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# Inequality in health

## - Testing the relative income hypothesis

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# Abstract

There is a strong consensus in the academic literature over the historical importance of economic growth for improvements in overall health quality, but stagnating increases in life expectancy in high-income countries seems to point towards a diminishing correlation between economic growth and health. A theory that has gained popularity in recent years is that a decreasing importance of absolute income levels as a determinant for people's health has been accompanied by an increasing importance of relative income. This thesis sets out to test the relative income hypothesis by analyzing if changes in aggregate income inequality have an effect on individual's subjective health.

The theoretical assumption is that individuals make social comparisons between themselves and the national average. Widened income gaps will then increase the level of psychological stress hormones, which have been found to cause various diseases, and thereby decrease the individual's level of subjective health.

The results from this analysis are unsupportive of the relative income hypothesis, indicating that absolute income is still a more important determinant of people's health.

*Keywords*: income inequality, subjective health, relative income hypothesis.

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# 1 Introduction

## 1.1 What explains the inequality in health?

The relationship between national income inequality and individual health have been a heated debate within the academic community. Books such as Richard Wilkinson's The Spirit Level and Michael Marmot's The Status Syndrome have in different ways popularized ideas about the harmful effects caused by inequality on individual health and general wellbeing. This thesis sets out to test the relationship between income inequality and health by using a multi-level logit regression model with micro level data from the fifth wave of the World Values Survey and aggregate data from the Quality of Government database.

A common argument in the inequality-health literature is that the significance of absolute income as a determinant for individual's overall health quality is diminishing and close to non-existing in the developed world. Instead, Wilkinson and Marmot argue that relative factors such as social and economic inequality are gaining more explanatory power as society develops beyond basic materialist needs. This argument has come to be known as *the relative income hypothesis*[1].

I will in this thesis test the relative income hypothesis by answering the following question:

*Does increased economic inequality cause negative health effects when individuals make social comparisons between themselves and their surrounding community?*

The hypothesis and its causal mechanism have been formulated in somewhat different ways, but the working hypothesis that will be used in this thesis is that individuals in the lower social strata tries to "keep up with the Jones" and that a failure to do so results in increased levels of the psychological stress hormone cortisol, which have been linked to a variety of diseases and self-destructive behaviors.

The end result does not support the relative income hypothesis and an inequality effect on health can therefore not be confirmed.

[1] A distinction can be made between the relative income hypothesis and Wilkinson's income inequality hypothesis, but the implications are of no importance for this study and will henceforth be overlooked.

## 1.2 The alternative hypothesis

The main objection against the relative income hypothesis is that most scientific research on the inequality-health relationship has been conducted at an aggregate level, using nationwide measures on inequality and health. A non-linear relationship between income and health at the individual level will give rise to an apparent relationship between inequality and health at the aggregate level, even though it in reality is nothing more than a statistical artifact. This statistical artifact has been called *the ecologic fallacy* and has been explained in greater detail in an article by Hugh Gravelle (1998, p.328). Fig. 1 is adapted from Gravelle's original article and demonstrates the ecological fallacy by using a hypothetical declining non-linear relationship between mortality risk and absolute income. Both countries in the figure have the same average income $\bar{y}$, but the income gap is wider in Country A than in Country B. The figure demonstrates that $m_A$, the aggregate mortality rate for Country A, will always be higher than $m_B$ in Country B when the marginal effect of income on mortality rate is diminishing, even if income inequality has no real effect on mortality.

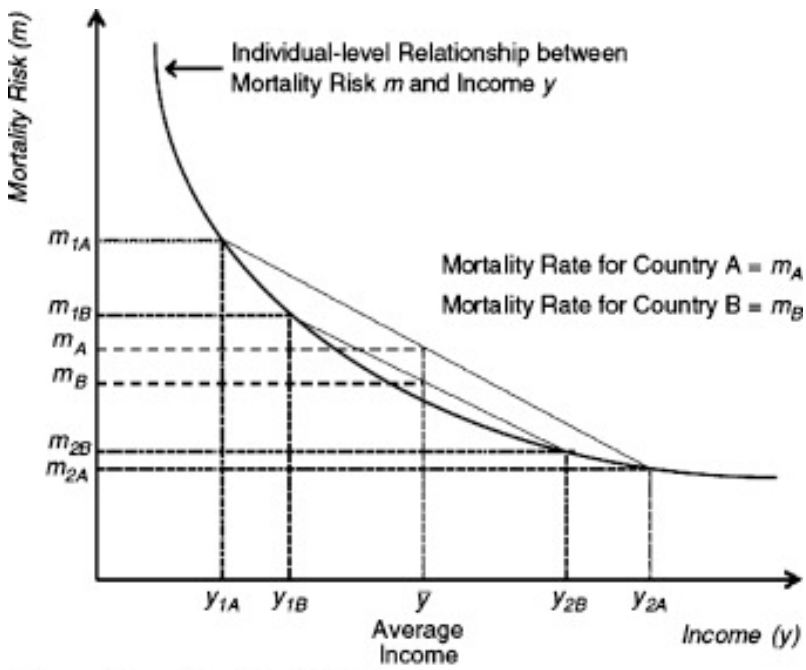


**Figure 1: The ecological fallacy (*Source*: Gravelle 1998).**

This ecological fallacy makes up the core argument in *the absolute income hypothesis* which states that the higher an individual's income the better their health, independent of the society's degree of inequality.

The absolute income hypothesis contradicts the relative income hypothesis and it will therefore be used as the alternative hypothesis. A failure to confirm the relative income hypothesis is equivalent to accepting the absolute income hypothesis and vice versa.

## 1.3 Subjective and objective health measures

Health can be measured in different ways and the choice of measurement will have to be made with consideration to its theoretical implication. The academic literature often uses subjective and objective measures interchangeably and it is therefore important to understand both measures.

This thesis will in its method use a subjective measure on individual self-rated health from the fifth wave of the World Values Survey as my dependent variable. *Subjective health* is a self-rated health measure where the individual is asked to rate his or her own health quality. The question that the respondent is asked to answer often take a general perspective on health quality, which allows the respondent to assess their overall health.

An alternative way of measuring health quality is through *objective health*, a measure that can be empirically observed by standardized diagnoses. Most health measures at the aggregate level are measured in this fashion and take the form of a physical attribute. Mortality rate and life expectancy at birth are two examples of objective health measures that will be used in this thesis and which measure a physical attribute that is easy to diagnose, you are either dead or you are not.

Both ways of measuring health have their advantages. Subjective measures tend to have a lower reliability, since self-stated measures can be affected by the individual's state of mind, which vary from day to day (this can be illustrated by the fact that the correlation between "state of health" and "feeling of happiness" in the fifth wave of the World Values Survey material is positively correlated by a factor of 0.38). But subjective measures are better at measuring general wellbeing and are cheaper and easier to acquire since they can be answered through simple surveys.

Studies over time have shown stable improvements in most measures of objective health while subjective health has remained unchanged (Bergh, Nilsson and Waldenström 2012, p.21). It is reasonable to believe that the subjective perception on health have differed over time and between cultures, something that might explain why subjective health is unaffected by technological development in healthcare and medicine.

The choice of measurement has also been shown to affect the outcome of health inequality studies (Bergh, Nilsson and Waldenström 2012, p.87). Subjective health tends to show a stronger support for the relative income hypothesis and choosing subjective health as the dependent variable in my method can therefore be considered as a gentle test of the relative income hypothesis.

# 2 Previous research

The debate on health inequalities has been polarized into two different camps that either support or reject the relative income hypothesis. Two central advocates of this hypothesis are Richard Wilkinson and Kate Pickett, who coauthored the previously mentioned book The Spirit Level and several articles on the subject. A lot of the previous research has revolved around their writings and both of them should be credited for their work. However, most references in the to their coauthored writings in the academic literature tend to only cite Wilkinson, which is a practical convention that will be followed in this thesis.

## 2.1 The Whitehall studies

The first studies that started a debate on a relative deprivation effect on health were the so-called Whitehall studies. These studies were conducted by analyzing an extensive screening examination on civil servants at Whitehall; a term often used to denote the governmental administration in Great Brittan. The first Whitehall study was conducted over a ten-year period, starting in 1967, and concluded among other things that civil servants with low-level administrative tasks had a higher mortality rate, greater risk of cardiovascular diseases and were more prone to develop an addiction to tobacco (Marmot, Shipley and Rose 1984, p.1003).

The first Whitehall study categorized 17530 male civil servants into five different occupational classes: administrative, professional, executive, clerical and "other". What is interesting about this classification system is that it uses occupation instead of income inequality as an operationalization for relative social position and class. The original hypothesis was that the level of stress was correlated with responsibility, and that it would increase as people advanced further up the occupational hierarchy. The results were rather the opposite and the study concluded that lower social status increases the general susceptibility to diseases. Later studies have supported these findings and suggested that the causal mechanism between social class and health is linked to the psychological stress hormone *cortisol* (Marmot, Shipley and Rose 1984, p.1006), which will be discussed in our theory.

Professor in epidemiology Sir Michael Marmot headed the second Whitehall study in 1985 and has since become a prominent figure in the inequality in health debate. His works are however not uncontroversial and he has been criticized for using aggregate level measures on inequality and health (Ben-Shlomo, Marmot and White).

## 2.2 Studies at the aggregate level

Operationalizing inequality can be done in different ways and Marmot's research focuses mostly on inequality within social hierarchies, such as the social position within the occupation ladder. A multitude of data on different measures of inequality and health are however available at the aggregate level, which allows for simple linear-regressions and correlation estimations with low scientific validity. Richard Wilkinson has pioneered these inequality-health studies at the aggregate level by using income inequality as a proxy for social class. The simplicity in these models makes them easy to interpret and explain to a wider public, something that has contributed to their widespread popularity.

The perhaps most well-known book in this category of studies is Wilkinson's The Spirit Level which presents an oversimplified picture of a complex relationship between not only inequality and health, but all kinds of problems. The Spirit Level is the epitome of the ecological fallacy and its graphical linear relationships between income inequality and health are tempting to accept because of their seemingly accurate predictions.

Figure 2 is adapted from the book and shows the relationship between Wilkinson's own index on "health and social problems" and income inequality. This is one of the most accurate linear predictions in the book and its almost perfect relationship seems just to good to be true. Wilkinson concludes that: "[t]his evidence cannot be dismissed as some statistical trick done with smoke and mirrors".

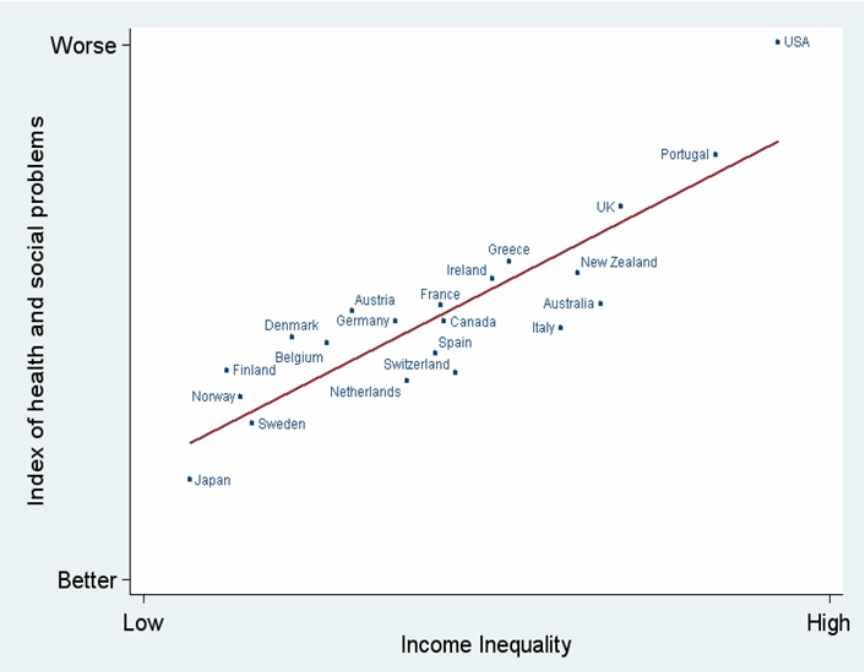


**Figure 2: Income inequality on health and social problems (source: Wilkinson and Pickett 2010).**

This might sound like a strong accusation, but it is likely that the countries and measures were selected and weighted to better fit the model. Figure 2 uses 21 developed countries, all of them are among the wealthiest in the world and all of them are members of the OECD. Using either the OECD countries or all countries with a GDP per capita above US$10000 would have been understandable choice of sample population, but excluding individual countries on the basis of size and number of citizens seems suspicious (Wilkinson and Pickett 2011, p.271-272). It is therefore unclear what the population of countries in Figure 2 is supposed to represent.

It is hard to replicate Wilkinson's index on health and social problems since it includes nine different measures, nonetheless using single aggregate measure might give some indication of how sensational the fit in Figure 2 is. I will use aggregated self-reflected health data from the World Values Survey and data on life expectancy from the World Bank to construct two different scatterplots on health inequality in the OECD. A gini-index from the World Bank is used as a measure of inequality in both figures. The results are shown in Figure 3 and 4 below.

The only countries that have been dropped from these figures are countries where data was missing. Figure 2 shows a week and positive relationship on inequality and subjective health while Figure 3 shows a week and negative relationship on inequality and life expectancy (objective health). These relationships seem weak and they point in opposite directions, possibly indicating a nonexistent relationship between inequality and health at the aggregate level.

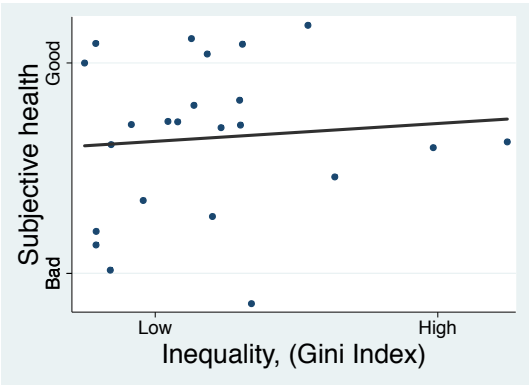


Figure 3: Inequality on Subjective health.

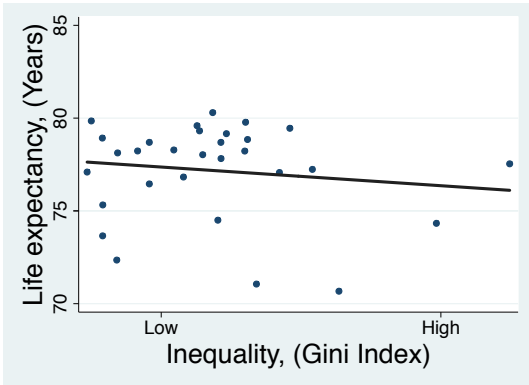


Figure 4: Inequality on Life exp. (Objective health).

Wilkinson concluded that the accuracy in Figure 2 could not be disregarded as "smoke and mirrors", but our exposition makes us believe otherwise.

Studies at the aggregate level without adjustments for individual income and characteristics have tended to result in exaggerated outcomes that favor the relative income hypothesis. Most of the literature that is used in this thesis has therefore been selected with this in mind, in order to avoid biased results.

The main critique against aggregate studies was already discussed in *1.2 "The alternative hypothesis"* and we will have reason to look at aggregate studies again

when we explore the theoretical relationship between inequality, income and health in *3.1 "A non-linear relationship"*.

## 2.3 Multi-level studies

The alternative to aggregate studies is to use individual data on health and aggregate data for inequality. This approach is called a multi-level model and it is this method that will be used for the analysis in this thesis.

Most of the studies conducted with a multi-level approach were unsupportive of the relative income hypothesis. A lot of these studies were very similar in their method and they often used subjective health data and a gini-coefficient to isolate the inequality effect on health. Two of these studies used subjective health data from the World Values Survey database - which is the same database that will be used in our method (neither of these two studies found any evidence in support of the relative income hypothesis). At first, Yaqiang Qi found a strong and significant relationship between relative income and health, but almost all of the effect disappeared after controlling for individual income (2012, p.463). Qi attributed the lost relationship between inequality and health after controlling for individual income to the shadow effect caused by the ecologic fallacy.

Jen, Jones and Johnston used the same data but a slightly different method and found that the individual level relationship between income inequality and health was non-linear, and that increased inequality was actually positively related with health (2009, p.650). This was a rather surprising finding so they theorized that the effect might be different for the poorest income quintile, since they would experience the worst health effects from social comparisons. They therefore conducted the analysis again and separated the effect on the poorest income quintile only to find the same result (ibid.).

Other multi-level studies have found partial support for income inequalities in health for specific groups but not others. One of the studies only found support amongst women (Wildman 2003, p.310), while another found support for both men and women, but only if they were between the ages of 45-65 (Huijts, Eikemo and Skalická 1969, p.1969).

Some of the studies were even supportive of the relative income hypothesis, despite controlling for individual income. A study on income inequality in China used happiness as a measure for individual well-being and found that inequality had a perceived effect on peoples happiness and that absolute income did not (Zhao 2012, p.447). A Japanese study found evidence suggesting that the relative income effect was strongest among the lower social classes and that the marginal effect of inequality was decreasing with each level of social class (Oshio and Kobayashi 2010, p.1362).

## 2.4 The group of reference

Both Marmot and Wilkinson state that inequality causes an independent negative health effect on individuals when they compare themselves with the rest of society. But whom do they compare themselves with and what constitutes the group of reference?

Inequality could be measured at a global level, and most people in the developed world (OECD) would in that sense belong to the wealthiest quintile of the world population. The other extreme is to measure inequality within the family unit, a workplace or among a group of friends. Neither of it is wrong nor does it prevent people from using different groups of reference in different circumstances.

Marmot's research and the Whitehall studies used occupational status as the operationalization of social position and suggested that psychological factors such as low sense of self-control and low self-esteem might increases health risks (Marmot and Bell 2012, p.5). The sense of self-control could probably be improved by giving the civil servants more freedom of decision and fewer restraints in the workplace, and it might therefore be unaffected by social comparisons. It is easier to see how self-esteem may relate to social comparisons and inequality as people with a low social position fails to keep up with society's expectations. However, Marmot does not provide a theoretical definition for the group of reference.

One way to define the reference group is simply to conduct research at multiple levels and analyze which measure of inequality that best fits the model. An article that compared inequality measures for multiple levels found that the definition of the reference group often affected the magnitude, significance and sometimes even the sign of relative income on health (Gravelle and Sutton 2009, p.142). The article distinguished between national and regional inequality and found that national inequality is more supportive of the relative income hypothesis than a regional measure.

A review by Wilkinson and Pickett on the health inequality literature came to the same conclusion. Their review summarized the findings in 155 papers and found that the support for the relative income hypothesis falls from 83 percent of the articles when using the nation as a reference group, to 73 percent for "large subnational areas", to 45 percent in the smallest units (Wilkinson and Pickett 2006, p.1774).

The previous research conducted on the group of reference gives us reason to believe that individuals tend to compare themselves with the national average. However, we also know that social comparisons are contextual and that the group of reference therefore is socially constructed, something that we will explore in more detail in *3.3 A culture of social comparison*.

## 2.5 Former communist states

Many of the articles used in this thesis found a significant and strong causal effect between living in a former communist state and reporting bad health[2]. This is an interesting finding that might shed some light on how changes in inequality affect people's health.

A study that compared 69 countries in terms of subjective health inequality found that none of the fifteen best countries were former communist states while nine out of the fifteen worst countries were (Jen, Jones and Johnston 2008, p.647). This seem to indicate that former communist states exhibit some kind of characteristic that brings down people's perception of their own subjective health.

The fall of the East Bloc in the early nineties sparked a rapid marketization process in the former communist states that restructured their economic institutions. Many lost their jobs and later gained new ones in the emerging private sector, a process that also caused increased income inequality. It is possible that increased inequality, unemployment and having experience communism all have independent effects on subjective health, but it is hard to separate these effects and further research on the subject is therefore needed.

Studies from China have shown that the introduction of market forces changed the social hierarchy, norms and culture, redefining traditional social contracts. Executive jobs in the public sector that were once regarded as high social positions in society lost status as new jobs in the private sector started offering higher salaries and more career options. This transition from an orthodox Marxist ideology to a meritocratic market society made income a relatively more important marker for social success than occupational position (Zhao 2012, p.436).

A case study on a small island in the Hainan province in China found that inequality has increased drastically on the island since the tourist industry was established. The island had previous mostly been populated by fishermen, but the tourist industry transformed the economic life on the island and raised the living standard for those who were hired, leaving the unemployed and fishermen with just as little as before. The subjective health quality decreased among the fishermen as a consequence of their loss of social status, but also because some of the fishermen took up drinking and were excluded from the new social activities that were to expensive for them to take part in (Inoue, Umezaki and Watanabe 2011, p.58).

These two studies were case studies from the market liberalization process in China, but the same logic of social paradigm shift could be used to explain why people in former communist states are more likely to report bad subjective health.

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[2] Countries that still call themselves communist but have been liberalizing their markets, such as China, Vietnam and Cuba, will be included into this category.

## 2.6 Reviewing the literature

The background research material for this thesis was selected with the ecologic fallacy in mind to avoid an unnecessary bias towards the relative income hypothesis. However, a majority of the studies still found some support for this hypothesis.

I have tried to classify each study according to their method of analysis in order to give some sense of how the method affects the outcome. Studies that use national or regional measures on health without adjusting for individual income were classified as *aggregate studies*, studies with adjustments to individual income were classified as *multi-level studies* and studies that did not fit into either of these two categories were classified as *"other"*. The last category is mostly made up of studies on the relationship between income, subjective social status and health. These studies are not testing the relative income hypothesis by using measures on income inequality, but instead looking to test if there is a *relative deprivation effect* on health by looking at how subjective social status affects people's health quality.

Each study was then classified as being either supportive or unsupportive of a relative income/deprivation effect on health based on the sign, significance and effect of the relationship. Not all studies provided a clear classification and some studies even found contradicting results, sometimes supporting a relative income/deprivation effect for one sex, age-group or area. These studies were hard to objectively classify and were in most cases labeled as unsupportive since they lacked a theoretical explanation for their inconclusive findings.

The results are shown in Table 1 below.

Table 1: Studies of inequality and health

| | Supportive studies | Unsupportive studies |
|---|---|---|
| Aggregate level | Wilkinson and Pickett (2006)<br>Wilkinson and Pickett (2008)<br>Wilkinson and Pickett (2010)<br>Marmot and Bell (2012)<br>Ben-Shlomo, Marmot and White (1996)<br>Marmot, Shipley and Rose (1984) | Canning and Bowser (2010) |
| Multi level | Zhao (2012)<br>Oshio and Kobayashi (2010)<br>Huijts, Eikemo and Skalická (2010)<br>Inoue, Umezaki and Watanabe (2012) | Bergh, Nilsson and Waldenström (2012)<br>Wildman (2002)<br>Jen, Jones and Johnston (2009)<br>Qi (2012)<br>Gravelle and Sutton (2009)<br>Clarke et.al. (2002) |
| Other | Karvonen and Rahkonen (2011)<br>Theodossiou and Zangelidis (2009)<br>Sakurai et.al. (2010)<br>Vonneilich et.al. (2012) | Ma and McGhee (2013)<br>Miething (2012) |
| Total studies | 14 | 9 |

The table shows that 14 out of 23 studies used in this thesis supported a relative income/deprivation effect (10 out of 17 supported if excluding the "other"-category). However, it has to be stressed that the selection of books and articles might have been biased towards supporting the relative income hypothesis since Wilkinson and Marmot's writings were used as the groundwork for this thesis.

It is also evident from looking at Table 1 that the method of analysis matters. A large majority of studies conducted at the aggregate level supports the relative income hypothesis, while a small majority of multi-level studies are unsupportive. The multi-level literature used in this thesis might in turn be considered as biased in favor of the relative income hypothesis, since more extensive reviews on the inequality and health litterateur have found an even stronger tendency for unsupportive findings (Bergh, Nilsson and Waldenström 2012, p.100).

# 3 Theory

We will now take a closer look at the explanation behind a possible relative income effect on health in order to construct a theoretical framework for the method. The assumption behind the hypothesis is still that people make social comparisons and that income inequality will cause negative health effects through increased levels of psychological stress hormones.

## 3.1 A non-linear relationship.

The ecologic fallacy is conditioned on a non-linear relationship between income and health at the individual level, but why do we have reason to believe that the relationship is non-linear? It is rational to assume that we spend more money on improving our health as our income grows and that the most efficient way to spend that money is by using the most cost efficient treatments and technology first. Our human biology and genetics often set an upper limit on how far we can improve our health conditions and each incremental improvement in health will therefore become more expensive the closer we get to this limit, or at least as long as the efficiency in our medical technology remains constant.

This non-linear relationship between income and health is at the center of the inequality in health dispute and its importance for the scientific outcome cannot be understated. The by Gravelle suggested solution to overcome this fallacy is to use a multi-level model which controls for individual characteristics such as income (1998, p.383), a technique that have almost exclusively resulted in outcomes that reject the relative income hypothesis (Gravelle and Sutton 2009, p.126; Bergh, Nilsson and Waldenström 2012, p.100).

Wilkinson has after this critique responded with two counterarguments against adjustments for individual income. His first argument states that controlling for individual income might control for a large portion of the experienced inequality:

"If a person's income is a marker of their social position, then adjusting inequality effects for individual income may be like controlling measures of class stratification for individual social status differentiation" (Wilkinson and Pickett 2006, p.1775).

This conflicting effect might certainly be conceivable, but excluding individual income will - as we have seen *1.2 The alternative hypothesis* - always give rise to the ecologic fallacy if the income-health relationship is non-linear at the individual level. Wilkinson disregards this relationship and the ecologic fallacy through his second argument, which states that the relationship between absolute

income and health is non-existing in the developed world (Wilkinson and Pickett 2006, p.1777).

It seems like - according to Wilkinson's own logic – as if he accepts that income has a significant effect on health in developing countries and that this effect is declining as income increases. Gravelle points out that this reasoning is equivalent to arguing that the marginal effect of income on health is declining and therefore that the relationship is curve-linear (1998, p.383). This would according to Gravelle imply that Wilkinson contradicts himself when he accepts the curve-linear relationship but denies the ecologic fallacy.

### 3.1.1 Wilkinson's threshold.

Would it not be conceivable for a relationship to ceases to exist after a certain stage in the economic development? This would certainly be plausible, but no evidence has so far indicated that this is the case between income and health. However, Wilkinson has arbitrarily estimated this threshold to occur at a level of US$5000 GDP per capita; commonly referred to as *Wilkinson's threshold*. We will now take a closer look at this potential threshold and explore why its theoretical construction is flawed.

The disappearing relationship between income and health is demonstrated in Wilkinson's book The Spirit Level by using global data to create a scatter plot on life expectancy at birth and GDP per capita (Wilkinson and Pickett 2010, p.19). This scatter plot is recreated in Figure 5 using World Bank data on 194 different countries. Trend lines have been added below and above Wilkinson's threshold to more clearly show that the marginal effect of income on life expectancy is decreasing at the aggregate level.

The upward sloping trend line beyond Wilkinson's threshold seems to reject its validity and instead point towards a curve linear relationship at the aggregate level. Some might also notice that outliers such as South Africa, with a life expectancy of 54 years and US$7765 GDP per capita, has a strong adverse effect on the slope of the trend line. This might explain why Wilkinson's threshold is given less attention in his later writings and why he exclusively focuses on OECD countries in The Spirit Level.

Using OECD as an operationalization of "the developed world" further reduces the sample population from 90 to 34 countries. It can be seen in Figure 5 that the OECD countries, represented by the diamond shaped dots, have a significantly higher average income level than the original sample.

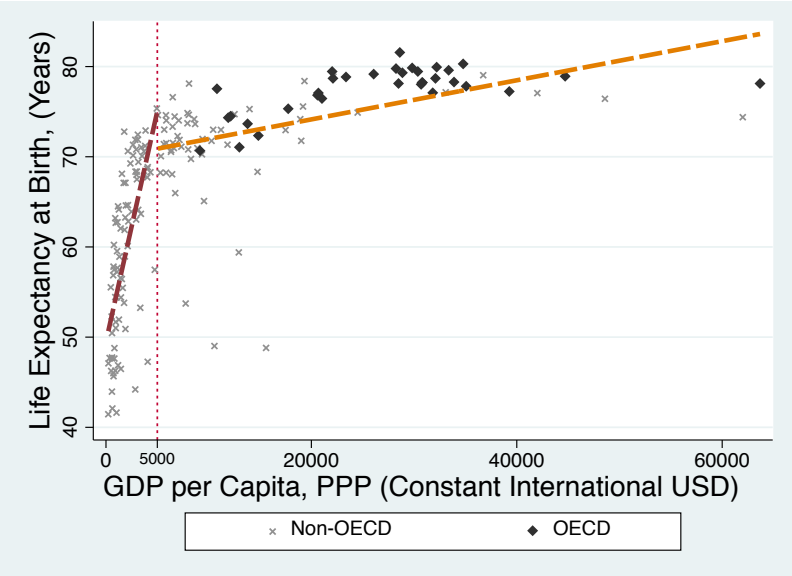


**Figure 5: The declining non-linear relationship between Gross Domestic Product and Life Expectancy.**

Figure 3 separates these OECD countries into one figure and shows that the income on life expectancy trend still remains positive, despite an even more narrow selection of developed countries. There is in other words no evidence supporting Wilkinson's threshold, not even at US$10000 GDP per capita.

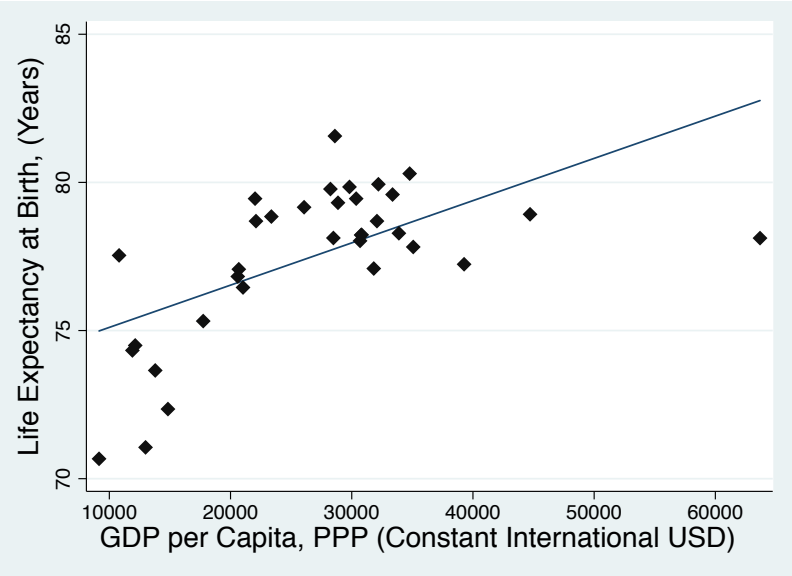


**Figure 6: A positive relationship between Gross Domesti Product per Capita and Life Expectancy.**

It is also important to point out that the ecological fallacy is not dependent on a curve linear relationship at an aggregate level. Wilkinson's threshold, a vanishing relationship between income and health at the aggregate level, could therefore exist even if the income-health relationship is curve-linear at the individual level.

We have now seen that Wilkinson's threshold is flawed by construction and it is therefor an unjustified critique of the ecological fallacy.

### 3.1.2 Adjusting for individual income

Adjusting for individual income have been shown to greatly reduce the support for the relative income hypothesis, but this thesis will use this technique since individual income is one of the most important factors for explaining health quality, even in the developed world.

Some countries might have extensive subsidizes on healthcare, making individual income less important as an explanatory factor for health quality. But healthcare is not the only good that you can buy with money that affects your health. Bergh, Nilsson and Waldenström have shown that the quantity of calories consumed a day is an important factor in explaining health quality, but also that it is intimately correlated with the level of income (2012, p.72). Some, like Wilkinson, will argue that we live in a post-scarcity society where we over consume calories and that higher income will not buy us better health (Wilkinson and Pickett 2010, p.22-23), but we still have theoretical reasons to believe that increased individual income will buy us better health. The microeconomic logic behind superior and inferior goods teaches us that consumers will move away from inferior products towards superior alternatives as income increases. If people value their health, which we will assume, then people will spend more of their income on healthier alternatives as their income increases, *ceteris paribus*. People might start buying more ecologically grown vegetables, switch from pork to leaner meat such as beef and stop buying semi-finished products.

The point here is that individual income cannot be excluded from our model if we believe that it affects health. This thesis will however as a consequence of Wilkinson's critique run two separate regressions with and without adjustment for individual income so that we can observe how absolute income changes the income inequality effect on health.

## 3.2 The direction of causality

A causal relationship can be established by obtaining significant results in a regression model, but finding the direction of causality will require a theoretical explanation.

The previous section explained how we believe that income affects health, but it is also theoretically possible to imagine the inverse relationship. A person with a good health is more likely to do well in school and make a career, thereby increasing their income. Both these effects probably exist in reality, which makes it hard to separate them without testing for a lagged effect through time-series analysis (Wilkinson and Pickett 2008, p.703).

The same problem arises when trying to establish an explanation for the direction of causality between income inequality and health. Good health could determine your social position or social position could determine your health, the former explanation is called *the health selection hypothesis* and the later is *the social causation hypothesis* (Huijts, Eikemo and Skalická 2010, p.1970).

This thesis will assume that social position affects an individual's health, not the other way around, since this is a necessary condition in order for the relative income hypothesis to hold. The research material used in this thesis also provided some evidence in support of this assumption. A research team studied how teenager's social position affected their subjective health in 29 Finnish high schools and found that teenagers with a lower social position more often rated their health as being low, despite the fact that most of these teenagers determined their social position by their parent's occupational status. This implies that their social position was unaffected by their health and that the difference in health therefore could be attributed entirely to the difference in social position (Karvonen and Rahkonen 2011, p.376).

One way to find out if income inequality causes health effects or if the relationship works the other way around would be to use a lagged inequality measure. It is reasonable to believe that past inequality causes health inequality in the future as health problems accumulate over time, and it would therefore be beneficial to use a time-series model that accounts for this.

## 3.3 A culture of social comparison

We saw in *2.4 The group of reference* that the level of aggregation at which we measured income inequality had a significant effect on the likelihood of finding supportive evidence for the relative income hypothesis. To measure inequality at a national level is however not an obvious choice of reference group, so we will therefore take a closer look at the theory of social comparison to better understand the context in which people compare themselves.

People experience relative deprivation as a consequence of being deprived of something they believe themselves to be entitled to. This feeling of entitlement is however a social construction and therefore shaped by our society and cultural values, which gives us reason to believe that the sensitivity towards inequality varies between different societies.

Wilkinson states in his book The Spirit Level that most western societies have become more individualistic and narcissistic over the past decades and that people today are more likely to respond positively to the question: "are you an important person?". This should according to Wilkinson not be misinterpreted as an increased feeling of self-secureness; since most people that answered positively on this question had failing test results in school (Wilkinson and Pickett 2010, p.47), which have traditionally been one of the most important indicators of successfulness. This group of respondents was also more sensitive to threats against their social position and often resulted to violence when society failed to give them the recognition they felt entitled to (ibid.). This example provides us with the first indication that our sensitivity towards inequality depends on the cultural context and that it has varied over time.

Comparative studies between the United States and Japan have shown that there is a contrast in how people perceive of themselves and how they want others

to perceive of them. Japanese people tended to be more self-critical of their own achievements, less inclined to boast about their own work and they would more often than Americans ascribed successes to the collective effort (Wilkinson and Pickett 2010, p.54-55). This behavior is according to Wilkinson explained by the more egalitarian Japanese culture where status competition is less important than maintaining good social relations. The differences between these two countries demonstrate that each country has specific characteristics that will affect their sensitivity to inequality.

Studies from China have shown that isolated islanders with few connections to the Chinese mainland have a stronger tendency to compare their own social status with that of their neighbor than the average Chinese citizen (Inoue, Umezaki and Watanabe 2012, p.52). It was also shown in the same study that they often evaluate each other in terms of "masculinity, housebuilding skills, and knowledge about how to utilize equipment in the bush" rather than through traditional status markers such as income and educational attainment (Inoue, Umezaki and Watanabe 2012, p.55).

One example of how people's values and ideas affect their sensitivity towards inequality is the difference between the political left in Europe and the United States. The left-wing political movement in Europe has traditionally been less acceptant towards income inequalities than their American counterpart, and this might be the reason for why some scientists have found a significant relative income effect on European left-wingers but not on American (Oshio and Kobayashi 2010, p.1359).

### 3.3.1 Differences between the sexes

Our exploration in the cultural differences in social comparisons has shown that there are many reasons to be skeptical of using a "one size fits all" reference group for income inequality. Two particular categories that always seem to give conflicting results are men and women.

A theoretical explanation for the difference between the sexes in sensitivity towards relative income is given in The Spirit Level. Income and social position is according to Wilkinson a relatively more important marker for sexual attractiveness in men than in women, and women value their looks relatively more than men (Wilkinson and Pickett 2010, p.143). Vonneilich et.al provides a similar but somewhat different theory, stating that men are "breadwinners" and the family would therefore be more dependent on the husband's income as a marker of their collective status (2012, p.9). Men's social position would according to these theories be more harmed if their relative income decreased, a hypothesis that has not been confirmed by the research material in this thesis.

One study showed a significant relative income effect on women's mental health but not on men (Wildman 2003, p.304), another study on eighteen retirement homes in Hong Kong found a relative deprivation effect on women but not men (Ma and McGhee 2013, p.3), and women that classified themselves as

working class were more likely to experience a class effect on health (Miething 2012, p.170).

These findings seem to reject Wilkinson's hypothesis of a stronger sensitivity towards inequality in men and instead point towards the opposit.

## 3.4 The causal mechanism

Both Wilkinson and Marmot explained the causal mechanism behind the relative income effect as being caused by the psychological stress hormone cortisol (Wilkinson and Pickett 2010, p.48; Kunz-Ebrect et.al. 2004, p.526). This is probably the most popular theoretical causal mechanism to be used in inequality in health studies and it is the explanation that will be used in this thesis as well; mostly because of or limited knowledge in the filed of medicine and psychology.

Repeated studies in medicine and psychology have found that individuals that were tasked with preforming a speech and a mathematical task in the presence of an evaluating audience stimulated increased levels of two stress hormones, cortisol and proinflammatory cytokine (Dickersson et.al. 2009, p.1240). Both these stress hormones have been found to cause negative health effects, such as reducing the immune system, raising the blood pressure and lowering fertility. The same experiment was repeated with a control group that was asked to preform the same tasks but without an audience. The results showed that the levels of stress hormones were significantly lower in the control group and the study therefore concluded that people are sensitive towards being evaluated and judged by others.

Studies on the connection between social position and psychological stress have confirmed that the level of stress is higher in lower social classes (Sakurai et.al. 2010, p.1835). We thus have a theoretical mechanism for how increased levels of these stress hormones might affect health and this explanation will hence be used as the causal mechanism for a plausible relative income effect on health.

## 3.5 The tunnel effect

Jen, Jones and Johnston found that increased inequality was positively related with health, but how is this possible? The economist Albert Otto Hirschman gave a possible answer to this question in a theoretical paper on how and why people find inequality justifiable. The existence of inequality is according to Hirschman justifiable if people believe that the difference in inequality arose from variation in work effort rather than discrimination, and if they believe that growing income inequality is a leading indicator of better times to come (Hirschman and Rothschild 1973, p.553-554).

The analogy that Hirschman used is called *the tunnel effect* and goes something like this: A driver is caught in a traffic jam inside a two-lane tunnel where all cars have stopped moving. The driver cannot see the end of the tunnel and is impatiently waiting for the jam to clear when he all of a sudden notices that the second lane starts moving. Naturally, the driver's expectations rise as he now anticipates to soon be moving again, but he gets disappointed after watching all the other cars pass by while he is waiting. Too much waiting and too much injustice might cause the driver to contemplate making an illegal move and cross the double line that separates the two lanes, unless he is still convinced that the inequality is a positive sign of better times to come (Hirschman and Rothschild 1973, p.545).

This tunnel effect is an important theoretical argument for why people would accept growing inequality and why inequality might even be positively correlated with health. This thesis will therefore use this as the theoretical explanation if we find a positive relationship between income inequality and health in our analysis.

## 3.6 A first world problem?

The relative income hypothesis is according to Wilkinson only observable in the developed world, but would it not be just as plausible to imagine an inequality effect in countries that are below Wilkinson's threshold?

It is plausible that the relative income effect is unobservable among developing countries in Wilkinson's scatterplots because the income effect dominates the income inequality effect, which dilutes the relationship. The advantage with using regression models instead of interpreting linear predictions in scatterplots is that we can adjust for these factors.

Wilkinson gives no theoretical explanation for why social position or relative income would not cause negative health effects in developing countries and there is therefore no reason to exclude these countries from the analysis.

# 4 Data and method

The purpose of this study is to create a gentle test of the relative income hypothesis, and this will be accomplish by using a subjective health measure and a national level inequality measure as the reference group; since these measures have shown the strongest support for a relative income effect on health (Wilkinson and Pickett 2006, p.1774; Bergh, Nilsson and Waldenström 2012, p.100).

## 4.1 The dataset

The data that will be used in this thesis is acquired from two different databases that have been merged into one combined set that includes both individual data from the fifth wave of the World Values Survey and aggregate data from Gothenburg University's Quality of Government database.

The fifth wave of the WVS was conducted between 2005-2007 and encompasses individual data from 57 countries, totaling more than 82.000 interviews. This dataset has been selected as the individual dataset because of its extensive cross-national measure on self-reflected health and its complementing data on individual characteristics such as personal income, education, sex, age, marital status and number of children.

The WVS dataset was then merged with the Quality of Government dataset, which is a collection of aggregate data for 193 countries. This dataset was included to give us aggregate data to adjust for country specific factors that might affect the individual's health. What is unique about the QoG dataset is that it contains a collection of data from different databases so that gives a solid foundation of aggregate data to work with.

The disadvantage with the QoG cross-sectional dataset is that the data is often gathered during different time periods, which lowers the reliability in each variable. Most of the QoG data that will be used is gathered during the same time period as the WVS was conducted or slightly earlier, causing a small unintended lag. This might actually have a positive effect on our model since aggregate variables such as the gini-index, healthcare expenditure and unemployment will have accumulating health effects that manifests themselves over a longer period of time (Theodossiou and Zangelidis 2009, p.233).

The QoG data was merged with respect to each individual's nationality in the WVS dataset. All observations with missing data for subjective health and gini-index were then dropped from the new dataset so that 45 countries and 67021 individuals remained.

## 4.2 Variables

The Quality of Government dataset sometimes contains many similar variables that have been gathered from different databases. Data from the World Bank's World Development Indicators database was chosen since this database had the most extensive and reliable data in the QoG dataset[3].

### 4.2.1 Dependent variable

The dependent variable that will be used in each model is the WVS's measure on self-stated health, which takes five values: "very good", "good", "fair", "poor" and "very poor". This variable was used to generate a bi-nominal variable that took two values: 0 = "poor" and 1 = "good"; poor is generated as all observations that stated very poor, poor or fair subjective health and good was generated as all observations that stated good or very good. The new variable consisted of 67021 observations in total, of which 46070 stated good health and 20951 poor health.

### 4.2.2 Micro level: independent variables

Data for seven different micro level control variables will be used in total. Age and sex are standard control variables that are included in all of the regression models; where age is simply the respondents stated age and sex is coded as 0 for men and 1 for women.

The third micro level variable is a self-positioned income scale where the respondent was asked to estimate his or her own income level on a scale from 1 to 10. This estimated income variable will be used to adjust for personal income and to eliminate the ecologic fallacy.

Educational attainment, marital status, how many children and trust in other people (0=high trust, 1=low trust) were all available in the VWS dataset and have been included into the models because of their potential impact on health.

### 4.2.3 Aggregate level:

The single most important independent variable that will be used is a gini-index from the World Bank. There are four different gini-indexes in the QoG material, but the World Bank's gini-index was chosen since it was used earlier in figure 4, 5

[3] More information about each variable can be found in the appendix or in the World Values Survey and Quality of Government codebooks.

and 6, and because it is preferable to be stringent in order to minimize the suspicion of data mining. This gini-index measures income inequality at an aggregate level on a scale between 0-100, where 0 is perfect equality and 100 is perfect inequality. It is well known that different inequality measures tend to rate countries differently in terms of inequality (Bergh, Nilsson and Waldenström 2012, p.31; Clarke et.al. 2002, p.1927), but studies have also shown that the choice of inequality measure does not significantly alter the relative income effect on health (Kawachi and Kennedy 1997, p.1126). It is therefore justifiable to just use a simple gini-index without repeating each regression with alternative inequality measures to reconfirm the results.

Gross Domestic Product per Capita will be added as a control variable because it is such a central macro economic variable that affects almost all aspects of life.

Health expenditure per capita is used as a proxy for the technology and quality of the healthcare system. Some studies have shown that improvements in the healthcare system might accounts for as much as 57 percent of all increases in life expectancy (Canning and Bowser 2010, p.1225), making it an important determinant of people's health that will have to be adjusted for.

Unemployment is a well-known factor that causes all kinds of disparity and therefore has to be included into the model. A micro level control variable for unemployment would have been even better, but was unavailable in the WVS dataset.

A communist-dummy was created to adjust for the social paradigm shift discussed in *2.5 Former communist states*, each non-former communist country was coded as 0 and former communist countries were codes as 1[4].

The last variable is generated by multiplying an OECD-dummy variable with the gini-index for every country; The OECD-dummy takes the value 0 if the country is not a member and 1 if it is. This variable should be interpreted as the relative income effect on health within the OECD, and it is added to make sure that there is not a hidden relative income effect on health that only exists in the "developed world".

## 4.3 Method

A multi level binominal logit regression method will be used to analyze the relationship between income inequality and subjective health. This method was chosen because the original dependent variable hade too few outcomes, which made it inappropriate to run an ordinary OLS-regression, and it therefore had to be recoded it into a binary outcome.

[4] The countries were classified as socialist/communist if they had been officially declared socialist or communist in the past. Exceptions were however made to Germany and Ghana, because they were considered as borderline cases.

The disadvantage with a logit regression is that its coefficient has no straightforward interpretation, which will imply that we cannot interpret the marginal effects of the relationship without having to calculate it separately[5]. The marginal effects of the relationship can still be calculated, but they will not be calculate them unless it is found necessary.

All statistical analyses be executed using STATA 12.0.

## 4.4 Models

We will run five models that have been constructed based on our theoretical knowledge of how income inequality might affect subjective health.

$$Subjective\ health = \alpha + \beta_1 Age + \beta_2 Sex + \beta_3 Gini$$

Model 1 is a minimalistic model that includes the income inequality measure and adjusts for the most basic individual characteristics age and sex.

$$Subjective\ health = \alpha + \beta_1 Age + \beta_2 Sex + \beta_3 Income + \beta_4 Gini$$

Model 2, includes the self-estimated income scale to adjust for income.

$$Subjective\ health = \alpha + \beta_1 Age + \beta_2 Sex + \beta_3 Income + \beta_4 Education + \beta_5 Marital\ status + \beta_6 Children + \beta_7 Trust + \beta_8 Gini$$

Model 3 adds the last individual independent variables, education, marital status, number of children and trust in other people. Adding children will change the importance of the income, because it adjusts for the expense of having to feed additional children. Income will now reflect household income instead of personal income, which is a better adjustment for purchasing power (Geyer 2010, p.495).

$$Subjective\ health = \alpha + \beta_1 Age + \beta_2 Sex + \beta_3 Income + \beta_4 Education + \beta_5 Marital\ status + \beta_6 Children + \beta_7 Trust + \beta_8 Gini + \beta_9 GDPC + \beta_{10} HeC + \beta_{11} Unemployment + \beta_{12} Communist$$

Model 4 introduces all the relevant aggregate level variables, GDP per capita, health expenditure per capita, unemployment and the communist-dummy.

$$Subjective\ health = \alpha + \beta_1 Age + \beta_2 Sex + \beta_3 Income + \beta_4 Education + \beta_5 Marital\ status + \beta_6 Children + \beta_7 Trust + \beta_8 Gini + \beta_9 GDPC + \beta_{10} HeC + \beta_{11} Unemployment + \beta_{12} Communist + \beta_{13} OECDgini$$

Model 5 is the last model and includes the additional OECD-gini.

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[5] This could have been avoided by using a logistic regression that would give us "odds ratios" instead of coefficients.

# 5 Results

The results from each model are shown in Table 2 (see appendix). Most of the coefficients are highly significant, a result of the choice of method and the high number of observations in each model (ranging from 60000 to close to 45000). The undoubtedly most important factor to look for in the table is the sign of the relationship, especially on the gini-index. The overall impression is that most control variables have signs that point in the direction of our theoretical predictions, despite a few exceptions. The signs on both health expenditure per capita and unemployment are contradicting our theoretical predictions, which might be indications of model misspecifications. The misspecification can very well be caused by a too long lag between these variables and the dependent variable (The healthcare expenditure data was gathered in 2003 and the unemployment data ranged from 1996-2007), but I decided to include them cause there is still reason to believe that health expenditure and unemployment belongs in the model and should therefore be adjusted for.

## 5.1 Testing the relative income hypothesis

The results from Model 1 shows that age is negatively related with health and that women tend to state lower subjective health than men. That higher age leads to deteriorating health was expected, and we saw in *3.3.1 Differences between the sexes* that most studies have already found a significantly lower health in women. The gini-index is however significant and has a negative effect on subjective health, which implies that rising inequality leads to lower subjective health and that the relative income hypothesis is supported by Model 1.

Model 2 uses the same control variables as Model 1, but includes the self-positioned income scale. The results show that personal income reduces the gini-index coefficient drastically and that it looses all significance after the adjustment. This demonstrates that personal income accounts for the entire relative income effect in Model 1, which implies that we now have reason to support the absolute income hypothesis. We have now arrived at the heart of the inequality in health controversy, since Wilkinson states that income will act like a proxy for social position and thereby adjust for the inequality effect. If this is the case, then we have no means to controlling for purchasing power, but not controlling for income will be just as wrong.

Model 3 is an extension of previous models and includes all the individual data from the WVS dataset that could plausibly affect health. The gini-index now shifts its sign and turns significant again, which will still be interpreted as support

for the absolute income hypothesis. We now also have reason to suspect that inequality is positively related with health and that people might even experience a potential tunnel effect.

The previous models have not adjusted for country specific aggregate data, so the aggregate control variables are therefore introduce into Model 4. Our communist dummy supports the findings in previous research that former communist countries seem to suffer from a paradigm shift in social values. GDP per capita is positively related with subjective health, which seems logical. Health expenditure and unemployment contradicts our expectations, but this has already been discussed above. The gini-index remains positive and significant, which makes us support the absolute income hypothesis after controlling for both micro and aggregate level independent variables.

It was assumed in *3.6 A first world problem* that there would be no discernable difference between the developed and the developing world in terms of a potential relative income effect, and Model 5 supports this assumption. The sign on the OECD-gini in Model 5 points towards the same relationship as we found on the gini-index in the two previous regressions, thereby giving us the final evidence in order to reject the relative income hypothesis and instead accept the absolute income hypothesis.

## 5.2 A possible tunnel effect?

How do we make sense of the strength in the logit regressions when the coefficients have no interpretation? We know from the sign of the relationship that income inequality has a positive impact on health and we are now interested in finding out if the effect is strong enough to even indicate a potential tunnel effect.

This problem can easily be solved by calculating the *odds ratio*. The odds ratio tells us how many times more likely we are to report good health if we increase the independent variable by one step, and it is calculated as:

$$OR = e^{\beta}$$

We can now calculate the odds ratio for the gini-index in Model 5 as:

$$OR_{gini-index} = e^{0.00637}$$

$$OR_{gini-index} = 1.0064$$

The odds ratio now tells us that an incremental increase in income inequality will increase the likelihood of reporting good subjective health by 0.64 percent.

The gini-index coefficient in Model 5 was the highest observed in all of the models, but it is still hard to subjectively judge whether the strength of the relationship is strong enough to support a tunnel effect. The span of the gini-index

ranged from 25 in Sweden to 58 in Brazil, and even a low increase for each step might lead to a noticeable difference. This thesis therefore concludes that there exists a weak tunnel effect and that people have a small tendency to get hopeful and healthier as a consequence of growing income inequality. The most important determinant for people's health is however still individual income, which according to the odds ratio for the gini-index in Model 5 increases the likelihood of reporting good subjective health by 21.8 percent for a one step increase in the ten-scale income measure.

# 6 Discussion

A test was constructed that met all criterions to be considered a gentle test and still failed to find any evidence in support of the relative income hypothesis. Rejecting the relative income hypothesis does however not imply that redistributive economic policies are not justified or that income redistribution does not increase the average health quality in a country. On the contrary, this is what is inferred by the non-linear relationship between income and health in the absolute income hypothesis. The marginal reduction in health caused by taking away money from the richest is still smaller than the marginal increase in health received by the poorest when income is redistributed in order to lower income inequality (Gravelle 1998, p.383), hence increasing the average health quality.

This thesis rejected the relative income hypothesis only after adjusting for individual income in Model 2, which according to Wilkinson also adjust for relative social position and therefore deludes a potential relationship between income inequality and health. This seems to be one of Wilkinson's core arguments against using a multi-level method and it is hard to completely disregard this argument without any econometric or scientific solution for overcoming it. None of the articles that were used in this thesis confronted Wilkinson's critique and problematized the adjustment for individual income, something that I find puzzling. Wilkinson's critique might be unjustified, but I still have not found a good counterargument in the literature. Further research on the effect of individual income adjustments is therefore needed in order to separate these two effects.

The relative income hypothesis states that people make social comparisons with others and that relative comparisons are more important than absolute improvements in living standard as determinants for over all health quality. People probably make social comparisons, but our findings seems to indicate that people are more concerned about their own position rather than everyone else's.

The importance of the health inequality debate have been linked with arguments for political action and the question is therefore very sensitive and highly politicizes. The Spirit Level has been used as a manifesto to push for increased equality and income redistribution, which makes our test of the relative income hypothesis an indirect test of the validity behind this political platform.

There is still public support for reducing income inequality in most developed countries (Wilkinson and Pickett 2010, p.248), this thesis have nonetheless concluded that the relative income hypothesis is not a legitimate argument to justify these policies.

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# 8 Apendix

Table 2: Logit regressions of self-rated health.

| Covariates | Models (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Micro data: | | | | | |
| Age | -0.0344*** | -0.0328*** | -0.0327*** | -0.0391*** | -0.0392*** |
| | (-61.51) | (-54.03) | (-45.02) | (-46.60) | (-46.61) |
| Sex | -0.250*** | -0.220*** | -0.194*** | -0.237*** | -0.238*** |
| | (-13.68) | (-11.18) | (-9.37) | (-10.69) | (-10.73) |
| Estimated income | | 0.223*** | 0.187*** | 0.196*** | 0.197*** |
| | | (48.33) | (37.34) | (36.16) | (36.19) |
| Educational attainment | | | 0.0727*** | 0.0470*** | 0.0464*** |
| | | | (15.93) | (9.37) | (9.25) |
| Marital status | | | -0.0230*** | -0.0322*** | -0.0318*** |
| | | | (-4.15) | (-5.41) | (-5.34) |
| How many children | | | -0.0159* | 0.000427 | 0.00110 |
| | | | (-2.27) | (0.05) | (0.14) |
| Trust in other people | | | -0.494*** | -0.479*** | -0.468*** |
| | | | (-19.54) | (-17.75) | (-17.29) |
| Aggregate data: | | | | | |
| Gini Index | -0.00620*** | -0.0000480 | 0.00470*** | 0.0186*** | 0.00637** |
| | (-6.13) | (-0.04) | (4.03) | (12.36) | (2.62) |
| GDP per Capita, PPP (Constant International USD) | | | | 0.0000471*** | 0.0000665*** |
| | | | | (9.34) | (11.25) |
| Health Expenditure per Capita, PPP (Constant USD) | | | | -0.000124* | -0.000243*** |
| | | | | (-2.33) | (-4.31) |
| Unemployment (%) | | | | 0.0107*** | 0.00984*** |
| | | | | (4.79) | (4.42) |
| Communist-dummy | | | | -0.779*** | -0.771*** |
| | | | | (-26.74) | (-26.32) |
| OECD x gini | | | | | 0.00710*** |
| | | | | | (6.39) |
| Constant | 2.861*** | 1.507*** | 2.026*** | 2.538*** | 2.484*** |
| | (48.80) | (22.20) | (22.62) | (25.09) | (24.22) |
| Observations | 60026 | 53713 | 49703 | 44542 | 44542 |

$z$ statistics in parentheses

* p<.05.

** p<.01.

*** p<.001.

# Variable descriptions:

Country data

| Country | Gini-index | OECD | Communist | Sample size |
|---|---|---|---|---|
| Argentina | 52.3 | No | No | 1002 |
| Australia | 30.5 | Yes | No | 1421 |
| Brazil | 58.2 | No | No | 1500 |
| Bulgaria | 29.2 | No | Yes | 1001 |
| Bukina Faso | 39.6 | No | No | 1534 |
| Canada | 32.6 | Yes | No | 2164 |
| Chile | 54.9 | Yes | No | 1000 |
| China | 41.5 | No | Yes | 2015 |
| Cyprus | 29.0 | No | No | 1050 |
| Egypt | 32.8 | No | No | 3051 |
| Ethiopia | 30.0 | No | Yes | 1500 |
| Finland | 26.9 | Yes | No | 1014 |
| Georgia | 40.3 | No | Yes | 1500 |
| Germany | 28.3 | Yes | No | 2064 |
| Ghana | 42.8 | No | No | 1534 |
| Guatemala | 55.3 | No | No | 1000 |
| India | 36.8 | No | No | 2001 |
| Indonesia | 39.4 | No | No | 2015 |
| Italy | 36.0 | Yes | No | 1012 |
| Japan | 34.6 | Yes | No | 1096 |
| Jordan | 38.8 | No | No | 1200 |
| South Korea | 31.6 | Yes | No | 1200 |
| Malaysia | 37.9 | No | No | 1201 |
| Mali | 40.0 | No | No | 1534 |
| Mexico | 49.7 | Yes | No | 1560 |
| Moldova | 36.9 | No | Yes | 1046 |
| Morocco | 40.6 | No | No | 1200 |
| Norway | 25.8 | Yes | No | 1025 |
| Peru | 54.7 | No | No | 1500 |
| Poland | 34.0 | Yes | Yes | 1000 |
| Romania | 31.5 | No | Yes | 1776 |
| Rwanda | 46.7 | No | No | 1507 |
| Slovenia | 29.2 | Yes | Yes | 1037 |
| South Africa | 57.7 | No | No | 2988 |
| Serbia | 28.2 | No | Yes | 1203 |
| Spain | 34.7 | Yes | No | 1200 |
| Sweden | 25.0 | Yes | No | 1003 |
| Switzerland | 33.7 | Yes | No | 1241 |
| Thailand | 42.0 | No | No | 1534 |
| Turkey | 42.7 | Yes | No | 1346 |
| Ukraine | 28.3 | No | Yes | 1000 |
| United States | 40.8 | Yes | No | 1249 |
| Uruguay | 44.8 | No | No | 1000 |
| Vietnam | 37.5 | No | Yes | 1495 |
| Zambia | 42.1 | No | No | 1500 |

# Micro level data from the World Values Survey

**V11: State of health (Subjective)**
V11. All in all, how would you describe your state of health these days? Would you say it is (read out):
-5 'Missing; Unknown'
-4 'Not asked'
-3 'Not applicable'
-2 'No answer'
-1 'Don´t know'
1 'Very good'
2 'Good'
3 'Fair'
4 'Poor'
5 'Very poor

**V237: Age**
V237. This means you are ____ years old (write in age in two digits).

**V235: Sex**
V235. (Code respondent's sex by observation):
-5 'Missing; Unknown'
-4 'Not asked'
-3 'Not applicable'
-2 'No answer'
-1 'Don´t know'
1 'male'
2 'female'

**V253: Scale of incomes**
V253. On this card is a scale of incomes on which 1 indicates the "lowest income decile" and 10 the "highest income decile" in your country. We would like to know in what group your household is. Please, specify the appropriate number, counting all wages, salaries, pensions and other incomes that come in. (Code one number):
1"Lower step"
2"second step"
3"Third step"
4"Fourth step"
5"Fifth step"
6"Sixth step"
7"Seventh step"
8"Eigth step"
9"Nineth step"
10"Upper step"

-1 'Don´t know'
-2 'No answer'
-3 'Not applicable'
-4 'Not asked in survey'
-5 'Missing; Unknown'

**V238: Highest educational level attained**
V238. What is the highest educational level that you have attained? [NOTE: if respondent indicates to be a student, code highest level s/he expects to complete]:
-5 'Missing; Unknown'
-4 'Not asked'
-3 'Not applicable'
-2 'No answer'
-1 'Don´t know'
1 'No formal education'
2 'Incomplete primary school'
3 'Complete primary school'
4 'Incomplete secondary school: technical/ vocational type'
5 'Complete secondary school: technical/ vocational type'
6 'Incomplete secondary school: university-preparatory type'
7 'Complete secondary school: university-preparatory type'
8 'Some university-level education, without degree'
9 'University - level education, with degree'

**V55: Marital status**
V55. Are you currently (read out and code one answer only):
-5 'Missing; Unknown'
-4 'Not asked'
-3 'Not applicable'
-2 'No answer'
-1 'Don´t know'
1 'Married'
2 'Living together as married'
3 'Divorced'
4 'Separated'
5 'Widowed'
6 'Single/Never married'
7 'Divorced, Separated or Widow (cs)'
8 'Living apart but steady relation (married,cohabitation)(cs)'

**V56: How many children**
V56. Have you had any children? (Code 0 if no, and respective number if yes):
-5 'Missing; Unknown'
-4 'Not asked'

-3 'Not applicable'
-2 'No answer'
-1 'Don´t know'
0 'No child'
1 '1 child'
2 '2 children'
3 '3 children'
4 '4 children'
5 '5 children'
6 '6 children'
7 '7 children'
8 '8 or more children'

**V23: Most people can be trusted**
V23. Generally speaking, would you say that most people can be trusted or that you need to be very careful in dealing with people? (Code one answer):
-5 'Missing; Unknown'
-4 'Not asked'
-3 'Not applicable'
-2 'No answer'
-1 'Don´t know'
1 'Most people can be trusted'
2 'Need to be very careful'

# Aggregate level data from Quality of Government

**Gini index:**
wdi_gini Gini Index
(Cross-section: 1995-2008 (varies by country), N: 142)
Gini measure of economic inequality, where greater values represent greater inequality. Data are based on primary household survey data obtained from government statistical agencies and World Bank country departments. Data for high-income economies are from the Luxembourg Income Study database.

**GDP per capita, PPP (Constant international USD):**
wdi_gdpc GDP per Capita, PPP (Constant International USD)
(Cross-section: 2002-2005 (varies by country), N: 178)
GDP per capita, PPP adjusted. (See wdi_gdp above for explanation.) Sources: World Bank and OECD.

**Health expenditure per eapita:**
wdi_hec Health Expenditure per Capita, PPP (Constant USD)
(Cross-section: 2003, N: 187)
The sum of public and private health expenditures as a ratio of total population. Data are in converted international dollars using 2005 purchasing power parity (PPP) rates. Source: WHO, supplemented by country data.

**Unemployment:**
wdi_ue Unemployment (%)
(Cross-section: 1996-2007 (varies by country), N: 157)
The share of the labor force that is without work but available for and seeking employment. Source: ILO.