# Between Country Inequalities in Health Lifestyles

Tom VanHeuvelen and Jane S. VanHeuvelen
Department of Sociology, University of Illinois at Urbana-Champaign

**Abstract:**
Where do individuals consolidate health behaviors into a universal set of healthy lifestyles, and to what extent are health lifestyles and subsequent health outcomes contingent on between country socioeconomic inequalities? To answer these questions, we harmonize information from the 2011 International Social Survey Programme and the 2014 European Social Survey to examine patterns of health lifestyles and subsequent associations with self-rated health and obesity in representative samples of 53 country-years nested in 35 countries, with repeated observations from 18 countries. We find individuals engage more frequently in all healthy behaviors in more affluent countries. Moreover, we find the positive health consequences of a universal health lifestyles to be primarily concentrated in more affluent countries. Critically, we move health lifestyles research forward by testing the consequences of changes in shared living conditions, finding that  we show that growth in economic development increases the propensity of healthy lifestyles within countries. Policy and theoretical implications are discussed.

Author Notes
Jane VanHeuvelen and Tom VanHeuvelen are in the department of Sociology at the University of Illinois Urbana-Champaign

Correspondence for Tom VanHeuvelen: Department of Sociology, University of Illinois Urbana-Champaign, 702 S Wright St, Urbana, IL 61801, tvanheuv@illinois.edu

Correspondence for Jane VanHeuvelen: Department of Sociology, University of Illinois Urbana-Champaign, 702 S Wright St, Urbana, IL 61801, jvh@illinois.edu

Health outcomes are inextricably linked to social context. For example, where a person lives influences their access to resources and exposure to health risk factors, or lack thereof. At the global level, patterns of disease and mortality have undergone a major shift, partially due to broadly shared changes in context rooted in economic development. Specifically, noncommunicable diseases—such as cancer, heart attacks, respiratory diseases, and diabetes – have supplanted communicable diseases as the leading causes of death worldwide (Farmer et al. 2013, WHO 2018). While key differences persist between countries and regions, the shift in the burden of disease away from infectious diseases and toward chronic conditions represents an important change in the etiology of the primary causes of death and illness. To combat chronic diseases, many health providers attempt to motivate patients to alter their lifestyle choices and health behaviors. Smoking cigarettes, drinking alcohol, consuming an unhealthy diet, and physical inactivity are the most frequently targeted health behaviors by healthcare providers and policy makers to address chronic diseases, due to their high correlation with negative health outcomes (CDC 2015). The increasingly broadly shared significance of health behaviors for individual and global health outcomes represents an important opportunity to reexamine the factors that motivate and enable people to lead a healthy life. Furthermore, the increased global risk of chronic disease offers a useful chance to build upon previous sociological studies of cross-national health inequalities to examine where individuals are consolidating health behaviors into a universal set of healthy lifestyles, and to what extent the link between health lifestyles and health outcomes is dependent on between country socioeconomic inequalities.

While most studies of health lifestyles and subsequent health outcomes focus on a single country context (Christensen and Carpiano 2014; Burdette et al. 2017; Saint Onge and Krueger 2017) or small set of bordering countries in a single world region (Cockerham, Hinote, Abbott and Haerpfer 2004; Cockerham, Hinote and Abbott 2006) recent cross-national research has underscored the importance of assessing social determinants of health as rooted not only in within-country inequalities, but in between-country inequalities as well (Beckfield et al. 2013; Präg et al. 2013, 2016). To that end, several recent studies have anchored unequal global health outcomes in broadly shared national contexts examining varying social, political and economic conditions between and within nations (Beckfield et al. 2013; Olafsdottir et al. 2014; Bakhatiari et al. 2018). Motivated by the increased importance of health behaviors for health outcomes as demonstrated by the global rise of noncommunicable disease, in this research we build upon previous studies to consider how between-country economic inequalities, specifically manifest as differences in economic development, influence participation in key health *behaviors*, and how the enactment of otherwise similar health lifestyles in different country contexts translate into health *outcomes*.

We use health lifestyles theory to connect country-level changes in development with individual-level participation in multiple and potentially contradictory health behaviors (Cockerham 2005, Saint Onge and Krueger 2017). While the theory of health lifestyles offers a framework well-suited for this type of analysis, it has largely been empirically tested in single country studies, or in a small number of countries in a similar world region. Thus, we know little about how participation in health lifestyle varies across countries, nor do we know how the association between health lifestyle participation and subsequent health outcomes might rely on broadly shared national contexts. To find out, we examine how inequalities across country-level economic conditions influence overall participation in health lifestyles, as well as subsequent health outcomes. Moreover, we move health lifestyles research forward by assessing whether change in economic conditions at the country level associates with improved health lifestyles and health outcomes.

To examine these issues, we harmonize data from the 2011 wave of the International Social Survey Programme (ISSP) and 2014 European Social Survey (ESS). Both surveys include information on similar health behaviors and health outcomes. Using data from 53 country-years nested in 35 countries, and repeated observations from 18 countries, we draw four main conclusions. First, we find that respondents on average engage in healthy lifestyles—eating healthy foods and exercising more while smoking and drinking heavily less—more frequently in more affluent countries compared to less affluent ones. Second, we find that the benefits of health lifestyles are *greater* in higher income countries for both self-rated heath and obesity. Third, we find that *growth* in a country's economic development associates with an *increase* in healthy health lifestyle participation. Finally, we find that growth in a country's economic development increases the magnitude of the association between health lifestyles and health outcomes. We use these results to develop an argument for why we observe changes in health outcomes across economic development, and we discuss implications for between country inequalities.

## BACKGROUND

### Health Lifestyles

Health lifestyles are "collective patterns of health-related behavior based on choices from options available to people according to their life chances" (Cockerham 2005:55, see also Saint Onge, Krueger, and Rogers 2014, Saint Onge and Krueger 2017). This definition builds upon the classic Weberian concept of *lifestyle*, whereby social action is understood through its regular and predictable manifestation across multiple individuals over time. This emphasis places much greater attention to structural factors shaping lifestyles than other definitions that prioritize individual choice (Cockerham 2005). Thus, the Weberian understanding of lifestyle emphasizes a critical interplay between individual agency, or "life choices," and social structure, or "life chances" (Cockerham 2005; Mollborn and Lawrence 2018).

Cockerham argues that health lifestyles are a "form of consumption" that one engages in to produce good health and so relates health behaviors to status group participation (2000:1314). Individual health behaviors are thus partially enacted in relation to how they signify larger group affiliation and social structures (Cockerham 2000). Drawing from a Weberian focus on status groups, health lifestyles focus above the individual level. According to Weber, status groups are comprised of individuals who share class and status backgrounds (Cockerham 2005). To maintain or gain membership in a particular status, one must take on the lifestyle of the groups (Cockerham 2005). Typically, the forms of consumption or practices include behaviors such as diet, exercise, smoking and alcohol use (Cockerham 2000; Cockerham 2004). The pattern of these behaviors reflect a population's "knowledge and norms about what constitutes healthy, stress relieving, or pleasurable behaviors" (Saint Onge and Krueger 2017).

Health lifestyles theory calls attention to the fact that specific health behaviors—such as diet, exercise, and use of drugs and tobacco—neither happen in isolation from one another nor are based entirely on individual choice (cf. Saint Onge and Krueger 2017). Rather, health behaviors occur in connection with other health behaviors, are influenced by beliefs about health and illness, are shaped by and signal status or group identity, and are either enabled or constrained by the particular context in which someone lives (Mollborn and Lawrence 2018). This focus provides an opportunity to examine the multiple and potentially conflicting patterns of health behaviors in which individuals engage (Burdette et al. 2017). Despite widely shared recognition of the importance for health behaviors on health outcomes, typologies of health lifestyles are designed to be neutral, so as not to privilege a single preferred health lifestyle (Cockerham 2005).

Over the past decade, scholarly attention to health lifestyles theory has grown (Burdette et al. 2017). Recent studies draw attention to the multiple pathways through which social conditions influence participation in different health lifestyles. For example, while the relationship between social class and health behaviors may be complicated or even in some instances contradictory (Christensen and Carpiano 2014), studies of health lifestyles find that higher social class is associated with participation in more health inducing behaviors and better health outcomes (Cockerham 2005). Furthermore, it is the ability to examine the complex and potentially contradictory patterning of health behaviors that is one of the major strengths and contributions of studies that use health lifestyles theory. Specifically, studies of health lifestyles show the importance of including behaviors that are health promoting, as well as, those associated with more negative health outcomes as a way of capturing varying typologies of health lifestyles that exist between groups (Saint Onge and Krueger 2017).

These group differences have largely been examined within a single national context. However, studies of health lifestyles include important motivations to consider national context as an important influence for health lifestyles, whether through local cultural norms (Cockerham, Kunz, Lueschen 1988, Christensen and Carpiano 2014) or through country-level structural constraints or ideologies (Cockerham 2000). For example, Cockerham (2000) explores health lifestyles in Russia and finds that working-class middle-aged men may be at a greater risk of participating in negative health behaviors, in particular high levels of alcohol consumption and to a lesser extent smoking and eating an unhealthy diet, due to cultural norms surrounding these activities and social structures that limit available alternate choices. Furthermore, a few studies have also included comparisons of health lifestyles between a select few nations with similar political legacies, such as former communist or socialist states (Cockerham, Hinote, Abbott and Haerpfer 2004; Cockerham, Hinote and Abbott 2006). Finally, VanHeuvelen and VanHeuvelen (forthcoming) examine gender differences in health lifestyles as varied along levels of economic development. The authors find substantial heterogeneity in health differences between men and women, depending on individual eating behaviors and national development context. Taken together, these studies demonstrate the utility of assessing health lifestyle variation across country contexts.

**Social Context and Health Lifestyles**

Despite previous research highlighting the importance of context, assessment of national level context for engagement in health lifestyles is rare. To date, empirical evidence for this relationship is limited in at least three critical ways. First, previous studies do not include a range of nations with varying levels of development (for an exception see VanHeuvelen and VanHeuvelen forthcoming). Focus on similar countries at similar levels of economic development simply restrict analytical capacity to assess the link between health lifestyles and between country inequality. Second, several studies that do assess health lifestyles cross-nationally have reduced the measurement of health lifestyles to a single health behavior. VanHeuvelen and VanHeuvelen focus specifically on participation in a healthy diet (forthcoming), while Cockerham, Hinote and Abbott assess alcohol consumption, smoking, and food consumption as separate health behaviors in their assessment of former socialist states

(2006). Finally, while previous work suggests that changes in broader institutional contexts impact health lifestyles (Cockerham, Hinote and Abbott 2006) and that health lifestyles change across the life course, particularly in relation to an individual's early life socioeconomic context (Burdette et al. 2017), scholars have not tested empirically how longitudinal *changes* in country level development influence participation in health lifestyles and subsequent health outcomes. Understanding shifts in health lifestyles as enabled or constrained by broader social contexts is an essential part of the theoretical underpinnings of health lifestyles theory, however, it remains empirically unexamined.

In the current study, we argue that the lack of integration between cross-national studies of health inequalities and health lifestyles is a missed opportunity to unpack what might be driving between country differences in health outcomes. Assessing health lifestyles cross nationally also has the opportunity to provide a deeper understanding of health behaviors within countries. Therefore, in the current study we argue that three aspects of health lifestyles theory are particularly well suited for the integration of a cross-national study of between-country inequalities in development. First, we argue that the theory's inclusion of group level analysis offers a useful method of conceptualizing between-country differences in health behaviors. As nations develop, there may be a corresponding increase in access and availability of new goods and services that ease participation in a particular set of health positive health lifestyles. Participation in health behaviors can serve as a marker of status that may be used to align with, or signal, participation in a country's newly realized economic development (Becker 2004).

Second, we use the theory's concept of "living conditions" as a way to integrate country level development into heath lifestyles. Living conditions are one of four structural variables that Cockerham identifies as influencing life chances, processes of socialization, and experience, all of which motivate the enactment of particular health behaviors (2005).[1] As defined by Cockerham, living conditions refer to things that are associated with housing, utilities, neighborhoods and safety (2005:59). Conceptualized more broadly, living conditions can be understood as a set of economic conditions that allow for access and availability for participation in health lifestyles. To date, few empirical studies have examined variables associated with living conditions. Furthermore, living conditions are often viewed through the lens of *individual-level* socioeconomic differences within a contained geographical region, such as the unequal distribution of access to grocery stores (Cockerham 2005). Yet, when considered in a cross-national perspective, we argue that country-level development can be conceptualized as a broadly shared living condition that directly impacts the life choices and life chances of the population, which in turn determine health lifestyles (VanHeuvelen and VanHeuvelen forthcoming).

Third, if between-country inequalities in development can be conceptualized as broadly shared living conditions, then economic growth can be used to test the contribution of living conditions to health lifestyle participation broadly for a population. We draw inspiration from longitudinal studies of health lifestyles in adolescence and youth (Burdette et al. 2017, Mollborn et al. 2018), which show that health lifestyles can shift across time periods within individuals conditional on family structure and school context. We similarly conceptualize individuals developing norms regarding health behaviors and facing different sets of opportunities and constraints to enact these health behaviors in relation to the broadly shared living conditions established by a country's level of economic development.

[1] The other structural variables include class circumstances, age, gender, race, ethnicity and collectivities.

In total, we consider how the living conditions associated with between country variation of economic development associate with different levels of engagement in health lifestyles. Furthermore, we test whether the growth of economic conditions allows for greater engagement with healthier health lifestyles. We are not aware of a cross-national study of health lifestyles examining this question, and so beyond the innovation of bringing health lifestyles theory to the cross-national study of health, the current study theoretically innovates health lifestyles theory by testing the key concept of living conditions.

We argue that an individual's particular health lifestyle should be influence by a broadly shared living condition of the respondent. Given that growth in such a living condition should not only motivate increased participation in health positive health lifestyles but also increase the effectiveness of translating these health lifestyles into positive health outcomes (Link and Phelan 1995, VanHeuvelen and VanHeuvelen 2017), it is reasonable to expect growth in shared living conditions to affect both health lifestyle participation, as well as subsequent associations with health outcomes. With the above discussion in mind, we test the following hypotheses:

Hypothesis 1: Richer countries participate in health life styles more frequent than poorer ones.

Hypothesis 2: Participation in health positive health lifestyles is uniformly associated with improved health outcomes across countries.

Hypothesis 3: The magnitude of the effect of Hypothesis 2 will be stronger in richer countries.

Hypothesis 4: Economic development within a country will result in increased effects for Hypothesis 1 and Hypothesis 3.

## DATA

We harmonize data from two cross-national surveys, the International Social Survey Programme's (ISSP) 2011 Health module and the 2014 European Social Survey (ESS) Social Inequalities in Health module. Both surveys include similar questions on health lifestyles and health outcomes. We are therefore able to make comparisons across two cross-national datasets with representative samples from large numbers of countries. In total, we have representative survey information from 53 country-years nested in 35 countries. Critical for the current study, 18 countries are sampled in both surveys, allowing us to assess the association between country-level characteristics and health lifestyles, net of unobserved time invariant country-level heterogeneity. Country samples are listed in Table 1.

[Table 1 About Here]

Our *health lifestyles* measures are constructed using four health behavior indicators: the frequency of *eating fresh fruits and/or vegetables*, *physical exercise*, *heavy alcohol consumption,* and *smoking cigarettes*. To make answer choices comparable across surveys, we recode survey-specific responses for the first three measures to indicate the number of days per week the respondent takes part in the health behavior. For categories that indicate ranges of dates, we take the average of the minimum and maximum possible values for the answer. For example, answer choices in the ISSP for the frequency of eating fresh fruits and vegetables include never, once a month or less, monthly, weekly, or daily. We code *once a month or less* as (1+12) / 2 = 6.5 days per year / 52.1429 = 0.125. For cigarette smoking, we recode responses as the number of cigarettes they smoke per day, from 0 to 40, multiplied by seven. Question wording, survey-specific outcome categories, and additional discussion of comparability are included in the online appendix.

We assess two health outcomes, *self-rated health* and *obesity*. The ISSP includes a self-rated health (SRH) question asking, "In general, would you say your health is" [1] Excellent [2] Very Good [3] Good [4] Fair [5] Poor. The ESS includes a question asking, "How is your health in general? Would you say it is" [1] Very good [2] Good [3] Fair [4] Bad [5] Very bad. We follow Bakhtiari et al. (2018) and recode responses of "Very Bad," "Bad," "Poor," and "Fair" as 0, and "Excellent," "Very Good," and "Good" as 1. Doing so allows for a more straightforward comparison across countries, and, in informal assessments of repeated country samples, we obtain more comparable results across survey waves within countries when we harmonize across survey questions with different outcome choices. Comparisons of different coding strategies are discussed in more detail in the online appendix.

We construct a measure of obesity using the provided height and weight information in both surveys to construct the respondent's body mass index (BMI). We classify individuals as *obese* if their body mass index is 30 or greater. We also replicated results distinguishing Obesity class I (30-35) and Obesity class II and greater (35 and higher) and reached substantively similar conclusions. A small number of individuals with unusually high (55 and above) or low (under 15) BMIs are excluded from analyses, as a qualitative assessment of these cases suggest that many are likely the result of miscoded height and/or weight information.

Our main country-level indicator of between country inequalities of development is l*ogged GDP per capita*, with values measured in 2011 US dollars, collected from the World Bank. We use a one-year lag and match values to country-survey specific years of survey administration.

### Individual- and country-level controls

We adjust for all individual-level characteristics available and comparable across the two surveys. These include *age*, *sex*, *educational attainment* measured in six categories (less than lower secondary, lower secondary upper secondary, post-secondary, advanced vocational, lower tertiary, upper tertiary), *marital status* (married/partnered, separated/divorced, widowed, never married), *work status* (employed, unemployed, student, permanently sick or disabled, retired, other), the respondent's relative *income*,[2] the number of individuals in the respondent's *household*, and frequency of *religious attendance*.[3] We also adjust for country-level characteristics that might confound the relationship between GDP per capita and health outcomes and lifestyles: *infant mortality*, the percent of individuals *aged 65 and older*, *healthcare spending as a percent of GDP*, the *unemployment rate*, and *the percent of a country's population living in an urban area.*

### Estimation Strategy

We employ a multilevel modeling strategy that is standard in cross-national studies of health behaviors and outcomes (Präg et al. 2016; Bakhtiari et al. 2018). When modeling results separately by survey, we use two-level regression models, with individuals nested in countries. When pooling surveys, we estimate three-level models, with individuals nested in country-years nested in countries. We use linear mixed-effects regression models when predicting health lifestyles, and mixed-effects logistic regression models when predicting health outcomes. Models predicting health outcomes include random coefficients for individual-level health lifestyle

[2] These are within-country standardized measures of income, following Brady and Finnigan (2014).
[3] Surveys have additional health variables. However, question wording and answer choices limited our ability to harmonize these variables.

scales, allowing slopes to vary across countries, as well as cross-level interactions between individual- and country-level measurements of socioeconomic status. We make additional adjustments, described in more below, when estimating cross-level interactions in our three-level regression models based on recent methodological developments by Giesselmann and Schmidt-Catran (forthcoming).

Our results proceed in five steps. First, we compute our two measures of health lifestyles. Second, we predict mean levels of health lifestyles across economic development. Third, we examine the degree of variation across countries and surveys in the association between health lifestyles and health outcomes. Fourth, we test whether the association between health lifestyles and health outcomes varies between countries based on levels of economic development. Finally, we test whether *change* in economic development within a country associates with *change* in health lifestyles and, subsequently, health outcomes.

**Health Lifestyles**

We conduct weighted principal components analysis on our four health behavior indicators: frequency of eating fresh fruits and vegetables, exercising, heavily drinking alcohol, and smoking cigarettes.[4] Results, estimated separately by survey and pooled together, are presented in Table 2. Table 2 shows that response patterns primarily load onto two components. High values for the first component identify those who frequently eat fruits and vegetables, exercise, refrain from heavy drinking, and do not smoke cigarettes. We label this factor *universal health*

[4] We considered additional methods of scaling, such as exploratory and confirmatory factor analysis, latent class analysis, and item response scaling methods. We prefer the current method because of the simplicity of principal components analysis compared to the many idiosyncratic decisions involved with factor analysis, and the lack of transformation of a set of continuous indicators to a categorical indicator. We are cognizant that any multivariate scaling decision could be reasonably argued against compared to a favored alternative. We hope that future research can improve upon the scaling decisions of this paper.

*lifestyle,* as this scale differentiates those who frequently partake in all health behaviors versus those who partake in none. High scores on the second component identify individuals who frequently eat fruits and vegetables, heavily drink alcohol, smoke cigarettes, and exercise. We label this factor *compensatory consumption,* as respondents with high values on this factor consume substances, whether healthy or not, and engage in frequent exercise.

[Table 2 About Here]

Three observations provide greater confidence in our use of these two health lifestyle scales. First, these two scales are generated both in the pooled sample and when principal components analyses are conducted separately across the two surveys. Separate principal components analyses across the ISSP and ESS result in similar conclusions about the two main dimensions of health lifestyles in these datasets. This replication provides confidence that our health lifestyle scales are not reliant upon particularities of one of the datasets. Second, many of the specific statistics associated with the separate principal component analyses are quite similar. The two components explain a similar amount of overall variance across the ISSP and ESS. And while differences of particular eigenvectors are observable across the two datasets, the components load onto the variables at roughly comparable magnitudes. For example, universal healthy lifestyle loads onto healthy fruit and vegetable consumption at 0.58 for the ISSP data and 0.60 for the ESS. The largest difference is the loading of smoking onto compensatory consumption. The value is 0.40 in the ISSP data and 0.17 in the ESS data.[5] Third, we estimated weighted principal components separately by country-years. In all but five cases these two factors were estimated. Additional discussion of these five cases are included in the online appendix.

[5] We also find very similar scales when using exploratory factor analysis with varimax rotation. The resulting two scales correlate with those produced by principal components analysis at 0.96 and 0.95.

We next descriptively assess the relationships between individual health behaviors, health behavior scales, and health outcomes across our country samples. Figure 1 visualizes the six correlations between our four health behavior indicators within each country-year, plotting these correlations against logged GDP per capita. For these correlations, we multiply the smoking and heavy drinking items by -1 so that high values in all scales indicate healthier behaviors. The left panel plots the 318 correlation coefficients across logged GDP per capita. The middle panel plots the country-year average correlation by logged GDP per capita, and the right panel plots the within country range of correlations across the four health behaviors.

[Figure 1 About Here]

Two main points from Figure 1 are notable. First, we observe slightly higher mean correlations across health lifestyle indicators in higher income countries, with the average correlation increasing from about 0.07 to 0.11. That is, respondents tend to participate in multiple healthy behaviors, to a small degree, more frequently in higher income countries. Second, more noticeably, the *range* of correlations is substantially lower in more affluent countries compared to less affluent ones.[6] That is, the correlations across the four health behaviors are not only slightly higher in more affluent countries, but the values of the correlations across the four items are more tightly clustered together. These results are suggestive that the four health behaviors used to construct our health lifestyle scales are more of a package deal in more affluent countries.

[Figure 2 About Here]

Figure 2 visualizes country-year means of our main health lifestyle scales—universal health lifestyle and compensatory consumption—and our two main health outcomes—self rated

[6] We draw the same conclusion if using the standard deviation of correlations or the gap between the 2nd smallest and 5th largest correlations.

health and obesity—against logged GDP per capita. We observe a clear positive relationship between universal health lifestyles and GDP per capita, and to a lesser extent, between compensatory consumption and logged GDP per capita. The correlation between country-mean health lifestyles and logged GDP per capita are 0.58 and 0.32, respectively. Country-year averages of universal health lifestyles and compensatory consumption differ by a maximum of 1.23 and 1.25, respectively, each of which is slightly larger than a standard deviation of the distribution of health lifestyle scales at the individual level. The bottom two panels show average self-rated health and obesity across logged GDP per capita. Markers are weighted by the country-year specific correlation between the health outcome and universal health lifestyle. We observe that more affluent countries tend to have higher self-rated health, while we observe no meaningful relationship between obesity and logged GDP per capita in these two samples.

## RESULTS

### *Predicting Health Behavior*

Our first hypothesis, that respondents in more affluent countries participate in healthy health lifestyles more frequently than respondents in poorer countries, receives support. Table 3 shows results from multilevel linear regression models predicting the association between logged GDP per capita and health lifestyles. Models build from simple bivariate associations between health lifestyles and logged GDP per capita, adjusting first for individual-level variables, and then adding country-level ones.

[Table 3 About Here]

Looking across the models of Table 3, we draw two main conclusions. First, across all modeling specifications, we observe a positive and significant association between logged GDP per capita and universal healthy lifestyles. We assessed the magnitude of this positive association using results in Models 3 and 9, by comparing predicted values of universal health lifestyles between logged GDP values of 9.5 and 11.3, the common range in the two datasets.[7] This change associates with a 0.53 (ISSP) and 0.79 (ESS) increase in universal health lifestyles, or roughly a ½ and ¾ standard deviation change in health lifestyles participation. Second, we observe no meaningful association between compensatory consumption along logged GDP per capita. This is true in both datasets, and with and without controls. In total, results are suggestive that universal healthy lifestyle participation expands along with growth in country affluence, while compensatory consumption does not.

***Predicting Health Outcomes***

To test our second hypothesis, that participation in health positive health lifestyles is uniformly associated with improved health outcomes across countries, we next examine how our two health lifestyles associate with self-rated health (SRH) and obesity. We begin by descriptively examining variation across countries of the association between universal heath lifestyles and our two health outcomes. To do so, we estimate logistic regression models separately by country-years adjusting for all individual-level controls discussed in the Data section. We then compute the discrete change in the predicted probability of high SRH or obesity associated with a country-specific one standard deviation increase in universal healthy lifestyles or compensatory consumption. Results are shown in Figures 3 and 4.

[Figure 3 About Here]

[7] These values approximately align with the logged GDP values of Poland and Norway.

Figure 3 shows results for SRH. In 42 of the 53 countries across the ISSP and ESS data, we observe a positive and significant change in the probability of high SRH associated with a standard deviation increase in universal healthy lifestyles. The significant changes in the predicted probabilities range between 0.02 and 0.08. Given that a standard deviation in the predicted probabilities of SRH in both samples are approximately 0.17,[8] the marginal change in probabilities associated with universal healthy lifestyles is relatively large.

[Figure 4 About Here]

In contrast, we observe few significant associations between compensatory consumption and SRH. In the ISSP, we observe a significant positive association in China and a significant negative association in France. In the ESS data, nine of the 22 countries have significant and positive associations, ranging between 0.025 and 0.04. Overall, whereas results clearly highlight a relationship between SRH and universal health lifestyles, we find no clear patterns between compensatory consumption and SRH.

Similar results for obesity are presented in Figure 4. For obesity, we observe fewer significant changes associated with more frequent participation in universal healthy lifestyles. While most discrete changes are in the intuitive negative direction, only 21 country-years have negative and significant effects.[9] The magnitude of the changes range from about -0.015 to -0.045. The standard deviation of the probabilities in the total samples is smaller for obesity compared to SRH, 0.07. Thus, although the absolute value of the discrete change is smaller compared to SRH, it nevertheless has a large relative magnitude on the probability of obesity. 18 country-years have significant and negative changes in the probability of obesity for

[8] This information comes from a simple pooled logistic regression including all individual level controls. Predicted probabilities are computed and the standard deviation of the probabilities is approximately 0.174.
[9] Turkey has a significant and positive association.

compensatory consumption. The magnitude of the discrete changes similarly range between -0.02 and -0.045. We observe frequent associations between universal health lifestyles and SRH, and less frequent yet nevertheless large associations between both health lifestyles and obesity. In total, evidence *partially* supports hypothesis 2: while universal health lifestyle participation improves health outcomes in most country-years, results are not uniform across all 53 contexts.

Notably, we observe larger changes in probabilities associated with universal health lifestyles among countries with higher GDP per capita (correlation is 0.51 for SRH, -0.51 for obesity). The relationship is not as great for compensatory consumption (0.14, -0.17). These observations provide preliminary evidence that universal health lifestyles have larger relative impacts on health outcomes in more affluent countries. We thus turn to formally model this relationship to test our third hypothesis: that the pro-health associations of health lifestyle participation are greater in more affluent countries.

We estimate multilevel logistic regression models predicting SRH and obesity. Models include random coefficients for our health outcome scales, and we including cross-level interactions between our health lifestyles and GDP per capita. Results are included in Table 4.

[Table 4 About Here]

Across models and datasets, we observe similar patterns as those displayed in Figures 3 and 4. Universal heathy lifestyles are of greater relative consequence in affluent countries for both SRH and obesity. In support of our third hypothesis, we uniformly observe a significant and positive interaction between universal healthy lifestyles and ln GDP per capita, and uniformly observe a negative and significant interaction between universal heathy lifestyles and GDP per capita for obesity. To help put these results into perspective, we estimated the discrete change in the probabilities of obesity and SRH associated with a standard deviation increase in universal healthy at logged GDP values corresponding to those in Norway (11.3) and Poland (9.5) .[10] While an increase in universal healthy lifestyles is associated with no change in the probability of obesity in the less affluent country case (0.119 – 0.122 = 0.003, p=0.42), a similar change in universal healthy lifestyles in the more affluent country is associated with a 0.03 decline in the probability of obesity (0.156 – 0.189=-0.033, p<0.001). A similar standard deviation increase in a universal healthy lifestyle is associated with a higher probability of positive SRH, moving from 0.027 in a less affluent country (0.705-0.678=0.027, p<0.001) to 0.048 in a more affluent country (0.863-0.814=0.048, p<0.001). Notably, the second differences for both outcomes, or the difference in these probability changes at the two GDP levels, are statistically significant at conventional levels for both outcomes.

A few additional points are noteworthy. First, we gain greater confidence in the robustness of our results by replicating them across ISSP and ESS datasets, drawing similar conclusions in both cases. Additionally, we observe strikingly similar magnitudes in changes in the probabilities across datasets. The second difference in the probabilities for SRH are 0.022 (ISSP) and 0.02 (ESS) and for obesity are 0.03 (ISSP) and 0.015 (ESS).

Second, we observe few significant results in cross-level interactions for compensatory consumption. Although higher rates of compensatory consumption consistently associates with lower obesity (both datasets) and with higher SRH (in ESS data), we observe no significant cross-level interactions with logged GDP per capita for either outcome in either dataset.

Results thus far help explain how health lifestyles contribute to unequal health outcomes across countries. Individuals in more affluent countries tend to participate in universal heathy lifestyles more frequently compared to those in less affluent countries, which, because these

[10] The ISSP data has countries with lower levels of GDP per capita, but we restrict our focus to the range between 9.5 and 11.3 because countries these values are found in both datasets.

health lifestyles tend to result in overall higher SRH and lower obesity, increases positive health outcomes. Moreover, participation in universal healthy lifestyles has greater consequence for health outcomes in more affluent countries. These findings suggest that the broadly shared context of economic development expands access to participate in more health positive health lifestyles, and also increases the health inducing benefits of these health lifestyles. Yet we have not demonstrated whether health lifestyles *change* alongside changes in country-level living conditions. We assess this next.

**Change in Health Outcomes and Behaviors**

To test our fourth and final hypothesis, that change in development both increases the frequency of health positive health lifestyles and increases the magnitude of the effect of health lifestyle participation on health lifestyles, we combine ISSP and ESS data. The harmonization of the ISSP and ESS data provides a unique opportunity to answer a key untested question in the health lifestyles literature: to what extent does growth in economic development—which we use as a macrolevel indicator of shared living conditions—lead to more frequent participation in healthier lifestyles? We address this question by assessing how *change* in economic development associates with *change* in health lifestyles, net of time invariant unobserved historical, cultural, and institutional factors that occur between countries. In the following results, we restrict our sample to the 18 countries with repeated observations and assess associations between logged GDP per capita, health lifestyles, and health outcomes.

[Figure 5 About Here]

We begin with a descriptive assessment of change in logged GDP per capita against change in our main outcomes of interest: universal health lifestyles, compensatory consumption, self-rated health, and obesity. Figure 5 shows the weighted country means of *change* in health lifestyles plotted against *change* in GDP per capita. Results show a clear positive association for both our universal healthy lifestyle and compensatory consumption measures. With the sole exception of Finland, growth of GDP per capita is associated with greater frequency of both healthy lifestyles.[11] Furthermore, we consider these changes to be robust to time-invariant country differences and potential issues with measurement across surveys, as a positive association is observable in the within-country deviations in both survey waves. The correlation of these changes is approximately 0.50 for each health lifestyle scale.

Table 5 shows results from three-level linear regression models predicting health lifestyle using logged GDP per capita, sequentially adjusting for individual- and country-level controls. All models include a dummy variable indicating ISSP or ESS survey, and country fixed effects are included in models 2 through 4. Models 3 adjust for individual-level controls, and models 4 include country-level controls. We observe a consistent finding in models predicting universal health lifestyles: within-country growth of GDP per capita associates with more frequent participation in this lifestyle. This association holds not only between countries, but also within-countries as well (Models 2-4). In contrast, associations between compensatory consumption and logged GDP per capita are inconsistent across modeling decisions. Although we observe positive and significant associations in models 2 and 3, the significant association is removed when other country-level variables are adjusted for.[12] We conclude that people are more likely to engage in a universal set of health behaviors when a country grows in development.

[Table 5 About Here]

[11] Sensitivity analyses of Finland suggest that results are driven by the nature of the heavy drinking measure. This indicates that future work is needed to better harmonize across the ISSP and ESS data.
[12] The variable primarily responsible for removing this significant association is health expenditures as a percentage of GDP.

How do these findings translate to health outcomes? We replicate the logic of Table 5, assessing a cross-level interaction between logged GDP per capita and universal health lifestyle, focusing specifically on universal health lifestyles and within country change of logged GDP per capita. For these results, two methodological cautions are in order. First, Giesselmann and Schmidt-Catran (forthcoming) demonstrate the risk of biased results when modeling a cross-level interaction that includes within-country change of a country-level variable. We therefore follow their suggestions to control for multiple potential cross-level associations between health lifestyle and logged GDP per capita to account for this potential concern.[13] Second, caution is needed when interpreting interaction coefficients of nonlinear models, as these might not accurately represent significant changes in the distribution of the more appropriate metric of the predicted probabilities (Doan et al. 2015). We therefore present the discrete changes associated with a standard-deviation increase in universal health lifestyles across logged GDP per capita values. Results are presented in Figure 6.[14]

[Figure 6 About Here]

We observe that a standard deviation increase in universal health lifestyles tends to result in larger magnitudes in the change of the probability of both obesity and high SRH among higher values of logged GDP per capita. For country-years with values of logged GDP per capita below about 10.2 (Czech Republic, Lithuania, Poland, Portugal, Slovenia), a standard deviation increase in universal health lifestyles results in an insignificant change in the probability of SRH. From logged GDP per capita values of about 10.3 to about 11.1 (Spain, Israel, Great Britain, France, Germany, Belgium, Finland, the Netherlands, Sweden, and Denmark), higher values of

[13] Specifically, we interact universal health lifestyles (UHL) and GDP and adjust for (1) country-averages of both variables (2) an interaction between UHL and country-average GDP (3) an interaction between country-average UHL and country-average GDP.
[14] Tables of regression coefficients are available upon request.

GDP associate with larger changes in the probability of (very) good health, with the magnitude of a standard deviation change increasing from about 0.035 to 0.06. At logged GDP per capita values of the two most affluent countries (Switzerland and Norway), an increase in universal health lifestyles participation is again statistically insignificant.

Results for obesity are similar. A standard deviation increase in universal healthy lifestyles results in an insignificant change in the probability of obesity below logged GDP values of about 10.5. From there to values of about 11.25 (Switzerland), a change in universal health lifestyles from about -0.017 to -.0425. Again, among the highest values of logged GDP per capita, an increase in universal health lifestyles is again associated with an insignificant change in the probability of obesity. We refrain from over-interpreting these results at the highest values of logged GDP per capita. They could either signify a peculiarity of our data, or a ceiling of the effect of growth in affluence for the relationship between health behaviors and outcomes. More research with future waves of data will be needed to distinguish between the two interpretations. Overall, results provide partial support for our fourth hypothesis. We find clear evidence that growth in GDP per capita within countries increases participation in universal health lifestyles. Then, for all but the most and least affluent countries in the sample, economic development associates with growth in the magnitude of the association between health lifestyle participation and health outcomes.

**CONCLUSION**

In this paper, we examined how health lifestyles, and their subsequent influence on health outcomes, vary across countries based on between-country inequalities of economic development. To do so, we harmonized data from the 2011 wave of the International Social Survey Programme (ISSP) and 2014 European Social Survey Programme (ESS), constructed two dimensions of health lifestyles based on four health behavior measures, and examined how these health lifestyles, as well as health outcomes, vary across countries via economic development.

We draw three main conclusions from results. First, we observe that individuals in more affluent countries tend to engage in universal health lifestyles—eating fresh fruits and vegetables, exercising, and refraining from smoking and heavy drinking—more frequently than those in less affluent countries. Our second health lifestyle dimension, compensatory consumption, associates with country-level development more sporadically.

These results suggest that engagement in particular health lifestyles is dependent upon a country-level economic context that provides access and availability for engaging in health behaviors. On the one hand, these results highlight the importance of health lifestyles theory for global policy work and academic research on health. It is not only that publics engage more frequently in positive health behaviors in more affluent country contexts, but that health behaviors become more tightly bunded in more affluent economic conditions.

Second, we find that the positive effects of health lifestyles are greater in higher income countries. Across both datasets, and for both health outcomes (SRH and obesity), we find higher probability changes in higher income countries compared to lower ones. Thus, differences in health outcomes, as they relate both to between country inequalities and to health lifestyles, are due to two complementary factors: more frequent participation in health lifestyles, and a greater payoff for greater involvement in health lifestyles.

These results highlight the importance of thinking of not only health but also health lifestyles as inherently multilevel. Simply put, two otherwise identical individuals who engages in all positive health behaviors in our sample can expect different results depending on their location in the global system of between-country inequality of development. This finding highlights the importance of shared context for the efficacy of participation in health lifestyles. We argue that a country's system of economic development provides access and availability for the participation in health lifestyles that makes such health behaviors more or less effective. This argument highlights the importance of medical sociological theories, such as fundamental causality (Link and Phelan 1995), for understanding health lifestyles. Together, these medical sociological theories of health and health outcomes highlight the need to not think of individual health behaviors as not solely individualistic, but to consider the influence of broader social context for individual health behaviors.

Third, we extend understanding of health lifestyles research by showing that *change* in country level development are positively associated with *change* in country average health lifestyles. We exploit the similar health behavior questions in the ISSP and the ESS to allow for a country-level analysis of change. To our knowledge, no study has demonstrated *what* causes change in health lifestyles over time. We argue that growth in country-level affluence allows for greater access and availability of a healthy lifestyle. This expectation is supported and cannot be explained fully by unobservable time invariant differences between countries.

These findings provide theoretical innovation for health lifestyles theory. To the best of our knowledge, no research exists that tests the causal ordering of living conditions and health lifestyles. We demonstrate that growth of country level affluence cooccurs with a population-level increase in both of our health lifestyles measures. Previous health lifestyles research focusing on single countries or single points in time could not detect this causal ordering: perhaps both health lifestyles and country development are the result of some third unobserved factor, such as culture, history, or a country's particular set of institutional configurations. Yet our research suggests that living conditions, operationalized at the country level, are fundamental for variation in the participation of health lifestyles.

This study provides two innovations to the study of health lifestyles. First, this is the most extensive study of the combination of multiple health behaviors in a cross-national study. Medical sociologists are increasingly turning to cross-national variation to understand the importance of social context for health outcomes (e.g. Beckfield et al. 2013; Prag et al. 2016). We similarly demonstrate how health lifestyle participation, and its subsequent influence on health outcomes, depend on national context. Second, we provide the most robust evidence to date on the importance of a shared national living condition for health lifestyle participation. Our innovative harmonization of two cross-national datasets allow us to assess *change* of economic development against *change* of health lifestyle participation. This approach removes many unobservable confounding factors that could bias results, such as national histories, cultures, or institutional configurations.

Our study has several important limitations. We highlight three. First, our harmonization of the ISSP and the ESS necessarily involves choices and decisions in an attempt to make the data comparable. This creates a risk that we made suboptimal decisions, or that inherently incompatible data are treated as comparable. Unfortunately, these data are the only that provide similar health lifestyle and health outcome behaviors from high quality data sources repeated across countries. Yet conclusions may need to be modified when future waves of either module are released.

Second, we only focus on four health behaviors. Other studies of health lifestyles focus on a richer variety of health positive and negative behaviors, such as meat or junk food consumption. Perhaps our health lifestyle scales would differ with a richer set of health behaviors.

Third, economic growth can have substantively different meaning depending on the distribution of income. Famously, economic growth in the United States has been primarily concentrated among high income earners in recent decades. The translation of economic development to health lifestyles might depend on individual-level income as well as the nature of economic inequality in a country. While this is beyond the scope of the current project, an assessment of our project in relation to inequality would likely yield nuanced insights.

In total, we demonstrate the utility of connecting health lifestyles research with cross-national studies of development and health. Between country inequalities in economic development influence population's participation in particular health lifestyles. Similarly, country affluence influences the relative payoff of such health lifestyle participation. Thus, the connection between country-level living conditions and health lifestyles are critical for understanding cross-national variation in health outcomes.

**REFERENCES**

Bakhtiari, Elyas, Olafsdottir, S., & Beckfield, J. (2018). "Institutions, Incorporation, and Inequality: The Case of Minority Health Inequalities in Europe." *Journal of health and social behavior*, 59(2), 248-267.

Becker, Anne E. (2004). "Television, disordered eating, and young women in Fiji: Negotiating body image and identity during rapid social change." *Culture, Medicine and Psychiatry*, *28*(4), 533-559.

Beckfield, Jason, Olafsdottir, S., & Bakhtiari, E. (2013). “Health inequalities in global context.” *American Behavioral Scientist*, 57(8), 1014-1039.

Brady, David, & Finnigan, R. (2014). “Does immigration undermine public support for social policy?” *American Sociological Review*, 79(1), 17-42.

Burdette, Amy M., Needham, B. L., Taylor, M. G., & Hill, T. D. (2017). “*Health lifestyles in adolescence and self-rated health into adulthood.”* Journal of health and social behavior, 58(4), 520-536.

Center for Disease Control and Prevention (CDC). (2015). Heart Disease Behavior. Retrieved from: https://www.cdc.gov/heartdisease/behavior.htm

Cockerham, William C. (2000)."Health lifestyles in Russia." *Social Science & Medicine*, 51(9), 1313-1324.

Cockerham, William C. (2005). “Health lifestyle theory and the convergence of agency and structure”. *Journal of Health and Social Behavior*, 46(1), 51-67.

Cockerham, William C. (2013). “Bourdieu and an update of health lifestyle theory.” In *Medical Sociology on the Move* (pp. 127-154). Springer: Netherlands. 127-154.

Cockerham, William C., Hinote, B. P., Abbott, P., & Haerpfer, C. (2004). “Health lifestyles in central Asia: the case of Kazakhstan and Kyrgyzstan.” *Social Science & Medicine*, 59(7), 1409-1421.

Doan, Long, Miller, L. R., & Loehr, A. (2015). “The power of love: The role of emotional attributions and standards in heterosexuals' attitudes toward lesbian and gay couples.” *Social Forces*, 94(1), 401-425.

Drewnowski, A., & Popkin, B. M. (1997). The nutrition transition: new trends in the global diet. *Nutrition reviews*, *55*(2), 31-43.

Farmer, Paul, Kim, J. Y., Kleinman, A., & Basilico, M. (2013). *Reimagining Global Health: An Introduction.* Univ of California Press.

Giesselmann, Marco, & Schmidt-Catran, A. W. (forthcoming). "Getting the within Estimator of Cross-level Interactions in Multilevel Models with Pooled Cross-sections: Why Country Dummies (Sometimes) Do Not Do the Job." *Sociological Methodology*.

James, Jack. (2015). "Current patterns of death and disease." *The Health of Populations: Beyond Medicine*. Academic Press.

Link, Bruce. G., & Phelan, J. (1995). "Social conditions as fundamental causes of disease." *Journal of Health and Social Behavior*, 80-94.

McKeown, Robert. E. (2009). "The epidemiologic transition: changing patterns of mortality and population dynamics." *American Journal of Lifestyle Medicine*, 3:1, 19S-26S.

Mollborn, Stefanie, & Lawrence, E. (2018). "Family, peer, and school influences on children's developing health lifestyles." *Journal of Health and Social Behavior*, 59(1), 133-150.

Phelan, J. C., Link, B. G., & Tehranifar, P. (2010). Social conditions as fundamental causes of health inequalities theory, evidence, and policy implications. *Journal of health and social behavior*, *51*(1 suppl), S28-S40.

Präg, Patrick, Mills, M., & Wittek, R. (2013). "Income and income inequality as social determinants of health: do social comparisons play a role?" *European Sociological Review*, 30(2), 218-229.

Präg, Patrick, Mills, M. C., & Wittek, R. (2016). "Subjective socioeconomic status and health in cross-national comparison." *Social Science & Medicine*, 149, 84-92.

Saint Onge, Jarron M., Krueger, P. M., & Rogers, R. G. (2014). "The relationship between major depression and nonsuicide mortality for US adults: the importance of health behaviors."

*Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, 69(4), 622-632.

Saint Onge, Jarron M., & Krueger, P. M. (2017). "Health lifestyle behaviors among US adults." *Social Science & Medicine*, 3, 89-98.

VanHeuvelen, Jane and VanHeuvelen, T. (2017). Rich Foods: The Cross-National Effects of Healthy Eating on Health Outcomes. *Advances in Medical Sociology*.

VanHeuvelen, Tom and VanHeuvelen, Jane. (forthcoming). The (Economic) Development of Healthy Eating Habits: Gender, Nutrition, and Health Outcomes in 31 Countries. *Sociology of Development.*

Wahdan, M. H. (1996). *The Epidemiological Transition*. http://www.who.int/iris/handle/10665/118829. World Health Organization

World Health Organization (WHO). (2018). The Top 10 Causes of Death. Retrieved from: http://www.who.int/news-room/fact-sheets/detail/the-top-10-causes-of-death

[Tables and Figures]

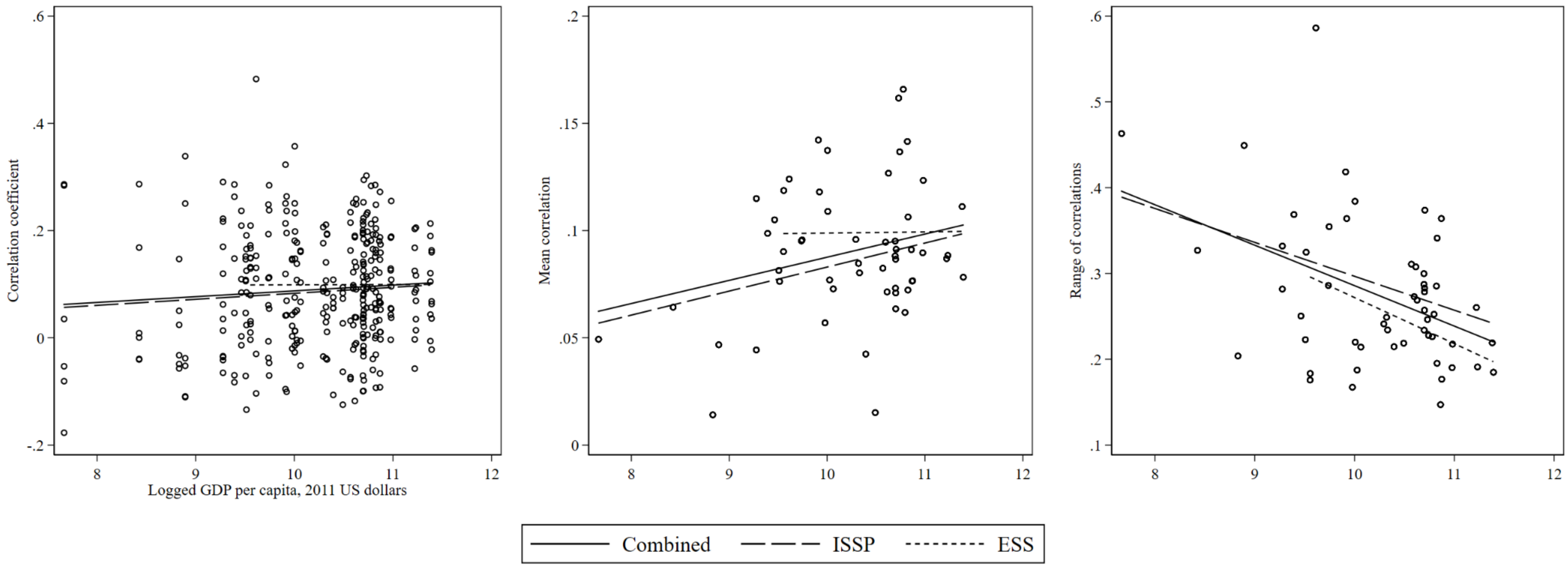


**Figure 1: Health behavior indicator correlations, by country, against logged GDP per capita**

Note: Data from 2011 International Social Survey Programme (ISSP) health module and 2014 European Social Survey (ESS). Lines represent linear fit between country-year correlations between health behavior items and logged GDP per capita. *Correlation Coefficient* plots six country-year correlations from four health lifestyle indicators against logged GDP per capita. M*ean correlation* plots the country-specific mean of the six correlations against logged GDP per capita. *Range of correlations* plots the maximum-minus-minimum of the six country-year specific correlations against logged GDP per capita.

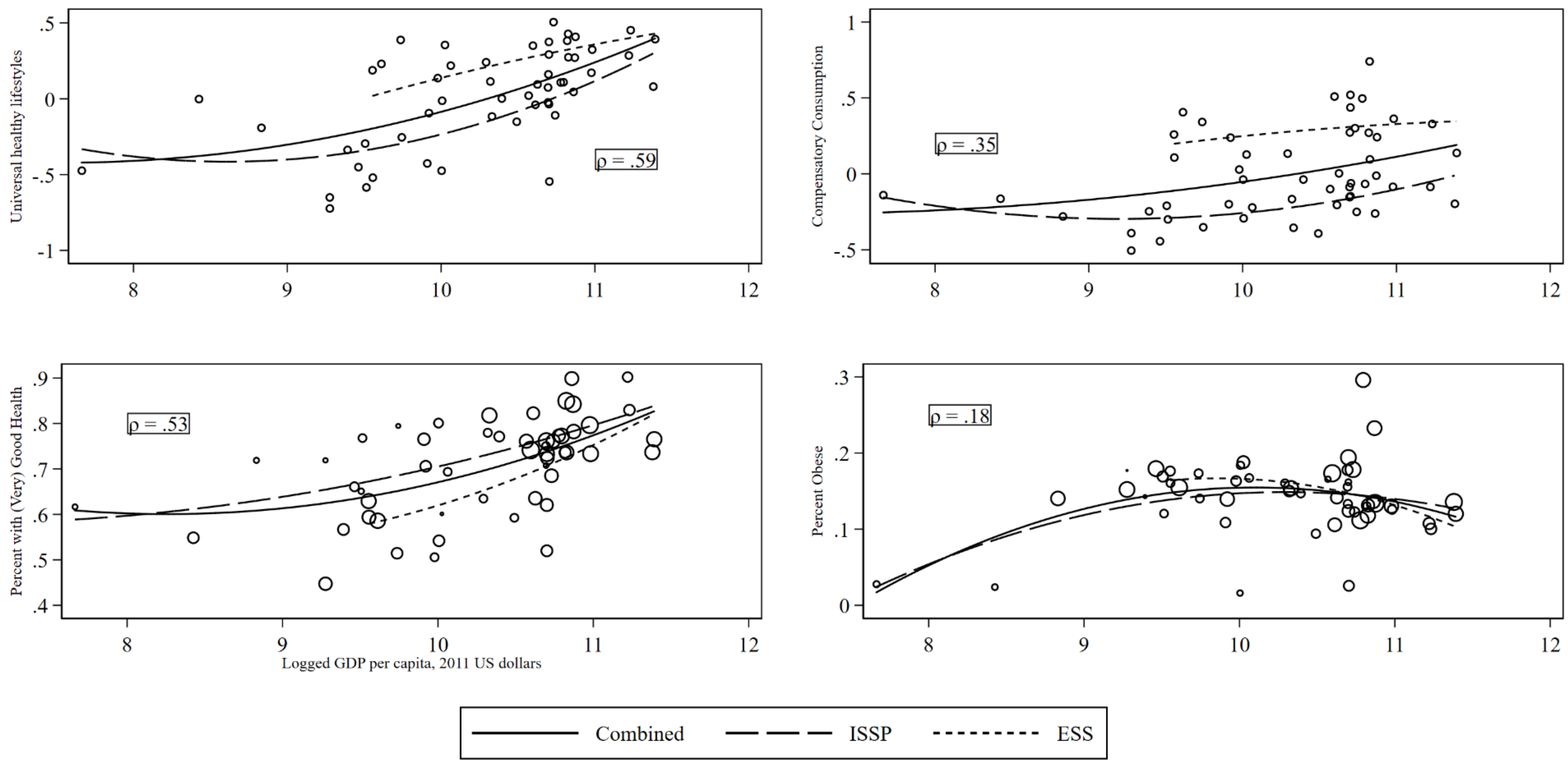


**Figure 2: Weighted country means of health lifestyles and health outcomes against logged GDP per capita**

Note: Data from 2011 International Social Survey Programme (ISSP) health module and 2014 European Social Survey (ESS). Lines represent quadratic fit between county-year average of health lifestyle or health outcome against logged GDP per capita. In bottom row, markers are sized according to the absolute correlation between universal health lifestyle and the visualized health outcome. ρ indicates the linear correlation between country-year weighted mean of health outcome or lifestyle and logged GDP per capita.

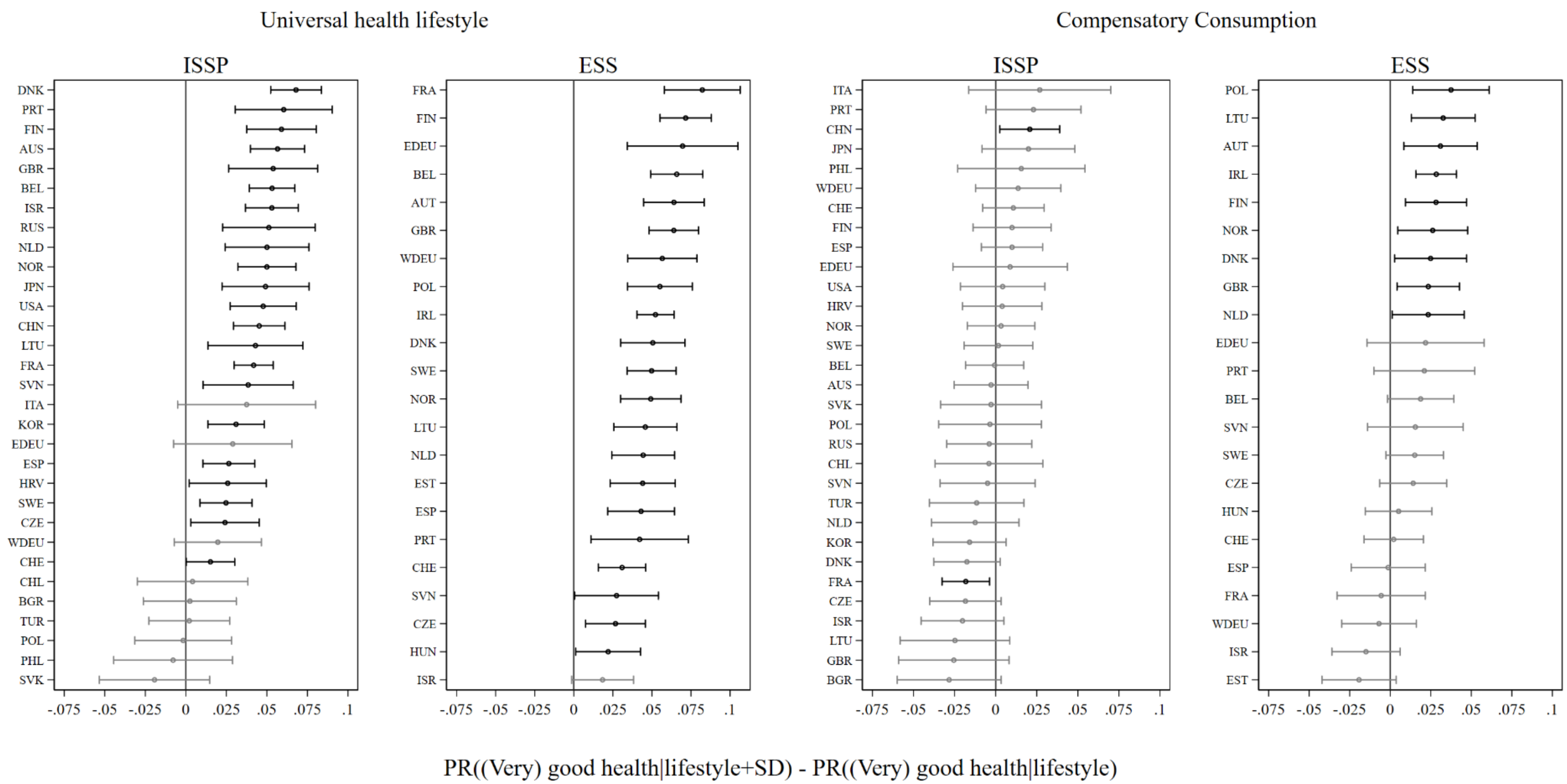


**Figure 3: Difference in the predicted probability of (very) good self-rated health for universal and compensatory consumption health lifestyles**

Note: Data from 2011 International Social Survey Programme (ISSP) health module and 2014 European Social Survey (ESS). Markers indicate change in the probability of (very) good self-rated health given a standard deviation increase in universal health lifestyle (left two panels) or compensatory consumption (right to panels). Logistic regression models estimated separately by country-year, with all individual variables from Data section included. Markers indicate magnitude of associated change in the probability of (very) good self-rated health, and lines are 95% confidence intervals. Gray markers and lines indicate insignificant changes. Black markers and lines indicate significant changes.

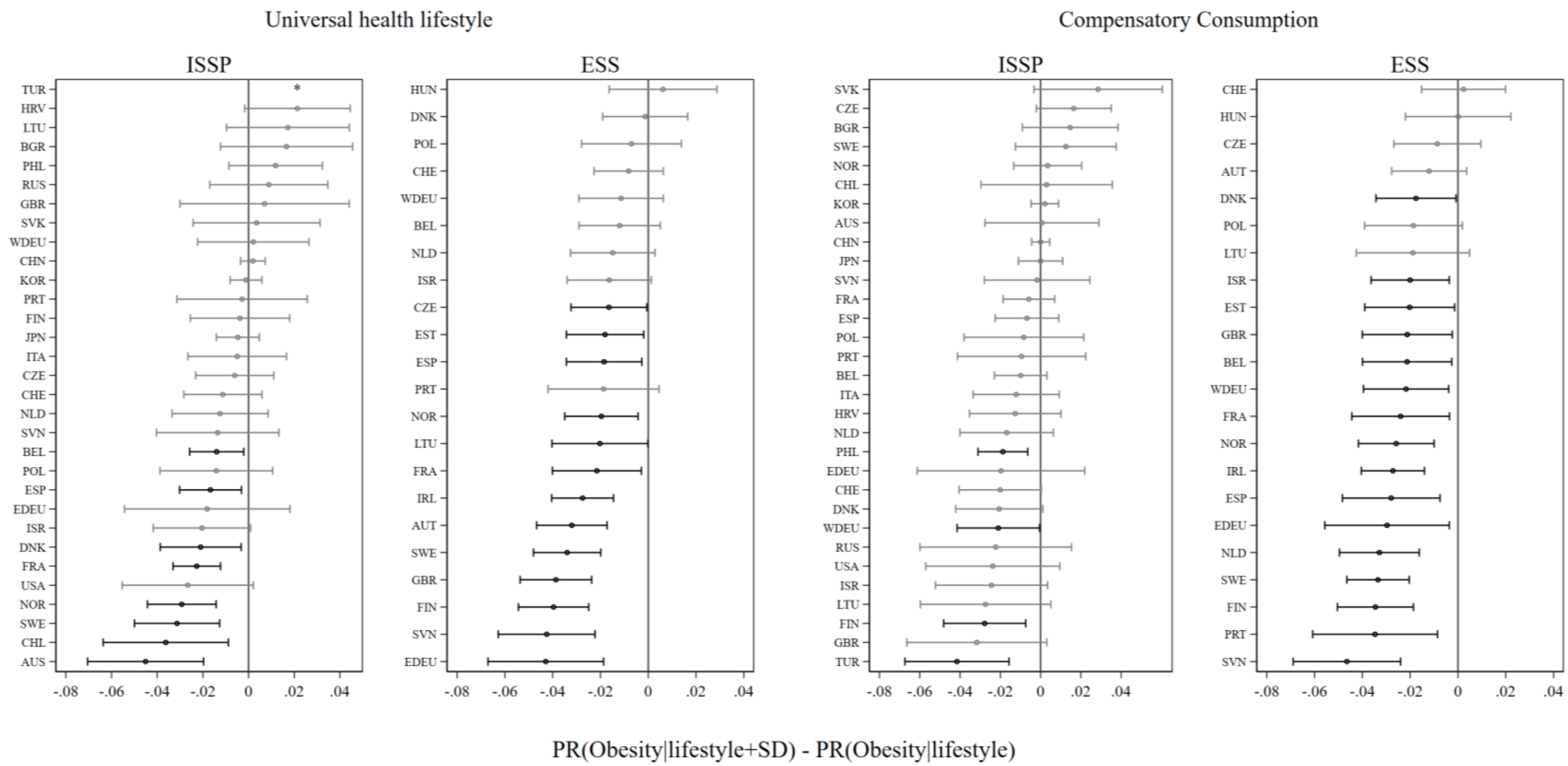


**Figure 4: Difference in the predicted probability of obesity for universal and compensatory consumption health lifestyles**

Note: Data from 2011 International Social Survey Programme (ISSP) health module and 2014 European Social Survey (ESS). Markers indicate change in the probably of obesity given a standard deviation increase in universal health lifestyle (left two panels) or compensatory consumption (right to panels). Logistic regression models estimated separately by country-year, with all individual variables from Data section included. Markers indicate magnitude of associated change in the probability of obesity, and lines are 95% confidence intervals. Gray markers and lines indicate insignificant changes. Black markers and lines indicate significant changes.

* Turkey ISSP coefficient excluded because of large, significant, outlying estimate (coefficient=0.075)

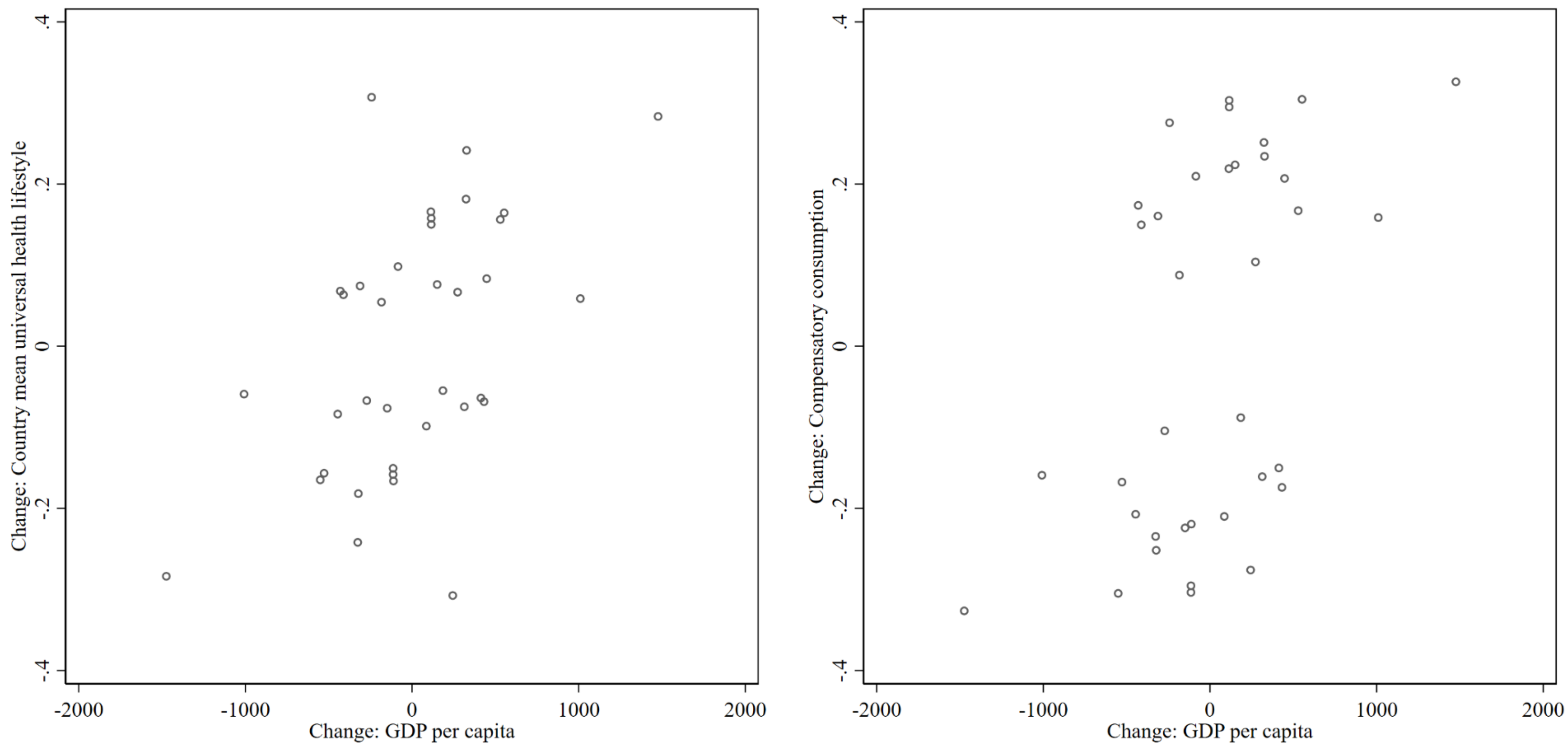


**Figure 5: Change in country means of universal health lifestyles and compensatory consumption against change in GDP per capita**

Data source: 18 country-years bolded in Table 1.

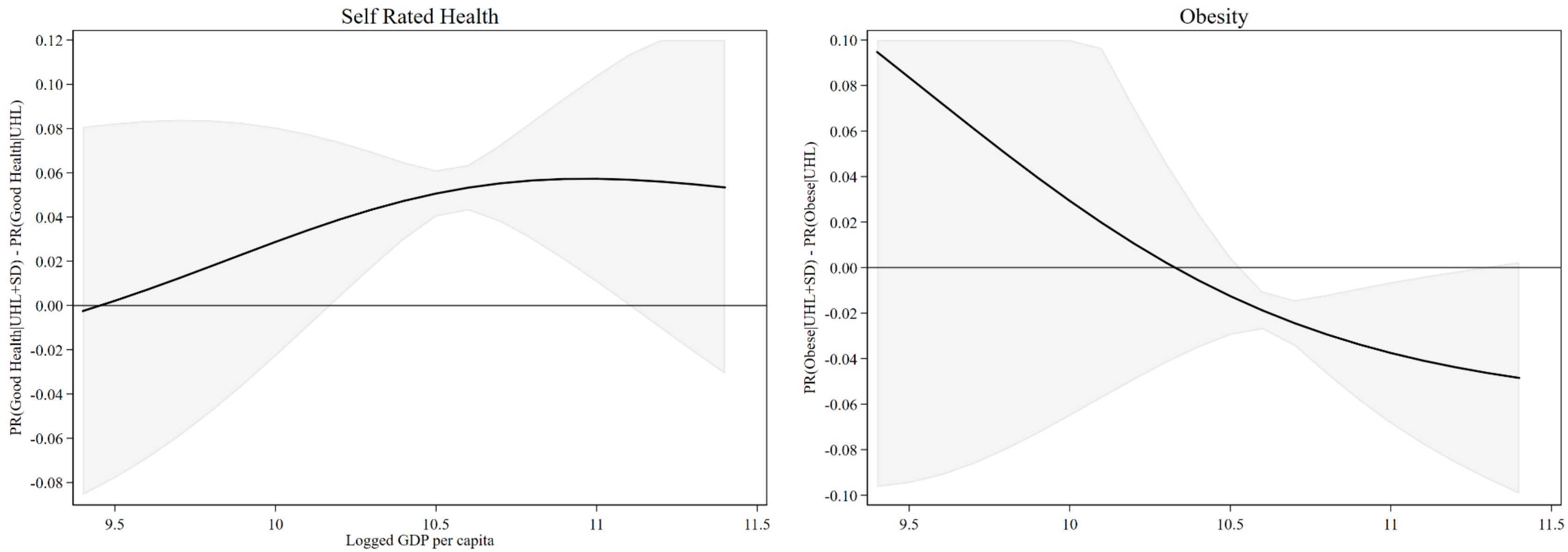


**Figure 6: Probability change in health outcomes, universal health lifestyle and GDP per capita**

Notes: Data come from 18 bolded countries in Table 1. Estimates of figures are computed following three-level mixed effects logistic regression models that include all individual- and country-level controls discussed in the Data section. Country fixed effects are included, as is an indicator variable differentiating ISSP and ESS surveys. Values indicate the change in the probability of either high self-rated health or obesity that corresponds with a standard deviation increase in universal health lifestyles. Shaded areas represent 95% confidence intervals of the probability change.

Table 1: Country Samples

| | 2011 ISSP | 2014 ESS |
|---|---|---|
| Australia | 1,279 | |
| Austria | | 1,692 |
| **Belgium** | 2,298 | 1,673 |
| Bulgaria | 893 | |
| Chile | 1,379 | |
| China | 5,348 | |
| Croatia | 938 | |
| **Czech Republic** | 1,394 | 1,819 |
| **Denmark** | 1,231 | 1,447 |
| Estonia | | 1,907 |
| **Finland** | 1,153 | 2,012 |
| **France** | 2,595 | 1,851 |
| **W Germany** | 984 | 1,939 |
| **E Germany** | 509 | 940 |
| Hungary | | 1,557 |
| Ireland | | 2,042 |
| **Israel** | 1,082 | 1,984 |
| Italy | 909 | |
| Japan | 1,019 | |
| South Korea | 1,517 | |
| **Lithuania** | 958 | 1,896 |
| **Netherlands** | 1,177 | 1,877 |
| **Norway** | 1,574 | 1,389 |
| Philippines | 1,012 | |
| **Poland** | 906 | 1,427 |
| **Portugal** | 898 | 1,192 |
| Russia | 1,223 | |
| Slovak Republic | 1,022 | |
| **Slovenia** | 1,001 | 1,130 |
| **Spain** | 2,373 | 1,782 |
| **Sweden** | 901 | 1,708 |
| **Switzerland** | 1,157 | 1,464 |
| Turkey | 1,395 | |
| **United Kingdom** | 562 | 2,017 |
| United States | 1,419 | |
| Observations | 42,106 | 36,745 |

Note: Data from 2011 International Social Survey Programme (ISSP) health module and 2014 European Social Survey (ESS). Bolded countries indicate repeat samples

Table 2: Weighted Principal Components Analysis for Health Behaviors

| | Component 1 | Component 2 | Component 3 |
|---|---|---|---|
| *ISSP* | | | |
| Eigenvalue | 1.125 | 1.199 | 0.786 |
| Weekly fruit / vegetable consumption | 0.5775 | 0.4042 | . |
| Weekly physical exercise | 0.3962 | 0.5946 | . |
| Weekly alcohol consumption | -0.4201 | 0.5701 | . |
| Weekly smoking | -0.5771 | 0.3977 | . |
| Percent variance explained | 0.313 | 0.300 | |
| | | | |
| *ESS* | | | |
| Eigenvalue | 1.324 | 1.0661 | 0.848 |
| Weekly fruit / vegetable consumption | 0.6007 | 0.2581 | |
| Weekly physical exercise | 0.2644 | 0.7448 | |
| Weekly alcohol consumption | -0.4147 | 0.5916 | |
| Weekly smoking | -0.6303 | 0.1691 | |
| Percent variance explained | 0.331 | 0.267 | |
| | | | |
| *Combined* | | | |
| Eigenvalue | 1.234 | 1.176 | 0.82 |
| Weekly fruit / vegetable consumption | -0.7012 | 0.0621 | |
| Weekly physical exercise | -0.6156 | 0.3533 | |
| Weekly alcohol consumption | 0.0649 | 0.7082 | |
| Weekly smoking | 0.3537 | 0.6081 | |
| Percent variance explained | 0.308 | 0.294 | |

Note: Data from 2011 International Social Survey Programme (ISSP) health module and 2014 European Social Survey (ESS).

Table 3: Mixed effects linear regression models of health lifestyle behaviors on GDP per capita and controls

| | *ISSP Data* | | | | | |
|---|---|---|---|---|---|---|
| | *Universal Healthy Lifestyle* | | | *Compensatory Consumption* | | |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Logged GDP per capita | 0.2077*** | 0.1813** | 0.2932* | 0.0628 | 0.0329 | -0.0046 |
| | (0.056) | (0.064) | (0.127) | (0.033) | (0.031) | (0.050) |
| Individual level controls? | No | Yes | Yes | No | Yes | Yes |
| Country level controls? | No | No | Yes | No | No | Yes |
| N | 42,106 | 42,106 | 42,106 | 42,106 | 42,106 | 42,106 |

| | *ESS Data* | | | | | |
|---|---|---|---|---|---|---|
| | *Universal Healthy Lifestyle* | | | *Compensatory Consumption* | | |
| | (7) | (8) | (9) | (10) | (11) | (12) |
| Logged GDP per capita | 0.2292* | 0.2623** | 0.4388** | 0.0856 | 0.0441 | 0.1873 |
| | (0.103) | (0.086) | (0.152) | (0.062) | (0.075) | (0.220) |
| Individual level controls? | No | Yes | Yes | No | Yes | Yes |
| Country level controls? | No | No | Yes | No | No | Yes |
| N | 36,745 | 36,745 | 36,745 | 36,745 | 36,745 | 36,745 |

Standard errors in parentheses

* p<0.05, ** p<0.01, *** p<0.001, two-tailed tests

Individual level controls include: age and age-squared, sex, educational attainment, occupational status, income and income squared, number of individuals in household, and frequency of service attendance. Country-level controls include infant mortality rate, the percent of the population aged 65 and older, expenditure on healthcare goods and services as a percentage of GDP, the unemployment rate, and the percent of the population living in urban area. See Table 1 for list of countries in samples. See Table 2 for health behavior measures and construction of health lifestyle measures

Table 4: Mixed effects regression models of self-rated health and obesity on health lifestyle measures, logged GDP per capita, and country- and individual-level controls

| | (Very) Good Self Rated Health (SRH) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | ISSP | | | | ESS | | | |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Universal Healthy Lifestyle | 0.2337***<br>(0.027) | -1.2631***<br>(0.310) | 0.2365***<br>(0.026) | -1.3091***<br>(0.310) | 0.3305***<br>(0.023) | -1.2368***<br>(0.271) | 0.3303***<br>(0.023) | -1.1914**<br>(0.375) |
| Compensatory Consumption | 0.0156<br>(0.028) | 0.0209<br>(0.027) | -0.2920<br>(0.275) | 0.2164<br>(0.173) | 0.0774***<br>(0.022) | 0.0769***<br>(0.021) | 0.5984<br>(0.353) | 0.1185<br>(0.409) |
| Logged GDP per capita | 0.5326<br>(0.295) | 0.5049<br>(0.281) | 0.5803*<br>(0.262) | 0.5202<br>(0.285) | 0.3702<br>(0.274) | 0.3597<br>(0.268) | 0.1754<br>(0.261) | 0.3582<br>(0.267) |
| Universal * GDP | | 0.1495***<br>(0.031) | | 0.1546***<br>(0.030) | | 0.1507***<br>(0.026) | | 0.1464***<br>(0.036) |
| Compensatory * GDP | | | 0.0283<br>(0.027) | -0.0214<br>(0.018) | | | -0.0501<br>(0.034) | -0.0038<br>(0.039) |
| N | 42,106 | 42,106 | 42,106 | 42,106 | 36,745 | 36,745 | 36,745 | 36,745 |

| | Obesity | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | ISSP | | | | ESS | | | |
| | (9) | (10) | (11) | (12) | (13) | (14) | (15) | (16) |
| Universal Healthy Lifestyle | -0.0911**<br>(0.030) | 1.5153***<br>(0.296) | -0.0891**<br>(0.031) | 1.5938***<br>(0.345) | -0.1820***<br>(0.023) | 0.8238*<br>(0.350) | -0.1813***<br>(0.023) | 0.8846*<br>(0.406) |
| Compensatory Consumption | -0.0948***<br>(0.027) | -0.0973***<br>(0.027) | 0.3623<br>(0.417) | -0.4444<br>(0.646) | -0.1471***<br>(0.016) | -0.1471***<br>(0.016) | -0.3658<br>(0.287) | -0.0241<br>(0.313) |
| Logged GDP per capita | 0.3360<br>(0.386) | 0.3229<br>(0.430) | 0.2428<br>(0.376) | 0.3451<br>(0.395) | -0.0758<br>(0.138) | -0.0878<br>(0.130) | -0.0692<br>(0.151) | -0.0867<br>(0.132) |
| Universal * GDP | | -0.1572***<br>(0.028) | | -0.1643***<br>(0.033) | | -0.0967**<br>(0.034) | | -0.1026**<br>(0.040) |
| Compensatory * GDP | | | -0.0454<br>(0.040) | 0.0322<br>(0.061) | | | 0.0209<br>(0.028) | -0.0118<br>(0.031) |
| N | 42,106 | 42,106 | 42,106 | 42,106 | 36,745 | 36,745 | 36,745 | 36,745 |

Standard errors in parentheses
* p<0.05, ** p<0.01, *** p<0.001, two-tailed tests
Models with cross-level interactions include random coefficients for individual level health lifestyle behaviors. Individual level controls include: age and age-squared, sex, educational attainment, occupational status, income and income squared, number of individuals in household, and frequency of service attendance. Country-level controls include infant mortality rate, the percent of the population aged 65 and older, expenditure on healthcare goods and services as a percentage of GDP, the unemployment rate, and the percent of the population living in urban area. See Table 1 for list of countries in samples. See Table 2 for health behavior measures and construction of health lifestyle measures. Change in predicted probabilities discussed in the Results section.

Table 5: Change in Logged GDP per capita against change in health lifestyles

| | Universal Health Lifestyles | | | | Compensatory consumption | | | |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Logged GDP per capita | 0.227*** | 1.472*** | 1.182*** | 0.941* | 0.067 | 1.076*** | 1.312*** | 0.363 |
| | (0.050) | (0.330) | (0.344) | (0.470) | (0.039) | (0.226) | (0.246) | (0.539) |
| Country fixed-effects? | No | Yes | Yes | Yes | No | Yes | Yes | Yes |
| Individual-level controls? | No | No | Yes | Yes | No | No | Yes | Yes |
| Country-level controls? | No | No | No | Yes | No | No | No | Yes |
| N | 54,272 | 54,272 | 54,272 | 54,272 | 54,272 | 54,272 | 54,272 | 54,272 |

Standard errors in parentheses

* p<0.05, **p<0.01, ***p<0.001, two-tailed tests

Data from 2011 International Social Survey Programme (ISSP) health module and 2014 European Social Survey (ESS). Sample includes countries included in both 2011 ISSP and 2014 ESS, bolded sample in Table 1. Individual level controls include: age and age-squared, sex, educational attainment, occupational status, income and income squared, number of individuals in household, and frequency of service attendance. Country-level controls include infant mortality rate, the percent of the population aged 65 and older, expenditure on healthcare goods and services as a percentage of GDP, the unemployment rate, and the percent of the population living in urban area.