

Income Inequality and Neuropsychology- A post COVID-19 Analysis

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First Draft – May 25, 2020

-Introduction-

The terms “inequality”, “wealth gap”, and “income gap” have been inescapable in recent media articles, research publications, and political dialogues in the United States. It highlights society’s growing awareness of a widening divide between the top and bottom-most tiers, along the measures of income, wealth, occupation, and education level. Beyond awareness, there is a sense of urgency as influential figures such as President Obama decreed income inequality as “the defining challenge of our time” [1] in 2013, and Pope Francis warned “inequality is disastrous for the future of humanity”[2] this year. Additionally, organizations such as the United Nations have made reducing inequality among their top 10 sustainable goals since 2015 [3]. This urgency takes root in the numerous physiological and mental health, social, environmental, political, and economic risks that inequality poses. These risks can be seen both globally and nationally, within the United States, and affect national, inter-relational, and individual level metrics. In a post COVID-19 world, income inequality gap has been exacerbated due to structural failures in financial inclusion. The ‘left behind’ are becoming almost invisible in the rear view mirror. If this **catastrophe** is unaddressed, ‘economic deaths’ will far exceed COVID-19 related deaths. The ill effects will have multigenerational repercussions.

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-Measures of Inequality-

“Inequality” can refer to a wide range of aspects of one group’s standing in society as compared to another, more endowed group. Commonly, researchers have looked at inequality among the dimensions of absolute and relative income, accumulated wealth, occupational standing, and educational level. These dimensions correlate to an individual’s ability to access resources, participate in society, and interact with others. Within this paper, we will be specifically looking at the dimension of income inequality to assess the effects it has. Importantly, among researchers one of the most established and standardized measures of income inequality is the Gini coefficient [4]. This statistical measure looks at the income or wealth distribution among a population, and is often used as a gauge of economic inequality. In the measure, a “0” coefficient indicates perfect equality (among incomes), whereas a “1” coefficient would indicate perfect inequality (i.e. all wealth belongs to one person). Much of the research cited within this review will refer to methodologies and analyses involving the Gini coefficient.

-Global Inequality-

While economic inequality in the United States has been intensively studied, it is important to note that recent literature has found similar trends of increasing inequality globally. Trends captured by the World Inequality Report in 2018 [5], demonstrated that global inequality has increased starting from 1980. Today, the top 1% capture twice as much global income growth as compared to the bottom 50%. While emerging markets have experienced tremendous growth, it is offset by the increasing inequality experienced in countries such as China, United

States, OECD countries, India, Russia, Brazil, and Middle Eastern countries. These trends have been captured by The Equality Trust, as depicted by the graph below which show the positive correlation between income inequality, and health and social problems.

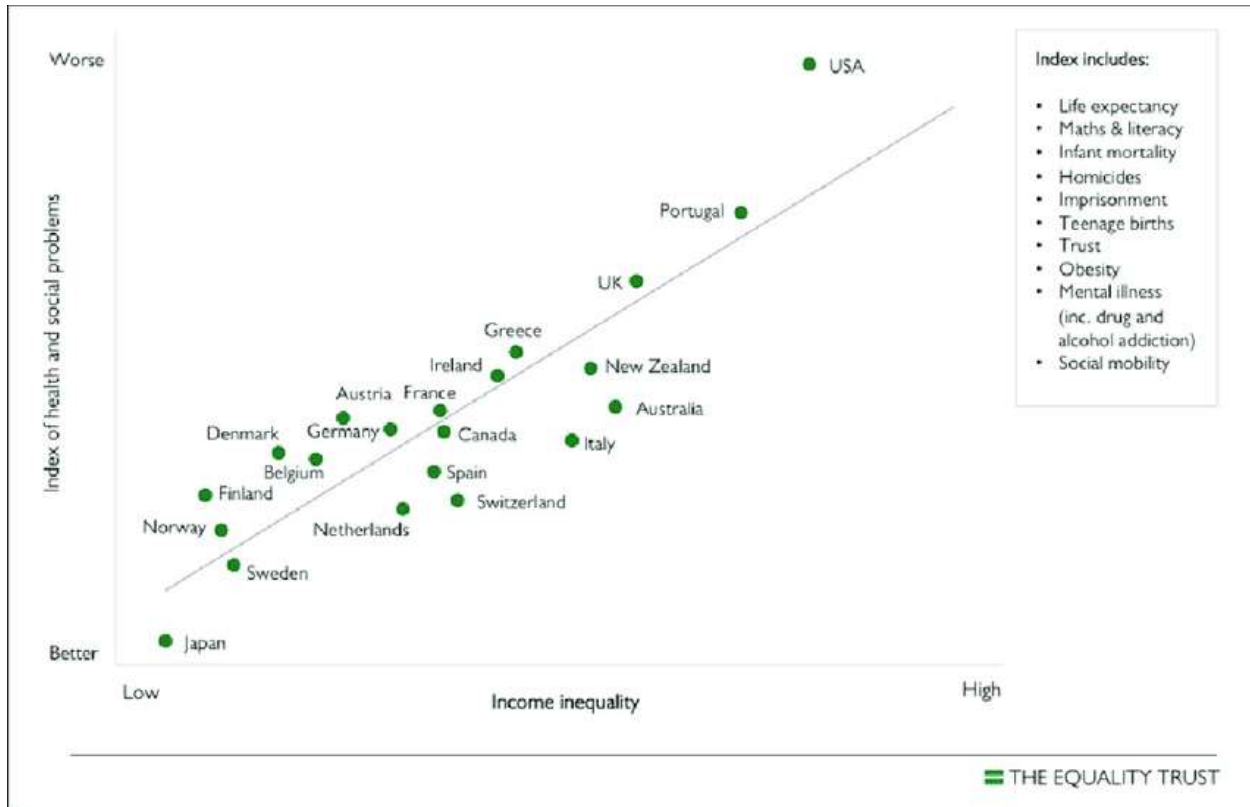


Figure 1

-United States: The 1970s-

Today there are various statistics on the gaps between the top 1% incomes, the disparities between CEO and average salary, and the comparison of hourly to yearly workers' income, which all provide evidence to Larry Katz' defining of "polarization" within the United States. Statistically, the share of all income among the top 1% earners increased 13.5% from 1970 to 2007, resulting in these top earners exceeding the total amount of income that the entire bottom 40% of households received [6].

It is important to understand the origins and pathway income inequality has taken to reach this point. Many researchers and historians turn to the 1970s, a period in which there was a significant increase in the top earners' wages, thus initiating a wealth gap [7]. This was followed by public policies, such as the decline of progressive taxation in the early 1980s, that allowed for the continuation of income protection and growth in the top tiers of earners. Correspondingly, research has found that the Global Progress Indicator (GPI) peaked in 1978, and has since decreased despite the increased Gross Domestic Product in the United States [8]. The GPI indicator is based upon combined measures of GDP, Human Development Index, Ecological Footprint, Biocapacity, Gini coefficient, and Life Satisfaction scores. This indicator is credited as better accounting for real welfare, and not GDP growth. Moreover, it demonstrates a correspondence between a time period in which the wealth gap started to grow, and welfare decreased.

-The Impact of Inequality: National Level-

One of the most uncertain components of research on income inequality is the effects that it has upon the economic health of a nation. In one study of OECD countries, it was found that income inequality had a statistically significant impact on future growth, which was attributed to the gap in skill development between high and low income families. It was further hypothesized that such a gap in skills would create a less productive workforce, and ergo less optimal economy. However, this study's review of related literature found that there was evidence for income inequality both helping or hurting economic growth of a nation [9]. Similar findings have been shown for specific analyses of United States.

Beyond economic health, economists and researchers have begun to look at a country's full portfolio of indicators that signal national well-being [10]. Specifically, the Genuine Progress Indicator (GPI) has been used as a holistic measure of national well-being. It still uses economic metrics such as GDP, but also factors in negative externalities of economic activity such as the cost of crime or the cost of resource depletion. When comparing the effects of income inequality on GDP, it was unclear why global GDP increased more than 3-fold since 1950 while income inequality has also increased. However, when comparing income inequality and GPI, researchers found that there was a negative relationship between the two. This indicated that economic progress, defined beyond GDP growth, is negatively affected by income inequality.

It should be noted that on a national level, income inequality has been found to affect intergenerational mobility. Such mobility indicates the changes in social status between different generations within the same family- in essence, to what extent does a child's future success depend on his predecessors' income or social status. In a study of the US, it was found that intergenerational mobility varied significantly across regions [11]. High mobility regions were found to have less income inequality, among other mediating factors such as less segregation, better primary schools, and greater social capital.

Finally, research has found a clear, unambiguous link between national population health and income inequality [12]. There is substantial research that shows health and well-being indicators are better for individuals in more equal countries [13]. These health indicators include children's health and development factors, long-term health factors, and mortality factors.

-The Impact of Inequality: Inter-relational Level-

One of the worrying consequences of economic inequality is the worsened social relations that it produces between individuals. This includes unconscious perceptions and biases, such as that women exhibit higher attraction to more masculine faces in more unequal societies [14]. More worryingly, it includes conscious perceptions about those from various socioeconomic status (SES) levels or income levels.

Building relationships with others and forming cohesive communities is largely dependent on individuals having mutual feelings of trust and respect. However, the psychosocial hypothesis has proposed that increased inequality accentuates that people belong to different status groups, resulting in the sentiment that there are few common goals and few collective goods [15]. Instead of seeing others as collaborators, they become competition that an individual must overcome, as argued in Wilkinson's Inequality hypothesis [16]. This creates social distances between people, supporting findings that show that as inequality rises, self-serving individualism and self-aggrandizement increase [17]. This in turn decreases reciprocity, trust, public friendliness, and results in people disengaging from civic and social participation. Support for this has been found in multiple research papers, in which increased economic inequality corresponds to individualistic tendencies. For example, a negative relationship between state level inequality and perceived agreeableness of other individuals was proven [18]. Moreover, in more unequal countries people are less willing to take action to improve the conditions of their fellow citizens and people are less generous [19] [20].

Underlying the psychosocial hypothesis is the question of why does increased cognition of social stratification produce more self-serving behaviors? The reason may lay in the Stereotype Content Model (SCM) which argues that socioeconomic disparities are associated

with stereotypes of those in different groups [21]. Specifically, more unequal societies report more ambivalent stereotypes, meaning that individuals are either seen along the warmth or competence spectrum, but not both. This might correlate to studies which find that lower income individuals are seen as less competent and more lazy [22].

Social relations are important beyond encouraging citizens to work together to tackle societal issues and invest in the good of others. On a biological level, a lack of received social support, or indegree connectedness, has been proven to increase fibrinogen concentrations- which has been linked to cardiac risk- within individuals [23]. This highlights that individuals are directly facing the negative consequences of inequality deteriorating inter-relationships.

-The Impact of Inequality: Individual Level-

While income inequality is frequently talked about in group and national level terms, a large body of research is now demonstrating that there are serious individual consequences to facing economic inequality. Research has shown that economic inequality creates a significantly different environment for lower SES individuals. Such environments include increased exposure to stress, environmental hazards, judgment and discrimination, violence, and critical life situations. Resultantly, individuals in lower economic stratifications disproportionately face a barrage of mental health and biological risks, extending even to a genetic level.

Mental Health:

The link between mental health and income inequality has been studied in various research papers, with an array of statistical findings. In another review of 27 studies on the relationship, a positive association was found between income inequality and incidence of mental health issues in a third of studies [24] [25]. However, in a third of studies an inconclusive relationship was deemed, and in another third it was found that no relationship existed. Thus,

researchers are still unsure of how income inequality can affect mental health, and what the underlying variables are that have resulted in a positive correlation between the two. There is still a need to investigate the extent of effect sizes between mental health and inequality, as well as the degree of causality between the two. In the following sections, the paper will investigate the evidence that has been found in relation to specific mental disorders and maladies.

Anxiety:

In 2012, Author Maura Kelley announced that an “anxiety epidemic was sweeping the US” [26]. The supporting evidence laid in America’s astounding increase in anxiety rates- one in five Americans experienced anxiety, a prevalence rate much higher than in any other country globally [27]. In answering the question of why, researchers investigated the variables that were causing stress among Americans [28]. Importantly, the top stressors included money, work, and the economy, with 61% of Americans reporting money as a stressor. Moreover, Americans with lower incomes reported a disproportionately higher amount of stress and higher inability to manage stress. In fact, the figure below from the American Psychological Association demonstrates how individuals with incomes below \$50,000 had higher stress than their counterparts.

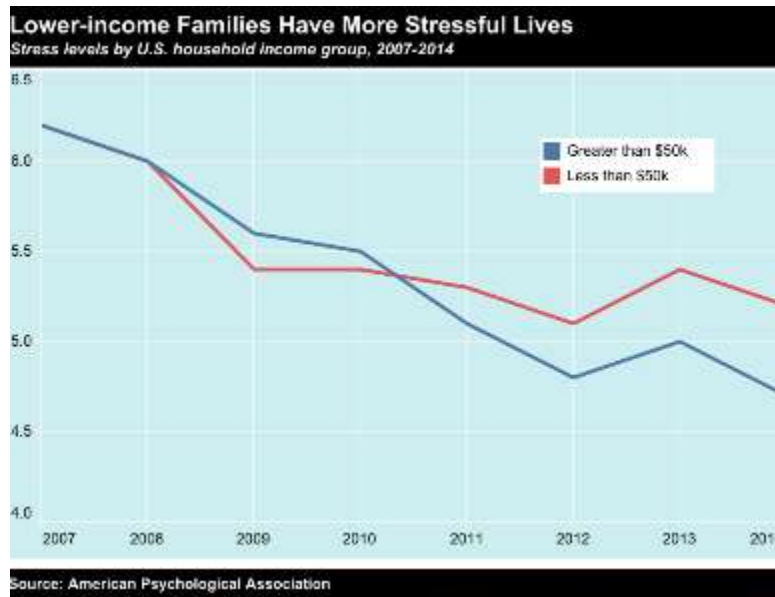


Figure 2

This background provides the context for why many researchers are investigating the link between income inequality and anxiety. One well-researched topic is the “Status Anxiety Hypothesis” which has evidence that individual psycho-social health is influenced by perceptions of one’s place in the social or status hierarchy, and thus, which worsens as inequality rises [29]. Specifically, as one perceives inferiority to others, the resulting emotional stress of shame and distrust can lead to increased anxiety. This hypothesis was notably supported by the finding that individuals from low-inequality countries reporter lower status anxiety, than their counterparts in higher inequality countries [30]. Another hypothesis, the “Social Capital Hypothesis”, gives evidence that increased income inequality reduces social mixing across SES groups, thus lowering interpersonal trust and increasing social anxiety.

Depression:

The link between income inequality and mental health extends to depression- one review of studies found that nearly two-thirds found a significantly positive relationship between income

inequality and risk of depression [31]. Research has supported this link on a global level, in which it has been proven that the Gini Index was positively associated with major depressive episodes in high income inequality developed countries [32]. And it extends to a national level- depression prevalence across US states was significantly associated with income inequality (the Gini coefficient) [33] [34]. As the Gini coefficient rose in states, so did the depression prevalence, even after adjustment for income, educational, and age factors.

The reasoning behind why there is a link between income inequality and depression still remains contested. From the “Social Rank Theory”, it has been argued that income inequality can cause feelings of inferiority, resulting in insecurity over hierarchical rank and anxiety over rejection [35] [36]. Additionally, individuals can feel a low sense of control in searching for ways to alleviate feelings of inferiority [37]. These negative affects can in turn increase individual vulnerability to depression, anxiety, and/or stress. This theory has been supported by research that shows that one’s income *rank* within a social comparison group is more strongly associated with depressive symptoms, as compared to one’s absolute income [38] [39]. A more economic explanation suggests that the higher likelihood of debt associated with lower income individuals, in turn correlates to the higher levels of stress these individuals have. As stress is a leading risk factor for depression, this might pose another explanation.

Life-Satisfaction (which can affect both anxiety and depression):

Behind the connection on mental health and income inequality is the repetitive finding that income inequality leads individuals to feel less satisfied with themselves as shown in Figure 3. Supporting, research on individuals in the US shows that income inequality is both associated with stronger social comparison and lower level of life satisfaction [40] [41] [42]. The reasoning behind this link is still being explored. Psychologically, it is hypothesized that income inequality

creates feelings of perceived unfairness and lower trust in others, resulting in less satisfaction. Additionally, from a Social Comparison perspective, income inequality may increase the frequency and consequence of comparing [43] [44]. Another hypothesis is that countries with higher income inequality are also more materialistic [45]. Materialism has been associated with lower well-being such as increasing risky health behaviors, increasing negative self-appraisals, and decreasing life satisfaction.

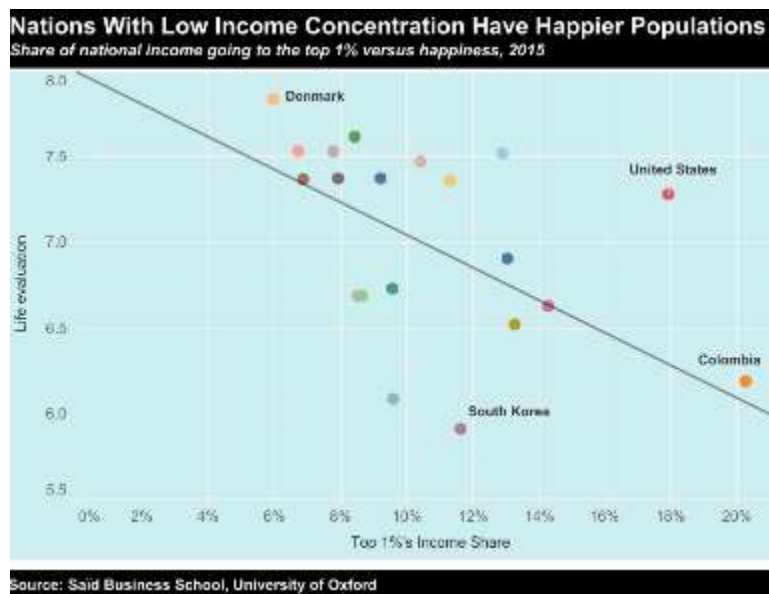


Figure 3

Physiological Health:

Obesity:

One of the physical well-being factors influenced by income inequality is obesity. Research has found strong correlational evidence for poverty and inequality being associated with widespread national obesity [46] [47]. In developed nations, inequality is one of the largest predictors for obesity rates. Researchers have attributed this link to the associated stress and

anxiety research has correlated with income inequality. One theory further proposes that viewing oneself as inferior can lead to increased calorie intake.

Genetic:

Various research has found correlations between inequality, and the expression and epigenetic state of a wide array of genes [48] [49] [50]. Evidence has specifically shown a relationship between quality of early social environments and health in adulthood (both of which are affected by inequality), and individual differences in neural systems that underlie the expression of behavioral and endocrine responses [51]. It is important to note that experiences that change the epigenome early in life often have effects on specialized organs such as the brain, heart, and immune system, therefore impacting the physical and mental health of an individual for their entire life. This extends across a variety of examples which have shown that genes modify in response to toxic stress [52], nutritional problems, and non-supportive environments [53]. One notable example is research has shown that adults with lower SES also had lower Global DNA hypomethylation, putting them at risk for biomarkers of cardiovascular disease [54]. Also notably, one study found that social status could be predicted by peripheral blood mononuclear cell gene expression with 80% accuracy [55]. This finding highlighted the critical molecular response individuals have to social conditions. Finally, the effects of inequality extend to pre-birth. One study found that epigenetic changes were observed with postnatal stress exposure, leading to long-term changes in the brain and peripheral tissues [56].

Childhood Development:

There has been extensive research into the relation between SES and childhood development. Before even being born, lower SES children in more unequal countries are more likely to experience growth retardation, inadequate neurobehavioral development, experience asphyxia, be born prematurely, be born with a birth defect or disability, or even die in infancy. This is exemplified below- the World Health Organization and OECD found a positive correlation between income inequality and infant mortality in 2019.

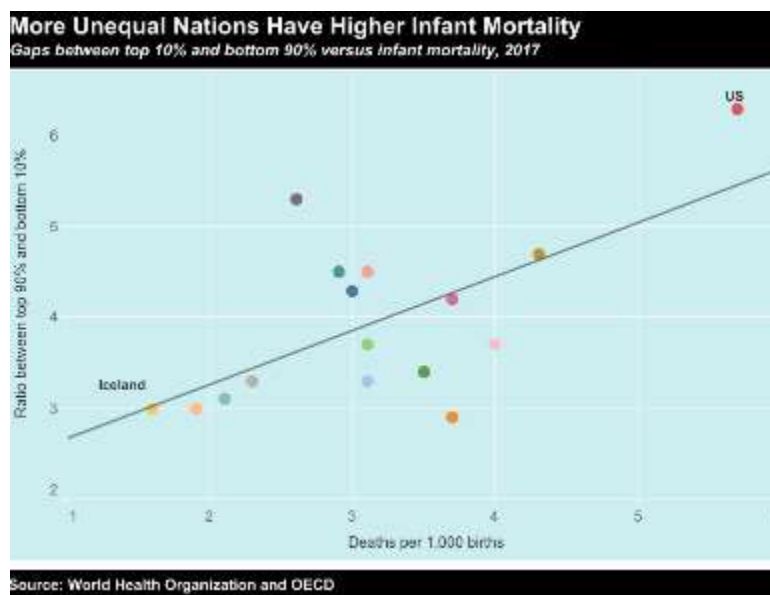


Figure 4

Later through childhood, it has been documented extensively how higher SES families are able to offer their children a wider array of resources that aid in their educational and personal development [57]. For example, lower SES children have lower nutritional access, lower health care access, more hazardous housing environments, lower exposure to cognitively stimulating environments, lower parent engagement, worse teacher treatment, more experiences of threatening and uncontrollable life events, and more exposure to violence [58]. Finally, these effects have long-term consequences. There is substantial evidence that low SES children more

often experience psychiatric disturbances or maladaptive social functioning, as well as continuing health problems.

Brain:

Finally, the newest body of research is drawing connections between income inequality and physiological changes in the brain [59]. Research has indicated findings that brain growth is impacted by family poverty [60], and that temporal dynamics and plasticity of the brain respond to learning environments [61] [62]. This indicates a field that needs to be further explored to determine how inequality, the mediating factors it causes mentally and epigenetically, and brain development and plasticity are related. It gives light to the extent of inequality's effect on the individual level, and provides further evidence to the possible mediating factors between inequality and individual wellbeing.

-Pathways Forward-

The body of research indicates that income inequality has correlation to negative costs at the national, inter-relational, and individual level. Future research needs to further understand the mediating factors between income inequality and its various negative consequences, as well as the extent of *causality* income inequality has on those. Furthermore, the individual level costs of income inequality are the most critical to focus on as mental, epigenetic, and brain health are all essential to well-being.

Beyond research, action needs to be taken to offset the damages caused to individuals by income inequality. While lowering income inequality itself is an extensive process which will require government and business restructuring of pay and tax systems, there are solutions that can be used to mitigate income inequality's negative externalities. Researchers are looking to

both improve social outcomes and encourage long-term growth in turning to various solutions. Such solutions vary from redistribution through taxes, implementation of minimum incomes, setting of goal pay ratios in companies, and development of service provisions [63]. Our paper will specifically argue for the benefits that redistribution policies via taxes have, as these ensure more equal share of growth and encourage future economic growth. These policies would also have the ability to promote better equality in accessing education.

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