Association between Childhood Socio-Economic Status and Adult Health in Botswana: A Cross-Sectional Study

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Abstract

Studies have shown that childhood socioeconomic status is a powerful predictors of adult health.However, little is known about the association between childhood SES and adult health in Botswana..Using data from the survey on "Chronic Non Communicable Diseases in Botswana attempt is made to study the association between the childhood socioeconomic status and adult health. The adult health is defined as the prevalence of selected non-communicable diseases and associated risk factors. Findings indicate that childhood socioeconomic circumstances have an independent effect on adult health. Poor childhood SES was found to be linked with alcohol consumption, poor fruit and vegetable consumption, smoking,overweight/obesity, and hypertension. Further research is needed-especially longitudinal studies to understand the process of how the socioeconomic conditions over the life course associated with the health of individuals in the context of Botswana.

Key words

Childhood socioeconomic status;Adult Health,Risk Factors;Non-communicable diseases,Botswana

Introduction

In recent years, attempts have been made to assess how socioeconomic factors at different levels of life course influence adult health[1-4]. This studies suggest that childhood socioeconomic status (SES) is a powerful predictor of adult health. Individuals with lower SES during childhood have been found to be at elevated risk of ill health and premature mortality, regardless of their socioeconomic circumstances during adulthood[5]. A review of 49 studies by Pollitt, et al.[6] supporting a link between SES throughout the life course and adult cardiovascular disease outcomes found that poorer socioeconomic conditions during childhood put individuals at greater risk for adult cardiovascular disease and cardiovascular-related mortality, independent of adulthood SES.

Meanwhile some evidence has shown that childhood and not adult SES is a stronger determinant of adult health [7-10]. As a result there are two views on how SES influence adult health. The first view is that childhood SES put individuals at a greater risk of ill health, independent of adult SES[6] while the second view posits that it is adult and not childhood SES which is a powerful predictor of adult health[8,9]. The current study seek to test the first hypothesis. The underlying argument for this hypothesis is that socioeconomic circumstances during childhood influence individual's choices, skills and behaviour related to preventive care, nutrition, and hygiene among others[11].

Further, it has been shown empirically that individuals from high SES background are more likely to take advantage of modern technology and are more aware of nutritional and health related problems[1-3], while in contrast those from poor SES are less likely to take advantage of available health resources, are unable to generate resources for improved nutrition and health hence they are more prone to NCD risk factors and non-communicable diseases (NCDs) [12-13].

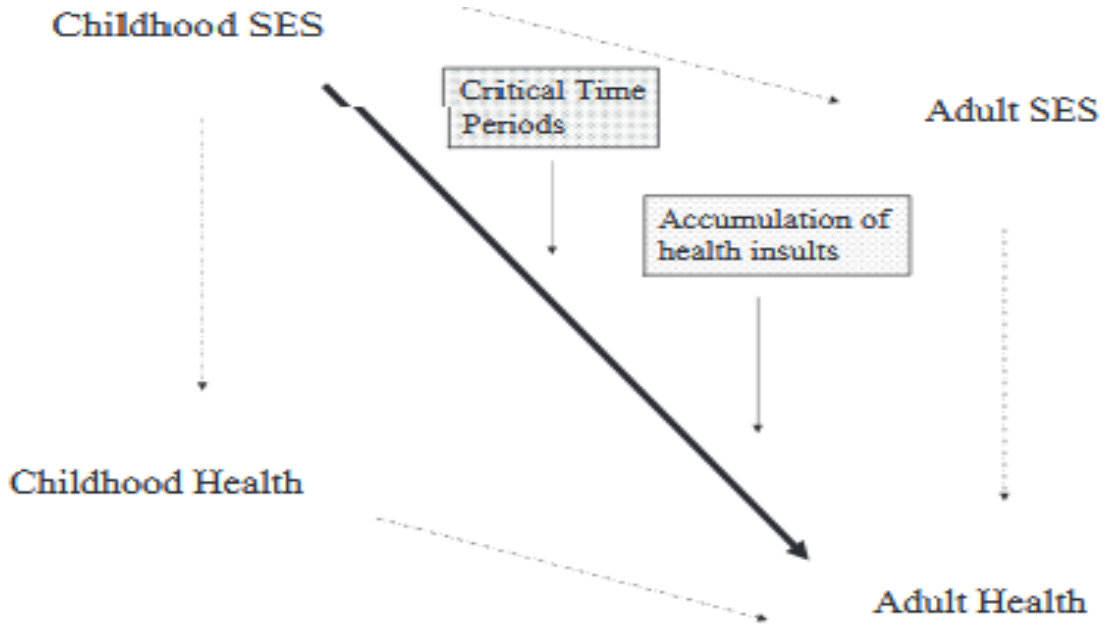
Most of the studies explaining whether childhood SES influence adult health are from high income countries (HICs)[7-10]. Consequently there is paucity of evidence of the link between childhood SES and adult health in low and middle income countries[14-18]. Even at that in LMICs the evidence on how childhood SES influence adult health is at best mixed and inconclusive. Consequently the debate on how childhood socioeconomic experiences influence adult health is relatively new in Sub-Saharan

Africa (SSA). In Botswana there is no evidence of studies examining the influence of childhood SES on adult health. The main aim of this study was to explore how childhood socioeconomic conditions influence the health of individuals in later life. This study is presumed to provide vital insights on the association between childhood SES and adult health in the context of Botswana.

Conceptual Model

The application of the life course approach (LCA) to epidemiology has helped epidemiologists and demographers to theoretically examine social gradients in population health[22]. The main aim of life course approach is to explore how socioeconomic and social risk factor trajectories, acting across the life course, influence health of individuals[22-23]. Figure 1 depicts the multiple interactions through which childhood SES is linked to health via adult SES. Children born from low SES households are at a greater risk of experiencing negative health outcomes in later life, such NCD risk factors and NCDs[25-27].

Figure 1: Pathways connecting the childhood socioeconomic status and adult health



Source: Conroy, Sandel, and Zuckerman[24]

Children from low SES households face the possibility of poor development which ultimately predispose them to NCDs such as diabetes, and hypertension in later

life[24]. Poor health behaviours disproportionately seen among low SES adults may influence poor health among their children [15]. For instance, a person who is exposed to households with poor socioeconomic conditions and NCD risk factors such as smoking, alcohol consumption, poor physical activity, poor fruit and vegetable consumption and malnutrition during childhood faces the greatest risk of continuing such behaviours into adulthood and ultimately developing NCDs[14-16].

It should be acknowledged that LCA presents great challenges for the continued development of testable theoretical models and effective study design and analysis. However, most studies have effectively used longitudinal and cross sectional data to study lifelong changes in health[28]. Similar approach has been used in this study to understand the influence of childhood SES on self-reported adult health [28, 29-31].

Materials and Methods

The study used cross sectional design by selecting respondents in three cities and towns, fifteen urban villages and fifteen rural areas across Botswana using a multistage probability sampling technique. The survey was carried out in March 2016. The survey collected self-reported data on several NCDs as classified by the WHO classification of diseases and their risk factors. Information collected from these respondents included social and behavioural characteristics, and anthropometric measurements (height and weight).

Measurement of variables

Outcome variables

Two NCDs were considered as outcome variables in this analysis;

Hypertension-The survey asked the question, “Have you ever even been diagnosed with hypertension (high blood pressure) in past 12 months?” The final variable was coded such that yes=1 and no=0.

Diabetes-The survey asked the question, “Have you been diagnosed with diabetes (high blood sugar) in the past 12 months?” The final variable was coded such that yes=1, and no=0.

Five NCD risk factors were also considered as outcome variables. Respondents were asked questions on tobacco use, alcohol consumption, physical activity and

fruit and vegetable consumption. All NCD risk factors were dichotomised to indicate whether respondents reported or did not report any NCD risk factors. For tobacco use respondents were asked whether they currently smoke tobacco products, yes=1 and no=0. Alcohol consumption was measured based on the intensity of alcohol consumed in the past 30 days. Respondents who had consumed alcohol in the past 30 days were asked about the number of standard alcohol drinks they had each day in the past 7 days and if they reported to have had three or more drinks per day (of approximately 60 g alcoho1) it was considered to be exercisive drinking=1 and 0=otherwise.

An adapted version of the WHO STEPS questionnaire for adults was used to assess participants' self-reported physical activity. The questionnaire assessed physical activity done in the past 7 days in the domains of work and walking (includes at work and at home, walking to travel from place to place, and any other walking for recreation, sport, exercise, or leisure). It estimated the time spent on moderate and vigorous intensity activities in terms of frequency (days per week) and duration (minutes per day) in each of the physical activity domain[25]. Poor physical activity variable was computed as daily minutes (min/day) of physical activity scores in the work and walking domains. The variable was computed by summing the time (min/day) in moderate-intensity and vigorous-intensity activities across the two domains such that if respondents took >10 minutes bouts of physical activity per day and <10 minutess bouts of physical activity per day they were considered physical active=0 and to have poor physical activity=1, respectively.

Poor fruit and vegetables consumption was created when an individual reported daily consumption of less than the recommended 5 servings of fruit and vegetables. Respondents reported the number of servings for fruits/vegetables they had in a typical day, and if the servings were less than 5 in a day, they were considered to be having poor fruit/vegetable consumption[26].

The survey collected anthropometric information on height in meters (m) and weight in kilograms (kg) as per WHO guidelines[27]. Body Mass Index (BMI) was used to classify overweight/obesity. BMI was derived from weight and height: weight (kg) / (height (m) x height (m))[1]. The Charder MS7301 250Kg digital scale and the Muac measuring tape were used for anthropometric measurements. Weight was measured, to the nearest 0.1kg, while height was measured in metres. BMI was

categorized into: underweight (BMI < 18.5 kg/m^2), normal weight (18.5 ≤ BMI <25 kg/m^2), overweight (25≤BMI<30 kg/m^2) and obese (BMI ≥30 kg/m^2)[1]. Overweight and obese were used to create a binary outcome variable which was coded as: being overweight/obese (BMI≥25 kg/m^2) =1; not overweight/obese =0 (BMI<25 kg/m^2).

A wealth index (WI) was constructed as a measure of current socioeconomic status (SES). WI is a composite measure, constructed using the indicators of ownership of consumer durables, housing characteristics, and access to public services. Information on a range of durable assets was collected during the survey (e. g. ownership of car, refrigerator, and television,), housing characteristics (e. g. material of dwelling floor and roof, main cooking fuel), access to basic services (e. g. electricity supply, source of drinking water, sanitation facilities) and ownership of livestock (e.g. cattle, goats, sheep, horses, chickens). Further to the collection of information on durable assets, information on land and livestock ownership was collected. Principal component analysis was employed to derive the wealth index variable, which had five categories from the 1st to the 5th quintile (poorest to richest).

Independent variables

The main independent variable for this study was childhood socioeconomic status. This is a composite variable derived from the combination of material (socioeconomic) and psychosocial conditions in childhood e.g. parental education, parental occupation, perceived childhood health, and childhood diet (Table 1). The positive childhood socioeconomic experiences were grouped together and negative ones were also grouped together and finally an index was created to come up with three categories for childhood socioeconomic status; low =1, middle =2 and high=3 childhood SES.

Table 1: Childhood SES variables

Childhood SES variables	**Survey question**
Father's Education Level	What was the education level of your father when you were born? The variable was recoded such that low education=1 (includes no education, informal education & primary) & high education level=0 (includes secondary & tertiary or high)
Mother's Education Level	What was the education level of your mother when you were born? The variable was recoded such that low education=1 (includes no education, informal education & primary) & high education level=0 (includes secondary & tertiary or high)
Father's Occupation	State activity status and occupation of your father during your childhood. The variable was recoded; public sector=1,private sector=2, self-employed=3, unemployed=4 (student, retired, homemaker)
Mother's Occupation	State activity status and occupation of your mother during your childhood. The variable was recoded; public sector (government)=1,private sector (non-government)=2, self-employed=3, unemployed=4 (student, retired, homemaker)
Stressful Childhood	Have your life been stressful. Yes=1, no=0
Childhood Diet	Kind of food taken during childhood? Vegetarian=1, non-vegetarian=0
Perceived Childhood Health	How did you feel of your health? Below average=1,avarage=2 & above average=3
Childhood Major Ailment	Do you remember any major ailment you suffered? Yes=1 & no=2

Control variables

Sex, age, education, residence, marital status, work and wealth status were used as control variables.These variables were conceptualized to have an association with the outcome variables. Therefore to hold their likely association with the outcome variables, they were included in the combined effects model, so that the association between their interactions with the outcome variables becomes isolated and discernible.

Statistical analysis

In order to examine the association between childhood SES and adult health, adjusted odds ratios (AORs) were derived by applying logistic regression model. Two models were fitted to data to ascertain the association between childhood SES

and health outcomes (NCDs and risk factors). Model 1: Assessed the association between childhood SES and risk factors for NCDs. Model 2: Assessed the association between childhood SES, hypertension and diabetes. In both models childhood SES is a key independent variable while sex, age, education, residence, marital status, work and wealth status were treated as control variables.Results of logistic regression analysis were presented as unadjusted odd ratios (UOR) for gross models and adjusted odds ratios (AOR) for net effects models. Data analysis was done using SPSS version 25 program. In order to control for cluster effects complex samples module in SPSS has been used since the NCDs survey used multistage probability sampling technique.

Results

Table 2 shows the socioeconomic characteristics of the study population. Females constituted a large proportion of the sample (69.1%). More than two fifths (45.3%) of the population resided in urban villages; just under a third (30.2%) resided in cities and towns while a quarter (24.5%) resided in rural areas and settlements. Almost three quarters (73.8%) of respondents were never married; over a third (35.5%) had primary education or less; over a quarter (27.2%) had junior secondary education while just under a fifth had senior secondary education (17.4%) and tertiary education and over (19.9%). Close to two fifth (37.5%) of respondents were not employed; while over a quarter were employed in either the public (10.5%) or private sector (15.7%). Just over one in every ten (11.2%) were self-employed, while close to a fifth (18.7%) were either home makers or students; while only 6.4 per cent were retired from work.

Table 2: Socioeconomic characteristics of the study population (N=1178) -NCD survey, 2016.

Variable	Percentage (%)	Frequency (N)
Sex		
Male	30.9	364
Female	69.1	813
Missing		***1***
Age in years		
<24	26.4	270
25– 34	29.5	302
35 – 44	19.2	196
45– 54	12.7	130
55 – 64	7.3	75
65+ years	4.9	50
Missing		***155***
Locality Type		
Cities/Towns	30.2	355
Urban Villages	45.4	534
Rural Settlements	24.5	288
Missing		***1***
Marital Status		
Never Married	73.8	864
Currently married	17	199
Formerly married	9.2	108
Missing		***7***
Highest Level of Education Attained		
Primary or Less	35.5	410
Junior Secondary	27.2	314
Senior Secondary	17.3	200
Tertiary & Over	19.9	230
Missing		***24***
Work Status in past 12 months		
Public Sector	10.5	122
Private Sector	15.7	182
Self Employed	11.2	130
Not Employed	37.5	436
Homemaker-Student	18.8	218
Retired-Other	6.4	74
Missing		***16***
Wealth status		
Lowest	19.9	234
Second	20.1	237
Middle	19.9	235
Fourth	20.1	237
Highest	19.9	235
Missing		***-***

Overall		**1178**

Childhood socioeconomic characteristics of study population

Table 3 gives the childhood socioeconomic characteristics of study population. The table reveals that majority of the respondents (79.1%) reported that their father's educational level was low. This was also true for the mother's education level (78%). As regards the occupation of the father, most respondents reported that their father was employed in the private sector (32.8%), while almost half (49%) of respondents indicated that their mothers were unemployed.

About one third (34.1%) of respondents indicated that they had a stressful childhood. When asked about how they perceived their health during childhood, 8.4% reported that their health was below average, 66.5% was average while only 25.1% reported that their health was above average. Just over one fifth (21.9%) of respondents reported that they had major ailment during childhood. For the childhood SES indicator it was observed that slightly over one quarter (25.6%) of respondents reported a low childhood SES.

Table 3: Percentage distribution of sampled population by childhood characteristics, NCD Survey 2016

Variable	N	%
Father's Education		
High	193	20.9
Low	732	79.1
Mother's education		
High	214	21.8
Low	768	78.2
Father's Occupation		
Public Sector	267	25.7
Private Sector	341	32.8
Self-employed	260	25.0
Unemployed	171	16.5
Mother's occupation		
Public Sector	145	12.7
Private Sector	174	15.2
Self-employed	265	23.1
Unemployed	562	49.0
Stressful childhood		
Yes	379	34.1
No	732	65.9
Kind of food taken during childhood		
Vegetarian	24	2.5
Non-vegetarian	939	97.5
Self-perceived childhood health		
Below average	97	8.4
Average	767	66.5
Above average	290	25.1
Major ailment during childhood		
Yes	258	21.9
No	920	78.1
Childhood SES Index		
Low	223	25.6
Medium	388	44.5
High	260	29.9

Association between childhood SES and NCD risk factors

Table 4 shows logistic regression results for the likelihood of association between childhood SES and NCD risk factors. Results on the bivariate associations between childhood SES and NCD risk factors are not included in this article. However, variables such as alcohol consumption, poor fruit and vegetable consumption and overweight/obesity. The odds of alcohol consumption remained constant before and after the introduction of control variable. It was observed that individuals who had low childhood SES were 2 times (AOR=2.19) more likely to report alcohol consumption than respondents who had high childhood SES, even after adjusting for current SES of respondents. This suggests that the significant association between childhood SES and alcoholconsumption is not spurious

Table 4: Odd ratios giving association between childhood SES and NCD risk factors

Childhood SES	**Alcohol**		**Poor fruit and vegetable consumption**		**Poor Physical activity**		**Smoking**		**Overweight/Obesity**	
	UOR	**AOR**	**UOR**	**AOR**	**UOR**	**AOR**	**UOR**	**AOR**	**UOR**	**AOR**
Low	2.19**	2.19**	4.87**	2.67**	0.81	0.87	1.11	2.18**	0.66**	0.92
Middle	1.38	1.32	1.49	1.34	0.68**	0.73	1.08	1.46	0.94	0.98
High	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Note: **Statistically significant at 5%; UOR-unadjusted odd ratios, AOR- Estimated adjusted odd ratios controlling for age, sex,education,residence,work status and wealth status. N=694.

It was also found that poor fruit and vegetable consumption was significantly associated with poor childhood SES. A decline was observed in the odds of poor fruit and vegetable consumption among individuals who reported poor childhood SES after introduction of control variables. For instance, individuals who had low childhood SES were two times (AOR=2.67) more likely to report poor fruit and vegetable consumption than those with high SES after adjusting for current SES.Furthermore, it was noted that the odds of smoking were two times (AOR=2.18) higher among people who reported low childhood SES than those who reported high childhood SES. On the other hand it was observed that individuals who reported low childhood SES were less likely to be overweight/obesity (AOR=0.66).

Association between childhood SES, hypertension and diabetes

Table 5: Odd ratios giving association between Childhood SES and selected NCDs

Childhood SES	**Hypertension-N=999**		**Diabetes-N=955**	
	UOR	**AOR**	**UOR**	**AOR**
Low	0.41**	1.53**	1.77	2.34
Middle	0.79	1.07	1.96	2.31
High	1.00	1.00	1.00	1.00

Note: **Statistically significant at 5%;UOR-unadjusted odd ratios, AOR- Estimated adjusted odd ratios controlling for age, sex, education, residence, work status and current wealth status.

Table 5 shows the odd ratios on the association between childhood SES and selected NCDs. It was found that before adjusting for current SES characteristics individuals who had low childhood SES were less likely (OR=0.41) to report hypertension than those who had high SES. However after controlling for current SES variables, the odds of reporting hypertension were higher (AOR=1.53) among

people who reported low SES during childhood. Results did not show any significant association between poor childhood SES and diabetes. This lack of statistically significant association between childhood SES and diabetes implies that diabetes affects both those who had poor childhood SES and non-poor childhood SES.

Discussion

After adjusting for current SES our findings showed significant association between alcohol consumption and poor childhood SES.This corroborates previous findings which have shown that childhood poverty is associated with earlier onset of alcohol consumption and with alcohol use disorders in adulthood[33]. This has also been supported by several reasons to believe that an association between childhood SES and later alcohol consumption is plausible. For instance, stressful life events during childhood such as low SES, sexual, emotional and physical abuse, emotional or physical neglect may lead to increase in the risk of alcohol disorders during adulthood[34-36]. Contrary to attestations that alcohol consumption is influenced by conditions in adulthood[35--36], findings from this study show that childhood circumstances drive alcohol consumption independent of adulthood socioeconomic conditions.

Poor fruit and vegetable consumption was found to be significantly associated with poor childhood SES. Individuals who reported low childhood SES were two times more likely to report poor fruit and vegetable consumption than those with high SES. Similarly other previous studies have shown a positive link between poor childhood SES and poor fruit and vegetable consumption[37-39]. For example, a recent study conducted in Japan also concluded that after adjustment for age and sex, older people who had low childhood SES were more likely to have poor fruit and vegetable intake than those with high childhood SES[40]. This is because food preference is determined early in life suggesting that the association between poor childhood SES and poor fruit and vegetable consumption during adulthood observed in this study may be explained by the type of diet that individuals from poor socioeconomic background were exposed to during their childhood.

The odds of smoking were two times higher among people who reported low childhood SES than those who reported high childhood SES. This is consistent with findings of a longitudinal study by Barbara, *et al*.[41] which found that poor childhood

socioeconomic circumstances, which were measured by the occupation-based score and parental education significantly, increased the risk of persistent smoking among adults. The cumulative effects of poor early life circumstances observed in this study may predispose individuals to smoking initiation, increased risk of progression to regular smoking and a reduced likelihood of cessation during adulthood. This finding emphasises how important it is, in the context of the policy debate, to recognise the accumulation of disadvantages that can occur during childhood which may ultimately leads to inequality in adult morbidity and mortality.

It was also found that individuals who reported low childhood SES were less likely to be overweight/obese. Contrary to this finding, empirical evidence from both developed and developing countries have found that childhood disadvantage (i.e., low childhood SES) is associated with increased weight among adults[28, 42-45]. These studies suggest that indicators of childhood SES may be associated with adult weight through a number of mechanisms, including parental modelling of daily weight-related behaviours (such as the consumption of energy dense foods and sedentary lifestyles). However, the observed negative association between low childhood SES and adulthood overweight/obesity in this study may be explained through a variety of mechanisms. For instance in Botswana, children from high SES background have been found to be predisposed to early markers of overweight/obesity such as the consumption of high energy dense food and sedentary lifestyles[46].On the other hand children from low SES families generally eat traditional diets and do a lot physical work.

We found that there was no significant association between childhood SES and poor physical activity. There is little evidence of studies showing any significant association between childhood SES and poor physical activity in LMICs. Consequently, mechanisms and pathways by which early childhood low income/SES impacts on physical health in adulthood remain elusive[47]. The observed lack of association between poor childhood SES and poor physical activity in this study may be explained by the adoption of sedentary lifestyles which have led to physical inactivity among both the poor and non-poor. It may also mean that current SES and not childhood SES better explains the non-variation in poor physical activity.

For NCDs, we found that the odds of reporting hypertension were higher among people who reported low SES during childhood. Congruent with this finding, the literature on the potential confounders and mediators of hypertension has emphasized the role childhood SES plays in the development of hypertension[48-49]. These studies suggest that children who are from low-SES families are likely to have worse health outcomes later in life. Individuals who reported hypertension and were from low SES families may have been predisposed to mediating factors for hypertension such as lack of lack of a proper nutritionally balanced diet, high salt intake, tobacco use, alcohol intake and high stress.

This study, like most other studies, found no associations between childhood SES and adult diabetes[50-51]. The impact of childhood SES on the risk of having diabetes in adulthood remains poorly understood when one's own adult SES is considered. There is therefore need for further research using longitudinal data and cross sectional data representative of the general population.

Conclusion

Findings indicate that childhood socioeconomic circumstances have an independent effect on adult health. Poor childhood SES was found to be associated with health risk behaviours such as alcohol consumption, poor fruit and vegetable consumption, smoking and overweight/obesity. It was also found that poor childhood SES was significantly linked to hypertension and asthma later in life. Our findings present initial evidence on the influence of childhood SES on health in later life. Further research is needed-especially longitudinal studies to examine more ardently how socioeconomic and social risk factors acting across the entire life course influence health of individuals.

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