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Front Pages

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The ***Athens Journal of Health and Medical Sciences (AJHMS)*** is an Open Access quarterly double-blind peer reviewed journal and considers papers from all areas of medicine (including health studies and nursing research). Many of the papers published in this journal have been presented at the various conferences sponsored by the Health & Medical Sciences Division of the Athens Institute for Education and Research (ATINER). All papers are subject to ATINER's Publication Ethical Policy and Statement.

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Athens Journal of Health and Medical Sciences
Editorial and Reviewers' Board

President's Message

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The current issue is the second of the tenth volume of the *Athens Journal of Health and Medical Sciences* (AJHMS), published by the **Health & Medical Sciences Division of ATINER.**

Gregory T. Papanikos
President
ATINER

Athens Institute for Education and Research

A World Association of Academics and Researchers

22nd Annual International Conference on Health Economics, Management & Policy, 19-22 June 2023, Athens, Greece

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Academic Members Responsible for the Conference

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- **Dr. Vickie Hughes**, Director, Health & Medical Sciences Division, ATINER & Assistant Professor, School of Nursing, Johns Hopkins University, USA.

Important Dates

- Abstract Submission: **DEADLINE CLOSED**
- Acceptance of Abstract: 4 Weeks after Submission
- Submission of Paper: **22 May 2023**

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Important Dates

- Abstract Submission: **3 October 2023**
- Acceptance of Abstract: 4 Weeks after Submission
- Submission of Paper: **8 April 2024**

Academic Member Responsible for the Conference

- **Dr. Vickie Hughes**, Director, Health & Medical Sciences Research Division, ATINER & Assistant Professor, School of Nursing, Johns Hopkins University, USA.
- **Dr. Carol Anne Chamley**, Head, Nursing Research Unit & Associate Professor, School of Health and Social Care, London South Bank University UK.
- **Dr. Andriana Margariti**, Head, Medicine Research Unit, ATINER & Lecturer, Centre for Experimental Medicine, Queen's University Belfast, U.K.

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Empirical Analysis of Obesity Determinants and Prevalence – The Case of Canada

By Stavroula Malla[*], Solomon Akowuah[±] & K.K.Klein[°]

Obesity has recently developed into a global epidemic. This study follows an integrated approach of examining the determinants and prevalence of obesity in Canada. A multimethod analysis revealed that almost two-thirds of Canadians are overweight or obese. It was found that males, the aged, the married, the less educated, physically inactive people, and people with poor self-rated health have increased probability of being overweight/ obese. Several regulatory policy options which could reduce the incidence of obesity and, in turn, increase social welfare and individual well-being are discussed.

Keywords: *obesity, determinants, prevalence, government policies and regulations*

Introduction

Obesity is increasingly becoming a major health risk in Canada and the world at large. More than 1.9 billion adults aged 18 years and over were overweight (39% of adults); of these over 650 million were obese (13% of adults) in 2016 worldwide (WHO 2021)[1]. Mounting evidence in the literature suggests that obesity is the main risk factor for cerebrovascular diseases (e.g., hypertension and stroke), heart disease and diseases of pulmonary circulation, diabetes, and cancer (e.g., Alter et al. 2012, Birmingham et al. 1999, Lebenbaum et al. 2018, Tan et al. 2011, Sarma et al. 2021). Policies that could reduce the rising morbidity and mortality rates, accompanied by increasing health care expenditures and negative obesity externalities, are of increasing importance to the nation[2].

The severity of the obesity epidemic has attracted several empirical studies into the causes and determinants of obesity. Several studies have been conducted to estimate the prevalence of overweight and obesity and/or to analyse the various determinants of obesity (e.g., Alter et al. 2012, Batal and Decelles 2019, Bélanger-Ducharme and Tremblay 2005, Edwards 2007, Hajizadeh et al. 2016, Huot et al. 2004, Janssen et al.2020, Javed et al. 2022, Kaplan et al. 2003, Katzmarzyk 2002, Mandal and Chern 2006, Ogden et al. 2006, Peralta et al. 2018, Shields 2006, Statistics

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[1]World Health Organisation (WHO) defines overweight and obesity for adults as follows: overweight is a Body Mass Index (BMI) greater than or equal to 25, and obesity is a Body Mass Index (BMI) greater than or equal to 30. While Body Mass Index (BMI) is defined as a person's weight in kilograms divided by the square of his height in meters (kg/m^2) WHO (2021).

[2]For more details, see Safaei et al. (2021), Tremmel et al. (2017), Kent et al. (2017), and WHO (2017).

Canada 2019, Tjepkema 2006, Ward et al. 2007). Many of these studies have employed different analytical techniques in attempts to establish a relationship between obesity and certain sociodemographic/socioeconomic and lifestyle factors.

Consequently, several socioeconomic and sociodemographic factors have been identified as significant determinants of overweight and obesity: age, gender, race, marital status, income, education, smoking status, alcohol use, fruits and vegetables consumption, comorbidity, physical activity, current BMI (Body Mass Index) status, etc. Moreover, such studies have also attempted to identify groups of people who are at risk of being obese as compared to the normal. The relationships were, however, not universal across studies on overweight/obesity and there were also some significant variations in the relationships. Overall, the important issue of obesity has not been adequately addressed in the literature, especially in Canada.

The current study attempts to shed light on the obesity epidemic and represents a step towards a better understanding of the economics of obesity. In particular, the goal of this study is to identify the major factors that significantly contribute to the incidence of obesity and propose policy measures to address those factors. The study analyses the socioeconomic and sociodemographic characteristics of obesity in Canada. Specifically, the paper evaluates the risk factors and determinants of obesity. In addition, it estimates overweight and obesity prevalence in Canada using measured data. Based on the findings from the study, it is also discussed how implementation of some regulatory policies and initiatives could help reduce the incidence of obesity and its associated cost in Canada. The results and policy implications of the study could be extended and are applicable to other countries and jurisdictions as well.

The study follows an integrated and multidisciplinary approach of estimating the prevalence of overweight and obesity in Canada as well as examining the socioeconomic and sociodemographic determinants of obesity in Canada using data collected in various surveys by Statistics Canada. In particular, this study uses data from the Canadian Community Health Survey provided by Statistics Canada to evaluate the socioeconomic and demographic characteristics of obesity based on a Multilevel Multinomial Logistic Regression Model (i.e., hierarchical modelling). Further, the study analyzes how implementation of government policies and regulations could help reduce obesity incidence, which, in turn, could reduce health care expenditures in Canada. Policy implications and recommendations that could improve social welfare and increase overall well-being are discussed.

Obesity has become a crisis that is not just a pressing health concern but also a threat to the global economy. Given the significant impact that a healthy diet and public policies can play in the reduction of the incidence of obesity and its associated chronic diseases and burdens on society, the study provides vital findings and recommendations regarding the pressing health and economic concerns of obesity.

The paper begins by describing the methods of analysis and data used in the study followed by estimates of the prevalence and determinants of obesity. A discussion of the study's results and policy implications closes the paper.

Methods of Analysis

This section provides a detailed discussion and justification of the method used for the analysis and describes the nature and source of data used. The section discusses the derivation of the econometric model used (i.e., the Multilevel Multinomial Logistic Regression Model) and justify its choice. Due to the categorical or ordinal nature of the dataset, including the main variable of interest —BMI (Body Mass Index), the Discrete Choice types of models are the most appropriate tool for this type of analysis. The two most often used models in the literature are the Multinomial Probit regression and the Multinomial Logistic regression. Although both models produce similar results, considering the ease of computation and the frequent usage of the Multinomial Logistic model in the empirical literature, the latter is used to perform the analysis. To incorporate the heterogeneity among the Canadian provinces into the analysis, we use a Multilevel Multinomial Logistic Regression Model (MMLRM). The province-level data is incorporated into the individual-level through a random intercept hierarchical model. Specifically, the study follows the hierarchical or multilevel modeling used by Raudenbush and Bryk (2002). Please see Appendix 1 for the full description of the model.

Data

The present study used confidential micro-level measured data from the latest available Canadian survey - the 2015 Canadian Community Health survey (CCHS) provided by Statistics Canada. The 2004 CCHS 2.2 data also were used to re-run the analysis to check the consistency of the results[3]. Both the 2015 and 2004 CCHS data were based on measured heights and weights. Research has shown that data based on self-reported heights and weights sometimes underestimate the prevalence of obesity (Bélanger-Ducharme and Tremblay 2005, Goldman et al. 2011, Le Petit and Berthelot 2005, Tjepkema 2006, Torrance et al. 2002).[4] A reasonable explanation of this problem is that people are more inclined to overestimate their height and underestimate their weight when self-reporting (Tjepkema 2006). Therefore, it is important to use data based on measured heights and weights.

Although other versions of the dataset like the annual CCHS exist, the 2015 and 2004 CCHS were chosen because most of the annual versions are based on

[3]Detailed findings from the 2004 CCHS 2.2 is available upon request.

[4]The comparison of the 1978-1979 Canada Health Survey (measured data) to the 1981 Canada Fitness Survey (self-reported data) by Torrance et al. (2002) indicated that, while the latter reported the percentage obese to be 9 percent, the former reported the percentage of people obese to be 13 percent. Moreover, comparing the 1988 Campbell Survey on Well-Being (self-reported data) with the 1986-1992 Heart Health Survey (measured data) also revealed that the percentage of people obese was 10 percent and 14 percent respectively. In addition, the estimated percentage of Canadians obese in 2003 (estimate based on self-reported heights and weights) was 15.2 percent, which is significantly below the 2004 estimate of 23.1 percent, which was based on measured heights and weights (Tjepkema 2006).

self-reported BMI. Furthermore, they do not focus on nutrition. The 2015 CCHS collected data on persons aged 1 and above in all ten provinces in Canada. The overall sample size of the 2015 CCHS was 20,487. The 2015 CCHS sampling strategy was designed to project the sample to the Canadian population (i.e., the sample is a fair representation of the population). The sampling weight provided by the 2015 CCHS was used in the estimations. For a detailed discussion on the sampling weight of the 2015 CCHS, refer to 2015 CCHS user guide provided by Statistics Canada. The groups of people excluded from the survey include: full-time members of the Canadian Forces, people living in the Territories, First Nation Reserves or Crown Lands, in prisons or care facilities and some remote areas. In addition, people aged below 18 years were excluded from the analyses because the emphasis of the studies was on adult obesity in Canada. By excluding people younger than 18 years from the analyses, the sample size was reduced to 14,200 (rounded). After deleting individuals with only self-reported heights and weights, non-responses, and missing data, the final sample size was 9,300.

Results and Discussion

Results from the Multilevel Multinomial Logistic Regression Model (MMLRM)

This section presents and discusses the results from the descriptive statistics and the econometric models (MMLRM). To test whether the use of the hierarchical modeling (i.e., MMLRM) was appropriate for the dataset, we estimated the variance of the random component at the provincial level, which was found to be significantly different from zero. In addition, the results from a likelihood ratio test indicated that the MMLRM fit considerably better than the simple multinomial logistic regression model (LR = 51.16 with p −value = 0.000).

Analysis of the 2015 CCHS data suggested that the prevalence of overweight and obesity among Canadian adults was 35.24 percent and 26.97 percent, respectively[5]. We found about 35.15 percent of Canadian adults to be of normal weight, while 2.64 percent were classified as underweight[6]. Table 1 presents the findings from the econometric model (MMLRM). Normal weight was selected as the reference BMI category. The first column under each BMI classification reports the odds ratios from the MMLRM[7]. The second and third columns report the standard errors and the p-values, respectively, associated with the model estimates.

[5]'Canadian adults' refers to Canadians aged 18 years and above.

[6]Analysis of the 2004 CCHS 2.2 data suggested that the prevalence of overweight and obesity among Canadian adults was 36.59 percent and 24.07 percent respectively. We found about 37.77 percent of Canadian adults to be of normal weight, while 1.58 percent were classified as underweight.

[7]Odds ratios above one indicate increased odds of overweight/obesity while odds ratios below one indicate reduced odds of overweight/obesity. The interpretation could be done using percentages by subtracting one from the odds ratio and multiplying the results by 100. For example, an odds ratio of 1.23 for overweight could be interpreted as 23 percent increased odds of becoming overweight.

Table 1. *Multilevel Multinomial Logistic Regression Results*

Variables	Overweight			Obese		
	O.R	S.E	P>z	O.R	S.E	P>z
Age groupings:						
18-24 (reference)						
25-34	1.642	0.191	0.000	2.416	0.335	0.000
35-44	1.882	0.230	0.000	3.483	0.493	0.000
45-54	2.217	0.272	0.000	3.893	0.552	0.000
55-64	2.352	0.301	0.000	3.515	0.521	0.000
65-74	2.675	0.369	0.000	3.433	0.544	0.000
75+	1.578	0.237	0.002	1.324	0.229	0.105
Sex:						
male (reference)						
female	0.508	0.028	0.000	0.626	0.038	0.000
Marital status:						
Married (reference)						
commom law	0.920	0.087	0.379	0.890	0.091	0.253
widowed	0.915	0.100	0.418	0.848	0.100	0.160
separated/divorced	0.883	0.083	0.184	0.895	0.089	0.267
single, never married	0.615	0.050	0.000	0.701	0.062	0.000
Country of birth:						
Canada (reference)						
other North America	0.925	0.247	0.770	0.910	0.264	0.745
South, Central America and Caribbean	1.348	0.215	0.061	1.100	0.190	0.581
Europe	1.054	0.114	0.627	0.770	0.094	0.031
Africa	1.292	0.245	0.178	0.558	0.137	0.017
Asia	0.608	0.052	0.000	0.212	0.024	0.000
Education:						
Less than high school diploma or its equivalent (reference)						
High school diploma or a high school equivalency certificate	0.938	0.085	0.484	0.857	0.081	0.104
Trade certificate or diploma	0.881	0.104	0.283	0.810	0.100	0.086
College/CEGEP/other non-university certificate or diploma	0.923	0.090	0.411	0.769	0.079	0.011
University certificate or diploma below the bachelor's level	0.965	0.142	0.807	0.656	0.108	0.011
Bachelor's degree (e.g. B.A., B.Sc., LL.B.)	0.802	0.082	0.032	0.554	0.062	0.000
University certificate, diploma, degree above the BA level	0.666	0.080	0.001	0.421	0.058	0.000
Household income grouping:						
Less than $5,000 (reference)						
$5,000 TO $9,999	0.634	0.226	0.200	0.815	0.333	0.616
$10,000 TO $14,999	1.031	0.321	0.921	1.434	0.522	0.322
$15,000 TO $19,999	1.254	0.370	0.442	1.470	0.517	0.273

$20,000 TO $29,999	1.232	0.348	0.460	1.428	0.486	0.295
$30,000 TO $39,999	1.145	0.323	0.632	1.404	0.478	0.318
$40,000 TO $49,999	0.949	0.268	0.853	1.287	0.437	0.458
$50,000 TO $59,999	1.230	0.351	0.468	1.555	0.534	0.199
$60,000 TO $79,999	1.266	0.361	0.408	1.427	0.492	0.302
$80,000 or more	1.069	0.293	0.807	1.541	0.512	0.193
Physical activity (150 minutes physical activity per week):						
Respondent met the physical activity guideline minimum (reference)						
Not met the physical activity guideline-minimum	0.978	0.052	0.676	1.252	0.073	0.000
Self-rated health:						
poor (reference)						
fair	1.592	0.353	0.036	1.283	0.253	0.206
good	1.621	0.335	0.019	0.931	0.170	0.695
very good	1.411	0.291	0.095	0.545	0.100	0.001
excellent	1.065	0.224	0.766	0.317	0.061	0.000
Has chronic condition:						
No (reference)						
Yes	1.250	0.090	0.002	2.027	0.154	0.000
Type of smoker:						
daily smoker (reference)						
occasional smoker	1.256	0.170	0.092	1.413	0.214	0.023
Not at all	1.272	0.100	0.002	1.791	0.153	0.000
Alcohol consumption (% total energy intake from alcohol):						
Present (reference)						
Absent	1.201	0.066	0.001	1.235	0.074	0.000
Cons:	0.539	0.200	0.097	0.327	0.135	0.007

Source: Authors' calculation.

The analysis and discussion of results is limited to normal weight, overweight and obesity since the focus of this study is not on the underweight category of BMI[8].

Except for people aged 75 and above, all the age groups are significantly associated with an increased risk of being overweight or obese when compared to the reference age group of 18 to 24. For instance, the 35-44 age group have odd ratios 1.882 and 3.483 of being overweight and obese, respectively. Although there is a progressively positive relationship between age and the likelihood of being overweight or obese, the relationship breaks down after the age of 74 years

[8]For the purpose of all the analysis in the study, unless otherwise stated, significance is assumed to refer to a 5 percent level.

for the overweight category and 54 years for the obese category[9]. This result is consistent with most findings from other studies (Alter et al. 2012, Bélanger-Ducharme and Tremblay 2005, Mandal and Chern 2006, Ogden et al. 2006, Shields 2006).

Females were significantly less likely to be overweight or obese as compared to males with odds ratios of 0.508 for overweight females and 0.626 for obese females. A significant number of studies also have reported similar findings (Bélanger-Ducharme and Tremblay 2005, Edwards 2007, Huot et al. 2004, Kaplan et al. 2003, Katzmarzyk 2002, Mandal and Chern 2006). This result is not surprising, as relatively more females seem to be concerned with their appearance and a lot of cosmetic and weight loss programs and commercials target women.

All the variables under marital status were observed to have lower probability to be overweight or obese when compared to the married variable. For example, the single/never-married category showed a significantly lower probability to be overweight or obese when compared to the married person in the same category. A possible explanation for such results is that singles might want to stay in good shape to attract a marriage partner (Edwards 2007).

People born in Asia were significantly less likely to be overweight/obese than people born in Canada. People born in Europe and Africa also were observed to have lower probability of being obese when compared to people born in Canada. The results for people born in the U.S., South America, Central America and the Caribbean were inconclusive as they were not statistically significant different than those born in Canada.

People with higher education were less likely to be obese when compared to people with lower levels of education (i.e., less than high school diploma or its equivalent). For example, people with university certificates, diplomas, or degrees above the BA level were observed to be significantly less likely to be overweight/ obese when compared to people with less than high school diploma or its equivalent. This result is consistent with the findings of many previous studies. Generally, evidence suggests that the probability of being overweight or obese is lower as the education level increases (Edwards 2007, Huot et al. 2004, Kaplan et al. 2003, Mandal and Chern 2006, Oliver and Hayes 2005, Tan et al. 2011, Ward et al. 2007).

Surprisingly, people from the high household income categories were more likely to be overweight or obese in comparison to people from the lowest household income category[10]. A possible explanation of this result is that, in the quest to amass wealth, people might spend too much time at their workplaces to the extent that they are unable to find sufficient time to exercise. Furthermore, increased wealth might increase sedentary activities— the rich might prefer driving to walking. Ward et al. (2007) and Edwards (2007) found similar results in their studies. These results, however, contradict the findings of several other studies that observed a negative relationship between income and BMI

[9]See Figure 1 in the Appendix 2 for pictorial view of this relationship.

[10]It is important to note that the results were not statistically significant at the standard level of significance. Further analysis using the same methods, however, with the 2004 CCHS provided similar results that were statistically significant.

(Bélanger-Ducharme and Tremblay 2005, Le Petit and Berthelot 2005, Oliver and Hayes 2005, Shields 2006, Shields and Tjepkema 2006).

As expected, greater physical activity was observed to be negatively related to obesity. However, greater physical activity did not result in significant differences in the overweight category. Generally, the results agreed with most of the findings from previous studies (Constăngioară et al. 2009, Edwards 2007, Hajizadeh et al. 2016, Huot et al. 2004, Kaplan et al 2003, Le Petit and Berthelot 2005, Mandal and Chern 2006, Tjepkema 2006, Ward et al. 2007).

People who rate their health to be excellent were significantly less likely to be obese when compared with those who rate their health to be poor. This result is not surprising as obesity often has been associated with ill-health. Furthermore, the result was boosted by findings from the chronic condition variable. Those who responded "no" to having any chronic condition were found to be significantly less likely to be overweight or obese when compared to those who responded 'yes' to having at least one chronic condition. This agrees with the findings from most studies that observed a relationship between the presence or health history of comorbidities and overweight/obesity (Huot et al. 2004, Kaplan et al. 2003, Mokdad et al. 2003, Tan et al. 2011, Tjepkema 2006).

We found that occasional smokers and those who had never smoked had increased risk of being overweight or obese when compared to daily smokers. People who had never smoked were observed to have the highest likelihood of becoming overweight or obese. The results agreed with findings from previous studies (Edwards 2007, Hajizadeh et al. 2016, Huot et al. 2004, Kaplan et al. 2003, Mandal and Chern 2006, Tan et al. 2011, Ward et al. 2007). Interestingly, increased alcohol consumption was significantly associated with reduced likelihood of overweight and obesity. This finding is consistent with the findings from most studies. In view of this, some studies recommend moderate drinking as a measure to tackle obesity (e.g., Kaplan et al. 2003, Smothers and Bertolucci 2001). However, it is important to note that considering the other health risks associated with smoking and alcohol consumption, caution must be taken when proposing any overweight or obesity intervention programs based on these findings.[11]

[11]Fruit and vegetable intake is an important factor to consider when analysing determinants of overweight/obesity. However, it was impossible to explicitly analyse their impact on obesity using the current data as it was one of the modules that the 2015 CCHS dropped. Therefore, using the same methods, we analysed the 2004 CCHS-Nutrition (which also is measured data) to find the relationship between obesity and fruit/vegetable consumption. As expected, an increase in consumption of fruits and vegetables was significantly associated with lower probability of overweight and obesity. The full results are available upon request. The findings were consistent with literature on the subject (Auld and Powell 2006, Edwards 2007, Hajizadeh et al. 2016, Mandal and Chern 2006, Shields 2006, Tjepkema 2006, Ward et al. 2007).

Summary and Conclusion

Obesity and its attendant conditions have become a principle public health concern worldwide. The main objective of this study was to identify the socioeconomic and sociodemographic determinants of obesity in Canada. We further estimated the prevalence of obesity in Canada by using the latest available nationwide representative dataset based on measured heights and weights. By using descriptive statistics and an econometric model, we found that the prevalence of underweight, normal weight, overweight, and obesity among Canadian adults are 2.65 percent, 35.15 percent, 35.24 percent, and 26.97 percent, respectively. Hence, the analysis revealed that almost two-thirds of Canadians are overweight or obese. Additionally, groups of people that were observed to have increased probability of being obese include the aged, males, married, less educated, physically inactive, and people who consume fewer fruits and vegetables.

Specific policies should be directed to target certain groups of people who are at increased risk of the disease. Much of the awareness creation of the dangers of high caloric intake and obesity management education programs should be directed towards highly vulnerable groups. By critically analysing the socioeconomic and sociodemographic determinants of obesity, we observed that certain groups of people are more vulnerable to this condition than others. For example, older people are at increased risk of becoming obese when compared to the younger generation. In addition, other groups that are observed to have increased odds of being obese include males, married, less educated, physically inactive, and people who consume fewer fruits and vegetables.

Furthermore, preventive education programs should be directed towards less vulnerable groups like the younger generation to help them minimise their probability of becoming overweight or obese. Obesity prevention programs could be incorporated into the education curriculum at various levels of schools. This would ensure that people get the necessary knowledge about causes of the condition at early stages of their lives.

Based on findings of this study, a number of policy recommendations are proposed. Specific policies such as obesity awareness and education programs should be directed towards groups of people that were observed to be at increased risk of being overweight or obese. Overall, this study recommends the following main intervention measures to tackle the obesity problem: nationwide introduction of obesity education campaigns, as well as potentially stronger economic measures such as the introduction of subsidies on healthy foods with low calorie contents, and the introduction of taxes on unhealthy foods with overblown calorie contents.

The findings of our study emphasize the need for interventions and policies to reverse the rising prevalence of obesity and minimize its health impacts. The study's findings will also help policy and decision makers in priority setting and enactment of intervention measures aimed at effective promotion of healthy diets and physical activities. The prevalence of obesity has already reached epidemic proportions, which reinforces the need for the development of effective healthy lifestyle programs. Overall, there is a pressing need for public health measures to

prevent (or, at least, to reduce) obesity and to save health care costs and societal resources.

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Appendix 1: Multilevel Multinomial Logistic Regression Model

The following two-level model is considered for the response variable R, which takes on the value of $m$with probability $\Pr(R = m) = j_m$ for $m = 1,\ldots,4$.

$$\begin{aligned}
&\Pr(R_{ij} = 1) = j_{1,ij} \\
&\Pr(R_{ij} = 2) = j_{2,ij} \\
&\Pr(R_{ij} = 3) = j_{3,ij} \\
&\Pr(R_{ij} = 4) = j_{4,ij} = 1 - j_{1,ij} - j_{2,ij} - j_{3,ij}
\end{aligned} \qquad (1)$$

where, $R_{ij} = 1$ implies i^{th} individual from j^{th} province is underweight, $R_{ij} = 2$ implies i^{th}individual from j^{th}province is healthy, $R_{ij} = 3$ implies i^{th} individual from j^{th}province is overweight, and $R_{ij} = 4$ implies i^{th} individual from j^{th}province is obese. Then the MMLRM can be written as:

Level 1 model (individual): $\theta_{mil} = \beta_{0j(m)} + X'_{ij}\beta$ (2)

Level 2 model (province): $\beta_{0j(m)} = \alpha_{00(m)} + Z'_{0j(m)}\alpha + \mu_{0j(m)}$ (3)

where

$$\theta_{mil} = \log\left(\frac{\varphi_{mij}}{\varphi_{Mij}}\right) = \log\left(\frac{\Pr(R=m)}{\Pr(R=M)}\right), for\ m = 1,2,3. \qquad (4)$$

The error term is not included in the level one model since θ_{mil} is already expressed as an expected value of the indicator variables for the various classifications of Body Mass Index (Mandal and Chern 2006); $\beta_{0j(m)}$ is the individual level intercept and β is the vector of coefficients corresponding to a vector of individual level predictor variables X_{ij}; $\alpha_{00(m)}$ is the intercept at the province level; and α is the vector of coefficients corresponding to a vector of province level predictor variables $Z_{0j(m)}$. The random component term $\mu_{0j(m)}$ has multivariate normal distribution with component means of 0 and variance-covariance matrix Σ, i.e.,

$$\mu_{0j(m)} \sim MN(0, \Sigma) \qquad (5)$$

From (2) and (3), the combined model can be written as:

$$\theta_{mil} = \alpha_{00(m)} + X'_{ij}\beta + Z'_{0j(m)}\alpha + \mu_{0j(m)} \qquad (6)$$

where the first three terms in (6) are the fixed part of the model and the last term in (6) is the random part of the model showing the variation among provinces. For simplicity, the slopes are assumed to be constant at all levels.

The conditional likelihood contribution of the j^{th} cluster can be written as a multivariate integral over the correlated error terms (Rabe-Hesketh et al. 2005). The likelihood contribution for a given cluster j can be written as:

$$f_{ij}^{(2)} = \int \phi(\mu_{0j(m)}) \prod_{i=1}^{n_j} f_{ij}^{(1)}(\xi|\mu_{0j(m)}) d\mu_{0j(m)}, \qquad (7)$$

where ξ is a vector of all the model parameters; $\phi(.)$ represents the normal density with mean 0 and covariance matrix Σ and $f_{ij}^{(1)}(.)$ is the conditional likelihood contribution of unit i in cluster j which can be written as:

$$f_{ij}^{(1)}(\xi|\mu_{0j(m)}) = R_{ij}\Phi(\theta_{mij}) + (1 - R_{ij})\Phi(-\theta_{mij}) \qquad (8)$$

where $\Phi(.)$ is the standard normal cumulative distribution function and R_{ij} is the response vector given in (1).

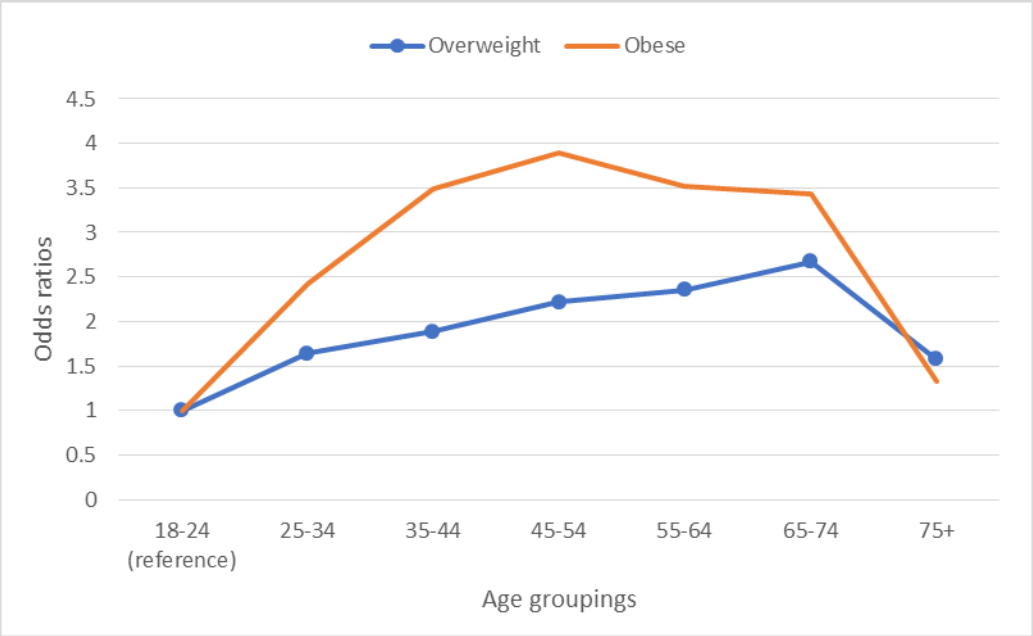
In order to estimate the MMLRM, we must evaluate and maximize the likelihood in (7) and (8). However, because of the complexity of the likelihood function due to the integral term in (7), it is very difficult to evaluate the likelihood contribution analytically. Therefore, it is necessary to approximate the maximum likelihood solution. One common approach to estimate the parameters is to evaluate the marginal likelihood numerically by applying Gauss-Hermite quadrature (Rabe-Hesketh et al. 2005). Specifically, we use the adaptive quadrature to evaluate and maximize the marginal log likelihood during the parameter estimation process due to its computational efficiency (Grilli and Rampichini 2006, Rabe-Hesketh et al. 2002). In addition, the integral in (7) is approximated using the numerical integration with 12 grid points. Increasing the number of grid points improves the approximation, however, in our experience, 12 points is often sufficient.

For clarity and ease of interpretation, the results from the MMLRM can be presented in terms of odds ratios by taking the exponential of equation (6). The MMLRM can be expressed in terms of odds ratios as follows:

$$\exp(q_{mil}) = \exp(a_{00(m)} + X_{ij}^{'} b + Z_{0j(m)}^{'} a + m_{0j(m)}) \qquad (9)$$

Appendix 2: Empirical Results

Figure 1. *Relationship between Age Group and Odds of Becoming Overweight/ Obese*



Source: Authors' calculation.

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Income Inequality, Health Outcomes and Financial Crisis: Novel Evidence

By Constantinos Alexiou[*]

This study revisits the existing relationship between income inequality and population health by subjecting it to a battery of empirical testing using different measures of inequality and health outcomes for 33 high-income OECD countries. Apart from the impact of macroeconomic covariates we also explore the effect of the global financial crisis (2007/8) on health outcomes. For the empirical investigation we have adopted panel cointegration analysis to obtain long-run estimates that are free of endogeneity bias. For robustness we also adopt a panel quantile regression (QR) in an attempt to provide a more detailed picture of the underlying relationships at several points of the conditional distribution. We find that in the long run, income inequality affects adversely population health which is also confirmed by the quantile estimates. The causal dimension however is more ambiguous whilst the global financial crisis is found to have an insignificant impact on health outcomes.

Keywords: *population health, income inequality, infant mortality, life expectancy, financial crisis*

Introduction

The debate over the role of income inequality as a one of the determinants of population health has been intense. Despite the various channels identified in the literature through which income inequality affects an individual's health the precise mechanism through which disparities in society's income distribution adversely affects health outcomes remains ambiguous. In this domain, various hypotheses have been developed that focus on the implications of increases in individual income on the marginal health benefits as well as the societal impact on income inequality (Lynch et al. 2004).

On the empirical front, the evidence suggests that there might be a negative relationship between income inequality and population health whilst the *relative income hypothesis*, i.e., the proposition that income distribution is an important determinant of population's health, is more complex that initially envisaged (Mellor and Milyo 2002, Osler et al. 2002, Shibuya et al. 2002, Deaton and Lubotsky 2003, Lynch et al. 2004). Despite the lack of empirical conviction, it is widely acknowledged that since the 1970s the growing income inequality observed in many countries has been detrimental to the welfare of the society (Atkinson et al. 1995, Lindert 2000).

The relationship between income inequality and health has significant implications for policy making as redistributive economic policies that target

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greater social justice and better population health should be considered in countries to promote a heathier population (Kawachi and Kennedy 1999, Pickett and Wilkinson 2015, Neumayer and Plumper 2016). The reverse causal dimension between income inequality and heath has also been proposed in the extant theoretical literature. The mechanisms through which health affects inequality are also explored through labor market effects, educational effects, and marriage market effects (see, Leigh et al. 2012).

On the effects of economic crises on health outcomes, prior research suggests that economic crises do positively affect mortality rates (and presumably other measures of health). The conventional wisdom holds that health deteriorates as the economy weakens and vice versa. An extensive empirical work by Brenner (1987) provided evidence in support of the belief that during recessions or other sources of economic instability, overall mortality as well as alcoholism and admissions to mental institutions increased markedly. At the time this piece of research was questioned on technical grounds (e.g., Wagstaff 1985) and later studies that addressed these concerns (e.g., Forbes and McGregor 1984), generated evidence that appeared to be sensitive to the choice of countries, time spans as well as proxies for health. Subsequent empirical studies using state of the art econometric and modelling techniques designed to overcome any previous limitations (e.g., Laporte 2004, Gerdtham and Johannesson 2005, Tapia Granados and Diez Roux 2009) failed to provide robust results, as the nature of the data sets used in all likelihood yielded biased estimates due in the main to important factors omitted from the estimations and spurious correlations that characterize economic conditions and health.

Undoubtedly, the recent global financial crisis (GFC) in 2007/8 has had a crippling effect on the global economy, and the reverberations of this shock can still be felt many years later (Alexiou and Nellis 2016). The resulting economic recession caused unemployment to increase in some countries uncontrollably wiping off a huge percentage of their GDP.

The concerted response of many governments to the devastating economic impact of the GFC was the implementation of austerity measures that mainly focused on cutting public spending, the privatization of public services and market deregulation (Escolar-Pujolar et al. 2014). The impact of these very policies resulted in further exacerbating the extant socioeconomic problems (Stuckler et al. 2009, Karanikolos et al. 2013).

On the empirical front, Atkinson and Morelli (2011) provided evidence of financial crises causing increases in inequalities; however they failed to establish a clear pattern as each crisis evolved in a different manner. Notwithstanding, it should be stressed that evidence of an increase in health inequalities during periods of economic crisis are paramount and effectively observed in the way the pattern of different health variables such as mortality, mental health, self-perceived health, alcohol abuse, crime rate has unravelled (Rajmil et al. 2013).

Prior to assessing the effects of income inequality on health we need to also clarify that inequality is distinctly different from poverty, in that income inequality might or might not be significantly associated with health, whereas poverty is almost invariably negatively correlated to health. According to Eibner and Evans

(2005) there is a strong and negative relationship between absolute poverty found in poor countries - where incomes are relatively unequal - and health.

In this study, we subject the relationship between income inequality and population health outcomes to a battery of empirical testing using different measures of inequality and health to check the robustness of our results. In this direction we adopt three alternative methodological frameworks that provide a) efficient long-run estimates b) insights of the underlying relationships at several points of the conditional distribution of the dependent variable(s) and c) evidence on the causal dimension of the variables under scrutiny. Finally, the impact of the global financial crisis (2007/8) is also considered.

The rest of the paper is organized as follows. Next section touches on the methodological frameworks utilized for the empirical investigation whilst the section afterwards presents and discusses the results. Finally, some concluding remarks are provided.

Methodology

Our intention to collect data for both high-income OECD countries as well as for developing economies was hampered by data availability. As a result, due to too many missing observations in the sample with the developing economies, we decided to drop the initial idea of conducting a comparative analysis, and instead resorted to a dataset of 33 high-income OECD economies that spans the period 1990 to 2017. The dataset consists of the following high income OECD countries: Australia, Austria, Belgium, Canada, Chile, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Latvia, Lithuania, Luxembourg, Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, United Kingdom, United States.

The baseline regression model of the health outcomes regression is a variant of the standard specifications encountered in the literature (see, Beckfield 2004).

$$\text{health}_{it} = a_0 + a_1\text{inequality}_{it} + a_2X_{it} + \varphi_1\text{crisis}_{it} + \varepsilon_{it}$$

where health denotes health outcomes as these are captured by infant mortality (infmort), and life expectancy (lifexpe); Inequality is captured by two measures based on the gini coefficient (i.e. ginidisp and ginimkt); X_{it} is a vector of control variables consisting of a GDP per capita (gdppc), education (edu), employment (EMP), health expenditure (healthgdp) and a dummy variable (crisis) that captures the 2007/8 global financial crisis.

We utilize the Gini index of inequality in equivalized household disposable income (post-tax, post-transfer) and a Gini index of inequality in equivalized household market income (pre-tax, pre-transfer) as advanced by Solt (2020). In so far as benefits assume a key redistributive role in alleviating inequality, we are of the view that benefits (as a share of income) tend to be more concentrated at the bottom of the income distribution than direct taxes and therefore have a greater

bearing than direct taxes in the redistribution process (Bourquin and Waters 2019). In view of this we opted for incorporating both measures of income inequality for robustness and comparison purposes. The Standardized World Income Inequality Database (SWIID 8.3) and the World Development Indicators (World Bank) were the main providers for the data used in this study. (See Tables A1 and A4 in the appendix for sources, definition of variables and descriptive statistics).

Cointegration Analysis

For the empirical investigation we have adopted panel cointegration analysis in an attempt to explore the relationship between health outcomes and inequality by obtaining long-run estimates that are free of endogeneity bias (see, e.g., Engle and Granger 1987).

Prior to engaging with cointegration analysis it is imperative that we check our series for unit roots. In lieu of the traditional tests for unit roots such as DF (Dickey-Fuller) or ADF (Augmented Dickey-Fuller) tests we utilize more robust testing techniques that have been shown in the respective literature to perform more efficiently than the traditional unit root tests applied to individual series (see Levin et al. 2002, Im et al. 2003). Evidence of a stationary linear relationship suggests that the non-stationary time series are cointegrated in which case a long-run equilibrium relationship amongst the variables of interest can be established.

In this direction we adopt a panel cointegration test that was advanced by Pedroni (2004). These tests are formulated as follows:

$$y_{it} = \alpha_i + \beta_1 X_{1,i,t} + \beta_2 X_{2,i,t} + \ldots\ldots + \beta_n X_{n,i,t} + v_{it} \quad (1)$$

where $X_{i,t}$ are the regressors and n the cross-sections. The residual regression equation assumes the following form:

$$v_{i,t} = \zeta_i v_{i,t-1} + z_{i,t.} \quad (2)$$

During this process the seven different statistics (i.e., Panel-v, panel-rho, panel non-parametric-t and panel parametric-t, group-rho, group non-parametric-t and group parametric-t) are estimated. Pesaran et al. (1999), argues that a dynamic heterogeneous regression can be embedded into the error correction specification by means of the ARDL approach to cointegration.

We employ an autoregressive distributed lag model (ARDL, p,q) in an attempt to obtain efficient long-run estimates. The general empirical specification of the ARDL expression can be modelled as follows:

$$Y_{it} = \sum_{j=1}^{p} \xi_{ij} y_{i,t-j} + \sum_{j=0}^{q} \zeta_{ij} X_{i,t-j} + v_t + \varepsilon_{it} \quad (3)$$

where X_{it} is a vector of explanatory variables and v_t captures the group-specific effect; i denotes cross-sections and t denotes time. In the context of cointegration the error term is an I(0) process and through re-parametrizing (3) the error correction specification can expressed in the following terms:

$$\Delta Y_{it} = \lambda_i y_{i,t-j} - \mu_i X_{i,t-j} \sum_{j=1}^{p-1} \xi_{ij} \Delta y_{i,t-j} + \sum_{j=0}^{q-1} \zeta_{ij} \Delta X_{i,t-j} + v_t + \varepsilon_{it} \quad (4)$$

where λ_i is the error correction coefficient which captures the speed of adjustment.

The ARDL specification and in particular the Pooled Mean Group estimator, provides consistent coefficients - as it includes lags of both dependent and independent variables - regardless of whether the regressors are exogenous or endogenous and irrespective of whether the variables are I(0) or I(1). The presence however of I(2) variables invalidates the methodology (Pesaran et al., 1999).

Further Empirical Probing: A Panel Quantile Approach

Broadly speaking, the traditional linear regression model looks at the relationship between a number of independent variables X, and a dependent variable y, based on the conditional mean function E(y|X). This rather narrow approach can be further enhanced by assessing the relationship between y and X at different points in their conditional distribution.

In an attempt to check the robustness of our results, we adopt a panel quantile regression (QR) in an attempt to provide a more detailed picture of the underlying relationships at several points of the conditional distribution of y simultaneously. QR which traces its origins to the seminal paper by Koenker and Bassett (1978) is more robust to non-normal errors and outliers; according to Alexiou and Vogiazas (2020) "it permits a richer characterization of the data by allowing us to consider the impact of a covariate on the entire distribution of y, not merely its conditional mean" (p. 301).

Most panel quantile estimators in the respective literature include additive fixed effects in the quantile function and provide estimates about the distribution of $(Y_{it} - f_i | G_{it})$, where Y_{it} is the outcome, G_{it} are exogenous variables, and f_i stands for fixed effects. According to Powell (2016), observations at the top of $(Y_{it} - f_i)$, may actually be at the bottom of the Y_{it} distribution and, consequently, additive fixed effect models can provide information about the outcome-relative-to-fixed-effect distribution rather than the effects of the treatment variables on the outcome distribution.

In this context, Powell (2016) proposes a panel data quantile method that provides estimates for the distribution of $(Y_{it} | D_{it})$, while allowing for individual level heterogeneity and maintaining the non-separable disturbance term typically used in quantile estimation. Most importantly the panel quantile estimator produces point estimates that can be interpreted in a similar way as cross-sectional regression results and are consistent for small *T*.

The regression model for quantile level τ of the response is given by:

$$Q_\tau(y_i) = \beta_0(\tau) + \beta_1(\tau)x_{i1} + \ldots + \beta_p(\tau)x_{ip}, \; i = 1, \ldots, n \quad (1)$$

and the β_j's are estimated by solving the least squares minimization problem:

$$\min_{\beta_{0(\tau)},\ldots,\beta_{p(\tau)}} \sum_{i=1}^{p} \rho_\tau(y_i - \beta_0(\tau) - \sum_{j=1}^{p} x_{ij}\beta_j(\tau)) \quad (2)$$

where $\rho_\tau(r) = \tau \max(r, 0) + (1 - \tau)|\max(-r, 0)$. Then, for each quantile level τ, the solution to the minimization problem yields a distinct set of regression coefficients.

Finally, in modelling the relationship between health and income one issue that should also be considered related to the reverse causality and the possibility of income being affected by health, in which case the impact of income on health may be overestimated. To address this issue, the causal dimension of the series is also examined by means of Granger Causality test to establish the direction of causality of the key variables (see Table A3 in Appendix).

Findings and Discussion

We commence our analysis by establishing the order of integration of the variables included in the models. An inspection of Table A2 in the Appendix suggests that our series exhibit a mixed order of integration, i.e., I(0) and I(1) as well as evidence of cointegration.

Table 1. *Long Run Estimates*

Variables	**Model 1 infmort**	**Model 2 infmort**	**Model 3 lifeexpe**	**Model 4 lifeexp**
ginidisp	0.211***		-1.874***	
	(0.01)		(0.146)	
ginimrkt		0.192***		-2.236***
		(0.009)		(0151)
emp	-0.219***	0.007	0.283***	-0.091
	(0.016)	(0.007)	(0.08)	(0.089)
Lgdppc	-2.412***	-2.651***	1.783***	1.612***
	(0.031)	(0.067)	(0.034)	(0.051)
gdppc^2	1.023***	1.046***	-1.912***	-1.389***
	(0.067)	(0.082)	(0.091)	(0.0089)
healthgdp	-0.297***	-0.388***	0.873***	2.088***
	(0.025)	(0.026)	(0.210)	(0.219)
inf	0.142***	0.08***	0.317*	0.224***
	(0.020)	(0.020)	(0.210)	(0.831)
edu	-0.234***	-0.371***	0.932***	0.835***
	(0.015)	(0.027)	(0.201)	(0.220)
crisis	0.638	0.872	-1.251	-1.981
	(0.892)	(0.845)	(1.037)	(1.971)

Notes: Robust standard errors in parentheses: ***, ** and * denote statistical significance at the 1%, 5% and 10% significance levels, respectively.

Table 1 presents the long-run estimates of the four different specification. More specifically, according to models 1 and 2 – which use infant mortality

(infmort) as the dependent variable – both measures of income inequality (ginidisp and ginimkt) are found to be highly significant indicating that high income inequality is positively associated with higher infant mortality which is line with our prior expectations (see also Beckfield 2004).

The effects of level of education (edu) and employment (emp) on infant mortality are found to be negative and significant which is in line with our expectations. Similar results are also established by Ko et al. (2014). Health expenditure (healthgdp) is highly significant bearing a negative sign. It should be stressed however that health expenditure might be indeed assumed to improve health outcomes but the underlying relationship in the literature appears to follow a social gradient, where the infant mortality dwindles the most in the poorest quintiles (see, Baker et al. 2018).

In so far as, potential nonlinearities may exist between health outcomes and income (Gravelle et al. 2002) we have incorporated in our model a squared term (Lgdppc^2). GDP per capita is found to be negatively related to infant mortality whilst the squared term exhibits a positive association.

The measure of inflation (inf) is also significant exerting a positive impact on infant mortality whereas the dummy variable that captures the 2007/8 global financial crisis is found to be insignificant. The latter might provide sustenance to the concerns of those who question the impact of economic crises on health outcomes on mainly technical grounds (Gravelle et al. 1981) as the evidence are case sensitive i.e. depend on to the choice of countries, time spans as well as proxies for health.

When life expectancy (lifeexpe) is employed as a dependent variable, (models 3 and 4) the signs of the explanatory variables are in line with our expectations. More specifically, the significant and negatively signed measures suggest that as income inequality increases life expectancy dwindles (see Beckfield 2004, Mayrhofer and Schmitz 2014). Neumayer and Plumper (2016) in similar study, examining the effects of market income inequality and income redistribution via taxes and transfers on inequality in longevity using a cross-sectional time-series sample of up to 28 predominantly Western developed countries found that "income inequality before taxes and transfers was positively associated with inequality in the number of years lived; income redistribution (the difference between market income inequality and income inequality after taxes and transfers were accounted for) was negatively associated with longevity inequality" (p. 160).

Moreover employment (emp), GDP per capita (gdppc), health expenditure (healthgdp), education (edu) and inflation are found to be positively affecting life expectancy whilst the non-linear term (gdppc^2) is found to be negative and significant which is in line with the results produced by Gravelle et al. (2002). The crisis dummy however as previously fails to register a significant result.

Table 2. *Short Run Estimates*

Variables	**Model 5 D(infmort)**	**Model 6 D(infmort)**	**Model 7 D(lifeexpe)**	**Model 8 D(lifeexp)**
Error Correction	-0.082***	-0.077***	-0.069***	-0.013***
	(0.0062)	(0.0060)	(0.0057)	(0.150)
D(ginidisp)	0.103*		0.091	
	(0.061)		(0.062)	
D(ginimrkt)		0.155**		-0.114**
		(0.07)		(0.055)
D(emp)	0.016*	0.021**	-0.061***	-0.045*
	(0.010)	(0.011)	(0.022)	(0.024)
D(gdppc)	-2.563***	-2.451***	1.071	1.132
	(0.023)	(0.036)	(1.051)	(1.893)
D(gdppc^2)	1.711	1.982	0.981	0.769
	(1.008)	(1.567)	(0.969)	(0.852)
D(healthgdp)	-0.077***	-0.094***	0.135	0.051
	(0.025)	(0.032)	(0.085)	(0.076)
D(inf)	0.002	-0.001***	0.0005	-0.001
	(0.004)	(0.0043)	(0.009)	(0.008)
D(edu)	-0.025**	-0.023**	0.031	0.049
	(0.014)	(0.012)	(0.245)	(0.156)
crisis	0.012	0.035	-1.871	-1.461
	(0.028)	(0.236)	(2.4620	(1.522)
Constant	4.016***	9.15***	4.348***	12.20***
	(0.412)	(0.843)	(0.589)	(1.033)
No. of Obs.	609	609	609	609
Log LL	-769.6	-735.4	-217.3	-225.1

Notes: Robust standard errors in parentheses: ***, ** and * denote statistical significance at the 1%, 5% and 10% significance levels, respectively.

As far as the short run estimates are concerned (see Table 2) the results are more ambiguous. To start with, the error correction term in all estimated models is found to be statistically significant and negative indicating the direction and speed of adjustment to its long-run equilibrium levels. The estimation results pertaining to models 5 and 6 are more or less akin to the respective ones established previously when the long run specifications were considered. In models 7 and 8 only one measure of inequality (ginimkt) is found to be significant bearing a negative sign whilst out of the rest of the control variables only employment is found to negatively affect life expectancy. The rest of the variables are found to be insignificant in both specifications including those that measured nonlinearities.

Table 3. *Table Quantile Regressions – Dependent Variable: Infant Mortality (infmort)*

Model 9								
Quantile	ginidisp	emp	Lgdppc	Lgdppc^2	healthgdp	inf	edu	crisis
0.10	0.111*** (0.020)	-0.022** (0.011)	-2.3671*** (0.02)	0.932*** (0.0763)	-0.111* (0.064)	0.187*** (0.046)	-0.026* (0.014)	-0.132 (0.154)
0.20	0.113*** (0.023)	-0.024* (0.014)	-2.672*** (0.078)	0.783*** (0.093)	-0.125** (0.050)	0.260*** (0.030)	-0.026** (0.014)	-0.298 (0.366)
0.30	0.139*** (0.015)	-0.032*** (0.012)	-1.631*** (0.063)	0.782** (0.0248)	-0.076* (0.040)	0.231*** (0.031)	-0.029*** (0.010)	-0.273 (0.260)
0.40	0.135*** (0.013)	0.041*** (0.009)	-1.983*** (0.073)	0.873*** (0.021)	-0.078*** (0.029)	0.232*** (0.038)	-0.029*** (0.006)	-0.285 (0.353)
0.50	0.138*** (0.016)	-0.046*** (0.009)	-1.975*** (0.063)	0.945*** (0.039)	-0.040 (0.032)	0.226*** (0.064)	-0.026*** (0.007)	-0.352 (0.360)
0.60	0.134*** (0.016)	0.039*** (0.009)	-1.782*** (0.046)	0.372*** (0.092)	-0.023 (0.028)	0.260*** (0.054)	-0.016*** (0.007)	-0.404 (0.555)
0.70	0.118*** (0.013)	-0.042*** (0.010)	-2.632*** (0.0728)	0.356*** (0.094)	-0.017 (0.026)	0.321*** (0.054)	-0.008 (0.006)	-0.459 (0.657)
0.80	0.120*** (0.011)	0.035*** (0.014)	-1.892*** (0.0467)	0.542*** (0.036)	-0.010 (0.024)	0.307*** (0.046)	0.001* (0.009)	-0.567 (0.566)
0.90	0.110*** (0.018)	0.0118 (0.020)	-2.679*** (0.0683)	0.467*** (0.067)	-0.002 (0.031)	0.248*** (0.032)	0.026*** (0.013)	-0.376 (0.279)
Model 10								
Quantile	ginimkt	emp	Lgdppc	Lgdppc^2	healthgdp	inf	edu	crisis
0.10	0.083*** (0.021)	-0.005 (0.012)	-2.901*** (0.028)	0.189*** (0.058)	0.003 (0.055)	0.207*** (0.059)	-0.014 (0.013)	-0.238 (0.182)
0.20	0.073*** (0.020)	-0.016 (0.012)	-2.893*** (0.278)	0.134*** (0.066)	0.008 (0.052)	0.248*** (0.037)	-0.012 (0.012)	-0.270 (0.151)
0.30	0.062*** (0.023)	0.013 (0.012)	-2.395*** (0.493)	0.150*** (0.058)	0.013 (0.049)	0.217*** (0.045)	-0.002 (0.013)	-0.208 (0.247)
0.40	0.065** (0.031)	-0.025*** (0.012)	-3.892*** (0.789)	0.144*** (0.062)	-0.009 (0.050)	0.254*** (0.047)	-0.003 (0.017)	-0.449 (0.168)
0.50	-0.030 (0.038)	-0.047*** (0.010)	-3.533*** (0.383)	0.112*** (0.044)	-0.050 (0.053)	0.249*** (0.067)	0.011 (0.022)	-0.388 (0.366)
0.60	0.005 (0.035)	0.052*** (0.010)	-2.803*** (0.478)	0.180*** (0.046)	-0.083 (0.061)	0.258*** (0.062)	0.027 (0.021)	-0.398 (0.371)
0.70	0.014 (0.030)	-0.060*** (0.009)	-2.784*** (0.493)	0.201*** (0.037)	-0.105 (0.056)	0.265*** (0.046)	0.025 (0.018)	-0.447 (0.559)
0.80	-0.013 (0.021)	0.054*** (0.014)	-3.034*** (0.789)	0.214*** (0.031)	-0.066 (0.075)	0.269*** (0.043)	0.042 (0.014)	-0.549 (0.697)
0.90	0.005 (0.018)	-0.016 (0.018)	-2.454*** (0.209)	0.238*** (0.030)	0.053 (0.027)	0.200*** (0.042)	0.072 (0.015)	-0.347 (0.268)

Notes: Standard error in parenthesis for each quantile (t). ***, ** and * denote statistical significance at the 1%, 5% and 10% significance levels, respectively.

Table 4. *Quantile Regressions – Dependent Variable: Life Expectancy (Lifeexpe)*

Model 11								
Quantile	ginidisp	emp	Lgdppc	Lgdppc^2	healthgdp	inf	edu	crisis
0.10	-0.316*** (0.089)	0.184*** (0.078)	2.789*** (0.933)	0.153 (0.187)	0.102 (0.131)	-0.321 (0.114)	0.493*** (0.060)	1.186 (0.583)
0.20	-0.141*** (0.047)	0.043 (0.052)	3.821*** (0.781)	0.136 (0.096)	0.532*** (0.209)	-0.137*** (0.094)	0.616*** (0.032)	0.344 (0.589)
0.30	-0.110*** (0.046)	0.054 (0.041)	3.012*** (0.678)	0.139 (0.073)	0.586*** (0.173)	-0.148*** (0.092)	0.629*** (0.030)	0.141 (0.432)
0.40	-0.131*** (0.049)	0.066 (0.037)	2.876*** (0.692)	0.190* (0.069)	0.717*** (0.155)	-0.182*** (0.102)	0.615*** (0.030)	0.220 (0.427)
0.50	0.153*** (0.045)	0.040* (0.031)	2.916*** (0.872)	0.178*** (0.046)	0.675*** (0.136)	-0.258*** (0.106)	0.635*** (0.027)	-0.059 (0.411)
0.60	0.140*** (0.044)	0.048 (0.026)	3.043*** (0.891)	0.250*** (0.047)	0.646*** (0.126)	-0.248*** (0.114)	0.646*** (0.023)	-0.020 (0.436)
0.70	-0.145*** (0.048)	0.065** (0.022)	2.738*** (0.561)	0.229*** (0.047)	0.498*** (0.119)	-0.322*** (0.109)	0.658*** (0.021)	0.236 (0.482)
0.80	-0.109*** (0.045)	0.069*** (0.020)	2.984*** (0.783)	0.244*** (0.039)	0.433*** (0.129)	-0.436*** (0.090)	0.683*** (0.019)	0.204 (0.451)
0.90	0.196*** (0.060)	0.019*** (0.023)	2.984*** (0.714)	0.274*** (0.030)	0.436** (0.195)	-0.414*** (0.088)	0.696*** (0.025)	0.630 (0.547)
Model 12								
Quantile	ginimkt	emp	Lgdppc	Lgdppc^2	healthgdp	inf	edu	crisis
0.10	-0.596*** (0.116)	0.156*** (0.048)	2.311*** (0.136)	0.298 (0.308)	0.137*** (0.075)	-0.108 (0.079)	0.317*** (0.067)	0.524 (0.512)
0.20	-0.428*** (0.064)	0.103*** (0.039)	2.069*** (0.781)	0.278 (0.328)	0.482*** (0.144)	-0.174*** (0.090)	0.422*** (0.039)	0.183 (0.419)
0.30	0.320*** (0.050)	0.107*** (0.035)	3.072*** (0.042)	0.286 (0.291)	0.507*** (0.125)	-0.209*** (0.075)	0.489*** (0.032)	-0.157 (0.458)
0.40	-0.293*** (0.049)	0.103*** (0.037)	3.221*** (0.834)	0.176 (0.318)	0.498*** (0.122)	-0.249*** (0.082)	0.514*** (0.034)	-0.311 (0.486)
0.50	0.297*** (0.057)	0.072*** (0.034)	3.489*** (0.158)	0.065 (0.163)	0.610*** (0.116)	-0.235*** (0.098)	0.527*** (0.039)	-0.159 (0.447)
0.60	-0.303*** (0.066)	0.082*** (0.027)	2.583*** (0.373)	0.005 (0.155)	0.484*** (0.121)	-0.301*** (0.126)	0.544*** (0.041)	-0.047 (0.461)
0.70	0.294*** (0.055)	0.069*** (0.022)	3.448*** (0.933)	0.313 (0.192)	0.451*** (0.119)	-0.260*** (0.096)	0.566*** (0.034)	-0.212 (0.434)
0.80	-0.305*** (0.047)	0.073*** (0.019)	2.433*** (0.671)	0.582*** (0.128)	0.407*** (0.130)	-0.300*** (0.088)	0.572*** (0.028)	-0.044 (0.490)
0.90	-0.332*** (0.043)	0.062*** (0.020)	2.043*** (0.185)	0.681*** (0.069)	0.415*** (0.180)	-0.417*** (0.084)	0.577*** (0.026)	1.090* (0.579)

Notes: Standard error in parenthesis for each quantile (t). ***, ** and * denote statistical significance at the 1%, 5% and 10% significance levels, respectively.

Tables 3 and 4 report the quantile regression estimates. As it can be discerned the previous long run estimated are confirmed at different points in the conditional distribution. In particular panel quantile regression analysis appears to be supporting the significant and adverse effect inequality can have on health outcomes. GDP per capita is also found to play a key role in determining health outcomes. When nonlinearities were explored it appears that in the specification where infant

mortality is the dependent variable, the squared term (gdppc^2) is highly significant bearing a positive sign and suggesting that too much income over time might cause infant mortality to increase. In the specification where life expectancy is the dependent variable the results are more ambiguous as the nonlinear term is found to be insignificant at the lower points of the conditional distribution but positive and highly significant at higher points suggesting that wealthier people are expected to live longer as their income increases.

As for the rest of the variables, health expenditure, in the infant mortality specification turns out to be negative and significant only at the lower points of the conditional distribution of model 9. In the specification where life expectancy is the dependent variable (models 11 and 12) however health expenditure appears to be having a positive and highly significant impact. Likewise, education is found to be significantly associated with infant mortality only in model 9 whereas in models 11 and 12 it is found to be significant bearing a positive sign. Price stability is found to be significant across all models whilst the dummy variable that accounts for the 2007/8 global economic crisis was found to be insignificant across all estimated models.

Finally, the Granger causality tests did not reveal any consistent and significant patterns (Table A3 in Appendix). More specifically, no causality was established between life expectancy and ginidisp, whilst a bidirectional feedback was established between life expectancy and ginimkt. The same pattern was also observed when the causal dimension between infant mortality and the two measures of inequality were considered. This stands in stark contrast to the study by Pickett and Wilkinson (2015) who, by reviewing the relevant literature, concluded that "the evidence that large income differences have damaging health and social consequences is strong and in most countries inequality is increasing. Narrowing the gap will improve the health and wellbeing of populations" (p. 316).

Conclusions

Previous socioeconomic studies suggest that income inequality should be perceived as a consequence of political and cultural factors as well as other holistic aspects that relate to health determinants at both micro and macrolevel. The existence of any a direct effect of income inequality on health outcomes is reduced to a hypothesized relationship that works through one or more health determinants.

The estimates generated in this study suggest that income inequality adversely affects health outcomes which is consistent with previous studies conducted in the area (see, Torre and Myrskylä 2014). Quantile regressions confirm in the most categorical manner that inequality negatively affects health outcomes at different points in the conditional distribution. The Granger causality tests however failed to reveal any consistent patterns, suggesting that the causal dimension is more convoluted than it is normally perceived.

As income per capita may reflect the economic conditions in a country, it has become customary in the large empirical literature on the determinants of health outcomes that GDP per capita is included as one of the key explanatory variables

that potentially have a significant effect on health outcomes. As Pritchett and Summers (1996) argue wealthier nations are bound to be healthier nations and any gains from rapid economic growth will be translated into health gains. Health outcome may also depend on country-specific factors such as education, nutrition or the speed and effective delivery of health-related services but also on exogenous factors such as for instance, advances in medical technology and the diffusion of health technology (Preston 2007).

Despite the highly significant effect that GDP per capita exerts on health outcomes the causal dimension however still remains ambiguous. More specifically the granger causality test points to a) a one-way direction that runs from life expectancy to income and b) a one way direction from income to infant mortality. Finally, the recent global economic crisis 2007/2008 was found to be insignificant across all estimated models.

Determining the key variables that can potentially affect health outcomes is indeed a complex modelling exercise as there are a host of factors that should be considered. Despite the robust results this study has generated it should be noted that the expected estimation outcomes might not be so straight forward to interpret as a number of inherent elements such as reciprocal association or relationships with time lags should also be taken into account.

Undoubtedly, health outcomes improve when income differentials shrink, and societies become more socially cohesive. A healthy population contributes to productivity gains and economic growth as well as to the sustainability of an ageing population. The lessons that policy makers should learn from, yet another study, is that decisions which increase inequality in our society, apart from creating a great sense of unfairness and injustice, are also bound to affect our wellbeing. Redistributive policies that target income inequality are therefore needed to improve both societal coherence and population health.

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Appendix

Table A1. *Description of Variables*

Variable	Definition	Source
ginidisp	Gini index of inequality based on household disposable (post-tax, post-transfer) income.	Standardized World Income Inequality Database, version 8.0, Solt (2019) (https://fsolt.org/swiid/)
ginimkt	Gini index of inequality based on household market (pre-tax, pre-transfer) income.	Standardized World Income Inequality Database, version 8.0, Solt (2019)
emp	Employment to population ratio (total %).	World Development Indicators, World Bank
healthexp	General government health expenditure (% of GDP).	World Development Indicators, World Bank
Lgdppc	Natural log of Gross Domestic Product per capita (US dollars).	Economic Outlook, OECD
inf	Inflation, consumer prices (annual %).	World Development Indicators, World Bank
edu	School enrolment (% gross).	World Development Indicators, World Bank
crisis	Crisis dummy (1 for the period 2007 onwards, and 0 otherwise.	
infmort	Mortality rate, infant (per1,000 live births)	World Development Indicators, World Bank
lifeexp	Life expectancy at birth, total (years)	World Development Indicators, World Bank

Table A2. *Panel Unit Root Tests (PANEL A) and Panel Cointegration (PANEL B)*

PANEL A	Levin, Lin Chu		Im, Pesaran and Shin		Fisher ADF		Fisher PP	
	Stat	p-value	Stat	p-value	Stat	p-value	Stat	p-value
infmor	-14.7	0.00***	-13.3	0.00***	319.8	0.00***	592.4.2	0.00***
lifeexpe	-2.2	0.01***	-11.7	0.00***	23.6	0.09*	43.1	0.11
D(healthgdp)	-13.2	0.00***	-9.4	0.00***	210.4	0.00***	304.2	0.00***
D(inf)	-37.5	0.00***	-28.7	0.00***	362.07	0.00***	385.57	0.00***
edu	-6.2	0.00***	-7.1	0.00***	109.3	0.00***	160.3	0.00***
emp	-2.4	0.01***	-2.4	0.01***	89.5	0.03**	290.1	0.03**
D(Lgdppc)	-2.6	0.00***	-7.8	0.00***	140.4	0.00***	121.0	0.00***
ginidisp	-5.2	0.00***	-2.4	0.00***	105.21	0.00***	116.7	0.00***
ginimrt	-6.4	0.00***	-2.7	0.00***	114.7	0.00***	187.14	0.00***

Notes: "D" denotes first difference i.e. the number of times the variable had to be differenced to become stationary. In this case these variables integrated of order 1 i.e. I(1) whereas the rest are I(0). ***, ** and * denote statistical significance at the 1%, 5% and 10% significance levels, respectively;

PANEL B			Weighted	
	Statistic	Probability	Statistic	Probability
Panel v	-0.083*	0.466	-3.89*	0.082
Panel rho	-3.671	0.872	-4.17	0.79
Panel PP	-2.103***	0.01	-8.69**	0.00
Panel ADF	-1.469**	-0.07	-1.80**	-0.03
Group rho	-4.56*	-0.08		
Group PP	-9.03***	0.00		
Group ADF	-2.92***	0.00		

Notes: Pedroni (2004) residual cointegration tests. The null hypothesis is no cointegration. The models have been specified with deterministic intercept and trend. ***, ** and * denote statistical significance at the 1%, 5% and 10% significance levels, respectively; Lag selection chosen according to Swartz Information Criterion.

Table A3. *Pairwise Causality Tests*

Null Hypothesis:	F-Statistic	Null Hypothesis:	F-Statistic
lifeexpe does not Granger Cause gdppc	11.1173***	lifeexpe does not Granger Cause healthgdp	0.05518
gdppc does not Granger Cause lifeexpe	2.48974	healthgdp does not Granger Cause lifeexpe	0.92036
infmort does not Granger Cause gdppc	1.61128	infmort does not Granger Cause healthgdp	1.82113
gdppc does not Granger Cause infmort	11.4111***	healthgdp does not Granger Cause infmort	158.135***
lifeexpe does not Granger Cause ginidisp	0.9169	lifeexpe does not Granger Cause inf	27.9028***
ginidisp does not Granger Cause lifeexp	0.00146	inf does not Granger Cause lifeexpe	94.0016***
lifeexpe does not Granger Cause ginimkt	48.4059***	infmort does not Granger Cause inf	36.4453***
ginimkt does not Granger Cause lifeexpe	6.02649***	inf does not Granger Cause infmort	71.6669***
infmort does not Granger Cause ginimkt	80.1270***	lifeexpe does not Granger Cause edu	0.96197
ginimkt does not Granger Cause infmort	26.01733***	edu does not Granger Cause lifeexpe	4.55283**
infmort does not Granger Cause ginidisp	0.8934	infmort does not Granger Cause edu	0.39888
ginidisp does not Granger Cause infmort	0.0788	edu does not Granger Cause infmort	22.2458***

Notes: ***, ** and * denote statistical significance at the 1%, 5% and 10% significance levels, respectively; Lag = 1.

Table A4. *Descriptive Statistics*

	ginidisp	ginimkt	healthgdp	infmort	lifeexpe	Lgdppc	edu	inf
Mean	30.00237	47.54772	5.995916	4.241530	78.95976	10.38283	102.1775	2.324639
Median	29.50000	47.90000	6.052636	3.900000	79.71951	10.56582	101.4939	2.081269
Maximum	48.50000	53.90000	9.278431	11.50000	83.60244	11.62597	126.5754	15.40232
Minimum	22.40000	37.20000	2.495476	1.500000	70.25854	8.843101	94.52988	-4.478103
Std. Dev.	4.646663	3.513979	1.560873	1.582508	2.990550	0.623446	4.160868	2.101558

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The Effect of the Creative Drama Activities on Shyness, Self-Esteem, and Mental Well-Being

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The purpose of this study was to investigate the effect of creative drama on the levels of shyness, self-esteem, and mental well-being in disadvantaged youth. This study was planned in a single group pretest-posttest design. 10 sessions of creative drama activities were held for each group by the drama-trained researchers approximately 120 minutes per week. The data of the study were collected by using the Personal Information Form, Coopersmith Self-esteem Inventory, Warwick - Edinburgh Mental Well-Being Scale, and Shyness Scale. After transferring the data to the computer-aided SPSS package program, the data were evaluated using percentages, averages and significance tests. While the Self-Esteem Scale average score was 59.846 ± 14.986, the Shyness Scale average score was 61.153 ± 15.032 and Warwick-Edinburg Mental Well-Being Scale average score was 51.096 ± 8.661 before the intervention, it respectively changed to 71.923 ± 13.430, 49.230 ± 12.267 and 55.384 ± 9.088 and these differentiations in all three dimensions were found to be statistically significant. It was observed that 10-week creative drama sessions increased the level of self-esteem and mental well-being of disadvantaged students as well as decreasing the level of shyness.

Keywords: *youth, creative drama, self-esteem, shyness, mental stress*

Introduction

The physical and mental health problems of young people socially and emotionally affect the individual, family, and society. Notably, these health problems are observed to be more common among young people living in disadvantaged conditions. Causes such as poverty, substance use, some mental illnesses, family problems, childhood traumas, some chronic illnesses pose some economic and social-based problems that impose difficult living conditions for young people (Health Foundation 2018, WHO 2019).

Mental and accompanying physical problems such as depression, fear, anxiety, decreased self-esteem, eating disorders, obsessive-compulsive behavior disorders, post-traumatic stress disorder are more common in young people with disadvantaged conditions. A decrease in self-respect or self-esteem, in particular, may cause individuals to feel worthless and deterioration of social relationships at all developmental stage (Harris and Orth 2019, Orth 2018). The mentioned problems can significantly reduce the quality of life in young people by constantly

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occupying their minds. In order to get rid of it, young people need programs that can support their self-esteem and reduce their mental stress. One of the most useful tools for increasing self-esteem in young people is creative drama studies (Adıgüzel 2015). Creative drama can produce highly beneficial results in terms of improving the communication skills, social awareness, and self-esteem levels of the participants. The creative drama has been shown to be useful in the development of empathy (Kosti et al. 2015, Scroggs et al. 2016), anger control (Kaçıra Çapacıoğlu, & Yıldız Demirtaş 2017), reducing of speaking anxiety (Ataş, 2015), increasing self-confidence, competence and problem-solving skills (Tsiaras 2016b, Palavan 2017), increasing peer relationship (Tsiaras 2016a) and academic success (Batdi and Batdi 2015, Ulubey 2018). According to the findings obtained in a study conducted by Altuntaş and Altınova (2015), it was found that creative drama activities applied in the experimental group statistically increased the social problem-solving skills of university students. In a study examining the effect of drama education on social skills in university students, it is determined that there was a significant difference between the social skill points of the experimental and the control group (Korukcu et al. 2015).

In the drama process, young people can have a critical approach to the situation they take part in while also gaining insight and finding clues about its solution by adopting this situation as their problems. At the same time, the participant can meet his needs for respect, acceptance, appreciation, taking responsibility, success, and trust in a group (Adıgüzel 2015). In this way, young people start developing the belief that they can control the problems related to their lives. It is stated that particularly the creative drama environment enables young people that suppress their emotions and thoughts and avoid showing them to express themselves in a non-threatening milieu like drama (Adıgüzel 2015, Abacı Karadeniz and Tepeli 2019, Dima and Tsiaras 2020). In this aspect, creative drama contributes to the psychological, social, and cultural development of young people as well as their psychological relief.

However, it draws attention in the literature reviews that the majority of the studies about young people are for diagnosing their existing problems, and the number of studies involving intervention to solve the problems is quite insufficient. This study aims to empower young people with disadvantaged conditions by using creative drama activities, considering that one of the most effective methods to save young people from "victim" perception is developing self-confidence.

Research Hypotheses

H1. There is a statistically significant difference between the Self-Respect Scale pretest-posttest average scores of the students attending the drama sessions.
H2. There is a statistically significant difference between the Shyness Scale pretest-posttest average scores of the students attending the drama sessions.
H3. There is a statistically significant difference between the Warwick-Edinburgh Mental Well-Being Scale pretest-posttest average scores of the students attending the drama sessions.

Methods

Type of the Study Design

This study was planned in a single group pretest-posttest design.

Sample and Setting

The study included young people studying a university and having some disadvantages such as violence, poverty, alcoholism, depression, chronic illness, childhood traumas, social traumas, social phobia, and shyness. For this purpose, the department administrations were contacted to identify students who may need creative drama activities. In order to prevent stigma in group formation processes, one-on-one interviews were made with students following purposeful sampling, and only volunteer students were included in the study. Interview processes with students for drama sessions continued until 3 different groups of 20 people were formed. After the drama groups were formed, the studies started with 62 students due to the fact that the two students requested to participate in the activities and needed drama sessions.

Data Collection Tools and Application

The data of the study were collected using the Personal Information Form, Coopersmith Self-Esteem Inventory, Warwick - Edinburgh Mental Well-Being Scale, and Shyness Scale. After the necessary explanations were made before the drama activities started, stated data collection methods applied to the participants. A week after the drama activities were completed, the Coopersmith Self-Esteem Inventory, the Shyness Scale, and the Warwick - Edinburgh Mental Well-Being Scale were reapplied.

Personal Information Form

The personal information form containing information about individuals was prepared by the researchers by reviewing the relevant literature. The Personal Information Form included some demographic features and 15 questions evaluating students' certain habits.

Coopersmith Self Esteem Inventory (CSEI)

It was developed by Coopersmith (1986). It was adapted to Turkish by Turan and Tufan (1987) and its validity and reliability study was carried out. The researchers determined the test-retest reliability of the scale to be 0.65 and 0.76 in the studies they conducted one year apart. The scale consists of 25 expressions with "yes" and "no" response options and consists of items that measure the person's perspective on life, family relationships and endurance. 1 point is given if items 1, 4, 5, 8, 9, 14, 19, and 20 in the inventory are marked "Yes". If items 2, 3, 6, 7, 10, 11, 12, 13, 15, 16, 17, 18, 21, 22, 23, 24 and 25 are marked as "No", 1 point is given. If they are not answered accordingly, "0" points are given. The

score obtained from the scale is "raw score". "Real score" is calculated by multiplying it by 4. The total score can vary between 0 and 100 points. If the score of the participants is between 10 and 30, it is in the "low" self esteem group. If it is between 30-70, it is in the "medium" self esteem group. If it is between 70 -100, it is in the "high" self esteem group.

Shyness Scale

"Shyness Scale", another scale used to collect data in the research, was developed by Chekk and Buss (1981) and adapted to Turkish by Güngör (2001) and reliability coefficient is found 0.83 and Cronbach's Alpha coefficient is 0.91. As a result of the factor analysis conducted to determine the construct validity of the scale, it was stated that the scale will be evaluated as one-dimensional. The scale, consisting of 20 items, is a 5-point Likert. The lowest score that can be obtained from the scale is 20, and the highest score is 100. The high scores obtained from the scale show a high level of shyness; low scores indicate low levels of shyness. In this study, the Cronbach's Alpha value of the scale was found .88.

Warwick - Edinburgh Mental Well-Being Scale (WEMWBS)

WEMWBS was used to evaluate the "well-being" situation in this research. WEMWBS is originally a one-factor scale consisting of a 14-item and 5-point Likert type. The total score is in the range of minimum 14 and maximum 70, and the increase in the score indicates an increase in the level of mental well-being. The reliability studies of the scale were carried out with the participation of individuals aged 16 and over, and the Cronbach's Alpha coefficient was found 0.89 with the data obtained from 348 people in total. The test-retest reliability of the scale was performed with a one-week interval on 124 people and the correlation coefficient was found to be 0.83 (Tennant et. al. 2007). Adaptation of WEMWBS to Turkish was carried out by Keldal (2015) and Cronbach's Alpha reliability coefficient was found 0.92. In this study, the Cronbach's Alpha value of WEMWBS was found 0.84.

Implementation of the Research

After the sessions were planned and the groups were formed, the time and place for the drama activity were decided according to the weekly course schedules of the students. Drama activities were held in two different halls, which were affiliated to the Provincial Directorate of Youth and Sports and where youth services were carried out, since there was no suitable hall in the university. 10 sessions of creative drama activities were held for each group by the drama-trained researchers approximately 120 minutes per week. The themes were applied to all three groups in the same way. Participants who could not attend one session due to any difficulty were given the flexibility to attend other sessions.

Each session was held in three stages as a warm-up, preparation and re-enactment and evaluation. The warm-up preparation phase was carried out with music in a way to include movements and games that may attract the interests and attention of young people. The reenactments, which were important for the drama

activities, were planned in a way to increase students' self-respect and self-esteem, to help them face their fears, to enable them to realize their communicative skills, and to express their feelings.

The main themes of the drama sessions were determined as follows;

Session 1: Meeting, communication with the group - interaction.
Session 2: Getting to know yourself.
Session 3: Communication skills / Face to face, eye to eye communication.
Session 4: Communication skills / Compliment responses.
Session 5: Confronting social phobia/fears.
Session 6: Trust-Insecurity.
Session 7: Protection from violence / Accurate expression of emotions.
Session 8: Facing Shyness / Fears.
Session 9: Expression of emotions.
Session 10: Assertive behaviors.

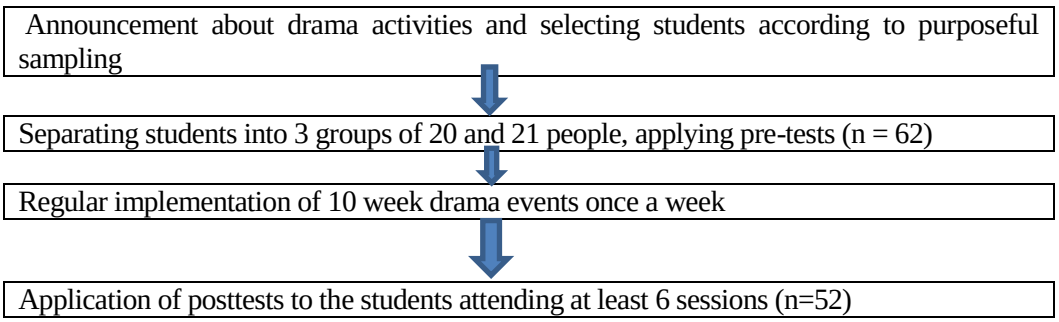
Evaluation of the Data

After transferring the data to the computer-aided SPSS package program, the data were evaluated using percentages, averages and significance tests. Firstly, the normality distribution analysis was performed on the data using the Kolmogorov-Smirnov test. The difference between the scale scores before and after the intervention was assessed with the Paired-Samples t-Test and Bivariate (Pearson) correlation analysis was used to determine whether there was a relationship between scale scores. The relationship between the number of sessions and scale scores was decided by Anova. For statistical evaluation, $p = 0.05$ was taken for the level of significance.

Ethical Dimension

After the study was planned, written consent was obtained from the a University Non-Interventional Research Ethics Committee (14.01.2019 Date, Decision No: 9) in accordance with the Helsinki Declaration.

Research Flow Chart



Results

The following conclusions based on the study conducted with some disadvantaged university students were reached after the evaluation of the drama activities that were carried out for 10 weeks. 85.5% of the students included in the study consisted of female students, the majority of whom were studying at the vocational school and the faculty of health sciences, and the vast majority (80.6%) of them were first-year students. 38.7% of the students stated that they graduated from Anatolian high schools, 4.8% of them worked, 16.1% smoked and 6.5% used alcohol. 61.3% of the students also stated that they had experienced a traumatic event such as family divorce, childhood violence, loss of close relatives, immigration that damaged their self-confidence in the past. Some familial characteristics of students were also evaluated within the scope of the study.

Considering the findings obtained; it was observed that the majority of mothers (87.1%) and fathers (64.5%) had education level in primary school and below, 12.9% of the students stated that their family's economic status was poor and 87.1% stated that their family income was barely enough to meet the expenses. The average number of persons per household was 8.09 ± 2.20, and the students were found to have an average of 6.50 ± 3.05 siblings.

Self-esteem, shyness, and mental well-being scale scores of the students included in the study were evaluated. Before the intervention, it was reported that the students scored 59.935 ± 14.367 (Min; 32, Max; 84) from the CSEI, 61.274 ± 14.941 (Min.24; Max. 100) from the Shyness Scale, and 51.258 ± 8.323 (Min. 34; Max. 70) from the WEMWBS (Table 1).

Table 1. *Distribution of Participants' CSEI, Shyness and WEMWBS Scores before the Intervention (N = 62)*

Scales	**Mean ± SS**	**Min.**	**Max.**
CSEI	59.935 ± 14.367	32	84
Shyness Scale	61.274±14.941	24	100
WEMWBS	51.258±8.323	34	70

Within the scope of the study, the correlation between participants' pre-intervention CSEI, Shyness, and WEMWBS scores with some variables were investigated. Since the students were recruited from disadvantaged groups and the disadvantage type could be different for each student, it was observed that scale scores were not affected by some variables such as gender, familial income level, past traumatic event experience, and smoking status ($p>0.05$) (Table 2).

Table 2. *Relationship of Participants' CSEI, Shyness, and WEMWBS Scores before Intervention with Some Variables (N = 62)*

	CSEI (Mean ± SS)	**Shyness Scale** (Mean ± SS)	**WEMWBS** (Mean ± SS)
Sex Female Male	59.245±14.781 64.000±11.489 t=0.840 p=0.363	62.924 ±14.842 51.555±12.084 t=2.174 p=0.026	50.735±8.408 54.333±7.500 t=-1.203, p=0.217
Family Income Level Poor Meet their needs	57.500±11.698 60.296±14.780 t=0.261 p=0.610	55.625±10.253 62.111±15.412 t=1.320 p=0.255	52.000±8.944 51.148±8.310 t=0.072 p=0.790
Traumatic Events Experienced Not Experienced	59.263±13.278 61.000±16.183 t=0. p=0.212 p=0.647	61.868±15.700 60.333±13.930 t=0.153 p=0.697	51.263±7.978 51.250±9.018 t=0.001 p=0.995
Smoking Smoker Non-smoker	62.400±11.805 59.461±14.862 t=.347 p=.558	58.100±14.738 61.738±15.044 t=.534 p=.468	49.400±4.718 51.615±8.838 t=.590 p=.445

In this study, the differentiation between the participants' CSEI, Shyness Scale, and WEMWBS scores before and after the intervention were evaluated. According to the findings; While the mean CSEI score before the intervention was 59.846 ± 14.986, it increased after the intervention to 71.923 ± 13.430 and the difference was statistically significant (t = -4.885 p = 0.001); while the average score of Shyness Scale before the intervention was 61.153 ± 15.032, after the intervention, it decreased to 49.230 ± 12.267 and the difference was statistically significant (t = 4.265 p = 0.001). When the WEMWBS score averages were evaluated the mean value, which was 51.096 ± 8.661 before the intervention, increased to 55.384 ± 9.088 after the intervention and the difference was statistically significant (t = -2.450 p = 0.018) (Table 3).

Table 3. *The Difference between Participants' CSEI, Shyness Scale and WEMWBS Scores Before and After the Intervention*

	CSEI (Mean ± SS)	**Shyness Scale (Mean ± SS)**	**WEMWBS (Mean. ± SS)**
Pretest (n=62)	59.846±14.986	61.153±15.032	51.096 ±8.661
Posttest (n=52)	71.923±13.430	49.230±12.267	55.384±9.088
Significance Test	t=-4.885 p=0.001	t=4.265 p=0.001	t=-2.450 p=0.018

Within the scope of the study, the correlation between participants' CSEI, Shyness Scale and WEMWBS post-test scores were observed. According to the findings, there was a negative correlation between self-esteem and shyness. Accordingly, shyness decreased as self-esteem increased and there was a positive,

meaningful correlation (R = 0.471**) between shyness and mental well-being. Besides, there was a significant negative correlation between shyness and mental well-being (R = -0.488**), in other words, the level of mental well-being increased as shyness decreased (Table 4).

Table 4. *Correlation Analysis Results between Participants' CSEI, Shyness and WEMWBS Post-Test Scores (N = 52)*

Factors	**CSEI**	**Shyness Scale**	**WEMWBS**
CSEI		-0.417**	
Shyness Scale			-0.488**
WEMWBS	0.471**		

**p<0.001.

Another aspect evaluated within the scope of the study is how students' attendance to creative drama sessions affects scale scores. When the relationship between the number of participation in structured creative drama sessions and the CSEI, Shyness Scale and WEMWBS post-test scores were evaluated, it was observed that as the number of attendance to sessions increased, Self-Esteem and WEMWBS scores increased and Shyness Scale scores decreased. While the correlation between the number of sessions and average scores on CSEI (t= 4.424 p=0.004) and Shyness Scale (t=3.015 p=0.027) were statistically significant, it was observed that there was a close correlation between the number of sessions and WEMWBS scores (Table 5).

Table 5. *Relationship between Number of Drama Sessions and CSEI, Shyness Scale and WEMWBS Post-Test Scores (N = 52)*

	CSEI (Mean± SS)	**Shyness Scale (Mean ± SS)**	**WEMWBS (Mean ± SS)**
Number of Sessions			
6 sessions	16.250±3.387	56.333±10.525	53.833±9.590
7 sessions	16.866±2.474	50.666±9.875	52.800±9.298
8 sessions	17.500±2.976	50.750±17.588	53.500±9.985
9 sessions	20.555±2.351	45.555±10.619	56.333±6.000
10 sessions	20.250±3.770	38.500±11.735	63.375±6.843
Significance Test	t= 4.424 p=0.004	t=3.015 p=0.027	t= 2.248 p=0.078

Discussion

Findings obtained in this study that was conducted with young people, studying at university and having some disadvantages such as social phobia, poverty, substance use, traumatic experience, mental stress, showed that 10-week drama sessions had a positive effect on their self-esteem, shyness and mental well-being. Particularly, the demand from our participating students about the continuation of drama activities gives an idea about the degree of effectiveness. Reducing the level of stress and shyness through creative drama activities was highly important

especially for the students starting university soon to adapt to university life. Although short-term effects of the operation were evaluated after 10 weeks of intervention, the long-term effects of drama sessions could not be assessed since the universities were closed due to the COVID-19 outbreak in Turkey and the students returned home.

The socioeconomic and cultural characteristics of the students, included in the study, were similar. It was remarked that they have lots of siblings and belong to a family in which the socioeconomic level was low, education opportunities were limited, and the social status of women was relatively low due to attachment to the traditions. All these variables could be considered among factors that reduce self-esteem, increase both the level of shyness and traumatic experiences, stated in Table 1. Thus, drama sessions were structured to help students know themselves, face shyness and social phobias, recognize barriers to communication, and develop self-esteem.

After the activities involving the 10-week creative drama sessions, the students' Self Respect, Shyness, and Warwick-Edinburgh Mental Well-Being Scale scores were differed significantly from the pre-intervention phase. In this context, while Self-Respect and Warwick-Edinburgh Mental Well-Being Scale scores increased satisfactorily, Shyness Scale scores also decreased as desired. In a study planned interventionally by Palavan (2017), the problem-solving skills levels and self-confidence levels of college students of primary education have improved after being introduced to the drama education. In the meta-analysis study of Ulubey (2018), the creative drama has a positive effect on skill development in students. In the study of Altuntaş and Altınova (2015), it was shown that drama activities had a positive effect on recognizing the emotional needs of university students (Altuntaş and Altınova 2015). In the study of Zaghloul (2018), it was indicated that creative drama improved the students' thinking and communication skills. As for the studies of Scroggs et al. (2016), the creative drama was shown to be effective in increasing empathy levels of university students. In the study conducted by Sarıkaya et al. (2019), it was observed that creative drama increased self-esteem and decreased social anxiety scores in nursing students. The work of Zaghloul (2018) demonstrated that the communication skills and thinking skills of the university students were increased after the intervention. In the study of Kaçıra Çapacıoğlu and Yıldız Demirtaş (2017), the application of creative drama was found to be effective in reducing the anger level of 9 th-grade students. According to study of Abacı Karadeniz and Tepeli (2019), creative drama education was effective in coping with shyness and improving assertive behavior of adolescent.

As can be seen from the latest study and findings from other studies, creative drama studies can have a positive effect on self-esteem and mental well-being among young age groups as well. However, when the literature review was made broadly, it was seen that creative drama activities play too little part in increasing adaptation, preventing mental problems, or gaining social skills in university youth. It was noteworthy that creative drama studies were used as a learning method mostly to increase the effectiveness of the lessons in high school and earlier terms. However, university students also need to be supported for developing

emotional maturity, effective coping strategies, coping with emotional situations such as social phobia, and shyness.

In this study, it was observed that the difference in self-esteem, shyness, and mental well-being scores was also related to the number of attendance to the sessions. Since participants taking part in more than half of the sessions were included in the final assessment, students with five or fewer participants were excluded from the assessment. It was observed in the evaluation that the intervention efficiency increased as the number of sessions increased. However, since the creative drama was mostly performed in dependent groups (students in formal education), how this dimension changed in other studies was not evaluated sufficiently. In this last study, the correlation between self-esteem, shyness, and mental well-being was examined. While there was a positive correlation between self-esteem and mental well-being, there was a negative correlation between self-esteem, mental well-being, and shyness. Shortly, it was seen that students felt better as they obtain self-realization, their shyness decreased, and their self-esteem increased. Although the parameters are not the same, it was shown in the study of Duraku et al. (2018) that low self-esteem was associated with the lower levels of psychological distress. In a descriptive study conducted with collage students in, there was important correlation between mental health and self-esteem (Nguyen et al. 2019), and in the study of Wulandari and Ridfah (2018), show that there was correlation of shyness towards self-esteem. In the study of Abdullah and Hashemi (2022), it was seen that creative drama activities increased the self-esteem levels of aggressive students. A systematic review written by Keane and Loades (2017) highlights the two-way relationship between self-esteem and mental illness. In this study, it is recommended to develop self-esteem in students. As can be seen from these results, one dimension can affect another positively due to the holistic structure of human health.

Conclusion

When the findings of the study were evaluated in general, it was observed that creative drama sessions applied to disadvantaged young people for 10 weeks had a significant effect on the participants' self-esteem, shyness, and mental well-being. Also, as the number of sessions attended increased, it was seen that the difference in scale scores was higher and the success of the intervention increased. Based on the findings, it was observed that there was a correlation between self-esteem, shyness, and mental health. Also, an improvement in one dimension affected and improved the other dimension.

Impact Statement

Considering the findings, recommendations include reconducting similar studies with larger samples and a control group and also conducting creative drama sessions in the first semester of the university education program, especially for

students having problems with shyness, stress, and adaptation since they have just started university.

Limitations

The research has some limitations. The study design was pre-posttest design and was carried out in a small group of students. The findings obtained from the study cannot be generalized to all students, especially students from different cultures.

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Examination of the Relation between Sleep Quality during Pregnancy and Adaptation to Pregnancy[1]

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This study was conducted to examine the relation between sleep quality in pregnancy and adaptation to pregnancy. The study had included 369 pregnant women presenting to the obstetric and gynecological outpatient clinic. The study had an analytical and cross-sectional design. Data was collected by using a sociodemographic and obstetric characteristics form, the Pittsburgh Sleep Quality Index and the acceptance of pregnancy subscale of the Prenatal Self-Evaluation Questionnaire. Obtained data was evaluated using descriptive statistics, analysis of variance, and Pearson correlation analysis. The mean score on the Pittsburgh Sleep Quality Index was 9.49±2.88 and the mean score on acceptance of pregnancy was 20.95±6.59. The mean scores for the Pittsburgh Sleep Quality Index, its subscales and acceptance of pregnancy increased from the first trimester to the third trimester and this difference was statistically significant. Also, a significant, moderate, positive correlation was found between the sleep quality of the pregnant women and their adaptation to pregnancy according to their trimesters. It can be concluded that the sleep quality of the pregnant women was poor in general but that the level of their adaptation to pregnancy was good. The sleep quality and adaptation to pregnancy decreased as pregnancy progressed throughout all the trimesters.

Keywords: *adaptation, pregnancy, sleep quality, trimester*

Introduction

Pregnancy is a period when women have the most precious and special memories of their life. It is important to protect physical and mental health of pregnant women to ensure their adaptation to pregnancy and to help them and their baby stay healthy and peaceful during pregnancy, labor and postpartum period. Sleep is needed to healthily adjust to biological and psychological changes in pregnancy (Köybaşı and Oskay 2017, Yeral 2019, Yeşilkaya 2018). A sleep problem experienced in pregnancy can lengthen the time to get prepared for motherhood roles. A disrupted sleep quality in pregnancy causes women to feel more nervous, become more tired, experience more difficulty in adaptation and have increased fear and anxiety and has a negative impact on adaptation to pregnancy (Özhüner and Çelik 2019, Öztürk et al. 2019). In a study by Yeral (2019), women in the first trimester experienced significantly more problems in terms of sleep latency, habitual sleep pattern and sleep disorders compared to women in the second trimester. Besides, women in the third trimester experienced significantly more problems regarding sleep latency, sleep quality and sleep

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disorders compared to women in the first trimester (Yeral 2019). Many other studies also showed a decrease in total sleep time, daytime sleepiness, disrupted night sleep and increased frequency of sleeplessness in the third trimester (Çelik and Köse 2017, Köybası and Oskay 2017, Özorhan et al. 2014, Öztürk et al. 2019). Çoban and Yanıkkerem (2010) found a negative relation between gestational week and sleep quality and noted that as the gestational week increased, the sleep quality decreased (Çoban and Yanıkkerem 2010). In a cross-sectional study with 386 pregnant women, a high rate of the women in the third tirmester had a poor sleep quality and the risk of poor sleep quality was 8.6 times higher in the third trimester than in the other trimesters (Özhüner and Çelik 2019).

Adaptation to pregnancy can be affected by poor sleep quality as well as many factors including physiological, psychological and emotional changes and social environment. It has been stated in the literature that sleep problems in pregnancy can cause hypertension in pregnancy, prolonged labor, preterm delivery and that tiredness and stress due to insufficient sleep result in more severe perceived labor pain, higher cesarean section rates and postpartum depression. As a result, maladaptation in pregnancy may arise as part of the negative effects of pregnancy-related sleep problems mentioned above (Beydağ and Mete 2008, Ko et al. 2010, Yurtsal and Eroğlu 2019). Although sleep problems in pregnancy may lead to numerous undesirable conditions in both pregnancy, labor and postpartum period, health professionals are not much aware of it since these problems are considered as normal (Hutchison et al. 2012, Köybaşı and Oskay 2017, Rezaei et al. 2013). To protect mental health of the women in pregnancy, to help them tolerate pregnancy-related physiological, psychological and hormonal changes and to adapt to pregnancy, prenatal healthcare should involve strategies to increase their sleep quality (Gao et al. 2019). It is important to evaluate sleep quality in pregnant women in order to inform them about this issue, to prevent problems likely to arise and to help them experience a healthy labor process (Çoban and Yanıkkerem 2010, Köybaşı and Oskay 2017, Özhüner and Çelik 2019). However, there have not been any studies that examined sleep quality in pregnancy and adaptation to pregnancy. Therefore, the present study was directed towards examining the relation between sleep quality in pregnancy and adaptation to pregnancy.

Research Questions

1. What is the sleep quality level of pregnant women?
2. Does the sleep quality level of pregnant women differ between trimesters?
3. What is the level of adaptation of pregnant women to pregnancy?
4. Does the level of adaptation of pregnant women to pregnancy differ between trimesters?
5. Is there a relation between the sleep quality of pregnant women and their adaptation to pregnancy?
6. Is there a relation between the sleep quality of pregnant women and their adaptation to pregnancy according to trimesters?

Material and Methods

Design

This analytical and cross-sectional study was performed in the obstetrics and gynecology outpatient clinic of at Cihanbeyli State Hospital in Konya City Center between 15 March 2020 1 and 15 March 2021.

Study Participants

A total of 369 pregnant women were included in the study through convenience sampling. Out of 369 women, 123 were in their first trimester, 123 were in their second trimester and 123 were in their third trimester. The sampling size was calculated with G-Power. According to this calculation, the sample size sufficient to achieve 80% power of the study was found to be minimum 352 by using the mean scores for the Pittsburg Sleep Quality Index (PSQI) in the first and third trimesters in the study titled "Sleep Quality and Tiredness in Pregnant Women by Çoban and Yanıkkerem (2010) and based on the effect size of 0.55 in the t-test, the statistical significance of α=0.05 and the confidence interval of 95%. Pregnant women at least graduating from primary school, speaking and writing in Turkish, aged 18 years or older, having a single fetus and a low risk of pregnancy and accepting to participate in the study were included in the sample. Exclusion criteria were a high risk of pregnancy with a pregnancy-related complication. A total of 424 pregnant women were invited to participate in the study. Forty-five women were not included in the study since they did not fulfill the inclusion criteria (Nine were illiterate, 27 declined to participate in the study, seven were younger than 18 years old and two could not speak and understand Turkish). As a result, data were collected from 379 pregnant women. Since ten women did not fill in the data collection tools completely, data collected from them were not included in the analysis and the study was completed with 369 pregnant women.

Data Collection

Data were collected with a sociodemographic and obstetric characteristics form, the The Pittsburgh Sleep Quality Index (PSQI) and the Acceptance of Pregnancy Subscale of Prenatal Self-Evaluation Questionnaire (PSEQ-AP).

Sociodemographic and Obstetric Characteristics Form; was prepared by the researchers. It is composed of a total of 12 questions about sociodemographic and obstetric characteristics (Yeşilkaya 2018, Çoban and Yanıkkerem 2010).

The Pittsburgh Sleep Quality Index (PSQI); is a self-report questionnaire and was developed by Buysse et al. in 1989 to determine the sleep quality, type of sleep disturbance and severity of sleep disturbance (Buysse et al. 1989). It has seven components, i.e., subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication and daytime dysfunction. Each component is scored from zero to three and scores for seven components are added to obtain a total score for the PSQI, which may range

between zero to 21. The cut-off value for the PSQI is five. A score of five or more shows a low sleep quality (Aktaş et al. 2015, Şenol et al. 2012). The validity and reliability of the PSQI for the Turkish population were tested by Ağargün et al. (1996) and Cronbach's alpha for the PSQI was reported to be 0.804 (Ağargün et al. 1996). Cronbach's alpha was found to be 0.759 in the present study. Data collected with the PSQI in this study was self-reported by the participants.

The Acceptance of Pregnancy Subscale of the Prenatal Self-Evaluation Questionnaire (PSEQ-AP); was created by Lederman et al. in 1979 to evaluate adaptation of prenatal women to pregnancy and motherhood roles (Beydağ and Mete 2008, Lederman et al. 1979). The scale does not have a cut-off value. It has seven subscales, i.e., Wellbeing of self and baby in labor, acceptance of pregnancy, identification with motherhood role, preparation for labor, helplessness and loss of control in labor, relation with partner/husband and relationship with mother. The highest and lowest scores for the scale are 316 and 79 respectively (Lederman et al. 1979). Lower scores for the scale show successful adaptation to pregnancy and motherhood roles. Cronbach's alpha for the scale in pregnancy was found to be 0.72-0.87 in studies performed in Sweden (Kiehl and White 2003). The validity and reliability of the scale for the Turkish population were tested by Beydağ and Mete in 2008. Cronbach's alpha for acceptance of pregnancy in the Turkish version was reported to be 0.80 (Beydağ and Mete 2008). This subscale is composed of 14 items. The highest and lowest scores for it are 56 and 14 respectively. Lower scores for the subscale acceptance of pregnancy show increased acceptance of pregnancy (Beydağ and Mete 2008, İşbir 2011). In the present study, this subscale was utilized to determine what extent pregnant women accepted their pregnancy and to evaluate their adaptation to pregnancy. Cronbach's alpha for it was found to be 0.79.

Piloting

Expert opinion about the sociodemographic and obstetric characteristics form, developed by the researchers, was requested from five lecturers specializing in Midwifery and Maternal Health and Diseases Nursing. It was piloted on ten pregnant women in the outpatient clinic where the study was performed to test its understandability and practicality. According to the piloting test, the form did not need to be revised. Besides, the pregnant women participating in the piloting study were not included in the study sample.

Ethical Considerations

Ethical approval was obtained from the ethical committee for 3 non interventional researches at Adnan Menderes University Health Sciences Faculty on 3 March 2020 (approval number: E.15226). Written permission was taken from Konya City Health Directorate to conduct the study in Cihanbeyli State Hospital in Konya, Turkey. The women participating in the study were informed about the aim of the study, time needed to fill in the data collection tools, voluntary basis for participation in the study and their right to leave the study whenever they wanted.

They were also assured that the data collected would not be used for purposes other than research. Questions asked by the women were answered and their informed consent was obtained. Permission was also obtained through email from Prof. Mehmet Yücel Ağargün to use the PSQI and from Assoc. Prof. Kerime Derya Beydağ to use the acceptance of pregnancy subscale of the PSEQ.

Data Analyses

Data was analyzed with the Statistical Package for Social Sciences-18 (PASW Inc., Chicago. IL. USA) by using numbers, percentages, mean values and standard deviation. Besides, variance analysis was employed to compare sleep quality and adaptation to pregnancy between trimesters. Pearson correlation analysis was performed to examine the relation between sleep quality and adaptation to pregnancy.

Results

Sociodemographic and obstetric features of the pregnant women included in the study are presented in Table 1. Thirty-five-point-five percent of the women were secondary school graduates. Most of the women (82.9%) were unemployed, more than half of the women (62.1%) had an income equal to their expenses and nearly half of the women (44.2%) were living in a town. Besides, more than half of the women (57.7%) had a nuclear family, most of the women (73.2%) had a health insurance. The mean age of the women was 27.15±5.72 years and the mean number of live children was 1.78±0.85. The median number of pregnancies was 2, the median number of spontaneous abortions was 1, the median number of induced abortions was 1 and the median number of stillbirths was 1.

The mean scores for the PSQI, its subscales and the PSEQ-AP are presented in Table 2. The mean score for the PSQI was 9.49 ± 2.88 and the mean scores for its subscales were as follows: 1.12 ± 0.77 for subjective sleep quality, 2.06 ± 0.71 for sleep latency, 1.86 ± 0.65 for sleep duration, 1.21 ± 1.19 for habitual sleep efficiency, 1.79 ± 0.63 for sleep disturbance and 1.45 ± 0.62 for daytime dysfunction. The mean score for the PSEQ-AP was 20.95 ± 7 6.59.

Table 1. *Sociodemographic and Obstetric Characteristics of the Women (n=369)*

Characteristics	Variables	N	%
Education	Primary school	76	20.6
	Secondary school	131	35.5
	High school	89	24.1
	University	73	19.8
Employment	Yes	63	17.1
	No	306	82.9
Income	Income lower than expenses	90	24.3
	Income equal to expenses	229	62.1
	Income higher than expenses	50	13.6
Place of living	City	38	10.3
	Town	163	44.2
	Small town	35	9.5
	Village	133	36.0
Type of family	Nuclear family	213	57.7
	Extended family	153	41.5
	Separated parents	3	0.8
Health insurance	Yes	270	73.2
	No	99	26.8
Characteristics	**Mean/Median**	**SD/Min-Max**	
Age (years)	27.15	5.72	
Number of live children	1.78	0.85	
Number of pregnancies	2	1-10	
Number of spontaneous abortions	1	1-4	
Number of induced abortions	1	1-2	
Number of stillbirths	1	1-2	

Table 2. *The Mean Scores for the PSQI, its Subscales and the PSEQ-AP (n=369)*

Scales & Subscales	Mean	SD
PSQI		
Subjective sleep quality	1.12	0.77
Sleep latency	2.06	0.71
Sleep duration	1.86	0.65
Habitual sleep efficiency	1.21	1.19
Sleep disturbance	1.79	0.63
Use of sleeping medication	0.00	0.00
Daytime dysfunction	1.45	0.62
PSQI	9.49	2.88
PSEQ-AP	20.95	6.59

Table 3 outlines a comparison of the mean scores for the PSQI, its subscales and the PSEQ-AP between trimesters. The mean scores for the PSQI and its subscales displayed an increase from the first trimester until the third trimester with a significant difference ($p<0.05$ for the PSQI and each subscale). According to the results of Scheffe test, performed to determine which pairs of trimesters differed in the mean scores for the PSQI and its subscales, the mean scores for the PSQI and its subscales were significantly lower in the first trimester than in the second and third trimesters. The mean scores for the PSQI and its subscales were also significantly lower in the second trimester than in the third trimester.

The mean score for the PSEQ-AP increased from the first trimester till the

third trimester with a significant difference (p=0.001). According to the results of Scheffe test, the mean score for acceptance of pregnancy was significantly lower in the first trimester than in the second and third trimesters and was significantly lower in the second trimester than in the third trimester (Table 3).

Table 3. *The Comparison of the Mean Scores for the PSQI, its Subscales and the PSEQ-AP between Trimesters (n=369)*

	1st Trimester Mean±SD (a)	2nd Trimester Mean±SD (b)	3rd Trimester Mean±SD (c)	ANOVA (f) P	Post hoc
PSQI					
Subjective sleep quality	1.05±0.52	1.07±0.39	1.25±0.65	f=6.256 p=0.003	(a) vs. (b): 0.002 (a) vs. (c): 0.001 (b) vs. (c): 0.013
Sleep latency	2.01±0.44	2.03±1.45	2.13±0.74	f=4.355 p=0.006	(a) vs. (b): 0.012 (a) vs. (c): 0.004 (b) vs. (c): 0.005
Sleep duration	1.75±0.39	1.80±0.14	2.02±0.65	f=3.256 p=0.021	(a) vs. (b): 0.001 (a) vs. (c): 0.004 (b) vs. (c): 0.001
Habitual sleep efficiency	1.15±1.65	1.18±0.32	1.30±0.41	f=5.142 p=0.018	(a) vs. (b): 0.003 (a) vs. (c): 0.002 (b) vs. (c): 0.001
Sleep disturbance	1.51±0.45	1.58±1.21	2.30±0.39	f=7.235 p=0.017	(a) vs. (b): 0.001 (a) vs. (c): 0.001 (b) vs. (c): 0.002
Daytime dysfunction	1.22±0.74	1.26±0.41	1.86±1.23	f=4.256 p=0.009	(a) vs. (b): 0.004 (a) vs. (c): 0.005 (b) vs. (c): 0.005
PSQI	9.01±1.45	9.04±0.79	10.40±1.21	f=6.589 p=0.002	(a) vs. (b): 0.001 (a) vs. (c): 0.002 (b) vs. (c): 0.001
PSEQ-AP	19.97±0.41	20.02±0.85	22.85±3.62	f=5.789 p=0.001	(a) vs. (b): 0.003 (a) vs. (c): 0.003 (b) vs. (c): 0.001

Table 4 demonstrates the relation between the mean scores for the PSQI, its subscales and acceptance of pregnancy. There was a significant moderate positive relation between the mean score for acceptance of pregnancy and the mean scores for subjective sleep quality ($r = 0.452$, $p<0.001$), sleep latency ($r = 0.523$, $p<0.001$), sleep duration ($r = 0.461$, $p<0.001$), habitual sleep efficiency ($r = 0.652$, $p<0.001$), sleep disturbance ($r = 0.396$, $p<0.001$), daytime dysfunction ($r = 0.685$, $p<0.001$) and the PSQI ($r = 0.541$, $p<0.001$).

Table 4. *The Relation between the Mean Scores for the PSQI, its Subscales and the PSEQ-AP (n=369)*

PSQI	PSEQ-AP	
	r	p
Subjective sleep quality	0.452	<0.001
Sleep latency	0.523	<0.001
Sleep duration	0.461	<0.001
Habitual sleep efficiency	0.652	<0.001
Sleep disturbance	0.396	<0.001
Use of sleeping medication	-	-
Daytime dysfunction	0.685	<0.001
PSQI	0.541	<0.001

Table 5 shows the relation between the mean scores for the PSQI, its subscales and the mean score for the PSEQ-AP according to trimesters. There was a significant moderate positive relation between the mean score for acceptance of pregnancy and the mean scores for the PSQI and its subscales in the first, second and third trimesters.

Table 5. *The Relation between the Mean Scores for the PSQI, its Subscales and the Mean Score for the PSEQ-AP according toTtrimesters (n=369)*

		PSEQ-AP		
		1st Trimester	**2nd Trimester**	**3rd Trimester**
PSQI				
Subjective sleep quality	**r**	0.301	0.412	0.463
	p	0.008	0.014	0.001
Sleep latency	**r**	0.314	0.541	0.412
	p	0.004	0.001	0.012
Sleep duration	**r**	0.306	0.469	0.542
	p	0.001	0.041	0.007
Habitual sleep efficiency	**r**	0.345	0.423	0.574
	p	0.005	0.004	0.003
Sleep disturbance	**r**	0.305	0.574	0.413
	p	0.021	0.011	0.002
Daytime dysfunction	**r**	0.345	0.582	0.528
	p	0.003	0.001	0.013
PSQI	**r**	0.317	0.516	0.434
	p	0.012	0.007	0.001

Discussion

This analytical and cross-sectional study directed towards examining the relation between sleep quality and adaptation to pregnancy revealed that the pregnant women had a poor sleep quality, but they adapted to pregnancy well. As the trimesters progressed, sleep quality and adaptation to pregnancy decreased. However, a high sleep quality paralleled an improved adaptation to pregnancy throughout all the trimesters.

The finding that the women had the mean PSQI score of 9.49±2.88 is of importance in that it is higher than the cut-off value for the scale and indicates a poor sleep quality. Consistent with this finding, Öztürk et al. (2019) revealed in their study with 204 pregnant women that the mean PSQI score was 7.27±3.18. In a study with 152 healthy pregnant women followed in an obstetric and gynecological clinic of a university hospital, Çelik and Köse (2017) found the mean PSQI score of 7.38±4.91. Pınar et al. (2014) showed in their study that the mean score for the PSQI was 5.13±3.35. Besides, the mean score for the PSQI was reported to be 10.04±2.98 by Özhüner and Çelik (2019) in their study with 386 pregnant women followed in three family healthcare centers and 7.11±3.55 by Köybaşı and Oskay (2017). In a meta-analysis including 24 studies from 12 different countries, Sedov et al. (2018) found that the mean score for the PSQI was 6.07±0.40. Compatible with the literature, the mean score for the PSQI in the present study was ≥5. The finding is of importance since it is an indicator of a poor sleep quality in the

pregnant women. Sleep quality is affected during pregnancy due the reasons such as physical and hormonal changes, anxiety, and increased abdominal discomfort due to growing fetus putting pressure on the diaphragm. Furthermore, accordıng to the literature, sleep qualıty during pregnancy is affected by many factors (Salbacak 2021, Amanak 2021, Sarınç and Ünlü 2014). The results that they emphasize the necessity of examining the factors that negatively affect sleep quality during pregnancy.

In the current study, the mean scores for the PSQI and its subscales displayed an increase from the first trimester until the third trimester. Further analyses showed that the pregnant women had the best sleep quality in the first trimester and the worst sleep quality in the third trimester. Congruent with the current study, there have been studies revealing that sleep quality worsened from the first trimester till the third trimester (Çoban and Yanıkkerem 2010, Köybaşı and Oskay 2017, Sharma and Franco 2004, Taşkıran 2011). However, some studies showed that pregnant women had the highest sleep quality in the second trimester and the poorest sleep quality in the third trimester (Çelik and Köse, 2017, Kostanoğlu et al. 2019, Pınar et al. 2014). In light of the evidence from both the present study and other studies reported in the literature, it is clear that pregnant women have a lower sleep quality in the third trimester than in the first and second trimesters. The reason why some studies revealed that pregnant women have the highest sleep quality in the first trimester while other studies showed that pregnant women have the highest sleep quality in the second trimester can be limitations of the studies or sociodemographic features of the pregnant women.

In the present study, the mean score for the PSEQ-AP was 20.95±6.59. The highest and the lowest scores that can be obtained for the PSEQ-AP are 56 and 14 respectively. It is reported that lower scores indicate increased acceptance of pregnancy (Beydağ and Mete 2008, İşbir 2011). It can be suggested that the pregnant women in the present study had sufficient adaptation to pregnancy. There have not been any studies on the relation between adaptation to pregnancy and sleep quality. However, many studies have been performed to examine adaptation to pregnancy. The mean score for acceptance of pregnancy was found to be 23.12±7.40 in a study performed by Demirbaş and Kadıoğlu (2014) to evaluate adaptation of prenatal women to pregnancy and associated factors, 30.1±8.8 in a study conducted by Bulut and Özdemir (2019) with pregnant women diagnosed as hyperemesis gravidarum and staying in a hospital. Besides, İşbir (2011) found in a study on the effect of a Roy's adaptation model based counseling on nausea and vomiting in pregnancy that the mean score for acceptance of pregnancy was 24.64±8.86 in the intervention group and 26.64±8.14 in the control group at baseline. In another study on the effect of Roy's adaptation model based education on gestational hypertension, adaptation to pregnancy and pregnancy outcomes, the mean score for acceptance of pregnancy was 44.12±11.09 in the intervention group and 40,89±10,56 in the control group at baseline (Amanak et al. 2019). Özçalkap (2018) showed that the mean score for acceptance of pregnancy was 45.46±6.81 in a sample representing the population of a city. As shown by the studies mentioned above, the mean scores for acceptance of pregnancy have a wide range. This suggests that acceptance of and adaptation to pregnancy are

affected by many factors. The present study showed that sleep quality in pregnancy was found to be a significant factor affecting acceptance of pregnancy. Further well-designed randomized controlled studies focusing on the effect of sleep quality on acceptance of pregnancy can contribute to maternal-child health.

In the current study, the mean score for acceptance of pregnancy significantly increased from the first trimester until the third trimester and further analyses revealed that adaptation to pregnancy decreased with the progression of pregnancy. However, conflicting with the current study, few studies have shown no relation between adaptation to pregnancy and gestational weeks (Demirbaş and Kadıoğlu 2014, Özçalkap 2018). Further studies are needed to elucidate this relation.

In the present study, the finding of the significant, moderate positive relation between the mean score for acceptance of pregnancy and the mean scores for the PSQI and its subscales throughout all the trimesters showed that as sleep quality declined so did adaptation to pregnancy. To our knowledge, there have not been any studies examining the relation between sleep quality and acceptance of pregnancy. However, it has been noted in the literature that pregnant women having difficulty in accepting pregnancy have poor adaptation to both pregnancy and motherhood and experience many fears about labor (Demirbaş and Kadıoğlu 2014, Lederman and Wels 2009). The information from both the present study and other studies indicate that randomized, controlled experimental studies are necessary to examine the relation between sleep quality in pregnancy and adaptation to pregnancy.

Conclusion

In the present study, although the pregnant women had a poor sleep quality, they had successful adaptation to pregnancy. It was observed that both sleep quality and adaptation to pregnancy decrease as pregnancy progresses, and as sleep quality increases, adaptation to pregnancy increases throughout all trimesters. In light of these findings, interventions directed towards enhancing the sleep quality that is effective in acceptance of and adaptation to pregnancy should be offered to pregnant women through structured education programs. It can be recommended that healthcare managers and decision-makers integrate structured education programs directed towards improving sleep quality in pregnancy into available prenatal care and raise awareness of health professionals through in-service training programs.

Limitations

This study has two limitations. First, the data collected was self-reported by the pregnant women participating in the study and only represent the study sample. Second, data collection was performed during COVID-19 pandemic. The participants might have felt uncomfortable during data collection since they had to

wear a mask and practice social distancing to reduce the risk of disease transmission. Therefore, they might have given responses which did not completely reflect their actual status.

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