



ORIGINAL RESEARCH ARTICLE

Socioeconomic inequalities in children's health-related quality of life according to weight status

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Abstract

Objectives: This study explores the association between socioeconomic position (SEP) and health-related quality of life (HRQoL) among Portuguese children according to their weight status.

Methods: A total of 1215 primary school-aged children (mean age 8.78 years) from three Portuguese districts (Lisbon, Porto, Coimbra) were assessed during 2016/2017. Father and mother's education (low, medium, high) and work status (employed, unemployed/retired) were used as SEP indicators. Self-reported HRQoL was assessed with the KIDSCREEN-27. Height and weight were objectively measured and body mass index categorized in normal, overweight or obese. Age, sex, and district-adjusted linear regression models were fitted to estimate associations between SEP indicators and HRQoL dimensions, according to weight status.

Results: We found that 24.9% of children were categorized as having overweight/obesity. The mean scores of the Physical Well-Being, and School Environment dimensions of HRQoL were lower among children classified with overweight/obesity compared to children with normal weight (57.21 vs 54.11, $P < .001$ and 57.85 vs 56.04, $P = .010$, respectively). Father's education was significantly associated with all HRQoL dimensions in children with a normal weight, but the same was not observed among children presenting overweight/obesity. An increase in the level of maternal education was also significantly associated with all HRQoL dimensions among children classified with a normal weight, and only for the School Environment dimension among children classified with overweight/obesity.

Conclusions: These results suggest the presence of socioeconomic inequalities in self-reported HRQoL from early age, particularly among children with normal weight.



1 | INTRODUCTION

Taking into consideration a holistic model of the human being (Ventegodt, Merrick, & Andersen, 2003), quality of life (and health-related quality of life [HRQoL], more specifically), has been defined by the World Health Organization (WHO) as a complex, multidimensional concept that incorporates individuals subjective evaluation of their position in life, regarding their expectations and concerns, and encompasses their physical and psychological health, independence, social relations, beliefs and relationship with the environment (Department of Mental Health - World Health Organization, 1999). The assessment of HRQoL, as a relevant patient-reported outcome, allows to monitor the relative effectiveness of interventions that aim to enhance life conditions. Furthermore, HRQoL assessment has been facilitated through the development of standardized and reliable tools, that are also applicable to children (Ravens-Sieberer et al., 2008).

Similar to several health outcomes, HRQoL follows a socioeconomic gradient, with disadvantaged groups (ie, in lower, compared to higher, socioeconomic position [SEP]) presenting poorer reports (Rajmil, Herdman, Ravens-Sieberer, Erhart, & Alonso, 2014). These inequalities might be more serious in places struck by macroeconomic financial crisis (Clause-Verdreau, Audureau, Leplege, & Coste, 2019; Mechili, Kalokairinou, Kaitelidou, & Diomidous, 2015), which was the case of Portugal, although limited evidence exists documenting the consequences of the economic crisis to this country's population health (Legido-Quigley et al., 2016). A review of studies published during 2012 to 2017, showed that socioeconomic inequalities in health either increased or remained stable from precrisis to post-crisis years in Europe (Heggebo, Toge, Dahl, & Berg, 2018). The detrimental effects to the social and health conditions of the population resulting from a socioeconomic crisis (and the subsequent adopted austerity policies) might be more strongly felt by the lower socioeconomic groups, who have fewer resources to deal with their (already) poor health condition.

Besides, even after the worst years of the economic crisis in Portugal, 24% of children were still at risk of poverty in 2018 (Eurostat, 2019). This suggests that a large proportion of children may not have sufficient conditions to achieve a balanced physical and mental health development.

Childhood obesity is currently a major public health concern, associated with a range of chronic conditions (Kumar & Kelly, 2017). The problem varies widely across regions: prevalence estimates of obesity in children and adolescents (aged 5-19 years) in Europe for 2016 were 11.3% for girls in Malta and 16.7% for boys in Greece, representing the highest estimates, while the lowest were

found for girls and boys in Moldova, 3.2% and 5.0%, respectively (Abarca-Gómez et al., 2017). In Portugal, 28.8% of children aged 6 to 8 years were estimated to have overweight/obesity (and 8.9% obesity only) (Rito, Wijnhoven, Rutter et al., 2012) placing the country among the five European countries with the highest prevalence (Wijnhoven, van Raaij, Spinelli et al., 2014). In high-income or industrialized populations, obesity tends to be more frequent among those classified with a low SEP, while in low and middle-income countries, the highest wealth and education groups (high SEP) still have the highest prevalence of overweight and obesity, as demonstrated in a study using data from 39 countries (Jones-Smith, Gordon-Larsen, Siddiqi, & Popkin, 2012). There is, thus, an influence of macroeconomic characteristics on individually measured overweight and obesity (Wells, 2012), that must also be accounted for, especially in places where the overall economic situation suffered significant changes following, for example, a global economic crisis.

The mechanisms relating inequality to childhood obesity and overweight are still not fully understood (Shrewsbury & Wardle, 2008; Ulijaszek et al., 2016). Most evidence comes from studies conducted with adult samples and considers the different levels of determinants that may influence the relation between SEP and overweight/obesity, better understood through a socioecological model framework (Pereira, Padez, & Nogueira, 2019). At the microlevel, studies have shown an influence of maternal nutrition, starting before and during pregnancy, and influencing child health outcomes several years later (Litvak, Parekh, & Deierlein, 2020). Such epigenetic effects are still poorly understood in terms of their underlying mechanisms of influence, but might be mediated by proximal determinants (eg, diet) or more distal factors (eg, environmental stress or chronic poverty) (Ulijaszek et al., 2016). Interpersonal and area level socioeconomic inequalities have also been associated with childhood obesity. The concept of "obesogenic" environment has been the focus of several studies, showing how structural factors may predispose individuals to overweight and obesity, essentially by encouraging high caloric food consumption (and more affordable, particular for low SEP groups), and discouraging physical activity (Guthman, 2013). However, several studies testing such "obesogenic" environment have produced inconclusive findings and the ecologic methodological approaches often taken by these studies, do not allow to rule out the possibility of reverse causation (Guthman, 2013).

Childhood obesity has also a detrimental impact on HRQoL (Jalali-Farahani, Shojaei, Parvin, & Amiri, 2018; Mollerup et al., 2017) as measured in both clinical (Manion & Velsor-Friedrich, 2017; Wille, Bullinger, Holl

et al., 2010) and population-based samples (Halasi, Lepes, Dordic et al., 2018; Ottova, Erhart, Rajmil, Dettenborn-Betz, & Ravens-Sieberer, 2012). HRQoL of school-aged children and adolescents is impaired in children with overweight/obesity compared to children with a normal weight (Costarelli, Koretsi, & Georgitsogianni, 2013; Halasi et al., 2018; Ottova et al., 2012). Furthermore, obesity in childhood or adolescence is considered a determinant of obesity in adulthood. It has also been shown that female children with obesity are more likely to develop depression, which persists into adulthood (Sutaria, Devakumar, Yasuda, Das, & Saxena, 2019). One explanation for the association between childhood obesity and depression lies in the fact that being classified as overweight or obese during this period represents an increased risk for being victim of teasing and bullying, as demonstrated by a previous meta-analysis (van Geel, Vedder, & Tanilon, 2014). As with depression, the negative impact of childhood obesity on HRQoL is likely to extend into adulthood.

HRQoL of school-aged children has been measured in the scope of multicenter and national population-based studies (Barriuso-Lapresa, Hernando-Arizaleta, & Rajmil, 2012; Ravens-Sieberer et al., 2008). However, little is known about existing socioeconomic inequalities in the HRQoL reports of children with a normal weight and children with overweight or obesity. Such associations have not been described after a period of economic crisis as the one impacting Portugal during 2008 to 2013 (Heggebo et al., 2018). Thus, the aim of the present study was to assess the association between SEP and HRQoL of Portuguese children according to their weight status.

2 | METHODS

2.1 | Participants and procedures

The present study is part of the “Inequalities in Childhood Obesity: the impact of the socioeconomic crisis in Portugal from 2009 to 2015” project. Sampling procedures were the same as those followed in a previous project conducted during 2009 to 2010 to assess childhood obesity prevalence and determinants (Jago et al., 2012; Machado-Rodrigues, Fernandes, Gama et al., 2018). In brief, the sampling procedure for the 2009 to 2010 cross-sectional study was based on a stratified random design that accounted for the number of children by age and sex in each district, to provide a nationally representative survey of children aged 3 to 10 years. In each district, schools were randomly selected and then year groups were selected within schools, with a total of 17 509 assessed at that time.

For the current study, schools participating in the 2009 to 2010 study from Coimbra, Lisbon and Porto districts were selected (each district covers a large geographical area encompassing several cities). Between November 2016 and April 2017 a total of 13 787 invitations were sent and 8472 preprimary and primary school-aged children (age range: 3.5-11.5 years, 50.8% male), were recruited from 118 schools of the three selected districts. Participation rates were 58% in Coimbra, 67% in Lisbon and 60% in Porto.

2.2 | Ethical procedures

The study protocol was approved by Direção Geral do Ensino (Portuguese Ministry of Education) and Comissão Nacional de Protecção de Dados (CNPd), the Portuguese Data Protection Authority (authorization number 745/2017).

Informed consent was obtained from children's parents. Specific authorization was asked to parents of children aged 7.5 years or older, so that children could self-complete a specific section of the questionnaire in the classroom that included the HRQoL measure. Children aged 7.5 years or older were selected considering the developmental level that would allow answering self-reported measures.

2.3 | Measures

2.3.1 | Sociodemographics and body mass index

The standardized questionnaire applied comprised parents' sociodemographics (age, sex, education, work status) and children health behaviors and characteristics (physical activity, sleep, eating habits, common mental health). Parents were asked to answer the sections pertaining to sociodemographics, children's physical activity and eating behaviors at home.

Children's height and weight were measured by trained researchers at school (SECA 220 scale, SECA 200 stadiometer), body mass index (BMI) was computed as kg/m^2 and categorized according to the International Obesity Task Force (Cole, Bellizzi, Flegal, & Dietz, 2000) cut-offs points into normal and overweight/obesity.

2.3.2 | Health-related quality of life

HRQoL was assessed with the Portuguese (translated and validated) version of the KIDSCREEN-27 (Gaspar &

Matos, 2008; Ravens-Sieberer et al., 2005; Ravens-Sieberer et al., 2007; The KIDSCREEN Group Europe, 2006) self-reported questionnaire, administered to children at school.

The KIDSCREEN-27 has 27 items that evaluate five HRQoL dimensions: Physical Well-being (5-item), Psychological Well-being (7-item), Autonomy and Parent Relations (7-item), Social Support and Peers (4-item), and School Environment (4-item). The first item asks about the general health status (“excellent/very good/good/fair/poor”) and the remaining items present five answering options (“not at all/slightly/moderately/very/extremely” or “never/seldom/quite often/very often/always”) (Costarelli et al., 2013).

Higher scores in each KIDSCREEN-27 dimension indicate a better HRQoL. Cronbach alphas in this sample were .755 for the Physical Well-being dimension, .773 for the Psychological Well-being dimension, .753 for the Autonomy and Parent Relations dimension, .846 for the Social Support and Peers dimension, and .813 for the School Environment dimension.

2.3.3 | Socioeconomic position

Father and mother's education and work status were used as indicators of SEP. Father and mother's education were categorized in three levels, according to the years of school completed, as follows: lower (less than or equal to 9 years of school completed), medium (from 10 to 12 years of school completed), high (university degree).

Father and mother's work status were assessed with the question: “are you currently working,” and categorized as “yes” (ie, currently working), and “unemployed” or “retired” (retired and unemployed parents were collapsed in one category because of the small size of the retired group: only three mothers and six fathers were retired in our sample).

2.4 | Data analysis

The KIDSCREEN-27 was answered by 1619 children, but 272 were excluded for having missing values. Further 132 cases were excluded due to missing data in father or mother's education or father or mother's work status variables, thus a total of 1215 cases were analyzed.

The KIDSCREEN-27 items were coded according to the instrument' manual (The KIDSCREEN Group Europe, 2006). Each HRQoL dimension was transformed into Rasch scales and then translated into *T*-values, using a specific syntax developed by the KIDSCREEN group.

Chi-square tests were used to compare proportions and *t* test to compare means, of each demographic and socioeconomic characteristics and HRQoL mean dimension scores between children presenting a normal weight and children presenting overweight/obesity.

Linear regression models were fitted to show the relative strength of association between SEP (father and mother's education and father and mother's work status) and the HRQoL dimensions (considering only the increase in each dimension per change in SEP level from low to high), adjusting for age, sex and district. The categories “retired” and “unemployed” of the father and mother's work status individual variables were collapsed to be fitted in the regression models (thus, each variable presenting two levels: employed and unemployed/retired, since only six retired cases existed for father work status and three for mother work status). Models were stratified for children with normal weight and children with overweight/obesity.

Generalized linear regression models were fitted to estimate mean scores (SE) for each HRQoL dimension according to the levels of the SEP variables (ie, father and mother's three educational levels and father and mother's two work status levels) and stratified by BMI classes (for children with normal weight and children with overweight/obesity). Models were adjusted for age, sex, and district. Pairwise comparisons for each estimated mean were established between the SEP variables levels and also between children with normal weight and those with overweight/obesity, using a Bonferroni correction. The significance level considered was 5% ($P < .05$). The analysis was conducted using SPSS v.24.

3 | RESULTS

Overall, 24.8% of participating children were classified as presenting overweight or obesity (18.9% overweight only and 5.9% obesity only), with a higher proportion of girls presenting overweight/obesity, compared to boys, as shown in Table 1.

Fathers of children presenting overweight/obesity were less educated compared to fathers of children presenting a weight classified as normal (35.1% vs 21.5%, with less than 9 years of school completed, $P < .001$). The same was observed regarding mother's educational level (19.5% vs 11.8%, with less than 9 years of school completed, $P < .001$).

Children classified with a normal weight presented higher mean scores than children classified with overweight/obesity, in the Physical Well-being dimension of the KIDSCREEN-27 questionnaire (57.21 vs 54.11,

TABLE 1 Sociodemographic characteristics and KIDSCREEN-27 mean scores according to children body mass index (normal and overweight/obese according to IOTF cut-offs)

Characteristics		Normal weight (n = 913)	Overweight/obese (n = 302)	P*
Sex: n (%)	Male	460 (50.4)	131 (43.4)	.041
	Female	453 (49.6)	171 (56.6)	
Age: mean (SD)		8.78 (0.78)	8.76 (0.75)	.654
District: n (%)	Coimbra	506 (55.4)	154 (51.0)	.120
	Lisbon	294 (32.2)	97 (32.1)	
	Porto	113 (12.4)	51 (16.9)	
Father education: n (%)	Low: <9 y schooling	196 (21.5)	106 (35.1)	<.001
	Medium: 10-12 y of schooling	311 (34.1)	122 (40.4)	
	High: University degree	406 (44.5)	74 (24.5)	
Mother education: n (%)	Low: <9 y schooling	108 (11.8)	59 (19.5)	<.001
	Medium: 10-12 y of schooling	265 (29.0)	133 (44.0)	
	High: University degree	540 (59.1)	110 (36.4)	
Father work status: n (%)	Currently working	864 (94.6)	276 (91.4)	.072
	Unemployed	44 (4.8)	25 (8.3)	
	Retired	5 (0.5)	1 (0.3)	
Mother work status: n (%)	Currently working	827 (90.6)	261 (86.4)	.123
	Unemployed	84 (9.2)	40 (13.2)	
	Retired	2 (0.2)	1 (0.3)	
KIDSCREEN-27: mean (SD)	Physical Well-being	57.21 (10.98)	54.11 (10.42)	<.001
	Psychological Well-being	57.75 (11.42)	56.95 (11.22)	.286
	Autonomy and Parent Relations	52.24 (11.84)	50.89 (11.54)	.079
	Social Support and Peers	54.98 (10.86)	53.77 (10.62)	.087
	School Environment	57.85 (10.58)	56.04 (10.45)	.010

Note: *P-value from chi-square test or *t* test.

Abbreviation: IOTF, International Obesity Task Force; SD, standard deviation.

$P < .001$), and in the School Environment dimension (57.85 vs 56.04, $P = .010$).

The regression coefficients (estimating the increase in each dimension per increase in educational level, from low to high, and in work status, from currently working to unemployed/retired, Table 2), show that father's education was significantly associated with all HRQoL dimensions in children with a normal weight, but the same was not observed among children presenting overweight/obesity. An increase in the level of maternal education was also significantly associated with all HRQoL dimensions among children classified with a normal weight, and only for the School Environment dimension among children classified with overweight/obesity.

The association of father's work status with HRQoL shows that father's retirement or unemployment (at the time of interview) was negatively associated with HRQoL, but a significant association in the adjusted models was only observed for children with a normal

weight for the Autonomy and Parent Relations and the Social Support and Peers dimensions. Mother's work status (ie, unemployed/retired), however, showed significant negative associations among children classified as normal weighted for all HRQoL dimensions except Psychological Well-being, and among children classified with overweight/obesity except for the Psychological Well-being and the School Environment dimensions.

Among children classified with normal weight, a consistent socioeconomic gradient was observed in the mean scores of all HRQoL dimensions, as detailed in Table 3, with lower mean scores for those whose father and mother had low education levels, followed by medium and high education levels. The differences in age-, sex- and district-adjusted mean scores between the lowest and the medium and higher father's education levels were statistically significant for all HRQoL dimensions, except for the Social Support and Peers dimension; in this case, there was a statistically significant difference only

TABLE 2 Regression analysis showing relative strength of associations between KIDSCREEN-27 dimensions and SEP variables (father and mother education levels, father and mother work status), in normal weight and overweight/obese children, adjusted for age, sex, and district

KIDSCREEN-27 dimensions						
	n	Physical Well-being	Psychological Well-being	Autonomy and Parent Relations	Social Support and Peers	School Environment
		Coefficient (95% CI)	Coefficient (95% CI)	Coefficient (95% CI)	Coefficient (95% CI)	Coefficient (95% CI)
Father education (three levels—low, medium, high)	913	1.827* (0.916; 2.739)	2.008* (1.057; 2.958)	2.260* (1.281; 3.239)	1.511* (0.607; 2.414)	2.077* (1.207; 2.947)
	302	0.933 (-0.623; 2.488)	0.524 (-1.159; 2.207)	0.905 (-0.831; 2.640)	-0.002 (-1.603; 1.599)	1.215 (-0.336; 2.766)
Mother education (three levels—low, medium, high)	913	1.996* (0.973; 3.019)	2.087* (1.020; 3.155)	2.230* (1.129; 3.331)	2.307* (1.298; 3.316)	2.502* (1.528; 3.477)
	302	1.051 (-0.574; 2.677)	0.605 (-1.153; 2.364)	1.130 (-0.683; 2.942)	0.097 (-1.576; 1.771)	1.828* (0.214; 3.442)
Father work status (two levels—currently working, unemployed/retired)	913	-1.097 (-4.275; 2.082)	-2.787 (-6.098; 0.524)	-5.601* (-9.005; -2.197)	-3.845* (-6.979; -0.711)	-1.430 (-4.474; 1.613)
	302	-1.747 (-5.956; 2.463)	-1.925 (-6.471; 2.621)	-3.003 (-7.689; 1.683)	-0.612 (-4.939; 3.716)	-1.595 (-5.799; 2.609)
Mother work status (two levels—currently working, unemployed/retired)	913	-3.075* (-5.513; -0.637)	-1.044 (-3.595; 1.507)	-3.159* (-5.785; -0.532)	-3.663* (-6.070; -1.256)	-3.069* (-5.404; -0.735)
	302	-4.291* (-7.716; -0.866)	-3.312 (-7.030; 0.405)	-6.172* (-9.964; -2.379)	-4.686* (-8.198; -1.173)	-3.364 (-6.798; 0.069)

Note: * $P < .05$.

Abbreviations: 95% CI, 95% confidence interval; SEP, socioeconomic position.

between the lowest and highest father's educational level groups. Adjusted mean scores of each HRQoL dimension according to mother's educational level, showed the same pattern among children with a normal weight classification. Among children classified with overweight/obesity, however, there were no significant differences across father and mother's educational levels, although the least educated groups (lower than 9 years school completed) presented lower mean scores compared to medium and high levels.

Children presenting a normal weight, whose fathers were employed, presented higher mean scores for all HRQoL dimensions compared to those with fathers unemployed/retired, but statistically significant differences in these means were noted only for the Autonomy and Parent Relations and the Social Support and Peers dimension. Among children classified with overweight, there were no significant differences in the mean scores of HRQoL dimensions according to father's work status.

Employed mothers, compared to unemployed/retired, were associated with higher HRQoL scores, and statistically significant differences were noted for all dimensions except Psychological Well-being among children with a normal weight, and except for Psychological Well-being and School Environment among children classified with overweight/obesity.

When comparing the estimated means between children classified with a normal weight and children classified with overweight/obesity within each category of father's education, there was a statistically significant difference for the Physical Well-being dimension within the medium education level group. For mother's educational level, the adjusted mean score of the Physical Well-being dimension differed significantly between children with a normal weight and children with overweight/obesity within the medium and higher educational level groups and the Social Support & Peers dimension differed within the higher educational level group.

This statistically significant difference (between children classified with a normal weight vs overweight/obesity) was also observed for the Physical Well-being and for the School Environment dimensions, among children whose father and mother were currently working.

4 | DISCUSSION

This study describes the relationship between SEP indicators and self-reported HRQoL among Portuguese school-aged children classified with a normal weight and children classified as having overweight/obesity. The results suggest the presence of a socioeconomic gradient, particularly among children categorized as having a

TABLE 3 KIDSCREEN-27 mean scores according to SEP (father and mother educational levels and father and mother work status) in normal weight and overweight/obese children, adjusted for age, sex, and district

KIDSCREEN-27 dimensions						
	n	Physical Well-being	Psychological Well-being	Autonomy and Parent Relations	Social Support and Peers	School Environment
		Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)
<i>Normal weight</i>						
Father education	Low: Lower than 9 y	53.85 (0.81) ^{a,b}	53.96 (0.84) ^{a,b}	49.01 (0.87) ^{a,b}	52.52 (0.80) ^a	54.79 (0.77) ^{a,b}
	Medium: 10-12 y	57.57 (0.65) ^d	58.51 (0.68)	52.78 (0.70)	54.75 (0.65)	57.50 (0.62)
	High: University degree	58.17 (0.59)	58.87 (0.62)	54.21 (0.64)	55.80 (0.59)	59.32 (0.57)
Mother education	Low: Lower than 9 y	53.68 (1.07) ^a	53.76 (1.12) ^{a,b}	49.37 (1.15) ^a	51.09 (1.06) ^a	53.82 (1.02) ^a
	Medium: 10-12 y	56.24 (0.70) ^d	57.13 (0.72)	51.24 (0.75) ^a	53.82 (0.69)	56.55 (0.66) ^a
	High: University degree	58.18 (0.53) ^d	58.84 (0.56)	54.01 (0.57)	56.01 (0.53) ^d	59.17 (0.51)
Father work status	Currently working	57.11 (0.45) ^d	57.88 (0.47)	52.98 (0.48) ^c	55.00 (0.44) ^c	57.81 (0.43) ^d
	Retired/unemployed	55.94 (1.56)	55.00 (1.62)	47.28 (1.67)	51.13 (1.54)	56.31 (1.49)
Mother work status	Currently working	57.35 (0.45) ^{c,d}	57.79 (0.47)	52.93 (0.49) ^c	55.12 (0.45) ^c	58.03 (0.43) ^{c,d}
	Retired/unemployed	54.26 (1.19)	56.73 (1.24)	49.74 (1.27)	51.45 (1.17)	54.95 (1.10)
<i>Overweight/obese</i>						
Father education	Low: Lower than 9 y	52.75 (1.04)	55.93 (1.13)	50.22 (1.17)	53.97 (1.08)	54.72 (1.04)
	Medium: 10-12 y	53.57 (0.95)	57.56 (1.04)	51.28 (1.08)	53.47 (0.99)	55.56 (0.96)
	High: University degree	54.98 (1.27)	57.18 (1.37)	52.08 (1.42)	53.96 (1.31)	57.34 (1.27)
Mother education	Low: Lower than 9 y	53.32 (1.36)	56.19 (1.48)	49.93 (1.53)	54.00 (1.41)	53.88 (1.36)
	Medium: 10-12 y	52.45 (0.93)	56.64 (1.01)	50.75 (1.05)	53.46 (0.97)	55.04 (0.93)
	High: University degree	55.19 (1.03)	57.63 (1.12)	52.17 (1.16)	53.98 (1.07)	57.46 (1.03)
Father work status	Currently working	53.73 (0.69)	57.05 (0.75)	51.37 (0.77)	53.83 (0.71)	55.80 (0.69)
	Retired/unemployed	52.33 (2.03)	55.52 (2.20)	48.38 (2.27)	53.11 (2.10)	54.29 (2.04)
Mother work status	Currently working	54.15 (0.69) ^c	57.33 (0.75)	51.88 (0.77) ^c	54.36 (0.71) ^c	56.09 (0.70)
	Retired/unemployed	49.87 (1.63)	54.02 (1.77)	45.71 (1.82)	49.68 (1.68)	52.73 (1.64)

^a*P* < .05 for pairwise comparison with class: high university degree.

^b*P* < .05 for pairwise comparison with class: medium 10-12 y.

^c*P* < .05 for pairwise comparison between employed and retired/unemployed.

^d*P* < .05 for pairwise comparison between normal and overweight/obese; normal and overweight/obese categories based on IOTF cut-off points.

Abbreviations: IOTF, International Obesity Task Force; SE, standard error; SEP, socioeconomic position.

normal weight, where a disadvantageous SEP, measured through father and mother's educational level and current work status, is associated with lower mean scores for all dimensions of HRQoL, as measured by the KIDSCREEN-27. Among children categorized as having overweight/obesity, father and mother's low educational level also represented lower mean scores across the HRQoL dimensions, although nonsignificant. The Autonomy and Parent Relations and the Social Support and Peers dimensions were significantly negatively related to father unemployment among children with a normal weight. These two HRQoL dimensions, together with the Physical Well-being dimension, were negatively influenced by mother unemployment in both groups of children with a normal weight and children classified with overweight/obesity.

This study revealed that the Physical Well-being dimension of children HRQoL was lower in those categorized as having overweight/obesity compared with those categorized with normal weight, which is in line with studies using clinical and community samples. The items composing the Physical Well-being dimension, reflect the child's general health status, if he/she has felt fit or well, if he/she has been physically active (running, climbing, biking), able to run well, and felt full of energy. It is thus not surprising, that the Physical Well-being dimension was significantly lower in children with overweight/obesity considering the association between overweight and high sedentary behavior rates and low physical activity levels among Portuguese children (Bingham et al., 2013).

An Iranian study, using the Pediatric Quality of Life Inventory (PedsQL) also found lower scores of HRQoL among children with obesity compared with healthy children (children with normal weight) and compared with children with other chronic diseases (aged 8-12 years) (Jalali-Farahani et al., 2018). The same was observed among adolescents aged 13 from Kuala Lumpur, Malaysia (Loh, Moy, Zaharan, & Mohamed, 2015) and among Iranian children and adolescents (aged 6-18 years) (Hovsepian et al., 2017). In the United States, a study of 4824 children (mean age of 11.12 years) using the PedsQL, found lower psychosocial HRQoL scores according to higher classes of overweight, compared to children with normal weight, and significantly lower physical HRQoL scores among children with extreme obesity (Wallander, Kerbawy, Toomey et al., 2013). Other studies conducted with adolescent samples using the PedsQL, found the same difference in the United States (Swallen, Reither, Haas, & Meier, 2005), Australia (Keating, Moodie, & Swinburn, 2011), and Jordan (Al-Akour, Khader, Khassawneh, & Bawadi, 2012).

There were no significant differences in the Social Support and Peers dimension and in the Psychological

Well-being dimension between children with normal weight and children with overweight/obesity, which would have been expected considering other studies. For example, in Serbia, an assessment of 182 children (aged 7-8 years), revealed a negative impact of obesity in the Social Support & Peers dimension of the KIDSCREEN-27 in boys (Halasi et al., 2018). In the KIDSCREEN Health Interview Survey study (children/adolescents aged 8-18 years from 10 European countries), children/adolescents with overweight had lower mean HRQoL scores than children/adolescents with normal weight, particularly on the Physical Well-Being and Self-Perception dimensions (Ottova et al., 2012). We did not find differences in the Social Support & Peers and in the Psychological Well-being dimensions in our data, which suggest that weight status is not associated with the factors measured through these HRQoL dimensions, in this group of children. Our sample differs in participant's age, since we assessed younger children that might not be yet as affected as adolescents by psychological correlates and social relationships with their peers. Depressive symptoms that may arise from a desire to change weight and impact HRQoL (Wynne, Comiskey, & McGilloway, 2016), may not be noticeable at this age.

We found lower scores for the School Environment dimension among children with overweight/obesity compared to children with normal weight. This may suggest that children with overweight/obesity are influenced by the factors that concern their school performance since this dimension is composed of items assessing if the child has been happy at school, got on well at school, been able to pay attention, and got along well with the teachers.

These results emphasizes the need to tackle childhood obesity at early stages given its association with increased frequency of mental health services attendance in later childhood (Carsley, Tu, Parkin, Pullenayegum, & Birken, 2018), with depression (Sutaria et al., 2019) and its potential impact on school performance (Wu, Chen, Yang, & Li, 2017), ultimately altering their developmental trajectory. However, interventions to tackle weight gain early should be sensitive and not contribute to increase children stigmatization (Greenhalgh, 2015). There is scarce evidence about early interventions to tackle childhood obesity, and interventions derived from public health models, which consider mainly individual-level behavior change as targets, have been largely unsuccessful so far (Hardin, McLennan, & Brewis, 2018). Interventions should, therefore, consider the contextual meanings attached to each aspect of weight and its related behavior (Hardin et al., 2018).

The lower scores found for the HRQoL dimensions, particularly among children categorized with a normal

weight and with low educated fathers, are congruent with previous research, namely with the KIDSCREEN multicenter study that explored socioeconomic inequalities of children HRQoL across 11 European countries, and found lower scores among disadvantaged groups (Rajmil et al., 2014). However, the shortest KIDSCREEN version was used in this 2003 multicenter study (KIDSCREEN-10). Portuguese children were not included, and the inequalities observed in this study might have increased during the economic crisis that affected Europe subsequently. Also, within a 2006 Spanish national survey, the KIDSCREEN-10 parents' version was applied to 6414 children (aged 8-15) and no social gradient was found for HRQoL, although children from disadvantaged social classes had slightly worse HRQoL scores than their peers from more advantaged classes (Barriuso-Lapresa et al., 2012).

Our study did not reveal significant differences in the dimensions of HRQoL explored among children with overweight/obesity, using father's and mother's educational level as SEP indicators. However, the Autonomy and Parent Relations and the Social Support and Peers dimensions were negatively related to father's unemployment among children with normal weight and these two dimensions, together with the Physical Well-being dimension, were lower among children classified with normal weight and children classified with overweight/obesity whose mothers were unemployed. Unemployment is a particular important measure of financial strain among families during periods of economic crisis (Kondilis et al., 2013), with potential negative consequences for the health of children and vulnerable groups (Rajmil, Siddiqui, Taylor-Robinson, & Spencer, 2015). The results of this study are, thus, consistent with the previously proposed mechanisms linking SEP with child development that have focused on differences in access to material and social resources, stress reactions in both parents and children, and health-behavior or lifestyle choices (Bradley & Corwyn, 2002).

Previous reviews have documented the inverse association between parental socioeconomic status and childhood adiposity, although dependent on the type of socioeconomic indicator used (Barriuso et al., 2015; Shrewsbury & Wardle, 2008). In this study, we stratified our analysis according to children weight status, in order to clearly depict the influence of different socioeconomic indicators (parental education and work status), on children HRQoL, while controlling for the known association between a low SEP and childhood adiposity, previously documented in studies conducted in high-income settings.

If socioeconomic inequalities in child's HRQoL were not influenced (confounded) by weight status, we would

expect the same gradient present among children categorized with a normal weight and children with overweight/obesity, when using the same SEP indicator. However, our results suggest that parental education was not as relevant to discriminate HRQoL among children with overweight or obesity as it was for children with normal weight. There may be different pathways through which SEP indicators influence these relations, with education, as a more stable indicator, being more closely linked to parental knowledge and beliefs (Barriuso et al., 2015), which will in turn impact children QoL and well-being. Parental occupation and work status may relate to different lifestyle choices and shared peer values associated with children QoL, and thus, be more relevant in families where children have overweight or obesity. Future studies should, nonetheless, include more than one SEP indicator where possible. Evidence is also needed to further understand the mechanisms underlying how higher-level contextual factors (eg, macroeconomic indicators) impact the susceptibility and exposure to the obesogenic niche (Wells, 2012), and how economic policy changes could impact obesity trends worldwide, and also how environmental or contextual factors (including those directly linked to SEP) influence childhood obesity prevalence in different settings (Guthman, 2013).

The proposal of interventions to tackle childhood obesity should also deal with the potential for increasing weight stigma (Greenhalgh, 2015). To address inequalities and focus solely on eating and exercise, might not be effective and prevention programs might benefit from addressing the influence of stress, which may arise from the individual's attempts to cope with negative emotions, namely those arising from weight stigma. The experience of weight stigma might be related, for example, with biochemical modifications, such as an increase in cortisol release or with behavioral reactions, namely the increase in eating behaviors (eg, "comfort eating") (Tomiyama, 2014), which, among other factors, might fuel a stress-obesity-stigma cycle (Tomiyama, 2019)."

4.1 | Strengths and limitations

This study assessed a large sample of children using a well-established standardized questionnaire, maximizing comparisons. Children answered the questionnaire in the classroom, not influenced by their parents' answers. The school setting facilitated the selection of children whose cognitive development is normally matured enough to provide valid answers.

We used father's and mother's education as a proxy measure of SEP, which has been considered an adequate indicator of social class when assessing samples of



children (Galobardes, Lynch, & Smith, 2007). Furthermore, we tested the distribution of father and mother work status according to father and mother educational level, and found that work status follows the same gradient as educational level, that is, proportionally there were more unemployed/retired parents with <9 years of school completed, than with 10 to 12 years of school completed and than parents with university degree. Nevertheless, future studies should consider other proxy measures (eg, income or type of employment) that could provide a deeper understanding of the dimensions of SEP associated with these health-related outcomes.

A bidirectional association has been documented between weight change and HRQoL (Sahle, Slewa-Younan, Melaku, Ling, & Renzaho, 2020). It is plausible that poor HRQoL may increase the risk of weight gain through its association with unhealthy lifestyle (in particular, with physical inactivity). More evidence is needed to explore the direction of these associations, and the current study design does not allow to draw inferences on the direction of causality.

Despite the large sample and the probabilistic sampling design followed, the current analysis uses only cases with valid (ie, nonmissing) information for the relevant variables, resulting in a smaller group, thus we cannot ensure that the included participants compose a representative sample of Portuguese preschool aged children.

5 | CONCLUSION

This study suggests that socioeconomic inequalities represent a significant burden in the reports of HRQoL, particularly among children with a normal weight. Regardless of the limited evidence on the impact to health of the socioeconomic inequalities observed following the economic crisis in Portugal, prevention efforts to combat inequalities are needed.

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CONFLICT OF INTEREST

The authors declare no conflicts of interest.

AUTHOR CONTRIBUTIONS

Diogo Costa conceived the study aim, analyzed and interpreted data and drafted the article. Marina Cunha, Cláudia Ferreira, Augusta Gama, Aristides M. Machado-Rodrigues, Vítor Rosado-Marques, Larissa L. Mendes, Helena Nogueira, Milene Pessoa, Maria-Raquel G. Silva, and Gustavo Velasquez-Melendez contributed to the study design and critically revised the article for important intellectual content. Cristina Padez was responsible for the study design, acquisition of data and drafting the article. All authors approved the final manuscript as submitted and agree to be accountable for all aspects of the work.

REFERENCES

- Abarca-Gómez, L., Abdeen, Z. A., Hamid, Z. A., Abu-Rmeileh, N. M., Acosta-Cazares, B., Acuin, C., ... Ezzati, M. (2017). Worldwide trends in body-mass index, underweight, overweight, and obesity from 1975 to 2016: A pooled analysis of 2416 population-based measurement studies in 128.9 million children, adolescents, and adults. *Lancet*, *390*, 2627–2642.
- Al-Akour, N. A., Khader, Y. S., Khassawneh, M. Y., & Bawadi, H. (2012). Health-related quality of life of adolescents with overweight or obesity in the north of Jordan. *Child: Care, Health and Development*, *38*, 237–243.
- Barriuso, L., Miqueleiz, E., Albaladejo, R., Villanueva, R., Santos, J. M., & Regidor, E. (2015). Socioeconomic position and childhood-adolescent weight status in rich countries: A systematic review, 1990–2013. *BMC Pediatrics*, *15*, 129.
- Barriuso-Lapresa, L., Hernando-Arizaleta, L., & Rajmil, L. (2012). Social inequalities in mental health and health-related quality of life in children in Spain. *Pediatrics*, *130*, e528–e535.
- Bingham, D. D., Varela-Silva, M. I., Ferrão, M. M., Augusta, G., Mourão, M. I., Nogueira, H., ... Padez, C. (2013). Socio-demographic and behavioral risk factors associated with the high prevalence of overweight and obesity in Portuguese children. *American Journal of Human Biology*, *25*, 733–742.
- Bradley, R. H., & Corwyn, R. F. (2002). Socioeconomic status and child development. *Annual Review of Psychology*, *53*, 371–399.
- Carsley, S., Tu, K., Parkin, P. C., Pullenayegum, E., & Birken, C. S. (2018). Overweight and obesity in preschool aged children and risk of mental health service utilization. *International Journal of Obesity*, *43*, 1325–1333. <https://doi.org/10.1038/s41366-018-0280-1>
- Clause-Verdreau, A. C., Audureau, E., Leplege, A., & Coste, J. (2019). Contrasted trends in health-related quality of life across gender, age categories and work status in France, 1995-2016: Repeated population-based cross-sectional surveys using the SF-36. *Journal of Epidemiology and Community Health*, *73*, 65–72.
- Cole, T. J., Bellizzi, M. C., Flegal, K. M., & Dietz, W. H. (2000). Establishing a standard definition for child overweight and obesity worldwide: International survey. *BMJ*, *320*, 1240–1243.

- Costarelli, V., Koretsi, E., & Georgitsogianni, E. (2013). Health-related quality of life of Greek adolescents: The role of the Mediterranean diet. *Quality of Life Research*, *22*, 951–956.
- Department of Mental Health - World Health Organization. (1999). *Annotated bibliography of the WHO quality of Life Assessment Instrument - WHOQOL*. Geneva, Switzerland: World Health Organization.
- Eurostat (2019). People at risk of poverty or social exclusion by age and sex. Retrieved from <https://ec.europa.eu/eurostat/web/income-and-living-conditions/data/database>.
- Galobardes, B., Lynch, J., & Smith, G. D. (2007). Measuring socioeconomic position in health research. *British Medical Bulletin*, *81-82*, 21–37.
- Gaspar, T., Matos, M. (2008). Versão portuguesa dos instrumentos KIDSCREEN-52: Instrumentos de Qualidade de Vida para Crianças e Adolescentes. (Portuguese Version of KIDSCREEN Instruments of Quality of Life in Children and Adolescents) FMH, Lisbon.
- Greenhalgh, S. (2015). *Fat-talk nation: The human costs of America's war on fat*. Ithaca: Cornell University Press.
- Guthman, J. (2013). Too much food and too little sidewalk? Problematizing the obesogenic environment thesis. *Environment and Planning A*, *45*, 142–158.
- Halasi, S., Lipeš, J., Đorđić, V., Stevanović, D., Ihász, F., Jakšić, D., ... Marinković, D. (2018). Relationship between obesity and health-related quality of life in children aged 7–8 years. *Health and Quality of Life Outcomes*, *16*(1). <http://dx.doi.org/10.1186/s12955-018-0974-z>
- Hardin, J., McLennan, A. K., & Brewis, A. (2018). Body size, body norms and some unintended consequences of obesity intervention in the Pacific islands. *Annals of Human Biology*, *45*, 285–294.
- Heggebo, K., Toge, A. G., Dahl, E., & Berg, J. E. (2018). Socioeconomic inequalities in health during the great recession: A scoping review of the research literature. *Scandinavian Journal of Public Health*, *47*, 635–654. <https://doi.org/10.1177/1403494818801637>
- Hovsepian, S., Qorbani, M., Motlagh, M. E., Madady, A., Mansourian, M., Gorabi, A. M., & Kelishadi, R. (2017). Association of obesity and health related quality of life in Iranian children and adolescents: The weight disorders survey of the CASPIAN-IV study. *Journal of Pediatric Endocrinology & Metabolism*, *30*, 923–929.
- Jago, R., Stamatakis, E., Gama, A., MourãoCarvalho, I., Nogueira, H., Rosado, V., & Padez, C. (2012). Parent and child screen-viewing time and home media environment. *American Journal of Preventive Medicine*, *43*, 150–158.
- Jalali-Farahani, S., Shojaei, F. A., Parvin, P., & Amiri, P. (2018). Comparison of health-related quality of life (HRQoL) among healthy, obese and chronically ill Iranian children. *BMC Public Health*, *18*, 1337.
- Jones-Smith, J. C., Gordon-Larsen, P., Siddiqi, A., & Popkin, B. M. (2012). Is the burden of overweight shifting to the poor across the globe? Time trends among women in 39 low- and middle-income countries (1991–2008). *International Journal of Obesity*, *36*, 1114–1120.
- Keating, C. L., Moodie, M. L., & Swinburn, B. A. (2011). The health-related quality of life of overweight and obese adolescents—A study measuring body mass index and adolescent-reported perceptions. *International Journal of Pediatric Obesity*, *6*, 434–441.
- Kondilias, E., Giannakopoulos, S., Gavana, M., Ierodiakonou, I., Waitzkin, H., & Benos, A. (2013). Economic crisis, restrictive policies, and the population's health and health care: The Greek case. *American Journal of Public Health*, *103*, 973–979.
- Kumar, S., & Kelly, A. S. (2017). Review of childhood obesity: From epidemiology, etiology, and comorbidities to clinical assessment and treatment. *Mayo Clinic Proceedings*, *92*, 251–265.
- Legido-Quigley, H., Karanikolos, M., Hernandez-Plaza, S., de Freitas, C., Bernardo, L., Padilla, B., ... McKee, M. (2016). Effects of the financial crisis and troika austerity measures on health and health care access in Portugal. *Health Policy*, *120*, 833–839.
- Litvak, J., Parekh, N., & Deierlein, A. (2020). Prenatal dietary exposures and offspring body size from 6 months to 18 years: A systematic review. *Paediatric and Perinatal Epidemiology*, *34*, 171–189. <https://doi.org/10.1111/ppe.12629>
- Loh, D. A., Moy, F. M., Zaharan, N. L., & Mohamed, Z. (2015). Disparities in health-related quality of life among healthy adolescents in a developing country—The impact of gender, ethnicity, socio-economic status and weight status. *Child: Care, Health and Development*, *41*, 1216–1226.
- Machado-Rodrigues, A. M., Fernandes, R., Gama, A., Mourão, I., Nogueira, H., Rosado-Marques, V., & Padez, C. (2018). The association of irregular sleep habits with the risk of being overweight/obese in a sample of Portuguese children aged 6–9 years. *American Journal of Human Biology*, *30*(4), e23126. <http://dx.doi.org/10.1002/ajhb.23126>.
- Manion, A. B., & Velsor-Friedrich, B. (2017). Quality of life and health outcomes in overweight and non-overweight children with asthma. *Journal of Pediatric Health Care*, *31*, 37–45.
- Mechili, A. E., Kalokairinou, A., Kaitelidou, D., & Diomidous, M. (2015). Greece financial crisis and quality of life. *Studies in Health Technology and Informatics*, *213*, 207–209.
- Mollerup, P. M., Nielsen, T. R. H., Bojsøe, C., Kloppenborg, J. T., Baker, J. L., & Holm, J. C. (2017). Quality of life improves in children and adolescents during a community-based overweight and obesity treatment. *Quality of Life Research*, *26*, 1597–1608.
- Ottova, V., Erhart, M., Rajmil, L., Dettenborn-Betz, L., & Ravens-Sieberer, U. (2012). Overweight and its impact on the health-related quality of life in children and adolescents: Results from the European KIDSCREEN survey. *Quality of Life Research*, *21*, 59–69.
- Pereira, M. M. C. E., Padez, C. M. P., & Nogueira, H. G. S. M. (2019). Describing studies on childhood obesity determinants by socio-ecological model level: A scoping review to identify gaps and provide guidance for future research. *International Journal of Obesity*, *43*, 1883–1890.
- Rajmil, L., Herdman, M., Ravens-Sieberer, U., Erhart, M., & Alonso, J. (2014). Socioeconomic inequalities in mental health and health-related quality of life (HRQOL) in children and adolescents from 11 European countries. *International Journal of Public Health*, *59*, 95–105.
- Rajmil, L., Siddiqui, A., Taylor-Robinson, D., & Spencer, N. (2015). Understanding the impact of the economic crisis on child health: The case of Spain. *International Journal for Equity in Health*, *14*, 95.

- Ravens-Sieberer, U., Auquier, P., Erhart, M., Gosch, A., Rajmil, L., Bruil, J., ... the European KIDSCREEN Group. (2007). The KIDSCREEN-27 quality of life measure for children and adolescents: Psychometric results from a cross-cultural survey in 13 European countries. *Quality of Life Research*, *16*, 1347–1356.
- Ravens-Sieberer, U., Gosch, A., Rajmil, L., Erhart, M., Bruil, J., Duer, W., ... KIDSCREEN Group, E. (2005). KIDSCREEN-52 quality-of-life measure for children and adolescents. *Expert Review of Pharmacoeconomics & Outcomes Research*, *5*, 353–364.
- Ravens-Sieberer, U., Gosch, A., Rajmil, L., Erhart, M., Bruil, J., Power, M., ... KIDSCREEN Group. (2008). The KIDSCREEN-52 quality of life measure for children and adolescents: Psychometric results from a cross-cultural survey in 13 European countries. *Value in Health*, *11*, 645–658.
- Rito, A., Wijnhoven, T. M. A., Rutter, H., Carvalho, M. A., Paixão, E., Ramos, C., ... Breda, J. (2012). Prevalence of obesity among Portuguese children (6–8 years old) using three definition criteria: COSI Portugal, 2008. *Pediatric Obesity*, *7*(6), 413–422. <http://dx.doi.org/10.1111/j.2047-6310.2012.00068.x>
- Sahle, B. W., Slewa-Younan, S., Melaku, Y. A., Ling, L., & Renzaho, A. M. N. (2020). A bi-directional association between weight change and health-related quality of life: Evidence from the 11-year follow-up of 9916 community-dwelling adults. *Quality of Life Research*, *29*(6), 1697–1706. <http://dx.doi.org/10.1007/s11136-020-02423-7>.
- Shrewsbury, V., & Wardle, J. (2008). Socioeconomic status and adiposity in childhood: A systematic review of cross-sectional studies 1990–2005. *Obesity*, *16*, 275–284.
- Sutaria, S., Devakumar, D., Yasuda, S. S., Das, S., & Saxena, S. (2019). Is obesity associated with depression in children? Systematic review and meta-analysis. *Archives of Disease in Childhood*, *104*, 64–74.
- Swallen, K. C., Reither, E. N., Haas, S. A., & Meier, A. M. (2005). Overweight, obesity, and health-related quality of life among adolescents: The National Longitudinal Study of Adolescent Health. *Pediatrics*, *115*, 340–347.
- The KIDSCREEN Group Europe. (2006). *The KIDSCREEN questionnaires—Quality of life questionnaires for children and adolescents*. Handbook. Lengerich, Germany: Pabst Science Publishers.
- Tomiyama, A. J. (2014). Weight stigma is stressful. A review of evidence for the cyclic obesity/weight-based stigma model. *Appetite*, *82*, 8–15.
- Tomiyama, A. J. (2019). Stress and obesity. *Annual Review of Psychology*, *70*, 703–718.
- Ulijaszek, S. J., Pentecost, M., Marcus, C., Karpe, F., Frühbeck, G., & Nowicka, P. (2016). Inequality and childhood overweight and obesity: A commentary. *Pediatric Obesity*, *12*, 195–202.
- van Geel, M., Vedder, P., & Tanilon, J. (2014). Are overweight and obese youths more often bullied by their peers? A meta-analysis on the relation between weight status and bullying. *International Journal of Obesity*, *38*, 1263–1267.
- Ventegodt, S., Merrick, J., & Andersen, N. J. (2003). Quality of life theory II. Quality of life as the realization of life potential: A biological theory of human being. *Scientific World Journal*, *3*, 1041–1049.
- Wallander, J. L., Kerbawy, S., Toomey, S., Lowry, R., Elliott, M. N., Escobar-Chaves, S. L., ... Schuster, M. A. (2013). Is obesity associated with reduced health-related quality of life in Latino, black and white children in the community? *International Journal of Obesity*, *37*(7), 920–925. <http://dx.doi.org/10.1038/ijo.2013.31>
- Wells, J. C. (2012). Obesity as malnutrition: The role of capitalism in the obesity global epidemic. *American Journal of Human Biology*, *24*, 261–276.
- Wijnhoven, T. M. A., van Raaij, J. M. A., Spinelli, A., Starc, G., Hassapidou, M., Spiroski, I., ... Breda, J. (2014). WHO European Childhood Obesity Surveillance Initiative: Body mass index and level of overweight among 6–9-year-old children from school year 2007/2008 to school year 2009/2010. *BMC Public Health*, *14*(1). <http://dx.doi.org/10.1186/1471-2458-14-806>
- Wille, N., Bullinger, M., Holl, R., Hoffmeister, U., Mann, R., Goldapp, C., ... Ravens-Sieberer, U. (2010). Health-related quality of life in overweight and obese youths: Results of a multicenter study. *Health and Quality of Life Outcomes*, *8*(1), 36. <http://dx.doi.org/10.1186/1477-7525-8-36>
- Wu, N., Chen, Y., Yang, J., & Li, F. (2017). Childhood obesity and academic performance: The role of working memory. *Frontiers in Psychology*, *8*, 611.
- Wynne, C., Comiskey, C., & McGilloway, S. (2016). The role of body mass index, weight change desires and depressive symptoms in the health-related quality of life of children living in urban disadvantage: Testing mediation models. *Psychology & Health*, *31*, 147–165.

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