Physical activity and health: evidence from a study of deprived communities in England

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ABSTRACT

This study aims to explore the relationship between physical activity levels and the self-reported health status of residents living in deprived communities in England. A cross-sectional interview survey was conducted in communities in receipt of funding from the New Deal for Communities (NDC) regeneration programme. A sample of 848 addresses was selected by random sampling from within each of the 39 NDC areas, and one adult from each household was selected for interview. A total of 19,574 residents were interviewed between July and October 2002. The main outcome measures were physical activity level and health status assessed using four self-reported health measures: health in the last 12 months, health change in the last 12 months, long-standing illness or disability and a mental health-related quality-of-life score. There are large regional and demographic variations in respect of NDC residents' physical activity levels. The areas with the lowest levels of physical activity are mainly located in northern industrial towns. Residents who did little or no physical activity were more than twice as likely to feel that their health was not good (adjusted OR 2.54, 95% CI 2.35–2.75).

Keywords physical activity, public health

Introduction

Despite the benefits to physical and mental health, the majority of people in the United Kingdom take little or no regular physical activity. In the United Kingdom, only 36% of men and 24% of women meet the government guideline of 30 min of moderate intensity activity on ≥5 days of the week. Nationally, more than one-third of adults are currently sedentary, defined as undertaking <30 min moderate activity a week. Physical activity also declines rapidly with age, such that only 17% of men and 13% of women in the 65–74 age group meet the current guidelines.1

In 2003, the WHO report into diet, nutrition and prevention of chronic diseases identified an obesity epidemic worldwide, which it attributed to the increased consumption of foods high in sugars and saturated fats in conjunction with a reduction in physical activity.2 Sedentary lifestyles and resulting overweight and obesity are both associated with higher risks of type 2 diabetes, cardiovascular disease, hypertension, stroke and certain forms of cancer. Coronary heart disease (CHD) and cancers are the leading causes of morbidity and mortality in many of the developed countries, and many deprived communities within those countries have higher morbidity and mortality rates for these than the national averages. The average standardized mortality ratio (SMR) and standardized illness ratio (SIR) for some of the most deprived areas in England are 162.9 and 176.6, respectively, versus a national average of 100 for each. This represents a greater number of deaths and more people suffering from illness or disability than would be expected given the sex and age structure of the area.3

Evidence is accumulating on the role of physical activity in the prevention4–6 and treatment7 of CHD and obesity.8,9 Findings show that sedentary people have about twice the risk of developing, or dying from, CHD compared with active people.4–6 The evidence has demonstrated that physical inactivity is one of the major modifiable risk factors for CHD. Research by the British Heart Foundation suggests that 37% of deaths from CHD are attributable to physical inactivity.10

In this article, we explore the relationship between physical activity levels, demographic characteristics and
health status of residents living in deprived communities in England. This work was undertaken as part of the establishment of baseline status for the National Evaluation of the New Deal for Communities (NDC), a £2bn regeneration programme funded by the Office of the Deputy Prime Minister (ODPM) and the Neighbourhood Renewal Unit (NRU). The NDC programme was created to address inequalities in 39 deprived areas in England, taking forward the government’s commitment to reducing inequalities.

Method

NDC Household Survey
The NDC Household Survey was developed and conducted by Market & Opinion Research International (MORI) and National Opinion Polls (NOP) as part of the national evaluation of the NDC programme. MORI and NOP targeted for interview ~500 residents aged ≥16 years from each of the 39 NDC areas, between July and October 2002. In addition, as a comparator sample, residents aged ≥16 years living in deprived areas adjacent to NDC areas were interviewed between November 2002 and January 2003. Interviews were conducted face-to-face in the home, using Computer-Assisted Personal Interviewing (CAPI).

The quota sampling framework involved randomly selecting addresses from within each of the NDC areas. Addresses were ordered by postcode, and 848 addresses were randomly selected in each (33,072 in total). No stratification was used given the relatively small size of the NDC areas. The interviewer randomly selected one property at each sampled address, one household within each selected property, and one adult within each selected household using a Kish grid. Where a person was unavailable for interview, an alternative was selected. Sixty-four percent of the original quota were interviewed with the rest obtained by additional interviews. To be eligible, a person had to be aged ≥16 and normally resident at the address. The comparator sample included residents living in deprived areas not in receipt of NDC funding, but within the same local authority district as each of the 39 NDC areas.

Validated questions from existing national surveys, including the General Household Survey and the Health Survey for England, were used covering residents’ health and health behaviours, lifestyle factors and physical activity levels. The survey collected information on a range of demographic characteristics (age, sex and ethnicity of all household members, household composition and tenure, education and employment) and four self-reported health measures: health in the last 12 months, health change in the last 12 months, long-standing illness or disability, and a mental health-related quality-of-life score. Respondents were asked: ‘Over the last 12 months, would you say that your health has on the whole been good, fairly good or not good?’, ‘compared with one year ago, how would you rate your health in general now?’, ‘do you have any long-standing illness, disability or infirmity?’, and five questions from the mental health domain of the SF-36 health survey. The SF-36 is a widely used generic measure of health-related quality of life. The population norm for these scores (SF-36 version 1) is 70, and a low score indicates a poorer level of health and well-being.

Physical activity level was measured using a simple summed composite score. Respondents were asked which of 14 defined categories of exercise they ‘do nowadays for 20 minutes at a time’, plus 1 additional ‘other’ category. A score of 1 was awarded for every positive response given, resulting in a possible range of scores from 0 to 15. A score of 0 indicates that the respondent does not take part in any physical activity for >20 min at a time. This measure was an abbreviated version of that used by the General Household Survey, and its initial implementation pre-dates the current UK government recommendation of 30 min of activity at least five times a week.

Data analysis
The extent to which physical activity levels vary by NDC area was initially examined using univariate analysis; differences by NDC area are considered in terms of the percentage of residents who took little or no exercise. Chi-square tests were used to examine the variation in the proportion of residents taking little or no physical activity between NDC areas.

Binary logistic regression models (both multilevel and non-multilevel) were used to explore individual-level factors (level 1) associated with physical activity levels in NDC areas (level 2) and to examine how physical activity levels vary by NDC area after taking into account such underlying characteristics of respondents in each area. The following level 1 explanatory variables were included in these models: age, gender, self-reported ethnicity, educational attainment, household composition, tenure and worklessness. The extent to which physical activity level may influence self-reported health was also examined using the same level 1 explanatory variables with NDC area at level 2. The four health outcomes were binarized measures that reflected general health in the last 12 months, health change in the last 12 months, the SF-36 version 2 mental health score, and long-standing illness or disability.
Results

Physical activity level by NDC partnership area

Fig. 1 shows the percentage of residents doing little physical activity (defined as a score of $\leq 1$ for the physical activity score) by NDC partnership together with the corresponding percentage for NDCs and comparator areas as a whole. It demonstrates the large variations across NDC areas in respect of residents’ physical activity level. On average, 9% of NDC residents do <20 min physical activity at a time. A further 16% do very little physical activity (defined as a score of 1), and only 13% approach the government guidelines for physical activity five times per week (defined as a score of $\geq 5$). The time measurement user here is shorter than the current government recommendation (20 min compared with the current recommendation of 30 min).

Fig. 2 shows the adjusted odds ratios for a physical activity score of $\leq 1$ by NDC partnership area. At $P=0.05$ level, eight NDCs are significantly below the NDC performance as a whole and are mainly located in northern industrial towns. Residents in Sunderland NDC are 50% more likely than NDC residents as a whole to do one or fewer sessions of continuous physical activity (for at least 20 min), which contrasts with Southwark residents who are, on average, almost 50% less likely than NDCs as a whole to fall into this category.

Physical activity and demography

The relationship between low physical activity level and respondent demographic characteristics was analysed using a multilevel logistic model\(^1\) with partnership area at level 2. This takes account of the clustered nature of the data. The adjusted odds ratios, given in Table 1, indicate that compared with men, women were, on average, significantly less likely to report low levels of physical activity (OR 0.73, 95% CI 0.68–0.78). The likelihood of not doing much exercise increased steadily with age, with those over retirement age being at least twice as likely as the youngest working age residents (16–24 years) to do little or no physical activity (OR 4.07, 95% CI 3.40–4.86). The type of household in which residents live is also associated with their physical activity level. Those from workless households and those in social sector housing (local authority and housing association) are more likely than other groups to do little or no exercise. Education (using NVQ level as a proxy) is also associated with physical activity level. Those residents with no qualifications are more than twice as likely to do little or no physical activity compared with those with four or more NVQs or equivalent (OR 2.14, 95% CI 1.89–2.44). When physical activity level is considered by ethnicity, although there is no significant difference between self-reported Black and White residents on physical activity levels, Asian residents are, on average, almost twice as likely as White residents to do little or no physical activity (OR 1.92, 95% CI 1.68–2.20). Also given in Table 1 are the corresponding odds ratios for a non-multilevel model. These differ little from the multilevel equivalents and indicate that there is little in the way of a clustering effect for the low physical activity outcome.

Physical activity and self-reported health

Those residents who do little or no physical activity are more likely to feel that their general health over the last 12 months is not good. Over half of those who do <20 min physical activity at a time feel their health is not good. This is more than twice the rate amongst residents who do one or more

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Fig. 1 Percentage of New Deal for Communities (NDC) and comparator residents who do one or fewer sessions of physical activity for at least 20 min at a time.
types of physical activity (26%) and more than three times the rate amongst residents who do three or more types of activity (15%). There is a similar relationship between the SF-36 mental health score and physical activity level. The crude average mental health score decreases with lower levels of physical activity from 72.2 in residents who do three or more types of activity to 63.2 in those who do no physical activity (for at least 20 min at a time). Overall, NDC respondents in 2002 scored an average of 70.4 on the SF-36 mental health dimension compared with an average of 72.8 for the comparator sample. In the UK assessment of SF-36 version 2 using a large sample from health authority populations in southern England, Jenkinson et al.\textsuperscript{15} found mental health averages of 71.2 and 72.8 for respondents classified as from manual and non-manual social classes, respectively.

Low physical activity levels significantly increase the chance that a person will have indicated some degree of poor health. Table 2 summarizes the results from four multilevel logistic models for binary health outcomes. The largest increase in odds of having poor general health is amongst those respondents who do little or no exercise. They are two and a half times more likely than those who do more than one type of exercise to say their health was poor in the last 12 months (OR 2.54, 95% CI 2.35–2.75). Residents who do little or no exercise are also more likely to report that their health has deteriorated in the past year (OR 1.88, 95% CI 1.74–2.03), to have a low SF-36 mental health score (classified as more than one standard deviation below the mean) (OR 1.84, 95% CI 1.68–2.01), and to have a long-standing illness or disability (OR 2.11, 95% CI 1.96–2.27).

Discussion

Main findings of this study

This article reports on the health status and physical activity of ∼19 500 residents living in 39 areas of deprivation and 2000 residents from comparator groups in England. It provides a baseline measure of physical activity levels amongst NDC residents at the start of the 10-year community-led programme designed to improve the health of those living in some of the most deprived communities in England. The degree to which inequalities in health status and physical activity exist varies considerably across individual NDCs. Residents of areas which are located in older, industrial, northern cities tend, overall, to have lower physical activity levels than those located in southern and eastern England. Residents who did little or no physical activity were two and a half times more likely than those who do more than one type of exercise to say their health was poor in the last 12 months (OR 2.54, 95% CI 2.35–2.75).
What is already known on this topic

This overall regional variation also exists for health inequalities \textit{per se} and is supported by recently published local Community Health Profiles.\textsuperscript{16} Recent statistics from the British Heart Foundation reveal that the north-south divide in death rates from CHD is not narrowing, despite fewer numbers dying from the disease. Premature deaths from CHD are highest in northeast England with 224 deaths per 10 000 men, and lowest in the southwest of the country where the equivalent figure in 146.\textsuperscript{17} This picture is repeated in figures from the Office for National Statistics that show northern England had a higher-than-average incidence and death rates for certain cancers, whereas rates in the south and midlands of England were lower than average.\textsuperscript{18} The residents most likely to report low physical activity levels are those from workless households, those on low incomes, those with no qualifications and older residents. Given the positive association between physical activity level and health status, it is unsurprising that these residents also have poorer self-reported health. The Health Survey for England in 2003 found that 36% of men and 24% of women in the United Kingdom were meeting the government guideline of 30 min of moderate intensity physical activity on \( \geq 5 \) days of the week.\textsuperscript{1} This national survey of approximately 16 000 adults and 4000 children throughout England is considered to be nationally representative of the general population.

What this study adds

This study identifies some of the inter-related factors that influence physical activity and self-reported health in this

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<th>Non-multilevel OR (95% CI)</th>
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<td>9877</td>
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</table>

Low physical activity = one or fewer sessions of physical activity for at least 20 min at a time.

The boldfaced numbers indicate odds ratios are significant at the 5% level.

*Adjusted for New Deal for Communities area (level 2) and number of home moves in previous 5 years (level 1).
population and that could be targeted in order to improve the health outcomes of NDC residents. The analysis of the household survey demonstrates that both physical activity levels and self-reported health are poor in residents of these deprived communities. It also provides evidence of a clear association between physical activity levels and self-reported health in this population.

In the MORI Household Survey, only 13% of residents in NDC areas were exercising five times a week and the sessions were shorter (20 min rather than the current measure of 30 min). This suggests that people living in these deprived areas are less likely than the population as a whole to meet the recommended levels of physical activity. This is supported by two recent studies which found that low-income populations were more likely to make unhealthy behaviour choices, and less likely to meet the US Government’s physical activity recommendations, than higher income populations.

The finding that low physical activity level amongst NDC residents is associated with poorer health status highlights the importance of, and need for, area-based initiatives that influence the physical activity level in this population.

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The finding that low physical activity level amongst NDC residents is associated with poorer health status highlights the importance of, and need for, area-based initiatives that influence the physical activity level in such populations. Furthermore, by identifying those specific population groups with the lowest physical activity levels and poorest health outcomes, interventions can be targeted more effectively at those with the greatest need. There are still the challenges of engaging those unwilling or disinterested in improving their lifestyles, as providing an intervention does not guarantee that people will make use of it. However, if as a result of NDC-funded initiatives and improving community engagement, residents increase their physical activity levels, then there is likely to be a positive impact on health. Any improvements to physical activity level, within the population in general, but particularly within these areas of high deprivation, will contribute towards the government’s health inequalities target—to increase life expectancy in those areas with the poorest outcomes—as well as those in the Department of Health’s Saving Lives: Our Healthier Nation, to reduce deaths from cancers and in those <65 years of age from CHD and stroke.

NDC partnerships are in a good position to target these at-risk populations and influence health behaviours, as they have engaged communities and government support and finance. The majority of the 39 NDC partnerships have proposed a plethora of local projects to promote and encourage healthy lifestyles, including an increase in physical activity. However, it remains to be seen whether, and which, local community-based initiatives can successfully achieve this outcome and increase physical activity level amongst their residents. The finding that respondents from workless households and those in social sector housing are more likely to do little or no exercise identifies a possible link between economic status and physical activity level. It is likely that specific factors such as financial issues are barriers that may need to be addressed when developing physical activity initiatives and, indeed, are being addressed in these areas as part of the NDC programme.

**Limitations of this study**

As this is an observational study, it provides only circumstantial evidence for the causal nature of the relationships we have observed. No direct relationship between physical exercise and poor health can be proved but we have demonstrated substantial evidence for the associations discussed. It is of course possible that the relationship between physical exercise and health is because individuals in poor health find it more difficult to exercise and not because the lack of

<table>
<thead>
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<th>Physical activity sessions</th>
<th>Poor general health in last 12 months**</th>
<th>Health worse in last 12 months</th>
<th>Low SF-36 mental health score**</th>
<th>Long-standing illness or disability</th>
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<td>≤1</td>
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<td><strong>1.88 (1.74–2.03)</strong></td>
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<td>19 199</td>
<td>18 965</td>
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<td>% outcome</td>
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<td>23.52</td>
<td>17.03</td>
<td>36.85</td>
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Statistically significant at <0.05 are in boldface.

*Adjusted for factors given in Table 1.

**General health was measured on a three-point scale: poor, fairly good and good. A low mental health score was classified as one which was more than one standard deviation below the mean.
exercise leads to poor health. In reality, it is likely that, while we know physical activity has a positive impact on health, poor health reinforces low activity levels.

This was a large household survey of ~19,500 residents in 39 NDC areas geographically spread throughout England. There are, however, some limitations to the data in that physical activity level was examined using a composite score. Respondents were asked which of 15 categories of exercise they do for at least 20 min at a time, and a score of 1 was awarded for every positive response given, resulting in a possible score ranging from 0 to 15. A score of 0 indicated that the respondent did not take part in any physical activity for >20 min at a time. However, a respondent who does one activity only for at least 20 min but on every day of the week would be given a score of 1. This method of scoring will underestimate physical activity level in some individuals. However, it is based on a measure used regularly by MORI in the General Household Survey.13 The General Household Survey asks about levels of exercise in the previous 4 weeks and 12 months. However, for this survey, the question was reduced to one measure of exercise ‘nowadays’ do to limited space in such a large survey (MORI, personal communication). We appreciate that the term ‘nowadays’ could be interpreted differently by different respondents, but the trends shown here are significant enough to allow for some over-emphasized relationships that may be generated by this. Also these trends should develop over time, allowing a clearer picture of these associations to develop when subsequent NDC Household Surveys provide data for comparison over time.

The score also has the potential to cause confusion, as it measures physical activity in 20-min sessions when the current UK government recommends 30 min of exercise on at least 5 days a week. However, this survey pre-dates the widespread acceptance of that measure, and until recently, the internationally accepted guidelines on the most beneficial level of physical activity were for people to take part in vigorous activity lasting at least 20 min on three or more occasions a week.24,25 Such patterns of activity have been shown to produce maximum cardiac benefit. However, it is now accepted that these targets may be unrealistic for much of the population and that there is greater potential for improving the health of the population as a whole if greater emphasis is placed on encouraging people with a sedentary lifestyle to take part in regular activity at a moderate level.

At the start of the NDC’s 10-year programme, it is not possible to draw conclusions as to what will and what will not work to increase physical activity levels and change health behaviours amongst NDC residents. Evaluation of the NDC programme at a national level is ongoing, and subsequent surveys have the potential to identify successful interventions and shed light on the reasons for their success, or otherwise, and that of the NDC programme. Such information will be vital to inform national and international policies. This survey has provided the baseline on which NDC communities are building their programmes and projects to address inequalities in health through the provision of physical exercise, in parallel with lifestyle changes such as healthy eating and smoking cessation. Given the current level of physical activity, any increase in physical activity and health-promoting behaviour would be a good outcome. The numbers that could potentially benefit by increasing physical activity are huge because 87% of NDC residents do not meet the current recommendations.

Funding

The NRU is currently sponsoring the 2002–2005 national evaluation of the NDC. This evaluation is being undertaken by a consortium of organizations co-ordinated by the Centre for Regional Economic and Social Research at Sheffield Hallam University. The views expressed in this article do not necessarily reflect those of the NRU. Those wishing to know more about the evaluation should consult the evaluation website in the first instance (http://ndcevaluation.adc.shu.ac.uk/ndcevaluation/home.asp).

Competing interests

No competing interests.

References