

# Taking a local government perspective for economic evaluation of a population-level programme to promote exercise

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**Taking a local government perspective for economic evaluation of a  
population-level programme to promote exercise**

## **ABSTRACT**

**Background.** In order to tackle the issue of physical inactivity, local governments have implemented population-level programmes to promote exercise. While evidence is accumulating on the cost-effectiveness of these interventions, studies have typically adopted a health sector perspective for economic evaluation. This approach has been challenged as it does not allow for key concerns by local governments, which are primary stakeholders, to be addressed.

**Objectives.** To show how taking a local government perspective for economic evaluation can be implemented in practice and this may affect the economic conclusions.

**Methods.** Based on data from a case study, the health equity impact of the intervention and its opportunity cost from a service provider viewpoint were assessed. The cost-effectiveness implications of a change in perspective were subsequently estimated by means of scenario analysis.

**Findings.** The intervention was found to provide adult residents living in the most deprived city areas with greater health benefits compared with the rest of the population. However, a negative net equity impact was found in the short-term. The opportunity cost of the intervention was estimated to be substantially lower than its financial cost (£2.77 per person/year), with significant implications for decision-making.

**Conclusions.** Taking a local government perspective can affect the conclusions drawn from the economic evaluation of population-level programmes to promote exercise, and therefore influence decision making.

**Keywords:** health equity, opportunity cost, local government, perspective, cost-effectiveness

## INTRODUCTION

Physical inactivity is a major public health issue <sup>1</sup>. The economic burden of insufficient physical activity is substantial to society, with conservative worldwide estimates reaching international \$53.8 billion to the health system, 58% of which are paid by public funds <sup>2</sup>. Despite national and international endeavors <sup>3</sup>, evidence has consistently shown that significant sections of the population do not currently exercise at recommended levels, and this is especially true in Western countries <sup>4</sup>. There is additionally a social gradient, whereby individuals from certain groups (e.g. from disadvantaged socioeconomic backgrounds) are less likely to engage in habitual leisure-time physical activity <sup>5,6</sup>.

To tackle this issue, local governments around the world, such as municipal governments <sup>7</sup> and counties in the US <sup>8</sup>, concejos municipales in Mexico and Colombia <sup>9</sup>, city councils in Australia <sup>10</sup> and local authorities in the United Kingdom <sup>11,12</sup> have responded with population-level initiatives providing exercise opportunities for local residents. These interventions have taken, for example, the form of urban regeneration projects constructing cycle and walkways <sup>11</sup>, providing accessible and safe green spaces <sup>13</sup> and offers of low-cost gym memberships <sup>14</sup>, or free exercise classes <sup>12, 15</sup>.

Such initiatives impose costs on the public purse and therefore the value for money of these interventions must be determined. To do so, economic evaluation is used to identify the optimal intervention for a given budget <sup>16</sup>. Economic evaluation is a comparative assessment of alternative and mutually exclusive courses of actions, in terms of their costs and consequences <sup>17</sup>. Relatively few economic evaluations have been conducted to evaluate such population-level initiatives <sup>18</sup>. These studies have typically used so-called “standard” approaches developed in pharmacoeconomic assessments <sup>19</sup>. In particular, the application of a

health sector perspective which considers whether the value generated in terms of population health improvements (e.g. quality-adjusted life years) is greater than the budget spent to implement the intervention. While those studies have found the interventions to be cost-effective in most cases <sup>18</sup>, such approaches have been called into question <sup>20-22</sup>.

The consideration of alternative perspectives, more recently in the form of impact inventories, has been suggested. In promoting an analytical framework for the implementation of a societal perspective, the extended impact inventory framework has been recently developed <sup>23</sup>. This framework has highlighted the relevance of considering the effects that population-level interventions can have on multiple sectors and their opportunity costs. It has also highlighted the importance of appropriate economic evaluations addressing the information needs of the decision-makers and moving away from an abstract sector perspective.

Choice of perspective is especially relevant within local governments which, in the context under study, have a dual role of public health agency and body administering the intervention. On one hand, local governments are in charge of promoting population health and reducing the existing health inequities <sup>24,25</sup>. On the other hand, they typically provide both financial resources and in-kind support in the form of staff and administrative and promotional activities <sup>9-15</sup>. This has implications for their organizations, in terms of value associated with alternative uses of the allocated resources. This is known as the opportunity costs of implementing the intervention.

Furthermore, the contrast between perspectives is apparent when considering the time horizon over which economic evaluation is conducted. In the health sector, a lifetime horizon has been recommended to be able to capture all relevant costs and benefits of health interventions <sup>19</sup>.

However, the shorter financial cycles of local governments mean that short time horizons ought to be considered. This has implications for interventions where the sustainability of the intervention effect over time is a source of uncertainty <sup>26</sup>, potentially impacting on the cost-effectiveness conclusions.

In a previous study, we assessed the cost-effectiveness of the Leeds Let's Get Active (LLGA) programme from a health sector perspective and found that it was not likely to be cost-effective at a £20,000 threshold, compared to no intervention <sup>15</sup>. We considered the population-level QALY gains generated from implementing the LLGA and its financial cost as being equal to the budget allocated, which was computed by the programme administrators using a full absorption costing method, in line with what is currently recommended in the NHS <sup>27</sup>.

Our previous economic analysis may not adequately inform investment decisions made by the local government. A change in perspective, from health care sector to local government, can affect the cost-effectiveness findings due to a different opportunity cost of hosting an intervention like the LLGA as the service provider. In addition, its role of public health agency requires an assessment of the impact of the intervention on existing health inequalities between socio-economic groups, which was a primary objective of the intervention <sup>28</sup>. This economic assessment has not yet been conducted for this type of interventions and could serve as an example on how a change in perspective can alter the identification of the optimal strategy. The present study aims to address this gap in the literature and highlight the challenges of doing so.

## **METHODS**

### **The case study**

In 2013, the local government (City Council) in the North of England was successful in securing public funding, allowing the LLGA to be financially sustained until the end of 2016. LLGA was a proportionate universal programme which aimed to promote exercise, especially among inactive residents from disadvantaged neighbourhoods. Briefly, the intervention consisted of free, mostly off-peak, exercise sessions (use of free weight areas, swimming pool and fitness classes) offered in 17 City Council-managed leisure centres in the most deprived areas<sup>29</sup>. From 2016 onwards, to make the programme sustainable over the longer term, the local authority decided to change the LLGA free offer to a small subsidised charge (no data were made available on this period)<sup>30</sup>.

Details on the available data and outcomes measures have been reported elsewhere<sup>15</sup>. Briefly, data on baseline socio-demographic variables (age, gender and Index of Multiple Deprivation (IMD) status, living in a top 20% score area or elsewhere) and current PA level (as measured by a single-item question derived by the International Physical Activity Questionnaire<sup>31</sup>), as measured in terms of number of active days (active day defined as a day with at least 30 minutes of at least moderate PA) were available for 51,847 adults who registered to the programme.

Programme attendance was monitored using an electronic card that was individually assigned to each participant and used to access the sessions (n=23,481). We computed the weekly rate of access to LLGA sessions for each participant and added it to the baseline PA category (4 categories: inactive=0, insufficiently active=1 or 2, moderately active=3 or 4; active>= 5 or more active days a week, assumed as fixed) to obtain a follow-up PA measurement at six

months. The intervention effect was therefore estimated as the difference in the distribution of the four PA categories between baseline and follow-up (i.e. parallel trends assumption).

## **Analysis**

We estimated the health equity impact of the intervention, and its opportunity cost from a service provider viewpoint to subsequently assess the cost-effectiveness implications of such change in perspective. The opportunity cost of the intervention was estimated under a decision-making context where the intervention was to be sustained for a further 39 months and external resources were no longer available to the local government, as it in fact happened with the LLGA after the allocated budget was spent. Average (per participant and year) intervention costs were calculated by dividing the estimated opportunity cost by the programme duration in years (39/12) and the respective number of individuals in the group. The price year was 2016.

## **Decision-analytic modelling**

A previously developed decision-analytic model was used to assess cost-effectiveness<sup>15</sup>. Briefly, the model is based on a continuous-time Markov chain structure and can simulate the impact of any PA intervention on health utility, mortality and costs in an adult general population. The model is divided into two arms (i.e. intervention and no-intervention), each of which is split into two sub-arms corresponding to the two IMD levels (top 20% score or elsewhere). The intervention effect is propagated as a time-dependent change in the distribution of the four PA states mentioned above. Model parameters vary according to PA state and IMD level. Seven chronic conditions associated with PA are modelled (type II diabetes, coronary heart disease, stroke, colorectal and breast cancer, depression and frailty syndrome), with distinct health utility decrements attached to them. All participants are



assumed to start in a healthy state and, based on their PA and IMD state, they can either remain healthy or transition to any of the seven disease states or die, at different rates. Details of the specific adaptations made to the previous modelling study to generate the health equity impact and cost-effectiveness implications of the intervention are provided in the dedicated paragraphs below.

**Opportunity cost of the intervention**

Three steps were followed to estimate the opportunity cost of the LLGA: identification, measurement and valuation <sup>32</sup>. Following on an activity-based costing approach <sup>33</sup> and based on the information available in terms of financial audit reports <sup>15</sup> and local governments’ organisation, functions and activities were identified relating to components of resource use during the first 39 months (**Table 1**).

**Table 1** Resource use for implementing the intervention in the first 39 months

|                 |                               | <b>Activities</b>                      |   |  |
|-----------------|-------------------------------|--|---|--|
|                 |                               | <b>Local government's organisation</b> | <b>Programme promotion</b>                      | <b>Programme delivery</b>  |
| <b>Function</b> | <b>Administration</b>         | Audit                                  | Business administration                         | Business administration  |
|                 | <b>Communication</b>          | Internal reporting                     | Recruitment of volunteers, community engagement | Leisure centre management  |
|                 | <b>Information Technology</b> | Data management                        | Programme website                               | Electronic cards and intervention data management                            |
|                 | <b>Technical services</b>     | Office management                      | Mass and social media campaigns                 | Physical activity professionals, project management and facility maintenance |

In considering the continuation of the programme beyond the first 39 months, however, only some of the activities shown in **Table 1** were presumed to be significantly impacted. Based on

the initial experience accumulated administering the LLGA programme, it was assumed that the higher-level organisational activities (first column) would no longer be affected. Similarly, fixed costs relating to administration and communication for the promotion and delivery of the intervention, and data management activities, were assumed to be incorporated into routine delivery of leisure services. Hence, using a marginal approach (i.e. considering only direct costs)<sup>34,35</sup>, resource use for the remaining four activities was measured, namely, programme website, media campaigns, project management and physical activity professionals. Market pricing was used to value the measured activities<sup>32</sup>.

### Cost-effectiveness implications

To allow for comparison with the results from our previous study, which used a health sector perspective, all the analyses were based on the sample of LLGA participants (n=51,874)<sup>15</sup>. Incremental cost-effectiveness ratios (ICERs) were calculated as differences between the total projected costs and quality-adjusted life years (QALYs) for the LLGA intervention and no intervention. Incremental net monetary benefits (INMBs) were computed valuing an extra QALY both at £20,000<sup>36</sup>, as well as at £3,800 in line with recent estimates of the marginal cost per QALY from a local public health perspective<sup>37</sup>.

The cost-effectiveness implications of taking a local government perspective were assessed by means of scenario analysis. First a change in intervention cost only was tested. Next, we explored the assumption regarding the maintenance of intervention effect over time. In our previous study, this was found to be a key driver of the results using a health sector perspective<sup>15</sup>. We vary the intervention effect from a base case of no decay (i.e. participants would remain in their 6-month post intervention physical activity category, and therefore

accrue the health benefits, for the whole time horizon), to a gradual return or immediate return to their baseline physical activity levels <sup>26</sup>.

### Health equity impact

A sub-group analysis (by IMD subgroup) of the effect of the LLGA intervention on baseline physical activity category was conducted. Following the approach used in a previous study <sup>38</sup>, quality of life-adjusted life expectancy was computed for each sub-group, defined as the number of years the cohorts were expected to live in full health.

The gross (differential) health impact of the intervention was estimated using the decision-analytic model to obtain the difference between subgroups in terms of incremental quality-adjusted life years (QALYs). The net health impact was subsequently calculated by accounting for the distribution of health opportunity costs due to resources being diverted <sup>39</sup>. No information was available regarding how the health services currently provided to the local population, which would be displaced if the intervention was implemented (i.e. health opportunity cost), were funded. Therefore, incremental costs were converted assuming that the health services were either funded exclusively using the local public health budget - health opportunity cost of £3,800 - or the national NHS budget - health opportunity cost of £13,500. Estimates of marginal changes in health expenditure by IMD status were sourced from a published analysis <sup>40</sup>. As commonly applied in public health research <sup>41</sup>, we used the difference between pre and post intervention in the slope index of inequality, and the relative index of inequality to assess the health equity impact of the LLGA intervention.

# RESULTS

## Cost-effectiveness from a local government perspective

The opportunity cost of implementing an intervention like the LLGA for a further 39 months from a service provider perspective was estimated at £466,956 (per-person/year cost equal to £2.77). This represents a reduction of around 70% from a budget of £1,524,000 (equal to a per-person/year cost of £9.04) spent for the implementation of the intervention for the first 39 months (see **Appendix I**). **Table 2** shows the average (per participant and year) costs of the intervention.

**Table 2** Comparison of average intervention costs (per participant and year)

|   |   | Intervention cost |
|---|---|-------------------|
| <b>Average participant</b>                | Per person                                | £ 2.77            |
|   | Per person attending at least 1 session   | £ 6.11            |
|   | Per inactive attending at least 1 session | £ 23.37           |
|   | Per inactive becoming more active         | £ 1,406.78        |
| <b>Participant from top 20% IMD score</b> | Per person                                | £ 14.16           |
|   | Per person attending at least 1 session   | £ 32.91           |
|   | Per inactive attending at least 1 session | £ 111.75          |
|   | Per inactive becoming more active         | £ 6,522.34        |

IMD=Index of Multiple Deprivation

From a local government perspective, attracting a local resident to the programme (i.e. registration) was estimated at a cost of £2.77 per person/year. The average cost of achieving the goal of a resident attending at least one programme session was £6.11, whereas 3.8 times as much would be necessary for an inactive adult to engage. The average cost of moving an inactive resident to an active state was substantially higher, at £1,406.78 per year. Around 4.7 times as much would be necessary for achieving these goals for adults living in the most deprived city areas.

**Table 3** compares the six scenarios corresponding to the possible combinations of perspective (and respective costing approach) and assumptions regarding the maintenance of intervention effect over time (i.e. no decay, immediate or gradual return to baseline PA level), relevant to the time horizon of the analysis.

**Table 3** Cost-effectiveness scenario analysis

|  |   |                  |      | Perspective    |                  |               |
|--|---|------------------|------|----------------|------------------|---------------|
|  |   |                  |      | QALY = £20,000 |                  | QALY = £3,800 |
|  |   |                  |      | Health sector  | Local government |               |
| Maintenance of intervention effect over time | Average participant                     | Base case*       | ICER | £ 115,230      |                  |               |
|  |   |                  | INMB | £ -1,211,403   | £ -153,359       | £ -359,436    |
|  |   | Gradual return   | ICER | £ 178,970      |                  |               |
|  |   |                  | INMB | £ 1,324,545    | £ -266,501       | £ -401,480    |
|  |   | Immediate return | ICER | £ 567,088      |                  |               |
|  |   |                  | INMB | £ -1,460,320   | £ -402,276       | £ -445,518    |
|  | Participant from top 20% IMD score area | Base case*       | ICER | £ 102,634      |                  |               |
|  |   |                  | INMB | £ -230,418     | £ -23,659        | £ -68,832     |
|  |   | Gradual return   | ICER | £ 158,168      |                  |               |
|  |   |                  | INMB | £ 253,478      | £ -46,719        | £ -76,439     |
|  |   | Immediate return | ICER | £ 492,531      |                  |               |
|  |   |                  | INMB | £ -238,685     | £ -76,927        | £ -86,653     |

Note: ICER=incremental cost-effectiveness ratio; INMB=incremental net monetary benefit. \* no decay

Under a base case assumption of no decay of intervention effect, the application of a service provider perspective on the intervention cost would shift the ICER close to the upper bound of the willingness-to-pay threshold range currently considered by NICE (£30,000). However, when more conservative assumptions about the maintenance of the intervention effect are considered, the ICERs would remain consistently above the threshold.

**Table 3** also shows that the INMB generated by the intervention is negative (i.e. health benefits provided by the intervention are less than its opportunity costs), ranging from £153,359 to £445,518, depending on how an additional QALY is valued. This would correspond to a per-participant (N=51,874) range of £2.96 to £8.59 and a per-resident (Leeds resident population  $\geq 16$  years old: 640,063<sup>42</sup>) range of £0.24 to £0.70, for the 39 months of

programme duration. However, if the programme was only targeted at residents living in the most deprived city areas, the INMB would be between 6.5 and 5 times lower than that for the entire population.

## Health equity impact

**Table 4** summarizes the results of the health equity impact assessment. A positive gross health equity impact was estimated at both a 39-month (0.00004) and a lifetime time horizon (0.00027), meaning that the LLGA would benefit - in terms of extended QALE - adults living in top 20% IMD areas to a greater extent, compared to those in the remaining 80% of the population. However, this would not be the case over the short time horizon (negative net health equity impact: -0.00004) or if the health services displaced due to implementation of the intervention were funded solely using the local public health budget, as the uneven distribution of the health opportunity costs (top 20% IMD group relies more on public service than the rest of the population) is taken into account.

**Table 4** Health equity impact of the intervention

| <b>N=51,874*</b>                      | <b>39 months</b>           | <b>Lifetime</b> | <b>39 months</b>                           | <b>Lifetime</b> |
|---------------------------------------|----------------------------|-----------------|--|-----------------|
| Total QALY gains                      | 0.0002                     | 0.0024          | 0.0002                                     | 0.0024          |
| Gross health inequality impact        | 0.00004                    | 0.00027         | 0.00004                                    | 0.00027         |
|                                       | <b>HOP from NHS budget</b> |                 | <b>HOP from local public health budget</b> |                 |
| Top 20% IMD average HOP               | 0.00029                    |                 | 0.00102                                    |                 |
| Lowest 80% IMD average HOP            | 0.00021                    |                 | 0.00073                                    |                 |
| Net health inequality impact          | -0.00004                   | 0.00019         | -0.00025                                   | -0.00002        |
| Baseline QALE inequality gap          | 1.09054                    |                 |  |                 |
| Post-intervention QALE inequality gap | 1.09058                    | 1.09035         | 1.09079                                    | 1.09056         |
| pre-LLGA SII                          | 1.47293%                   |                 |  |                 |
| post-LLGA SII                         | 1.47299%                   | 1.47268%        | 1.47327%                                   | 1.47296%        |
| pre-LLGA RII                          | 1.45568%                   |                 |  |                 |
| post-LLGA RII                         | 1.45574%                   | 1.45543%        | 1.45602%                                   | 1.45571%        |

HOP=health opportunity cost; IMD=Index of Multiple Deprivation; RII=relative inequality index, QALE=quality-adjusted life expectancy; SII=slope of inequality index; \*(Top 20% IMD group=10,137' 19.5%; Non-top 20% IMD group=41,737, 80.5%)

This is also shown by a baseline QALE inequality gap of 1.09054 years of full health which, while decreasing over a lifetime (1.09035) under an assumption of health opportunity cost being calculated from a NHS perspective, increases over a 39-month time horizon (1.09058) and under a local public health budget perspective (39 months: 1.09079; lifetime: 1.09056). This effect is reflected by the slope and relative indices of inequality, which indicate an intervention effect narrowing the baseline inequality gap between the IMD subgroups only under one scenario (NHS perspective over a lifetime time horizon). However, these estimated effects are small in absolute value, as only a limited proportion of participants was found to change PA category following registration to the programme (0.2%).

## **DISCUSSION**

This paper is concerned with illustrating how taking a local government perspective for economic evaluation can be implemented in practice. Motivated by a real-life population-level programme to promote exercise, we took a decision maker's viewpoint addressing two key functions of local governments in this intervention context, namely, public health agency and service provider. To inform this, we conducted a health equity impact assessment of the intervention and estimated its opportunity cost and cost-effectiveness implications. This analysis generated relevant economic evidence for local governments, which can be used to inform investment decisions relating to this type of interventions. While the economic estimates are likely to be specific to the case study intervention design and context, this study showed the potential implications that choice of perspective, and consequently analytical methods, can have on the identification of the optimal strategy.

## Main findings

Results from this study show that providing free exercise opportunities, such as those offered from the LLGA programme, has the potential to provide adult residents living in the most deprived city areas with greater health benefits, compared with the rest of the population, both in the short term the long term. However, this positive differential health effect, which is primarily driven by a positive change in health utility due to increased PA, may be overshadowed by the health opportunity cost of implementing the intervention, once this is factored in. This is due to the fact that residents from lower socio-economic backgrounds often rely on publicly funded health services more heavily than the rest of the population. Hence, the opportunity cost from displacing current health services will be larger for that group and could be greater than the health benefits provided by the intervention in the short term. Furthermore, the forgone health benefits will also increase as the proportion of funding coming from the local public health budget increases. This is because additional public health expenditure is more productive in generating health than additional NHS expenditure<sup>38</sup>, hence more QALYs are likely to be forgone from displacing health services funded using public health budgets. This highlights the relevance and challenges in conducting equity-informative economic evaluations.

The present analysis showed that the opportunity cost of this intervention from a service provider viewpoint is substantially lower than its financial cost. The average opportunity costs were overall comparable to other types of population-level interventions to promote exercise, especially as it concerns to the cost per person / inactive engaging with the intervention<sup>43</sup>. The average costs per inactive individual moving to an active state were instead found to be between 10% and 2.5 times higher than comparable interventions<sup>43</sup>. Conversely, given that



large number of residents attracted, the average cost per person registering to the programme was found to be marginal, close to making this type of intervention cost neutral.

These average cost estimates may be particularly informative if considering that the intervention context under study was one such that the body administering the intervention could no longer rely on external funding and had to bear the whole cost of the project to continue providing the free sessions. This scenario reflected a real-life decision-making setting, making the analysis conducted here relevant for future policy decisions, especially as this intervention that can be easily replicable, readily integrated into routine leisure centre management and does not require large capital investments.

The application of a local government perspective on the intervention cost was found to potentially affect the identification of the optimal strategy. While the programme was associated with a negative incremental net monetary benefit, the per-person range of monetary values needed to offset it were estimated to be relatively low. Furthermore, magnitude and sign of the incremental net monetary benefit will depend on how the additional health benefits are valued, which may change across countries and on who is receiving them <sup>44</sup>. In addition, other intervention effects which may be relevant to local governments (e.g. social capital <sup>45</sup>) were not captured here.

## **Limitations**

This health equity impact assessment relied on observational evidence on the effectiveness of the programme. The analysis rested on a pragmatic assumption, whereby individuals would maintain the same physical activity level had they not attended the free exercise sessions. In addition, it was assumed that attending a LLGA session would result in a level of physical

exertion at least equal to 30 minutes of moderate physical activity. Moreover, an assumption such that no compensatory effects (e.g. change in dietary habits) would occur on the path to health improvement was made. While the plausibility of these assumptions could be argued, they typify this evaluation setting and this study does not attempt to make any causal claims.

Lack of information regarding levels of health inequality aversion from the local government<sup>46</sup> prevented us from conducting an analysis of the trade-offs between the objectives of reducing health inequality and maximising population health for alternative social welfare functions (e.g. Atkinson and Kolm<sup>47</sup>). Within the LLGA case study, however, such analysis could have been conducted only for one of the four considered scenarios (i.e. health opportunity cost entirely on the NHS budget and a lifetime time horizon). In fact, under a local public health perspective and a short-term time horizon the LLGA would be cost-ineffective and widen the existing health inequality gap, therefore representing a lose-lose situation (i.e. south-west quadrant of the health equity impact plane<sup>47</sup>).

The paucity of the data and information available on the resources used and routine leisure centre management activities impacted by the intervention meant making pragmatic assumptions, which limited our ability to formulate an accurate assessment of the opportunity cost of the intervention. Indeed, we based our analysis on the data available and untested assumptions, for instance, on the value forgone from hosting the intervention. To this purpose, a micro-costing approach<sup>48</sup> would have allowed for granular data and information to be collected, yet this would have required an early involvement of the research team which is not typically feasible<sup>49</sup>. In addition, economic spill-over effects that were not measured here (e.g. leisure centre revenues from paying memberships) have the potential to affect estimation, and therefore influence decision-making. While this represented an approximation of the real

opportunity cost, the present analysis illustrates how to conduct such assessment, in so doing promoting transparency in costing practices, which has been advocated elsewhere <sup>50</sup>.

The analysis was conducted on a single UK-based case study, therefore generalisability of the findings to other regions and countries may be somewhat limited. The opportunity cost of the intervention, and therefore cost-effectiveness, is likely to vary according to the circumstances under which the intervention is delivered. Project management staff, which accounted for a third of the total intervention cost, were assumed to be hired ad hoc and unit costs were sourced from a UK government database. If project management activities were instead incorporated into the role of existing personnel, such an assumption would lead to an overestimation of the cost. Further, local governments will differ between one another in terms of the flexibility of their organisations to incorporate an intervention like the LLGA into routine activities and practices, hence requiring different resources. Local decision makers may also be interested in evaluating the impact of the intervention on other dimensions of inequality other than socio-economic status (e.g. race <sup>51</sup>) which were not explored here.

Moreover, the opportunity cost and health equity impact results will vary according to the size and characteristics of the local populations and socio-economic environments under study.

The ability of the intervention to attract local residents with an offer of free off-peak exercise classes will depend on what other alternative options are available in the leisure centre market and to what extent membership cost and distance from the facilities represent barriers to the residents, especially those living in the deprived areas. Moreover, adaptation of the programme marketing strategies (e.g. web-based versus community-based approaches) will be likely needed to resonate with different audiences of adults in different settings (e.g. rural communities versus city dwelling) <sup>52</sup>. However, this study provides one of the few worked

examples on how to conduct a health economic analysis tailored to the decision makers' information needs, which has been often overlooked in economic evaluations<sup>20-22</sup>.

## **CONCLUSIONS**

Population-level programmes to promote exercise can have economic implications that extend beyond improvements in population health. Choice of perspective for economic evaluation can affect the identification of the optimal strategy and therefore influence decision making. Taking a local government perspective is important for tailoring the economic analysis to the information needs of these decision makers for which health equity is of primary concern and face opportunity costs that are not often reflected and made explicit in budget expenditures.

## APPENDIX I LLGA INTERVENTION COST

Financial cost from a health sector perspective (previously published <sup>15</sup>)

| Project activity   |                          | Cost in £'000s |
|--------------------|--------------------------|----------------|
| Staffing           | total                    | 605            |
|                    | of which non-managerial  | 135            |
| Loss of income     | total                    | 850            |
| Marketing          | total                    | 69             |
|                    | of which launch campaign | 25             |
|                    | of which website         | 17             |
| <b>Total costs</b> |                          | <b>1,524</b>   |

Opportunity cost from a local government perspective

| Activity                        | Source of information        | Cost                | Assumption   |
|---------------------------------|------------------------------|---------------------|--|
| Programme website               | Local Authority reports      | £ 8,500.00          | Total expenditure for website design and management £ 17,000: 50% attributable                             |
| Media campaigns                 | Local Authority reports      | £ 34,399.86         | Total expenditure £ 68,799,72: 50% attributable  |
| Project management              | Local Authority reports      | £ 168,654.50        | Total expenditure for project managers £168,654.50   |
| Physical activity professionals | Scheduled programme sessions | £ 255,401.20        | 142 hourly exercise sessions, 170 weeks, average annual salary = £22000 annual salary, £10.58 hourly wage* |
| Total                           |                              | <b>£ 466,955.56</b> |  |

\* National Careers Service. Fitness instructor 2017. Available from: <https://nationalcareers.service.gov.uk/job-profiles/fitness-instructor>.

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