



## Heterogeneous ‘adaptation’ and ‘income effects’ across self-reported health distribution?

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### ABSTRACT

Self-reported health is a key quality-of-life measure affected by well-known cognitive biases, such as adaptation (or anchoring to past health conditions) along with a socio-economic vector. There are good reasons to think that both effects heterogeneously impact the health distribution. This paper carries on empirical exercise to test whether the effects of adaptation and income are indeed, affected by individual heterogeneity. We use a continuous scale of health (the Visual Analogue Scale or VAS) and ex-post evaluations of the individual health status to capture adaptation using quantile regression. Our findings suggest that adaptation effects exhibit an inverse U-shaped form, more common in the median of the health distribution. Income effects exhibit a marked and non-linear impact at low quantiles. This is consistent with the hypothesis that income investments for relatively healthy people translate into very moderate effects on health. Health changes evaluated by the median individual are relatively more affected by adaptation.

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### 1. Introduction

Health status is found to be inversely related to socio-economic status (Deaton, 2002), which is taken as an identification of health inequalities (Marmot, 2002).<sup>1</sup> However, very few studies have focussed on the possibility that individual responses depend on the distribution of health status. As a result, the fact that common combinations of health inputs, such as lifestyles and income constraints, give rise to systematically heterogeneous outcomes across individuals is attributed to the existence of “unobservable effects”.<sup>2</sup> On the other hand, individual data are often affected by cognitive biases, but the income/health association is seldom examined after controlling for their effects; only a handful of studies have addressed these issues (Groot, 2000). One of the most common biases is individual’s adaptation to a particular health status so

that when a certain health status is perceived to have improved, then this affects at the individual valuation of the particular health state.

There is weighty evidence for the existence of individual heterogeneity behind the income/health association. Deaton (2002) found a positive link between health and income per head, *being average health closely related to average income among the poorest*. The relationship between income and health and life-expectancy was found to be non-linear (Smith, 1999). To date, very little research has been reported on the association between income and health across the self-reported health distribution. The income and health relationship, rather than linear, is likely to depend on individual position within a given health distribution (Hausman et al., 2002).<sup>3</sup> Further reasons for heterogeneity are based on the fact that, unlike income, health cannot be redistributed, and also that health-related behaviour often heavily depends on individual choices, and is therefore affected by individual differences in prudence when taking risky actions, in the amount of health information received, and in social capital among other factors.

Individuals adapt to a previous health status held at a certain time (Groot, 2000).<sup>4</sup> In the psychological literature, there is

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<sup>1</sup> Narrowing undesirable disparities in health status is a policy target in all Western countries. This often leads to the adoption of policy measures to improve the health of those who are worst-off, so as to reduce ‘avoidable inequalities’ in health (Wagstaff and van Doorsaler, 2000).

<sup>2</sup> Income determines the resources individuals have at their disposition to produce health, as also do activities involving social participation e.g., enjoying leisure time (Marmot, 2002). Therefore, people who are poor might enjoy good health if their level of social participation is high. Indeed, when analysing results, material living conditions cannot be viewed independently of the individual’s social environment.

<sup>3</sup> Wilkinson (1994) argued that once societies have reached a certain level of affluence a general increase in the absolute standard of living resulting from economic growth no longer makes much difference to health.

<sup>4</sup> One remarkable exception is Gerdtham and Johannesson (2004). Using longitudinal microdata they found a strong association between income and mortality,

a specific term for a form of adaptation: “the hedonic treadmill” (Helson, 1964). This means that people adapt to stimuli that result from past stimuli, and implies that individuals could neutralise the effects of adaptation by changing their point of reference. If adaptation takes place, it is likely to reduce the effects of repeated stimulus (Frederick and Lowenstein, 1999). Other contributions refer to Kahneman’s experiments on utility, whereby total utility is conceptualised as the personal integration of instant utilities. Instant utilities in turn include hedonic and affective experiences from individuals’ immediate reports (Kahneman, 1999). Finally, it is reasonable to argue that adaptation is subject to context- and individual-dependent heterogeneity (Farrel and Fuchs, 1982; Sen, 1999).

This paper undertakes a simple empirical test of the influence of individual heterogeneity (“backwards adaptation”) on the association between income, and self-reported health. It uses quantile regression to examine the income-health association at different points of the health distribution.<sup>5</sup> This can be done thanks to the Visual Analogue Scale (VAS) health measure, whereby respondents rate health from worst (death) to best (best imaginable health state), usually on a scale from 0 to 100.<sup>6</sup> The data were collected from the Catalan Health Survey for 1994, the only year when income data were available at the time of the analysis. Without attempting to claim causality, the study makes a set of reduced-form estimates of self-reported health production functions.

The study investigates the following questions. First, the extent to which adaptation influences self-reported health, and whether this differs across individuals depending on their position in the self-reported health distribution (‘individual heterogeneity matters’). Second, the influence of income on self-reported health after controlling for adaptation, and the extent to which this influence changes across the health distribution. As a corollary of this it examines whether there are appreciable diminishing health returns on income transfers. Finally, it examines the influence of other well-known health-production determinants, including educational and socio-demographic variables, and a set of lifestyle variables (smoking, drinking, sport, sleep and work risks), which are arguably individually heterogeneous too.

The next section reports evidence on the determinants of health and on health distribution. Section 3 explores the data and explains the methodology, and Section 4 reports the results. Section 5 contains the final conclusions.

## 2. Background

### 2.1. Health and income: a conceptual exploration

Health as a household-produced good is subject to individual, social and technological determinants. Examining the determinants of income is important for a variety of reasons, including its effect on reducing health inequalities. Evans (2002), in a discussion on the determinants of health, suggested that the ‘neo-materialist approach’ (whereby income does play a role in influencing health) conveys information on individual rank or hierarchy within a society. Thus it is likely that individuals in inferior socio-economic positions will experience frustration and stress and face threats that reduce individual health. Among the relevant variables are the indi-

vidual’s disposable income; that is income that could be devoted to the production of health and other goods. *Yet the effect of income is less comprehensible and likely not to be a linear function. If the effect of income declines across the health distribution function, then one might argue that income exerts diminishing returns to scale. That is, income might exhibit concavity, implying that the effect of income at higher income levels declines. This in turn implies that the effect of income at lower levels of the health distribution might be counteracted to reduce inequalities in health* (Contoyannis and Forster, 1999).

Individual assessment of health stocks depends on the following factors: previous health status (which proxies what we label here as “adaptation”); individual income as a direct influence on health status and an indirect influence on health behaviour; other determinants of both health behaviour and expectation of health depreciation (e.g., gender and age); lifestyles (Kenkel, 1995); schooling, (which supposedly conveys skills for codifying health information and thus affects health production efficiency (Kenkel, 1991; Farrel and Fuchs, 1982<sup>7</sup>); and finally social and physical environmental factors. Hence, average health status is claimed to be influenced by a large set of determinants but primarily by *individual lifestyles*<sup>8</sup> (Kenkel, 1995). There are also other determinants, such as psychological factors (Wilkinson, 1996), and access to medical care (McCord and Freeman, 1990). Contoyannis and Forster (1999) argue that the multiple of these factors influences health production and thus determines the distribution of health among individuals. Finally, an important variable that could account for part of unobserved individual heterogeneity is prior health status (Kenkel, 1995).

At the social level, health is determined by environmental determinants, e.g., working conditions, cultural and socio-economic networks, and access to knowledge. Evans (2002) divides the determinants of health into three parts: those that result from early environments or ‘latent effects’ (e.g., biological disadvantage); those that depend on intensity of exposure or ‘cumulative effects’; and finally those that result from complex interactions with the environment or ‘pathway effects’. However, some of these effects cannot be observed at the individual level, such as the effect of having a stressful job, which is behaviourally explained. Evidence on high health inequalities occurring in the former Soviet Union, indicates that inequalities in health may be determined by the position in the social hierarchy rather than income (Marmot and Bobak, 2000). Wilkinson (1996) reasoned that individual position in a social hierarchy was more important than absolute income in causing stress, and accordingly constructed what is known as the relative-income hypothesis. On the other hand, education and access to knowledge might be connected to lesser access to health information leading to healthier choices and more preventive behaviour (Kenkel, 1995).

According to one health-production function framework, individuals combine market and non-market inputs in the output of good health. However, although individuals produce a share of their own health themselves, they are heterogeneously efficient in doing so. Hence, even when there is equality in individual health endowments (e.g., genetic determinants), health status is likely to differ depending on the distribution of health-enhancing factors at each

while the impact of relative income and income inequalities was non-statistically significant.

<sup>5</sup> This method has received little attention in economic health literature but is increasingly employed (Abrevaya, 2001).

<sup>6</sup> Even though Visual Analogue Scales are under criticism as measures of health utility (Dolan, 2000), they seem to be less sensitive to biases than other methods (Broome, 1991).

<sup>7</sup> However, it could be argued that both health and education are the result of human capital investments, and thus are likely to be two aspects of the same phenomenon. Thus, individuals’ time preference is likely to be associated with both education and health investment and, following Kenkel (1991, 1995), schooling might reflect the influence of unobserved differences among individuals.

<sup>8</sup> There is much debate on whether lifestyles such as smoking are the result of individual decisions and therefore avoidable, or the result of a specific social environment at onset, and later in life the result of addictive preferences, and thus not totally avoidable.

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