

Sambo, Emmanuel Ndenor

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HEALTH ECONOMICS GROUP

Faculty of Medicine and Health
Norwich Medical School



SOCIOECONOMIC INEQUALITY AND COGNITIVE & PHYSICAL DISABILITIES AMONG OLDER PEOPLE IN ENGLAND

Emmanuel Ndenor Sambo
MSc Health Economics

Health Economics Group, Norwich Medical School
University of East Anglia

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ABSTRACT

While the ratio of the younger to older populations grows smaller, the population of the old with health problems is increasingly growing. The likelihood of being disabled is higher for an individual with a lower socioeconomic status than that of an individual with a higher socioeconomic status. The social gradient in health has been found to persist even in the 65 and over age group; therefore, it is important to understand how the associations between disabilities in old age and socioeconomic inequalities thrive. In this study, data from the fifth wave of the English Longitudinal Study of Ageing was used to explore the associations between socioeconomic status and the likelihood of being disabled among non-institutionalised older people in England. Along with marital status, subjective and objective indicators of socioeconomic status were jointly then alternatively used as explanatory variables controlling for age and gender to estimate likelihoods of having cognitive and physical disabilities in old age using Logistic regression models. Results showed that socioeconomic status was associated with the likelihood of being disabled in old age. More than the set of models containing both, the set with either the subjective or objective measures of socioeconomic status explained the relationships between disabilities and socioeconomic status better. Disadvantaged socioeconomic status was associated with higher likelihoods of being disabled whether using the subjective or objective measures of socioeconomic status. From the analysis, education, although attained at younger ages still had significant effects on the likelihood of being disabled. This study contributes to the understanding of the persistent relationship between socioeconomic status and disabilities.

Key words: Older people, Socioeconomic Inequalities, Cognitive and Physical Disabilities

1. INTRODUCTION

England and indeed most developed countries have over the past decades, been experiencing a rise in their aged population. The oldest of old (85 years and over), as explained by Christensen *et al* (2009), has been shown to be the most expanding segment in developed populations in recent times. Bloom, Canning and Fink (2010) attribute this change in age structure to, 1. The rise in the level of life expectancy in these developed countries and the world at large, 2. Decline in fertility rates which has reduced the relative number of young people and has disproportionately pushed up the share of the elderly thereby, making the young to old population ratio smaller, and 3. Past variations in birth and death rates, most evidently the baby boom in developed countries after the Second World War.

This increase in the population of older people has also come with an increase in the number of adults with cognitive impairments (Mazzucco *et al*, 2013) and generally poorer health states (Mathews *et al*, 2005) making older people account for the majority of the population of those in poor health (Grundy and Holt 2001, Christensen *et al* 2009). Physical and cognitive disabilities are more common among elderly people, these with other diseases make the older age group the major consumers of health services in the UK as well as other developed countries (Grundy and Holt, 2001). This fact has led to growing concerns about identifying determinants of health and health inequalities in later life (Grundy & Sloggett 2003)

Evidence of disparities in health status with respect to differences in socioeconomic status sometimes referred to as the *social gradient in health* have been well established by numerous studies showing that those in the most socioeconomically disadvantaged groups also suffer the greatest health disadvantage (Fox, Goldblatt and Jones 1985; Elo and Preston 1996; Grundy and Holt, 2000, and Marmot 2005). With fewer resources to

manage their predicament, People with the least material resources are unreasonably exposed to negative social and psychological conditions that have undesirable effects on their physical and mental health. This topic has engaged researchers from different disciplines including economics, sociology, medicine, and epidemiology and lots more.

Various studies have found a positive relationship between socioeconomic status and health. Adjusting for other factors, health status improves as socioeconomic status improves. There are although a few exceptions to this assertion, for example, there have been studies that found evidence of associations between higher income and higher rates of self-perceived morbidity in some developing countries (see Murray, Yang and Qiao 1992).

Goldman (2001) identifies three possible explanations for the observed patterns of *causation* between health and socioeconomic status. The first hypothesis is the *causal mechanism* where one's health status is influenced by his or her socioeconomic status (see for example, Smith, 1999). The second hypothesis is the *selection or reverse causation*, which suggests that unhealthy or less healthy individuals may become more socially isolated which then reduces their social position due to their inferior health status through a set of pathways, while healthier individuals may be able to work more than those who are ill, enabling them to accumulate more wealth (see Wu, 2003). The third hypothesis, identified by Meer et al (2003) although less commonly employed involves *artefactual mechanisms* such as measurement errors, an example is when an unnoticed third factor that is not accounted for, simultaneously affects both health and wealth.

Whatever the explanation for the mechanism through which one's health affects or is affected by socioeconomic status, the existence of some correlation between the two is not questioned, a priori, as health status increases, we expect socioeconomic status to

also increase. The literature is replete with evidence of the relationships between mortality and socioeconomic status (see for example Martelin 1994; Elo & Preston, 1996 and Marmot & Shipley 1996).

But the direction of this relationship (whether causal or selection) is important for policy makers to determine an entry point for interventions, whether health or wealth comes first or a simultaneous approach to handle the two would be more appropriate has remained debated.

Disability in old age is caused by both non-modifiable (such as age, gender, genetics) and modifiable risk factors (such as, age related impairments, sedentary lifestyle, social and environmental factors) (WHO, 2003). There is also evidence of disabilities being related to early life circumstances. Understanding the pathways through which the different modifiable factors that influence disability do so is important in order to set the right strategies for prevention.

This paper explores the links between socioeconomic status and health, specifically physical and cognitive disabilities in older people in England. It begins by reviewing the literature on the existing findings on their relationships, and then it makes use of a nationally representative data -ELSA (English Longitudinal Study of Ageing) to study these relationships empirically.

This study seeks to explore the relationships between socioeconomic inequalities and cognitive & physical disabilities, using data from the fifth wave (2010-2011) of the English longitudinal Study of Ageing (2012); it uses marital status, occupationally defined social class, and education as the explanatory variables. This study takes a step further by introducing a relatively uncommon variable (self-reported social status) in this subject to explore this relationship. To the best of the author's knowledge,

subjective social status has only been used as an explanatory variable in exploring the relationships between socioeconomic status and health in very few studies (see for example Demakakos *et al*, 2008) and not in understanding its relationship with the likelihood of having physical or cognitive disabilities in old age. It is a subjective measure of social status assessed by where an individual *feels* s/he belongs on the social ladder (measured by what rung the individual feels he is on, the lowest being worst off and the highest being the best off)

1.2 RESEARCH QUESTIONS

This study will attempt to answer the following research questions

1. How is socioeconomic status associated with cognitive and physical disabilities in older people?
2. How is one's subjective perception of his relative socioeconomic position in old age, associated with the likelihood of his being disabled?
3. Can the subjective and objective indicators of socioeconomic status be interchangeably used in studying the associations between socioeconomic status and health (disabilities)?

2. DEFINITION OF KEY CONCEPTS AND UNITS OF DATA MEASUREMENT

2.0. INTRODUCTION

In order to give a clear understanding of the contextual framework as applied in this study, this chapter defines the key terms and the various contexts in which they are employed in the study. It further reviews some theoretical and empirical evidence of the relationships that exist between the various indicators of socioeconomic status and health –disabilities in older population.

2.1 SOCIOECONOMIC STATUS

Social class has been observed to be a good starting point for providing clues about the many etiologic agents in health (Liberators, Link and Kelsey, 1988). Epidemiologists have considered the links between socioeconomic position and health in a lot of studies, and have presumed the roles that may be played by socioeconomic status on health to be both as a risk factor and as a confounder. When it is considered to be a risk factor, with the major interest being in its relation to disease, it will be important to note that poor measurement of social class leading to random classification will likely dilute any actual bivariate associations between the two variables _health and socioeconomic status (ibid). It therefore is important to select indicators of social class that will be sensitive to those measures that such indicators are intended to represent.

An example of the problems caused by an inappropriate choice of indicators of socioeconomic status can be seen in the study of the relationships between schizophrenia and social class by Hollingshead and Redlich, (1958) which produced a biased result (Liberators, Link and Kelsey, 1988). In the study, Hollingshead and Redlich used a composite index that was severely education-influenced as the socioeconomic indicator and found no evidence of downward social mobility from parental origin after the development of the disease, not considering the fact that education could be a

misleading indicator, since the onset of schizophrenia typically occurs in late adolescence or early adulthood, often after education has been completed (Link, Dohrenwend, and Skodol, 1986). Later, other studies that used occupation-based measures of social class (Goldberg & Morrison 1963; Eaton 1980; Wiersma et al 1983 and Link, Dohrenwend, and Skodol, 1986), consistently found evidence of downward social mobility by the time of first admission to mental hospital. It therefore means that Hollingshead and Redlich missed this as a result of their use of an inappropriate indicator (Liberators, Link and Kelsey, 1988). This illustrates the kind of consequences to be expected when inappropriate indicators are chosen.

2.2. THEORETICAL BASIS FOR SOCIAL CLASSIFICATION

From a sociologist point of view, Weber (1946) views social class based on three dimensions, *Class*, *Status* and *Power* -party. He sees class to have an economic basis which implied control and or ownership of resources indicated by measures of income. Weber suggests a positive relationship between Income (control and or ownership of resources) and the esteem one receives in the society, therefore, the higher the income that accrues to an individual, the higher placed such an individual is expected to be on the social strata in the society, all things being equal. Weber sees status as prestige and honour in the community, which implied “access to life chances” with respect to social and cultural factors such as one’s family background, lifestyle and social networks (Lipset, 1968). Weber saw power in a political context.

2.3. CRITERIA FOR JUDGING THE UTILITY OF SOCIOECONOMIC INDICATORS IN THE STUDY OF HEALTH INEQUALITIES

Contrary to past assumptions of homogeneity in health and social status of older people (Victor, 1989); there has been a growing body of evidence that counters that notion

especially in recent times where most deaths in developed countries (including the United Kingdom) now occur at old age. Morbidity in these countries is also higher in the aged population. This then suggests that health inequalities exist in the aged population. It also shows the need to investigate the different mechanisms through which these inequalities come about.

Measuring the socioeconomic status of older individuals is particularly difficult for a whole number of reasons -explained in the course of this chapter. These difficulties discourage research and make policy formulation and implementation complex and sometimes imprecise (Grundy and Holt, 2001). Therefore, there is the need for setting standards against which to measure the utility of socioeconomic status indicators especially as it is employed in this study.

Grundy and Holt (2001) give criteria against which the utility of socioeconomic indicators in the study of health inequalities can be judged. These criteria include:

1.) Being grounded in theory. 2.) Ease and reliability of data collection. 3). Sufficient sensitivity to allow identification of manageable number of groups ranked in some logical hierarchy. This requirement is particularly important if the aim of the study is to find the differences between and within groups in the social health gradient from the most advantaged to the most disadvantaged. 4.) Indicators of socioeconomic status should not be outcomes of health, as problems of possible reverse causation may exist thereby making interpretation difficult.

2.4. OCCUPATION EDUCATION AND INCOME *as objective indicators of socioeconomic status*

Weber's conceptualisation of social class has been reflected in the three most commonly used indicators of socioeconomic status -education, income and occupation (Grundy and Holt 2001). These three indicators are correlated and possess some degree of

overlap in most cases. No single one of the three possesses all of the qualities above mentioned. Grundy and Holt (2001) therefore, suggest the composite use of the three of them. But this might introduce problems of multicollinearity as the three indicators have been found to have high degree of correlation (see appendix 3 for cross tabulations of education and social class). Multicollinearity makes it difficult to disentangle the separate influences of the independent variables on the dependent variables (Moffatt, 2013).

2.4.1. OCCUPATION

Most studies have based their measures of social class on occupational ranking (Liberators, Link and Kelsey, 1988). This is because many sociologists consider occupation/occupational class to be a reliable single indicator of relative standing in industrial societies (Haug, 1977).

An individual's occupation has been found to determine his/her level of exposure to both the emotional (psychological) and Physical stress that comes with the occupational class. Occupation also determines the degree of intrinsic and extrinsic rewards one gets and the extent to which such individual has personal control in his/her work environment. One's occupation also determines the level of risk (occupational hazard) such a person would be exposed to as a result of the environment where such jobs operate.

Liberators, Link and Kelsey, (1988) explain two grounds upon which occupations are ranked. 1.) *Prestige* Based on the public opinion of their level of esteem and 2.) The second ground is based on their educational requirements and monetary payoffs, because education and income are conceptualized as allocating persons to different lifestyles and power positions.

Social classification of older populations based on their current occupation is particularly problematic because at older ages, most of the individuals studied should ideally be retired. But it should not just be dropped because occupationally defined social status at time t_0 can have an effect on an individual's health status at a future time say time t_2 .

2.4.2. EDUCATION

The level of education attained by an individual and the amount of knowledge acquired as a result can affect such an individual's behaviour and practices by influencing lifestyle and social networks. Education is also used as a proxy measure for variables in the economic domain since it provides the qualification to acquire certain occupations and income. Although Grundy and Holt (2001) do not find an association between education and disabilities, which they attributed to the fact that most of the participants in their studied population were not really varied in the level of their educational attainment, as most had just the basic level of education, Freedman *et al* (2008) attribute the decrease in disability and its delayed onset in the same age group that Grundy and Holt (2001) studied to higher educational attainment in the composition of the aged population. This then means that education will serve as a good measure of social classification if the levels of attainment in a given sample are varied.

The mechanisms through which education as a measure of socioeconomic status influences health include *lifestyle behaviours* such as exercise and dieting, *values* such as giving importance to preventive health habits, and *problem solving capacity* (Liberators, Link and Kelsey, 1988).

Problems of reverse causation are less serious with education as an indicator of socioeconomic status because educational attainment is normally fixed early in life (Grundy and Holt 2001). Because of its association with many lifestyle characteristics

and the simplicity of collecting data on education, it is a popular single indicator. It also more stable than income and occupation, as it is not possible to reduce the level of education one has attained. On the other hand, this stability can also be a negative feature as seen in the earlier example about Hollingshead and Redlich's (1958) study of schizophrenia and social mobility since a loss of cognitive abilities cannot be reflected in one's level of education as long as it has been achieved before the onset of the disability.

2.4.3 INCOME

Based on Weber's theorising of social class above, we find income to be a good measure (indicator) of social class. But it is important to note that income alone, does not completely give a comprehensive yardstick for social stratification especially among the aged population.

Income inequality, (although the definition may vary with respect to the context in which it exists) affects one's health outcome. The definition of poverty may qualitatively vary between rich and poor settings, from its meaning mere inability to afford food, clean water and housing in poor settings to it meaning difficulty or in extreme cases, one's inability to heat his home properly due to economic strains (Groffen et al, 2008).

Even in the most developed countries where poverty levels are expected to be low, there exists evidence of widening income disparities (World Bank, 2006). Though one may be tempted to believe that developed or 'rich' countries do not have poor citizens, at least not to the extent that they struggle to get the basics of life, such as shelter, and food, the rise in the number of 'food banks' or food rescue organisations common in these countries (see for example, Desain *et al.*, 2006) indicates that there are people that are struggling to make ends meet (Groffen, *et al.*, 2008).

Fuchs (1993) notes that income has a weaker association with health when compared against wealth, education and occupation, all of which are longer-run measures of

socioeconomic status, this does not rule out the fact that an individual's income affects his health. But income, which is seen as short run, builds up over time, to wealth.

2.5. SOCIOECONOMIC INEQUALITIES

Socioeconomic inequalities exist when resources in a population are unevenly distributed on the basis of some set standards of allocation that are typically predicated on some socially defined characteristics. While this may sound rewarding to the hard working population –assuming the socially defined standards are based on achievements strictly gained through hard work, it becomes a biased system in populations where there are some people whose social status cannot be changed. Such include those social positions defined by say, gender and ethnicity.

Socioeconomic inequalities exist in almost every setting, but the extent to which they define the differences in health status among the different socioeconomic groups differs. Differences in health outcomes based on social and economic background (SEP gradients) have been recognized as avoidable and unfair inequalities that must be interrogated and addressed (Marmot, 2005).

2.5.1. Between Health Inequalities and Inequities

Health inequality is the uneven distribution of health or health care opportunities and services within and between populations. These inequalities can be classified into two kinds -either *legitimate* or *illegitimate* (Donni, Peragine and Pignataro, 2014). While legitimate health inequality is seen as the type that exists as a consequence of the different levels of effort individuals put in leading a healthy life -suggesting that individuals should be held responsible for their health states, illegitimate health inequality on the other hand, is seen as the type of inequality that exists as a result of factors and circumstances that are beyond the control of those individuals concerned.

Roemer (1998) in an attempt to put forward an argument for Equality of opportunity in health makes a distinction between unchosen circumstances and individual choices, the former being circumstances that are just given and not a result of individual's preferences. He described the latter to be a result of the concerned individual's actions or inaction. To achieve equality of opportunity, Roemer (1998) suggests that the inequality due to individually uncontrollable factors must be removed while allowing unequal outcomes among individuals emanating from different levels of effort (Donni, Peragine and Pignataro, 2014).

But drawing a line between preferences and uncontrollable circumstances (or resources) is a lot harder than it may first seem, there is the possibility of an endogenous relationship where one's circumstances will influence her behavior and vice versa. For example, one's family background may be seen as an uncontrollable circumstance but the habit that might be as a result of the way she was nurtured in the family is seen as her choice.

Understanding Inequality of opportunity in Health

Donni, Peragine and Pignataro (2014) model a health status function, where they propose health h to be a joint result of individual effort e -seen as those lifestyle characteristics that may influence one's health state such as poor dieting, and social circumstances c -such as socioeconomic background. This deterministic model does not take random components such as luck into account therefore every factor other than circumstance is seen as effort. These two sets of characteristics therefore, explain individuals' health status.

$$h=g(c, e) \tag{1}$$

Therefore, equality of opportunity is said to be existent if all who exert the same lifestyle behavior are characterized by the same level of health.

2.5.2. Health Inequity

Health inequities are systematic differences in the health status of different population groups (WHO, 2011) that arise not as a result of preferences but that of constraints which may be income, environment, and time costs among others. These inequities bring along with them to the individual and society, significant social and economic costs. Conclusions about health (in)equity should involve considerations of the causes of health inequalities. Therefore if an individual is constrained by some factor other than his/her choice to reach a lower level of health than others it may be considered as inequitable. Morciano (2013) considers as social injustice, health inequalities that arise as a result of differences in constraints derived from socioeconomic status.

An example of the complexities that may arise from the analysis of health inequity can be seen in high income countries with universal health coverage where the poor often make more use of health care than the rich. But this greater use of health services emanates largely due to their lower health or greater need for health care services. Making immediate inference from this health inequality of the existence of health inequity by examining the differences in health, or access to health care can be wrong. There therefore, has to be a robust way of assessing health inequities.

A simple conclusion that can be drawn is that, not all health inequalities are *per se* inequitable because health inequalities can be driven by various factors some of which may not be influenced by policy for example. There therefore is health equity if the differences in health that exist are a result of different choices made by the individuals on the same sets of health opportunities.

2.6. DISABILITIES

Disability can be seen as the condition of being unable to do things that one naturally or normally should be able to effectively do without help from another person (Verbrugge 1994). It is a multidimensional concept and experience arising from the interactions of health conditions and physical environment (Emerson et al 2009). It is an ability restricting impairment. The World Health Organisation sees disability as an umbrella term that encompasses impairments, activity limitations and participation restrictions (WHO, 2014). WHO defines impairments to be problems in body function or structure; activity limitation to be difficulty encountered by an individual in executing a task or action; it sees participation restriction is a problem experienced by an individual in involvement in life situations.

Disabilities are in many kinds and they affect different functions in a person. These functions may vary from vision, movement, judgement, memory, learning, communicating, hearing, mental health, to social relationships (CDC, 2014).

Disability gap is the difference between an individual's capability to complete a particular task and the demand imposed by the task (Verbrugge, 1990). Disability gaps can be reduced or increased by either altering what the task demands or the capability of the individual. If capability is kept constant and the demand is reduced, for example by introducing a machine, which would then demand less effort, the disability gap is reduced. The individual's capability can also be improved, which also reduces the disability gap. By recognizing and implementing change where needed, elderly individuals, even those mildly to moderately disabled, can maintain an active, independent life (Ostir *et al* 1999).

Several domains of disability have been proposed; they include physical, cognitive, sensory, emotional and social functioning. Frailty in old age may be associated with one

or two of these domains (Guralnik and Simonsick 1993). This study focuses on the physical and cognitive domains of disability. Guralnik and Simonsick (1993) explain that physical and cognitive disabilities have the greatest impact on the overall burden of frailty and disability in the United States. Several studies have also shown that a significant number of adults and children in the UK live with one form of disability or the other (see Gordon et al, 2000; Bajekal and Harries 2004; Emerson & Hatton 2007 and Breeze & Lang 2008)

The costs of disabilities are enormous both to the disabled person and the carers. Disabled people may suffer social exclusion and discrimination associated with their disability; they are also more likely to be exposed to socioeconomic conditions that are detrimental to their health (Emerson et al 2009)

2.6.1. Physical Disability

ADL (Activities of Daily Living)

Functional disability is seen as difficulty in performing basic activities of daily living (ADL). It is characterised by loss of independence in these basic activities of self-care such as bathing, using the toilet, moving out of and into bed without assistance. Essentially they are those activities, which are fundamental to maintaining older people's independence and quality of life (Convinsky et al 2003).

ADL difficulty is a measure which identifies those at risk of becoming dependent in ADLs, and which is less sensitive to environmental differences than ADL dependency (Verbrugge & Jette, 1994).

2.6.2. Cognitive Disability

Cognitive disability can be seen as difficulty in performing various mental tasks which may range from inability or difficulty to recollect information, communicating, to learning disabilities to dementia. Due to how broad the concept can be, this study will narrow its focus to memory, -the individual's ability to recall words mentioned immediately.

It is worthy of note that ADLs are self-reported difficulties and are therefore somewhat subjective whereas the Cognitive Function measure used in this study (as measured by the number of words immediately recalled) is more objective. It is also known that self-reported and observational measures give different results (Grundy & Slogett, 2003).

This therefore might have implications for how each is related to subjective and objective measures of socioeconomic status.

3. THEORETICAL FRAMEWORK FOR THE RELATIONSHIPS BETWEEN HEALTH AND SOCIOECONOMIC STATUS

3.0 INTRODUCTION

This chapter reviews the theoretical evidence that have been established of the relationships between health (disabilities) and socioeconomic status. It also gives an overview of the various pathways through which socioeconomic status affects or is affected by health. This chapter further reviews the existing explanations for the various mechanisms through which socioeconomic factors influence disability in old age.

3.1 THE ONSET AND PREVALENCE OF DISABILITIES IN OLDER PEOPLE

Most cases of disabilities have been found to start to appear in later life (Freedman *et al* 2008), the various forms of disabilities can be caused or further aggravated by socioeconomic factors including, age, housing tenure, income, environment, marital status and a lot more. Evidence from different studies demonstrates various degrees of the association between these socioeconomic factors and disability especially in old age.

Attribution

In the process of searching for explanations for phenomena, classical attribution theory suggests that people make all sorts of attributions (Sarkisian, *et al.* 2001). In most cases, the attributions made by people concerning the causes of their predicament (disabilities in this case) can be completely wrong, but they make these attributions to feel better and make the condition acceptable. Blaming every symptom of disabilities on the ageing process would direct attention of the elderly person and of course, the policy maker away from other more serious possible factors (environmental, psychosocial and

behavioural) that may actually be their root causes (Kart 1981), that kind of misattribution could have tragic consequences.

As much as disabilities may be more prevalent in older populations, there is danger in writing it off as what just “comes with age”, and therefore, unavoidable. Doing so could lead to an underutilization of health care services that could have extended the individual’s (active) life expectancy. For example, an aged man experiencing difficulties walking up the stairs may just write off his condition as one of those that come with old age when it is in fact, as a result of a modifiable health condition. This misattribution may lead to the individual not being diagnosed and treated of the underlying health condition, which could have the potential of degenerating to a worse condition and in some cases be an avoidable cause of death.

It is therefore, important to understand the causal links between disabilities and every controllable factor and the mechanisms through which disabilities in older people are aggravated in order to be able to suggest possible solutions to improve their (active) life expectancy.

3.2 SOCIOECONOMIC INEQUALITIES AND HEALTH

It has been established that persons of higher socioeconomic status who are more socially integrated experience lower rates of morbidity and mortality than their respective counterparts (Goldman 2001). A large number of studies give evidence of the positive relationship between socioeconomic status and health generally (Adam *et al*, 2002; Adda, Chandola & Mamott, 2002; and Mathews *et al*, 2005). This positive association between health and socioeconomic status has consistently been demonstrated within and between levels of the social hierarchy. Adda, Chandola and Mamott (2003) in investigating the conclusions from Adam *et al* (2002) of the

relationship between socioeconomic status and health, find that similar patterns of the relationship between Socioeconomic status and health exists across countries despite the considerable differences in health care services coverage.

Evidence of socioeconomic inequalities in health has been demonstrated for over a long period of time. In England for example, this has been shown for over 150 years (Farr 1860). Lancet (1843) showed that the wide disparities in average life expectancy that existed between those born to the aristocrats (35 years) in Liverpool and those born to labourers (15 years) was as a result of differences in the social classes of the gentry and labourers. Information such as this drew attention to the need to improve living standards in order to increase general life expectancies. This agitation climaxed with the publication of the *Black Report* 1980, which was commissioned by the government in England to among other tasks, assemble information about differences in health status across social classes (DHSS, 1980). The report found, evidence in favour of the priori that there was a positive relationship between health and socioeconomic position. This hypothesis has only gained credence over time, as other studies in England and other countries have found evidence in its favour (see for example, Mackenbach *et al.*, 2007; Adler & Stewart, 2010 and Johnson, 2011).

3.3 THE MECHANISMS THROUGH WHICH HEALTH AFFECTS OR IS AFFECTED BY SOCIOECONOMIC STATUS

The black report provided the first clear framework for explaining the social inequalities in health (Benzevel *et al*, 2014). It gives four possible explanations for social inequalities in health as:

- i. An artefact of measurement error
- ii. A result of social selection
- iii. A consequence of individual behaviour
- iv. A result of the individual's social and material circumstances

These make up their different explanations for the observed patterns between health and socioeconomic status. As much as the Black report committee were confident about their findings, they made provision for uncertainty by acknowledging the complexity in understanding and explaining the perceived patterns of the social inequalities in health (Macintyre 1997).

3.3.1 Artefactual Mechanism:

The artefactual explanation for socioeconomic inequalities in health suggests that differences in health status with respect to social status exist as a result of an error in the way the variables were measured. But the black report itself dismisses the notion that this could be the sole reason for social inequalities in health, acknowledging that the extent to which this theory would hold true depends on the way the variables were measured. Methodological challenges continue to increase as the study of the social inequalities in health continues to become more sophisticated. Nonetheless Bambra (2011) considers as unrealistic, the idea that all inequalities in health are a result of measurement problems.

3.3.2 Natural/Social Selection:

The second explanation by the Black report -*social/natural selection* suggests that inequalities in socioeconomic status are influenced or caused by health inequalities. It suggests that individuals, through a set of pathways become socially isolated as a consequence of their poor health status. This implies a reversed direction of causation from health to socioeconomic status, sometimes referred to as selection. This explanation suggests that health is responsible for health-related social mobility. Poor health, by this theory, leads to disadvantaged socioeconomic circumstances. Less strictly put, health at least contributes to an individual's socioeconomic status. But it depends on the measure of socioeconomic status that is being considered; health does not always influence every measure of socioeconomic status. For example, deterioration in an individual's health does not reverse his/her educational attainment. Whitehead (1992) for example, explains how this theory may only hold for a small proportion of the existing social inequalities in health. Although the postulation is not completely accepted as the sole explanation for the socioeconomic inequalities in health, the two way relationship between health and income is still explored in economics and epidemiology in understanding the burdens of ill health (see for example, Smith 1999, Russell, 2004).

It should be noted that, how early disabilities set in in the life an individual would matter in determining the extent to which the resultant effect on one's socioeconomic situation could be. Therefore the effect of health on socioeconomic status varies from person to person depending on what point in their lives the disabilities set in. If disabilities set in before an individual reaches a certain socioeconomic threshold, the effect on such an individual's socioeconomic status is more devastating than when he/she has attained a certain level socioeconomically.

3.3.3 Behavioural Explanation:

Activity limitations often appear later in life but risk factors for such limitations and underlying chronic impairments may be traced to behaviours and exposures in earlier life (Freedman *et al* 2008). The third explanation -*individual behaviour*, suggests that individuals in lower socioeconomic circumstances are more likely to indulge in health harming behaviours (such as the ingestion of hard drugs and excessive alcohol intake). This would suggest that such individuals are responsible for their health status, which is a hard version of the theory; a softer version of this theory would be that individuals' behaviours influence the inequalities in health. This theory also, does not hold true in every case, some people in poor living conditions for example, would not behave in health damaging ways but their inability to afford the basics of life, (such as shelter, and proper nutrition) would still increase their vulnerability to ill health.

3.3.4 The Materialist explanation:

The fourth explanation suggests that inequalities in health exist as a result of the varying degrees of access that the different social classes have to material resources. This implies that those with the least access to material resources, (income and wealth) mostly referred to, as the most disadvantaged social classes are more likely to suffer ill health. Income is at the core of the materialist explanation for the links between health and socioeconomic status (Benzeval *et al.* 2014). Macintyre (1997) gives a softer explanation to this theory, being that health inequalities are a consequence of both material and psychosocial processes that depend largely on the level of esteem accorded to different social classes in a society. An example of a mechanism with which to explain this theory can be seen in a situation where a "poor" person depressed as a result of his economic situation resorts to an unhealthy behaviour -such as excessive intake of alcohol or smoking which in turn, leads to poor health.

In all four of the explanations above, the positive relationship between health and socioeconomic status that has been established in various studies is not questioned, but the direction of causation has remained the sole debate. Goldman (2001), in trying to disentangle the different underlying mechanisms, cautions that *selection* –also known as reverse causation and *causal mechanism* should not be viewed as competing explanations in the sense that the presence of one precludes the other's. Rather to the extent that selection operates it must do so alongside a complex set of pathways.

3.4 SOCIOECONOMIC CAUSES OF DISABILITIES

Socioeconomic status has been found to have a positive relationship with the onset of disability (Grundy and Glaser, 2000). Adam *et al* (2003) showed evidence of a very strong relationship between socioeconomic status and mental illness. Grundy and Holt (2000) show a positive relationship between poor self-rated health, the prevalence of disabilities and lower socioeconomic status.

Different components of socioeconomic status have been shown to make up the factors that influence an individual's likelihood to be disabled or generally have a poor health status. These components could be the political, social and economic forces that control the environment where the individual finds his or herself (Marmot 2008).

3.4.1 Early Childhood circumstances:

Early social and physical circumstances are important in determining an individual's life long trajectories and health opportunities (Marmot *et al.*, 2008). The greatest burden of under-5 infant mortality is borne by the most economically disadvantaged groups in an economy (Black, Morris & Bryce, 2003). This health inequity, beyond mortality also exists for other health indicators, with children in the most economically disadvantaged

being more susceptible to poorer health conditions compared with children in better socioeconomic positions. Evidence of this trend abounds within and between the social strata.

In cases where the infant in this disadvantaged group is resilient enough to survive all the early childhood diseases and illness episodes, they hardly reach their developmental potentials, obviously for reasons that include absenteeism from school, poor physical and cognitive development among other reasons; this in turn has huge implications for their health (Grantham-McGregor *et al.*, 2007). Negative early childhood experiences are also associated with criminality and poor economic participation (Irwin, Siddiqi & Hertzman, 2007).

The health inequities faced by the economically disadvantaged groups have the capability of being transmitted down generational lines. Grantham-McGregor *et al.*, (2007) illustrates how this intergenerational transmission may occur. Children from disadvantaged backgrounds may be faced with malnutrition, poor cognitive and physical development, missed school days which then leads to poor performance in school, and therefore low educational attainment which hinders them as adults, to get good paying jobs and rising through the occupational ranks, and so they remain in the same or worse condition their parents were in. Their children in turn stand the chance of facing the same fate; this creates a vicious cycle of poverty and ill health, also known as the poverty trap. Therefore, poor early childhood circumstances have a long-term negative effect on the health and socioeconomic conditions of an individual.

3.4.2 Education

Educational attainment could determine an individual's health in old age, this is because the level of education attained by an individual in many ways determines the type of employment, level of income, social networks and living conditions that such individual would be faced with later on in life (Cutler and Lleras-Muney, 2006; Bloom 2007). Education may increase feelings of personal control and promote better health behaviours, it also provides the capacity for a higher paid job therefore, greater income and pension in later life (Grundy and Sloggett, 2003).

3.4.3 Subjective measure of wealth

Mathews *et al* (2005) in their study of the socioeconomic factors associated with the onset of disabilities in adults aged 75 and over, found that a subjective measure of financial difficulty accounted more for the prevalence and onset of disability. Wildman (2003) also found this subjective measure of financial wellbeing to play a major role in the prevalence of mental problems although his study population was composed of adults aged 16 years and over.

The health problems that subjective measures of wealth could initially trigger are more psychosomatic in nature, but they can translate into other diseases that make an individual prone to disability. To illustrate this, an individual might consider himself not financially measuring up to a certain standard and out of frustration resent to health damaging behaviours such as excessive intake of alcohol or unhealthy foods that among other damaging effects, could make him obese, and obesity has been found to have a high likelihood of catalysing the disablement process.

Laughton *et al.* (2009) report that people with obesity are between five to nine times more likely to have limitations in mobility-related activities compared with people with healthier weight. Because obesity causes mechanical stress on the joints, an obese individual faces the risk of having difficulties in basic activities of daily living such as walking, climbing up the stairs and experiencing pains. Obese individuals are also more likely to maintain a sedentary lifestyle, which in itself is harmful to one's health. Obese people suffer functional limitations and mental distress as a result of the pain and discomfort caused by their weight. (Gatineau, Hancock and Dent, 2013)

3.4.4 Income

Mathews *et al* (2005) found no association between income and the onset of disability. Arber and Ginn (1993) also found that once social class had been adjusted for, income has no association with the onset of disability in adults aged 65 years and over. Grundy and Glaser (2000) found that income had less effect on the onset or progression of disability compared with Housing Tenure and Social class in early old age.

This could be due to the fact that income in old age across all social classes is disproportionately lowered compared with when the individual was younger. Old age is viewed as a period of dissaving (Morciano, 2013). A better measure would be stock of wealth, which would give a picture of the income that accrued to such individual when s/he was younger and at income earning age. However, income from pension alone can be used as a proxy of income in younger adult age, which is a measure of the amount of income that accrued to the individual (as wages and salaries) while s/he was at working age. This although, would only make sense if the income at young age were pensionable.

The feeling that comes with possession of material resources includes that of control and self-sufficiency, which help eliminate feelings of low self-esteem and aid social integration. Material resources do not only give one the ability to purchase food and shelter, they also aid an individual to purchase services that may preserve feelings of autonomy and control which then enables social participation (Grundy & Sloggett, 2003).

Poor social connectedness has been associated with high mortality rates and poor health (Grundy, Bowler & Farquhar, 1996). As income influences social connectedness through its influence on an individual's self-perceived measure of wealth and the level of esteem the society accords him/her, it has an effect on an individual's stress levels.

3.4.5 Housing Tenure

Housing tenure is associated with other indicators of socioeconomic status such as income, which in turn influences health. Macintyre *et al.*, (2003) observe an association between housing tenure and mortality and morbidity, demonstrating how housing tenure can be used as a measure of material and/or social deprivation. Housing tenure as a measure of socioeconomic status is also preferred because of its quality of relating to current material circumstances (Arber and Ginn, 1993). Grundy and Holt (2001) explain that one of the advantages housing tenure has over other occupationally based indicators of socioeconomic status is its ability to equally apply to men and women.

In a study of a sample of Scottish adults, Macintyre *et al.*, (1998) found that people who lived in rented properties had higher death rates than people in owner occupied properties. They noted that apart from home ownership being a marker of income, evidence existed of a direct relationship between health and housing tenure. Home

ownership has been associated with stability and reduced stress and anxiety (Costa-Font, 2008). Homeowners also have more incentive to maintain their houses more than they would otherwise do, which in turn reduces the likelihood of the negative impacts of poor maintenance such as defective heating & water systems (Dietz and Haurin, 2003).

Grundy and Glaser (2000) found housing tenure to be a good indicator of the effect of socioeconomic inequalities on the onset and progression of disabilities in old age. They, in their study of the influence of socio-demographic differences in the onset and progression of disability in early old age found housing tenure to be more sensitive than income in detecting those differences.

A caveat, although evidence of the effect of housing tenure on health abounds, Macintyre (2003) explains that it is pertinent to note that a range of contextual features (such as historical period, society or region, and culture.) possess the potential of influencing the economic effects and social significance of housing tenure on health.

3.4.6 Marital Status

“In general, married people have the best health followed by the never married and then the formerly married” (Grundy and Sloggett, 2003). Grundy and Sloggett (2003) attributed this assertion to the protective feeling of care and support received in marriage, and selection factors- good health increases the chances of marrying and in fact, remarrying.

This assertion does not completely hold true in every case especially in old age, for example, never married women have been found to have better health in old age due to the social ties they have over time, been able to establish as an alternative source of the

protective feeling and care that comes with marriage. (Goldman, Korenman & Weinstein, 1995). It still holds true though, for men who, due to the comparatively lower mortality rate in women have a higher likelihood of having the support that comes with marriage in old age when the need arises. Whereas, women -who are more likely to be widowed at old age than men, (due to the relatively higher mortality rate in men) are less likely to have that support because they fall in the “formerly married” category.

3.4.7 Demographic factors

Age and Gender

Convinsky *et al* (2003) found strong evidence of a positive relationship between loss of independence in activities of daily living and age. Although age may be seen as a confounder, there is established evidence of a positive relationship between it and the onset and prevalence of disabilities. Given the same circumstances, an older individual has a higher likelihood of being disabled than a younger person.

Various studies that have made adjustments for sex have found evidence of an correlation between health in old age and gender. Older females have been found to have higher likelihoods of having difficulties in activities of daily living than males.

3.5 CONSEQUENCES (COSTS) OF DISABILITIES IN OLDER PEOPLE

The burden of disabilities or poor health in general can be on the individual, household, or the economy as whole. Ill health has been associated with direct and indirect costs that may be social or economic in nature (see Russell, 2004). These direct (economic) costs include treatment fees- although this may not seem to be a direct problem to the

ill individual in countries like the UK where there is free access to healthcare, the cost of treatment is still borne by the government; therefore, the direct economic burden is not “evaded” as such but transferred from the individual to the government. But the cost of treatment (hospital user fees) is just one part of the burdens of ill health. Other costs such as transportation to the hospital, and time given up by friends and relations of the ill individual also make up costs that are not accounted for in most cases.

The extent to which physical disabilities affect individuals vary from person to person, it also depends on what activity/function is lost as a result of the disability. To illustrate; a painter who loses his legs and becomes less mobile is not as affected as he would be if he lost his hands. The effect of such loss as that of mobility would have greater impact on individuals who would need to walk around to carry out their businesses. But these kinds of effect might just be related to physical functioning. Cognitive disabilities -in chronic cases such as dementia could mean a complete halt to every economic and social activity by the affected individual.

3.5.1 Loss of Independence

Disability directly affects every day functioning by bringing about restrictions on an individual’s physical activity, the ability to maintain self-sufficiency, and (ultimately) the freedom to live a chosen lifestyle (Ostir, *et al* 1999). In a case where the individual is say, diabetic and has a cognitive disability such an individual may have difficulties in following treatment regimens unless assisted.

Dependency refers to reliance upon an outside agency (human or mechanical) to perform particular tasks. Ostir *et al* (1999) see dependence as the “extreme end” of a difficulty continuum, so that an individual that experiences increasing difficulty with

activities of daily living ultimately ends up requiring assistance. This limits the affected individual's autonomy. Loss of independence in turn increases the risk of institutionalization and death.

3.5.2 Labour Productivity Loss

Although this study looks at cognitive and physical disabilities in older populations which would mostly be expected to be retired and should not be actively working even in the absence of any disabilities, labour productivity losses still occur as consequences of disabilities suffered by the aged population. This may be the case, with physical disabilities for example, where a disabled old individual requires help for any of self-care, cooking, walking up and down the stairs, and an informal carer -a caregiver who is not paid for his/her job supports such an individual. These informal carers, ideally, should be engaged in other activities that could be productive but as a consequence of the disability of the adult, they are unable to participate in such activity. In the case where the informal caregiver does not have a job, he/she gives up his /her leisure time to assist the disabled individual.

3.5.3 Weakening of social networks and social isolation

A consequence of disabilities -cognitive or physical is the weakening of social networks and isolation of the individual. Because of inabilities, an individual may not be able to function properly and as a result may be isolated from his social networks. Drimie & Casale (2009) note that social networks constitute a key component of household's ability to cope with stressors.

3.5.4. Mental degeneration

Older adults with disabilities are more likely to be depressed. They perceive their health to be poorer than those not disabled (Partridge, Johnston & Morris, 1996), this in turn makes them worry about their health status, which as a consequence worsens their mental health. There is evidence of a positive relationship between depression and functional disability, depression has been found to reduce in older adults with reductions in their levels of functional disabilities (See Von Korff *et al*, 1992). Therefore, as one's disability worsens, their likelihood of being more depressed increases.

3.5.5. Cost to Government/ Health system

The costs associated with the provision of health services to elderly people with disabilities is quite substantial, Pope and Tarlov (1991) estimated the per capita cost of medical care among older adults with disabilities to be three times that of those without disabilities. Disability has been shown to increase utilisation of health care services and medical costs associated with disability. Ferrucci *et al* (1997) reported older adults who develop severe or progressive disability to be two to three times more likely to be hospitalized than those who had little or no disabilities.

Hancock and Pudney, (2014) report an estimated 25% of people aged 65 and over in the UK receiving one form of disability benefit or the other. The worry here is the fact that this population group (the aged) has been shown to be growing and has been predicted to grow even further (as a result of factors stated in chapter one above), sustaining these benefits which are publicly funded may cause much strain on the government as the ratio of the working-age population to the aged inevitably gets smaller. Morciano, Hancock & Pudney (2014) note the subject of how to fund these care

needs for the growing numbers of older people has already become a that of international debate (see also Gleckman, 2010 and Swartz *et al.*, 2012).

A policy implication here should be noted that as the older population grows politically stronger by virtue of its size, it becomes more difficult to adopt certain policies such as cutting health pension and disability benefits that might cut costs to the government which does not favour them (Bloom, Canning and Fink 2010).

3.5.6. Death

Disability is a marker of disease severity and overall health burden (Spector, 1997); it is a predictor of adverse health outcomes in older adults and even death. Just as people with poorer health have a higher likelihood of mortality compared with healthier ones, disability, though depending on the type and degree of severity, reduces one's quality of life and in turn increases the chances of death.

4. MATERIALS AND METHODS

4.1 THE SAMPLE AND DATA SOURCE

The data used were obtained from the fifth wave (2010-2011) of The English Longitudinal Study of Ageing (ELSA, 2012). The ELSA was chosen because it provides all the data necessary to carry out this study. The English Longitudinal Study of Ageing (ELSA) is a nationally representative longitudinal panel study of non-institutionalised people aged 50 and over that was set up to document the experience of growing old in England in the 21st century (Stephoe *et al.*, 2012). It makes available high quality longitudinal data obtained with the aid of interviews, tests for physical and cognitive functioning, and a self-completion questionnaire. These are repeated on the same participants at two-year intervals, attrition of the sample population is made up for through *refreshments*. It also employs nurse visits on alternate waves to collect biomarkers (Stephoe *et al.*, 2012).

The data obtained can be used to investigate trends in economic circumstances, physical and mental health, social status, cognitive function, social relationships and biology of the participants, findings from which can be used to inform decisions about the whole of England as the sample is nationally representative. Banks *et al.*, (2008) note that the vastness of the socioeconomic measures that ELSA provides permits an in-depth assessment of both economic and psychosocial pathways in relation to the socioeconomic health inequalities that have also been found to exist in older people. The data ELSA provides can also be used for cross-disciplinary exploration as it gives information on economics, health, social participation and lots of other fields.

4.2. SAMPLE SIZE

The initial sample size before setting the 65+ years age restrictions and before dropping observations with missing values was 10,274. All observations that did not contain all the relevant variables or meet set criteria were dropped (a total of 6053) bringing the total number of observations to 4,221. The huge drop in the number of observations is explained mainly by the 65 years and over age constrain that was placed on the sample, this alone accounts for about 84% of all the deleted observations.

4.3. COVARIATES USED IN THE ANALYSIS

Demographic variables

Age was top coded at 90 years; it was grouped into three categories -65-74 years, 75-84 years and 85+. Sex and current legal marital status -whether the individual is married, never married or formally married as the demographic indicators. The age range was 65-90. All bivariate and multivariate analysis excluded those with missing values on any of these variables, reducing the sample size to 4,221.

Tenure

This variable tells whether the participant owned the house s/he was living in outright, was buying it with the help of a mortgage, shared ownership (part rent, part mortgage), rented it, or it was rent free (that is, s/he lived with a relation or friend without paying). This variable was further dichotomised into two categories owned outright and not owned. It was assumed that individuals who fell under the “buying with the help of a mortgage” category must have paid off most part of the mortgage since they already were at advanced ages; therefore that category was considered as owning outright. Every other category was recoded as “not owned”.

Education

The highest level of education attained by individuals was recorded. The responses were grouped into five – No qualification, Foreign/Other, CSE, GCE O/A level, higher education below degree and degree or equivalent. Missing values were dropped. Although it has been argued by many that a large proportion of today's elderly population have no or minimal level of formal educational qualifications and they are therefore, not so varied in their levels of educational attainment, the author is of the view that younger people that were educated as at the onset of this argument would have moved into this "older people's" age group. To illustrate this argument, a 51 year old educated individual by the year 2000 when Grundy and Holt (2001) put forward the argument for low levels of educational attainment among the elderly, would be 65 years old in the year 2014. Level of educational attainment is therefore more significant as a measure of socioeconomic status in the older people now than it was 15 years ago.

Occupationally based Socioeconomic Status

This variable assessed the individuals' social class with respect to their occupation while they were still working. The National Statistics Socioeconomic Classification (NSSEC, 2010) was used to place individuals into three categories- Managerial or administrative, Intermediate and routine occupations. Missing values were dropped.

Self-reported socioeconomic status

Individual participants were asked to on a scale of 0-10, (0 being the worst off in the society and 100 the best off), state where they perceive they are on the social ladder. Missing values were dropped. These values were furthered grouped into five categories: lowest 2, between 3rd & 4th, between 5th & 6th, between 7th & 8th, and the highest 2

Health (disabilities)

Because the study was interested in cognitive and physical disability, the measures of health that were employed were basically on cognitive and physical disabilities in the participants. For cognitive disability, we limited the indicator to measure the individuals' ability to recall ten words immediately after listening to them being called out; cognitive disability was therefore, measured by the number of words the individual was unable to recall immediately after listening. This was further dichotomised (see 4.4 below)

Physical disability was measured by the number of activities of daily living (ADL) the individual had difficulties in performing. The activities measured were 15 in number; the individual reported which of them they had difficulties in performing. Missing values were excluded.

The outcome measure for severe functional disabilities is explained in 4.4 below

4.4. DICHOTOMIZING THE RESPONSE VARIABLES

In an attempt to dichotomize the response variables so as to make them binary outcome measures that can be used in simple logistic regressions, we employ a technique for eliciting the threshold number of words out of ten that would be expected of an individual with no memory-based cognitive disability to recall. Failure to remember up to this threshold number of words would therefore mean that the individual has a short term memory related cognitive disability. A similar technique is used by NICE to ascertain cost effectiveness thresholds. (Claxton *et al*, 2013).

The respondents used to elicit this threshold number of words were 20 students of the University of East Anglia, which were randomly met and requested to participate in the study. A list of ten random words was created, these words were called out to each of the 20 respondents, and the number of words that each respondent was able to recall

was recorded ranging from 5 to 10 words recalled. The mean was calculated and used as the threshold number of words out of ten that an individual with no memory-based cognitive disability should be able to recall. (see appendix a. for ethical approval).

But because the sample size was small, random resampling was carried out using Microsoft Excel 2011 and the averages were recorded. This process was bootstrapped with 1,000 replications to come up with a mean value of 7 (rounded to the nearest whole number).

The outcomes therefore, take values for:

a. Cognitive disabilities,

0: The individual is able to recall up to 7 words out of 10 (no disability)

1: The individual is unable to recall up to 7 words out of 10 (disabled)

b. Functional disabilities,

0: The individual has no difficulty in performing any of the 14 ADLs listed (no disability)

1: The individual has difficulty in performing at least 1 of 14 ADLs listed (disabled)

A second approach in dichotomizing the functional disability response variable, in line with what is obtainable with the PSSRU Projections of Demand for and Costs of Social Care for Older People (Wittenberg *et al*, 2011), is setting a threshold at two activities of daily living. An individual is therefore considered severely functionally disabled if s/he needs help with two or more ADLs:

The third response variable used would be coded as.

c. Functional Disabilities (2)

0: The individual does not need help performing up to 14 ADLs listed (no disability).

1: The individual has needs help in performing at least 2 of 14 ADLs listed (severely disabled).

4.5. STATISTICAL ANALYSIS

Data were analysed using Stata/IC v.11.2 (Stata Corporation, College Station, Texas) throughout the study apart from dichotomising the cognitive function response variable which used Microsoft Excel (2011). For the descriptive statistics, frequencies and percentages were calculated and reported for both categorical and continuous variables, arithmetic means were also calculated. All observations with missing values, or unmet criteria (such as those with top coded age recorded as -7) were dropped.

Three sets of logistic regressions were run adjusting for age and gender for each of the explanatory variables, against one of the three response variables in every case. Results from the regressions showed that all the explanatory variables had statistically significant relationships with each of the response variables (see appendix b for a summary presentation of the results).

Logistic regression models were used to investigate the relationships between five indicators of socioeconomic status and: i. Cognitive disabilities ii. Physical disabilities, and iii. Severe physical disabilities, controlling for age and gender. Using the logit command on Stata, the three models were run with either of cognitive disabilities, physical disabilities and severe physical disabilities as dichotomous response variables. Gender, age-group, marital status, housing tenure, occupationally-based social class, education and subjective social position were used as the explanatory variables in all three models. All the explanatory variables were categorised with one category dropped as a base case to avoid the dummy variable trap -a case of multicollinearity in every case.

Considering how the social ladder data was gathered- as it makes the individual take money, jobs and level of education into consideration while rating themselves on the ladder, (Adler *et al*, 2000), there is the likelihood that this variable may have a high

degree of correlation with the education and occupationally based social class variables (See appendix 2 for cross tabulations of the three variables). Correlation between the explanatory variables could cause the problem of multicollinearity, which makes it difficult to disentangle the separate influences of each explanatory variable on the response variable.

We therefore, estimate two sets of logistic regression models, 1. Including social ladder and excluding Education and Social Class among the explanatory variables. 2. Including Education and Social Class and excluding Social Ladder among the explanatory variables

5. RESULTS DISCUSSION AND CONCLUSION

5.0 RESULTS AND DISCUSSION

After those observations with missing variables had been dropped, men made up 46.66% of the remaining sample size of 4,221 (Table 1 below). About 64% of the population was either married or living with a partner. Nearly 60% of the sample population had held intermediate or higher occupations, and about 55% of the population had completed secondary or higher education qualifications. Almost 78% of the population owned outright the houses where they lived. Close to 61% of the population reported being above the 5th of 10 rungs of the subjective social ladder.

The age range was 65-90, the median age of the sample was 72 years; mean age was 73.18 years (95% Confidence Interval [CI] 73.01 – 73.37).

The overall mean number of words not immediately recalled by the individuals was 4.45 SD 0.03 (95% Confidence Interval [CI] 4.40 - 4.50) which increased by age group and was higher among men compared with women in every age group except the 85 + age group where the mean number of words not immediately recalled in women was 5.79 SD 0.16 (95% Confidence Interval [CI] 5.4 – 6.11) as against 5.32 words SD 0.16 (95% Confidence Interval [CI] 5.0 - 5.64) in men. The overall mean number of activities of daily living with difficulties reported by the individual participants was 2.59 SD 0.06 (95% Confidence Interval [CI] 2.48 – 2.71). This also increased by age group and was higher in women compared with men in every age group.

Table 1. Demographic, Health, and Socioeconomic Characteristics of the Sample

	Women		Men		Total	
<i>n</i>	2,253		1,968		4,221	
	Freq.	%	Freq.	%	Freq.	%
<i>Age group</i>						
65-74	1,397	62.01	1,238	62.91	2,635	62.43
75-84	734	32.58	627	31.86	1,361	32.24
85-90	122	5.42	103	5.23	225	5.33
<i>Marital Status</i>						
Married/With Partner	1,190	52.82	1,495	75.97	2,685	63.61
Never Married	91	4.04	93	4.73	184	4.36
Formerly Married ¹	972	43.14	380	19.31	1,352	32.03
Missing Values	1		2		3	
<i>Cognitive Functioning²</i>						
0	14	0.62	5	0.25	19	0.45
1 - 2	267	11.85	169	8.59	436	10.33
3 - 4	1,294	57.43	1,080	54.88	2,374	56.24
5 - 6	487	21.62	502	25.51	989	23.43
7 - 8	120	5.33	156	7.93	276	6.54
9 - 10	71	3.15	56	2.85	127	3.01
Missing Values	4		6		10	
<i>Physical Functioning³</i>						
0	1,473	65.38	1,428	72.56	2,901	68.73
1 - 3	584	25.92	429	21.80	1,013	24.00
4 - 6	142	6.30	78	3.96	220	5.21
7 - 9	38	1.69	31	1.58	69	1.63
10- 12	14	0.62	0	0.0	14	0.33
13 -15	2	0.09	2	0.10	4	0.09
Missing Values	0		0		0	
<i>Housing Tenure</i>						
Own it Outright	1,870	83	1,696	86.18	3,566	84.40
Not owned outright	383	17	272	13.82	655	15.60
Missing Values	12		3			
<i>Highest Level of education attained</i>						
No Qualification	804	35.68	472	23.98	1,276	30.23
Foreign/Other	291	12.92	92	4.67	383	9.07
CSE or GCE O/A level	631	28.01	627	31.86	1,258	29.80
Higher Education Below Degree	290	12.87	346	17.58	636	15.07
Degree or Equivalent	237	10.52	431	21.91	668	15.83
Missing Values	14		19		33	
<i>Socioeconomic status. ⁶</i>						
Managerial & Professional occupations	573	25.43	810	41.16	1,383	32.76
Intermediate occupations	714	31.69	423	21.49	1,137	26.94
Routine and Manual occupations	966	42.88	735	37.35	1,701	40.30
Missing Values	42		19		61	

	Women		Men		Total	
<i>n</i>	2,253		1,968		4,221	
	Freq.	%	Freq.	%	Freq.	%
<i>Self-reported Socioeconomic Status⁷</i>						
Lowest 2 rungs	17	0.75	14	0.71	31	0.73
Between 3 rd & 4 th rung	178	7.90	157	7.98	335	7.94
Between 5 th & 6 th rung	783	34.75	570	28.96	1,353	32.05
Between 7 th & 8 th rung	978	43.41	855	43.45	1,833	43.43
Highest 2 rungs	297	13.18	372	18.90	669	15.85
Missing Values	483		375		858	

¹ Formerly married could mean separated through divorce or death. ² Number of words that cannot be recalled immediately. ³ Number of ADLs with difficulties. ⁴ Part rent part mortgage ⁵ Living with a friend or relative. ⁶ Occupationally defined social status⁷ A scale of 0-100 (0 being worst off, and 100 the best off) further grouped into ten rungs on a social ladder.

5.1 SUMMARY OF FINDINGS

The aim of this study was to explore the associations between socioeconomic status and disabilities (cognitive and physical) among older non-institutionalised populations in England. It was also an aim of this study to see if subjective and objective measures of socioeconomic status can be used interchangeably in the study of these associations. Results from three sets of three logistic models have been used to explore these relationships (see tables 2, 3 and 4 below).

5.1.1 Results from the First set of models

Including all explanatory variables

From the results in table 2 below, all three models contained at least one explanatory variable whose entire categories had no statistically significant effect on at least one of the response variables.

Marital Status only had statistically significant influences in models 1 and 2 although the influence of being single on the likelihood of having difficulties in at least one ADL did not in the second. Educational attainment maintained statistical significance in all three models. The influence of gender and age in all three models were found to have strong statistical significance.

In model 1, the effect of the subjective measure (social ladder) on the likelihood of having a memory related cognitive disability had no statistical significance. The second and third models showed that occupationally based social class (an objective measure) had no significant effect on the likelihood of having difficulties in performing at least one ADL and the likelihood of having severe physical disabilities respectively.

Attempting to solve this problem that is a likely effect of multicollinearity, two sets of logistic regression models are run; one excludes the subjective explanatory indicator of socioeconomic status (social ladder) and the other, the objective indicators (education and occupationally based social class).

5.1.2 Results from the second set of models

Excluding the subjective indicator of socioeconomic status (social ladder)

Gender and Age

The results show that males are more likely to have memory based cognitive disabilities than females in old age. But are less likely to have difficulties in performing ADLs than females in old age, it also shows that women are more likely to have difficulties in two or more activities of daily living. The model generally shows that gender is significant in determining the probability of having a disability (whether cognitive or physical) in old age.

Results from the models (shown in table 3 below) also show a positive relationship between age and the probability of being disabled, (physically, cognitively and having a severe physical disability). As one ages, his/her likelihood of being disabled increases.

Table 2: First set of three logistic models with all explanatory variables showing associations between socioeconomic status and physical & cognitive disabilities and severe physical disability

	Model 1		Model 2		Model 3	
	Cognitive Disability		Physical Disability		Severe Physical Dis.	
	Coefficients (SE)		Coefficients (SE)		Coefficients (SE)	
<i>Gender</i>						
Male	0.606***	(.0773)	-0.196**	(.0747)	-0.328**	(.1099)
<i>Age Group</i>						
65-74 years ¹	0.000		0.000		0.000	
75-84 years	0.668***	(.0821)	0.652***	(.0742)	0.485***	(.1073)
85+ years	1.581***	(.2417)	1.200***	(.1476)	0.965***	(.1861)
<i>Marital Status</i>						
With Partner ¹	0.000		0.000		0.000	
Never Married	0.373*	(.1859)	-0.171	(.1807)	-0.253	(.2737)
Formerly Married	0.282***	(.0850)	0.211**	(.0790)	0.188	(.1127)
<i>Housing Tenure</i>						
Own Outright ¹ /Buying with mortgage	0.000		0.000		0.000	
Not owned	0.060	(.1151)	0.446***	(.0970)	0.625***	(.1232)
<i>Occupationally Based Social Class</i>						
Managerial & Professional occupations ¹	0.000		0.000		0.000	
Intermediate occupations	0.136	(.0973)	-0.070	(.0999)	0.040	(.1520)
Routine and Manual occupations	0.239*	(.0989)	0.029	(.0970)	0.111	(.1456)
<i>Education</i>						
No qualification ¹	0.000		0.000		0.000	
Foreign/Other	-0.259	(.1444)	-0.246	(.1284)	-0.427*	(.1874)
CSE or GCE O/A level	-0.657***	(.1013)	-0.293***	(.0905)	-0.302*	(.1276)
Higher Ed below Degree	-0.625***	(.1247)	-0.267*	(.1187)	-0.394*	(.1818)
Degree or Equivalent	-1.032***	(.1310)	-0.618***	(.1358)	-0.577**	(.2132)
<i>Social Ladder</i>						
Lowest 2 rungs ¹	0.000		0.000		0.000	
Between 3 rd & 4 th rung	-0.334	(.5670)	-0.478	(.3923)	-0.144	(.4464)
Between 5 th & 6 th rung	-0.649	(.5543)	-0.795*	(.3809)	-0.613	(.4344)
Between 7 th & 8 th rung	-0.797	(.5539)	-1.075**	(.3813)	-0.859*	(.4361)
Highest 2 rungs	-0.692	(.5595)	-1.177**	(.3911)	-1.024*	(.4602)
Constant	1.402*	(.5629)	.035	(.3936)	1.470*	(.4589)
Observations	4221		4221		4221	
AIC	4713		4928		2805	
BIC	4820.580		5036.030		2912.796	
r ² _p	.0726		.0668		.0682	
LogL	-2339.3337		-2447		-1385	

Notes: ¹ Reference Categories. Parentheses contain asymptotic Standard errors

*p < 0.05, ** p < 0.01, *** p < 0.001

Marital Status

Findings from the results show that marital status is significant in determining the probability of an individual having any of the three forms of disabilities explored in this study. A married individual or one living with a partner is least likely to have a memory related cognitive disability than one who has been separated either through death or divorce or a single individual. The category most likely to have a memory related cognitive disability is single (never married).

This set of models also shows that divorced or widowed individuals are more likely to have difficulties in performing at least one ADL than individuals with similar characteristics who are married. The same relationship as reported by the set of models exists between being divorced or widowed and having a severe physical disability. The models do not show a statistically significant relationship between being single and the likelihood of having difficulties in at least one ADL or having severe functional disabilities.

Housing Tenure

The set of models do not show a statistically significant relationship between housing tenure and the likelihood of having a memory related cognitive disability. It shows that house owners are less likely to have difficulties in any ADL than individuals with similar characteristics who do not own the houses where they live. This same pattern of relationship, as reported by the models, exists between housing tenure and the likelihood of having a severe physical disability.

Table 3: Second set of three logistic models showing associations between socioeconomic status and physical & cognitive disabilities excluding subjective measure of socioeconomic status

	Model 1		Model 2		Model 3	
	Cognitive Disability Coefficients (SE)		Physical Disability Coefficients (SE)		Severe Physical Dis. Coefficients (SE)	
<i>Gender</i>						
Male	.613***	(.0771)	-.182*	(.0742)	-.308**	(.1094)
<i>Age Group</i>						
65-74 years ¹	000		000		000	
75-84 years	.664***	(.0820)	.640***	(.0737)	.470***	(.1069)
85+ years	1.554***	(.2416)	1.150***	(.1468)	.910***	(.1847)
<i>Marital Status</i>						
With Partner ¹	000		000		000	
Never Married	.386*	(.1853)	-.123	(.1793)	-.193	(.2720)
Formerly Married	.293***	(.0846)	.238**	(.0784)	.222*	(.1120)
<i>Housing Tenure</i>						
Own Outright ¹ /Buying with mortgage	000		000		000	
Not owned	.109	(.1139)	.522***	(.0951)	.711***	(.1217)
<i>Occupationally Based Social Class</i>						
Managerial & Professional occupations ¹	000		000		000	
Intermediate occupations	.143	(.9709)	-.048	(.0994)	.066	(.1515)
Routine and Manual occupations	.266**	(.0981)	.088	(.0961)	.175	(.1445)
<i>Education</i>						
No qualification ¹	000		000		000	
Foreign/Other	-.275	(.1442)	-.267*	(.1278)	-.460*	(.1867)
CSE or GCE O/A level	-.676***	(.1020)	-.336***	(.0898)	-.357**	(.1266)
Higher Ed below Degree	-.658***	(.1242)	-.328**	(.1177)	-.468**	(.1804)
Degree or Equivalent	-1.069***	(.1284)	-.748***	(.1327)	-.728***	(.2088)
Constant	.663***	(.1284)	-.911***	(.1150)	-2.199***	(.1702)
Observations	4221		4221		4221	
AIC	4717		4957		2821	
BIC	4799.309		5039.447		2903.551	
r ² _p	.0702		.0598		.0601	
LogL	-2345.3937		-2465.4629		-1397.5147	

Notes: ¹ Reference Categories. Parentheses contain asymptotic Standard errors

*p < 0.05, ** p < 0.01, *** p < 0.001

Occupationally Based Social Class

The set of models show that individuals in managerial and professional occupations are less likely to have memory related cognitive disabilities than individuals in routine and manual occupations with the same characteristics. The relationship between occupationally based social class and the likelihood of having a memory based cognitive

disability as shown by this model is not statistically significant for individuals in the intermediate occupations category of the social class.

The set of models show that occupationally based social class is not statistically significant in determining the probability of an individual having difficulties in at least one activity of daily living or the probability of having severe physical disabilities.

Education

Findings from the set of models demonstrate a pattern of negative relationships between the probabilities of having a memory related cognitive disability and the level of educational attainment. The least likely to have such cognitive disability as reported by the model, is an individual with a degree or equivalent, followed by an individual with a CSE or GCE O/A level then an individual with a higher education below a degree. The category most likely to have a memory related cognitive disability is the 'no qualification' category. The foreign other category has no statistical significance in this model.

The second model in this set of models shows the same pattern of negative relationships between the probabilities of having difficulties in at least one ADL and the level of educational attainment. The category least likely to have such physical disability as reported by the model is the degree or equivalent, followed by the CSE or GCE O/A level category, then the higher education below degree category. The most likely category is the 'no qualification' category then the foreign qualification category.

The pattern in the third model shows that the likelihood of having a severe physical disability is highest among individuals with no qualification, followed by individuals with CSE or GCE O/A level, then individuals with foreign qualifications. The category least likely to have severe physical disabilities is the degree or equivalent category.

5.1.3. Results from the third set of models

Excluding the objective indicators of socioeconomic status social class and education variable

Gender and Age

Results from this model (table 4 below) remain consistent with the first set of models. Males having higher likelihood of having memory based cognitive disabilities than females with similar socioeconomic characteristics. It also shows that women are more likely to have difficulties performing at least one ADL and having severe physical disabilities than men with similar socioeconomic disabilities.

The same pattern as obtained in the first set of models of the positive relationship between the likelihood of being disabled (including memory based cognitive disability and physical disability or severe physical disability) is also obtained in the second.

Marital Status

The results show that, married individuals or those living with partners have a lower likelihood of having a memory related cognitive disability than individuals with similar socioeconomic characteristics who are separated. This model gives a relationship between the likelihood of having a memory related cognitive disability and being single that is not statistically significant. These findings were same for relationship between the probability of having difficulties in at least one ADL and marital status.

The result for the relationship between marital status and the probability of having a severe physical disability as presented by the third model in the set of models (in table 4 below) were not statistically significant.

Housing Tenure

Results from the three models in the set of models showed that housing tenure is important in determining the probability of an individual to be disabled (including memory based cognitive disability, physical disability and severe physical disability).

The results show that individuals who do not own the houses they live in are more likely to have any of the three forms of disabilities discussed in this study compared with individuals with similar socioeconomic characteristics who own the houses they live in.

Social ladder

The results show that the relationship between the subjective measure of socioeconomic status and the probability of having a memory based cognitive disability only becomes statistically significant from the 7th rung of the social ladder, after which there is a negative relationship between the probability of having a memory based cognitive disability and an individual's position on the social ladder. This same pattern of relationship and statistical significance is seen between the one's position on the social ladder and the likelihood of having a severe physical disability.

The same pattern is seen in the relationships between the probability of having difficulties in performing at least one ADL and one's position on the social ladder, all other things being the same. Only that the statistical significance of the relationship in this case starts from the 5th rung of the social ladder.

Table 4: Third set of three logistic models excluding the objective measures of Socioeconomic showing associations between socioeconomic status and physical & cognitive disabilities

	Model 1		Model 2		Model 3	
	Cognitive Disability		Physical Disability		Severe Physical Dis	
	Coefficients (SE)		Coefficients (SE)		Coefficients (SE)	
<i>Gender</i>						
Male	.440***	(.0733)	-.248***	(.0724)	-0.381***	(.1073)
<i>Age Group</i>						
65-74 years ¹	0.000		0.000		0.000	
75-84 years	.722***	(.0808)	.677***	(.0735)	0.510***	(.1065)
85+ years	1.624***	(.2400)	1.225***	(.1462)	0.995***	(.1845)
<i>Marital Status</i>						
With Partner ¹	0.000		0.000		0.000	
Never Married	.260	(.1817)	-0.219	(.1798)	-0.291	(.2727)
Formerly Married	.276***	(.0836)	0.218**	(.0787)	0.200	(.1125)
<i>Housing Tenure</i>						
Own Outright ¹ /Buying with mortgage	0.000		0.000		0.000	
Not owned	.275*	(.1109)	0.540***	(.0938)	0.729***	(.1197)
<i>Social Ladder</i>						
Lowest 2 rungs ¹	0.000		0.000		0.000	
Between 3 rd & 4 th rung	-.416	(.5606)	-0.513	(.3906)	-0.204	(.4453)
Between 5 th & 6 th rung	-.782	(.5459)	-0.863*	(.3790)	-0.716	(.4328)
Between 7 th & 8 th rung	-1.071*	(.5450)	-1.202**	(.3788)	-1.023*	(.4336)
Highest 2 rungs	-1.127*	(.5495)	-1.385***	(.3873)	-1.269**	(.4553)
Constant	1.258*	(.5455)	-0.098	(.3798)	1.529***	(.4355)
Observations	4221		4221		4221	
AIC	4816		4946		2811	
BIC	4885.835		5016.305		2880.725	
r ² _p	.0498		.0611		.0622	
LogL	-2397.0045		-2462.2396		-1394.4493	

Notes: ¹ Reference Categories. Parentheses contain asymptotic Standard errors

*p < 0.05, ** p < 0.01, *** p < 0.001

5.2 HYPOTHETICAL APPLICATION OF THE RESULT FROM THE MODELS

To determine the interchangeability of the subjective and objective measures of socioeconomic status, results from the three sets of three models to calculate the probability of a hypothetical individual with certain characteristics having any of the three forms of disabilities, the logit model below is employed to calculate the probability of a house owner 77-year old widowed man, who has a degree and is in the

intermediate occupational social class, this individual sees himself on the 7th rung of the social ladder.

$$P_{(y_i=1)} = \frac{\exp(x_i' \beta)}{1 + \exp(x_i' \beta)} \quad (1)$$

(Source: Thomas, 1997)

Where $P_{(y_i=1)}$ is the probability of an event being 1

$x_i' \beta$ the Linear predictor of:

x_i a vector of all observed covariates

and β a vector of regression coefficients

The results were as follows:

From the second set of three models -excluding social ladder as an explanatory variable, the probabilities of that individual having a memory based cognitive disability, difficulties with at least one ADL and having a severe physical disability are 84%, 34% and 10% respectively. The third model gives the following probabilities for an individual with the same characteristics; 79%, 18% and 8% (see appendix for results from the remaining set of models and details of the spread sheet calculation for all three models).

5.3 STRENGTHS AND LIMITATIONS OF THE STUDY

5.3.1 Strengths

Findings from this study contribute to our understanding of the relationships between health and socioeconomic status in several ways. 1. It uses a large nationally representative data containing both observational and self-reported indicators of disabilities and socioeconomic status. 2. It does an in-depth literature review of the subject across different domains (sociology, epidemiology and economics). 3. It uses an

original approach in creating a threshold for short term memory based cognitive disabilities.

The study compares the viability of interchangeably using subjective and objective measures of socioeconomic status which goes beyond what others feel of an individual to what such an individual feels about their selves and how that feeling is associated with their health.

As the approach used in this study is standardized, the study can be replicated over time and in different areas to produce comparable findings.

5.3.2 Limitations

The self-reported nature of the ADLs used in this study is likely to be one of the major limitations of this study. This is so because reporting such by a respondent would depend on such an individual's willingness and ability to be realistic and truthful. Some may feel embarrassed to accept their obvious socioeconomic positions. Grundy & Slogget (2003) note the difficulties that may arise in using self-reported measures among which include reporting bias.

By dichotomizing the response variables, it becomes difficult to measure the severity in both measures of cognitive and physical disabilities employed. Also, since the memory test respondents were all students (or at least in an academic environment) this threshold may be biased as, being educated might have a positive effect on one's memory capacity which therefore makes it not the *typical* recall level that would be expected beyond academic settings.

The cross sectional nature of the analysis in this study does not allow for information about the persistence of those conditions that are reversible or possess the ability to progress. It also does not allow for one to efficiently explore any endogeneity between the response and explanatory variables.

Since the study uses data from the fifth wave of ELSA, there is the likelihood of bias due to selective attrition over time. Also, because the sample is for non-institutionalized people, the findings might be biased due to the fact that most severe cases of these forms of disabilities would be found in institutions; therefore the study will only represent individuals with less severe cases of disability.

5.4 CONCLUSION AND RECOMMENDATION.

“Developing effective strategies to reduce health inequalities is a daunting task” (Mackenbach *et al*, 2003) and understanding the causal factors and links to these socioeconomically driven health inequalities makes for an entry point for policy makers and intervention. This study has attempted to assess the individual and joint significance of one subjective and four objective indicators of socioeconomic status in determining the likelihood of having cognitive or physical disabilities in old age. It has also sought to find if subjective and objective measures of socioeconomic status can be used interchangeably in studying these associations by using coefficients from the estimated logit models to calculate probabilities of an individual with certain characteristics having any of the three forms of disabilities studied.

The health consequences of socioeconomic inequalities have been found to persist even in older age groups. Findings from this study further reiterate the socioeconomic health gradient theory where socioeconomically better-placed individuals are less likely to be disabled in old age than those that are relatively less socioeconomically advantaged.

Chapters 2 and 3 defined key concepts used in the study and reviewed the various explanations of the mechanisms through which socioeconomic status and health (disabilities) may be associated. Light was shed on the difference between socioeconomic inequalities in health and health inequities.

In Chapter 4 above, the findings about marital status and health (disabilities in particular) were consistent with Grundy and Sloggett (2003)'s observation that the married are least likely to have health problems in old age and the separated are the most likely. This may be explained by the support and care that spouses give each other, which is missing in the 'separated' category, the single (never married) would be better placed than the separated because they, overtime, would have built social relationships that substitute the spouses they would have had.

The findings about education showing the inverse relationship between level of educational attainment and the likelihood of being disabled is also consistent with findings from Grundy and Sloggett (2003), Cutler & Lleras Muney (2006), Bloom (2007) and Freedman *et al* (2008). This may be so because education affects one's lifestyle and health behaviors, it also affects one's likelihood of getting a good paying job which in itself is strongly related to current and future income (in terms of pension) and health.

The finding of a lower likelihood of house owners to have a disability as compared with those in houses they do not own in this study is also consistent with findings from Abber and Ginn (1993), Macintyre *et al*, (1998), Grundy and Glaser (2000), Macintyre *et al* (2003) and Dietz & Haurin (2003). This may be explained by Costa-Font (2008)'s assertion that home ownership is related with reduced stress, Homeowners also have more incentive to maintain their homes, which helps them avoid the consequences of poor maintenance.

Occupation may influence one's likelihood of being disabled as it determines his level of exposure to physical and psychological stress. This may explain the finding of the negative relationship found in this study between occupational class and the likelihood of being disabled.

The relationship between the subjective measure of social status and disabilities found in this study is consistent with findings from Demakakos *et al* (2008) where the higher up an individual perceives himself to be on the social ladder, the lower his likelihood of having a poor self-rated health state.

In 5.2 above, we find the resultant probabilities calculated from the models with the subjective and objective measures of socioeconomic status reasonably close except for the likelihood of having difficulties in at least one ADL (model 2), which suggests that the two models can be used interchangeably.

Further studies would be needed to understand these associations better and establish the substitutability or otherwise of the subjective and objective indicators of socioeconomic status in this subject.

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