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Won't Somebody Please Think of the Children?

A Study Examining If and How Adolescent Health
Is Affected by the Business Cycle

by

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1 Introduction

Childhood and adolescent health, both physiological and psychological, have become increasingly crucial topics in terms of public health. Childhood overweight and obesity have been on the rise in recent years in most countries (Wang and Lobstein, 2006). Currently, about a third of all children in the U.S. are either considered overweight or obese (Lobstein et al., 2015), and it has been estimated that the direct yearly cost of an overweight or obese child is 468 and 680 euro respectively (Breitfelder et al., 2011). Unfortunately, the same increasing trend can be seen in child and adolescent mental health (Collishaw, 2015), and it has been estimated that around 10-20% of all children and adolescents worldwide are affected by mental health problems (Kieling et al., 2011). Furthermore, there are signs that adolescent health is determinant for future adult health and outcomes. Lundborg et al. (2014) found that mental health problems during adolescence had a significant impact on labour market outcomes. Obesity during childhood or adolescence increases the risk of all-cause mortality and death due to coronary heart disease during adulthood (Must and Strauss, 1999). Hence, there is a need to understand what factors affect adolescent health, as it not only affects current but also future prospects for the individual and society as a whole.

Although there are major indications of the significance of adolescent health on future outcomes, little research has been provided that analyses how youth health is affected by transitory changes in the economy. Ample evidence exists, on the other hand, for the adult population that mortality moves in a pro-cyclical pattern, i.e., that fatalities decrease as the economy falters. In this strand of literature, Ruhm (2000*b*) was the first to produce reliable evidence for this pattern and suggest four mechanisms for its occurrence. One that has gathered the most interest, and support from microdata, is the suggestion that the alternative cost for achieving better health decreases during economic downturns. When unemployed, one does not have to sacrifice working time to visit the doctor, plan a healthy diet or engage in physical activity. Since Ruhm (2000*b*) several other authors have found similar results when using U.S. and international data (Ariizumi and Schirle, 2012; Gonzalez and Quast, 2011; Lin, 2009; Granados, 2005; Gerdtham and Ruhm, 2006). Yet, not discussed by these authors is the possibility that the effect might not be limited to each individual respectively

but could also trickle down to the youth in their household. The alternative cost for parental supervision might decrease as well during recession, leading to health improvements for adolescents. Hence, there might exist an indirect link between the business cycle and health for adolescents. This possibility has led some to study the business cycle effect on youth health. However, some of these studies suffer from methodological problems identified by Ruhm (2015) that could result in unreliable coefficient estimates. Furthermore, few of these authors have studied the possible mechanism through which these improvements take place.

Hence, this thesis examines the impact of macroeconomic shocks on adolescents health, specifically those aged between 14 and 18 years. Using data from the Youth Risk Behavior Surveillance System (YRBSS) covering U.S. states from 1999 to 2019, this study investigates various health outcomes and behavioural variables among high-school students. The thesis focuses on physical and mental health outcomes, analyzing how changes in body weight and attempted suicide rates are influenced by the business cycle. Additionally, behavioural variables are explored to understand potential channels through which changes in health outcomes occur, such as changes in substance use, physical exercise, or diet. The empirical analysis employs a two-way fixed effects model, incorporating state and year fixed effects, to examine the response of these variables to economic fluctuations.

The findings indicate that physical health outcomes for adolescents tend to move counter-cyclically. During recessions, height-adjusted weight and the likelihood of being obese or overweight decrease. However, mental health displays a slight tendency to move pro-cyclically, while the probability of being underweight is unaffected by the business cycle. However, none of the point estimates for the behaviour variables were significant, giving no evidence through which mechanism these changes occur. Two heterogeneity analyses were conducted to investigate gender and age group differences. The results indicate that males and females exhibit similar effects in terms of weight outcomes. However, in contrast to males, females display a significant pro-cyclical pattern in attempted suicide. Nevertheless, the study failed to determine why this discrepancy between the genders occurs when analysing health behaviours. Furthermore, the age of respondents was found to be insignificant in nearly all point

estimates, raising doubts regarding the hypothesis that parental supervision is the channel through which the business cycle affects youth health.

This thesis is structured as follows. The next section *Past Research* highlights the insight gained from the literature that evaluates the connection between health outcomes and the business cycle, adult and youth alike. Afterwards in the *Data & Methodology* section, the YRBSS dataset is explored and outlined to the reader. Furthermore, the two-way fixed effects method is defined to the reader in this section as well. Then, in the *Results* section, the main result is presented as well as the two heterogeneity analyses. Lastly, in the *Discussion & Conclusion*, the results found in the thesis are summarised, connected and contrasted against the findings found in previous research.

2 Past Research

Ruhm (2000*b*) was the first to provide reliable evidence that mortality rates were affected by transitory changes in the economy and that they showed a pro-cyclical pattern. These results were found using a fixed effects model on U.S. state mortality data from 1972-1991, where the primary proxy for economic conditions was the state unemployment rate. These results were further supported by analysing yearly microdata from the Behavioral Risk Factor Surveillance System (BRFSS) between 1987-1991. BRFSS collects representative state-level data on respondents' health behaviour and health outcomes, such as smoking and drinking habits, physical activity, diet, number of doctor visits and weight. Applying the same methodology as for the analysis of state mortality rates, Ruhm (2000*b*) showed that healthy behaviour showed a counter-cyclical pattern. Tobacco consumption and obesity decrease, whereas physical activity and consumption of healthier foods increase as the economy weakens. These behaviour patterns give support for one of the proposed mechanisms that might be driving the effect. That the alternative cost for pursuing healthy behaviour diminishes as the economy falters, leading to improved health outcomes during recessions. These changes in behaviour patterns were confirmed by Ruhm (2005), who used a longer sample window from the BRFSS than Ruhm (2000*b*). Ruhm (2005) further demonstrated that changes in income did not account for the shifts in healthy habits during economic shocks.

Further studies have confirmed the main insights gained from Ruhm (2000*b*) and showed that the effect is not specific to the U.S. Gerdtham and Ruhm (2006) found the same pattern in mortality as Ruhm (2000*b*) in 23 OECD countries between 1960-1997. The same goes for Ariizumi and Schirle (2012), who analysed Canadian provincial data from 1977-2009, Gonzalez and Quast (2011), who used Mexican data from 32 states over the period 1993 to 2004, Lin (2009), who studied the effect for eight Asian Pacific countries between the years of 1976 and 2003, and Granados (2005), who used data from Spain between 1980-1997. These studies used the same identification approach as Ruhm (2000*b*), exploiting geographical variation in unemployment and mortality rates with a fixed effects model. Furthermore, in all of the mentioned papers, the unemployment rate was used as the main proxy for local economic conditions. However, the affected age groups and the size of the effect differ between

the papers. As shown by Ariizumi and Schirle (2012) and Gerdtham and Ruhm (2006), these inconsistencies between studies can be due to differences in healthcare provision and institutions. Ariizumi and Schirle (2012) found that quality of elderly care could mitigate the pro-cyclical mortality pattern for seniors and Gerdtham and Ruhm (2006) showed that the effect diminishes in size as the size of the welfare system increases.

On the other hand, not all dimensions of well-being improve during recessions, which raises doubts regarding the main mechanism between economic shocks and health, as posited by Ruhm (2000*b*). While physical health may improve during economic downturns, psychological health appears to suffer. This phenomenon was already noted in Ruhm (2000*b*), who found that suicides, which serve as a reliable indicator of mental health, increased with the unemployment rate. Subsequent studies by Ruhm (2003) confirmed the pro-cyclical nature of mental health, leading Ruhm (2005) to conclude that recessions might trigger heightened stress levels that manifest themselves in declining mental health. Moreover, Hollingsworth et al. (2017) also identified a counter-cyclical pattern in fatalities and emergency room visits due to drug overdoses. Therefore, Hollingsworth et al. (2017) also concludes that stress increases during recessions, which results in deteriorating mental health, and this could be expressed through greater drug use.

Although existing research has established a strong link between health and business cycles, results also indicate that this effect has declined over time since the latter parts of the 1980s. For instance, Lin (2009) divided their sample period into two periods, 1976-1996 and 1997-2003, to see whether there was a structural break after the 1997 Asian financial crisis. Although the coefficient sign remained negative in the second period, the impact of the unemployment rate on total mortality became insignificant. Ruhm (2015) offer more proof of the waning effect of economic fluctuations on health. Using state mortality data from 1976 to 2010, Ruhm (2015) demonstrates that point estimates for the unemployment rate on total mortality approaches zero over time and become insignificant after the latter part of the 1980s when using a rolling 20-year window. However, there is a divergence in terms of coefficient estimates in the sample concerning different causes of death. Fatalities due to external causes, such as traffic accidents, homicide and suicide, became counter-cyclical throughout

the analysis period. Similarly, McInerney and Mellor (2012) observe counter-cyclical patterns in the mortality rate for the elderly population between 1994 to 2008, but no evidence that health behaviour responds to economic shocks. Ruhm (2015) offers two possible explanations for this trend: (i) short-term behaviour changes induced by transitory economic fluctuations may have diminished with the reduction in macroeconomic volatility after the inflation crisis of the 1970s (ii) mental health and suicide have shown a counter-cyclical pattern. As drug abuse may serve as a coping mechanism for declining mental health, the increase in drug overdoses, resulting from the opioid crisis, could have negated the pro-cyclical trend of total mortality.

Although extensive research has examined the relationship between the business cycle and health, this research has mainly been limited to adults. Few studies have investigated the effect of the business cycle on child or youth health. Dehejia and Lleras-Muney (2004) explored if fluctuations in the economy affected the rate of low birth weight, postnatal and neonatal mortality. Using birth records from the U.S. between the years 1975 and 1999, they found that all three outcomes showed pro-cyclical tendencies for babies that were conceived during recessions. Further analysis of the health behaviour of pregnant women during recessions from the BRFSS showed that alcohol and tobacco consumption decreased when the unemployment rate rose, supporting and providing a possible explanation for the results found in the birth and death records. Golberstein et al. (2019), on the other hand, studied how mental health changes with the economy for children between the ages of 4 and 17. Using a fixed effects model similar to past studies, Golberstein et al. (2019) found that mental health, like adults, moves pro-cyclical and the size of the effect is similar to those found in Ruhm (2000*b*). Using data from Spain between 1987 and 2012, Bellés-Obrero et al. (2016) finds that children's obesity rate falls during economic decline, whereas a healthy diet and physical exercise becomes more frequent. A similar pro-cyclical pattern in children's weight is found Arkes (2009) in the U.S., but only for males. Lastly, Arkes (2007) finds drug and alcohol use increases as the economy shrinks.

However, Arkes (2009) and Arkes (2007) uses data from the National Longitudinal Survey of Youth (NLSY), a cohort study that follows 8,984 respondents born between 1980 and 1984.

As a result of using longitudinal data, the studied time period in both studies are relatively short (roughly 7 years worth of data is analysed in both studies). Such a short sample period can result in unreliable point estimates as shown by Ruhm (2015). Ruhm (2015) advocate caution regarding results based on a sample window smaller than 20 years, as the point estimates can be volatile and depend heavily on what starting year is selected. Although a sample period of 10 to 15 years can give the same coefficient sign as having a larger sample period, the estimates will most likely be insignificant due to the small sample size.

In contrast to adults, the mechanism linking the economic cycle to health outcomes for children and youths is less clear-cut. However, Arkes (2007) offers four possibilities of how a depressed economy could lead to better health outcomes for children in terms of substance abuse. Among these possibilities, the most credible mechanism, and is also highlighted by the other authors (Bellés-Obrero et al., 2016; Arkes, 2009; Golberstein et al., 2019), is the parental supervision time may increase during a recession. This possible pathway is also consistent with the one proposed by Ruhm (2000*b*), whereby healthy behaviour becomes relatively less costly during recessions. Such reduction in the alternative cost might impact not only the individuals themselves, but also the members of their household, including their children. Parents may have more time to cook healthy dinners for their children, drive them to after-school activities, and engage with them more overall on an emotional level. This hypothesis is further supported by studies examining how increases in parental time affect children's health. Mörk et al. (2014) finds a small negative effect between parental unemployment and children hospitalisation, while Anderson et al. (2003) shows that children to mothers, who spend more time at work, are more likely to be overweight. Additionally, Ruhm (2000*a*) gives evidence that increases in parental leave time lead to lower rates of low birth weights, postnatal and neonatal deaths.

This thesis contributes to the existing body of research in several ways. Firstly, to the best of the author's knowledge, this study is the first to utilise the YRBSS dataset to examine the impact of economic shocks on youth health. By focusing on a population that has not yet been extensively studied by researchers, this thesis extends previous investigations and tests the external validity of insights gained from prior studies. Moreover, while previous

research has separately explored the effects of economic changes on U.S. youth weight (Arkes, 2009) and mental health (Golberstein et al., 2019), these studies do not investigate the underlying mechanisms driving these results. In contrast, this thesis goes beyond examining health outcomes alone and expands on the existing literature by investigating the potential mechanisms through which these changes occur, drawing inspiration from the work of Bellés-Obrero et al. (2016) and Ruhm (2000*b*).

3 Data & Methodology

The data utilised in this thesis is derived from the YRBSS survey.The YRBSS gives insight into the health behaviour and health outcomes of youths in the United States, including alcohol/tobacco consumption, mental health, physical activity, weight and dietary habits. The Centers for Disease Control and Prevention (CDC), a U.S. federal agency, has conducted this cross-sectional survey biennially during the spring semester on the national, state, and tribal levels since 1991, with the latest data point coming from 2019 (Centers for Disease Control and Prevention, 2022), for middle- and high-schools. However, due to low participation rates and a lack of data outlining respondents' height adjusted weight in the middle-school dataset, this thesis only utilises respondent data from high school students. Therefore, the analysis is limited to students in grades 9 to 12, i.e. adolescents primarily between 14 and 18 years of age. Despite the low state participation rate in the middle school survey, it should be noted that the YRBSS survey has been demonstrated to collect data of good quality (Brener et al., 2013).

There are multiple reasons for using the YRBSS data in this thesis, but there are also shortcomings that should be acknowledged with using the dataset. First, to the author's knowledge, this is the first time the YRBSS dataset has been utilised to study the effect of the business cycle on youth health, providing a new avenue for investigating the research question. However, not all states have participated in the YRBSS since its inception in 1991. During the first wave of the YRBSS, 26 states participated, but only 9 of these states collected enough data to generate representative samples. Although the participation rate has increased over time, between 1993 to 2001 an average of 22 states gathered enough data to make it representative. From 2003 to 2019, on average, 40 states provided representative data. Moreover, the states of Minnesota, Oregon and Washington did not partake in the YRBSS throughout the entire data period, and Indiana, Massachusetts and Ohio do not permit their data to be redistributed. As a result, these states are not part of the sample used in this thesis. Lastly, some variables of interest for this thesis were not included in the YRBSS standard questionnaire until 1999. Consequently, taking into account these data limitations, the sample window for this thesis spans from 1999 to 2019. However, even with these data

limitations, the YRBSS has collected representative data from 1,349,576 respondents since 1999. This is the largest sample size, by a considerable margin, in comparison to the other papers analysing child and youth health's connection to economic shocks. Furthermore, as the time window spans 20 years, the risk of obtaining volatile or insignificant estimates, as observed by Ruhm (2015), is reduced.

Similar to past research, a fixed-effects model is applied to analyse the data from the YRBSS. The basic model specification is described below, where the subscripts i, j and t are used to indicate the individual, state and year respectively:

$$H_{ijt} = \alpha_j + X_{ijt}\beta + UR_{ijt}\gamma + \rho_t + \varepsilon_{ijt}$$

H_{ijt} indicates the specific health outcome or behaviour, α_j represents the state fixed effects, X_{ijt} is a vector of indvidual-specific covariates, UR_{ijt} denotes the state unemployment rate, ρ_t is a time fixed effect and ε_{ijt} is the error term. As explained by Ruhm (2015), the α_j controls for differences between states, but that are fixed over time. These can be steadfast differences in health behaviour, such as smoking or dietary habits. On the other hand, ρ_t controls for changes in health outcomes and behaviour that varies evenly across states, i.e. nationwide effects in health behaviour and outcomes. The individual-specific covariates, controlled in X_{ijt}, include age, gender and ethnicity.

In some of the regressions run in the analysis, the state's real median household income is included to see if the changes in either health outcome or behaviour are a result of economic condition or changes in income, as in Ruhm (2000*b*), Ruhm (2003) and Ruhm (2005). This data point was retrieved from the U.S. Census Bureau (United States Census Bureau, 2022) and is adjusted to 2021 dollars. The decision to use state-level median income stems from the absence of information regarding respondents' household income or socioeconomic status in the YRBSS dataset. On the other hand, Ruhm (2005) advises against using individual-level data due to potential endogeneity bias, as health outcomes and income may be determined simultaneously. While this concern is more applicable when analysing adult populations, it

may also apply to adolescents if parents are the ones channelling the effect. Yet, Ruhm (2005) notes that using group averages will lead to less precise estimates. In line with past research, the proxy for state economic condition is the state unemployment level, which is gathered from the U.S. Bureau of Labor Statistics (U.S: Bureau of Labor Statistics, 2023). As the data is generally collected during the spring Brener et al. (2013), the UR_{ijt} is calculated as the 12-month average between June, in the year before data collection, and the month of May of the year when the data was compiled. This was done to make sure that UR_{ijt} better captures the economic environment that has affected the respondent's health outcomes and behaviour. Furthermore, standard errors are clustered on state levels to account for any dependence between respondents' error terms within each state.

Moreover, all regression results from Tables 2 to 9 are performed with the supplied YRBSS sampling weights. These weights help to account for student non-responses, and the actual distribution of students by grade, sex, and ethnicity in each state (Brener et al., 2013), making the results representative for all students in grades 9-12. Lastly, for all dichotomous independent variables, the coefficient is estimated with a linear probability model. Although, linear probability models have been used extensively in the literature (Ruhm, 2000*b*, 2003) Golberstein et al. (2019) uses a probit model as the probability of the outcomes is close to zero. However, as discussed by Angrist and Pischke (2009, p.106-107), the differences in marginal effect estimates between OLS, probit, and tobit models are negligible, even when dealing with probabilities close to zero or one—consistent with previous literature reporting similar findings between the linear probability model and other nonlinear alternatives (Ruhm, 2000*b*, 2003; Golberstein et al., 2019). Consequently, the utilization of a linear probability model in this thesis should not compromise the conclusions and facilitates the interpretation of coefficient estimates.

Table 1 displays the independent variables analysed in this thesis, some indicating health outcomes and others revealing respondents' health behaviour. The independent variables, and their construction, largely follow the methodology of Ruhm (2000*b*). In terms of health outcomes, five variables are studied: the respondent's body mass index (BMI), obesity, overweight, underweight, and suicide attempts in the past 12 months. These outcomes capture

both physical and psychological health. The focus on obesity and overweight is motivated by their steady rise in the U.S., and their negative impact on children's performance in school and quality of life (Lobstein et al., 2015). Hence, it is of interest to see if the likelihood of being obese or overweight is affected by the business cycle, as this would suggest that intervention against childhood obesity or overweight needs to change in accordance with economic conditions.

Table 1: Descriptive Statistics of Variables Used

Variables	Sample size	Mean	Std. dev.
Health outcomes:			
Body mass index (weight in kgs/height in meters squared)	1,208,128	23.3	4.9
Obese (% of students in $\geq$ 95th percentile for BMI, based on CDC sex- and age-specific reference data)	1,208,128	13.1	33.8
Overweight (% of students between 85th and 95th percentile for BMI, based on CDC sex- and age-specific reference data)	1,208,128	15.2	35.9
Underweight (% of students $\leq$ 5th percentile for BMI, based on CDC sex- and age-specific reference data)	1,208,128	3.0	17.0
Attempted suicide (in past 12 months)	967,923	8.5	28.0
Health behavior:			
Current drinker (%)	1,199,183	35.8	47.9
Current tobacco smoker (%)	964,696	15.9	36.6
Current cannabis smoker (%)	1,257,583	19.9	39.29
Regular physical exercise (at least 60 minutes, 3 or more times per week in %)	956,479	65.6	47.5
Doing something about weight (% of students either trying to lose or gain weight)	933,631	63.4	48.2
Ate vegetables the past 7 days	1,014,532	88.5	31.9
Economic conditions:			
Unemployment rate (average for past 12 months in %)	1,208,128	5.3	1.9
Real median household income (thousands of dollars in 2021$)	1,208,128	67.8	12.7
Individual characteristics:			
Age	1,208,128	16.0	1.2
Female	1,208,128	49.3	50.0
White	1,208,128	56.3	49.6
Black	1,208,128	17.2	37.8
Hispanic	1,208,128	19.1	39.3
Other ethnicity	1,208,128	7.4	26.2

Data are for students, currently enrolled in 9th to 12th grade, from the Youth Risk Behavioural Surveillance System between 1999 and 2019. State unemployment rates and median household income comes from the U.S. Bureau of Labor Statistics (2023) and U.S. Census Bureau (2022) respectively. Means and standard deviations are calculated with the weights provided in the YRBSS dataset.

The inclusion of the underweight variable is to evaluate if the respondent has a higher likelihood of achieving healthy weight during recessions, regardless of their weight category, or if weights overall decrease during recessions. Using respondent-reported suicide attempts instead of actual youth suicide death rates is motivated by the fact that the ratio between

attempted and completed suicides for adolescents is approximated to be 100:1 and 50:1 for males and females respectively (Shain et al., 2016). Hence, using completed suicide rates might underestimate the effect of business cycles on youth mental health. The obesity, overweight and underweight variables are defined based on the CDCs (2023) definition of these health conditions. All students above the 95th, between the 85th and 95th, or below the 5th BMI percentile, based on CDC's sex- and age-specific growth charts, are considered obese, overweight, or underweight respectively. Furthermore, these three variables are dichotomous, whereas the BMI variable is continuous, while the question regarding suicide attempts is a dichotomous variable.

Several variables are used to assess the respondent's health behaviours, as outlined in Table 1. Examining these variables can shed light on the mechanisms driving the results in health outcomes. For example, it is of interest to see if changes in health outcomes, such as height-adjusted weight, correspond to changes in the health behaviours, such as physical activity or diets. Besides offering possible support for the health outcomes, studying adolescent diets, physical activity, and substance use is crucial, as health behaviours during these years have an impact on adult behaviour and outcomes (Sawyer et al., 2012). There is evidence suggesting that childhood eating habits affect the occurrence of heart diseases and cancer later in life (Rockett and Colditz, 1997). To gauge substance use, three variables were created that indicate if the respondent has consumed tobacco, alcohol or marijuana in the past 30 days respectively, as in Ruhm (2000*b*) and Arkes (2007). These variables are named current drinker, current tobacco smoker, and current cannabis smoker respectively. To measure physical exercise, a similar variable as in Ruhm (2000*b*) was created, indicating whether the respondent engaged in physical activity three times or more last week, lasting for at least 60 minutes. This variable was named regular physical exercise. The variable, doing something about weight, measures if the respondent is either currently trying to lose or gain weight. However, the method of doing this is not specified in the question. Hence, this variable can act as an indirect measure of both changes in physical exercise and diet. Lastly, changes in diet were more directly gauged by a variable that indicates if the respondent has eaten a vegetable during the previous seven days. It was constructed based on respondents' answers

to three questions in the YRBSS survey regarding how many times they had eaten green vegetables, carrots or any other vegetables in the past seven days. All of the variables that gauge health behaviours are dichotomous.

As can be observed in Table 1, the sample sizes can vary quite considerably depending on the independent variable. This is attributable to several factors. Firstly, answer rates varied for each question that the outcome and behaviour variables were constructed from, leading to variations in the sample size. However, the primary reason for the divergent sample sizes between the independent variables is that states have the ultimate authority to determine the questions asked in their respective jurisdiction's YRBSS survey. Hence, although all of the independent variables are based on questions that have been part of the standard YRBSS questionnaire since 1999 (except for the variable regular physical exercise, which was added to the standard YRBSS survey in 2005), they may not have been part of every state's YRBSS questionnaire. For example, although Maryland has been participating in the YRBSS since 2005, they removed the question regarding suicide attempts in 2011. Furthermore, North Carolina has been conducting the YRBSS survey between 2001 and 2019 but did not include the question between 2011 and 2015. The author is unaware of the underlying reason why some states, such as Maryland and North Carolina, or any other state, choose to exclude questions from the standard YRBSS survey. However, since state officials handling decisions regarding education can be publicly elected, selected by the governor, or appointed by the state board of education (McGuinn and Manna, 2013), alterations in the YRBSS state survey may reflect changes in governance and political dynamics. If the missing data points are due to such changes, then it would raise concerns about sample selection endogeneity. The political governance of the state could be correlated with the implementation of health programs that might target the independent variables studied in this thesis. Though, if this is the case or not for the unbalanced panel is just pure speculation of the author.

In addition to the main analysis of the entire sample, this thesis also includes two heterogeneity analyses. Building on Arkes (2009) finding that males' weight gain shows signs of counter-cyclicality, while females' weight moved pro-cyclical, this study examines whether similar divergent patterns can be found in the YRBSS data concerning weight and other

variables. Furthermore, as discussed in the previous literature section, research on the connection between the business cycle and children's health argues that this may be the case as parental supervision may vary with economic conditions. However, one could then expect that a possible effect would diminish with age, as adolescents become more independent from and less dependent on their parents. To explore this, three age groups were created: one group for those aged 14 and below, 15-16 and 17-18. Although most respondents are between the ages of 14 and 18, the YRBSS dataset also includes high school students aged 12 and 13. These students make up a small proportion of the overall sample size (11290 respondents, or about 0.8%).

4 Results

Table 2 presents the main results when the regression model is run on the entire sample for the health outcomes listed in Table 1. The findings for BMI, obesity, and overweight indicate that weight gain for adolescents moves counter-cyclically. Specifically, a percentage point increase in the unemployment rate leads to a 0.028 reduction in average BMI, which corresponds to a 1.2-percent reduction in the sample average. Notably, this effect is twice as large as that reported in Ruhm (2000*b*) and differs from Bellés-Obrero et al. (2016), who found no significant effect. In conjunction with the result for obesity and overweight, this decline in BMI suggests that individuals tend to attain a healthier weight during economic recessions. A percentage-point increase in the unemployment rate induces a significant decrease in the likelihood of being obese or overweight by 0.17- and 0.1-percentage points, respectively. These contractions translate to a 1.3- and 0.7-percent decrease at the sample means.

Table 2: Main Results - Health Outcomes

	BMI		Obese		Overweight		Underweight		Attempted Suicide	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Unemployment Rate	-0.0283***	-0.0346***	-0.0017**	-0.0021***	-0.0010*	-0.0011*	0.0001	0.0001	0.0015	0.0018
	(0.0093)	(0.0110)	(0.0007)	(0.0007)	(0.0006)	(0.0007)	(0.0003)	(0.0003)	(0.0010)	(0.0012)
Median Income		-0.0049		-0.0003		-0.0001		-0.0000		0.0003
		(0.0058)		(0.0003)		(0.0002)		(0.0001)		(0.0004)
State & Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Individual Covariates	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Median Household Income	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes

The table shows the regression results for the studied health outcomes. All regression controls for individual covariates, such as age (age and age squared), ethnicity (white, black, hispanic, or other ethnic backgrounds), gender, and include vectors of state and year dummies. Every even column reports the coefficient estimates when real median household income is controlled for. All reported coefficients for dichotomous outcome variables (obesity, overweight, underweight, and attempted suicide) are estimated with a linear probability model. Standard errors are clustered on the state level and are reported in the brackets below the estimator. Significance at the 10%, 5%, and 1% is indicated by *, **, *** respectively.

The results closely mirror those found by Ruhm (2000*b*) for adults, where a 1.7- and 0.7-percent decrease in the likelihood of being obese and overweight, respectively, was found. However, the estimated effect is smaller compared to Bellés-Obrero et al. (2016). Furthermore, these estimators are relatively insensitive to the inclusion of states' median household income. However, when BMI is the outcome variable, the inclusion of median household income has a notable effect on the estimator for the impact of changes in the unemployment rate. Unlike BMI, obesity and overweight, both underweight and attempted suicide exhibit

pro-cyclical patterns. For every point increase in the unemployment rate, the probability of attempting suicide increases by 0.15-percentage points, or a 1.7-percent increase at the sample means. However, the estimators for being underweight and attempting suicide are insignificant. Moreover, the estimator for the unemployment rate, when underweight is the outcome variable, is nearly zero. In contrast, Bellés-Obrero et al. (2016) finds a significant pro-cyclical tendency in the likelihood of being underweight. Yet, as for the weight variables, the 1.7-percent increase in attempted suicide is close to Ruhm (2000*b*) reported 1.3-percent increase in completed suicides for the adult population. The regressions are also insensitive to the inclusion of the state median household income. Further, common for all regressions performed is that the estimator for states' median household income is insignificant.

Based solely on the results presented in Table 2, it seems evident that health for adolescents follows a counter-cyclical pattern, similar to adults, concerning outcomes related to physical aspects.

Table 3: Main Results - Health Behaviors

	Current Drinker		Current Tobacco Smoker		Current Cannabis Smoker	
	(1)	(2)	(3)	(4)	(5)	(6)
Unemployment Rate	0.0027	0.0028	0.0003	0.0002	0.0034	0.0033
	(0.0024)	(0.0027)	(0.0017)	(0.0019)	(0.0023)	(0.0024)
Median Income		0.0001		-0.0001		-0.0001
		(0.0007)		(0.0007)		(0.0004)
	Regular Physical Exercise		Doing Something About Weight		Ate vegetables the past 7 days	
Unemployment Rate	0.0027	0.0026	0.0017	0.0011	0.0013	0.0015*
	(0.0023)	(0.0023)	(0.0012)	(0.0013)	(0.0008)	(0.0008)
Median Income		-0.0003		-0.0004		0.0002
		(0.0005)		(0.0005)		(0.0004)
State & Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Individual Covariates	Yes	Yes	Yes	Yes	Yes	Yes
Median Household Income	No	Yes	No	Yes	No	Yes

The table shows the regression results for the studied health behaviours. All regression controls for individual covariates, such as age (age and age squared), ethnicity (white, black, hispanic, or other ethnic backgrounds), gender, and include vectors of state and year dummies. All coefficients are estimated using a linear probability model. Every even column reports the coefficient estimates when real median household income is controlled for. Standard errors are clustered on the state level and are reported in the brackets below the estimator. Significance at the 10%, 5%, and 1% is indicated by *, **, *** respectively.

However, an examination of the regression results in Table 3, which shows the outcomes for the studied health behaviour variables, does not reveal any clear indication of how these weight changes occur. Although physical exercise and diet move in a counter-cyclical pattern, which could account for the reduction in BMI and the likelihood of having an unhealthy weight observed in Table 2, all of the effects are small, imprecise, and, consequently, insignificant at any level of statistical significance. The variable, ate vegetables the past 7 days, is the sole independent variable with a statistically significant estimator for the unemployment rate. However, it is only significant at the 10-percent level when state median household income is controlled for. Furthermore, the 0.15-point rise in the likelihood of eating vegetables is equivalent to a 0.17-percent rise in the sample mean. Bellés-Obrero et al. (2016)finds significant results for counter-cyclical patterns in exercise and diet; however, the variables used by Bellés-Obrero et al. (2016) differ from those employed in this thesis. Examining the top row of Table 3 yields identical results. The effects of joblessness on the likelihood of being a current drinker, tobacco or cannabis smoker are insignificant and minor in size. Nonetheless, when evaluating the point estimators' signs, we see that the likelihood of using various addictive or intoxicating substances increases during economic downturns. Specifically, the likelihood of drinking alcohol or smoking cannabis increases by 0.27- and 0.34-percentage points when the unemployment rate increases by 1 percentage point, or a boost of 0.75- and 1.71-percent in the sample means. Arkes (2007) instead finds a significantly larger pro-cyclical pattern for marijuana, more than twice as large as the finding in this thesis. A larger effect was also observed for current alcohol consumption in Arkes (2007), but the estimates were also insignificant. These results found in this thesis may help to explain why the probability of attempting suicide rises during economic decline, as they may serve as coping mechanisms for worsening mental health. Furthermore, they provide some evidence that parental supervision might decline when the economy strengthens, allowing adolescents to have more opportunities to engage in risk-taking behaviour.

In summary, the results suggest that economic recessions may have a positive effect on the weight status of individuals, as suggested by the decline in BMI, and the probability of either being obese or overweight, when the unemployment rate rises. While weight gain displays

a counter-cyclical movement, underweight and attempted suicide demonstrate no significant movement, but the point estimates indicate pro-cyclical movements. On the other hand, although adolescent weight seems to shift toward healthy weight ranges during recessions, no conclusive evidence can be found in the studied behaviour variables to support how these patterns occur. Interestingly, the similar-sized effects observed in this thesis and Ruhm (2000*b*) for the health outcomes variables offer some support to the hypothesis that parental supervision might be driving the effect. Since a similar-sized effect would suggest that the effect of business cycle on adult health choices also passes down to the youths of the household, both good and bad. The heterogeneity analysis of gender or age differences, which will be presented subsequently, can offer some clarification for the divergent results found between health outcomes and behavioural variables.

4.1 Heterogeneity Analysis

4.2 Gender

Table 4 reports the heterogeneity analysis results for the health outcomes when the sample is segregated by gender. Interestingly, when comparing the result for when BMI, obesity, overweight and underweight are the outcome variables, the point estimates for the unemployment rate are nearly identical between males and females.

Table 4: Heterogeneity Analysis - Health Outcomes for Males and Females

Males	BMI		Obese		Overweight		Underweight		Attempted Suicide	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Unemployment Rate	-0.0287**	-0.0338***	-0.0016**	-0.0021**	-0.0009	-0.0010	0.0002	0.0000	-0.0004	0.0005
	(0.0121)	(0.0125)	(0.0007)	(0.0009)	(0.0009)	(0.0009)	(0.0005)	(0.0004)	(0.0011)	(0.0014)
Median Income		-0.0040		-0.0004		-0.0000		-0.0001		0.0008
		(0.0067)		(0.0003)		(0.0003)		(0.0002)		(0.0005)
Sample Size	593,195	593,195	593,195	593,195	593,195	593,195	593,195	593,195	465,696	465,696
Sample Mean (%)	23.6	23.6	16.4	16.4	14.9	14.9	3.5	3.5	6.7	6.7
Females	BMI		Obese		Overweight		Underweight		Attempted Suicide	
Unemployment Rate	-0.0289*	-0.0358**	-0.0019	-0.0021*	-0.0010	-0.0013	0.0001	0.0002	0.0034***	0.0031**
	(0.0161)	(0.0175)	(0.0011)	(0.0011)	(0.0009)	(0.0011)	(0.0004)	(0.0005)	(0.0012)	(0.0012)
Median Income		-0.0054		-0.0002		-0.0002		0.0000		-0.0002
		(0.0058)		(0.0003)		(0.0003)		(0.0001)		(0.0004)
Sample Size	614,933	614,933	614,933	614,933	614,933	614,933	614,933	614,933	502,227	502,227
Sample Mean (%)	23.0	23.0	9.8	9.8	15.4	15.4	2.5	2.5	10.3	10.3
State & Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Individual Covariates	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Median Household Income	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes

The table shows the regression results for the studied health outcomes when the sample is dived between the genders. All regression controls for individual covariates, such as age (age and age squared), ethnicity (white, black, hispanic, or other ethnic backgrounds), and include vectors of state and year dummies. Every even column reports the coefficient estimates when real median household income is controlled for. All reported coefficients for dichotomous outcome variables (obesity, overweight, underweight, and attempted suicide) are estimated with a linear probability model. Standard errors are clustered on the state level and are reported in the brackets below the estimator. Significance at the 10%, 5%, and 1% is indicated by *, **, *** respectively.

Although, as the sample mean values tend to be smaller for females than males, except for the overweight outcome variable, the percentage decrease from the sample mean is larger for females. For instance, a percentage point gain in joblessness for females results in a 1.94-percentage decrease in the sample mean, compared to the male's 0.98-percentage decrease. These results diverge quite remarkably from those observed by Arkes (2009), who found significant results for counter-cyclical tendencies in weight gain for males, but the reverse for

females. Nevertheless, a clear divergence is evident when it comes to attempted suicide. Males point estimates are close to zero, imprecise and insignificant, while females have a relatively larger and significant 0.34-percentage point increase in the likelihood of attempting suicide when the unemployment rate goes up by one percentage point, or, in terms of the sample mean, a 3.30-percent increase.

The discrepancy in the results observed in Table 4 for attempted suicide could help to disentangle which possible mechanism is driving that behaviour. Yet, an examination of the findings presented in Table 5, which summarises the regression result for males and females concerning substance use, does not yield a clearer picture.

Table 5: Heterogeneity Analysis - Health Behaviors (substance use) for Males and Females

Males	Current Drinker		Current Tobacco Smoker		Current Cannabis Smoker	
	(1)	(2)	(3)	(4)	(5)	(6)
Unemployment Rate	0.0040	0.0042	0.0004	0.0010	0.0050**	0.0051**
	(0.0028)	(0.0032)	(0.0019)	(0.0023)	(0.0024)	(0.0025)
Median Income		0.0001		0.0004		0.0001
		(0.0008)		(0.0009)		(0.0005)
Observations	580,612	580,612	467,755	467,755	610,331	610,331
Sample Mean (%)	34.9	34.9	16.9	16.9	21.5	21.5
Females	Current Drinker		Current Tobacco Smoker		Current Cannabis Smoker	
Unemployment Rate	0.0013	0.0014	0.0002	-0.0006	0.0017	0.0014
	(0.0024)	(0.0025)	(0.0019)	(0.0020)	(0.0024)	(0.0026)
Median Income		0.0001		-0.0005		-0.0002
		(0.0007)		(0.0006)		(0.0004)
Sample Size	618,571	618,571	496,941	496,941	647,252	647,252
Sample Mean (%)	36.7	36.7	14.9	14.9	18.3	18.3
State & Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Individual Covariates	Yes	Yes	Yes	Yes	Yes	Yes
Median Household Income	No	Yes	No	Yes	No	Yes

The table shows the regression results for the studied health behaviours (current drinker, current tobacco smoker and current cannabis smoker), when the sample is dived between the genders. All regression controls for individual covariates, such as age (age and age squared), ethnicity (white, black, Hispanic, or other ethnic backgrounds), and includes vectors of state and year dummies. All coefficients are estimated using a linear probability model. Every even column reports the coefficient estimates when real median household income is controlled for. Standard errors are clustered on the state level and are reported in the brackets below the estimator. Significance at the 10%, 5%, and 1% is indicated by *, **, *** respectively.

Even though the sample mean for all variables is approximately the same for both genders, showing that no gender is more prone to substance use, we see that males are more responsive

to economic fluctuations for alcohol and cannabis consumption than females. Males' likelihood of being an alcohol or cannabis consumer grows by an insignificant 0.4- and a significant 0.51-percentage points, respectively, for each percentage point increase in the unemployment rate. This corresponds to an elevation of 1.-1 and 2.3-percent from the sample mean respectively. Females, on the other hand, show no significant changes in substance use behaviour as the economy shifts. The point estimates for females are considerably lower than for males and insignificant for all variables. These results contrast with Arkes (2007) analysis of gender differences in substance use, which found similar-sized effects of alcohol and cannabis consumption between genders. Yet, Arkes (2007) finds no significant effect in terms of alcohol consumption. Both genders' current tobacco consumption does not exhibit any tendencies to align with or move opposite to the economy. Thus, the results presented in Table 5, along with the health outcomes regression results found in Table 4, seem to suggest that there is no clear link between fluctuations in substance use and attempted suicide. This implies that the mechanism presented in Table 5 does not have an obvious link to the health outcomes studied.

In terms of gender differences in health behaviours, Table 6 reports the regression results for males and females for the health behaviour variables related to physical exercise and diet. Although Table 4 reveals similar results for BMI, obesity, and overweight across both genders, stark differences emerge in physical exercise and vegetable consumption. The point estimates demonstrate that males show a counter-cyclical pattern in regular physical exercise, while females show a pro-cyclical pattern. However, only the latter shows a significant effect, with a 0.6-percentage point in the likelihood of regular physical exercise for every percentage point rise in the unemployment rate. This roughly represents 1-percent raise relative to the sample mean. Conversely, male vegetable consumption appears to vary with the business cycle, showing a significant effect. Specifically, for every one percentage point increase in joblessness, the likelihood of consuming vegetables rises by 0.21-percentage points, corresponding to a 0.2-percent increase at the sample means. In contrast, the estimators for doing something about your own weight are insignificant for both genders. Although, the point estimate is bigger for females than for males. Therefore, based on the proposed mechanism analysed in

this thesis, it is challenging to reconcile why both genders exhibit decreasing weights, and the probability of having unhealthy weights, during recessions with equal effects.

Table 6: Heterogeneity Analysis - Health Behaviors (physical exercise & diet) for Males and Females

Males	Regular Physical Exercise		Doing Something About Weight		Ate vegetables the past 7 days	
	(1)	(2)	(3)	(4)	(5)	(6)
Unemployment Rate	-0.0004	-0.0006	0.0010	0.0005	0.0021**	0.0024**
	(0.0028)	(0.0027)	(0.0015)	(0.0016)	(0.0009)	(0.0009)
Median Income		-0.0005		-0.0004		0.0002
		(0.0005)		(0.0007)		(0.0004)
Sample Size	465,036	465,036	454,916	454,916	493,192	493,192
Sample Mean (%)	72.2	72.2	59.6	59.6	86.6	86.6
Females	Regular Physical Exercise		Doing Something About Weight		Ate vegetables the past 7 days	
Unemployment Rate	0.0058**	0.0058**	0.0024	0.0018	0.0005	0.0007
	(0.0026)	(0.0026)	(0.0015)	(0.0018)	(0.0012)	(0.0011)
Median Income		-0.0001		-0.0004		0.0002
		(0.0007)		(0.0006)		(0.0005)
Sample Size	491,443	491,443	478,715	478,715	521,340	521,340
Sample Mean (%)	58.9	58.9	67.2	67.2	90.3	90.3
State & Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Individual Covariates	Yes	Yes	Yes	Yes	Yes	Yes
Median Household Income	No	Yes	No	Yes	No	Yes

The table shows the regression results for the studied health behaviours (regular physical exercise, doing something about weight, and ate vegetables the past 7 days) when the sample is dived between the genders. All regression controls for individual covariates, such as age (age and age squared), ethnicity (white, black, hispanic, or other ethnic backgrounds), and include vectors of state and year dummies. All coefficients are estimated using a linear probability model. Every even column reports the coefficient estimates when real median household income is controlled for. Standard errors are clustered on the state level and are reported in the brackets below the estimator. Significance at the 10%, 5%, and 1% is indicated by *, **, *** respectively.

4.3 Age

As described in the Data Methodology section, the effect of the business cycle on adolescents may diminish with age. As the mechanism proposed for the effect, that parental supervision might decrease during upturns, could weaken as adolescents become more independent with age. Nonetheless, this hypothesis is not supported by the results in Table 7, where the health outcomes are presented for the three age groups. In fact, the largest effect, for nearly all outcome variables except for underweight, can be found for the students aged between 17 and 18. Furthermore, the only strong evidence for business-cycle-induced variation in health outcomes exists for those aged either 17 or 18 in terms of attempting suicide. This age group

exhibit a significant, at the 5-percent level, 0.3-percentage point increase for every percentage increase in joblessness, which corresponds to a 3.4 percentage increase at the sample mean. While most of the other point estimates for the unemployment rate are insignificant, the significant ones are sensitive to either the inclusion or exclusion of state median household income and are significant at the 10-percent level. Yet, it should be noted that the overall patterns for all outcome variables, except underweight, have the same coefficient signs as in the main result. Similar to the heterogeneity analysis for genders, there are no signs that the overall pattern of health outcomes changes when the sample is dived based on the respondent's age.

Table 7: Heterogeneity Analysis - Health Outcomes for the Different Age Groups, 12-14, 15-16, and 17-18

Age: 12-14	BMI		Obese		Overweight		Underweight		Attempted Suicide	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Unemployment Rate	-0.0029	-0.0205	0.0009	-0.0001	-0.0020	-0.0030	-0.0014*	-0.0015	0.0018	0.0023
	(0.0237)	(0.0264)	(0.0019)	(0.0019)	(0.0014)	(0.0019)	(0.0008)	(0.0009)	(0.0016)	(0.0020)
Median Income		-0.0137		-0.0008		-0.0008		-0.0001		0.0005
		(0.0103)		(0.0006)		(0.0006)		(0.0002)		(0.0007)
Sample Size	165,670	165,670	165,670	165,670	165,670	165,670	165,670	165,670	126,511	126,511
Sample Mean (%)	22.2	22.2	13.4	13.4	16.8	16.8	2.2	2.2	9.4	9.4
Age: 15-16	BMI		Obese		Overweight		Underweight		Attempted Suicide	
Unemployment Rate	-0.0076	-0.0090	-0.0007	-0.0008	-0.0000	-0.0000	-0.0003	-0.0004	0.0004	0.0009
	(0.0128)	(0.0121)	(0.0007)	(0.0007)	(0.0006)	(0.0006)	(0.0004)	(0.0004)	(0.0010)	(0.0010)
Median Income		-0.0012		-0.0000		-0.0000		-0.0001*		0.0004
		(0.0033)		(0.0002)		(0.0002)		(0.0000)		(0.0003)
Sample Size	640,245	640,245	640,245	640,245	640,245	640,245	640,245	640,245	512,703	512,703
Sample Mean (%)	23.0	23.0	13.0	13.0	15.2	15.2	2.7	2.7	8.9	8.9
Age: 17-18	BMI		Obese		Overweight		Underweight		Attempted Suicide	
Unemployment Rate	-0.0311	-0.0387	-0.0021	-0.0025*	-0.0017	-0.0018	0.0001	0.0002	0.0026**	0.0035**
	(0.0211)	(0.0238)	(0.0014)	(0.0014)	(0.0012)	(0.0013)	(0.0006)	(0.0006)	(0.0013)	(0.0015)
Median Income		-0.0061		-0.0003		-0.0001		0.0000		0.0007
		(0.0075)		(0.0004)		(0.0003)		(0.0002)		(0.0005)
Sample Size	402,213	402,213	402,213	402,213	402,213	402,213	402,213	402,213	328,709	328,709
Sample Mean (%)	24.0	24.0	13.3	13.3	14.6	14.6	3.6	3.6	7.7	7.7
State & Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Individual Covariates	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Median Household Income	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes

The table shows the regression results for the studied health outcomes. The sample is dived between the three age groups (12-14, 15-16, and 17-18). All regression controls for individual covariates, such as age (age and age squared), ethnicity (white, black, hispanic, or other ethnic backgrounds), gender, and include vectors of state and year dummies. Every even column reports the coefficient estimates when real median household income is controlled for. All reported coefficients for dichotomous outcome variables are estimated with a linear probability model. Standard errors are clustered on the state level and are reported in the brackets below the estimator. Significance at the 10%, 5%, and 1% is indicated by *, **, *** respectively.

In terms of health behaviours, as seen in Tables 8 and 9, some of the same tendencies as seen in Table 7 can be observed. Nearly all of the point estimates for the unemployment rate are insignificant. Only for the variable, doing something about weight in Table 9, is the point estimate significant at the 10-percent level for the age group 15-16 when median household income is excluded from the regression. However, in contrast to Table 7, studying the point estimates for Table 8 there are no noticeable differences in variation of substance use created by the business cycle between the age groups. Although, in terms of regular physical exercise and vegetable consumption, the effect is larger for the younger age groups, those aged between 12-14 and 15-16, than those aged either 17 or 18. Nonetheless, nearly all of these estimates are insignificant. Hence, the age heterogeneity analysis points towards the fact that a possible connection between health outcomes and behaviours are primarily not age affected.

Table 8: Heterogeneity Analysis - Health Behaviours (substance use) for the Different Age Groups, 12-14, 15-16, and 17-18

Age: 12-14	Current Drinker		Current Tobacco Smoker		Current Cannabis Smoker	
	(1)	(2)	(3)	(4)	(5)	(6)
Unemployment Rate	0.0024	0.0027	0.0010	0.0028	0.0032	0.0040
	(0.0043)	(0.0041)	(0.0024)	(0.0023)	(0.0028)	(0.0025)
Median Income		-0.0003		-0.0004		-0.0001
		(0.0007)		(0.0007)		(0.0005)
Sample Size	169,394	169,394	131,045	131,045	176,474	176,474
Sample Mean (%)	24.1	24.1	9.6	9.6	12.4	12.4
Age: 15-16	Current Drinker		Current Tobacco Smoker		Current Cannabis Smoker	
Unemployment Rate	0.0025	0.0022	0.0006	-0.0001	0.0029	0.0027
	(0.0024)	(0.0029)	(0.0017)	(0.0019)	(0.0019)	(0.0020)
Median Income		-0.0002		0.0005		0.0000
		(0.0004)		(0.0004)		(0.0002)
Sample Size	635,067	635,067	511,024	511,024	666,268	666,268
Sample Mean (%)	32.7	32.7	14.0	14.0	18.3	18.3
Age: 17-18	Current Drinker		Current Tobacco Smoker		Current Cannabis Smoker	
Unemployment Rate	0.0038	0.0045	0.0001	0.0002	0.0044	0.0042
	(0.0025)	(0.0028)	(0.0027)	(0.0030)	(0.0031)	(0.0034)
Median Income		0.0005		0.0001		-0.0002
		(0.0009)		(0.0008)		(0.0005)
Sample Size	394,722	394,722	322,627	322,627	414,841	414,841
Sample Mean (%)	43.7	43.7	20.4	20.4	24.4	24.4
State & Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Individual Covariates	Yes	Yes	Yes	Yes	Yes	Yes
Median Household Income	No	Yes	No	Yes	No	Yes

The table shows the regression results for the studied health behaviours (current drinker, current tobacco smoker, and current cannabis smoker). The sample is dived between the three age groups (12-14, 15-16, and 17-18). All regression controls for individual covariates, such as age (age and age squared), ethnicity (white, black, hispanic, or other ethnic backgrounds), gender, and include vectors of state and year dummies. Every even column reports the coefficient estimates when real median household income is controlled for. All reported coefficients for dichotomous outcome variables (obesity, overweight, underweight, and attempted suicide) are estimated with a linear probability model. Standard errors are clustered on the state level and are reported in the brackets below the estimator. Significance at the 10%, 5%, and 1% is indicated by *, **, *** respectively.

Table 9: Heterogeneity Analysis - Health Behaviours (physical exercise & diet) for the Different Age Groups, 12-14, 15-16, and 17-18

Age: 12-14	Regular Physical Exercise		Doing Something About Weight		Ate vegetables the past 7 days	
	(1)	(2)	(3)	(4)	(5)	(6)
Unemployment Rate	0.0075	0.0070	0.0008	0.0019	0.0016	0.0020
	(0.0046)	(0.0048)	(0.0026)	(0.0025)	(0.0019)	(0.0021)
Median Income		-0.0010		0.0009		0.0003
		(0.0010)		(0.0009)		(0.0006)
Sample Size	140,699	140,699	116,083	116,083	139,293	139,293
Sample Mean (%)	69.8	69.8	61.8	61.8	87.7	87.7
Age: 15-16	Regular Physical Exercise		Doing Something About Weight		Ate vegetables the past 7 days	
Unemployment Rate	0.0027	0.0028	0.0026*	0.0015	0.0016	0.0017*
	(0.0032)	(0.0031)	(0.0015)	(0.0016)	(0.0010)	(0.0010)
Median Income		0.0001		-0.0008		0.0001
		(0.0007)		(0.0005)		(0.0004)
Sample Size	504,696	504,696	496,099	496,099	540,385	540,385
Sample Mean (%)	67.1	67.1	63.0	63.0	88.3	88.3
Age: 17-18	Regular Physical Exercise		Doing Something About Weight		Ate vegetables the past 7 days	
Unemployment Rate	0.0018	0.0016	0.0009	0.0004	0.0007	0.0010
	(0.0027)	(0.0027)	(0.0019)	(0.0021)	(0.0012)	(0.0013)
Median Income		-0.0005		-0.0003		0.0002
		(0.0006)		(0.0007)		(0.0004)
Sample Size	311,084	311,084	321,449	321,449	334,854	334,854
Sample Mean (%)	62.3	62.3	64.3	64.3	88.9	88.9
State & Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Individual Covariates	Yes	Yes	Yes	Yes	Yes	Yes
Median Household Income	No	Yes	No	Yes	No	Yes

The table shows the regression results for the studied health behaviours (regular physical exercise, doing something about weight, and ate vegetables the past 7 days). The sample is dived between the three age groups (12-14, 15-16, and 17-18). All regression controls for individual covariates, such as age (age and age squared), ethnicity (white, black, hispanic, or other ethnic backgrounds), gender, and include vectors of state and year dummies. Every even column reports the coefficient estimates when real median household income is controlled for. All reported coefficients for dichotomous outcome variables (obesity, overweight, underweight, and attempted suicide) are estimated with a linear probability model. Standard errors are clustered on the state level and are reported in the brackets below the estimator. Significance at the 10%, 5%, and 1% is indicated by *, **, *** respectively.

5 Discussion & Conclusions

In the results section and subsequent heterogeneity analysis, there is evidence indicating that the business cycle affects adolescents' health outcomes. Specifically, weight gain appears to move counter-cyclically, with a decrease in the likelihood of obesity or overweight, suggesting that adolescents reach a more healthy weight during recessions. A pro-cyclical pattern is observed in mental health, as the likelihood of suicide attempts seems to increase during recessions, although this estimate is insignificant. However, the results for behaviour variables do not provide a clear indication that significant changes in weight are driven by changes in behaviour. Specifically, the point estimate for the unemployment rate remains insignificant for the independent variables related to respondents' physical activity, and diet in the main result. Nonetheless, counter-cyclical tendencies are observed for physical exercise and diet. However, the same counter-cyclical tendencies are seen in substance use, specifically alcohol and cannabis smoking. Lastly, apart from the estimates of BMI, the inclusion of median household income did not significantly affect the estimates. This suggests that changes in income do not drive the observed effect on health outcomes. However, it is important to note that the measurement used for income is relatively crude and imprecise when interpreting the results.

Although insignificant, the findings in the main results for the possible mechanisms offer some insight into the reasons why weight decreases and mental health deteriorates during recessions. Nevertheless, the possible link becomes less clear when considering gender heterogeneity results. While both genders show similar patterns and effects regarding weight, females exhibit a significant and stronger response to the business cycle in terms of attempted suicide. However, only males demonstrate a stronger counter-cyclical behaviour in substance use. This suggests that the connection between substance use and attempted suicide is not straightforward. Furthermore, only females show significant counter-cyclical tendencies in physical exercise, whereas males exhibit the same significant tendencies, but only for vegetable consumption. Thus, understanding why males and females exhibit the same decrease in weight and why females see a deterioration in mental health during recessions is challenging. Additionally, the age heterogeneity analysis does not indicate that the effect diminishes with

age. In fact, the results seem to indicate that there is no connection between age and health choices or outcomes, questioning the hypothesis that parental supervision might be driving the effect.

Although the results do not provide definitive evidence that adolescent health is affected by the business cycle, it is noteworthy that the observed effects align with previous research. However, the gender effects in this thesis differ from past studies. For instance, Arkes (2007) also found an increase in substance use among adolescents during recessions. Additionally, Bellés-Obrero et al. (2016), who examined the relationship between the business cycle and youth weight in Spanish adolescents, discovered a significant counter-cyclical effect in the probability of obesity, but the counter-cyclical effect for BMI was not significant. Moreover, the pro-cyclical tendency of mental health, as observed in Golberstein et al. (2019), was also evident in this thesis. However, in contrast to Arkes (2009), this thesis did not find any gender differences in weight gain. Arkes (2009) reported that females increased their weight and had a higher likelihood of obesity during recessions, while the opposite was true for males. Furthermore, Arkes (2007) provided results for both genders regarding alcohol and cannabis consumption in the past 30 days. Arkes (2007) found a similar-sized, significant counter-cyclical effect for both genders in terms of cannabis consumption and a similar counter-cyclical, insignificant effect for alcohol consumption. However, this thesis found that males' consumption of these substances during recessions was considerably higher than that of females. This discrepancy between this thesis and the mentioned studies may be attributed to the smaller sample window employed in those studies.

Furthermore, in contrast to current research that has been studying mortality data, this study still finds a counter-cyclical pattern in health outcomes. Hence, this study indicates that the diminishing effect of the business cycle on health outcomes might be overstated in terms of adolescents. It is interesting to note that the size of the effect for some health outcomes closely mirrors those found in Ruhm (2000*b*). As Ruhm (2000*b*) studied a period when pro-cyclical tendencies in mortality were observed, this further supports the notion that a connection between individual health and the business cycle might still exist, despite limited support in recent mortality data. Moreover, this finding provides some support for

the hypothesis that parents' health changes due to the business cycle might be channelled down to their children. A large discrepancy between the effects on health outcomes in parents and children would be hard to understand if parents were the main driving factor behind this behaviour in children. However, it should be noted that the effect on BMI in adolescents was twice as large as that found in Ruhm (2000*b*). Additionally, Ruhm (2000*b*) also found significant effects on physical exercise and diet changes, in contrast to the findings of this thesis.

In conclusion, this thesis provides limited evidence that adolescent health is affected by the business cycle. However, the observed effect pattern aligns with previous research in many aspects. Therefore, the observed effects in this thesis should not be disregarded, considering the consistency with prior studies on both adolescents and adults. Although the age heterogeneity analysis did not support the hypothesis that parental supervision might vary with the business cycle, the comparable effect sizes between this thesis and those in Ruhm (2000*b*) shed light on the possibility that changes in parents' habits might be trickling down to their children. Therefore, further research should explore the relationship between parents and youths to gain a deeper understanding of the question at hand. Additionally, as the current research is mainly limited to children and adolescents in the U.S., it would be of interest to investigate whether similar effects are present internationally, considering potential differences in institutions that could influence the size of the effect. Lastly, it would also be of interest to analyse other possible mechanisms than those employed in this thesis to enhance our understanding of how these weight changes take place, and why females show a larger tendency to exhibit worse mental health during recessions.

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