Didobi

MAYOR OF LONDON

UCL

NIGHT TIME WORKERS

A research paper by Didobi and UCL

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CONTENTS

1. EXECUTIVE SUMMARY

The aim of this short research project was to establish an understanding of the data that can inform on the presence and activities of night time workers. The focus geography for this research was the London Borough of Camden.

We outlined four research objectives for this task along with trying to engage with as broad a group of people as possible through a steering group that included members from the GLA, Camden Council, Didobi and UCL. In addition engagement activities took place with Uber, TfL and Autonomy along with some international academics.

Research objectives

- To research and evaluate data that can inform on night workers within Camden.

- To research the inter relationship between disparate data that might increase the understanding of night workers in Camden.

- To present the most comprehensive picture possible of night workers with the data and time available.

- Provide guidance to the GLA on how best to understand who London's night workers are, what jobs they do, where they work, where they live, and how they get to and from work.

Data, analysis and research into night workers is very limited both in London as well as other major global cities. With growing populations in our cities, the demands on the infrastructure - be it health, transport or consumer facing activities - have increased significantly. Research by the GLA shows that 1.6 million people work at night (6pm-6am), that 65% of Londoners are active at night and that 50% of night bus journeys are for work.

SO HOW CAN WE UNDERSTAND WHERE THESE PEOPLE TRAVEL FROM TO WORK AT NIGHT, WHERE THEY TRAVEL TO, HOW THEY GET TO WORK AND BACK ALONG WITH WHAT SERVICES, AMENITIES AND CONDITIONS DO THEY FACE IN THE WORK PLACE?

Some of the key challenges that this research has revealed include;

- Data that can specifically identify night workers by number and location is very difficult to find. Examples include origin and destination data of workers, night time building locations and use, and the number of night workers employed.

- The geography of most data relating to night time activity derived from the census is at a high geographical level such as by borough or MSOA. The new BT Mobility data will be in 350m^2 hexagons.

- Traditional data models such as mobility data of people are based on assumptions that peoples' locations at night are where they live and not work.

- Night time activity is not a specific focus for local authorities and data that might be relevant is held by different teams, in some cases updated irregularly and there is no awareness of the value that it might have on understanding night worker activity and their needs.

- Organisations or companies that operate at night and have data that can inform research are difficult to engage with (TfL) or unwilling to share data due to commercial sensitivity (Uber, Deliveroo, Just Eat …) or the costs involved are prohibitive.

To understand night workers, it is key to recognise which locations have businesses that operate at night, how the shift patterns of night workers operate in order to understand when they need access to services, where they need to travel to, the number of people working in a location at night and finally they employment conditions and pay as this will determine affordability and compliance with the London Living Wage.
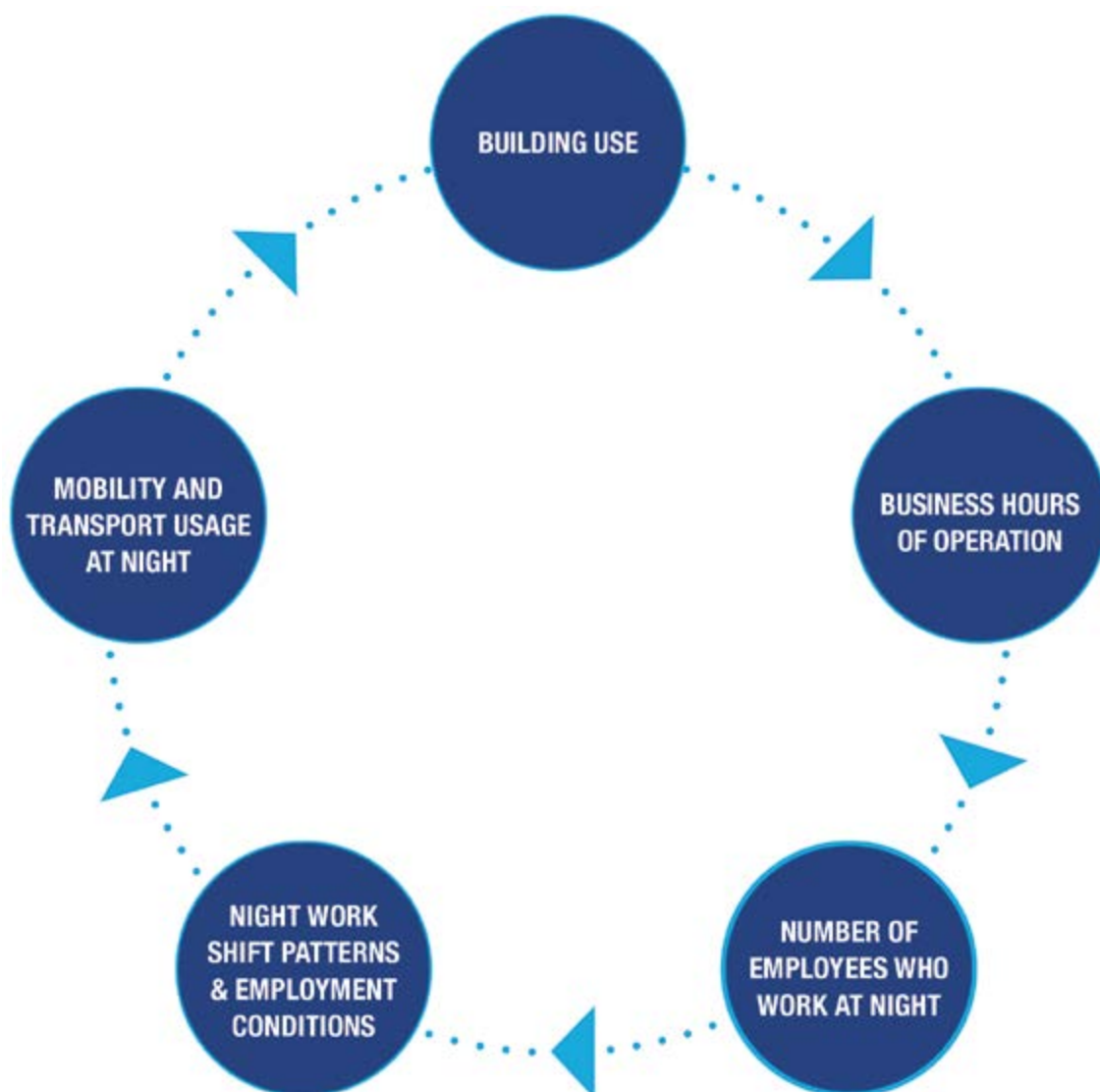
Figure 1. Key determinants in identifying night workers (Didobi).

This project has analysed multiple datasets in the context of understanding their value to understanding night workers. We have found that no single dataset will answer the question, but that access to some key data such as aggregated origination and destination data from TfL could provide some important insights. In other cases, such as night buses, it is difficult to reach any valid findings due to there just being a tap-in (origin) in the data with no idea of the destination of the passenger. Further analysis of tap-in data from 0001hrs-0600hrs based on known night worker locations might provide some insights on the presence of night workers and their mode of transport but not their destination which might be further complicated when multiple buses are taken by the night worker to reach home or their place of work.

The project has created a data directory along with visualisation of data that provides an understanding of activities at night but not at a level that is able to answer the research questions in a current and comprehensive manor. It has, however, identified and brought together relevant data sets that can be used to build on this project and that will enable a more comprehensive project to take place.

Figure 2. Nightworker datasets collated and overlaid online (Didobi/Emu Analytics).

This project has been a worthwhile exercise in understanding the data available on nightworkers along with potential datasets that could inform the research further such as the TfL data. It has also shown the complex data ecosystem that exists to source this data be it from the census, the GLA, a borough, open data or private sector sources. Finally, it has shown that the subject of night workers is not one that has evolved as a mainstream research policy area be it here in London or any other major global city. This presents a great opportunity for London to lead the way with further research into an important and growing number of night workers.

2. UNDERSTANDING THE NIGHT-TIME ECONOMY

According to the London Datastore approximately a quarter of Londoners were employed in the evening and night-time economy in 2022, working between the hours of 6pm and 6am (London Datastore 2023). Compared to those who work during the day, there is little public information on the distribution of these night workers - such as knowing where they work, how they travel and what amenities they use during work hours. This report presents an initial foray into a range of datasets that might provide better insights into those who work after dark in order that the GLA may piece together a more comprehensive picture. For this project the Camden Local Authority has been used as a case study.

This report lists many official and alternative data sources that can be used to estimate night-time workers at a range of geographical scales, with the most granular being the Output Area (encompassing 40-250 households). We present example analysis of 'static' datasets, such as the proportion of night workers recorded in the 2021 Census, and utilise the 'Directory of London Businesses' dataset, to estimate demand for night-time employment. We also explore 'dynamic' datasets which are crucial for forming an understanding of the night-time economy in near-real time. This is possible with the use of alternative datasets including continuously produced mobility data such as tube entries and exits as well as mobile phone location data. These datasets are collected with high temporal granularity meaning that they can be used to understand mobility between 6pm and 6am.

From our work on this report, we conclude that no single dataset will offer a universal and comprehensive picture of night-time workers in London. There are however a large number of potential datasets that each offer a piece of the puzzle which, with careful integration and interpretation, can be linked together to deliver more detailed insights into the substantial number of Londoners who head to their place of work in the evening.

The night-time economy is defined as economic activity occurring between 6pm and 6am (ONS 2023). According to the Office for National Statistics (ibid.), the 'night-time economy' is captured by the following Standard Industrial Classification 2007 (SIC 2007) industries:

1. Cultural and leisure activities

2. Activities which support night-time cultural and leisure activities

3. 24-hour health and personal social services

4. Activities which support wider social and economic activities

Further breakdown of the above categories can be found in the Appendix Table 2.

3. DATA FOR UNDERSTANDING NIGHT WORK

UCL has conducted an extensive search of existing datasets on night-time workers and night-time economic activities. A summary of existing datasets which provide insight into different aspects of night work are displayed in Table 1 of the Appendix, along with the links to the data and a summary of what the dataset entails. These data sources aim to capture the variety of components which comprise the night-time economy. The identified datasets have been divided into six different categories:

1. **BOUNDARIES:** geographic boundaries that can be used to facilitate spatial data analysis.

2. **NIGHT-TIME WORKERS:** data that has been specifically collected to estimate and summarise night-time worker characteristics.

3. **MOBILITY:** data that capture the population on the move which form a proxy for night-time activity estimation.

4. **RETAIL:** data associated with the retail structure (with specific focus on the borough of Camden) that can provide insights on retail structures specific to the night-time hours.

5. **ECONOMIC:** data related to individual spending habits, income statistics and governmental project expenditure structure (with a specific focus on Camden)

6. **SOCIO-DEMOGRAPHIC:** data related to crime incidents and census data that provides insights on the type of people residing in the area.

4. DEMAND FOR NIGHT-TIME WORKERS

One way of understanding the distribution of night-time workers is through an analysis of night-time worker demand, i.e. looking at where they are needed.

Though there is little information on the precise volume of night-time workers in Camden, it follows that identifying the businesses and services that operate between 6pm-6am will give some indication of where there is likely to be demand for workers. This section identifies the locations of businesses operating within industries associated with the night-time economy. These business/service categories include pubs, bars, nightclubs, hotels and hospitals.

Analysis of night-time businesses to understand distribution of night-time workers

The 'Directory of London Businesses' is an extensive list of businesses located in London with information including the industry classification (SIC code) of each business. A similar dataset is available for the borough of Camden, which is updated annually. The Office for National Statistics (ONS) has defined the 'night-time economy' as being made up from SIC codes that fall within 4 general categories (see Appendix Table 2 for sub-categories).
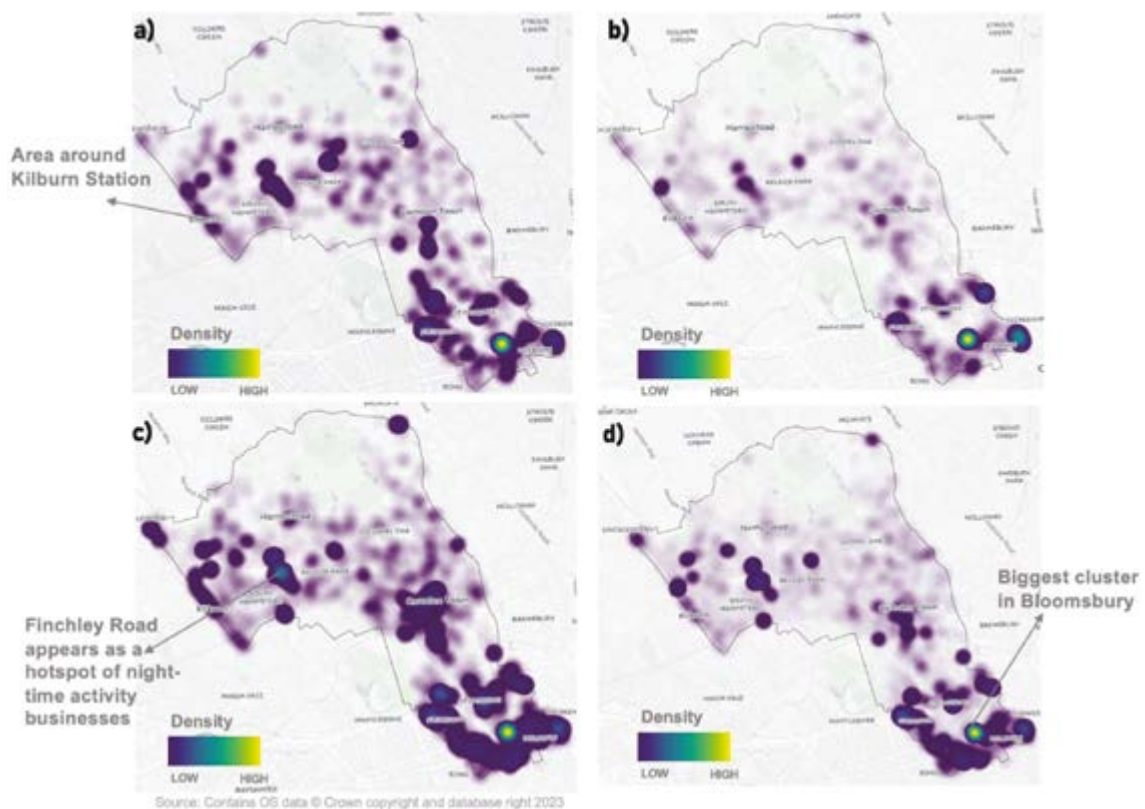
1. Cultural and leisure activities

2. Activities which support night-time cultural and leisure activities

3. 24-hour health and personal social services

4. Activities which support wider social and economic activities

By only mapping businesses that fall within one of those categories, we are able to get an understanding of the demand for night workers. Figure 6 illustrates the distribution of companies associated with each of the four categories across Camden. Given that 'Activities which support wider social and economic activities' are linked to the most sub-categories (see Appendix), they are the most common across the borough. In order to better understand the general distribution of night-time businesses we have mapped the key hotspots in Figure 6 broken down by the four categories.
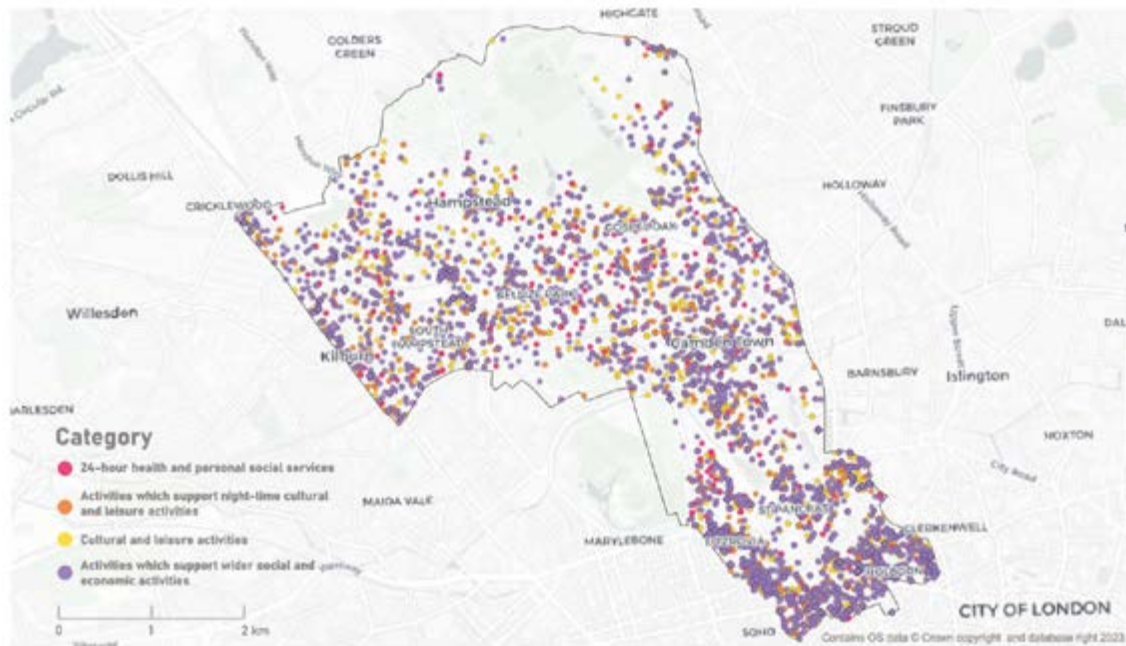
Figure 3: Night-time businesses in Camden.

Figure 2 illustrates a major hotspot of night-time businesses in Bloomsbury, followed by several other hotspots in Soho, Holborn, Camden Town, Finchley Road and Kilburn Station, which are regions that include some of the most popular high streets in Camden.

Figure 4: Hotspot analysis of a) Cultural and leisure activities, b) Activities which support night-time cultural and leisure activities, c) 24-hour health and personal social services, d) Activities which support wider social and economic activities.

Business data doesn't give a very granular impression especially for places that correspond to food. Therefore, a further breakdown of important patterns that drive night-time worker demand is presented in Figure 4 which shows the distribution of Pubs, Bars, Nightclubs, Hotels, and Hospitals. The data is taken from the Food Hygiene Agency Ratings which records a complete list of businesses ratings by premises category. Whilst the actual hygiene rating is not of interest in this research, the categories are a useful proxy to help locate night-time activities.
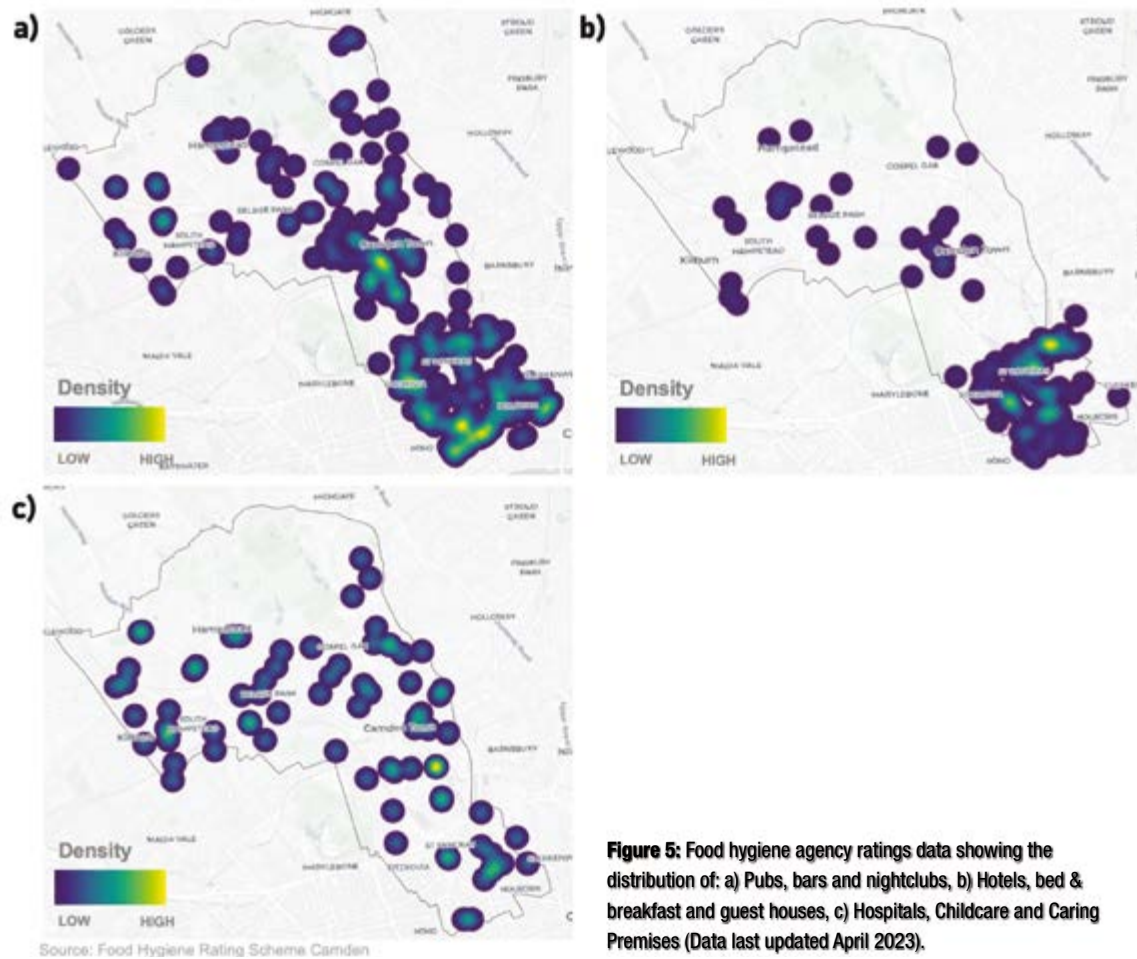
Figure 5: Food hygiene agency ratings data showing the distribution of: a) Pubs, bars and nightclubs, b) Hotels, bed & breakfast and guest houses, c) Hospitals, Childcare and Caring Premises (Data last updated April 2023).

As seen in Figure 5a, Pubs, Bars and Nightclubs are concentrated around Soho, Fitzrovia, Holborn and Camden Town whilst Hotels are concentrated in Kings Cross St Pancras (Figure 5b), and Hospitals are scattered around the borough (Figure 5c). This might be due to the different use of the spaces, as hospitals are required for the health of the wider population of the borough, whilst pubs, bars, nightclubs, and hotels are located in areas which consist of higher demand for the services they provide. This analysis therefore identified how the night-time business locations differ between the '24-hour health and personal social service' category and other categories. In terms of commute to work, hospital workers would require public transport services with greater coverage of the borough of Camden, whilst pub, bar, nightclub and hotel night-time workers might be better served by the current public transport network.

NIGHT-TIME BUSINESS TYPE	TOTAL
Pubs, Bars and Nightclubs	253
Hotel/bed & breakfast/guest house	131
Hospitals/Childcare/Caring Premises	77

Figure 6: Total number of businesses by type
(Source: Food Hygiene Rating Scheme Camden)

Figure 6 lists the total number of businesses by type, extracted from the Food Hygiene Rating Scheme. Businesses such as restaurants and fast-food chains have both night-time and day-time operation characteristics and thus have not been included in the table. A detailed dataset of opening hours of stores could indicate which restaurants are open during the night. Lastly, night-time workers that are contracted on other types of work such as council services (waste collection etc) , road works and food delivery, are more challenging to locate but necessary to create a complete picture. Therefore, business locations can only indicate a proportion of the night-time workers and alternative data sources might be required to comprehensively understand all types of night-workers.

5. SUPPLY OF NIGHT-TIME WORKERS

In addition to locating the areas of demand for night-time workers we can try to piece together a picture of the supply, i.e. who the workers are and where they might be coming from. This can be approximated from data from the recently released 2021 Census since it contains information regarding the employment characteristics of the population. This section therefore maps the population of Middle Super Output Areas (MSOA), containing approximately 2,000 to 6,000 households), by industry to demonstrate the utility of census data in understanding the supply of night-time workers.

Census 2021 data

Census data for the population employed in different industries are only available at the MSOA level and not the more granular OA. However, future census data releases might include more granular geographies, which could be used to replicate the outputs produced below in more detail. The 'Population by Industry' variable includes the total number of usual residents aged 16 years and over in employment the week before the census in more than 100 listed industries.

Industries associated with the night-time economy were extracted to understand where night-time workers live. It should be noted that some industries can be both part of the night-time and day-time economy and thus the percentages are likely to be an overestimation of the population working during the night-time. Figure 7 illustrates the percentage of the population in each MSOA that is employed in night-time economy industries. The highest percentage is found near Euston where 75% of the population is employed in industries with night-time characteristics. On the contrary, the lowest percentages are found in Hampstead and Belsize Park regions (~40%).
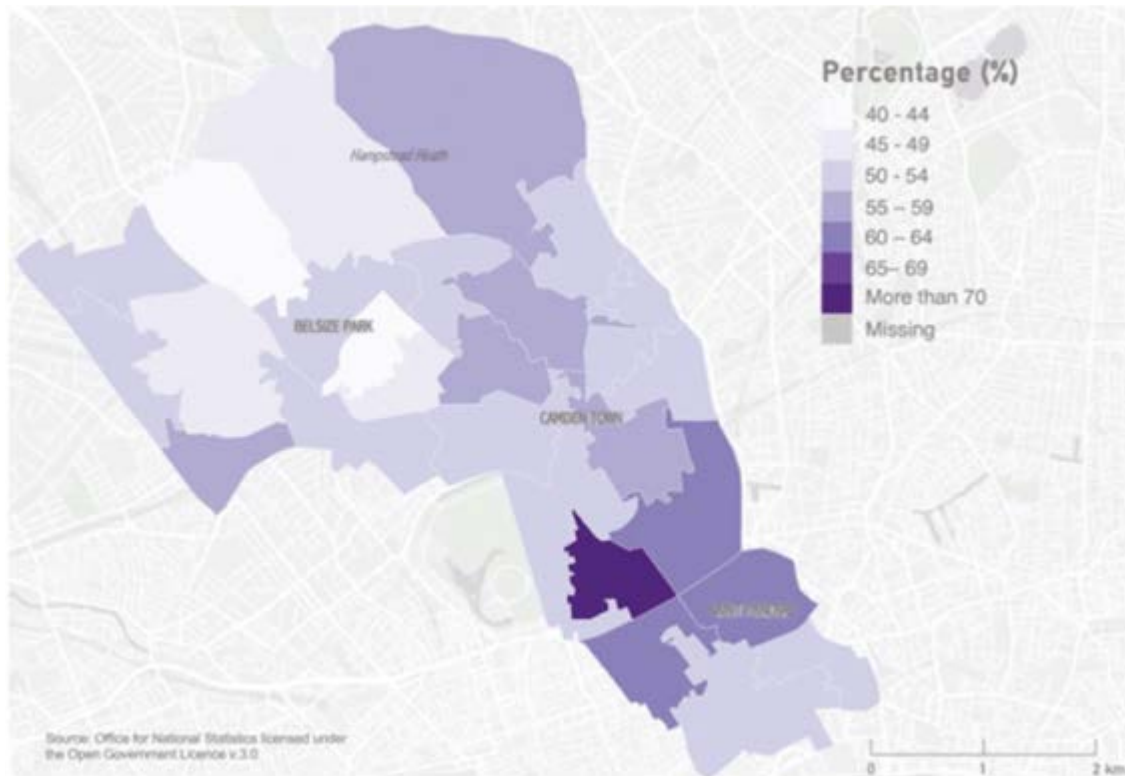
Figure 7: Percentage of employed population in night-time economy industries by MSOA from 2021 Census.

One major drawback of the census is that it reveals information on where night-time workers live instead of where they work. In order to therefore gain a deeper understanding of the links between home and employment locations, additional information must be incorporated into the analysis. This report mapped the MSOA population by industry to extract the proportion of night-time workers, but in order to facilitate a deeper understanding of the socio-economic characteristics of these workers, cross-tabulations of census variables could benefit future analyses. Therefore, this analysis can be enriched by incorporating information from multiple census variables such as 'Method of Travel to Work' and 'Distance Travelled to Work', as well as origin-destination (flow) data.

6. INDICATORS OF NIGHT-TIME ACTIVITY

Alternative forms of data can help to unravel the relationship between both the supply of and the demand for night-time workers in Camden. Data collected by transport service providers such as Uber can show areas of increased night-time activity, whilst data from Transport for London (TfL) can indicate locations where there is likely a high quantity of activity in evening hours. Similarly, mobile phone location data can assess areas of night-time activity in Camden, and could be used to differentiate between patrons of the night-time economy and night-time workers.

Though valuable, alternative data can raise unique challenges. For example, data from Uber and TfL may include a mix of individuals, some workers and some patrons of the night-time economy. Additionally, while these data may show spikes in night-time activity, they may not reveal patterns such as late-night shift changes at hospitals, which involve a relatively low number of individuals. While alternative data sources can indicate the location of night-time activities, and the probable location of night-time workers, without further disaggregation they cannot be used to precisely quantify the population of night workers or identify differences in the travel patterns of night-time workers and patrons of the night-time economy.

a. Uber

Uber released an interactive heatmap for the first quarter of 2020 showing the density of Uber trips at different time intervals. This research explored the interval between 6pm and 6am to identify the total number of Uber trips passing through each street around Camden. Comparisons were made between weekends (Figure 8) and weekdays (Figure 9). This data shows that weekends saw much greater traffic volumes than weekdays. This suggests that Uber is primarily used for leisure purposes instead of commuting purposes and therefore, while it may indicate areas of increased activity during night times on weekends, it does not offer significant insight into the commuting and employment patterns of night-time workers.

Figure 8: Uber mobility data for weekends in the first quarter of 2020.

Figure 9: Uber mobility data for weekdays in the first quarter of 2020.

b.TfL station entries & exits

TfL produces detailed data on the quantity of entries and exits for Overground and Underground stations in Camden. The data is available in two formats: (1) a daily time series showing entries and exits within individual stations, which provides a measurement of the volume of travel in each station, and (2) a survey of entries and exits by 15-minute interval for individual stations, which can show differences in the transport demand at different times of day (Figure 6.2.2 in , Appendix).
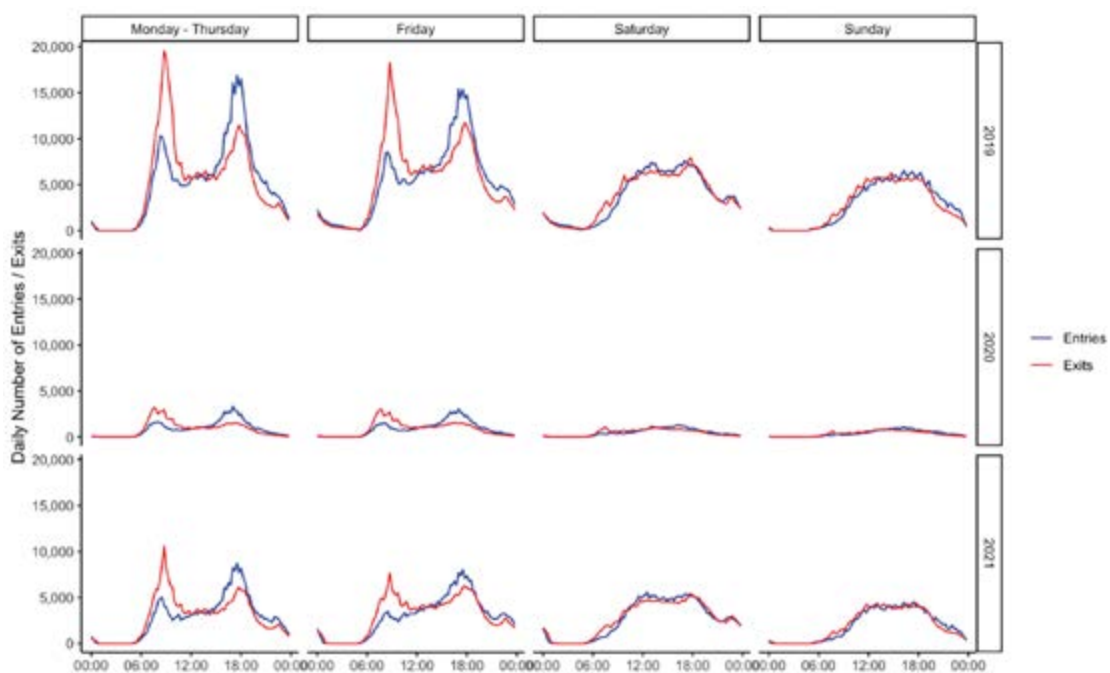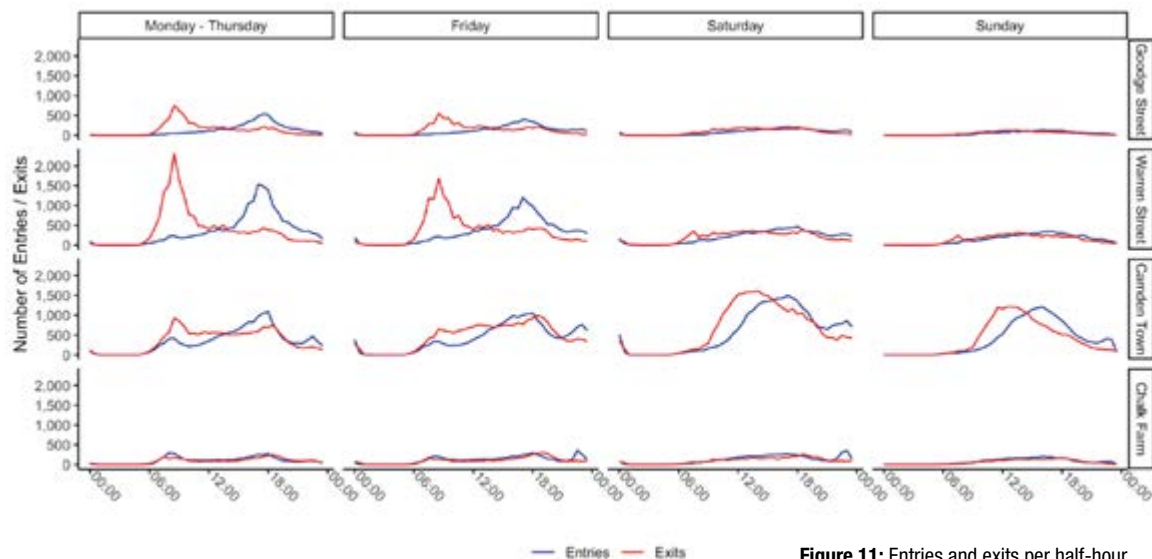

Figure 10: Entries and exits per half-hour for all stations in Camden.

Daily counts of entries and exits show a significant variance in the volume of travel at stations in Camden, which includes some of the busiest transit stations in the UK. Differences in entries and exits each hour of the day can also indicate how these stations are used by commuters and others. Goodge Street and Warren Street, for example, show a notable difference between exits on weekday mornings, indicating a large quantity of daytime commuters, compared to Camden Town and Chalk Farm, which shows a peak of exits in the early evening on weekends, and a corresponding increase in entries in the late evening, likely indicating patronage of the night-time economy (Figure 11).


Figure 11: Entries and exits per half-hour for selected stations in Camden (2021).

Though this publicly available, TfL data can provide some indication of relative differences in night-time activity in different areas in Camden, it does not reveal where passengers are travelling from and to (and when). It would therefore be preferable to work with TfL to obtain origin-destination flows on their network based on taps in and out of the system. These can be created in an aggregate way to prevent any risks to privacy and disclosure. The hope is that such data could further identify differences in the locations where journeys tend to originate for night-time workers, compared to patrons of the night-time economy. However, this data raises privacy concerns for individual workers, as well as a specific data licence to analyse granular travel flows in the TfL network.

c.TfL Santander bike-sharing data

The Santander bike-sharing system is a docked bike-sharing system in London for which detailed data on trip origin and destinations are released. The structure of the available data is presented in Table 7 of the Appendix.

For this research, data for 2022 has been extracted for trips taking place between 6pm and 6am in order to get insights on mobility during the night-time. The bike-sharing system does not extend to the entire borough of Camden and hence the absence of data beyond Camden Town (see Figures 12 and 14). Figure 12 presents the total number of trips that originated from each of the 64 bike-share docking stations of Camden, to get an indication of popular docking stations for leaving the area, whilst Figure 14 presents the total number of trips that ended at each docking station for understanding popular docking stations when arriving to the area. Figures 13 and 15 display the names of the most visited docking stations for origin and destination trips respectively.
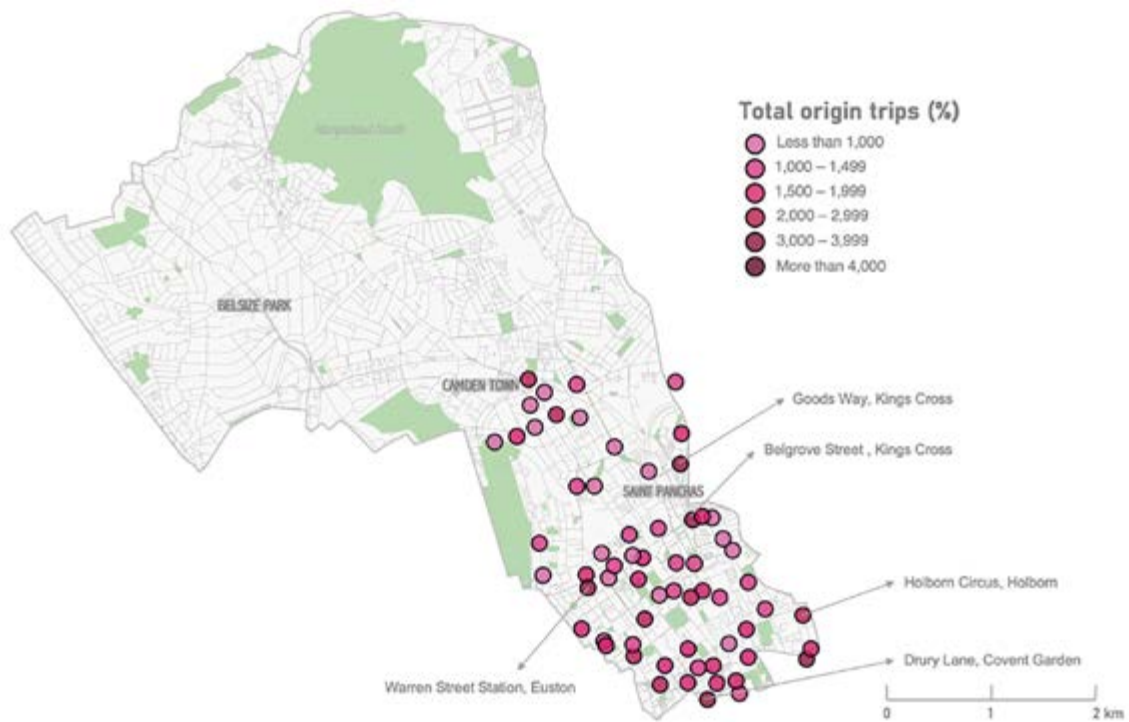
Figure 12: Night-time bike-sharing trips in 2022 by docking station of origin (6pm-6am).

| RANK	STATION	ORIGIN TRIPS
1	Belgrove Street, Kings Cross	3758
2	Warren Street Station, Euston	3616
3	Drury Lane, Covent Garden	3504
4	Goods Way, Kings Cross	3260
5	Holborn Circus, Holborn	3213

Figure 13: The five stations in Camden with the highest number of origin trips in 2022 between 6pm and 6am
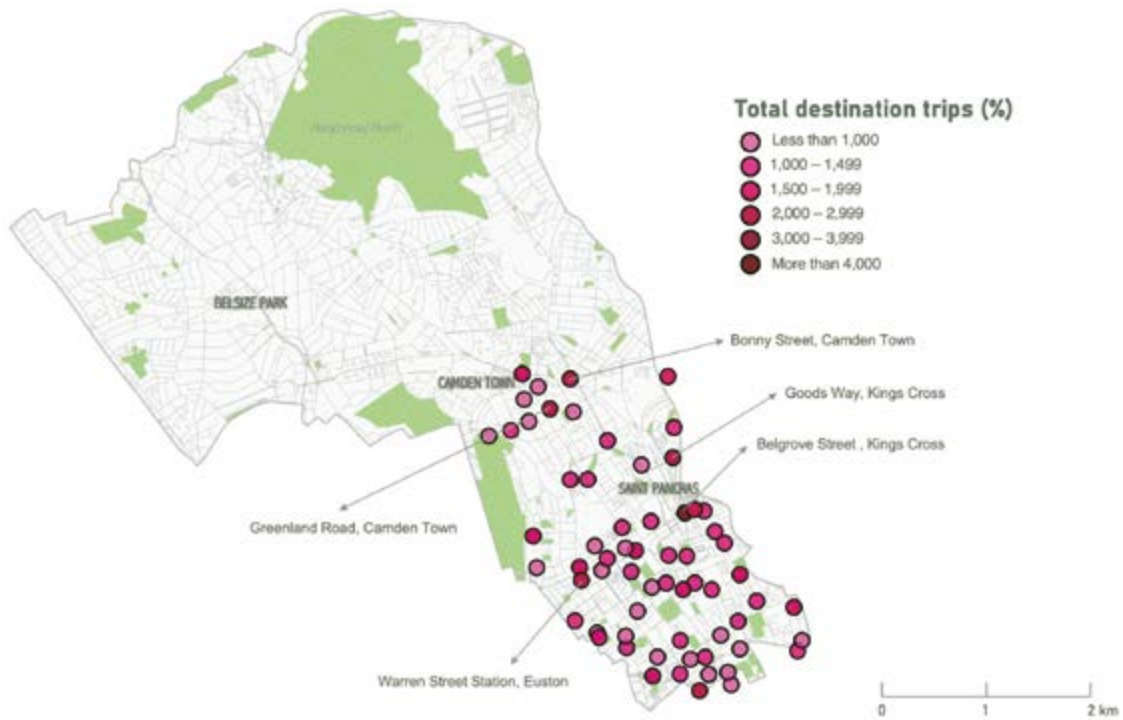
Figure 14: Night-time bike-sharing trips in 2022 by docking station of destination (6pm-6am).

RANK	STATION	DESTINATION TRIPS
1	Belgrove Street, Kings Cross	4724
2	Warren Street Station, Euston	2903
3	Goods Way, Kings Cross	2461
4	Bonny Street, Camden Town	2312
5	Greenland Road, Camden Town	2293

Figure 15: The five stations in Camden with the highest number of destination trips in 2022 between 6pm and 6am.
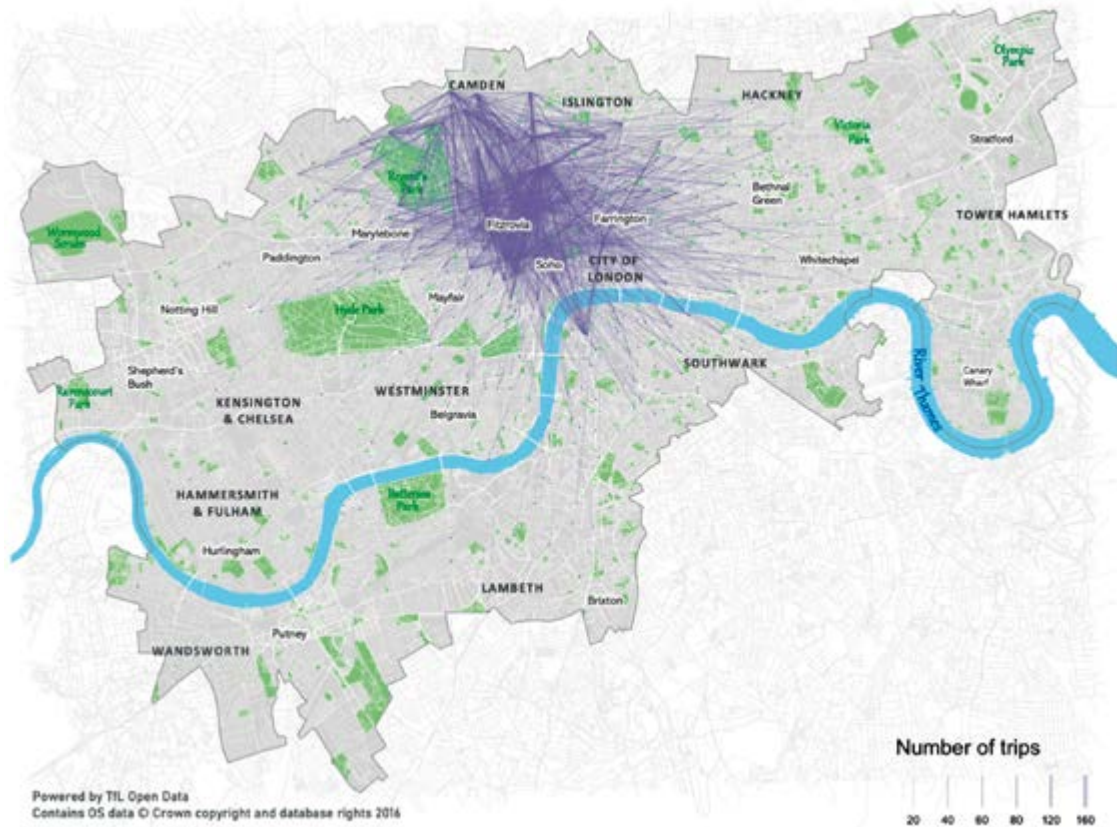
Figure 16: Origin-destination trips taking place between 6pm to 6am and originating or ending in one of the docking stations within the borough of Camden.

Figure 16 illustrates the origin-destination trips represented by lines of shortest path that connect docking stations of origin to those of destination. The line width corresponds to the total number of trips between each pair of stations for 6pm-6am for 2022. Docking stations outside Camden were included only if they were involved in trips that either originated or ended in one of Camden's docking stations. In the figure, it is evident that the single most important docking station outside Camden is located in Waterloo, whilst within the borough, the most influential docking stations are located in Kings Cross, Euston and Camden Town. In terms of the most popular origin-destination pairs, these are listed in Figure 17.

RANK	ORIGIN STATION	DESTINATION STATION	NUMBER OF TRIPS
1	Warren Street Station, Euston	Albany Street, The Regents Park	156
2	Goods Way, Kings Cross	York Way, Kings Cross	128
3	Pancras Road, Kings Cross	Bonny Street, Camden Town	127
4	Soho Square, Soho	Belgrove Street, Kings Cross	110
5	York Way, Kings Cross	Goods Way, Kings Cross	100

Figure 17: The most common origin-destination pairs.

The analysis of the bike-sharing data undertaken above was performed to exemplify the utility of the dataset as further breakdowns can be made to understand trips by day of the week, hour and minute. Night-time workers can be inferred by understanding the surroundings of docking stations and making assumptions on the types of users by hour. However, the fact that the bike-sharing system doesn't extend north of Camden Town might constrain the system's functionality as a mode for commuting, especially for workers that live outside the bounds of the system i.e., outside central London. Dockless bike-sharing systems can in turn be consulted to further understand bike-sharing as a commuting mode for night workers.

d. Mobile phone location data

Mobile phone location data provide a potential source of granular information about the characteristics of night-time workers. There are two primary forms of mobile phone location data: in-app location data (precise GPS location data collected from the users of specific applications) and Call Detail Record data (approximate location data typically collected from a larger population of mobile network customers). Either form of mobile phone location data can be aggregated to indicate areas of increased night-time activity, acting as an indicator of increased demand for night-time services.

However, at the individual level, these data can provide sufficient information to differentiate between patrons of nigh-time services and the patterns of activity of night-time workers. A worker, for example, could be identified by recurrent visits to a non-residential location during night-time hours (distinct from night-time leisure activities which occur with much lower frequency). Visits can be identified according to a series of rules set by the researcher to define the different types of locations such as home and work. Additionally, because mobile phone location data is collected continuously through time, this data could then be used to identify the transit routes used by night workers.

Although mobile phone location datasets may be a promising source of information on work, residence, and transport behaviours of night-time workers, they also have potential limitations that must be balanced in exchange for greater individual granularity. The first is the privacy of night-time workers. Although mobile phone location data may allow for the exploration of individual patterns of movement, this must be conducted in a secure data environment, where results of any analysis must be aggregated prior to dissemination. This aggregation requires a sufficient sample of individuals to characterise patterns of night working, and to group night workers by individual characteristics (such as home district, or industry of employment). This difficulty is confounded by uncertainty about the sample of individuals from whom mobile phone location data is collected. All mobile phone location datasets reflect a specific customer segment (such as the subscribers to a specific mobile network), and therefore may only provide partial coverage of the overall night-time population. Nonetheless, these data may be able to provide granularity not available through other existing forms of data, and more comprehensive information on the characteristics of night workers.

7. CONCLUSIONS

From our work on this report, we conclude that no single dataset will offer a universal and comprehensive picture of night-time workers in London. There are however potential datasets (listed in full in Table 1 of the Appendix) that each offer a piece of a large and complex puzzle. We have highlighted a few of these in the above report and whilst the focus was on Camden, the findings and examples are scalable and deliverable across the GLA.

High-level summaries exist on the night-time economy, but these lack the detail required for the kinds of policy interventions that might be needed to better cater for those who work in it. Consequently, datasets need to be linked together in order to create a holistic representation of the night-time economy. This report explored the feasibility of using Uber, bike-sharing data and tube entry and exit data to understand population movement at night but given that night workers cannot be distinguished from visitors and residents, the greatest level of insight may lie in mobility data. Whilst this is the single most granular data source that can produce insights for understanding where night-workers are, it is unlikely to deliver a high degree of certainty given the way it is collected.

We are therefore proposing a multi-pronged approach to sourcing datasets that provide proxies for the kinds of information that are useful at the finer geographic scales. These can be used in combination or in isolation depending on the question that the GLA are looking to answer with regards to addressing the needs of night-time workers.

8. RECOMMENDATIONS

From what we have learnt from this project, we believe that further research could greatly enhance the understanding of night workers in London. To achieve this we would propose the following next steps:

- The creation of a night workers classification. This would be built from a mix of datasets where we would create small area estimates of activity and numbers of night workers.

- A data-led survey of night workers in order to map where they come from and how they get to work along with shift patterns and workplace conditions. This would need to be a significant number - '000s not '00s.

- Pursuit of additional datasets such as the new BT mobilty data and TfL origin and data flows

- Create and maintain a dashboard of the discrete night worker relevant data and the classification to build awareness, share findings and to grow the research agenda into night workers

- Test the classification by mapping night worker survey responses to the patterns seen in the data.

- Expand the geography to Camden, Islington and Newham where strong research relationships exist with the boroughs.

The time to complete this project would be 6-9 months and there could be an opportunity for UCL to support it with access to survey researchers to support its wider research goals and building strong relationships and impact research with its city. This would reduce costs and enable greater scale to be achieved through access to a large number of students who in turn would benefit from the experience and analysis that the project would deliver.

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10. RESEARCH TEAM

- The research team was drawn from UCL, Didobi and Emu Analytics.

- Professor James Cheshire – Department of Geography, UCL

- Mikaella Mavrogeni – PhD Student, Department of Geogrpahy, UCL

- Hamish Gibbs – PhD Student, Department of Geography, UCL

- Matthew Hopkinson – Managing Director Didobi and Honorary Professor of Practice at UCL

- Dr Julia Williams – Associate Didobi

- Dr Chris Duley – Associate Didobi

- Alice Goudie – Senior Location Intelligence Analyst, Emu Analytics

11. APPENDICES

Table 1: Datasets that can be linked to the night-time economy.

DATA TYPE	DATA SOURCE	AGGREGATION LEVEL	INFORMATION	LINK	DATA LICENSE
Boundaries					
	Open Data Camden, 'Camden Ward Boundaries'	Ward	This spatial dataset contains each ward boundary that makes up the London Borough of Camden; originally taken from the OS Boundary-Line product.	https://opendata.camden.gov.uk/Maps/Camden-Ward-Boundaries/cvwp-5m5j	Open Government License
	ONS, Output Area (Dec 2021) Boundaries Full Extent (BFE) EW	Output Areas (OA)	This file contains the digital vector boundaries for Output Areas in England and Wales as of 21st March 2021	https://geoportal.statistics.gov.uk/datasets/output-areas-dec-2021-boundaries-full-extent-ew-bfe/explore	Open Government License
	ONS, LSOA (Dec 2021) Boundaries Full Extent (BFE) EW	Lower Super Output Areas (LSOA)	This file contains the digital vector boundaries for lower layer super output areas for England and Wales, as of 21st March 2021.	https://geoportal.statistics.gov.uk/datasets/ons::lower-layer-super-output-areas-dec-2021-boundaries-full-extent-bfe-ew/explore	Open Government License
	ONS, MSOA (Dec 2021) Boundaries Full Extent (BFE) EW	Middle Super Output Areas (MSOA)	This file contains the digital vector boundaries for middle layer super output areas for England and Wales, as of 21st March 2021.	https://geoportal.statistics.gov.uk/datasets/ons::msoa-dec-2021-boundaries-full-extent-bfe-ew/explore	Open Government License
Night-time workers					
	Open data Camden, 'Street Works Register Camden'	Precise point location	This dataset contains street works that are happening in the London Borough of Camden. Attribution includes the organisation that is carrying out the work, the proposed start and end dates of the work and the street on which the works are taking place. The location of the works are represented as points, however the actual extent of the works may be an area or line on the stated road.	https://opendata.camden.gov.uk/Transport/Street-Works-Register-Camden/hb3v-f3s2	Open Government License

	GLA, 'Number of workplaces in the Night-time Economy in London MSOAs, 2001-2017'	MSOA	Number of workplaces and employees working in industry sectors that operate in the evening or night. The "night time economy" is defined as the following Standard Industrial Classification 2007 (SIC 2007) industries: Cultural and leisure activities, Activities which support night-time cultural and leisure activities 24-hour health and personal social services, Activities which support wider social and economic activities	https://data.london.gov.uk/dataset/london-night-time-economy	Open Government License
	ONS, 'Night-time workers, UK 2012-2022'	National	National and regional breakdowns of night-time workers by industry groupings, gender, working patterns, age groups, time of day usually worked, place of birth (UK or outside the UK), and whether or not they work from home.	https://www.ons.gov.uk/businessindustryandtrade/business/activitysizeandlocation/datasets/nighttimeworkersuk	Open Government License
	UK Data Service, Quarterly Labour Force Survey Household Datasets, 1990-2023	Household	The Labour Force Survey is carried out quarterly by asking a sample of individuals about their circumstances and work including type of employment, hours and days worked etc.	https://beta.ukdataservice.ac.uk/datacatalogue/series/series?id=2000026#!/access-data	Open
	Census 2021, 'Industry – TS060'	MSOA	Usual residents aged 16 years and over in employment the week before the census in more than 100 listed industries. Industries associated to the night-time economy can be extracted to understand where nigh-time workers live	https://www.nomisweb.co.uk/sources/census_2021_bulk	Open Government License
	Census 2021, 'Occupation – minor groups – TS064'	MSOA	Usual residents aged 16 years and over in employment the week before the census in more than 80 different occupations. Occupations associated to the night-time economy can be extracted to understand where nigh-time workers live	https://www.nomisweb.co.uk/sources/census_2021_bulk	Open Government License

Mobility					
	O2 Footfall data	MSOA	Anonymised and Aggregated data by O2. The People Counts shows the number of people dwelling in each MSOA area per hour, split by: Resident – based on where the user has spent most of their evening and night-time in the latest historical month available. Worker – based on where the user has spent most of their working hours predominantly based on February 2020 where available. Visitor (at least 30mins in location).	https://data.london.gov. uk/high-street-data-service/partnership-data/	Government
	TFL Annual entry/ exit station counts per quarter hour	Station	Individual TfL managed rail modes (London Underground, London Overground, Docklands Light Railway and TfL Rail) The data coverage can be the entry / exit of the station (that may include one or more modes) or boarding / alighting for a specific mode in the station.	http://crowding.data.tfl. gov.uk/	Open
	TFL Demand by Station Type	Station	Demand by Station Type shows how daily activity- in terms of entry and exit taps at ticket barriers- for each underground station has changed since around the start of the year.	https://app.powerbi. com/view? r=eyJrljoiMjZjMmQwY TktZjYxNS00MTIwLT g0ZjAtNWlwNGE0ODM zZGJhliwidCl6ljFmYmQ 2NWJmLTVkZWYtNGV lYS1hNjkyLWEwODljM jU1MzQ2Yils ImMiOjh9	Open
	CDRC Santander Bike Sharing	Precise docking station location	Daily updated data on the maximum simultaneous usage numbers for the larger UK bikeshare systems.	https://data.cdrc.ac.uk/ dataset/bikeshare-activity	Open

	R 'bikedata' package, Santander bike-sharing origin-destination data	Precise docking station location	Extract individual origin-destination trip data for specified time periods from SQLite3 database	https://github.com/ropensci/bikedata	Open
	Open Data Camden, 'Camden Cycle Counters Phase 2'	Street level on cycle lanes	Cycle counters in Camden provide count of cyclists along cycle routes by hour of the day, recording in and out counts as well as the northing and easting of the cycle lanes	https://opendata.camden.gov.uk/Transport/Camden-Cycle-Counters-Phase-2/it3h-aqrf	Open
	Huq mobility data	Precise location	The dataset contains location data derived from in-app mobile-phone usage across Great Britain. Mobile phone applications seek user's consent for recording and storing a mobile device's GPS location when the app is in use. The total number of unique devices and the total number recorded locations are aggregated in unique tiles. Aggregated counts of less than 10 are censored to preserve individual privacy.	https://huq.io/	Commercial
	Open Data Camden, 'Parking Services Penalty Charge Notices 2021-22'	Street location	This dataset contains transactional penalty charge notice data held in the London Borough of Camden's parking management system; inclusive of penalty charge notices issued by Civil Enforcement Officers on street and those issued by Civil Enforcement Officers via CCTV. Attribution includes contravention code, ticket type, street, parking restriction, vehicle category and status of case.	https://opendata.camden.gov.uk/Transport/Parking-Services-Penalty-Charge-Notices-2021-22/j2dn-jtw9	Open
	UBER mobility heatmap	Street level	A public dataset showing the volume of activity of mobility devices.	https://movement.uber.com/explore/london/mobility-heatmap/query?lat.=51.51262&lng.=-0.1658002&z.=12&lang=en-GB	Open

	Census 2021, 'Method of travel to work - TS061'	OA	Method of travel to workplace for all usual residents aged 16 years and over in employment the week before the census. This variable can give an indication of the areas relying more on public transport and vice versa to understand where better public transport provision might be needed especially in relation to areas with a high proportion of night-time workers.	https://www.nomisweb. co.uk/sources/ census_2021_bulk	Open Government License
Retail					
	Open data Camden, 'Food Hygiene Rating Camden'	Store locations	This dataset contains food hygiene ratings or inspection results given to businesses located in the London Borough of Camden, and reflect the standards of food hygiene found on the date of inspection or visit by Camden Borough Council. Businesses include restaurants, pubs, cafes, takeaways, hotels and other places consumers eat, as well as supermarkets and other food shops. Attribution includes the business name, address, rating value (0-5), rating date, ward name and spatial location. Please note, not every business has the correct spatial location - these are included in the data but omitted from the map.	https://opendata. camden.gov.uk/Health/ Food-Hygiene-Rating- Scheme-Camden/ ggah-dkrr	Open Government License
	Open Data Camden, 'Public Conveniences in Camden'	Precise Locations	This dataset contains public conveniences in the London Borough of Camden. Attributes include the address and geographic coordinates of each facility; these are largely taken from Camden's Local Land and Property Gazetteer and published under the OS Presumption To Publish process.	https://opendata. camden.gov.uk/ People-Places/Public- Conveniences-In- Camden/4b2v-65nr	Open Government License
	Open Data Camden, 'Camden Markets and Kiosks'	Precise Locations	This dataset contains the location of markets and kiosks in the London Borough of Camden as well as the nearest parking bays to these locations.	https://opendata. camden.gov.uk/ Community/Camden- Markets-And-Kiosks/ ikye-tidm	Open Government License

	Local Data Company 'Retail type, vacancy and address data'	Store location	Retail Type and Vacancy data tables include: Shop name, Shop use, Classification, Category, Subcategory (inc. Retail Type/Vacancy). Retail Address data table includes: Unit, Building, Street No, Street, Town, Postcode, Latitude, Longitude.	https://www. localdatacompany.com	Commercial
	Open Street Map, 'Hospitals'	Polygons - Precise location	Can be directly downloaded using the add_osm_feature() function in R with key = "healthcare" and value = "hospital"	https://wiki. openstreetmap.org/ wiki/Main_Page	Open
	Open Street Map, 'Nightclub'	Polygons - Precise location	Can be directly downloaded using the add_osm_feature() function in R with key = "amenity" and value = "nightclub"	https://wiki. openstreetmap.org/ wiki/Main_Page	Open
	Open Street Map, 'Bar'	Polygons - Precise location	Can be directly downloaded using the add_osm_feature() function in R with key = "amenity" and value = "bar"	https://wiki. openstreetmap.org/ wiki/Main_Page	Open
	Open Street Map, 'Pub'	Polygons - Precise location	Can be directly downloaded using the add_osm_feature() function in R with key = "amenity" and value = "pub"	https://wiki. openstreetmap.org/ wiki/Main_Page	Open
	Open Street Map, 'Commercial'	Polygons	Can be directly downloaded using the add_osm_feature() function in R with key = "landuse" and value = "commercial"	https://www.getthedata. com/open-pubs/ camden	Open
	Open Pubs, Camden	Precise location	Subset of the Open Pubs dataset including only pubs falling within the Camden local authority.	https://www.getthedata. com/open-pubs/ camden	Open
	Companies House UK Government, 'Condensed SIC list in CSV format'	NA	The Standard Industrial Classification (SIC) used in classifying business establishments and other statistical units by the type of economic activity in which they are engaged.	https://assets. publishing.service. gov.uk/government/ uploads/system/ uploads/attachment_ data/file/527619/ SIC07_CH_condensed_ list_en.csv/preview	Open

	Safegraph UK Places data	Precise location	Places datasets have information about brand affiliation, hours of operation, historical data on when businesses open and close at this location, and building footprint information, all of which further contextualize the location.	https://www.safegraph.com/products/places	Commercial
	Camden Retail Survey Map	Precise building location	Retail buildings classified by the type of commercial activities they serve	https://ssa.camden.gov.uk/connect/analyst/mobile/#/main?mapcfg=%2FMapProjects%2FCamdenRetailSurvey	Open
Economic					
	Open data Camden, 'Companies Registered in Camden and Surrounding boroughs'	Business address	This datasets contains companies which have a registered address located in the London Boroughs of Camden, Barnet, Brent, City and County of the City of London, City of Westminster, Haringey and Islington; this does not necessarily mean they are located in these boroughs. The data is based on the Basic Company dataset published by Companies House; the location is based on postcode. Attributes include the name of the company, the registered address, accounts information and what it does.	https://opendata.camden.gov.uk/Business-Economy/Companies-Registered-In-Camden-And-Surrounding-Bor/iix4-id37	Open Government License
	Mastercard 'Spend data'	High street	Card data from Mastercard aggregated to high street / town centre level to show how spending patterns have changed over time. Including total spend and number of transactions. Currently only accessible to approved officers in London Boroughs which have signed up to join the High Streets Data Partnership	https://data.london.gov.uk/high-street-data-service/partnership-data/	Government

	Open Data Camden, 'Camden Non-Domestic Rates – Rateable Values'	Local authority	A list of properties in the rating valuation list since 1 April 2010, including transitional relief allowed for each year.	https://opendata. camden.gov.uk/ Business-Economy/ Camden-Non-Domestic-Rates-Rateable-Values/ jumr-tymj	Open Government License
	Open Data Camden, 'Community Infrastructure Levy Projects In Camden'	Local authority	Details of infrastructure projects which have been funded from the 'local' proportion of the Community Infrastructure Levy - can show investment going into an area.	https://opendata. camden.gov.uk/login	Open Government License
	London Datastore, 'Directory of London businesses'	Address	A list of businesses located in London showing a range of information including company name, address, postcode, local authority, and SIC code (industry it belongs to). The Free Company Data Product is a downloadable data snapshot containing basic company data of live companies on the register. Companies House update the latest snapshot within 5 working days of the previous month end. The London file available here was published on 1 May 2018.	https://data.london.gov. uk/dataset/directory-of-london-businesses	Open Government License
	Nomis, 'Occupation by ethnic group by sex by age'	Output Areas	2011 Census estimates that classify usual residents aged 16 and over in employment the week before the census in England and Wales by occupation, by ethnic group, by sex and by age. The estimates are as at census day, 27 March 2011. These statistics provide central government with an understanding of the workforce and the type of skills available and are particularly useful for local economic development, monitoring labour market trends and contributing to schemes created to increase the number of skilled jobs for local residents. The data influence both central and local government resource allocation, Public Service Agreement (PSA) targets for regional competitiveness, and can inform equality and diversity strategies.	https://www.nomisweb. co.uk/census/2011/ dc6213ew	Open Government License

Socio-demographic				
	Police Crime Data	Crime location	These CSV files provide street-level crime, outcome, and stop and search information, broken down by police force and 2011 lower layer super output area (LSOA).	https://data.police.uk/data/	Open
	ONS, Population and household estimates, England and Wales: Census 2021	Local authority	Population counts by 5-year age group and sex for each Local Authority in England and Wales	https://www.ons.gov.uk/peoplepopulation andcommunity/ populationandmigration/ populationestimates/ datasets/ populationandhouse holdestimatesengland andwalescensus2021	Open Government License
	Index of Multiple Deprivation (2019) Camden Summary	LSOA	Camden summary showing: - the Summary district-level averages - the full listing of Camden LSOAs (ward order) with all domains - Comparative maps of Index of Multiple Deprivation (IMD) 2007, 2010, 2015 & 2019 - Ward summary	https://opendata.camden.gov.uk/People-Places/Indices-of-Deprivation-2019-Camden-Summary/mge7-u9r7	Open
	Modelled ethnicity estimates	Output Area	Ethnicity data (modelled).	https://data.cdrc.ac.uk/dataset/cdrc-modelled-ethnicity-proportions-lsoa-geography	Open (Safeguarded)
	A&E attendance in London by day and hour	London	Annual A&E attendance in London, number and percentage of attendances by time of day.	https://data.london.gov.uk/dataset/a-e-attendance-in-london-by-day-and-hour	Open
	Census 2021, 'Population density - TS006'	OA	Persons per square kilometre	https://www.nomisweb.co.uk/sources/census_2021_bulk	Open Government License
	Census 2021, 'Number of usual residents in households and communal establishments – TS001'	OA	Total residents either living in a household or a communal establishment	https://www.nomisweb.co.uk/sources/census_2021_bulk	Open Government License

Table 2. 2007 Standard Industrial Classifications (ONS, 2023)

GENERAL CATEGORY	SIC 2007 NAME	SIC 2007 CODE
Cultural and leisure activities	Hotels and similar accommodation	551
	Restaurants and mobile food service activities	561
	Event catering and other food service activities	562
	Beverage serving activities	563
	Private security activities	801
	Creative; arts and entertainment activities	900
	Gambling and betting activities	920
	Sports activities	931
	Amusement and recreation activities	932
Activities which support night-time cultural and leisure activities	Retail sale in non-specialised stores	471
	Retail sale of food; beverages and tobacco in specialised stores	472
	Retail sale of automotive fuel in specialised stores	473
	Retail trade not in stores; stalls or markets	479
	Passenger rail transport; interurban	491
	Other passenger land transport	493
	Holiday and other short-stay accommodation	552
	Security systems service activities	802
24-hour health and personal social services	Provision of services to the community as a whole	842
	Hospital activities	861
	Other human health activities	869
	Residential nursing care activities	871
	Residential care activities for mental retardation; mental health and substance abuse	872
	Residential care activities for the elderly and disabled	873
	Other residential care activities	879
	Social work activities without accommodation for the elderly and disabled	881

	Animal production	014
	Mixed farming	015
	Support activities to agriculture and post-harvest crop activities	016
	Processing and preserving of meat and production of meat products	101
	Processing and preserving of fruit and vegetables	103
	Manufacture of dairy products	105
	Manufacture of bakery and farinaceous products	107
	Manufacture of other food products	108
	Manufacture of pulp; paper and paperboard	171
	Manufacture of articles of paper and paperboard	172
	Printing and service activities related to printing	181
	Manufacture of basic chemicals; fertilisers and nitrogen compounds; plastics and synthetic rubber in primary forms	201
	Manufacture of rubber products	221
	Manufacture of plastics products	222
	Manufacture of domestic appliances	275
	Manufacture of motor vehicles	291
Activities which support wider social and economic activities	Manufacture of bodies (coachwork) for motor vehicles; manufacture of trailers and semi-trailers	292
	Manufacture of air and spacecraft and related machinery	303
	Manufacture of medical and dental instruments and supplies	325
	Manufacture of gas; distribution of gaseous fuels through mains	352
	Wholesale of food; beverages and tobacco	463
	Freight transport by road and removal services	494
	Sea and coastal freight water transport	502
	Passenger air transport	511
	Warehousing and storage	521
	Support activities for transportation	522
	Other postal and courier activities	532
	Motion picture; video and television programme activities	591
	Television programming and broadcasting activities	602
	Photographic activities	742
	Veterinary activities	750
	Temporary employment agency activities	782
	Activities of call centres	822
	Other education	855
	Activities of other membership organisations	949
	Other personal service activities	960

Table 3. Night-time businesses in Camden

GENERAL CATEGORY	SIC 2007 NAME	SIC 2007 CODE	COMPANY NAME	LONGITUDE	LATITUDE
Cultural and leisure activities	Hotels and similar accommodation	551	1st Continent Hospitality Limited	529013.8	185766.4

Table 4: Food Hygiene Rating Scheme Camden Data

BUSINESS NAME	LONGITUDE	LATITUDE	CATEGORY	POSTCODE
Jesmond Hotel	529688.8	181964.3	Hotels, bed & breakfast and guest houses	WC1E 6HJ
The Euston Flyer	530040.8	182747.4	Pubs, bars and nightclubs	NW1 2RA
Harmood Children Centre	528485.8	184563.3	Hospitals, Childcare and Caring Premises	NW1 8DQ

Table 5. Census Employment Data

MSOA21CD	MSOA21NM	TOTAL EMPLOYED POPULATION	TOTAL NIGHT-TIME EMPLOYED POPULATION	PERCENTAGE OF NIGHT-TIME EMPLOYMENT	GEOMETRY
E02000166	Camden 001	3674	2075	56.48	POLYGON ((527118.2 187603.6…

Table 6: TfL Entries and Exits Data

6.1.1 Structure of TfL Daily Entries and Exits

DATE	STATION	ENTRIES	EXITS	TOTAL TAPS
2022-05-02	Belsize Park	10	20	30

6.1.2 Structure of TfL Entries and Exits per-Quarter Hour

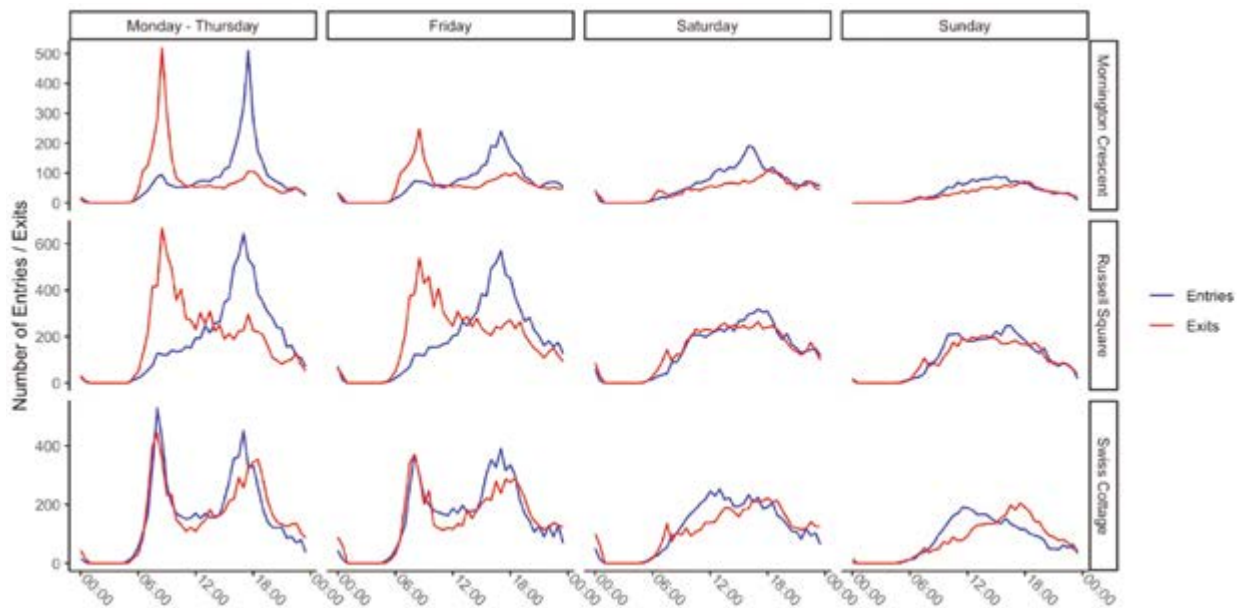| STATION	YEAR	DAY	DIRECTION	TIME	TAPS
Belsize Park	2020	Monday to Thursday	Entries	05:00	10

6.2.1 TfL Daily Entries and Exits for stations in Camden
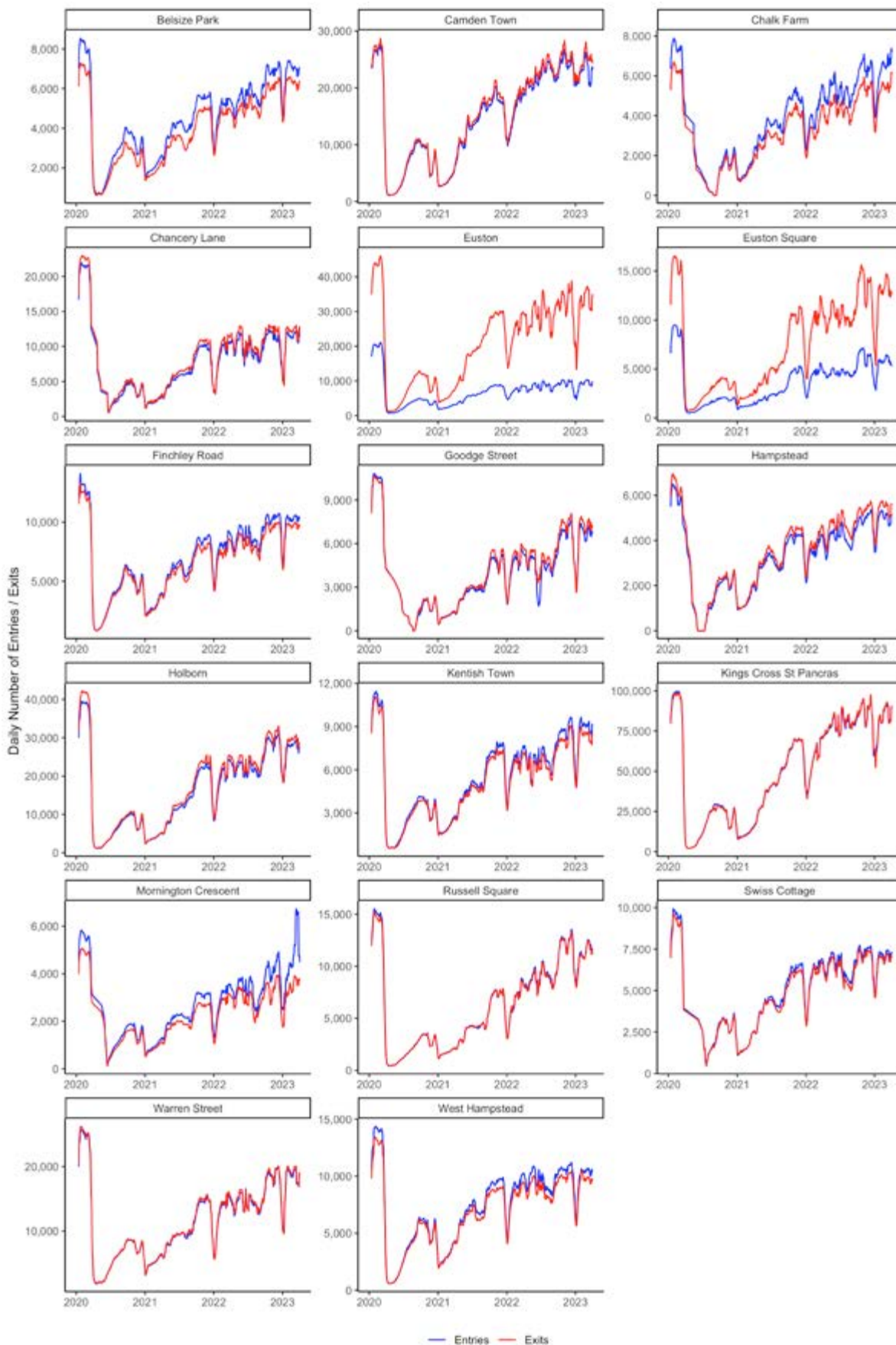
Entries — Exits

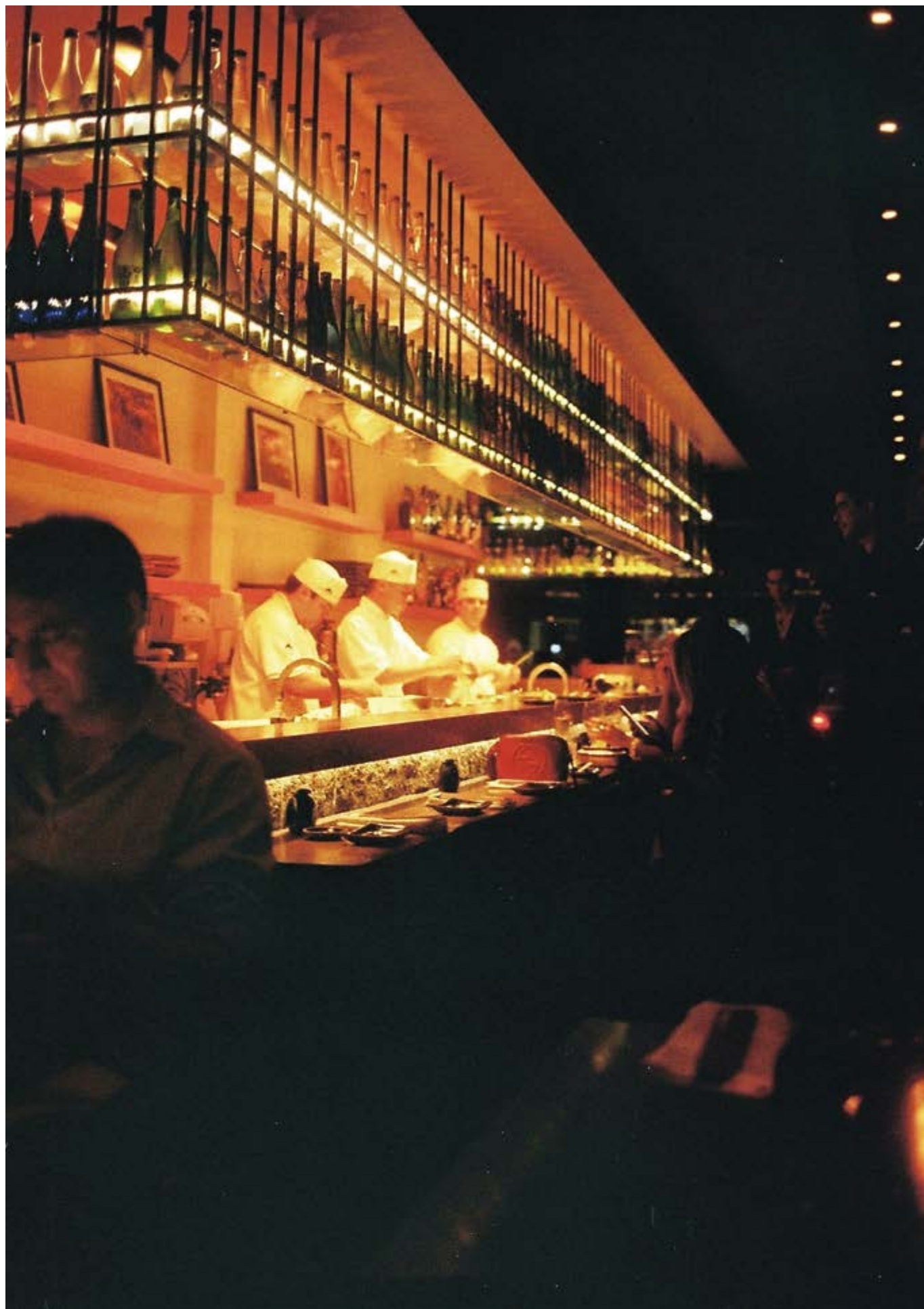## 6.2.2 TfL Entries and Exits per-Quarter Hour for stations in Camden (2021)
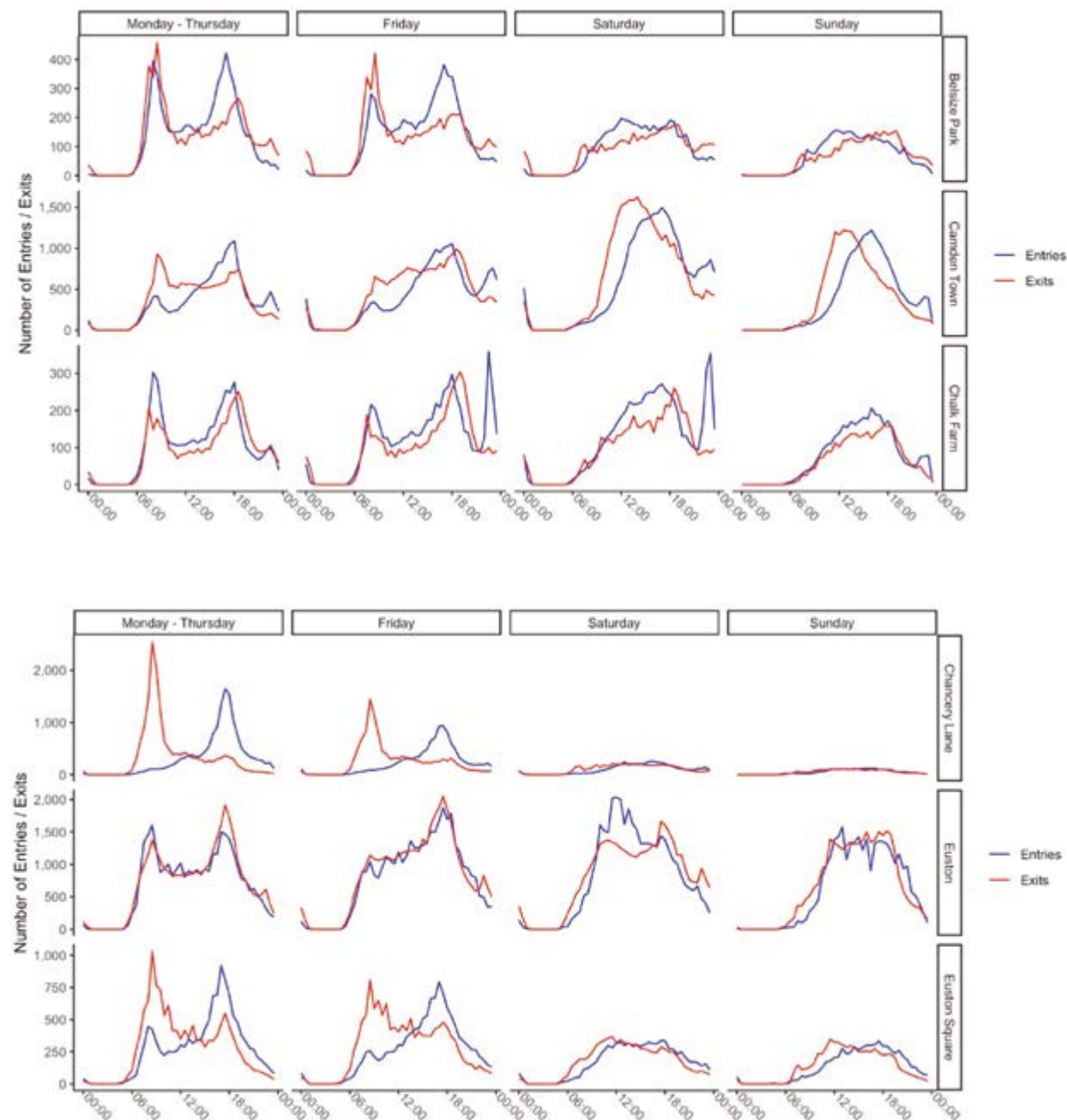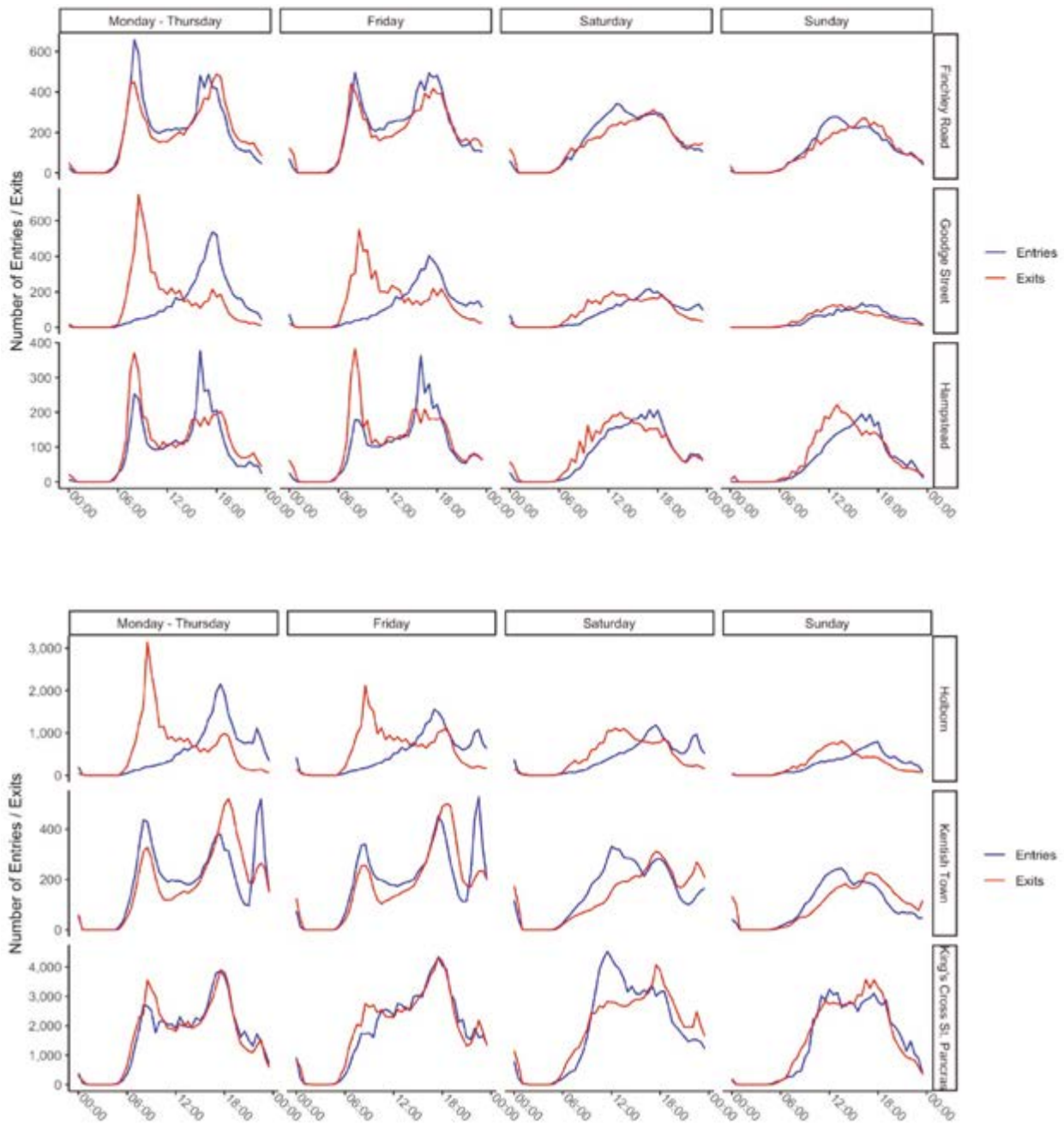
Table 7. TfL Santander bike-sharing origin-destination data

Data was extracted from the 'bikedata' package in R.

TRIP ID	TRIP DURATION (SEC)	START TIME	STOP TIME	START STATION ID	END STATION ID	BIKE ID
134	1320	2022-05-02 17:39:00	2022-05-02 18:01:00	lo717	lo381	5642

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