The effect of the London 2012 Olympic and Paralympic Games on health and natural environment engagement in the Lee Valley

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Contents

Project Details

This report results from research by Natural England to investigate the effects of the Olympic Legacy on the Lee Valley, using statistical and spatial analysis of the Monitor of Engagement with the Natural Environment survey.

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Executive Summary

As the London 2012 Olympic and Paralympic Games legacy was designed to deliver a long-term physical activity legacy, especially to the local population, Natural England were interested in how the Games may have affected the health and outdoor visit behaviour of people from the Lee Valley.

This report therefore examined how indicators of physical activity and natural environment engagement as measured by the Monitor of Engagement with the Natural environment (MENE) survey, changed in light of the Games for the people of the Lee Valley.

This report is not intended to try to approve or disprove the legacy. However we hypothesised that if there were improvements in, for example, physical activity levels for respondents in the Lee Valley, that these may begin to occur in the months following the end of the Games.

Specifically the report compared changes in respondents from the Lee Valley to changes in similar clusters of respondents from other London boroughs and other local authorities in England, in order to observe whether changes were unique for the Lee Valley population.

All findings reported are statistically significant at the 95 percent level of confidence. This means that the differences between results are likely to be real differences as opposed to differences which are the result of sampling error or chance.

Findings:

For all location groups combined, there was no significant change from before until after the Games in the proportion of respondents who reported health or exercise motivations when taking leisure visits to natural environments. Individually, respondents from the Lee Valley showed no significant change either.

Being male, over 65, undertaking physical activities on your leisure visit, and meeting recommended physical activity guidelines significantly increased the likelihood that health or exercise motivations would be reported for a leisure visit to a natural environment.

For all location groups together, there was no significant change from before until after the Games in the proportion of respondents who reported undertaking physical activities on their leisure visits. Individually, the proportion of respondents from the Lee Valley reporting physical activities on their leisure visits went significantly down over the same time period.

Owning a dog, being in education, being white British and being male were just some of the demographic factors that significantly increased the likelihood that a respondent would report undertaking physical activities on their leisure visit to a natural environment.

For all location groups, there was a near significant drop in the proportion of people who reported undertaking at least one day of 30 minutes moderate physical activity in the past week. Individually, respondents in the Lee Valley were significantly less likely to report undertaking at least one day of 30 minutes moderate physical activity in the past week, in the year following the Games.

Being in education, in the highest socio-economic grading, and aged 16-24 were just some of the demographic factors that significantly increased the likelihood that a respondent would report undertaking at least one day of 30 minutes moderate physical activity in the past week.

For all location groups collectively, there was no significant change in the proportion of respondents who reported meeting physical activity guidelines. After the Games, the proportion of respondents in the Lee Valley who reported meeting physical activity guidelines went significantly down.

Owning a dog, being white British, and undertaking physical activities on leisure visits were just some of the demographic factors which significantly determined the likelihood that a respondent would report achieving recommended physical activity guidelines.

For all respondents jointly, there was a significant increase in the probability of visiting urban green space (as opposed to other types of natural environment) in the year following the Games. Individually, the proportion of respondents from the Lee Valley visiting urban green space also went significantly up in the year after the Games.

Not owning a car, being of black or minority ethnicity, and being aged 16-24 were all associated with a significantly higher likelihood that a respondent would visit urban green space (as opposed to other types of natural environment).

For all location groups together, there was a significant increase in the probability that respondents would take more than one visit to natural environments in the past week in the year following the Games (compared to the three years prior to the Games). Individually, the respondents of the Lee Valley showed the same increase in probability.

Owning a dog, reporting meeting physical activity guidelines, and being aged over 65 were just some of the demographic factors associated with a significantly higher likelihood of making more than one visit to natural environments in the past week.

We conclude that there is little evidence from MENE to suggest that the Games have had a beneficial effect on the health of the Lee Valley population thus far. We could tentatively state that the Games may have had a positive effect on the proportion of people in the Lee Valley visiting urban green space and visiting natural environments more than once in the last week, though it is not clear why these increases occur. Further research could use MENE as a resource for exploring any emerging trends for the Lee Valley population regarding changes in health or natural environment engagement as a result of the London 2012 Olympic and Paralympic Games.

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Background

The London 2012 Olympic and Paralympic Legacy, proposed when Great Britain made a bid to host the games, was designed to boost the economy of East London, foster more community cohesion, bring social and economic benefits to London as a whole, increase disability-sport participation, and increase mass participation in sport and physical activity.[1]

In academic literature there is little evidence to suggest that hosting the Olympic and Paralympic Games leads to increased uptake of sports and physical activity.[2] Only very negligible impacts on physical activity and sport participation in the short term were noted after the Sydney Games in 2000, no impacts were found following Athens 2004, while subsequent physical activity media campaigns following Beijing 2008 went unassessed.[3] Specifically concerning London 2012, doubts have been expressed about

> **"...there is little evidence to suggest that hosting the Olympic and Paralympic Games leads to increased uptake of sports and physical activity.**

the effects on East London, claiming that the legacy was only built around the narrative that East London was a 'problem' in order to serve the needs of the International Olympics Committee,[4] and thus, resultant evaluations of the legacy upon the local population have been proposed.[5] Nevertheless, the UK was probably the first host nation to set out a tangible physical activity participation legacy with the first of the four areas of focus in the Government's plans being to "...encourage the whole population to be more physically active"[6], and thus, such claims are beginning to be researched.

The Active People Survey, run by Sport England, showed that in April 2012 (before the Games), 15.4 million played sport at least once a week; in April

> **"the UK was probably the first host nation to set out a tangible physical activity participation legacy with the first of the four areas of focus in the Government's plans being to "...encourage the whole population to be more physically active"...**

2013 (8 months after the end of the Games) this figure reduced to 15.3 million people.[7] This suggests that no significant trends in sport participation have thus far been observed as a direct result of the 2012 Games, though it is important to note that this survey looks solely at sports participation and not at physical activity participation more generally. Furthermore, theoretically Olympic and Paralympic physical activity legacies may only work in a broader strategic programme incorporating collaboration with public health bodies, and extensive knowledge of the determinants of health behaviour change.[8,9]

In this spatial analysis of data from Natural England's Monitor of Engagement with the Natural Environment (MENE) survey, we examined whether various physical activity indicators changed in the year following the commencement of the London 2012 Games for people in the Lee Valley area of London, compared to similar areas within and outside of London. In a subsidiary way, we aimed to test whether visits to natural environments - in particular urban green spaces - increased since the start of the games. This allowed us to determine whether people at least got 'out and about' rather than increased their physical activity levels per se.

Sample demographics

The Monitor of Engagement with the Natural Environment (MENE) survey began in 2009 to gather information on the public's engagement with the outdoors. Jointly commissioned by Natural England, Defra and the Forestry Commission, MENE captures a wealth of information about visits taken to the natural environment and related behaviours and attitudes.

The survey was an ideal resource for this analysis as it is rich with data on health, physical and sporting leisure activity, demographic details (commonly used to predict health outcomes), and can be adapted to include area-level social and environmental information (also common health predictors). Furthermore, it surveys a huge, representative sample of the English population which is growing year-on-year.

Headline findings from MENE suggest people in the Lee Valley are much less likely to engage with the natural environment than the rest of Greater London. Since London 2012 aimed to benefit the lives of these residents, we were especially interested in changes to health and natural environment engagement for this population from before until after the start of the Games.

To examine the legacy, we decided to test the effects of the Olympic Games on the population of the Lee Valley. As the Lee Valley consists of seven boroughs (Barking and Dagenham, Enfield, Hackney, Haringey, Newham, Tower Hamlets, and Waltham Forest) we decided to compare the results of these areas to other, similar areas. Therefore, we matched these boroughs in terms of their multiple deprivation score[a] with seven boroughs within London and seven local authorities in the rest of England, as displayed in the map below.

[a] A score representing the population-weighted average of four local authority district summary measures, namely: a) Local concentration (population weighted average of the ranks of a local authority district's most deprived LSOAs that contain exactly ten percent of the district's population). b) Extent (proportion of a local authority district's population living in the most deprived LSOAs in the country). c) Income scale (number of people who are income deprived). d) Employment scale (number of people who are employment deprived).

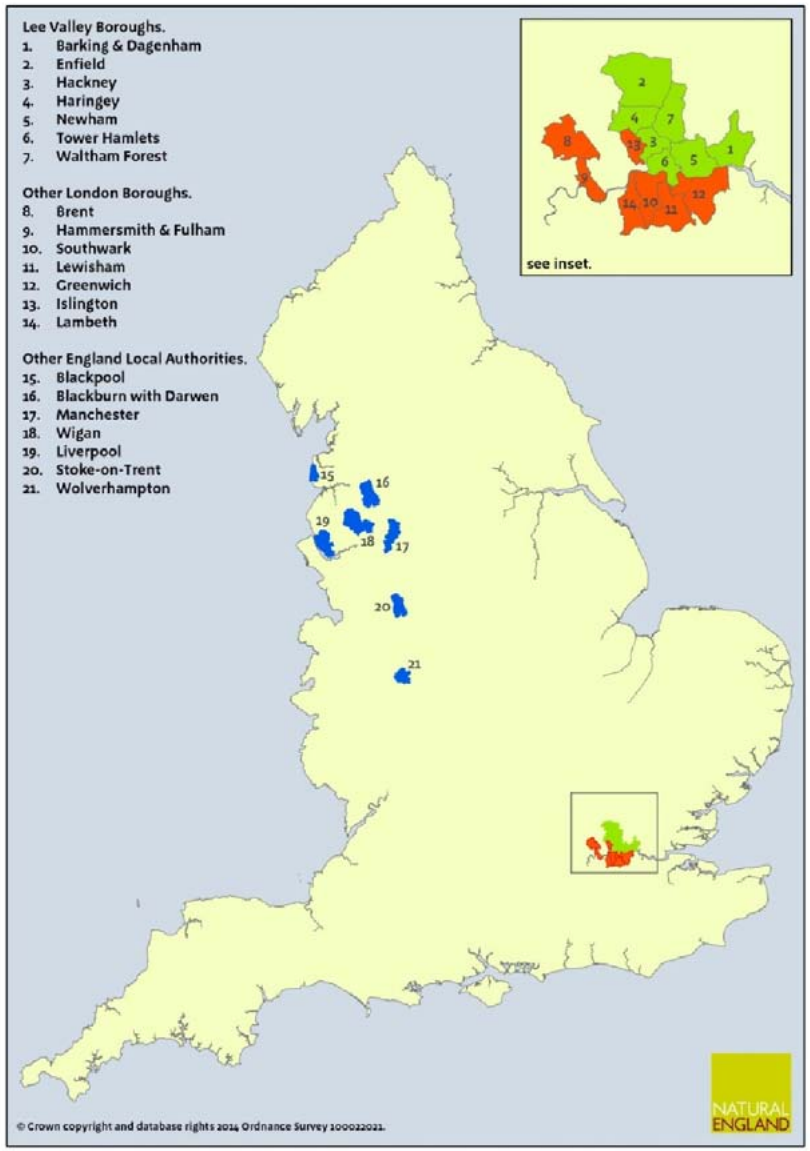


Figure 1. Map of the three location groups used in this report with the individual boroughs and local authorities they comprise.

We analysed four years' worth of MENE data as follows:
July 27th 2009 – July 26th 2012 = Before the start of the Games
July 27th 2012 – July 26th 2013 = After the start of the Games[b]

To determine the variables we should control for in the analysis we looked at both the demographics of the sample and barriers that were most commonly reported. Table 1 (opposite) shows the breakdown of demographics between the three location groups.

> **"Headline findings from MENE suggest people in the Lee Valley are much less likely to engage with the natural environment than the rest of Greater London.**

Table 1 also shows that almost half of the Lee Valley population were aged 34 or younger whereas in the other England local authorities, the population are noticeably older. This is important as older people tend to experience more barriers to physical activity.[10] We therefore controlled for age differences in the analysis.

[b]Although this segregation means that we compared uneven amounts of data, all analysis compares averages across individuals and there is no reason to suggest that grouping these three years should bias analysis in a particular way. Furthermore, the methodology is robust in dealing with unequal sample sizes such as this.

[1]Data on green space were derived from the Generalised Land Use Database (2005). The raw data represented the percentage of green space relative to other types of land use in a lower-layer-super-output area (LSOA). For the whole of the UK, these proportions were then divided into quintiles to represent higher and lower coverage and appended to the MENE data using LSOA codes (credit to Benedict Wheeler at the European Centre for Environment and Human Health for providing us with this data).

Table 1. Proportions of the sample in different demographic and area-level dimensions by location group.

		Lee Valley	Other London	Other England
Respondents	**Total Number Surveyed**	8,531	8,531	7,888
Gender	Male	49.3%	48.0%	46.1%
	Female	50.7%	52.0%	53.9%
Age	16-24	20.7%	17.8%	18.3%
	25-34	28.7%	25.1%	17.3%
	35-44	19.0%	19.4%	14.9%
	45-54	11.9%	15.5%	13.9%
	55-64	8.1%	9.3%	13.4%
	65+	11.6%	13.0%	22.2%
Socio-economic Grading	AB	11.1%	13.4%	11.8%
	C1	27.2%	28.6%	23.8%
	C2	21.6%	20.3%	18.0%
	DE	40.1%	37.7%	46.4%
Working Status	Full time	37.1%	40.3%	30.0%
	Part time	13.3%	12.4%	11.2%
	Retired	13.5%	15.1%	26.4%
	In Education	11.8%	10.1%	9.1%
	Not working	24.3%	22.0%	23.4%
Ethnicity	White British	28.4%	37.5%	79.0%
	BME	71.6%	62.5%	21.0%
Life limiting illness or disability	Yes	13.7%	14.3%	26.5%
	No	86.3%	85.7%	73.5%
Green space[1]	1st quintile	50.7%	47.3%	24.1%
	2nd quintile	24.8%	29.5%	29.2%
	3rd quintile	18.1%	16.9%	28.0%
	4th quintile	6.2%	5.8%	16.5%
	5th quintile	0.2%	0.4%	2.2%

A lot of respondents in the Lee Valley and other England groups were classified in the lowest economic groups (D and E) compared to other London respondents.[d] Lower socio-economic status groups in the UK tend to have less favourable attitudes towards leisure-time physical activity compared to higher socio-economic status groups.[11] We might therefore have expected to find higher overall likelihoods of practicing physical activity in the other London boroughs compared to the Lee Valley boroughs and other England local authorities. Hence, we took socio-economic status into consideration for this analysis.

The other England local authorities had a lower proportion of full-time employees and a higher proportion of retirees reflecting the older population in these areas. People in employment involving much sedentary behaviour and long working hours achieve less leisure time physical activity[12], thus we accounted for working status in this analysis.

Over a quarter of the respondents from the other England local authorities reported having an illness or disability which limited the extent to which they could carry out daily activities. This is important as it may affect the extent to which they visit outdoor environments and practice physical activity, so we accounted for whether a respondent has a limiting illness or disability in this analysis too.

Most respondents in the Lee Valley and other London boroughs were of black or minority ethnicities, but this was not the case in the other England local authorities. There is evidence that BME groups tend to make less use of public open space[13] so the above differences in ethnicity were taken into account in the present analysis.

Lastly, it is clear that respondents from the Lee Valley and other London boroughs live in areas with scarce green space; approximately half the respondents lived in LSOAs that are in the lowest quintile of green space coverage in the UK. Respondents from other England local authorities were more evenly spread across LSOAs in the lower 3 quintiles of coverage. Due to these differences we included the proportion of green space (relative to other land use) as a control variable in this analysis.

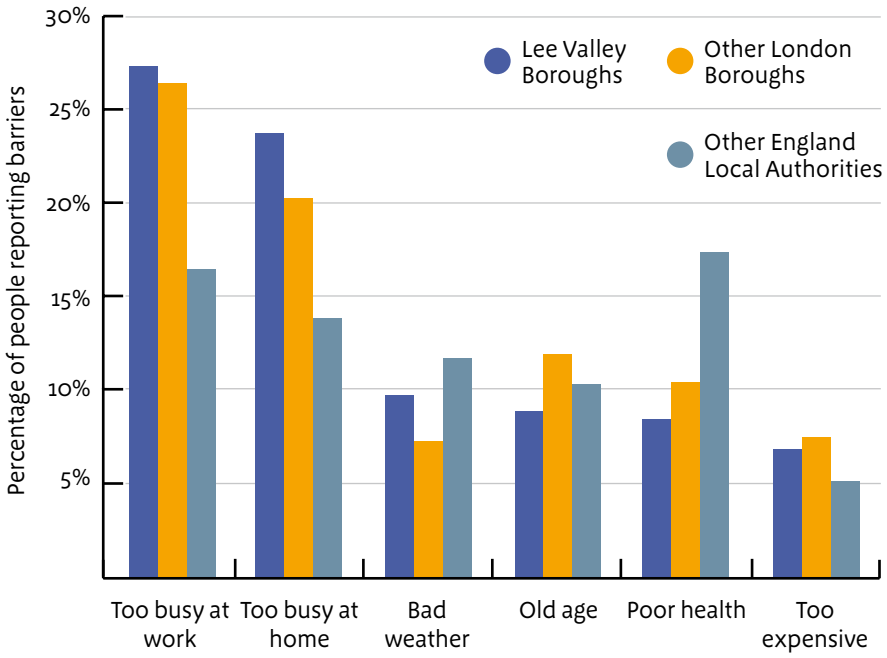
> **"respondents from the Lee Valley and other London boroughs live in areas with scarce green space; approximately half the respondents lived in LSOAs that are in the lowest quintile of green space coverage in the UK.**

MENE also collects data on barriers which inhibit respondents who visit natural environments infrequently or not at all. For the Lee Valley, there were 765 responses over the 4 year period; for the other London boroughs there were 723 respondents; and for the other England respondents there were 545 respondents.

The following chart shows the breakdown of responses according to location.

[d]Matching the Lee Valley boroughs with local authorities in the rest of England was straightforward, but as well as we tried to match the Lee Valley boroughs with similarly deprived boroughs in London, the Lee Valley boroughs are the most deprived in London, so finding completely comparable boroughs in the remainder was an impossibility; this is why these differences are present.

Figure 2. The most commonly reported barriers for respondents in each location group.



For all areas, citing being too busy at work or home, poor health, and old age all appeared within the top five barriers. These findings further supported the need to account for working status, age, and the presence of illness or disability in this analysis. Furthermore, as "too busy at home" was a frequently reported barrier, we additionally controlled for the presence or absence of children in a respondent's household as a proxy for this. It is not yet possible to account for weather variables in the MENE dataset, but Natural England are working with partners to be able to capture this data.

Analysis and methodology

For the remainder of the report, we pose a series of questions concerning the Olympic legacy, and then attempt to answer them using statistical analysis of the MENE data:

1. Do motivations for health and exercise when visiting outdoor natural environments increase from the 3 years before until the year after the London 2012 Games? And are changes more pronounced for Lee Valley residents?
2. Do people undertake more physical activities when visiting outdoor natural environments from the 3 years before until the 1 year after the London 2012 Games? And are changes more pronounced for Lee Valley residents?
3. Are more people undertaking at least one day per week of 30 minutes, moderate intensity (sufficient) physical activity after the Games? And are the differences greater for Lee Valley residents?
4. Are more people meeting recommended physical activity guidelines after the Games? And are the changes from before until after the Games more pronounced for Lee Valley residents?
5. Do visits to urban green spaces increase from before until after the Games? And are potential increases greater for Lee Valley residents?
6. Does the proportion of people visiting natural environments more than once per week increase from before until after the Games? And are potential increases greater for residents of the Lee Valley?

To analyse each of these six questions we use a method called binary logistic regression. This allowed us to predict the likelihood of a variable which has two outcomes such as 'yes' or 'no'.

Binary logistic regression allowed us to determine whether the proportion reporting 'yes' changed in response to one or more other variables. For this analysis we were particularly interested in whether the responses came from before or after the start of the Games, and in which of the three areas the respondent lived. By including other variables, we could also see how the proportion reporting 'yes' changed for respondents with different characteristics.

The resulting analysis revealed increases or decreases in the percentage likelihood of people reporting 'yes' for any one variable accounting for all others we entered, and also whether these were statistically significant.

In this report all results are stated as likelihood increases or decreases with accompanying percentage point differences. **Unless otherwise stated, all results and percentage chances reported are statistically significant at the 95 percent level of confidence**. This analysis is intended to form a baseline, exploratory study; future studies with MENE can refine, expand or improve this design whilst examining any emerging trends in the years following the Games.

It is important to note that these analyses model association only and one should not attempt to infer causation from any results stated. Whenever we state that the Games could have had an effect on a certain variable, this is a **very tentative** statement. We have controlled for some variables that may have changed from before until after the start of the Games, but it is impossible to account for all changes that occurred in the locations, or to the respondents, from the three years prior until one year after the Games; because of this, any such statements should be treated with caution.

More generally, we examined physical activity as reported by the respondent in some sections. It is well established that self-reports of physical activity are not well correlated with objective estimates of physical activity[14] and thus any statements of proportions of people, for example, achieving recommended levels of physical activity, should be taken carefully.

Analyses

The effect of the Games on health and exercise motivations

We were interested in whether the proportion of people who reported taking leisure visits to natural environments for health or exercise reasons increased from the three years before until the year after the Games, and whether these changes were more pronounced for Lee Valley residents.

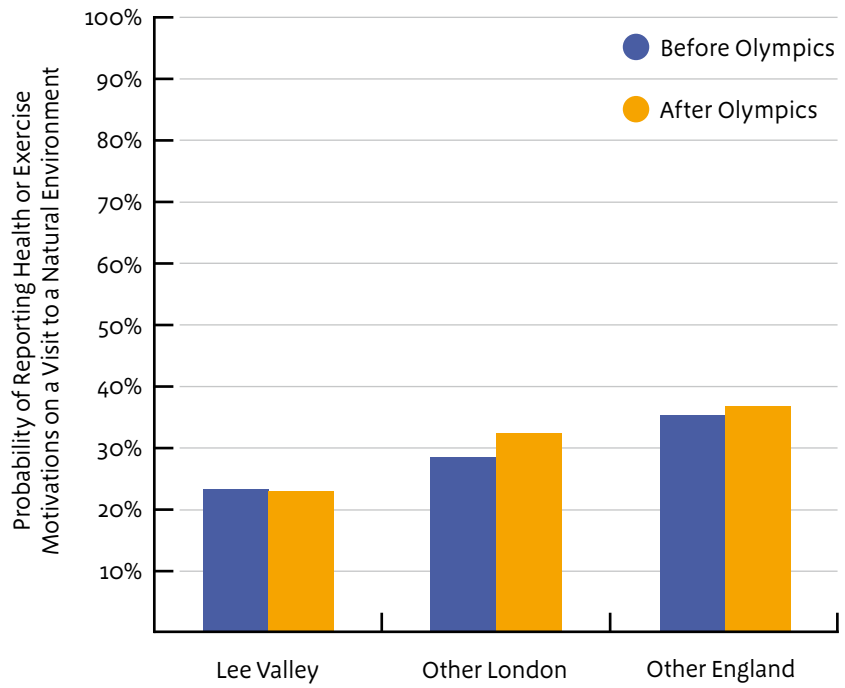
In the first three years of MENE, respondents were asked on a monthly basis what motivated their visit to a natural environment (in subsequent years, this question is being asked weekly). Respondents can choose from a list of options, one of which is, "for health or exercise." If the legacy was effective we should see increases in the proportion of people reporting this motivation, with perhaps the greatest increase being amongst the residents of the Lee Valley. 3,482 respondents were included in this analysis.

> **...there appeared to be no significant change in the proportion of respondents who reported being motivated by health and exercise from before until after the Games.**

Controlling for a series of demographic variables and looking at all respondents collectively, there appeared to be no significant change in the proportion of respondents who reported being motivated by health and exercise from before until after the Games.

Across all four years, the respondents from the other England group of boroughs were over one and a half times (13 percentage points) more likely to report motivations for health compared to respondents from the Lee Valley.

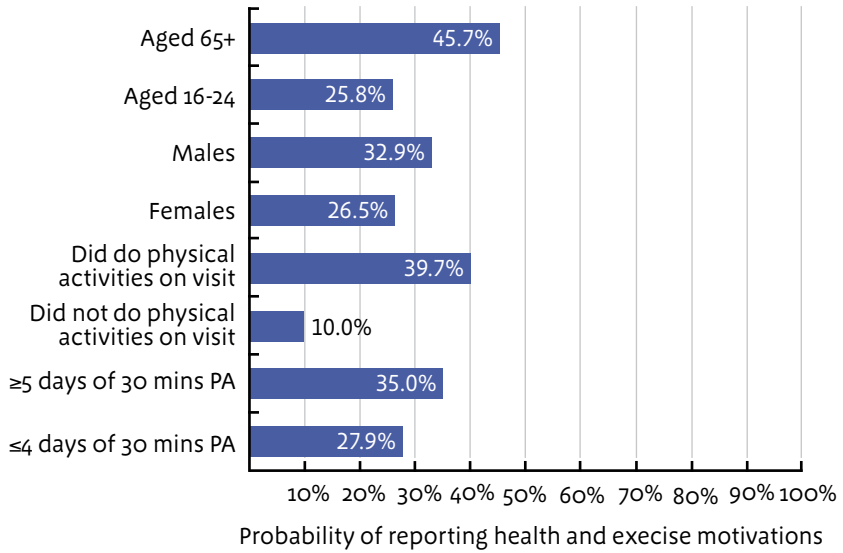
Figure 3. Percentage probability of reporting a health or exercise motivation when making a leisure visit by location group and time (adjusted for control variables).



More notably, when we split up the analysis, it became apparent that although there was a significant increase in the proportion of residents reporting health and exercise motivations in the other London group (and a near significant increase for other England residents), there was no significant change for residents of the Lee Valley, in fact there was a slight decrease as shown in the graph above.

This contradicts predictions of the legacy; instead of the local residents of the Lee Valley being more motivated to be healthy and exercise when they go outdoors, there is no change. However, independent of a number of other factors, this evidence suggests that **the Games could be said to have had a positive effect in terms of the proportion of people being motivated by health and exercise in the other London boroughs**. Nonetheless, it must be noted that there could be other factors that changed from before until after the Games that may be driving these effects which we could not account for in the present analysis.

Figure 4. Percentage probability of reporting a health or exercise motivation according to different demographics (pooled for all three location groups over the four year period).



The graph opposite shows where health and exercise motivations significantly differed across variables included in our analysis. The key findings are summarised as follows:

- People who reported meeting physical activity guidelines were over one and a quarter times (seven percentage points) more likely to report health or exercise motivations (for a visit to the natural environment) than those that did not.
- People who undertook exercise-based activities on their leisure visit were almost four times (30 percentage points) as likely to report having been motivated by health, than those which did not undertake exercise-based activities.
- Male respondents were almost one and a quarter times (six percentage points) more likely than female respondents to report health or exercise motivations. This is consistent with scientific research that reports that females experience more barriers to health and exercise than males.
- Respondents aged 65 or older were over one and three quarter times (20 percentage points) more likely than 16-24 year olds to report health and exercise motivations for their visit. This is surprising considering most research finds that older people experience poorer health and more barriers to exercise. What this may mean is that people aged 65+ consider other outdoor activities, such as relaxing in a natural environment, to be healthy activities rather than just exercise or physical activity.

"After the Games, although there was a significant increase in the proportion of residents reporting health and exercise motivations in the other London group (and a near significant increase for other England residents), there was no significant change for residents of the Lee Valley.

What this means in practice is that for respondents in these areas, being more physically active in general, doing physical activities on your outdoor visits, being male, and being 65 or over were all associated with a higher likelihood of being motivated by health and exercise on natural environment visits. However, if a respondent is motivated by health and exercise, this does not necessarily mean that they will undertake exercise-based activities on their visit. Therefore, in the next chapter, we examined whether the Games affected the proportion of people undertaking recreational physical activities on their leisure visits to natural environments.

The effect of the Games on undertaking recreational physical activities

In this chapter we investigated whether respondents undertook more physical activities when visiting outdoor natural environments in the three years prior to, until the year after, the Games and whether any changes were more pronounced for Lee Valley residents.

On a weekly basis, MENE asks respondents to state all the activities they undertook on their visit to a natural environment. The survey provides a list and respondents can choose all that apply. For this analysis we classed 'physical activities' and 'more sedentary activities' as follows:

> **"...the proportion of people who reported undertaking physical activities on their leisure visit did not change significantly from before until after the Games.**

Table 2. The list of possible leisure activities offered in the MENE survey segregated into 'physical' and 'more sedentary' activities.

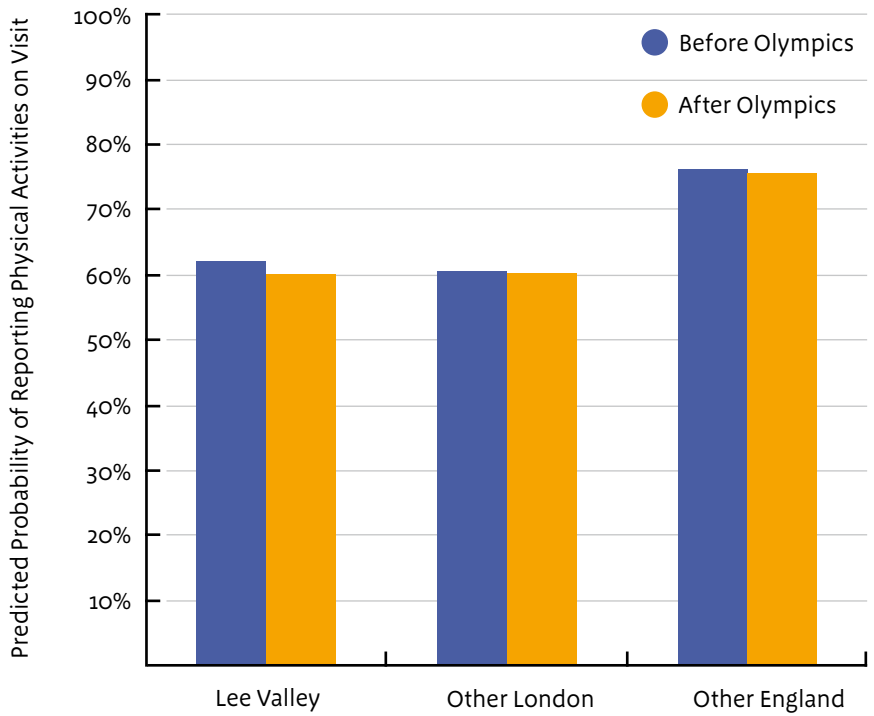
Physical activities	More sedentary activities
Fieldsports (e.g. shooting and hunting)	Eating/drinking
Horse-riding	Fishing
Off road cycling or mountain biking	Off road driving or motorcycling
Road cycling	Picknicking
Running	Playing with children
Swimming outdoors	Appreciating scenery from your car (e.g. at a viewpoint)
Walking, not with a dog (including short walks, rambling and hill walking)?	Visits to a beach, sunbathing or paddling in the sea
Walking, with a dog (including short walks, rambling and hill walking)?	Visiting an attraction
Watersports	Wildlife watching
Informal games and sport (e.g. frisbee or golf)	Any other outdoor activities
	None

If the legacy was effective, higher proportions of respondents should be reporting undertaking physical activities on their natural environment visits after the Games, with perhaps the largest increases amongst the residents of the Lee Valley. 6,675 respondents were included in this analysis.

Controlling for a number of variables, across all locations, the proportion of people who reported undertaking physical activities on their leisure visit did not change significantly from before until after the Games.

Across all four years, respondents from the other England boroughs were **one and a quarter times (15 percentage points) more likely** than other London respondents and **almost one and a quarter times (15 percentage points) more likely** than Lee Valley respondents, to report undertaking physical activities on their leisure visit.

Figure 5. Percentage probability of a respondent reporting doing physical activities on their leisure visit by location group and time (adjusted for control variables).



When we split up the analysis it became apparent that there were differences across location groups. Before the Games, residents from the Lee Valley were **significantly more likely to report doing physical activities** on their visit compared to residents from the other London boroughs, however after the Games, the proportion of Lee Valley residents reporting such activities significantly reduced and was now no different from the proportion of other London respondents reporting physical activities. There were no significant changes in reportage for either of the other London or other England groups.

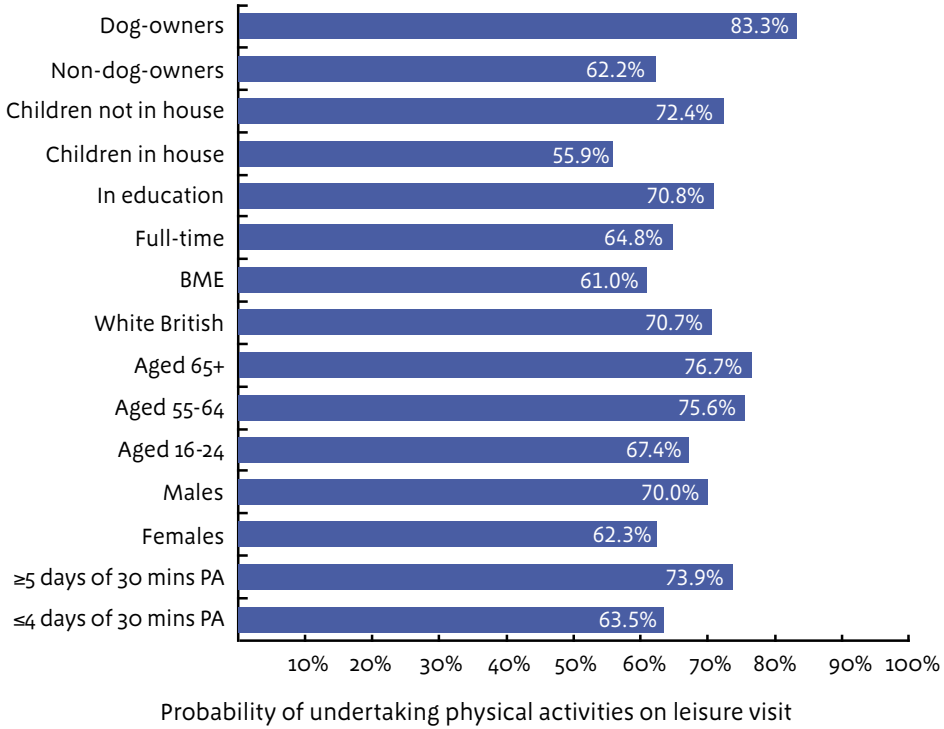
> **"The proportion of Lee Valley residents undertaking physical activities on their leisure visits to natural environments significantly reduced from before until after the Games.**

Again, this refutes what the Olympic legacy predicted which suggested that more people would be undertaking physical and sporting activities after the Games. Although **we cannot account for indoor sport and activities**, in terms of outdoor activities in natural environments, there is no overall change in the proportions of people doing physical activities, and there is a significant drop in the proportion of residents from the Lee Valley doing such activities – the people for whom the legacy should be having the greatest impact.

The graph opposite shows how the probability of undertaking physical activities on a leisure visit differed according to various respondent characteristics. All differences are significant and the results can be summarised as follows:

- People who reported meeting recommended physical activity guidelines were **1.2 times (ten percentage points) more likely** to report doing physical activities on their visit than those that did not.
- Males were **1.1 times (eight percentage points) more likely** than females to do physical activities on their visit. Again this result is consistent with scientific research stating that females experience more barriers to physical activity than males.
- 55-64 year olds were **1.1 times (eight percentage points) more likely**; and 65+ year olds **1.1 times (nine percentage points) more likely**; than 16-24 year olds to report undertaking physical activities on their visit.
- BME respondents were **1.1 times (10 percentage points) less likely** than white British respondents to report undertaking physical activities on their leisure visit. This is consistent with scientific literature stating that BME populations experience more barriers to outdoor physical activity.
- Respondents in education were **1.1 times (six percentage points) more likely** than respondents working full-time to undertake physical activities on their visit. This may be because people in education tend to have more free time and reflects what was discovered earlier when looking at the barriers data.
- Respondents with no children in their household were nearly **one and a third times (16.5 percentage points) more likely** than those with children in their household to report undertaking physical activities on their leisure visit.
- Respondents who owned a dog were **over one and a third times (21 percentage points) more likely** to have undertaken physical activity on their visit than respondents who did not own a dog. This is likely due to the fact that dog walking is included as a 'physical activity' under our definition.

Figure 6. Percentage probability of reporting undertaking physical activities on a leisure visit according to different demographics (pooled for all three location groups over the four year period).



Therefore for these respondents, being more physically active, being male, being aged over 55, being of white British ethnicity, being in education, not having children in your household and owning a dog were all associated with a higher probability that one will undertake physical activities on their outdoor leisure visit to natural environments. However, we do not yet know if the effect of the Games could make people who were not previously physically active, uptake at least some physical activity; this possibility is explored in the next chapter.

The effect of the Games on undertaking at least one day of adequate physical activity

In this part, we investigated whether more respondents were undertaking at least one day per week of 30 minutes, moderate intensity (sufficient) physical activity after the Games, and whether any increases were greater for Lee Valley residents. MENE asks every respondent surveyed:

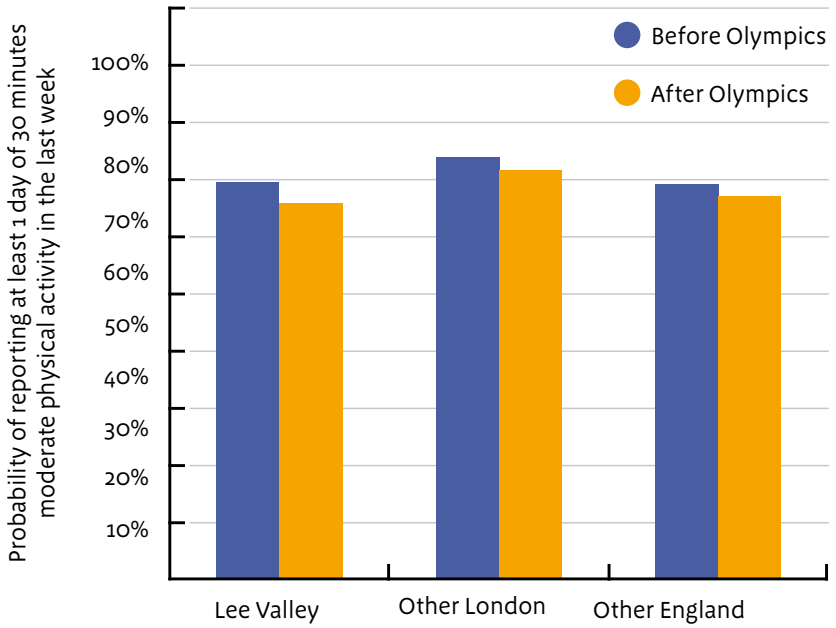
> "In the past week, on how many days have you done a total of 30 minutes or more of physical activity, which was enough to raise your breathing rate? This may include sport, exercise, and brisk walking or cycling for recreation or to get to and from places, but should not include housework or physical activity that may be part of your job."

The participant responds by stating how many days they met these criteria. For this analysis we compared respondents who reported zero days in the last week with those who reported one or more days in the last week. If the legacy was successful, we would observe an increase in the proportion of respondents reporting at least one day of sufficient physical activity in the last week, with perhaps the greatest increases amongst the residents of the Lee Valley. 6,675 respondents were included in this analysis.

Controlling for a number of variables, across all locations, there was a **nearly significant *drop*** in the proportion of respondents reporting undertaking at least one day per week of sufficient physical activity. Specifically, all respondents were almost three percentage points less likely to report having done one day of sufficient physical activity in the last week after the Games; although this seems a small drop, it represents a near statistically significant decrease.

Across all four years, respondents from other London boroughs were **1.1 times (four and a half percentage points) more likely** to have had reported one day of sufficient physical activity in the last week compared to respondents from other England local authorities. Respondents from other London boroughs were **1.1 times (nearly 5 percentage points) more likely** to have had reported one day of sufficient physical activity in the last week compared to respondents from the Lee Valley.

Figure 7. Percentage probability of reporting doing one day of 30 minutes moderate physical activity in the past week by location group and time (adjusted for control variables).



When splitting up the analysis, there were no differences across time for the different locations. Individually, all location groups' probabilities of reporting one day of sufficient physical activity in the last week went significantly down, as the graph above shows.

> **"After the games, there was a nearly significant drop in the proportion of respondents who reported undertaking at least one day of sufficient physical activity.**

The maps below show which areas of the Lee Valley demonstrated the most significant reductions in the probability of achieving at least one day of sufficient physical activity in the past week. Reductions seem to be spread across the Lee Valley, but notably large decreases are apparent in the Enfield area (northernmost areas of the map).

Again, this goes against the predictions of the Olympic legacy. In our sample, people are less likely to be physically active on at least one day in the past seven, in the year after the Games.

Figure 8. Chloropleth maps of MSOAs in the Lee Valley before and after the Games. The darker the shading the more likely the respondents in that MSOA were to undertake at least one day of sufficient physical activity in the past week.

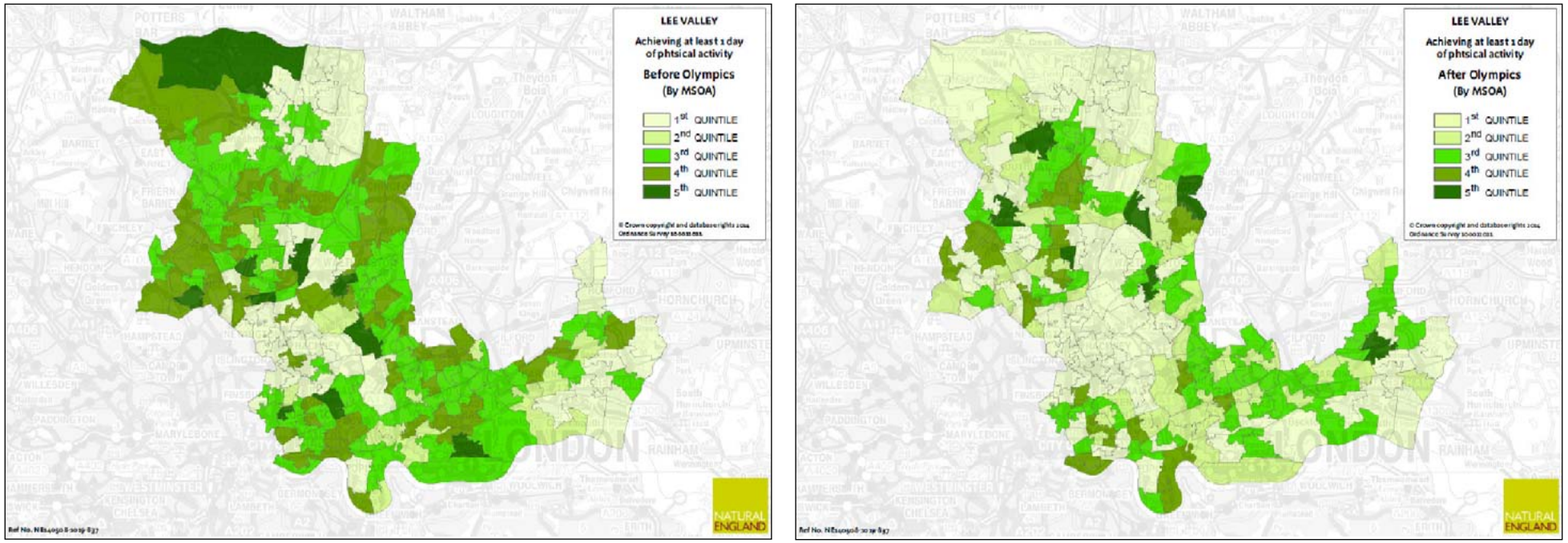
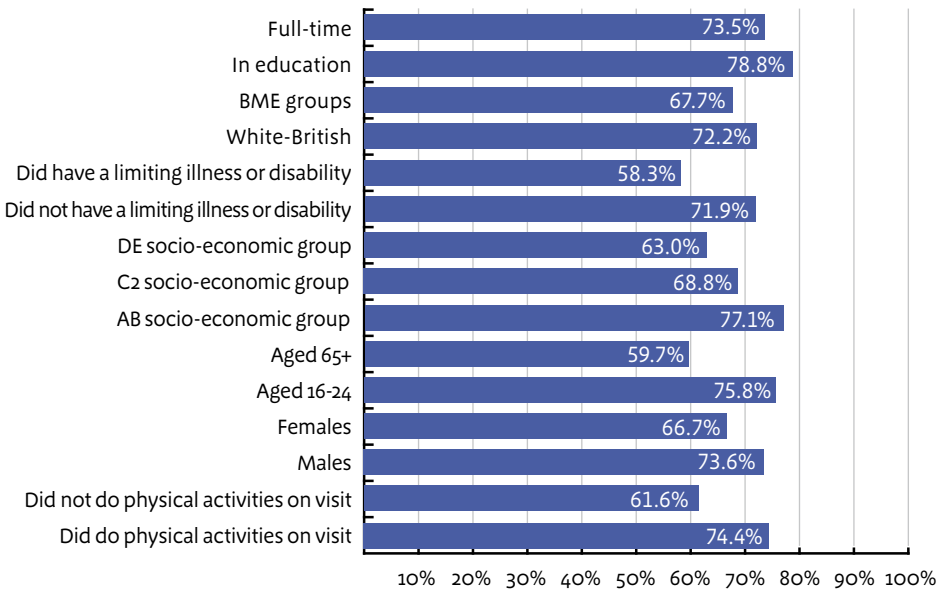


Figure 9. Percentage probability of reporting doing one day of 30 minutes moderate physical activity in the past week according to different demographics (pooled for all three location groups over the four year period).



The graph above shows the individual variables upon which respondents significantly differed in the likelihood of reporting completing at least 1 day of sufficient physical activity in the last week. The results can be summarised as follows:

- People who undertook physical activities on their leisure visit were **1.2 times (13 percentage points) more likely** to report completing at least one day of sufficient physical activity in the past week than those who did not. This could mean that the activity completed on the respondent's leisure visit was at least 30 minutes, moderate-intensity and thus contributed to them achieving at least one day of sufficient activity in the past week.
- Males were **1.1 times (seven percentage points) more likely** to report completing at least one day of sufficient physical activity in the past week compared to females. Again this reflects the evidence that females experience more barriers to physical activity than males.
- 16-24 year olds were **over one and a quarter times (16 percentage points) more likely** than 65+ year olds to report completing at least one day of sufficient physical activity in the past week. This is interesting as the 65+ age group were more motivated by health and exercise. What this probably means is that for 65+ year olds, 'healthy' activities are not necessarily exercise-based activities; they could be concerned with rest and relaxation for example. Considering that 65+ year olds had a significantly higher chance of doing physical activities on their leisure visit, it may also mean that the physical activity that older people do on their leisure visit is not of a high enough intensity to contribute to achieving at least one day of 30 minutes moderate intensity exercise in the past week (e.g. it may have been a slow walk, amble, or dog walk).
- Respondents classed in the AB socio-economic group were **1.1 times (eight percentage points) more likely** than C2 respondents, and **1.2 times (14 percentage points) more likely** than DE respondents to have had reported completing at least one day of sufficient physical activity

in the past week. This is consistent with research that suggests that people of lower socio-economic status suffer from more barriers to physical activity than people of higher socio-economic status.

- Respondents who *did not* have a limiting illness or disability were **almost one and a quarter times (14 percentage points) more likely** to report completing at least one day of sufficient physical activity in the past week than those that do have a limiting illness or disability.
- White-British respondents were **1.1 times (4 percentage points) more likely** than BME respondents to report having completed at least one day of physical activity in the past week. This could be for a number of reasons including cultural and religious or because both indoor and outdoor environments that cater for physical activity are not suited to the behavioural dispositions of black and minority ethnic populations.
- Respondents in education were **1.1 times (5 percentage points) more likely** than full-time workers to achieve at least one day of sufficient physical activity in the past week. This could be due to the fact that those people in education may have more free time in order to practice physical activity.

In summary, for the respondents in this sample, doing physical activities on a leisure visit, being male, being aged between 16-24, being in the AB socio-economic group, not having a limiting illness or disability, being white British, and being in education were all associated with a higher likelihood of completing at least one day of sufficient physical activity in the last week. Although the Games appear to not make people who were sedentary uptake some activity, it could change the proportion of people meeting recommended physical activity guidelines; this possibility is explored in the next chapter.

The effect of the Games on meeting recommended physical activity guidelines

In this section, we explored whether more people reported meeting recommended physical activity guidelines after the Games and if so, whether any increases were more pronounced for Lee Valley residents.

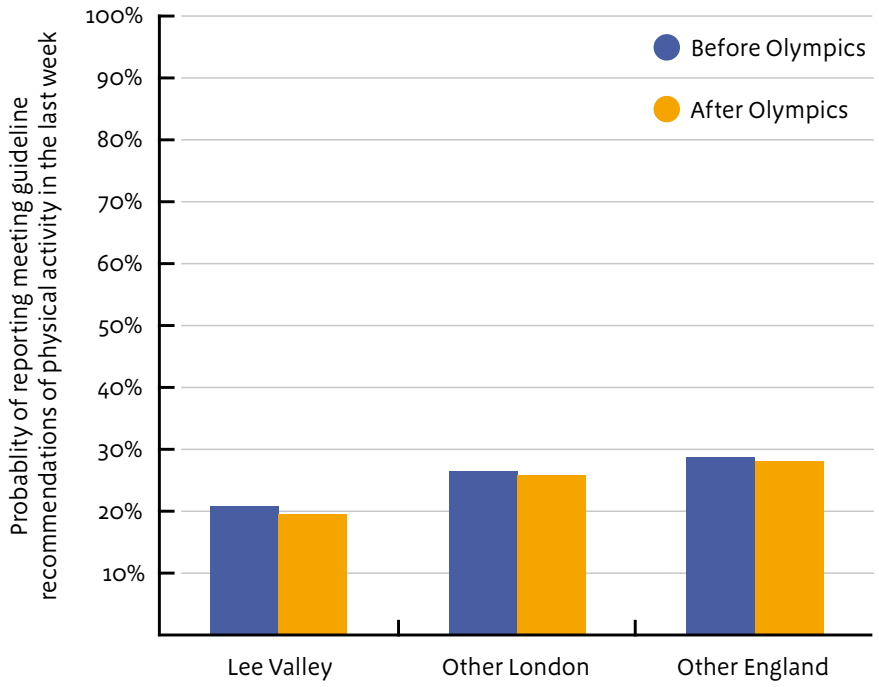
Using the same MENE item that we used in the last chapter, we took any respondent that reported completing at least five days of 30 minutes physical activity in the past week as someone who met recommended physical activity guidelines, and anyone who did less than this, as someone who did not meet recommended guidelines.[15] If the legacy was successful, we should be able to observe a significant increase in the proportion of people who reported meeting recommended physical activity guidelines, with the residents of the Lee Valley perhaps showing the greatest increases. 6,675 respondents were included in this analysis.

> **For all respondents, there was no significant change in the proportion who reported meeting recommended guidelines from before until after the Games**

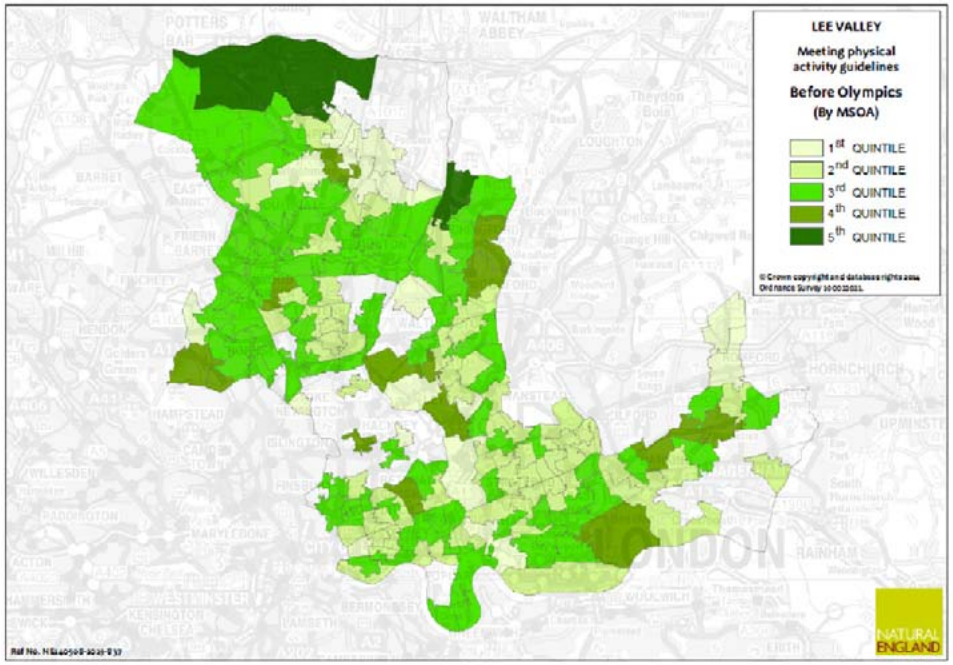
For all respondents, there was **no significant change** in the proportion who reported meeting recommended guidelines from before until after the Games

Controlling for all variables across all four years, whilst there were no differences between the other England and Lee Valley borough respondents, respondents from other England local authorities were **1.1 times (5 percentage points) more likely** than respondents from other London boroughs to report achieving recommended levels of physical activity.

Figure 10. Percentage probability of reporting meeting physical activity guidelines by location group and time (adjusted for control variables).



When splitting up the analysis, there were no differences across time for different location groups as you can see in the graph above. Individually, the probability of reporting meeting recommended physical activity guidelines **went significantly down** for both the Lee Valley and other London location groups after the Games.



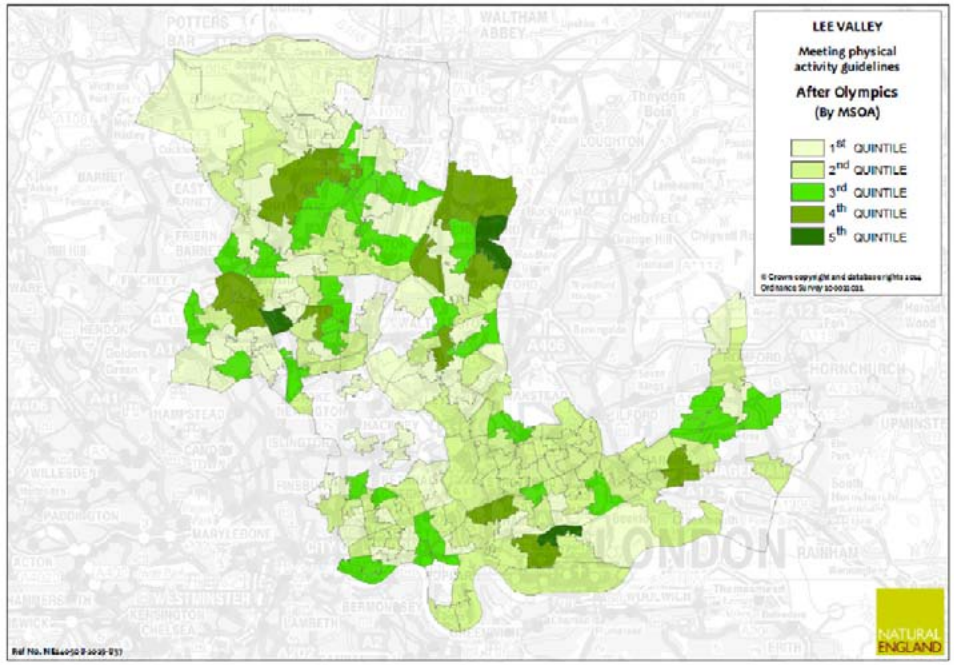
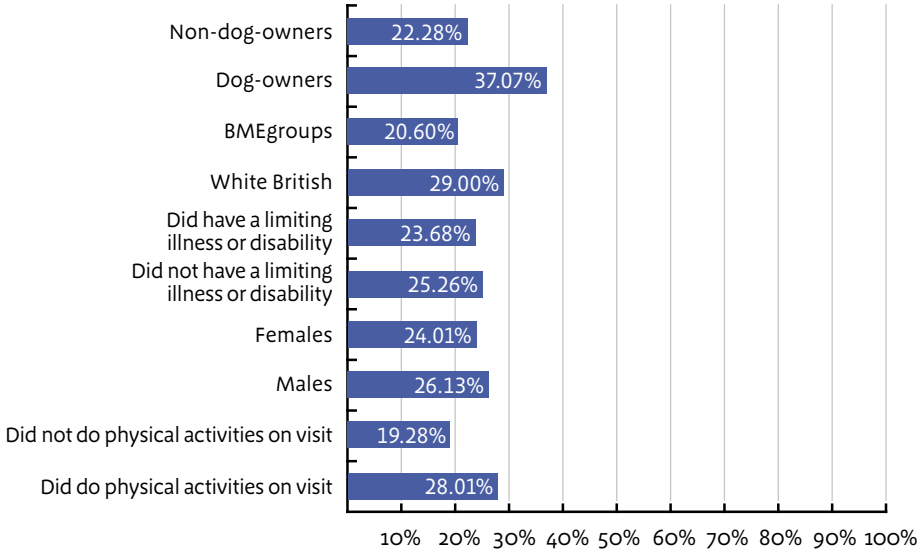


Figure 11. Chloropleth maps of MSOAs in the Lee Valley before and after the Games. The darker the shading the more likely the respondents in that MSOA were to report meeting recommended physical activity guidelines.

> **"the probability of reporting meeting recommended physical activity guidelines went significantly down for both the Lee Valley and other London location groups after the Games.**

The maps above show the areas of the Lee Valley in which the reduction in proportions of respondents meeting recommended physical activity guidelines was most noticeable. As with the last chapter, reductions are spread across the Lee Valley but Enfield areas (the northernmost MSOAs in the map) display noticeable decreases.

Figure 12. Percentage probability of reporting meeting physical activity guidelines according to different demographics (pooled for all three location groups over the four year period).



The graph above shows the individual variables upon which respondents **significantly differed** in the likelihood of reporting meeting recommended physical activity guidelines in the past week. The results can be summarised as follows:

- Respondents reporting undertaking physical activities on their leisure visit were **nearly one and a half times (nine percentage points) more likely** to report meeting recommended physical activity guidelines.
- Males were **1.1 times (two percentage points) more likely** than females to achieve recommended levels of physical activity. This is a small but significantly higher proportion.
- There were **no differences** in age or socio-economic status in terms of the proportion of respondents who reported meeting recommended physical activity guidelines. This is surprising given that a lot of physical activity research posits that older and poorer individuals experience more barriers to achieving recommended levels of physical activity. However, perhaps these differences do not appear here as all location groups only have rather low proportions of respondents who achieve recommended levels of physical activity.
- Respondents who did not have a limiting illness or disability were **1.1 times (two percentage points) more likely** to report having met recommended physical activity guidelines than those who did.
- White-British respondents were **1.41 times (eight percentage points) more likely** than BME groups to report having met recommended physical activity guidelines. Again this is consistent with other research that demonstrates the BME populations experience more barriers to achieving recommended levels of physical activity (e.g. cultural, religious, lack of facilities etc).
- Dog owners were **1.66 times (15 percentage points) more likely** than respondents who do not own a dog to report achieving recommended levels of physical activity. This is likely because walking at a moderate pace for 30 minutes is something you are likely to do with your dog on a daily basis if you are a dog owner.

Therefore in our sample of respondents, doing physical activities on your visit, being male, not having a limiting illness or disability, being White-British and owning a dog were all associated with a significantly higher likelihood of reporting achieving recommended levels of physical activity. In this analysis, owning a dog was by far the highest predictor of achieving recommended levels of physical activity. It is important to note however, that whilst, for example, not having a limiting illness is associated with a higher likelihood of achieving recommended levels of physical activity, the likelihood is still only just over 25%. What this means is that although there are factors that significantly increase chances of achieving recommended physical activity levels, most respondents still do not meet them.

Thus, there appears to not be a great amount of evidence supporting the notion that the Games have improved physical activity and health related variables. Nevertheless, we wanted to explore a subsidiary idea; that the Games had the possibility to encourage more visits, particularly to local green space. This idea is explored in the next two chapters.

> **"...owning a dog was by far the highest predictor of achieving recommended levels of physical activity.**

The effect of the Games on visits to urban green space

In this section we examined whether visits to urban green spaces increased from before until after the Games and if so, whether any increases were greater for respondents from the Lee Valley.

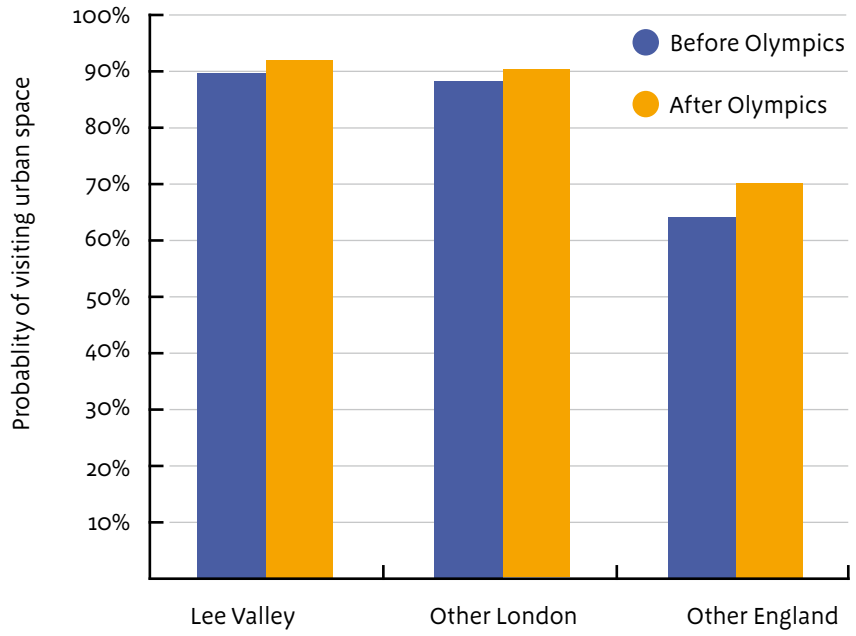
For every visit to a natural environment reported, MENE asks the respondent to report the general type of environment they visited. Respondents can choose from one of four options: In a town or city (e.g. urban green space), in a seaside resort or town, other seaside coastline (including beaches and cliffs), or in the countryside (including areas around towns and cities). In this analysis, we compared respondents who reported visiting urban green space with respondents who reported visiting one of the other three general types of location.

There is no specific effect on natural environment visitation predicted in the Olympic legacy documents, but the creation of new green space in and around the Lee Valley as a result of the Games may mean we observe pronounced increases in the proportion of Lee Valley respondents reporting visiting natural environments that were in a town or city compared to other general types of natural environment. 6,674 respondents were included in this analysis.

For all respondents, visits to urban green space as opposed to other locations **significantly increased** from before until after the Games. Specifically respondents were **three and a half percentage points more likely** to visit urban green space, compared to other types of environment, after the Games – as you can see below, all location groups displayed an increase in urban green space visits in the year after the Games.

Across all four years, respondents from other London boroughs were **one and a third times (22 percentage points) more likely** to use urban green space than respondents from other England local authorities. Residents of the Lee Valley were **over one and a third times (24 percentage points) more likely** to use urban green space than respondents from other England local authorities. These results may reflect the fact that there is a lot less choice of types of natural environment to visit for residents from London compared to residents of the other England local authorities. For example, Blackpool, one of the other England local authorities, has a prominent coastal environment which people are more likely to visit perhaps than urban green spaces.

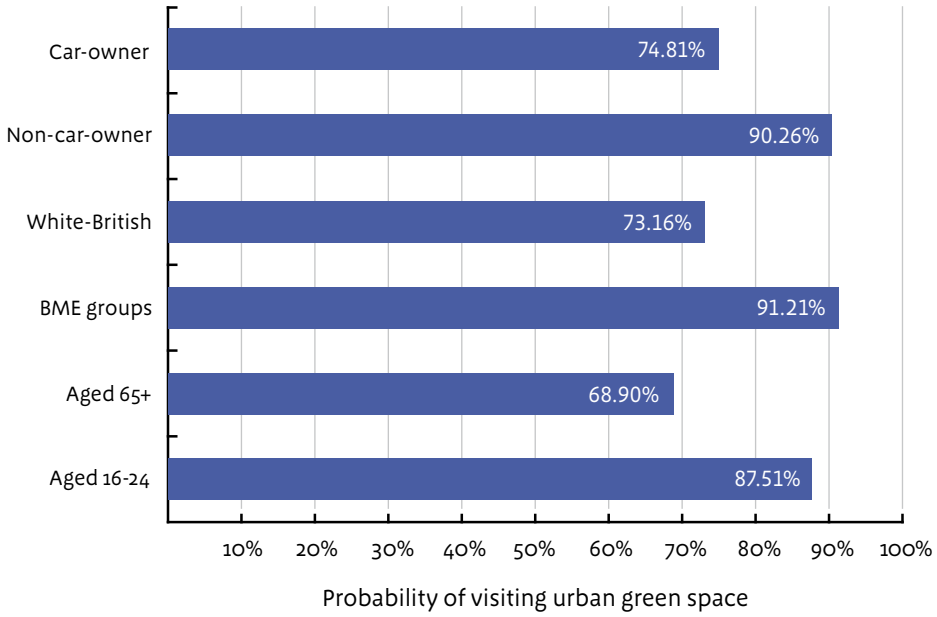
Figure 13. Percentage probability of a respondent visiting urban green space on their leisure visit by location group and time (adjusted for control variables).



> **"...visits to urban green space as opposed to other locations significantly increased from before until after the Games.**

When splitting up the analysis, it became clear that there were differences between the location groups across time. Whilst there were significant increases in likelihood for all location groups, the other England group exhibited a steeper increase, suggesting that the Games had the largest positive effect on visits to urban green space in these local authorities.

Figure 14. Percentage probability of reporting visiting urban green space according to different demographics (pooled for all three location groups over the four year period).



The graph above shows the individual variables upon which respondents significantly differed in the likelihood of visiting urban green space on their leisure visit to a natural environment. These results are pooled for all three location groups.

- 16-24 year olds were **over one and a quarter times (19 percentage points) more likely** than 65+ year olds to visit urban green space. This suggests that urban green spaces are more appealing to younger people.
- BME groups were **one and a quarter times (18 percentage points) more likely** than white-British groups to visit urban green space. As the presence of BME groups is high in the Lee Valley and other London location groups, this suggests that these demographics tend to prefer urban green space to other sorts of natural environment, or that they can only access this sort of environment when making an outdoor leisure visit.
- Respondents who owned a car were **1.2 times (15 percentage points) less likely** to visit urban green space than respondents without a car. This suggests that people who own cars choose to access other sorts of natural environments as these are more accessible.

In summary, being aged 16-24, being of black or minority ethnicity, and not owning a car were all associated with a higher likelihood of visiting urban green space in these respondents. Again, it is important to note that whilst certain demographic/lifestyle characteristics were associated with a higher probability of visiting urban green space, in reality all populations were rather likely to visit it. For example, even though respondents aged 16-24 were more likely to visit urban green space than 65+ year olds; 65+ year olds still had almost a 70 percent chance of visiting it.

Whilst this evidence shows some support for the effect of the Games on urban green space visits, there may be other variables that changed from before until after the start of the Games that could be driving the increase

in urban green space visits that we cannot account for. For example, if the weather happened to be a lot worse in the year following the Games for the North-West, it may prevent people from the other England local authorities travelling further afield and thus may be responsible for a higher proportion of reported urban green space visits, as these tend to be more local to a respondent's residence. Further research would be required to investigate the influence of weather as it is beyond the scope of the present research.

Although there appear to be increases in urban green space visits, we also wanted to test whether the effect of the Games could be associated with a higher proportion of people making multiple visits to natural environments in the last week compared to just one. This possibility is explored in the final chapter.

The effect of the Games on the number of visits made to natural environments

In this section we looked at whether the proportion of respondents visiting natural environments more than once per week increased from before until after the Games and whether any potential increases were greater for residents of the Lee Valley.

MENE surveyors ask all respondents:

> "I would like to record details of occasions when you made out of door visits during each of the last 7 days. How many times, if at all, did you make this type of visit yesterday (or another day)?"

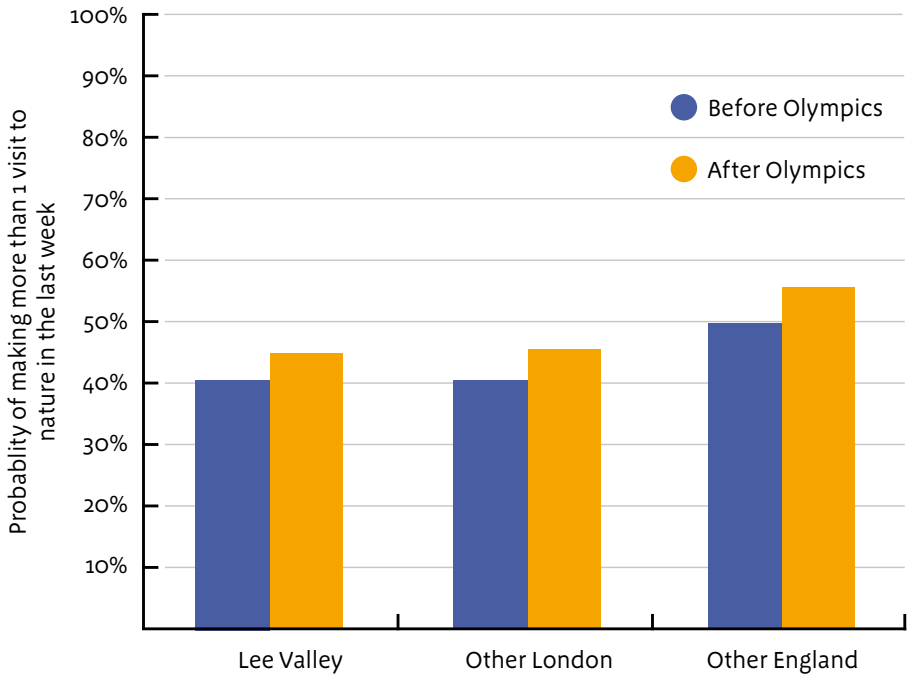
Surveyors make it clear that 'out of doors' refers to natural environments and that any reported visits should not include routine shopping trips or time spent in one's own garden. In this question we compared respondents that reported only making one visit to a natural environment in the past week with respondents who reported making two or more visits to natural environments in the past week. Again, there is no specific effect predicted by the Olympic legacy literature upon making visits to natural environments, but with the addition of new green space in the Lee Valley, we may have expected pronounced increases in the proportion of Lee Valley residents making more than one visit to natural environments in the past week, on account of the extra incentive the additional green space may provide. 6,675 respondents were included in this analysis.

For all respondents, the likelihood of making multiple visits to natural environments in the past week increased significantly after the Games.

Specifically, after the Games, respondents were **1.1 times (five percentage points) more likely** to make multiple visits to natural environments in the past week.

Across all four years, respondents from other England local authorities were almost **one and a quarter times (ten percentage points) more likely** than other London borough respondents and almost **one and a quarter times (ten percentage points) more likely** than Lee Valley borough respondents, to make multiple visits to natural environments in the past week.

Figure 15. Percentage probability of reporting more than one leisure visit to a natural environment in the past week by location group and time (adjusted for control variables).

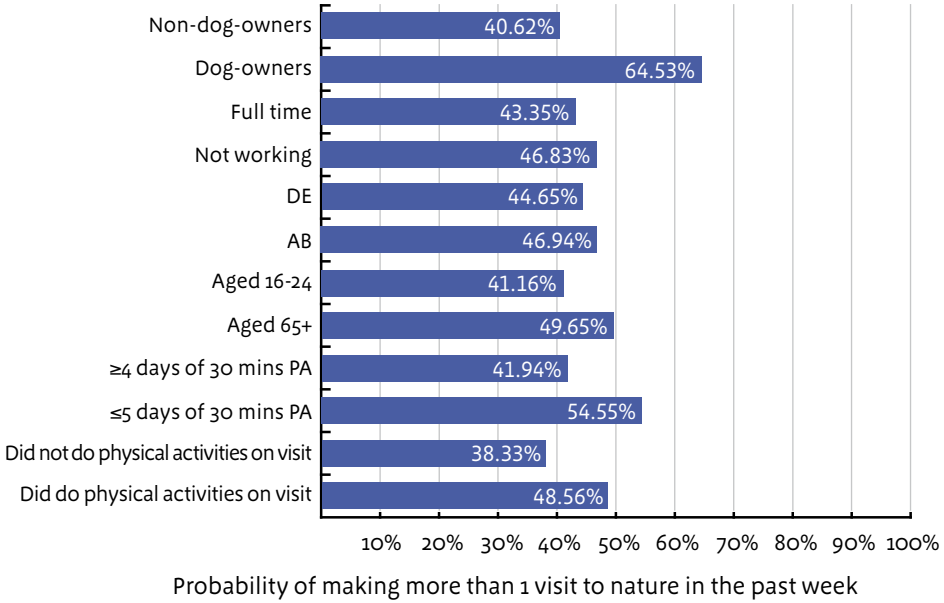


"...the likelihood of making multiple visits to natural environments in the past week increased significantly after the Games.

By splitting up the analysis we found that across time, there were slight differences across locations with other London boroughs and other England local authorities experiencing marginally **steeper increases** in the proportions of respondents visiting natural environments more than once in the past week from before until after the Games, compared to Lee Valley boroughs. All location groups individually experienced significant increases in the proportion of respondents visiting natural environments more than once per week.

Again, although increasing visits to natural environments was not part of the Olympic legacy strategy, our findings suggest it may have been a consequence of the Games – taken together with the last set of results, respondents appear to be making **more visits to natural environments per week** and specifically **more visits to urban green space**.

Figure 16. Percentage probability of reporting more than one visit to a natural environment in the last week according to different demographics (pooled for all three location groups over the four year period).



The graph above shows the individual variables upon which respondents significantly differed in the likelihood of making multiple visits to natural environments in the past week. The results can be summarised as follows:

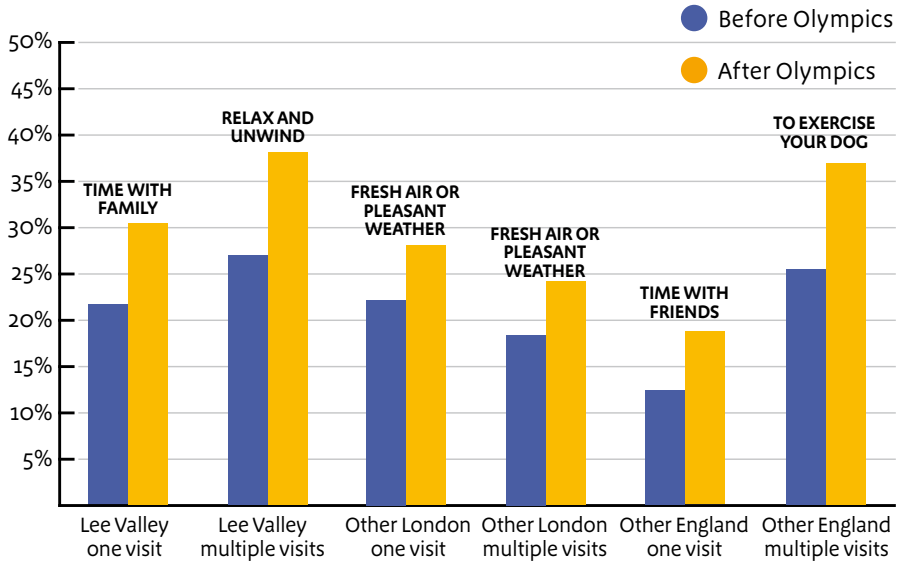
- Respondents who undertook physical activities on their natural environment visit were **over one and a quarter times (ten percentage points) more likely** to make multiple visits to natural environments in the past week than those who did not. This suggests that people who use natural environments more than once per week may be using them for physical activity purposes.
- Respondents who reported meeting recommended physical activity guidelines were **1.3 times (13 percentage points) more likely** to make multiple visits to natural environments in the last week than those who reported not meeting recommended guidelines. This suggests that fitter people are more frequent users of natural environments.
- 65+ year olds were **1.2 times (eight percentage points) more likely** than 16-24 year olds to make multiple visits to natural environments in the past week. This may be because older people have more free time in order to enjoy natural environments.
- Respondents in the DE socio-economic grading were **1.1 times (two percentage points) less likely** to visit natural environments multiple times in the past week than respondents in the AB socio-economic grading. This may seem small, but represents a significantly smaller proportion of respondents.
- Respondents who were not working were **1.1 times (three percentage points) more likely** to multiple visits to natural environments in the past week than respondents who worked full-time. Again, this is likely because people who are not in work have more free time.
- Dog owners were **1.6 times (24 percentage points) more likely** to make multiple visits to natural environments in the past week than non-dog-owners. This is likely because dogs need walking in outdoor environments on a regular basis.

This reveals that doing physical activities on your natural environment visit, achieving recommended physical activity guidelines, being aged 65 or over, being in the AB socio-economic grading, not working, and owning a dog were all associated with a significantly higher likelihood of making multiple visits to natural environments in the past week. Owning a dog was by far the highest predictor of making more than one visit to a natural environment in the past week.

It is important to note that this analysis only takes into account respondents that visit natural environments at least once per week. The evidence suggests that the Games encouraged people who already visited natural environments to visit more. We do not know if the Games got people who never visit natural environments, outside more. This is a question that could be researched in the future.

We wanted to explore further why higher proportions of people were making multiple visits to natural environments after the Games. In an attempt to answer this, we examined some descriptive statistics about people's motivations for visiting natural environments which are displayed below.

Figure 17. The motivations for leisure visits which increased the most from before until after the Games by location group and visit frequency.



We cannot be sure of the reasons surrounding why the increases in visitation are occurring, but this graph suggests that for people in the Lee Valley, making multiple visits in the past week was associated with a rise in reporting a desire to relax and unwind. For respondents from other London boroughs, the increases may be due to better weather. The increases for respondents from other England boroughs seem to be due to more dog walking visits being surveyed. Therefore, one suggestion for the Lee Valley is that residents do not seem to be using their green space more post-Games for exercise or health reasons, but they are at least using it more often, seemingly for relaxation purposes.

Conclusion

In summary, using the results from MENE we did not find a lot of evidence of the Games providing immediate benefits in terms of encouraging greater physical activity by local residents or wider communities. After the Games, the residents of the Lee Valley boroughs in this sample, were no more motivated by health and exercise on their leisure visits after the Games, did not undertake any more physical activities on their visits, and the proportion of respondents achieving recommended levels of physical activity per week or even one day went significantly down.

The only major positive health indication was that for respondents from other London boroughs and other England local authorities, motivations for health and exercise on natural environment visits significantly increased after the Games. It is important to note however, that we could not account for all variables that may have had an impact on physical activity levels. For example, weather data, aesthetic perceptions of natural environments and perceptions of green space safety in general could not be accounted for in the present analysis, and all have been shown to impact practicing physical activity.[16,17,18]

That said, there are items addressing green space perceptions being included in the fifth year of MENE data collection, so accounting for such variables may be possible in the near future.

Equally, our analysis is only based on one year of data after the commencement of the Games; and the physical activity legacy of the London 2012 Olympic Games may take longer to emerge within national datasets; indeed recent legacy literature has highlighted the legacy as a 10 year project.[19]

Nevertheless, there were more positive results in terms of increases in visits to natural environments per week and in visits to urban green spaces (largely local spaces). Although it is not outlined in the legacy that more visits to outdoor and natural environments should be a consequence of the games, we have nonetheless found an association. This is particularly important as some of these people represent demographics that are generally less well presented in visitor research.

Both the Lee Valley boroughs and other England local authorities experienced increases in the proportion of respondents visiting urban green spaces after the start of the Games and all location groups demonstrated a significantly higher proportion of respondents visiting natural environments more than once per week post-Games. Again, these associations warrant further exploration as we could not account for all factors that may be influencing increased visits.

Results in the Lee Valley suggest that encouraging active engagement with the natural environment may not be as simple as providing new green space and promoting its availability.[e] Such behaviour change may require integrated input from experts in urban planning, leisure and recreation, public health and behavioural science[20] and more research would be helpful to enable us to better understand how to encourage greater active engagement, particularly amongst comparable communities.

[e]However we recognise that not all of the new green space created was publicly available immediately after the end of the Games; its continued promotion may yet encourage greater engagement.

The present analysis is a mere snapshot of the possibilities of MENE. It was outside the scope of this project to investigate the reasons behind all the demographic differences that were found with regard to both physical activity and visit variables, but future analyses could, for example, analyse what visit characteristics are associated with increased health and exercise motivations for younger, female, or BME populations exclusively.

Alternatively, future analyses could focus on a regional level, for example how physical activity and visit variables differ in the South-West England region considering the abundance of natural resources available. Additionally, a repeat analysis could be conducted in a few years when there is even more post-Olympic data to analyse and when weather data are included. The inclusion of visit date codes and geographical referencing means it is possible to ascribe a multitude of location or date based data to the MENE dataset in order to study phenomena such as seasonal differences or fine-grained analysis at a number of geographical levels.

Changing health and physical activity patterns is a major challenge facing the UK government, and one which is unlikely to be solved by purely the occurrence of a mega sporting event such as the London 2012 Olympic and Paralympic Games. However, our data analysis suggests a less tangible legacy with regards to increased outdoor visitation may have some substance and this could be worthwhile investigating in the future. MENE is an ideal resource in order to be able to do this with its wealth of demographic, geographical and visit-based information.

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