Does ethnic density influence community participation in mass participation physical activity events?: a case of parkrun

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Thumbnail Sketch

What is already known on this subject?

parkrun organise weekly 5km running and walking events at parks and green spaces across the world. Recent research has shown that despite equitable geographical access to parkrun events in England, participation is much lower in more deprived areas.

What this study adds?

This study uses regression modelling techniques to better understand the relative influence of geographical access, deprivation and ethnic density on parkrun participation rates in local communities. It finds that areas with higher ethnic density tend to have lower participation rates, even when controlling for deprivation.

Policy implications

Identifying why particular communities are less likely to engage in parkrun, and finding ways to improve participation from these commmunities is likely to both improve overall population health and reduce inequalities.

Abstract

parkrun has been successful in encouraging people in England to participate in their weekly 5km running and walking events. However, there is substantial heterogeneity in parkrun participation across different communities in England: after controlling for travel distances, deprived communities have significantly lower participation rates.

This paper expands on previous findings by investigating ethnic disparities in parkrun participation. We combined geo-spatial data available through the ONS with participation data provided by parkrun, and fitted multivariable Poisson regression models to study the effect of ethnic density on participation rates at the Lower layer Super Output Level.

We find that areas with higher ethnic density have lower participation rates. This effect is independent of deprivation. An opportunity exists for parkrun to engage with these communities and reduce potential barriers to participation.

Introduction

parkrun is a collection of free mass participation 5km running events that takes place every Saturday morning. There are currently over 500 locations in England, with a combined weekly attendance of over 100,000. parkrun has been identified as being successful at engaging with individuals who may not otherwise have taken part in organised physical activity (Haake 2018; Stevinson and Hickson 2013), and there is some evidence that it has increased overall physical activity levels in participants (Stevinson and Hickson 2018). Overall, there is a consensus that parkrun has huge public health potential (Reece et al. 2019).

However, qualitative research from Sheffield (Goyder et al. 2018) and more broadly the United Kingdom (Fullagar et al. 2019) identified that parkruns located in more deprived areas have lower attendances, and that ethnic diversity in parkrun was limited. This leads to concern that as with many public health interventions, parkrun is "likely to be responsible for significant intervention generated inequalities in uptake of opportunities for physically active recreation" (Goyder et al. 2018).

Undertaking quantitative analysis of the determinants of participation in parkrun is therefore long overdue. Aside from a single previous study from Australia (Cleland et al. 2019), with substantial limitations including, as noted by the authors, that "The sample was limited to a non-random sample of parkrun participants in one State of Australia and may not be generalizable to other parkrun populations." (p.21), no other studies have attempted to identify the determinants of participation in parkrun.

Our previous work revealed that there is substantial heterogeneity in parkrun participation across different communities in England: after controlling for geographical distance to nearest event, deprived communities have significantly lower participation rates (Schneider et al. 2019). The analysis was able to quantify, for the first time, how participation in parkrun varied in different communities in England. However, the analysis was interested only in the relationship between participation, access and deprivation and did not consider ethnic density as a potential determinant of participation in parkrun. Yet, evidence from survey data shows that non-White-British individuals in England are less likely to be physically active, and to engage in sport in general (Rowe and Champion 2000). We thus hypothesised that at the community level, all else being equal, areas with higher ethnic density have lower levels of participation in parkrun participation.

Methods

Data was obtained from multiple sources at the Lower layer Super Output Level (LSOA). There are 32,844 LSOAs in England, each of which is a geographical area containing around 1,000-3,000 people.

parkrunUK provided data on the number of parkrun finishers from each LSOA in England between the 1st January and 10th December 2018, we use the number of finishers as a proxy for parkrun participation, althoough we appreciate that people participate in parkrun in other ways (e.g. volunteering). We also used parkrun event location data, which are publicly available on the parkrunUK website.

The rest of the data, including Index of Multiple Deprivation (IMD) Score, Ethnic Density, Rural-Urban Classification, Population Density, Percentage Working Age and LSOA centroids were obtained from the Office of National Statistics (ONS). Full sources are listed in the table below, and all ONS data is provided open source on the author's GitHub page.

Table 1. Variables used in the Analysis

Variable	Description	Source
run_count	number of finishers from each LSOA in England between 1st January and 10th December 2018	parkrunUK
imd	Index of Multiple Deprivation scores for each LSOA	ONS
total_pop	total number of individuals in each LSOA	ONS.
pop_density	population density for each LSOA	ONS
rural_urban	Rural-Urban Classification	ONS

Variable	Description	Source
perc_bme	Ethnic Density: percentage of population non-white-british	ONS
mn_dstn	distance from LSOA centroid to nearest parkrun	derived from ONS
perc_non_working_age	derived from ONS data on age-groups in each LSOA	ONS
run_rate	derived from run_count and LSAO populations	derived

After merging these datasets we had detailed data on 32,844 LSOAs, including participation (number of finishers) and several characteristics of the LSOAs which we hypothesised may influence participation. Since previous work (Schneider et al. 2019) has found correlations between participation and deprivation, distance to nearest event, and population density we included all these variables. We also extended the analysis to include ethnic density (we use the percentage of the population that reported being non-White-British as a proxy for ethnic density) and the percentage of the population of working age. We are interested in ethnic density as we hypothesised that areas with higher ethnic density would have lower participation rates, all else being equal. We included the percentage of the population that is working age as a control to limit for the effect of populations heavily skewed toward older people (e.g. care homes), or very young people (e.g orphanages/immediately around special needs schools)). Since participation in parkrunUK is dominated by those aged 20-60 Haake (2018) we felt this was justified.

We first studied the bivariate Pearson correlations between the dependant variable (weekly parkrun participation per 1000 population) and all indepdentant variables described. Results are visually illustrated using the correlation plots (Wei and Simko 2017) and (stratified) heat maps. We then fitted a multivariable regression model to investigate the independent effects of the predictors on parkrun participation. A Poisson distribution with a log-link and with the LSOA total population as an offset variable was used to model parkrun participation as a rate (runners per LSOA population). Model fit was assessed using Pseudo R^2, based on quasi-likelihood functions (Zhang 2017). All analyses were conducted in R (R Core Team 2018).

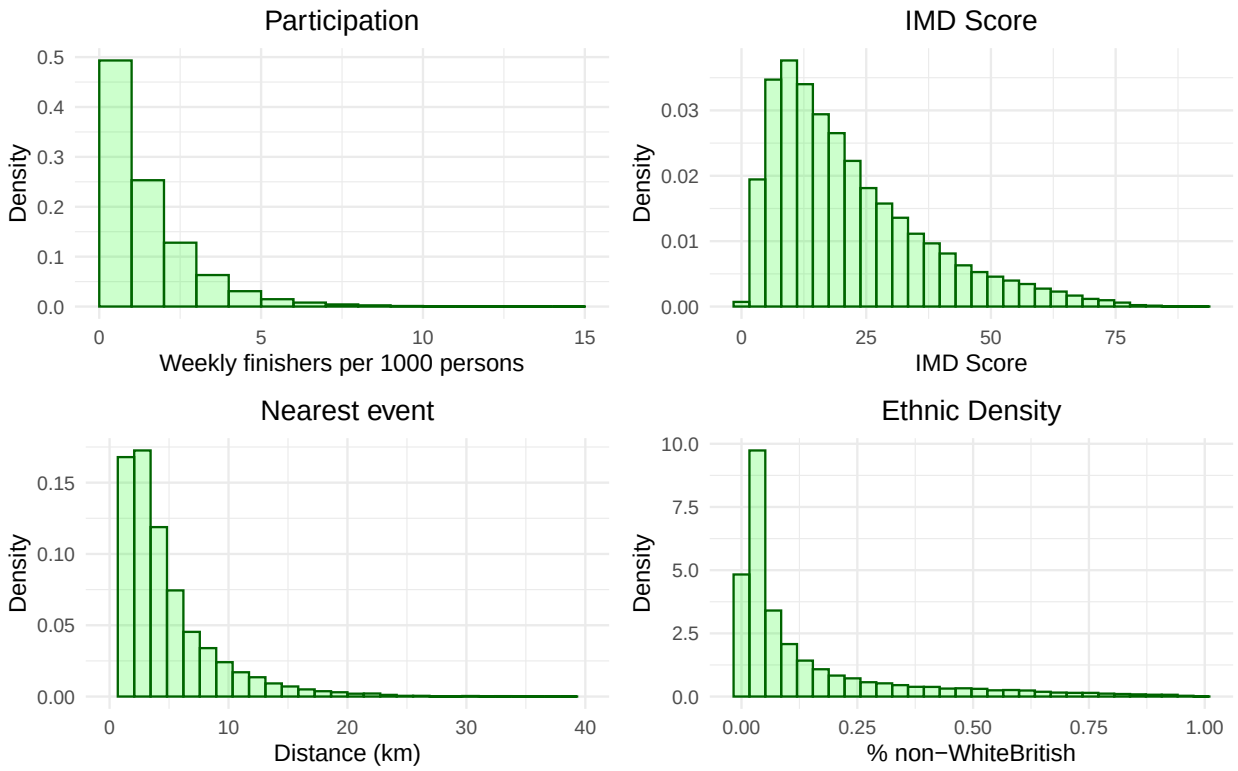

Figure 1: Distributions of Participation, IMD Score, Nearest Event and Ethnic Density

Results

Descriptive Statistics

Participation in parkrun varies across LSOAs. Around half of all communities (LSOA) average less than 1 finisher per week per 1000 people. Approximately a quarter average between 1 and 2 finishers, and around an eighth between 2 and 3 finishers. There is considerable variation in ethnic density, with most LSOA having a large majority of White-British residents, and few areas having over 50% non-White-British residents. Deprivation is positively skewed, meaning that most areas are not deprived, with a few very deprived areas. Finally, around 70% of LSOAs are within 5km, a parkrun, of a parkrun. Again, this is positively skewed with most LSAO being within 3-4km.

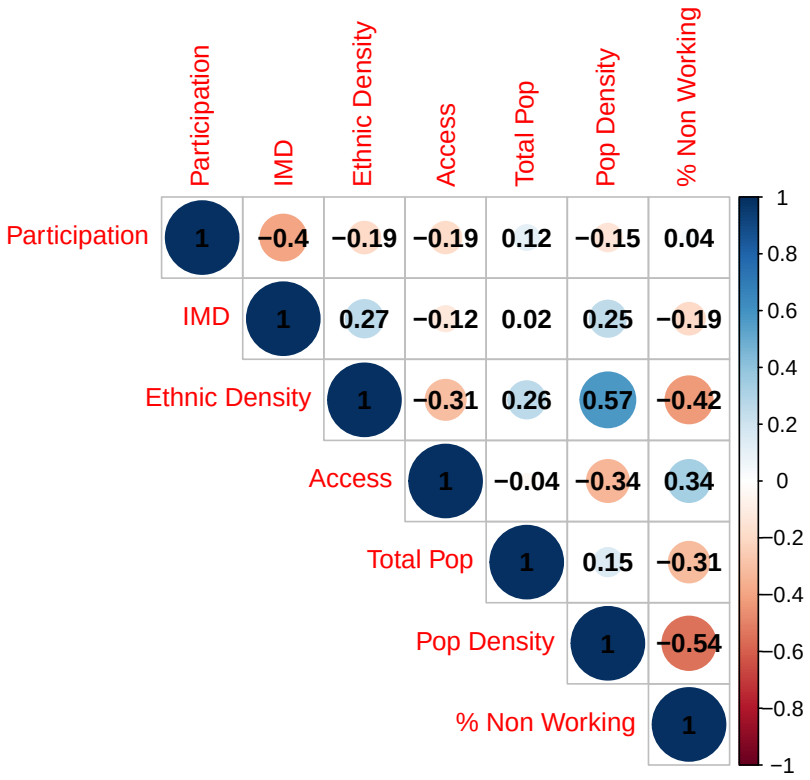

Figure 2: Correlation Plot for Variables in Analysis

Correlation Matrix

There is a negative correlation between particpation (run_count) and: deprivation (imd), distance to nearest parkrun (mn_distance), population density (pop_density) and ethnic density (perc_bme). Ethnic density is strongly postively correlated with population density, negatively correlated with percentage non-working age, and moderately positvely correlated with IMD suggesting that areas with higher ethnic density are more densely populated overall, more deprived and have higher percentage working age people.

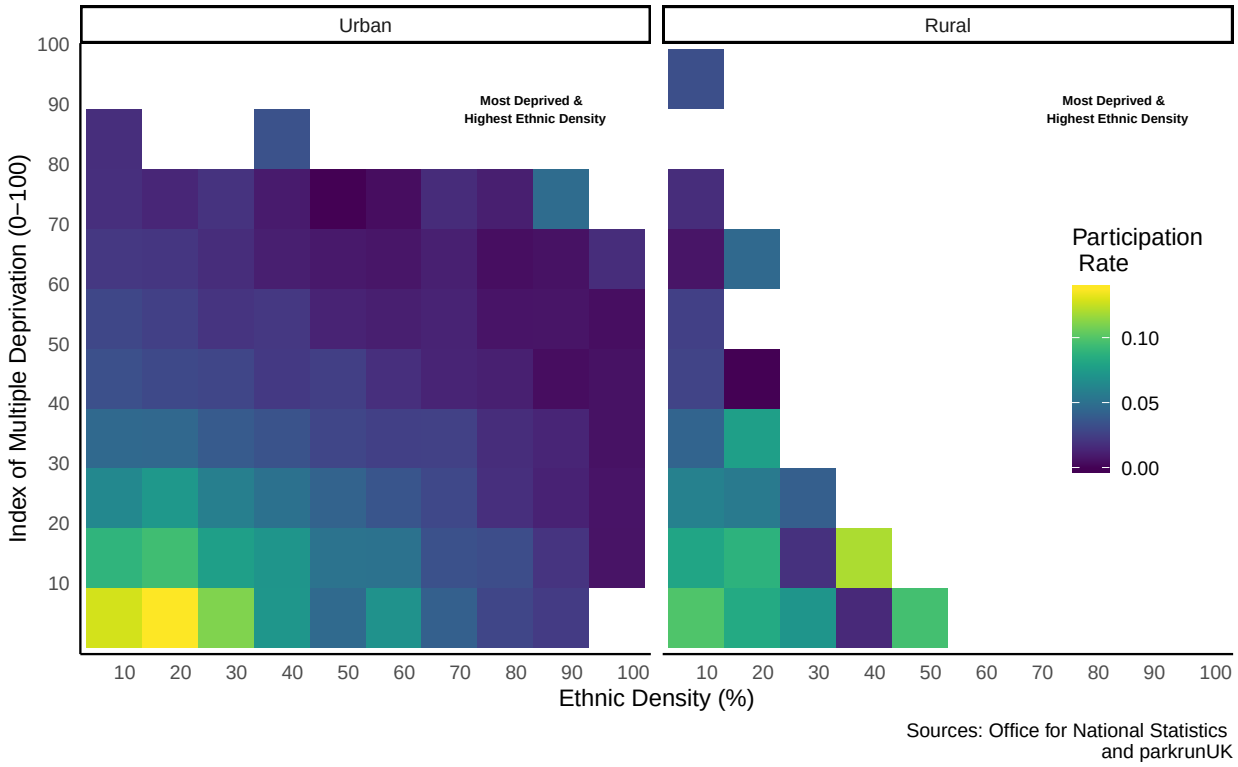

Figure 3: Colour plot for parkrun participation by rural-urban status, IMD and Ethnic Density

The colour plots below show the participation levels for LSOA by deprivation and ethnic density for Urban and Rural areas (as defined in Bibby and Brindley (2013)). Yellow, green and blue indicate high, moderate and low levels of participation respectively.

The plot shows that participation is generally greatest in areas that have low levels of deprivation and low levels of ethnic density (bottom left), and lowest in areas with high levels of deprivation and high ethnic density (top-right). Areas with either high deprivation, or high ethnic density, tended to have low participation, suggesting that both are important independently. The relationship was robust to Urban Major areas and Urban Minor areas but did not hold in Rural areas where data was more limited. It is important to note that we do not control for other factors, such as the age of residents or the population density and there are therefore many confounding factors.

Poisson Model

The results of the Poisson regression show that areas with a higher ethnic density have lower participation rates, even when controlling for the effect of deprivation, distance to events, population density and percentage of population working age. The effect is smaller than deprivation and distance, but still material and significant. This confirms the results of our rudimentary, but easily interpretable analysis using colour plots.

Table 2: Regression Results

	Dependent variable:		
	run_count		
	Original scale	Scaled - min model	Scaled - full model
	(1)	(2)	(3)
imd	-0.034^{***}	-0.532^{***}	-0.519^{***}
	$(-0.034, -0.034)$	$(-0.533, -0.530)$	$(-0.520, -0.517)$
pop_density	-0.070^{***}		-0.106^{***}
	$(-0.071, -0.069)$		$(-0.108, -0.105)$
mn_dstn	-0.112^{***}	-0.424^{***}	-0.475^{***}
	$(-0.112, -0.111)$	$(-0.426, -0.423)$	$(-0.477, -0.474)$
perc_non_working_age	-0.134^{***}		-0.011^{***}
	$(-0.148, -0.121)$		$(-0.012, -0.009)$
perc_bme	-1.524^{***}	-0.320^{***}	-0.285^{***}
	$(-1.532, -1.515)$	$(-0.322, -0.319)$	$(-0.287, -0.284)$
Constant	-0.737^{***}	-2.798^{***}	-2.804^{***}
	$(-0.747, -0.727)$	$(-2.800, -2.797)$	$(-2.805, -2.803)$
Observations	32,844	32,844	32,844
Log Likelihood	−1,231,308.000	−1,245,048.000	−1,231,308.000
Akaike Inf. Crit.	2,462,628.000	2,490,104.000	2,462,628.000
Note:			*p<0.1; **p<0.05; ***p<0.01

Discussion

Our findings show that areas with higher ethnic density have lower participation rates. This effect persists after controlling for other area characteristics such as deprivation, access to events and population density. While our previous analysis Scheider et al., 2019 has shown that participation in parkrun is lower in more deprived communitiesthe present results suggest that some of the negative effect on participation previously attributed to deprivation can actually be attributed to differences in participation by area ethnic density.

parkrun's visition of creating a "healthier and happier planet by continually breaking down barriers to participation and bringing people together from all walks of life whenever they want to come along" (p.5) Cutforth (2017) has huge potential in improving population physical activity and therefore public health. Our findings indicate that participation in deprived communities with high ethnic density was particularly low in 2018. Understanding the reasons for these differences in participation is a crucial first step in breaking down barriers, and replicating these methods in several years may give parkrun the ability to monitor trends in participation from different groups in society and allowing parkrun to monitor the effectiveness of their efforts to reach minority communities.

Limitations

This analysis is ecological and therefore it is not possible to make conclusions at an individual level without risking an ecological inference fallacy. We have been careful throught to make conclusions at the level of the LSOA, rather than te individual. Nevertheless, given that the evidence at the individual level points to lower participation in organised sport by those from ethnic minority backgrounds (insert REF), we think it is likely that the same effect exists at the individual level.

Our dependent variable is the number of finishers by residents of each LSOA. This is a count variable where each walk or run finished is treated equally (e.g. 10 finishes by one person is equal to 10 people completing one event). We cannot draw inferences on the number of people who took part within each LSOA at some point in the year, but instead focus on the total finisher count.

We use percent non-White-British as a crude proxy for ethnic density, and do not estimate participation by ethnic groups seperately. It is possible that there are significant differences between participation rates of different minority ethnic groups. Future analysis could look into which groups are most/least engaged in order to target efforts most efficiently.

We controlled for several variables which we thought would influence participation, it is possible that there are other confounding factors which have not been included.

Conclusion

parkrun is already in the process of increasing the number of events in deprived areas of England to encourage participation from disadvantaged groups. Our findings show, however, that in addition to deprivation and access, ethnic density is another important determinant of participation. Breaking down barriers to engagement in parkrun has the potential to improve overall population physical activity and therefore improve overall health and reduce health inequalities.

References

Bibby, Peter, and P Brindley. 2013. "The 2011 Rural-Urban Classification for Small Area Geographies: A User Guide and Frequently Asked Questions (V1. 0)." *Government Statistical Service*.

Cleland, Verity, Meredith Nash, Melanie J Sharman, and Suzi Claflin. 2019. "Exploring the Health-Promoting Potential of the 'Parkrun' Phenomenon: What Factors Are Associated with Higher Levels of Participation?" *American Journal of Health Promotion* 33 (1): 13–23.

Cutforth, Christopher. 2017. "So Much More Than a Run in the Park." *The Leisure Review*, no. 84.

Fullagar, Simone, Sandra Petris, Julia Sargent, Stephanie Allen, M Akhtar, and Gozde Ozakinci. 2019. "Action Research with Parkrun Uk Volunteer Organisers to Develop Inclusive Strategies." *Health Promotion International*, In–Press.

Goyder, EC, C Edmonds, A Sabey, D Lawrence, A Bullas, M Taylor, and S Potter. 2018. "P2 What Factors Predict Participation in a Mass Community Physical Activity Programme? The Case of the Five Sheffield 'Parkruns'." BMJ Publishing Group Ltd.

Haake, Steve. 2018. "Parkrun: A New Model of Physical Activity for Large Populations?" *The Sport and Exercise Scientist* 57: 18–19.

R Core Team. 2018. *R: A Language and Environment for Statistical Computing*. Vienna, Austria: R Foundation for Statistical Computing. https://www.R-project.org/.

Reece, Lindsey J, Helen Quirk, Chrissie Wellington, Steve J Haake, and Fiona Wilson. 2019. "Bright Spots, Physical Activity Investments That Work: Parkrun; a Global Initiative Striving for Healthier and Happier Communities." *Br J Sports Med* 53 (6): 326–27.

Rowe, Nick, and Ross Champion. 2000. "Sport Participation and Ethnicity in England." *Headline Findings. Sport England, London*.

Schneider, Paul P, Robert A Smith, Alice M Bullas, Thomas Bayley, Steve SJ Haake, Alan Brennan, and Elizabeth Goyder. 2019. "Where Should New Parkrun Events Be Located? Modelling the Potential Impact of 200 New Events on Socio-Economic Inequalities in Access and Participation." *medRxiv*, 19004143.

Stevinson, Clare, and Mary Hickson. 2013. "Exploring the Public Health Potential of a Mass Community Participation Event." *Journal of Public Health* 36 (2): 268–74.

———. 2018. "Changes in Physical Activity, Weight and Wellbeing Outcomes Among Attendees of a Weekly Mass Participation Event: A Prospective 12-Month Study." *Journal of Public Health*.

Wei, Taiyun, and Viliam Simko. 2017. *R Package "Corrplot": Visualization of a Correlation Matrix*. https://github.com/taiyun/corrplot.

Zhang, Dabao. 2017. "Rsq. Partial: Partial R-Squared for Generalized Linear Models."