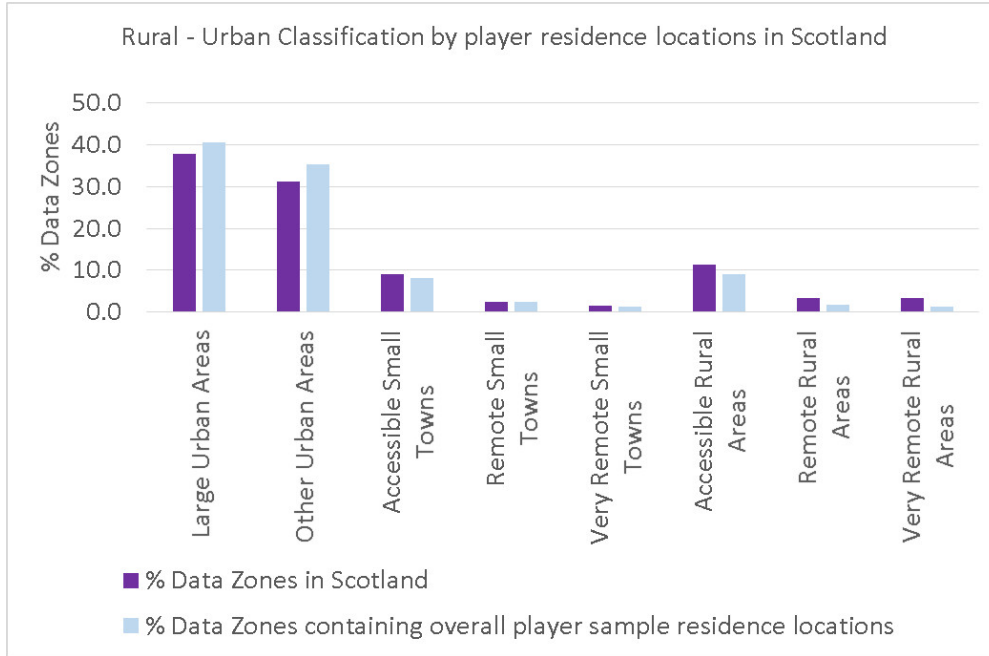
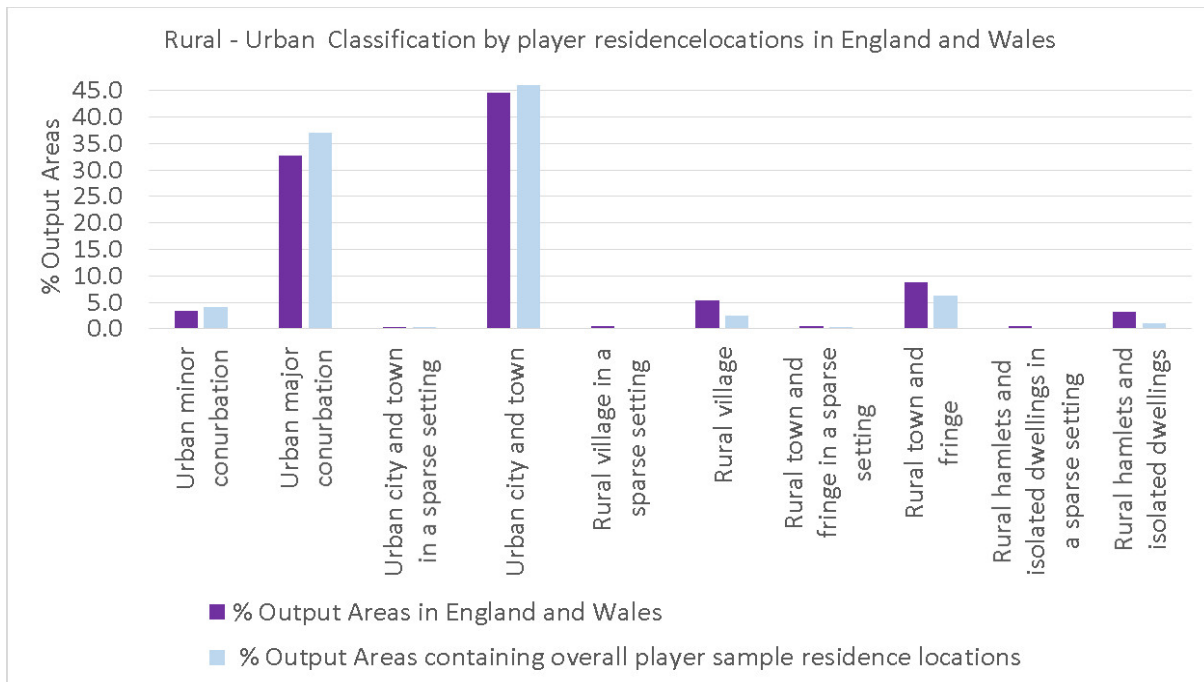


Figure 66: Player residence neighbourhoods by Rural-Urban Classification. Data sources: Office for National Statistics (ONS).



## 5.5 LBO and player catchments

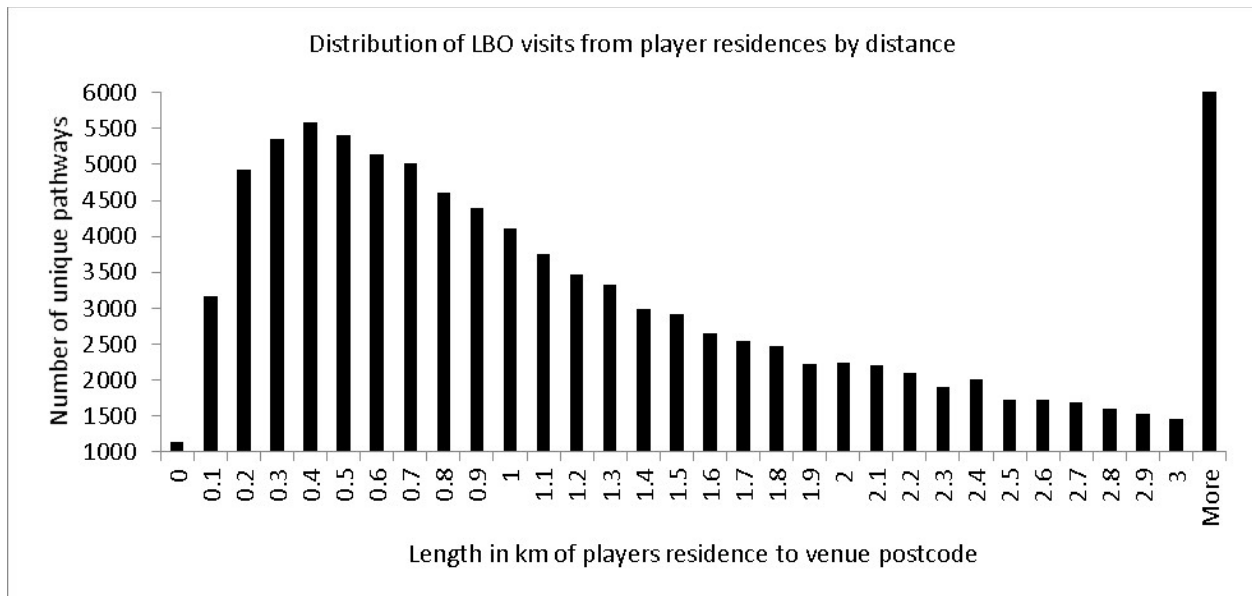
We have investigated the distances players travel from their home address to LBO venues, enabling us to capture broad catchment areas and the sphere of influence of machines within LBOs.

The **modal** distance travelled (to nearest 100 metres) between a player residence and an LBO with machine is **400m**. This reinforces the choice of this distance in our modelling outlined earlier.

The **mean** distance travelled between a player residence and an LBO with machine is **25km**.

The **median** distance travelled between a player residence and an LBO with machine is **3.6km**.

*Figure 67: Distribution of distances travelled to LBOs. Data sources: Inspired Gaming, Scientific Gaming, Featurespace, Geofutures.*



An estimated 8% of loyalty card players sampled live within 400m of an LBO where they have played a machine, nationally. 23% live within 1km, and 46% live within 3km (figure 68), suggesting quite local choices being made and a typical pattern of accessibility to goods and services. Figures are based again on the number of pathways recorded between player residences and LBOs, where individual players may have visited multiple LBOs, and the same LBO multiple times.

There is significant variation in travel distances, as we would expect depending on the location of the LBO. The variation between distances travelled to LBOs situated in town centres can be seen in figure 69, again highlighting local conditions influencing players, as well as individual player preferences.

LBOs in the economic centres of conurbations and large towns can often have a much more localised customer base and geographic sphere of influence, because of the general extent of the populations they serve; more isolated towns often serve a larger geographic area because there are no other centres to access.

An examination of distance travelled by the urban or rural typology of a player residence reflects this pattern of sphere of influence to economic centres as we would expect, with players in rural and remote locations generally travelling further to LBOs situated in larger urban areas, either in, or out-of-town (figures 70 and 71).

These figures omit certain details which would be extremely useful to determine several factors in movement and travel to LBOs. For example:

- the motivations for visiting certain shops
- the types of accessibility encountered
- transport used
- whether the LBOs are in particularly accessible locations
- for the overall distributions shown, how many of these journeys were made within the same day directly from a home to an LBO.

The data is modelled on information recorded on loyalty cards rather than dynamic, live travel data or surveys, and we must presume that for many of the extremely large distances recorded, these may be players on holiday, business, other travel, or who have moved home for example. Because of this, the average statistics may realistically be closer to LBO locations.

Figure 68: Cumulative frequency of distances travelled to LBOs. Data sources: Inspired Gaming, Scientific Gaming, Featurespace, Geofutures.

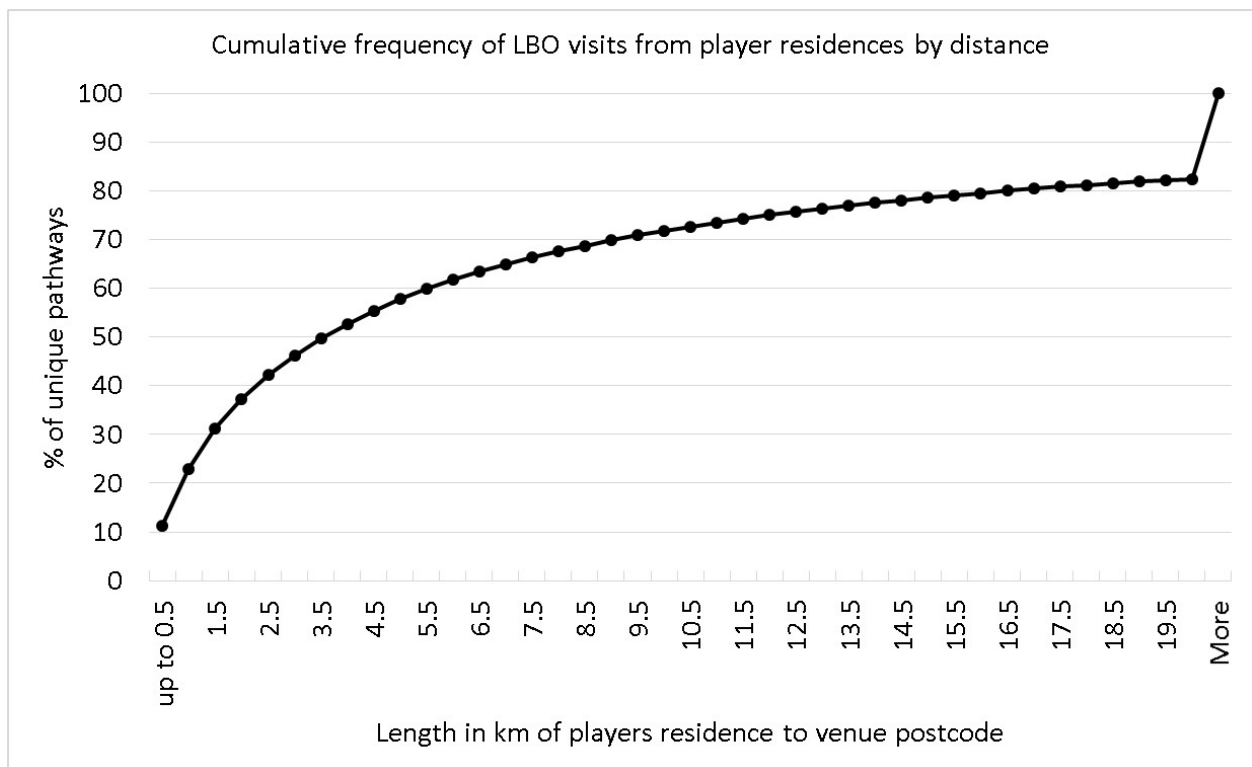


Figure 69: Median distances travelled to LBOs by town centres. Data sources: Inspired Gaming, Scientific Gaming, Featurespace, Geofutures.

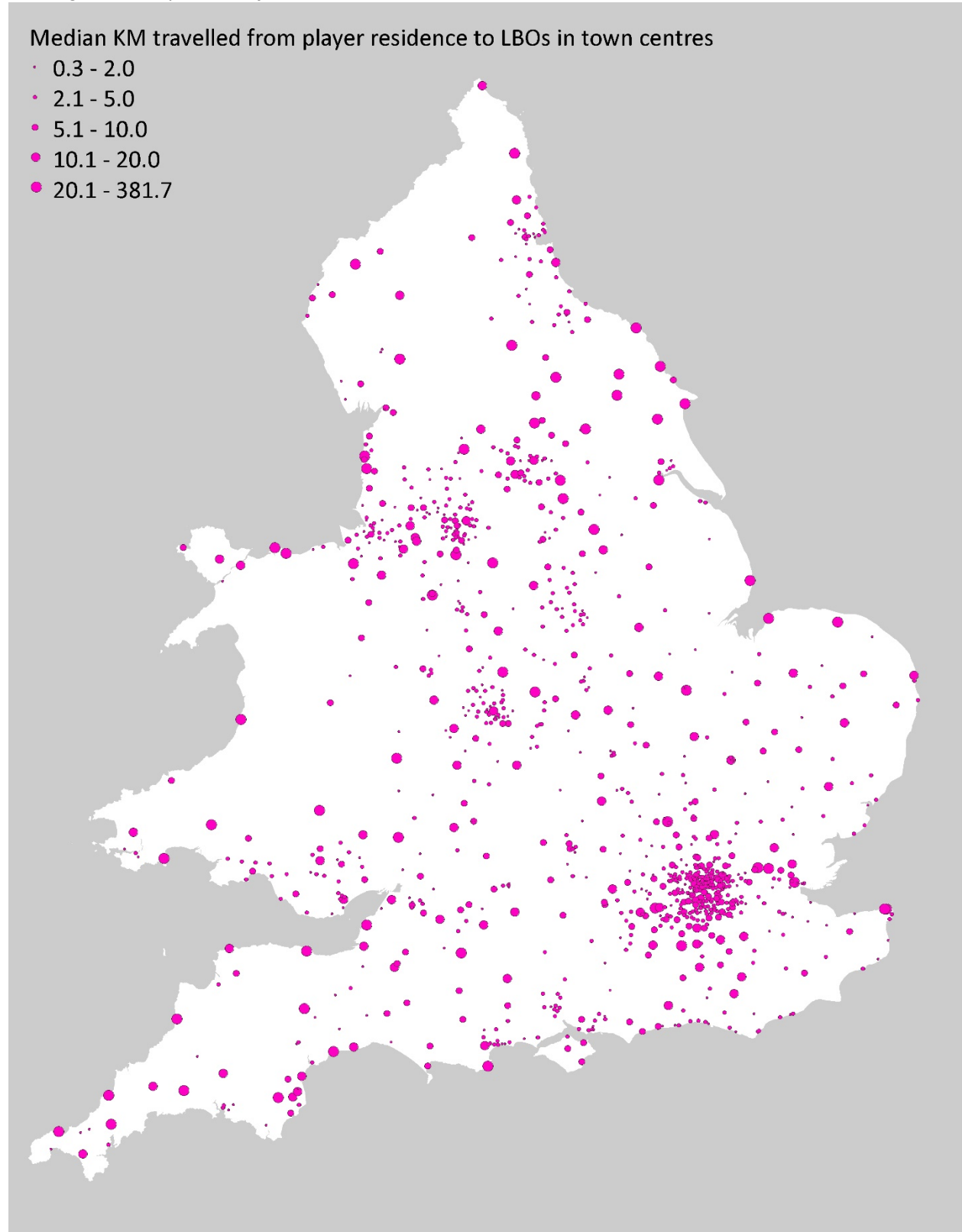


Figure 70: Distance travelled to LBOS by Rural-Urban Classification in England and Wales. Data sources: Office for National Statistics (ONS), Geofutures.

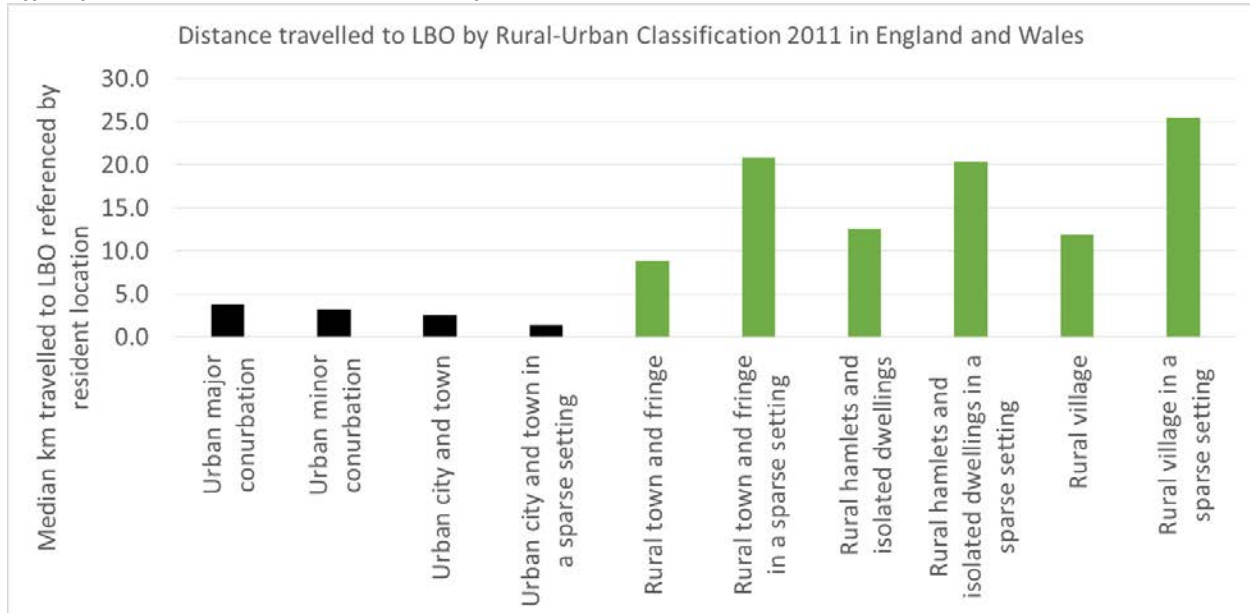
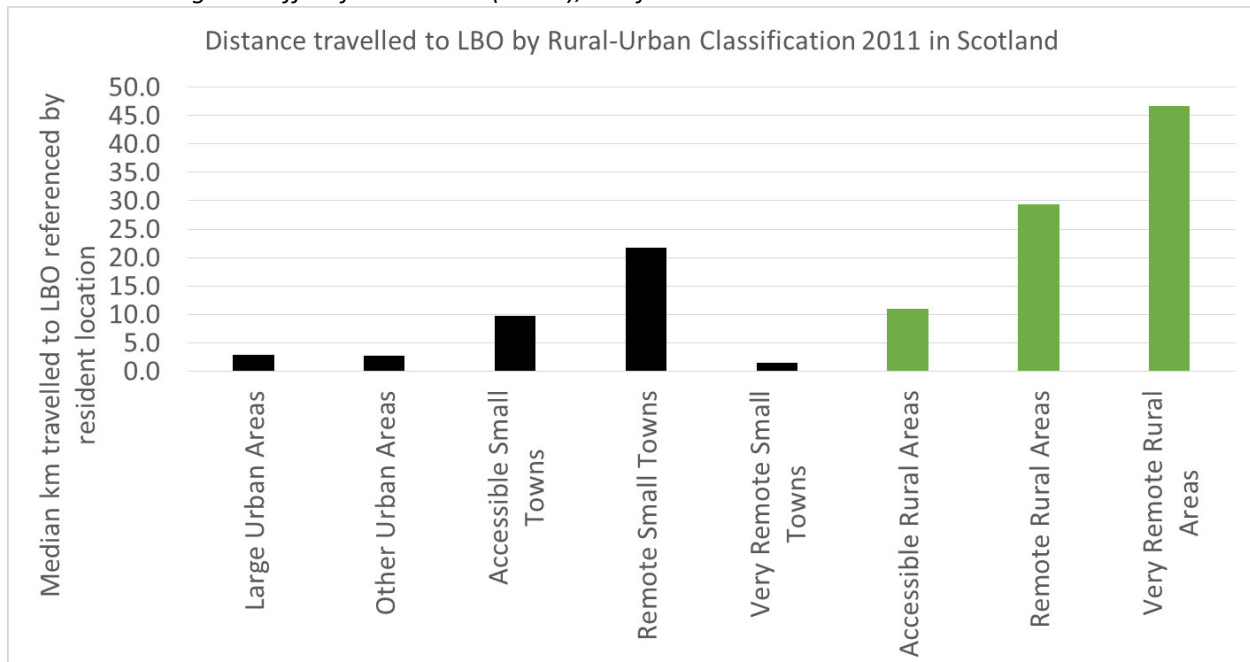


Figure 71: Distance travelled to LBOS by Rural-Urban Classification in Scotland. Data sources: Government Register Office for Scotland (GROS), Geofutures.



Session data reveals that a small number of players regularly gamble (figure 72), defined by the number of different days a player visits an LBO. These figures might be under-estimated, as a player may visit multiple LBOs not captured here, and this data may be more representative of players using the same shops regularly. These regular players tend on average to live closer to the LBOs in which they are gambling (figure 73). We have removed distances above 50km as unrepresentative of travel between a

home and an LBO for comparison showing a slightly more localised effect (figure 74). We must note that this does not necessarily equate to problem gambling.

Figure 72: Distribution of number of different days played. Data sources: Featurespace, Geofutures.

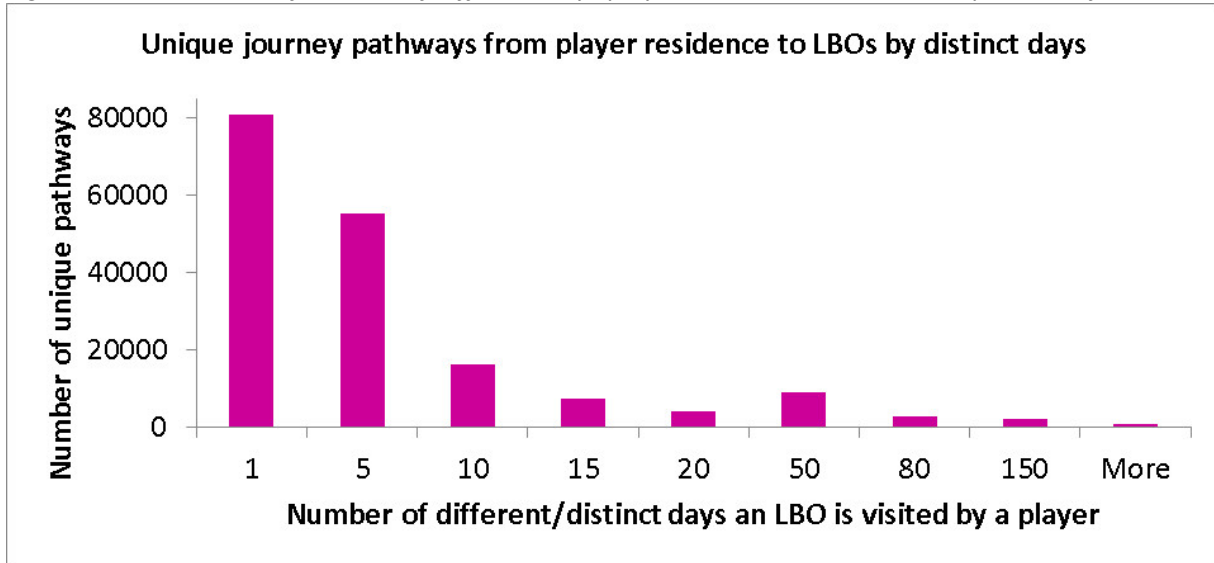


Figure 73: Distance travelled to LBOs by number of different days played. Data sources: Featurespace, Geofutures.

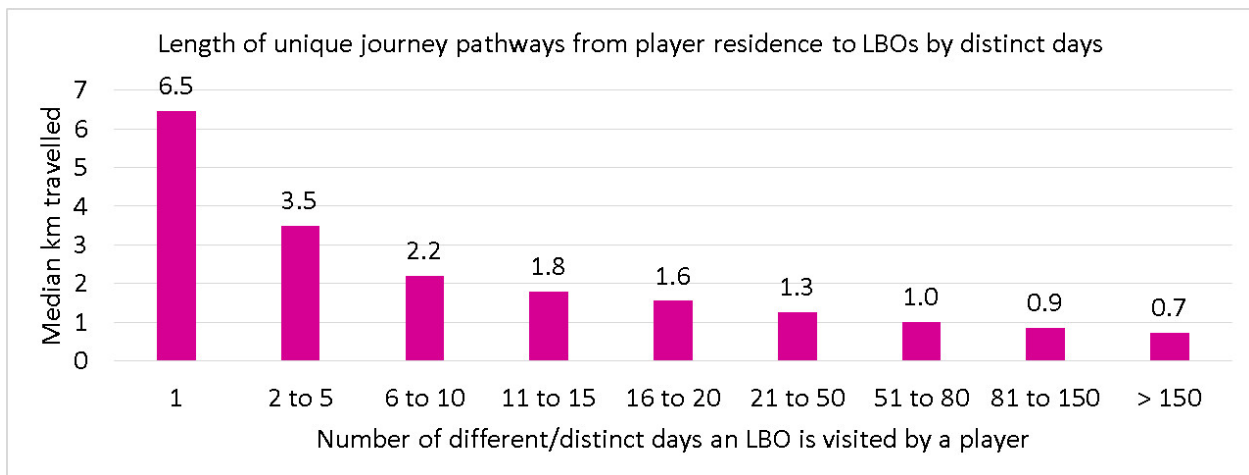
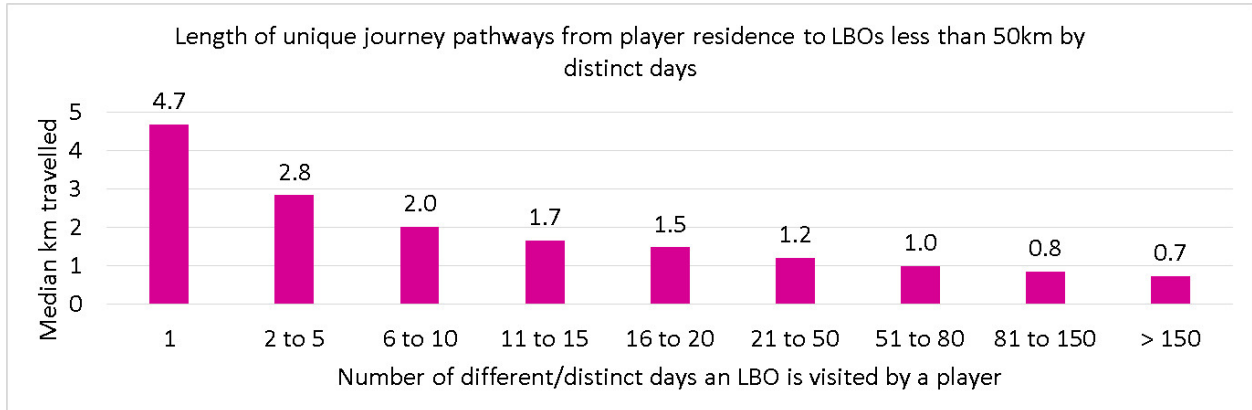




Figure 74: Distance travelled to LBOs less than 50km, by number of different days played. Data sources: Featurespace, Geofutures.



Similarly, session data has revealed, a small number of players gamble many sessions (figure 75). Again this data may be more representative of players using the same shops regularly, as counts of sessions are aggregated to individual LBOs over time, but it shows these players tend to live closer to LBO venues (figures 76 and 77). Again these are average values which do not necessarily equate to problem gambling in all cases; session averages will mask distinct patterns of play which could be expanded on whilst examining travel patterns and shop locations with further research.

Figure 75: Distribution of number of sessions played. Data sources: Featurespace, Geofutures.

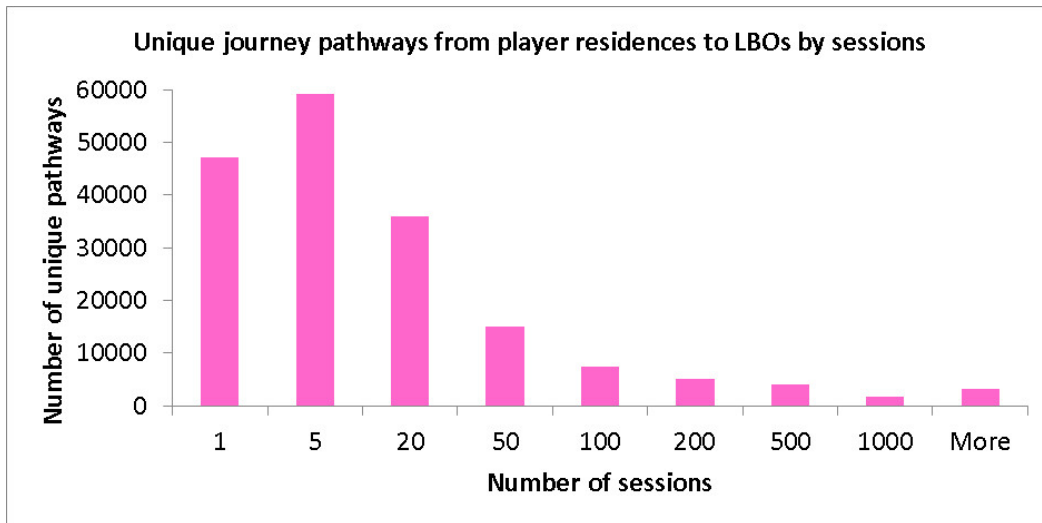


Figure 76: Distance travelled to LBOs by number of sessions played. Data sources: Featurespace, Geofutures.

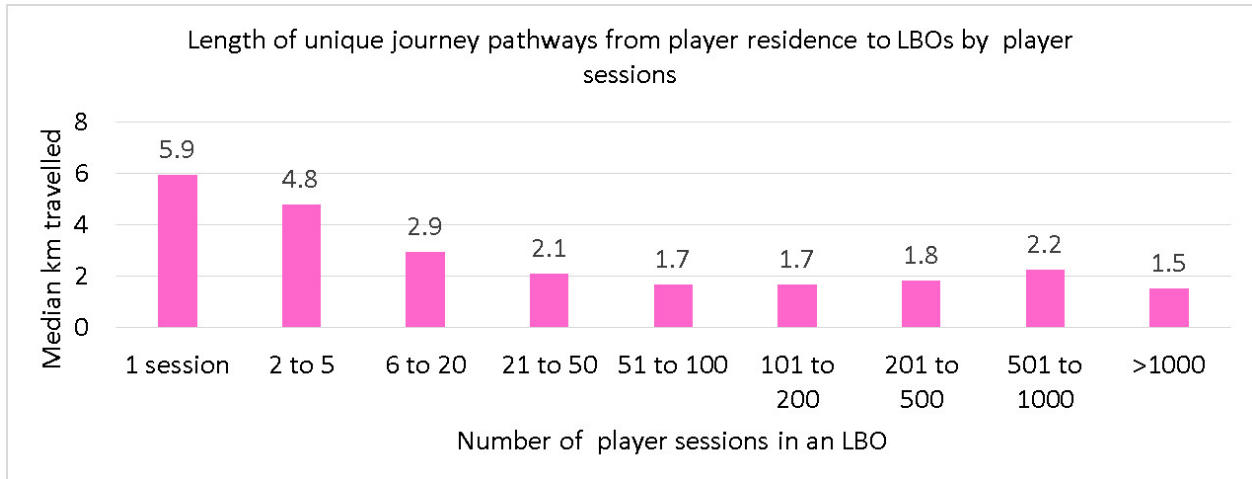
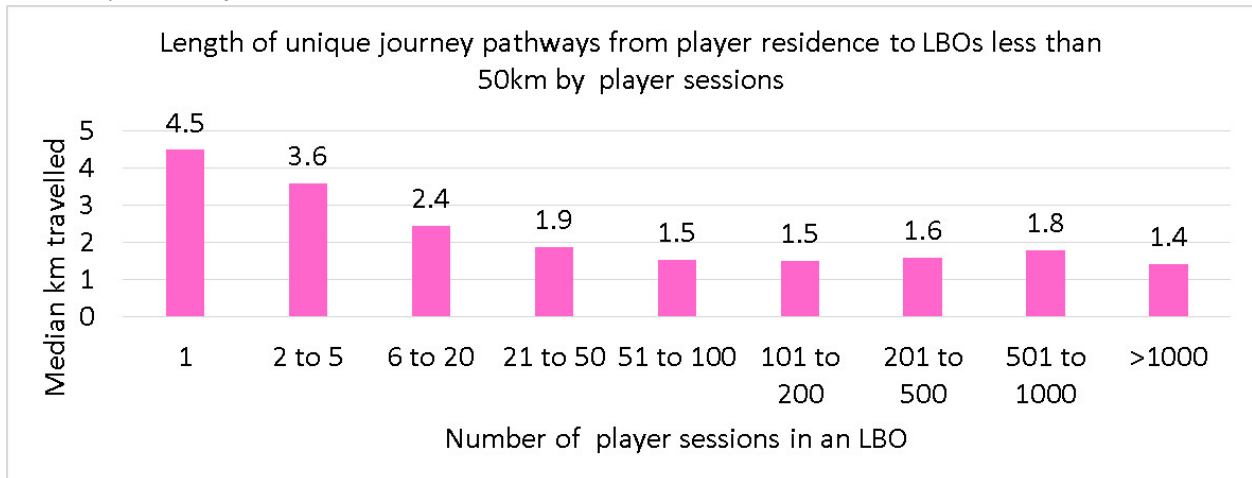


Figure 77: Distance travelled to LBOs less than 50km by number of different days played. Data sources: Featurespace, Geofutures.



## 6. Further suggested research

The examination of betting shops and machines is set within a wider context of neighbourhood, urban and economic conditions. Some key indicators have illustrated trends and potential impacts, and also painted a more complicated picture. Further useful extension to this work should seek to identify relevant indicators of interest to examine in more detail.

### Temporal analysis

- So far our analysis has been fairly static, but time-series trends can help to develop context. What are the local change factors that may be driving and declining demand for customers? Where is there significant localised growth and where are the established places? The turnover of opening and closing of shops from a non-bookmaker use may reveal significant regional trends and types of places.

### A more detailed understanding of local economies

- Our research aims to contextualise the LBO economy relative to other economic spaces. So far we have used discrete town centre boundaries to examine economic centres. In reality geography is fuzzier, and economic spaces are varied and spread widely. By using continuous spatial data representations of businesses in the same form as we have modelled population density, we can examine local economies more precisely, and draw out patterns particularly in off-centre and hinterland locations. This may also include the coincidence of specific types of retailers, and the availability and cost of retail space. This would require a detailed business data set such as VOA tables.
- In the wider context of LBO locations, there is the potential to consider how LBOs contribute to local employment and services, and how this varies by the type of place.

### A more detailed understanding of place typologies

- To help us deepen our understanding of LBO locations, we may include opening hours, public transport and accessibility, public realm, resident income estimates and daytime population characteristics.
- The development of a full place typology by which to segment and contextualise data would expand on the limited rural-urban classification.

### Refining current methodologies

- Cross-tabulating any uni-variate socio-economic indicators would give us a more precise understanding of any inter-relationships and gambling trends. For example, although we have identified ethnically diverse and deprived neighbourhoods as significant characteristics, are the relevant residents within these neighbourhoods both ethnically diverse AND deprived? Where is the crossover to identify the multiple set of circumstances which may predicate problem gambling and harmful play?

- At this point it may be appropriate to extend the in-depth qualitative analysis to triangulate the analysis. Analysis may also be deepened geographically by focusing on a variety of specific case-study locations.
- Sensitivity testing should test the impact of changing what is defined as a relevant 'local' area to LBOs and players. Whilst we do not expect significant changes to these results, they would be increasingly robust after testing.
- This analysis treated proximity areas to LBOs with machines as overlapping 400m buffers, and did not account for the number of LBOs existing within these different sized areas. It may be useful to examine the relationship between relevant and interesting metrics and the intensity of bookmakers at any 'proximate' location, to examine whether the volume of machines on offer has an impact on gambling prevalence or other metrics.

## 7. References

- Bracken, I. & Martin, D. (1989) *The generation of spatial population distributions from census centroid data*, Environment and Planning A, Vol 21 pp. 537 – 543.
- Collins, D., Green, S., d'Ardenne, J., Wardle, H., & Williams, S. (2014) *Understanding of Return to Player messages: Findings from user testing*. NatCen Social Research, London.  
[http://www.responsiblegamblingtrust.org.uk/user\\_uploads/pdfs/understanding%20of%20return%20to%20player%20messages.pdf](http://www.responsiblegamblingtrust.org.uk/user_uploads/pdfs/understanding%20of%20return%20to%20player%20messages.pdf) Accessed December 2014.
- Excell, D., Bobashev, G., Gonzalez-Ordonez, D., Wardle, H., Whitehead, T., Morris, R. J., & Ruddle, P. (2014) *Gambling Machines Research Program: Report 3 – Predicting Problem Gamblers: Analysis of industry data*. Featurespace Ltd, Cambridge.  
[http://www.responsiblegamblingtrust.org.uk/user\\_uploads/report%203%20-%20predicting%20problem%20gambling%20-%20final.pdf](http://www.responsiblegamblingtrust.org.uk/user_uploads/report%203%20-%20predicting%20problem%20gambling%20-%20final.pdf) Accessed December 2014.
- Martin, D. (1996) *An assessment of surface and zonal models of population*. International Journal of Geographical Information Systems. Vol 10, 973-989
- Martin, D., Tate, N. J., & Langford, M. (2000) *Redefining population surface models: experiments with Northern Ireland census data*, Transactions in GIS, Vol 4 (4) pp. 343 – 360.
- Office for National Statistics (ONS) (2014) *Methodology Note for the 2014 Area Classification for Output Areas*  
<http://www.ons.gov.uk/ons/guide-method/geography/products/area-classifications/ns-area-classifications/ns-2011-area-classifications/methodology-and-variables/index.html> accessed September 2014.
- Office for National Statistics (ONS) (2013) *The 2011 Rural - Urban Classification for Small Area Geographies: A User Guide and Frequently Asked Questions (v1.0)*  
[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/239478/RUC11user\\_guide\\_28\\_Aug.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/239478/RUC11user_guide_28_Aug.pdf) accessed September 2014.
- Openshaw, S. (1984) *Modifiable Areal Unit Problem, The (Concepts and Techniques in Modern Geography)*. Geo Books, Norwich.
- Parke, A., Harris, A., Goddard, P., & Parke, J. (2014) *The Role of Stake Size in Loss of Control in Within-Session Gambling: Impact of Stake Size on Reflection Impulsivity, Response Inhibition and Arousal when Gambling on a Simulated Virtual Roulette Gambling Task: Implications for Gambling Related Harm*. University of Lincoln & the Responsible Gambling Trust.  
[http://www.responsiblegamblingtrust.org.uk/user\\_uploads/pdfs/the%20role%20of%20stake%20size%20in%20loss%20of%20control%20in%20within-session%20gambling.pdf](http://www.responsiblegamblingtrust.org.uk/user_uploads/pdfs/the%20role%20of%20stake%20size%20in%20loss%20of%20control%20in%20within-session%20gambling.pdf) Accessed December 2014.

Thurstain-Goodwin, M and Unwin, D. (2000) *Defining and delineating the central areas of towns for statistical monitoring using continuous surface representations*, Transactions in GIS, Vol 4 (4) pp. 305 – 317.

Wardle, H., Moody, A., Spence, S., Orford, J., Volberg, R., Jotangia, D., Griffiths, M., Hussey, D., Dobbie, F. (2011), *British Gambling Prevalence Survey 2010*. London, NatCen.

Wardle, H., Keily, R., Astbury, G. & Reith, G. (2012) *'Risky Places?': Mapping Gambling Machine Density and Socio-Economic Deprivation*, Journal of Gambling Studies, Vol 30 (1), pp 201-212.

Wardle, H., Parke, J. & Excell, D. (2014) *Machines Research Programme: Report 1 - Theoretical markers of harm for machine play in bookmaker's. A rapid scoping review*. Natcen Social Research, London.  
[http://www.responsiblegamblingtrust.org.uk/user\\_uploads/pdfs/report%201%20theoretical%20markers%20of%20harm%20for%20machine%20play%20in%20a%20bookmakers%20-%20a%20rapid%20scoping%20review.pdf](http://www.responsiblegamblingtrust.org.uk/user_uploads/pdfs/report%201%20theoretical%20markers%20of%20harm%20for%20machine%20play%20in%20a%20bookmakers%20-%20a%20rapid%20scoping%20review.pdf) Accessed December 2014.

Wardle, H., Excell, D., Ireland, E., Ilic, N., & Sharman, S. (2014) *Gambling Machines Research Programme: Report 2 - Identifying problem gambling – findings from a survey of loyalty card customers*. Natcen Social Research, London.  
[http://www.responsiblegamblingtrust.org.uk/user\\_uploads/pdfs/report%202%20identifying%20problem%20gambling%20-%20findings%20from%20a%20survey%20of%20loyalty%20card%20customers.pdf](http://www.responsiblegamblingtrust.org.uk/user_uploads/pdfs/report%202%20identifying%20problem%20gambling%20-%20findings%20from%20a%20survey%20of%20loyalty%20card%20customers.pdf) Accessed December 2014.

Wardle, H., Ireland, E., Sharman, S., Excell, D., & Gonzalez-Ordenez, D. (2014) *Patterns of play: analysis of data from machines in bookmakers*. Natcen Social Research, London.  
[http://www.responsiblegamblingtrust.org.uk/user\\_uploads/pdfs/patterns%20of%20play%20-%20analysis%20of%20data%20from%20machines%20in%20bookmakers.pdf](http://www.responsiblegamblingtrust.org.uk/user_uploads/pdfs/patterns%20of%20play%20-%20analysis%20of%20data%20from%20machines%20in%20bookmakers.pdf) Accessed December 2014.

Wardle, H. & Philo, D. (2014) *Changes in machine gambling behavior: Headline findings from a follow-up study of participants to the Health Survey for England 2012, Scottish Health Survey 2012 and the British Gambling Prevalence Survey 2010*. NatCen Social Research, London.  
[http://www.responsiblegamblingtrust.org.uk/user\\_uploads/pdfs/changes%20in%20machine%20gambling%20behaviour.pdf](http://www.responsiblegamblingtrust.org.uk/user_uploads/pdfs/changes%20in%20machine%20gambling%20behaviour.pdf) Accessed December 2014.