

**Social Interactions and the Demand for Sport:
An Economic Analysis¹**

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Abstract

This paper explores the decision to participate in sports activities in the UK and the subsequent frequency of participation. The paper draws links between economic and other theories of social interaction to motivate the discussion and links these theories to assessing policy initiatives in the UK. Cluster analysis is combined with a Heckman analysis to examine the empirical evidence provided by the General Household Survey in 2002. The results suggest that social and personal capital are of paramount importance in determining sports participation and consequently it is these features that policy should focus upon.

Key Words: Sports, Participation, Frequency, Cluster Analysis, Heckman Analysis.

JEL Classification: B41, C2, D11, D12

1. Introduction

As a form of physical activity, mass participation sport is now firmly on the public policy agenda in the UK and elsewhere.² The health and well being of citizens forms part of popular discourse, evidenced by repeated references to ‘obesity’ epidemics in the media and indicated by the establishment of new policies, policy agents or a refocusing of previous efforts to address this issue. For example in the UK a new central government minister for Public Health has been established to work in partnership with the Department for Culture, Media and Sport, the Department for Communities and Local Government, the Department for Transport, the Department

² There are a variety of definitions of sport that emanate from particular literatures, that is embracing sociological, psychological, philosophical and economic concepts. Some discussion of these definitions is provided in Downward *et al* (forthcoming). For current purposes sports are viewed as activities involving physical activity and undertaken for recreational, that is non-obligated, purposes in a formal or informal setting and accepted as such in policy and public discourse. In this regard the sports monitored in official data meet this definition. Of course, they should in no sense be viewed as definitive in an axiomatic sense.

for Education and Skills and sports delivery bodies to raise participation. The legacy effects of increased mass participation were also championed in the recent successful 2012 London Olympic bid. This is indicative of a more general pattern in most economies where government departments formulate policy which is then implemented by sports policy agencies working alongside the various stakeholders in sport, such as governing bodies, sports clubs and volunteer bodies *etcetera* (see, for example, Houlihan, 1997; Green and Houlihan, 2005; Downward et al forthcoming).

In England the implementation of sports participation policy is being shaped by the identification of particular ‘drivers’ and ‘settings’ of change by Sport England, the relevant sports policy agency. The purpose of this paper is to further contribute to discussion of such policy initiatives by extending the analysis of Downward (forthcoming). The paper proceeds as follows. In the next section a brief resume of the policy context in the UK is provided. Section 3 then reviews the main elements of the theoretical and empirical literature on sports participation, focussing particularly on the suggested need to focus upon lifestyle factors and the spillover effects of interdependent sports demands. Using an elementary model based on Becker (1974), section 4 then sketches the logic of how investment in personal and social capital, through social interactions, can conceptually account for lifestyle and complementary consumption in sports. The important issue in highlighting this model is to indicate that a focus upon personal and social capital formation can help to draw together the various theoretical contributions to understanding sports participation from different disciplines and theoretical traditions within disciplines. This is important because sports policy bodies do draw upon broader portfolios of evidence than simply economics (see for example, Sport England 2005).

Section 5 then presents details of the data and variables used in the analysis, as well as discusses the two-fold quantitative approach used in the paper. An exploratory cluster analysis of all variables in the sample is first employed to identify lifestyle, that is social capital, subsamples in the data. Membership of these clusters is then employed as a variable in a Heckman model alongside the original variables, including proxies for personal consumption-capital accumulation, to examine the choice to participate in sport and the frequency of this participation. Sections 6 and 7 then present the empirical results and discuss the policy implications of the paper respectively. The latter discussion focuses upon some policy tensions that emanate from the analysis and which hinge upon the philosophical differences between accounts of participation. Conclusions then follow.

2. UK Sports Participation Policy

As discussed in Downward *et al* (forthcoming), the public policy environment of sport is typically hierarchically layered embracing supranational, national and local government. These government agencies work alongside sports policy bodies to shape and implement specific policies according to strategic priorities, in conjunction with the key stakeholders in sport. These stakeholders include national and international governing bodies and associations, sports event organisers, sports clubs and the voluntary sector.

In the case of the UK, as a member of the European Union, the economic regulation of sport falls under the remit of the Treaty of Rome. More generally, however, sport is viewed as subject to the subsidiarity principle, which means that it is essentially a

matter for Member States. This means that in the UK the Department for Culture, Media and Sport and the Department for Education and Skills have recently overseen strategic priorities for sport in the wider community and within education. As noted earlier, a new Minister for Public Health has been appointed to link these Departments to the Department for Communities and Local Government and the Department for Transport. Lying below central government agencies, and in addition to local government, most countries have sports policy bodies which act as vehicles for delivering central and local government initiatives or allocating finances to sport. In the UK, UK Sport and four sports councils, ‘Sport England’, ‘sportScotland’ and ‘The Sports Council for Wales’ and ‘The Sports Council for Northern Ireland’ perform these functions. As Carter (2005) indicates, there is a blurred distribution of functions and funding between the agencies. However, broadly speaking UK Sport focuses on elite sport and the other councils mass participation in devolved regions. The current public policy agenda for mass participation in sport in the UK, thus, reflects this hierarchical transference of priorities as illustrated by the following quotation.

“The situation in which we find ourselves is that participation rates have remained stubbornly static and inequities in participation between different social groups have continued largely unchanged over the last 30 years or so with perhaps the exception of more women taking part in fitness related activities. There are significant and growing numbers of people who live their lives in a sedentary way that was unheard of in previous generations.

The costs to society and to individuals from sedentary behaviours are growing to the point where it is becoming a major public policy concern.” (Sport England, 2004a, p3).

This expressed priority is a reflection of central government and the Department for Culture Media and Sport, that published “Game Plan, a strategy for delivering Government’s sport and physical activity objectives” in 2002. The implied critique of

sports provision in the UK in this document thus led Sport England to develop a strategic response encapsulated in “The Framework for Sport in England, Making England an Active and Successful Sporting Nation (TFFSIE)” (Sport England, 2004b).³

Key to Sport England’s strategy towards participation contained in TFFSIE is a conceptual model of participation. This was developed from widespread consultation. Building upon Game Plan’s objectives, Sport England commissioned the Henley Centre for Forecasting to explore both existing data and the opinions of over 350 experts during seminars in the UK. In addition numerous academics were commissioned to review the evidence concerning the roles of such factors as demography, the family, social inclusion, early learning and volunteering in promoting participation, the results of which were published as Sport England (2004a). The conceptual framework derived to explain changes in participation, is summarised in Table 1 which identifies ‘drivers’ and ‘settings’ of change.

INSERT TABLE 1

The intuition behind these drivers and settings is simple. For example, as one ages, or works longer hours, or volunteers more to support sport, or less volunteers provide support for sport then participation will fall, either through individual choice or, in the latter case, because of supply constraints. Not surprisingly, moreover, such changes will be mediated through decision making social environments such as the home, workplace or educational environment.

³ Part of the response involved a restructuring of Sport England following substantial criticism of the organisation.

This raises two important and related points for this paper. The first is that, conceptually speaking, Sport England (2004b) recognises that the preferences of individuals are, at least partially, endogenous. Moreover they recognise that the context of decisions, or equivalently the social structures surrounding agents, affect the choices of agents in return. In this regard it is acknowledged that decision making involves an ‘agency-structure’ or ‘choice-constraint’ interaction. This is not surprising because Sport England (2004a) drew upon a general social scientific discussion involving contributions from a variety of theoretical and disciplinary sources. The second important point, however, is that the theoretical exposition and synthesis in the analysis tends to be brief and intuitive, and economic argument does not play an explicitly prominent role. The evidence base is also primarily descriptive. Consequently, this paper seeks to examine the issue of agency-structure interaction of mass participation in sport in the UK but make the economic theoretical issues at stake more transparent and, importantly, subject them to statistical testing by a large scale data set.

3. Theoretical and Empirical Literature Review

Theories of Sports Participation

As Downward (forthcoming) argues, the economic theory that has been employed to explain sports participation can be understood as drawing upon two traditions: an orthodox, neoclassical perspective and a heterodox or wider social science perspective.⁴ Broadly speaking the analysis of sport in economics has tended to

⁴ Space precludes a full discussion of these distinctions though it is implied in the discussion that differences lie more in methodological and philosophical issues than the subject matter of analysis. At times, thus, the differences appear subtle as implied in Section 4 and 6.

emerge indirectly from theoretical concerns with decision-making more generally the more narrow the conceptualisation of economics.

In brief a natural focus of neoclassical approaches has been to employ a rational-choice framework to model the individual's attempt to maximize subjective utility subject to constraints. The income-leisure trade off model of labour supply can be viewed as the traditional exposition of this in which leisure, i.e. sport, is defined as the dual of work, which provides income for consumption (for example, see Gratton and Taylor, 2000). Leisure has an explicit opportunity cost in the wage-rate because it involves consuming non-obligated time. Consequently changes in the wage-rate, or preferences can be used to analyse changes in the demand for leisure.

A more comprehensive foundation is, however, provided by Becker (1965) in which the allocation of time is explicitly integrated into the consumption decisions of individuals. It is recognised that individuals make these decisions as part of a household. The distinction between consumption and production is removed as the analysis emphasises that 'time' and 'market goods' combine as resources in household production to generate the basic commodities that yield utility from consumption. In this regard the traditional income-leisure trade off model becomes a special case of Becker's approach in which the cost of leisure consists only of foregone earnings, and the cost of other commodities other market goods. As all economic activities involve time and other goods, purchased via markets, economic agents essentially make choices involving the relative intensity of these inputs in both producing and consuming commodities.

There are a number of interrelated points to note regarding Becker's analysis that are central to subsequent discussion in this paper. The first is that Becker (1976, 1992) is one of the few economists to be explicit about economic methodology and emphasises that his approach is not defined by the material under investigation but rather its method. Consequently economic agents maximise welfare, as perceived by them, subject to income, time, information and other limiting resources constraints. It is assumed that economic agents exhibit stable preferences and that in addition to markets as typically identified in economics, the social structures in which agents operate act as if they are markets to allocate resources according to the shadow prices of resources.⁵ The second is that individuals can allocate time and market goods to invest in personal capital, skills and capabilities, or social capital and reputation which provides the greatest return for the household. In this regard preferences become partially endogenous. The third point is that this suggests that results from econometric work on any given sample need to be interpreted carefully. On the one hand the measured income and price effects may mask the true resource allocation issues at stake. This is because they only crudely capture the true shadow prices of economic allocation. On the other hand the usual proxy variables for tastes, such as socio-economic characteristics, should be viewed at least partially as the results of agents' decisions. It follows that variations in their impact should not necessarily be seen as evidence of unstable preferences, but potentially resource adjustment over time in line with decision making based upon stable preferences.

Other economic approaches have been suggested as relevant for the examination of sports demand. These are 'heterodox' in that they draw upon a variety of

⁵ In this sense naive views that economics is concerned only with material objects or formal exchange and contract are rejected.

methodological and theoretical elements from a wider social-scientific literature. For example, from a psychological perspective, Scitovsky (1976) argues that in contrast to the assumption that preferences are stable, they evolve implying that consumption skills need to be learned. This is because ‘sensation seeking’, ‘arousal’ or ‘anxiety’ are a source of demand for sports activities and these adjust as individuals balance boredom and stimulation. More generally psychological approaches to choice suggest that decision making involves a limited range of alternative options being assessed following norms or rule-based heuristic criteria. This is because economic agents suffer from bounded rationality (Earl, 1995, 1986, 1983). ‘Satisficing’ in this way allows thresholds of satisfaction to be reached in hierarchical deliberation. Consequently this suggests that demand structures are hierarchical and subject to incremental change and income may segment sports consumption decisions. Prices only ration choice, in this context, within particular classes or categories of goods (Gratton and Tice, 1991).⁶

Such ideas are drawn upon in the Post Keynesian approach to consumption which also takes explicit account of the individual being influenced by the wider social environment (Lavoie, 1994). In the context of sport, ‘learning by doing’ and ‘consumption-spillover effects’ are emphasised by Adams, Davidson and Seneca (1968) in a study of water-based recreational activity, and it is also postulated, drawing upon Veblen (1925) and Galbraith (1958), and by implication Bourdieu (1984, 1988, 1991) that individual preferences are shaped explicitly by social values. In this respect consumption patterns such as the growth in leisure evolve as certain classes seek to distinguish themselves from other classes, whilst these in turn seek to

⁶ This is, of course, implied in separable utility functions. However, the descriptions of behaviour are clearly different.

emulate them. For Veblen, this occurs through a process of the ‘conspicuous consumption’ of leisure or material goods. For Bourdieu this occurs through a more subtle process of ‘distinction’. This is brought about through the exercise of different habits and norms by which social structure regulates, if not strictly determines, individual behaviour; coupled with the acquisition of cultural capital, which is the stock of knowledge accumulated by education, training and social class. Distinction emerges, therefore, as a difference in lifestyle.⁷

It is clear that there are differences in these approaches. However, despite drawing upon different concepts, traditions of enquiry and methodological apparatus, some important commonalities are clear in the literature. The first is that agents are represented as having partially, at least, endogenous preferences. This reflects personal investment in consumption skills and learning by doing. Habits of consumption are thus likely. The second is that preferences are also shaped by interaction with the social environment. This suggests that lifestyles and shared social characteristics are seen to be important. The final point is that socio-economic variables are more likely to be associated with consumption decisions that say, purely price and income effects as a result of the previous two points. Significantly elements of these propositions can be found to varying degrees in the empirical literature.

Empirical Literature

The literature providing large scale empirical testing of sports participation is relatively sparse. Significantly it does not always make explicit reference to economic

⁷ These accounts thus seek to provide alternative perspectives upon how agents and their social environment interact in human behaviour. In general sociological studies share their emphasis and have left behind sweeping societal level analyses. For example in the literature on the sociology of leisure a prevalent focus of analysis is the construction of identities such as ‘masculinity’ through competition and ‘femininity’ through concepts of body shape during the activity of sport. In this regard individuals can accept and shape their identities or preferences and do not just have to accept social constraints. See for example Kay (2004).

theory though, of course, inferences about theory can be drawn from them. Early US studies covering a variety of outdoor recreational activities were undertaken by Adams, Davidson and Seneca (1966), Davidson (1967), Adams, Davidson and Seneca (1968) Davidson, Tower and Waldman (1969) and Cicchetti, Davidson and Seneca (1969). In summary this US literature suggests that there is a consistent rise in participation for younger, male, white and more educated respondents as well as those with a higher income. There is also some evidence that having children in the household reduces participation. Caution should be attached to the results however as typically, given the historic context, Ordinary Least Squares regressions were employed on binary data measuring participation or not in various activities.

In the UK more recent studies are presented by Gratton and Tice (1991) Farrell and Shields (2002), Downward (2004) and Downward (forthcoming). Consistent with the more recent date, appropriate binary variable estimators are employed however, with the exception of Downward (forthcoming) none of the others use weighted data.⁸ Broadly speaking these provide support for the greater impact of socio-economic characteristics such as the form of employment and level of education upon sports participation as opposed to work hours and household income levels which might be indicative of traditional substitution and income effects. Farrell and Shields (2002) and Downward (2004) also particularly indicate the importance of gender and household factors such as the presence of children having effects on the participation rates of particular sports. For example, they find that males tend to participate more than females in sports and declines in participation in sport are identified with

⁸ The potential importance of this is indicated by noting that Farrell and Shields (2002) do not obtain any regional effects on participation. In contrast Downward (forthcoming) does. The Official weights for the data are partially based on regional information from Census data. In Downward (forthcoming) the North and Wales are significantly associated with participation in Rugby, Scotland with Golf and the East with cycling. All of these results are highly plausible in the UK.

increasing age, being married and the presence of children in households. The latter is particularly the case for females. In addition 'lifestyle' factors such as drinking and self-reported better health tend to raise participation, whilst smoking reduces it.

Finally, Gratton and Tice (1991) and Downward (forthcoming) indicate that consumption in other sports is strongly associated with participation in any particular sport. Downward (forthcoming) indicates that this interdependency may have a hierarchical structure. In this respect household income and work-hour effects upon participation tend only to be significant when considering participation in any sport. However, as one focuses upon specific sports, socio-economic categories and other factors as discussed above only remain significant. Downward (forthcoming) thus concludes that on balance the heterodox ideas and those emanating from Becker's analysis appear to have most relevance to understanding sports participation. If demands are hierarchical, and categorical measures of socio-economic status are viewed as incremental effects upon participation, however it is concluded that the heterodox accounts receive more support. Distinguishing between these accounts then relies upon the emphasis placed upon particular results.

It is quite clear, however, that in general from the theoretical and empirical review above that disentangling these perspectives is problematic. Moreover, the empirical literature suggests that broader household and lifestyle factors do affect participation. The remainder of this paper thus addresses these issues in more detail by attempting to provide a more adequate analysis of lifestyle factors and, in particular, exploring the theoretical similarities and distinctions between Becker's and the heterodox analyses of participation.

4. The Demand for Sport: Personal and Social Capital Investment

The literature review above confirms that from a theoretical perspective the accumulation of consumption skills and habits of consumption, and interaction with the social environment, reflected in the development of lifestyles, is important for understanding sports demand and that these processes can be understood as the accumulation of personal and social capital respectively. It is possible to explore the logic of these two processes drawing upon Becker (1974) to provide a simple static exposition.

Assume the agent possesses the following Cobb-Douglas utility function:

$$4.1 \quad U = C_1^\alpha C_2^\beta$$

Where C_i $i = 1, 2$ are two 'commodity' bundles. They might refer to different commodities or the same commodity at different times, or a set of characteristics that are possessed or desired. Consider that consumption of C_2 is contingent upon an initial endowment of C_1 , given the superscript '0', and the exercise of effort E .

$$4.2 \quad C_2 = C_1^0 + E$$

The money budget constraint facing the agent can be written as

$$4.3 \quad p_1 C_1 + p_2 E = M$$

Because out of current money income greater consumption of C_2 is facilitated by E .

However, 4.2 and 4.3 imply a 'wealth' constraint

$$4.4 \quad p_1 C_1 + p_2 C_2 = M + p_2 C_1^0$$

whereby the left hand side indicates the expenditure on the commodities, and the right hand side the current money income available to the agent plus the value of previous consumption; the endowment of goods, skills or characteristics already accumulated.

Solving for the demand function for C_2 , following the usual constrained optimisation exercises leaves

$$4.5 \quad C_2 = \left(\frac{\beta}{\alpha + \beta}\right) \frac{M}{p_2} + \left(\frac{\beta}{\alpha + \beta}\right) C_1^0$$

which is the standard Marshallian demand for a commodity derived from a Cobb-Douglas utility function augmented by the last term on the right. The interpretation of this term clearly suggests that consumption is higher than it would have been because of the introduction of the expression 4.2.

If we interpret the expression 4.2 as representing investment in the consumption skills needed to undertake a sport then this suggests that previous consumption in the same activity can increase current consumption of the same activity. Likewise, if the commodity bundles are different sports then consumption of one sports activity can increase the consumption of another sports activity because of, for example implicit skill transfer, such as agility, timing, hand-eye coordination *etcetera*. There is an obvious rationale, therefore, for expecting the demand for any one sport to be positively related to the demand for other sports in the context of personal consumption capital investment.

Significantly, too, if we interpret the commodity bundles as originally proposed by Becker (1974), then C_2 might be thought of as a series of characteristics of other persons. In this case the first term on the right-hand side of equation 4.2 becomes the initial endowment of these characteristics held by the agent, and 4.2 the investment of effort in accruing these characteristics because they yield utility. This suggests that, for example, an increase in money income would yields a positive investment in the characteristics C_2 , adding to the stock of existing characteristics because

$$4.6 \quad \frac{\partial C_2}{\partial M} = \left(\frac{\beta}{\alpha + \beta}\right)p_2^{-1}$$

In contrast if the characteristics were considered undesirable, that is $\beta < 0$ in 4.1, then the derivative in equation 4.6 would turn out to be negative implying that a rise in income would lead to a reduction in the characteristics accrued by the agent, from previous stocks, for example the original social environment in which the agent was based. Rises in income may facilitate a shift away from these characteristics in favour of investment in others. What this suggests, of course, is that sets of characteristics are likely to be associated with distinct groupings over time as variables change depending on different sets of preferences. This is, of course, a description of social capital accumulation.

The point of this simple exercise is to illustrate that based on relatively straightforward and simple assumptions about the accumulation of personal and social capital, embodied in Becker's (1974) analysis, the predictions that this yields embrace common themes in the broader literature on sports participation. In particular the analysis shows that previous participation in a particular sport, or other sports, is likely to increase participation in any particular sport. The exercise also shows that once one recognises that any individual's utility depends upon the utility of others, because sharing or distinguishing characteristics with them matters, then similarities and distinctions between agents will develop and consolidate. In other words lifestyles will emerge. The next two sections of the paper thus focus on the empirical examination of these issues, before returning to a discussion of the policy implications of these theoretical and empirical findings.

5. Data, Variables and Method

Following Downward (forthcoming) data from the 2002 General Household Survey (GHS) are employed in this research. This is the latest published Official data set exploring a large range of sports and leisure activities. Whilst the survey is conducted annually, the modules addressing sports and leisure are only implemented periodically and the previous occasions were 1993 and 1996. Data on participation is collected for activities undertaken in the 4 weeks before the interview, coupled with their frequency, and participation for the 12 months before the interview took place. In this paper, the focus is upon the decision to participate or not, and their frequency, in the last 4 weeks before the interview for 14,819 adults aged 16 or over. In addition a broad range of personal and socio-economic characteristics are identified as factors that may influence these decisions, either collectively or individually. Table 2 provides details of the name and measurement according to the relevant broad set of characteristics.

INSERT TABLE 2 HERE

Because of the theoretical discussions above, rather than simply analysing the individual data, the method undertaken in all of the previous empirical research, a cluster analysis was first undertaken to identify the shared personal and socioeconomic characteristics of respondents. In other words it was recognised that the sample data may contain sub-samples of individuals with common lifestyles as measured by the accumulation of characteristics that make some individuals similar and others distinct.

Cluster analysis is appropriate in this regard because it comprises a set of multivariate statistical techniques with the aim of identifying and classifying objects, that is the

cases and *not* the variables, into similar types. These methods have a long tradition of application in the medical and biological sciences, as well as social science research, in which different cases need to be identified (Byrne, 2003; Romesburg, 2004).

Cluster analysis groups the cases or individuals according to similarities in the values of the variables that are used to describe the behaviour of cases.

There are a wide variety of methods of cluster analysis, but they are traditionally either hierarchical or relocalational. In the former individual cases are formed into successively larger clusters, by allocating cases to clusters or combining clusters sequentially until one single cluster is constructed. This leaves the researcher able to explore the interpretation of possible alternative classifications. In other methods cases are iteratively reallocated to best fit a predetermined number of clusters. In either case a distance measure is required to calibrate the similarity or dissimilarity of cases. With Ratio, Interval and Ordinal data Euclidean distances or varieties of coefficients can be calculated that lie between various ranges. With nominal data 'matching' coefficients based on proportions of shared characteristics can be calculated. (Romesburg, 2004).

In this paper, because the data set contains variables measured on a variety of scales and it is also very large 'Two-step' cluster is employed making use of SPSS. This is a relatively new method of clustering that has the advantage of combining the maximum likelihood distance measures developed by Banfield and Raftery (1993) for continuous variables and Melia and Heckerman (1998) for categorical variables to allow for combinations of these. The maximum likelihood procedure can be used to best fit cases to a predetermined number of clusters, or to identify the number of

clusters that best fit the data. As the name suggests, Two-step clustering embraces a two-stage approach. It is based on Zhang *et al* (1996) to reduce the computation problems and enhance the efficiency of the use of other methods with large data sets (see SPSS, 2001 for a discussion). In the first stage a relocational approach is used to initially estimate the clusters based on information criteria. In the second stage cluster allocations are refined by maximising the distance between the closest clusters in a hierarchical approach. The overall number of cases remains the same over the two stages.⁹ In this paper, as the emphasis is upon exploration of the possibility of lifestyles, the number of clusters was identified from the data.

Whilst cluster analysis is essentially exploratory, this is not to suggest that there were no theoretical expectations about the results. At the outset of policy concerns with sports, The Council of Europe (1980) and Rodgers (1978) developed classifications of leisure, recreation and sport which have become accepted categories, and are still implied in the 1993 Council of Europe, European Sports Charter. Rodgers (1978) argues that sports have four essential elements present. Physical activity, for a recreational purpose, with frameworks of both competition and institutions. Recreational activity would not include institutional competition, whilst leisure may not include physical activity, but reflect the use of non-obligated time. One might expect the sports and leisure activities in the GHS to be grouped according to such characteristics.¹⁰

⁹ Although maximum likelihood methods are employed it should be noted that there is considerable flexibility in the use of cluster analysis consequently a rationale should be provided for each application. In this regard the cluster analysis should be regarded as exploratory.

¹⁰ One might intuitively expect that sports may also cluster around technical characteristics such as racquet sports, team sports etcetera. One should caution against this expectation, however. On the one hand the cluster analysis is undertaken over the whole range of variables so sports comprise only one aspect of lifestyles. Secondly there may exist social and cultural barriers between apparently similar sports.

An important outcome of this method is the ability to define a cluster membership variable for each of the cases. Subject to meaningful interpretation, therefore, this can act as an explicit indication of previously latent lifestyle sub samples in the overall sample. Membership of these clusters can then be employed as a variable in a Heckman model alongside the original variables, including proxies for personal consumption-capital accumulation, to examine the choice to participate in sport and the frequency of this participation. If all of the other variables are included as well, then this gives the opportunity to assess the relative strength of personal and social capital influences upon sports participation as well as individual characteristics.

The Heckman model can be considered as the appropriate method to examine the choice to participate in sport and then its frequency, because it is conceivable that the sample of individuals undertaking sports of different frequencies is censored, that is contingent upon the choice to participate in the sport. This implies that the sample of observed frequencies of participation could be a non-random sample. In one sense this appears to be necessarily true. Surely, one cannot have a frequency of participation without an initial participation decision. However if one accepts the definition of sports participation as reflecting the consumption of non-obligated time, and also one recognises that the rational choice framework of economics of personal and social capital accumulation challenges the extent to which individuals are *constrained* in their behaviour, then it is possible to see the choice set as comprising voluntary decisions to participate on any number of occasions which could include not at all. It remains, therefore, that this assumption needs to be tested. However, the Heckman model allows for this.

$$5.1 \quad F_i = x_i\beta + \eta_i \quad F_i > 0 \text{ only if } P_i = 1.$$

$$5.2 \quad P_i = z_i\gamma + \varepsilon_i \quad P_i = 1 \text{ and } 0 \text{ otherwise}$$

Where η is $N(0, \sigma)$

ε is $N(0, 1)$

$\text{Corr}(\eta, \varepsilon) = \rho$

Equation 5.1 indicates that the frequency of participation, F , for any case 'i' is a linear function of a set of variables x , plus a random error assumed to follow the normal distribution. However, the frequency of participation can only be observed if the individual 'i' participates in the sport or not, as described by equation 5.2 for P_i . Participation, P_i , also depends on a set of variables, z , plus a random error that in this case is assumed to be bivariate normal. If equation 5.1 is estimated directly without account being taken of equation 5.2, and the correlation between the random errors (ρ) is non zero, then the estimates from equation 5.1 will be biased. The Heckman model, in contrast, estimates 5.1 accounting for 5.2 using either a two step or maximum likelihood method.

In the former case a control for sample selection can be obtained by including Mills Lamda, calculated as $\lambda = \sigma \rho$, in equation 5.1. If the coefficient on this term is significant, according to a standard t-test (or large sample equivalent), then sample selection bias was evident and purged from the regression which now produces consistent estimates. In the latter case a direct Wald test of $\rho = 0$ can be undertaken by comparing the joint likelihood of 5.1 and 5.2 being independent equations against the

likelihood of their being non-independent equations. This test follows a chi-squared distribution.

The choice between the Heckman estimation methods to an extent depends upon practical considerations. For example, the maximum likelihood approach can be used on weighted data, which is desirable as discussed earlier, whereas the two-step method cannot. However, the maximum likelihood approach can be unstable and fail to converge (Statacorp, 2003). In this research therefore, which used StataSE8 to provide the estimates, the maximum likelihood method was tried first on weighted data and if this failed to converge the two-step method was employed. In all cases cluster sampling was employed to account for the non independence of cases as they were sampled as part of households, and Huber-white robust standard errors used to control for non-spherical disturbances. If sample selection bias was rejected on the basis of two-step Heckman estimates because the maximum likelihood method did not converge, separate weighted, cluster sampling regressions and logit models were estimated for the frequency and choice to participate respectively to allow for the weighting of the observations.

A final issue that is important in using the Heckman model is to consider the identification of equation 5.1. In general, in systems of equations, instrumental variable estimation requires the use of a regressor variable that is correlated with the endogenous variable of the equation being estimated, but uncorrelated with the error term unlike the original regressor variable. Thus one needs independent variation in one equation to isolate parameter estimates of the other equation. In the Heckman model identification can be achieved by in two ways. The first is to impose some

theoretical structure on the model by, for example, including variables in equation 5.2 that are not in equation 5.1. The second is to let the alternative functional forms, implied in the error terms, identify the equations. It can be argued, particularly by those that hold to a rigid view of statistics as being used to test sharply defined theoretical conjectures, that the latter is a weaker approach to adopt. However, an alternative view is to recognise that the choices made, that is functional forms, do reflect real differences in the decisions being as made as these are reflected in the outcome values of the variables and hence the distributional assumptions implied.¹¹ In this paper the latter strategy is adopted. This also reflects the exploratory nature of the research, which has been stressed throughout the paper because, as implied above, there is no strong reason to assume that the factors that affect the decision to participate in a sport are necessarily different to those that determine how frequently participation takes place. Moreover the aim is to assess the relative importance of personal and social capital influences upon participation as opposed to individual characteristics.

6. Results

The cluster analysis yielded 3 distinct clusters for 9738 cases. The first cluster contained only 281 cases, the second cluster contained 2012 cases and the final largest cluster contained 7445 cases. This suggests that of the total sample of 14819 cases, 9738 cases had distinct profiles. A further 5081 cases produced an indistinct pattern of behaviour. In the subsequent regression analysis these indistinct cases are treated as the omitted base category for the cluster membership variable.¹² Space precludes a profile of all of the variables so Table 3 focuses upon the sports participation

¹¹ In philosophical terms this is an ontological commitment as opposed to a use of the method on purely pragmatic or instrumental terms.

¹² One should think of these cases as the intersection point of three other sets.

characteristics of the cases and Table 4 some of their main socioeconomic characteristics. Because the cluster analysis groups cases according to distributions of values of variables across a multivariate setting, one can always describe the clusters according to any particular variables of interest.

INSERT TABLE 3 HERE

In Table 3 the sports and leisure activities listed are grouped according to the modal frequency of cases engaging in a particular activity. The three columns under each cluster indicate the percentage of cases undertaking *that* activity, out of a total given by the value for N in that row of the last column.¹³ Consistent with expectations, the first group of activities are reasonably described as leisure activities. It is in the second and third clusters that sports are located. For example, the second group of activities are predominantly recreational activities whilst the latter group are predominantly team sports. The clusters are thus labelled as Leisure, Recreation and Sport respectively.

INSERT TABLE 4 HERE

In Table 4 some broader characteristics of the clusters are presented. The upper part of the table reports the percentage frequencies of particular attributes across the clusters. It should be noted here that the percentages are calculated against the total number of cases of each *set* of characteristics, rather than each row total. This helps to show how the characteristics is distributed across the clusters. The last column does,

¹³ The high value of N for the activity 'Running of Arts Events' suggests that events were interpreted very broadly. The value is something of an outlier.

however, report the number of cases according to each specific characteristic. The lower part of the table reports the mean and standard deviations of numeric variables.

The distribution of gross frequencies suggests that most cases in the sample are likely to be married with no children and consequently one adult male and female in the household. Health is likely to be good. The sample is balanced in terms of sex and educational attainment and ethnicity is broadly what one would expect for the UK and indicative of Official data. Perusing the results across clusters reveals that cases in the leisure cluster are more likely to be older, female, with a lower income and a more diffuse educational profile. They are also more likely to be married or have been married, though the proportions of household composition are broadly in line with cases in the recreational cluster. Significantly, however, they participate in less sports activities.

In the recreational and sports clusters, in contrast, cases are more likely to be younger, male, single and not have children. Educational profiles also rise as well as the likelihood of good health, incomes and the number of sports participated in.

Intuitively, thus, the results are indicative of lifestyle transitions associated with age. Notably participation in the number of leisure activities does not differ across clusters, which indicates that sports participation is a form of leisure that does adjust to lifestyle stage. Broader leisure pursuits that may not involve physical activity do not.

To investigate the choice to participate in specific sports activities or not, and the frequency with which this takes place, as discussed above Heckman models were estimated including all of the individual and socio-economic variables and the cluster

membership variables, as well as the number of activities participated in. The latter two variables measure the social and personal capital accumulation of the individuals respectively, whilst the former variables allow for the exploration of the effects of independent influences on decisions.

Table 5 presents the Heckman regression results for participation in any sport, and the total number of times that activities were participated in over the four weeks before the interview as a measure of aggregate sports participation.¹⁴ The maximum likelihood estimation was successful, the regressions significant overall and the test of independent equations rejected, suggesting that the choice to participate in sports activities and the frequency of participation are not independent decision in the aggregate. These results are indicated by the Wald test statistics at the bottom of the table. In the first column significant variables are noted. The second and third column present the estimated coefficients and the large sample ‘z’ statistics respectively.¹⁵

INSERT TABLE 5 HERE

The coefficient estimates suggest that participation in any sport is likely to increase if there is participation in more sports and the membership of sports or other clubs. This is also the case with cases having access to a vehicle, being a skilled manual worker and someone who drinks alcohol. Such results are clearly consistent with investment in personal consumption capital, and the increased likelihood of sports participation being male. In contrast, increasing age, living in the North or Scotland, being the

¹⁴ Only significant variables at the five *per cent* level are reported and constant values suppressed for economy. Full results are available on request from the authors.

¹⁵ In all regression results a five *per cent* significance level is adopted. Estimates are also presented for two decimal places.

individual responsible for housekeeping, undertaking voluntary work or being semiskilled reduce the likelihood of participating in any sport. The first result is intuitive. The second does point to some regional constraints on participation. The latter three are conceivably connected with gender, time and income and time constraints respectively. Significantly the likelihood of participating in any sport actually reduces for cases in the sports cluster. The implication here, is that this cluster is a relatively distinct set of individuals, as implied by its relatively small size.

The frequency of participation rises for those who have a perception of being more healthy. It also rises for those who participate in a larger number of sports as well as those belonging to the sports and recreation clusters, but not the leisure cluster. There is an element of aggregation likely in the former result, but on balance these results reinforce the view that investment in personal consumption characteristics, and lifestyles or social capital that has a sports component reinforce the frequency of sports activity.

Other factors that raise the frequency of participation are cases being in the North, cases with more adult males in the household and cases that work unpaid. The results for the North suggest particularly strong commitment once constraints on participation are overcome. The latter two cases could plausibly be linked to males reinforcing patterns of behaviour for one another through shared preferences, as males are more likely to be associated with the sport and recreation clusters. Working unpaid hours indicates an opportunity to be flexible in time allocation that is not possible in typical work relations. Significantly, in this regard, increased incomes reduce the frequency of participation, as does being a manual and non-manual

employee, or possessing qualification of at least A-level standard and having access to a vehicle. These are characteristics of work-time constraints on participation. Finally, volunteering in leisure activities reduces the frequency of sports participation. This further suggests the distinction between leisure and sports lifestyles.

Broadly speaking the results indicate that for sports participation, investment in personal consumption capital and social capital can increase the chance of cases participating in sport, as well as their frequency of participation. However, work related income-time constraints can mitigate against more frequent participation.

To disaggregate the results regression analyses for swimming, cycling, keep fit and weight training are explored as recreational sports, and rugby and netball for more specialised sports. Tables 6-8 present these pairs of sports respectively. In the case of the recreational sports it is notable that the equations were found to be independent. The same is also true of rugby. In these cases separate weighted robust regressions were estimated on the full sample, allowing for cluster sampling on households for both the choice to participate and also the frequency of participation.

INSERT TABLE 6 HERE

Table 6 supports the main results that participation in swimming and cycling are both more likely to occur with cases participating in other activities and for those in the leisure cluster. However they are less likely to participate in these activities if the cases belong to the sport cluster.

Swimming and cycling are also more likely to take place in the presence of children in the household. The main difference between the activities is that swimming is more likely for married and female cases, and those where children of both pre school age and school age are present in the household, whereas for cycling this is more likely to be the case for males with school age children in the household. Moreover participation is less likely in swimming with the presence of more adult males in the household and less likely for cycling with more adult females in the household. Access to a car has opposite effects on participation, increasing the likelihood of participation in swimming and decreasing it for cycling.

The number of sports participated in raises the frequency of participation in both cases as does belonging to a sports or other club. Membership of the recreational cluster also raises the frequency of participation in swimming. As with the decision to participate, being female or male, and the presence of pre-school and school-age children, or school-age children raises the frequency of participation in swimming and cycling respectively. In contrast the number of adult females in the household reduces the frequency of participation in cycling. Significantly, being responsible for keeping house in the case of swimming, and being employed in a manual or non-manual occupation reduces the frequency of participation in swimming and cycling. These results clearly describe gender-oriented family activities of a leisure or recreational nature.

INSERT TABLE 7 HERE

In the cases of the recreational activities keep fit and weight training, the effects of the family variables disappear. However, consistent with this, in both activities increasing age reduces the likelihood of participation. As participation in keep fit is more likely for females and for weight training more likely for males, this is suggestive of younger gender oriented activities. There is no evidence of personal capital effects, as measured by the number of sports, but interestingly in the case of keep fit, the number of leisure activities is significant. As dance and other arts activities, including leisure classes, may embrace elements of music, movement or aesthetics generally, this might be indicative of different consumption skills being required. However, in both activities there is evidence that social capital does affect the likelihood of participation. Sport and Recreational cases are more likely to participate in keep fit and weight training, but this is not the case for Leisure cases. Good health, however, does increase the likelihood of participation in both activities. Similar results apply in the case of the frequency of participation, though this is also enhanced by membership of a sports or other club. Other notable results are that voluntary and unpaid work reduces the frequency of participation.

INSERT TABLE 8 HERE

Considering the results for the more specialised sports of rugby and netball there is once again evidence of personal and social capital effects. Whilst the number of sports only increases the likelihood of participation in rugby, in both activities this rises for those in the sports cluster but not the recreational and leisure clusters. Notably too, the sports are associated with younger cases and also along lines of gender, which is consistent with their traditions. Strong regional effects are identified for Rugby,

associated with its original professional location in the North and indicative of it being the national game in Wales. The frequency of participation rises for rugby for those in a sports club, which is consistent with its technical and physical demands but declines with an array of work related characteristics. The latter is also true of Netball.

7. Policy Implications

The policy implications of the above analysis can be discussed under two broad themes. The first concerns assessing the target of sports policy and the potential policy levers that can be identified from the research. The second issue concerns the manner and logical prior concern with the likely efficacy of any policy intervention.

In the first instance, the empirical analysis identifies that one should not view participation in specific activities in isolation but that, if relevant, sports participation policy should target broads sets of activities. In terms of these activities the consistently significant variables that increase the likelihood of participation are the age and gender of the individual, coupled with their participation in a number of other activities and their membership of particular clusters of cases. Consistent with the theoretical discussions of Sections 3 and 4 these latter variables can be viewed as representing investment in personal consumption capital and social capital. The frequency of participation in a specific activity is, however, likely to fall as a result of various paid work-related characteristics and also voluntary and unpaid work. This is indicative of an income-time constraint. In contrast frequency of participation is likely to rise when cases are members of clubs. This suggests that once a threshold of investment is made in consumption activity, then this reinforces commitment to the activity. In addition the analysis implies that the frequency of participation may only

be dependent upon the choice to participate in the aggregate. In terms of section 4, this implies a degree of separability in the utility function, as the decision to participate in any particular activity a number of times may only be conditional upon a prior allocation of resources to sports activities in general. It is once these constraints are set that work-time and other constraints allocate time to activities.

In terms of Sport England's model of drivers of change in participation, thus, only ageing and time emerge as a distinct factors, with the latter connected to work and volunteering constraints. The other drivers; well-being, investment, education and access, appear to be broadly subsumed within the personal and social capital effects identified above, despite specific occasions when, for example, regional effects might identify differences in investment in sport, or gender and access to a vehicle indicate issues of access more generally defined. What this suggests is that policy levers should target age, gender and broader lifestyles if general increases in participation are desired. To target, say, specific clubs may only enhance the frequency of participation of particular and minority cases. This clearly raises issues associated with both the targeting and domain of sports policy, with a refocus away from competitive activity focussed around traditional stakeholders such as sports clubs and their governing bodies as part of an implied hierarchy into elite level competition overseen by a sports policy body, and a reorientation back towards mass participation in more casual activity as, for example, championed under various 'Sport for All' campaigns in the past (Council of Europe, 1980).

These issues suggest that in the UK, the movement towards a rationalisation of the sports policy delivery bodies along elite or mass participation lines, and the

appointment of the new Minister for Public Health looking to link sports policy to wider policy development is a timely step in the right direction as the nature of sports funding and provision has increasingly been oriented towards elite sports development. (Green and Houlihan, 2005; Downward *et al* forthcoming).

In what sense, however, should policy agencies intervene in the delivery of sports?

The theoretical review in Section 3 highlighted a number of theoretical positions associated with the decision to participate in sport and Section 4 suggested a potential theoretical synthesis of these approaches, the predictions of which are broadly supported. It is the generality of the mechanisms implied in the synthesis, therefore, that would underpin the general applicability of any policy mechanisms proposed on the basis of this analysis. However, whilst the predictions of the approaches may well be shared, the implied mechanisms underpinning the predictions are different.

Consider again the methodological approach of Becker (1976, 1992). Section 3 identified this as embracing economic agents with stable preferences maximising welfare, as perceived by them, subject to income, time, information and other limiting resources with markets and social structures allocating resources according to their shadow prices. Under such circumstances policy intervention is ruled out. This is because the model sketched in Section 4 can be shown to imply a version of the Coase Theorem, derived as the ‘Rotten Kid’ theorem, if any interdependency between consumption reflects a policy makers utility depending on the policy recipients utility (Becker, 1974). Consequently any transfers of income between the policy maker and the recipient, for example, to facilitate sports participation will *not* affect the consumption or welfare of either even if the former intends to enhance the welfare of

the latter and the latter does not reciprocate. For example, if the transfers to recipients require tax revenue to fund them, future tax burdens are rationally taken account of by current recipients of transfers and behaviour account for them. Likewise, even if transfers were made conditional of the consumption of specific activities, for example, to promote consumption of merit goods, incentives exist to undermine this policy. If the recipient did not want to spend the transfers on the targeted activity they would be clearly be worth less to them than to the policy maker. This might result in further reductions in consumption of what is perceived to be an inferior good. This might then completely undermine the incentive to give transfers. Under such circumstances there can be no strong rationale for active sports policy other than ensuring equal access to information about sports and physical activity to the population to allow agents to make choices.

In contrast if one views consumption activity as emergent from processes as described by the heterodox approaches, under which preferences can actually change, for example as a result of the opportunity to participate in previously unfamiliar activity, and that constraints face voluntary action, for example because agents do not possess optimising capability or particular characteristics and social circumstances act to exclude consumption opportunities, then an equation like that implied in 4.5 might be viewed in an entirely different way. One might argue that it is simply shows that a lack of prior experience of particular activities, or the possession of particular characteristics act as a barrier to participation. Likewise income differentials, interpreted as reflecting variances in economic opportunity, will affect participation. Under such circumstances active policy becomes desirable and should target both the constraints and agent choice in seeking to promote greater participation.

Obvious examples would be to ensure that facilities are available to all, preventing exclusion on personal or social criteria through legislation, coupled with the flow of resources to support areas in which choices are desired but not attainable, for example because of economic underdevelopment or cultural restraint.

It is clear therefore, that whilst common *predictions* are possible from a variety of accounts of participation, and that these can be supported by statistical inference, there is an ‘identification’ problem hinging over the interpretation of the predictions. It seems that this problem may only be resolved logically with reference to discussion of broader philosophical views on the nature of choice and a subsequent political preference over these views.¹⁶

8. Conclusion

This paper has addressed the determinants of both the choice to participate in sport, and the frequency of that participation. Based on a synthesis of various theoretical accounts, which yield the broad predictions that investment in personal consumption and social capital will be integral to understanding sports participation, this paper has explored a large scale-data set in the UK and found results that support these predictions. Along with specific individual factors that affect participation, such as age and gender, it is argued that these results are broadly consistent with the current

¹⁶ It might be argued that more detailed longitudinal analysis of the impact of policies on specific cases might help. However, one then faces problems of arbitrating between theoretical accounts on the basis of individual case accounts of their behaviour. Economic theory is predicated on using assumptions to yield predictions, but whose validity is lacking in a realistic sense. One this analysis reveals is that policy is an essentially normative process, and that this process includes arbitrating between competing accounts which data, in a non-experimental context, cannot arbitrate between (For more on these issues see Downward, 2003).

analysis of sports policy bodies in the UK. It is also argued that current changes in the organisation of sports policy in the UK, and its overseeing through a broader central governmental Minister are appropriate innovations in policy in as much that policy activism should focus upon broad sets of activities and also shape choices as well as eliminate constraint, for example, through education. However, it is argued that this may raise policy tensions between calls for mass participation and elite sports development.

More fundamentally, however, one caveat to this analysis, is that it can be shown that the empirical results can be seen to be equally supportive of a theoretical approach deriving from Becker (1974) in which policy activism is unlikely to work. It is clear, therefore, that the choice of policy activism or not resides in more philosophical and political concerns than empirical results *per se*.

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Table 1. Sport England Analysis of Determinants of Participation

Seven Drivers of Change Ageing population Time Pressures Well-Being and Obesity Levels of Investment Utilising Education Variations in Access Volunteers and Professionals	Five Settings for Change The Home The Community The Workplace Higher and Further Education Primary and Secondary School
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Source Sport England (2004b, p10)

Table 2. Social Economic and Sports Variables

<u>Conceptual Category</u>	<u>Variable name</u>	<u>Variable Measurement</u>
<u>Individual/Social Characteristics:</u>		
Age	Age	Years – continuous
Sex	Sex	Male or Female 1 = Male, 0 = Female
Ethnicity*	Whbrit	White British 1 = Yes 0 = No
Educational Attainment	Degree, schoola, schoolo	First degree (equivalent) or more, Alevels, Olevels or equivalent. 1= Yes 0 = No (Other or no qualifications is the omitted category)
Marital status	Married*	Married or Not 1 = Yes 0 = No
Household composition	nadmales	Number of adult males in the household
	nadfems	Number of adult females in the household
	n0to4	Number of pre-school children in the household
	n5-15	Number of school age children in the household
Health	Genhlth	General view of health 1 = Not good 2 = Fairly good 3 = Good
	Illness	Presence of longstanding illness 1 = Yes 0 = No
	limitact	If longstanding illness affects activity 1 = Yes 0 = No
Smoking	Cignow	Smoke cigarettes nowadays 1 = Yes 0 = No
	Cigarreg	Smoke cigar at least once a month 1 = Yes 0 = No
	Pipe	Smoke a pipe at least once a month 1 = Yes 0 = No
Drinking	Drinknow	Drink alcohol nowadays 1 = Yes 0 = No
	Drinkamt	Amount of alcohol drunk 1 = hardly to 5 = heavily`

Table 2 continued. Social, Economic and Sports Variables

<u>Economic Characteristics:</u>		
Employment status*	Empman, Prof, Nonman, Personal, Skillman, Semiskill, Unskill	Employer or manager, Professional, nonmanual, personal services, skilled manual, partially skilled manual or technical worker, unskilled. 1 = Yes 0 = No (Other employment status is the omitted category)
	Working, Retired, Keephous*	In work, retired from work, or keeping house 1 = Yes 0 = No (Not working, unable to work, the omitted category).
Region*	North, Mids, South, Wales, Scotland	Northern England and Yorkshire; East and West Midlands and East Anglia; South West and South East England; Wales; and Scotland. 1 = Yes 0 = No (London is the omitted category)
Access to Motor Vehicle	Usevc1	Own or use a motor vehicle 1 = Yes 0 = No.
Income	Weekinc	Gross household income in £000s
Hours worked	Tothrs	Total usual hours of work per week
Unpaid hours	Unpaidhr	Total weekly unpaid hours work
<u>Sports Characteristics</u>		
Sports participation	Sp4walk; Sp401- sp440	Participation in walking of at least 2 miles, sports activities 1-40 in the last 4 weeks 1 = Yes 0 = No
Sports club participation	Sp401sc-sp440sc	Sports participation in a sports club 1= yes 0 = No
Other club participation	Sp401oc-sp440oc	Sports participation in an other club 1= yes 0 = No
Sports Frequency	Sptim1-Sptim40	Number of times undertaking the activity in the last 4 weeks
Sports volunteering	Voltime	Hours spent on sports volunteering 1= Less than one hour per week to 5 = five hours or more per week
The number of sports activities	numsportw	The number of sports participated in during the last 4 weeks
Leisure Volunteering	Voltime2	Hours spent on arts and other volunteering 1= Less than one hour per week to 5 = five hours or more per week
The number of arts and leisure activities	numcultw	The number of arts and other leisure activities participated in during the last 4 weeks. These activities such as watching TV, listening to the radio, reading, painting, dancing and the arts.

*In these variables a much wider set of characteristics were investigated initially. However problems of small sample sizes associated with specific sports required some aggregation of categories.

Updated from Downward (forthcoming)

Table 3. Cluster Sports Participation Profile

Sport and Leisure Activity Undertaken in past 4 weeks	Cluster 1 'Sport'	Cluster 2 'Recreation'	Cluster 3 'Leisure'	N
Walk of 2 or more miles	3.77	27.64	68.59	3770
Snooker	7.86	39.65	52.49	865
Watched TV	2.89	20.66	76.45	9643
Listened to radio	3.01	21.77	75.23	8812
Listened to records/tapes	3.10	22.10	74.58	8475
Read books	3.00	23.73	73.27	6342
Sung/Played an instrument	4.11	30.88	65.01	1046
Performed in a play	5.36	36.90	57.74	168
Painting	3.55	28.95	67.51	874
Dancing	3.84	30.15	66.01	1068
Enrolled on a course	3.96	27.97	68.08	733
Attending leisure class	5.63	43.38	50.99	657
Written stories/poetry	5.21	33.44	61.35	326
Running an arts event	2.84	18.93	78.23	9478
Swimming indoors	5.41	48.33	46.26	1349
Swimming outdoors	9.77	65.80	24.43	307
Cycling	7.15	47.56	45.28	965
Indoor bowls	0.00	70.67	29.33	75
Outdoor bowls	10.00	67.50	22.50	40
Tenpin bowling	7.76	46.84	45.40	348
Keepfit/aerobics	4.37	52.80	42.82	1303
Martial arts	42.39	42.39	15.22	92
Weight training	12.38	73.94	13.68	614
Weight lifting	13.85	74.62	11.54	130
Gymnastics	0.00	90.48	9.52	21
Football indoors	22.87	65.43	11.70	188
Football outdoors	18.21	54.05	27.75	346
Cricket	3.45	82.76	13.79	58
Tennis	10.98	76.88	12.14	173
Badminton	10.33	78.80	10.87	184
Squash	20.14	68.35	11.51	139
Table tennis	16.36	67.27	16.36	110
Jogging/running	13.77	68.64	17.59	523
Angling	10.58	53.44	35.98	189
Ice skating	4.88	95.12	0.00	41
Golf	5.37	57.22	37.41	540
Skiing	18.18	75.00	6.82	44
Horse riding	7.62	67.62	24.76	105
Climbing	32.39	63.38	4.23	71
Motor Sports	18.03	40.98	40.98	61
Shooting	27.62	44.76	27.62	105
Rugby	80.00	11.43	8.57	35
American football	100.00	0.00	0.00	3
Gaelic sports	100.00	0.00	0.00	2
Hockey	89.47	0.00	10.53	19
Netball	76.47	11.76	11.76	17
Basketball	53.85	35.90	10.26	39
Athletics	70.59	17.65	11.76	17
Sailing	52.24	29.85	17.91	67
Canoeing	74.07	25.93	0.00	27
Windsurfing	82.35	17.65	0.00	17
Curling	100.00	0.00	0.00	3
Volleyball	90.48	9.52	0.00	21

Table 4. Summary Cluster Profile*

Variable	Description	Sport	Recreation	Leisure	N
Sex	Male	2	12	34	4727
	Female	1	9	42	5011
Ethnicity (Whbrit)	White British	3	19	70	8894
	Non White British	0	2	7	844
Marital Status	Single never married	1	7	17	2413
	Married	1	12	47	5818
	Married and separated	0	1	2	275
	Divorced	0	2	8	952
	Widowed	0	0	3	280
N0to4	0	2	18	66	8401
	1	0	2	8	1055
	2	0	1	2	262
	3	0	0	0	20
N5to15	0	2	15	56	7088
	1	0	3	11	1432
	2	0	2	7	939
	3 or more	0	1	2	279
Nadfems	0	0	2	6	827
	1	2	16	60	7632
	2	0	2	9	1086
	3 or more	0	0	1	193
Nadmales	0	0	2	11	1284
	1	2	15	54	6976
	2	1	3	9	1222
	3 or more	0	1	2	256
Health	Not good	0	1	11	1162
	Fairly good	1	5	22	2706
	Good	2	15	43	5870
First degree or more A Levels O Levels Other		1	10	21	3085
		0	3	10	1360
		1	5	21	2589
		0	2	25	2704
Household income £ week	Mean	1690	888	612	9738
	sdev	3465	880	538	
Number of sports (numsportw)	Mean	5	3	1	9738
	sdev	3	2	1	
Number of Cultural activities (numcultw)	Mean	4	4	4	9738
	sdev	1	1	1	
Age	Mean	36	41	45	9738
	sdev	12	13	13	

*percentages rounded up to integers

Table 5. Regression Results Anysport

Participation: anysport			Total frequency: anysport		
skillman	0.21	5.96	genhlth	1.03	4.49
keephous	-0.26	-4.61	usevcl1	-2.55	-4.54
scotland	-0.25	-4.55	volttime2	-1.28	-5.00
usevcl1	0.14	3.58	numsportw	2.22	8.99
age	-0.01	-15.09	sport	11.78	7.93
numsportw	0.14	12.90	recreation	7.55	10.39
spsc	0.44	8.03	leisure	-2.08	-4.14
spoc	0.45	9.87	weekinc	-0.53	-2.53
drinknow	0.21	3.25	unpaidhr	0.19	2.34
sport	-0.28	-2.89	empman	-1.42	-2.33
north	-0.09	-2.64	nonman	-1.20	-2.30
volttime	-0.05	-2.44	schoola	-1.20	-2.22
semiskill	-0.06	-1.35	north	1.28	2.22
			nadmales	0.66	2.20
Wald $\chi^2(45)$		1506.82	$P > \chi^2$	0.00	
Wald $\chi^2(1)$	($p=0$)	90.17	$P > \chi^2$	0.00	
N		11722			

Table 6: Regression results for swimming and cycling

Participation: Indoor Swimming			Frequency: Indoor Swimming		
sex	-0.95	-9.88	sex	-0.34	-7.14
n0to4	0.56	7.14	numsportw	0.22	11.21
n5to15	0.18	4.06	Recreation	0.78	6.10
numsportw	0.67	20.65	sp401sc	4.25	5.51
cignow	-0.31	-3.32	sp401oc	5.14	14.42
nadmales	-0.28	-3.29	n0to4	0.21	3.17
married	0.25	2.53	cignow	-0.11	-2.79
usevcl1	0.34	2.51	voltme2	-0.10	-2.72
Sport	-0.69	-2.47	n5to15	0.08	2.26
Leisure	0.35	2.45	keephous	-0.21	-2.23
keephous	-0.42	-2.29	voltme	-0.06	-2.21
Recreation	0.37	2.27			
Mills Lamda	1.36	0.18			
Wald $\chi^2(45)$	1194.10	$P > \chi^2 = 0.000$	F(47,7068)	19.38	$P > F = 0.000$
N		11401.00	N		11726.00
Participation: Cycling			Frequency: Cycling		
sex	0.41	4.19	usevcl1	-0.65	-5.67
numsportw	0.72	22.22	numsportw	0.50	13.57
Sport	-0.84	-2.87	empman	-0.39	-3.30
Leisure	0.44	2.74	nadfems	-0.24	-3.48
usevcl1	-0.37	-2.72	sex	0.22	3.02
drinkamt	-0.12	-2.55	sp403sc	5.38	3.01
nadfems	-0.20	-2.46	sp403oc	3.36	2.98
n5to15	0.11	2.16	mids	0.37	2.86
cignow	-0.21	-2.07	cignow	-0.20	-2.80
numcultw	0.08	2.02	nonman	-0.21	-2.00
Wald $\chi^2(1)$ (ρ)=0	0.82	$P > \chi^2 = 0.365$			
Wald $\chi^2(45)$	1057.67	$P > \chi^2 = 0.000$	F(47,7068)	8.92	$P > F = 0.000$
N		11689.00	N		11726.00

Table 7. Regression Results for Keep Fit and Weight Training

Participation: Keep Fit			Frequency: Keep Fit		
sex	-1.37	-12.92	sex	-0.36	-5.53
cignow	-0.38	-3.97	voltime2	-0.26	-5.23
age	-0.02	-4.15	Recreation	1.38	8.30
numcultw	0.20	5.75	sp407sc	6.48	6.05
Recreation	0.98	5.67	sp407oc	6.13	24.29
genhlth	0.24	3.44	unpaidhr	-0.02	-3.33
Sport	0.68	2.56	Leisure	-0.28	-3.40
Leisure	-0.37	-2.44	Sport	0.84	3.08
illness	0.24	2.23	genhlth	0.13	3.02
schoola	0.29	2.05	voltime	-0.12	-2.56
			cignow	-0.14	-2.34
			north	0.26	2.33
			age	-0.01	-2.00
Wald χ^2 (1)		P> χ^2			
(ρ)=0	3.46	=0.063			
Wald		P> χ^2			
χ^2 (44)	694.92	=0.000	F(46, 7068)	26.77	P>F=0.000
N	11114.00		N	11326	
Participation: Weight Training			Frequency: Weight Training		
sex	0.68	3.9	sex	0.22	4.96
age	-0.05	-7.17	pipe	-0.29	-4.79
Sport	1.20	3.88	age	-0.01	-6.11
Recreation	0.98	3.81	voltime2	-0.14	-4.26
Leisure	-1.30	-4.87	Sport	1.25	4.48
nadfems	-0.35	-3.14	Recreation	0.83	7.30
drinkamt	0.16	2.34	Leisure	-0.22	-5.08
genhlth	0.25	2.09	sp409sc	6.14	7.11
retired	-1.06	-2.06	sp409oc	6.89	19.57
			degree	-0.17	-2.45
			nadfems	-0.09	-2.26
			married	-0.11	-2.19
			north	0.19	2.17
			genhlth	0.06	2.04
Wald χ^2 (1)		P> χ^2			
(ρ)=0	1.49	=0.222			
Wald		P> χ^2			
χ^2 (43)	624.94	=0.000	F(46, 7068)	19	P>F=0.000
N	11331.00		N	11726	

Table 8. Regression Results for Rugby and Netball

Participation: Rugby			Frequency: Rugby		
numsportw	0.19	3.27	sp413sc	5.27	8.35
Leisure	-2.55	-3.26	prof	-0.04	-2.65
Sport	1.62	3.10	empman	-0.02	-2.30
sex	2.35	2.90	skillman	-0.01	-2.12
age	-0.08	-2.66	working	-0.03	-2.01
Recreation	-1.75	-2.52			
wales	2.75	2.40			
numcultw	0.30	2.07			
north	2.12	1.98			
Wald χ^2 (1) (p)=0	1.92	P> χ^2 =0.165			
Wald χ^2 (39)	227.55	P> χ^2 =0.000	F(47, 7068)	3.91	P>F=0.000
N	7871.00		N	11726	
Participation: Netball			Frequency: Netball		
sex	-1.31	-3.92	degree	3.25	2.73
age	-0.04	-5.12	whbrit	3.32	2.34
voltime	0.29	5.49	empman	-5.79	-2.22
Sport	1.07	4.80	prof	-5.81	-2.00
Leisure	-0.90	-3.79	nonman	-5.75	-2.00
Recreation	-0.83	-2.55			
Wald χ^2 (1) (p)=0	17.15	P> χ^2 =0.000			
Wald χ^2 (13)	Undefined*				
N	11726.00				

The very small sample of netballers implies constraints on the data set such that the overall statistic cannot be calculated.

