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Desigualdades sociais no estado nutricional e consumo alimentar de escolares brasileiros

Mariana Slywitch Noronha de Morais

UBERLÂNDIA - MG
2018

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Dissertação apresentada ao Programa de Pós-Graduação em Ciências da Saúde da Faculdade de Medicina da Universidade Federal de Uberlândia, como requisito parcial para obtenção do título de Mestrado em Ciências da Saúde.

Área de concentração: Ciências da Saúde.

Orientadora: Profª. Dra. Catarina Machado Azeredo

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RESUMO

Introdução: Evidências mostram que indivíduos de baixo nível socioeconômico são propensos a uma má nutrição, o que contribui para desigualdades na saúde e aumento da prevalência de desvios nutricionais na infância. Ademais, não há estudos nacionais avaliando a desigualdade social no estado nutricional e consumo alimentar de adolescentes. **Objetivo:** Avaliar a desigualdade social no estado nutricional e no consumo alimentar de escolares brasileiros. **Material e Métodos:** Utilizou-se dados da Pesquisa Nacional de Saúde do Escolar (PeNSE), realizada em 2015, que consistiu em alunos de 13 a 17 anos de escolas públicas e privadas das zonas urbana e rural representativas do Brasil. As variáveis de interesse foram as características demográficas, sexo, o estado nutricional e o consumo alimentar de frutas, hortaliças, refrigerante, guloseimas e *fast food*. As condições socioeconômicas foram avaliadas com base em um escore de riqueza criado a partir de respostas sobre a posse de bens e acesso aos serviços, por meio da análise de componentes principais (ACP), posteriormente dividido em quintos. Foram calculados o Slope index of inequalities e o Concentration index, além de medidas de desigualdade simples baseadas em diferenças e razões. O teste t foi utilizado para identificar diferenças estatisticamente significantes da desigualdade entre os sexos. **Resultados:** O sexo masculino foi mais propenso à obesidade no maior quintil de riqueza. O SII de +7,79 e CIX de +15,23, mostraram que a desigualdade favoreceu os mais ricos. Quanto ao consumo, os índices de desigualdade tiveram valores positivos semelhantes em todos alimentos utilizados, mostrando que a desigualdade favoreceu os mais ricos. **Conclusão:** A desigualdade social entre adolescentes propiciou um consumo e desvios nutricionais desiguais, sendo os mais

ricos mais afetados pela obesidade e por um maior consumo de alimentos saudáveis e não saudáveis.

Palavras-chave: desigualdade social, estado nutricional, consumo alimentar, adolescente.

ABSTRACT

Introduction: Evidence shows that individuals with low socioeconomic status are prone to malnutrition, which contributes to health inequalities and increases the prevalence of nutritional disorders in childhood. In addition, there are no studies in Brazil assessing the social inequality in adolescents' nutritional status and food consumption. **Objective:** To assess social inequalities regarding the nutritional status and food consumption of Brazilian students. **Materials and Methods:** We used the data from the 2015 National Adolescent School-based Health Survey (PeNSE – Pesquisa Nacional de Saúde do Escolar), which was a research with students aged 13 to 17 years of public and private schools in urban and rural areas in Brazil. The variables of interest were the demographic characteristics, sex, nutritional status and food consumption of fruits, vegetables, soft drinks, treats and fast food. We created a wealth score based on answers about the ownership of goods and access to services by means of the principal component analysis (PCA), later divided into quintiles. We calculated the Slope index of inequalities and the Concentration index, along with simple inequality measures based on differences and ratios. The t-test identified statistically significant differences in sex inequality. **Results:** Male students were more prone to obesity in the wealthiest quintile. The SII of +7.79 and CIX of +15.23 showed that inequality favored the richest students. Regarding consumption, the inequality indices had similar positive values for all foods analyzed, showing that inequality favored the richest individuals. **Conclusion:** Social inequality among adolescents fostered unequal consumption and nutritional deviations. The richest ones were more affected by obesity and by a higher consumption of healthy and unhealthy foods.

Keywords: Social inequality. Nutritional status. Food consumption. Adolescents.

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LISTA DE ABREVIATURAS E SIGLAS

ACP	Análise de Componentes Principais
CIX	Concentration index
CNS	Conselho Nacional de Saúde
CONEP	Comissão Nacional de Ética em Pesquisa
DCNT	Doenças Crônicas Não Transmissíveis
EUA	Estados Unidos da América
GSHS	Global School-based Student Health Survey
IBGE	Instituto Brasileiro de Geografia e Estatística
IMC	Índice de Massa Corporal
OMS	Organização Mundial da Saúde
PeNSE	Pesquisa Nacional de Saúde do Escolar
POF	Pesquisa de Orçamentos Familiares
PSF	Programa Saúde da Família
RS	Rio Grande do Sul
SII	Slope index of inequality
TCLE	Termo de Consentimento Livre e Esclarecido

SUMÁRIO

1 INTRODUÇÃO

Mundialmente, há uma epidemia de sobrepeso e obesidade. A incidência desses desvios nutricionais triplicou desde 1975, tanto em adultos quanto em crianças e adolescentes (WHO, 2017). Em 2014, havia 41 milhões de crianças abaixo de 5 anos com sobrepeso. Já entre os adultos, 41 milhões estavam acima do peso e 600 milhões eram obesos. Dados atuais mostram que na população mundial, 10% das crianças e adolescentes entre 5 e 17 anos de idade apresentam excesso de massa corporal, e 2 a 3% delas sãos obesas (WHO, 2017). Vale ressaltar que a obesidade iniciada na infância pode permanecer na fase adulta e propiciar o desenvolvimento de doenças crônicas não transmissíveis (DCNT), tais como, doença cardiovascular, diabetes melitus, distúrbios musculoesqueléticos e câncer (NATIONAL INSTITUTE OF HEALTH, 2015). Além disso, o aumento do índice de massa corporal (IMC) também contribui para o surgimento de distúrbios psicológicos, reduzindo a qualidade e a expectativa de vida (OLIVEIRA, SOARES, 2002).

No Brasil, a taxa de obesidade e sobrepeso entre crianças e adolescentes de 6 a 18 anos triplicou de 4% na década de 1970 para 13% em 1997 (WHO, 2004). Dados da Pesquisa de Orçamentos Familiares (POF) de 2008-2009 analisando a tendência secular, mostraram que para os adolescentes de 10 a 19 anos do sexo masculino, o déficit de peso reduziu de 10,1% em 1974-1975 para 3,7% em 2008-2009, o sobrepeso aumentou de 3,7% para 21,7% e a obesidade de 0,4% para 5,9%. Já entre as adolescentes do sexo feminino, o déficit de peso era de 5,1% em 1974-1975 e passou para 3% em 2008-2009, o sobrepeso aumentou de 7,6% para 19,4% e a obesidade de 0,7% para 4% (BRASIL, 2010).

É importante salientar que o baixo peso afeta de forma desigual os indivíduos ricos e pobres, tanto em países de alta renda quanto nos de baixa renda, dessa forma a prevalência geral acaba mascarando as desigualdades. (RESTREPO-MÉNDEZ et al., 2015; BLACK et al., 2008). Ademais, a desnutrição, em 2002, era responsável por metade dos gastos indiretos em saúde nos países

subdesenvolvidos (WHO, 2002). Diante desse índice, as políticas de saúde pública têm contribuído para eliminar a desnutrição (UAUY, SOLOMONS, 2006).

Em relação aos desvios nutricionais, dentre os diversos fatores associados ao déficit de peso, sobrepeso e obesidade, destaca-se o nível socioeconômico. Um estudo realizado em Illinois-EUA por Zahnd et al. (2015), mostrou que o nível socioeconômico mais baixo estava associado a uma maior prevalência de obesidade e que as meninas eram mais afetadas pela desigualdade social. Outros estudos em países de alta renda, mostraram que riscos sociais cumulativos estavam relacionados a um aumento do risco de obesidade em escolares (SINGH et al., 2010a; SPRINGER et al., 2015; SUGLIA et al., 2013). Já no Brasil, um estudo de Araújo et al. (2010), sugeriu que a obesidade aumentava proporcionalmente ao nível socioeconômico e os meninos eram mais afetados. Ademais, o déficit de peso estava associado ao menor nível socioeconômico (ARAÚJO et al., 2010)

Quanto ao consumo alimentar, estudos têm mostrado que o padrão do consumo de alimentos por crianças e adolescentes possui uma forte influência de fatores socioeconômicos (CRAIG et al., 2010; FITZGERALD et al., 2010). Nos países de alta renda, por exemplo, os adolescentes de menor nível socioeconômico têm uma maior ingestão de gorduras, sal e açúcares. (DARMON, DREWNOWSKI, 2008; FRASER et al., 2000; JOHANSSON et al., 1999). Já nos países de baixa renda, essa relação se inverte e os adolescentes dos maiores níveis socioeconômicos ingerem mais gorduras, sal e açúcares (POPKIN et al., 2012; SUBRAMANIAN et al., 2011).

Os estudos mostram que, no Brasil, a obesidade e sobrepeso se intensificam a cada ano (BRASIL, 2010) enquanto outros mostram que as desigualdades sociais têm reduzido lentamente (WHO 2013; ELGAR et al., 2015; OXFAM BRASIL, 2017). Sabe-se que estudos realizados no Brasil avaliaram apenas a associação entre desigualdade social e desvios nutricionais, não avaliando dados sobre consumo alimentar (CARVALHO et al., 2017; ARAÚJO et al., 2010) Outrossim, esses estudos são regionais e não mostraram a realidade dos escolares brasileiros como um todo (CARVALHO et al*.,* 2017; ARAÚJO et al., 2010; SANTOS et al., 2016; CONCEIÇÃO et al., 2010). Por outro lado, as tendências encontradas

em estudos realizados em países de alta renda podem não refletir a realidade brasileira.

2 FUNDAMENTAÇÃO TEÓRICA

2.1 Desigualdades sociais em saúde

As desigualdades sociais em saúde são conhecidas como desigualdades sistemáticas, evitáveis, injustas e desnecessárias (MARMOT et al., 2008). Segundo o modelo proposto pela Comissão dos Determinantes Sociais da Saúde (CDSS), há 2 tipos de Determinantes Sociais de Saúde: os determinantes estruturais e os determinantes intermediários (MARMOT et al., 2008).

Os determinantes estruturais são os mecanismos que geram e reforçam hierarquias sociais, definem o poder e o acesso a recursos. As políticas públicas (educação, saúde e proteção social), macroeconômicas e sociais (mercado de trabalho e habitação), cultura e valores sociais são exemplos de determinantes estruturais. Eles causam as principais desigualdades em saúde, tanto dentro de um mesmo país quanto entre os países (MARMOT et al., 2008).

Já os determinantes intermediários, são bens materiais, condições de vida e trabalho, fatores comportamentais e biológicos, coesão social, fatores psicossociais e sistema de saúde (SOLAR, IRWIN, 2010). Ademais, esse determinante engloba os estilos de vida e comportamentos, tais como, consumo de álcool e outras drogas, tabaco e atividade física, além de circunstâncias estressantes e falta de apoio social (MARMOT et al., 2008).

Sabe-se que populações com menores níveis socioeconômicos têm risco aumentado de ter uma pior condição de saúde (OLSTAD et al., 2016; MARMOT et al., 2008). Isso acontece pois há uma distribuição desigual de bens materiais e recursos sociais, tais como renda, ocupação e educação (MARMOT et al., 2008).

2.2 Medidas de desigualdade

As medidas de desigualdade utilizadas no presente estudo foram o SII - *Slope Index of Inequality* e o CIX - *Concentration Index*. Essas duas medidas são muito úteis, pois geram diferentes conclusões sobre a desigualdade. Elas são calculadas através da ponderação do tamanho da população, gerando um único número que exprime a desigualdade entre todos os subgrupos. Diferentemente de outras medidas de desigualdade que avaliam apenas os extremos, o SII e o CIX,

estimam a desigualdade por toda população. Dessa forma, indefere o tamanho dos grupos, podendo fazer comparações no tempo e entre países (WHO, 2013).

O SII mede a desigualdade absoluta entre o grupo mais favorecido e o menos favorecido. Já o CIX mede a desigualdade relativa em termos de porcentagem de saúde da população entre os grupos mais e menos favorecidos (WHO, 2013).

Esses índices são calculados por meio de regressão logística dos índices de variável de saúde, transformando a variável em uma classificação cumulativa de probabilidades *(ridit score)* variando de 0, grupo menos favorecido, e 1, grupo mais favorecido (BARROS, VICTORA, 2013).

O SII é usado para mostrar o gradiente de saúde através de múltiplos subgrupos com ordem natural, por exemplo, riqueza e educação. Ele representa a diferença absoluta dos indicadores de saúde entre os grupos mais e menos favorecidos, por usar um modelo apropriado de regressão logística, leva em consideração toda a distribuição da variável. Para o cálculo, coloca-se peso na amostra de toda a população variando de 0 (subgrupo menos favorecido) a 1 (subgrupo mais favorecido). Depois, faz-se uma distribuição cumulativa da população. Assim, a diferença entre os valores gerados do mais alto ao mais baixo, considerando todos os outros subgrupos na regressão, gera o SII (WHO, 2013).

Se a linha de regressão é plana, o valor do SII é 0, mostrando que não há desigualdade no indicador estudado. Se o indicador se distribui do menos favorecido ao mais favorecido, o resultado será um valor positivo, indicando que a variável é mais prevalente nos subgrupos mais favorecidos. Por outro lado, valores negativos significam que o indicador de saúde é mais prevalente nos subgrupos menos favorecidos (BARROS, VICTORA, 2013; WHO, 2013).

Já o CIX é uma medida relativa de desigualdade que mostra o gradiente através de múltiplos subgrupos com ordem natural. Ele indica a amplitude da concentração do indicador de saúde entre os mais e os menos favorecidos e varia de -100 a +100, mas, na prática, os valores não excedem 50 e valores de 20 e 30 são considerados alto nível de desigualdade relativa. Valores negativos, mostram que a variável está concentrada entre os menos favorecidos, e valores positivos, indicam uma concentração entre os mais favorecidos. Quando não há desigualdade o CIX é 0 (WEHRMEISTER et al., 2017; WHO, 2013).

Para o cálculo, a população é classificada de acordo com a posição socioeconômica (eixo X), da mesma forma que o SII, coloca-se peso na amostra de toda a população variando de 0 (subgrupo menos favorecido) a 1 (subgrupo mais favorecido). Já no eixo y, coloca-se a fração cumulativa do índice correspondente em cada subgrupo e a curva de concentração é feita unindo os pontos. Nesse gráfico, existe uma curva hipotética de igualdade representada pela curva diagonal de 45º. Dessa forma, se a curva de concentração estiver acima da curva de igualdade, o indicador de saúde estará mais concentrado entre os desfavorecidos, já se estiver abaixo da curva da igualdade, o indicador de saúde terá maior prevalência entre os mais favorecidos. Quando não há desigualdade, a curva do CIX corresponde à curva da igualdade. O índice de concentração é calculado como o dobro da área entre a curva hipotética de igualdade e a curva de concentração (WHO, 2013).

2.3 Estado Nutricional e Nível Socioeconômico

O aumento do IMC global tanto em adultos quanto em crianças e adolescentes, emergiu como um dos problemas de saúde pública mais grave (MALIK et al., 2013). O orçamento gasto com sobrepeso e obesidade aumentou em média de 6,5% para 9,1% nas últimas 3 décadas (SPRUIJT-METZ, 2011). Em contrapartida há uma redução do déficit de peso, resultado de políticas públicas visando sua eliminação (UAUY, SOLOMONS, 2006). Sabe-se que o nível socioeconômico influencia o consumo e consequentemente o estado nutricional de crianças e adolescentes (SINGH et al., 2010a; SINGH et al., 2010b).

Além da genética, a família tem profundas influências sobre os comportamentos da criança e do adolescente, o que pode gerar desvios nutricionais (SPRUIJT-METZ, 2011). Um estudo desenvolvido com adolescentes de 12 a 17 anos nos Estados Unidos, comparando décadas de 1990 e 2000, mostrou que após anos com aumento progressivo da obesidade nos adolescentes, aparentemente na última década esse desvio nutricional atingiu um platô, e em famílias com alto nível socioeconômico a prevalência de obesidade diminuiu. Ainda, esse estudo observou que o aumento da escolaridade dos pais, reduziu a prevalência de obesidade e aumentou a proporção de atividade física, comparando as duas décadas (FREDERICK et al., 2014).

Sabe-se que o nível socioeconômico exerce diferentes influências sobre o estado nutricional em regiões distintas, por sexo e por faixa etária. Por exemplo, um estudo realizado na Malásia, país de média renda, mostrou que o IMC não teve relação com nível socioeconômico (ABDUL MAJID et al., 2016). Já um estudo transversal desenvolvido nos Estados Unidos, mostrou que a pobreza aumentou a prevalência de obesidade somente para os adolescentes de 15 a 17 anos (Miech et al. 2006).

Por outro lado, um estudo desenvolvido em Pelotas-RS, Brasil, mostrou que o nível socioeconômico foi diretamente proporcional à obesidade e ao sobrepeso para os meninos. Já para as pré-adolescentes do sexo feminino, o sobrepeso teve relação direta com os quintos de riqueza, mas a obesidade se concentrou nos quintos médios de riqueza (ARAÚJO et al., 2010). Outro estudo de coorte realizado em Pelotas –RS, com adolescentes de 18 anos de idade, mostrou que o nível socioeconômico teve relação direta com sobrepeso e obesidade para o sexo masculino e relação inversa para o sexo feminino (VICTORA, BARROS, 2006).

Ainda, um estudo transversal desenvolvido na África do Sul mostrou que o aumento de IMC se distribuiu em todas as faixas etárias e níveis socioeconômicos, no entanto foi mais proeminente nas meninas de 8 a 10 anos nos quintos de média e alta riqueza nos ambientes urbanos formais. Além disso, o maior ganho de IMC nas crianças foi nos quintos médios de riqueza (SARTORIUS et al., 2017).

Já um estudo desenvolvido no Reino Unido com pré-adolescentes de 11 anos de idade, mostrou relação inversa de obesidade e sobrepeso e nível socioeconômico para ambos os sexos (GOLDING et al., 2001).

2.4 Consumo Alimentar e Nível Socioeconômico

Estudos mostram que o nível socioeconômico exerce influência no consumo alimentar de crianças e adolescentes (CRAIG et al., 2010; FITZGERALD et al., 2010). O custo efetivo de verduras e frutas é maior que de lanches rápidos ricos em gorduras saturadas, ademais, alternativas saudáveis são difíceis de encontrar em bairros pobres, onde há uma menor concentração de supermercados (FREDERICK et al. 2014).

Os estudos realizados nos países de alta renda mostraram que os adolescentes de menor nível socioeconômico consumiam menos frutas e vegetais, e

tinham uma maior ingestão de gorduras, sal e açúcares. (FISCHER et al., 2011; FISMEN et al., 2012; DARMON, DREWNOWSKI, 2008).

A Noruega, a fim de promover melhores hábitos de consumo, atuou intervindo no lanche escolar, priorizando frutas e vegetais, além de retirar maquinas de refrigerante do ambiente público escolar (HOLTHE et al., 2011). Ademais, o governo impôs altas taxas sobre o refrigerante e outras bebidas açucaradas não alcoólicas, além de proibir propagandas de doces e bebidas voltadas às crianças e adolescentes. Assim, um estudo norueguês mostrou que o nível socioeconômico foi diretamente proporcional ao consumo de frutas e vegetais, já o consumo de guloseimas e refrigerantes não teve associação ao nível socioeconômico. Possivelmente devido a ação governamental intervindo no consumo (FISMEN et al., 2014).

Já nos países de baixa renda, essa relação se inverteu e os adolescentes dos maiores níveis socioeconômicos ingeriram mais frutas e vegetais, além de consumirem mais gorduras, sal e açúcares (POPKIN et al., 2012; SUBRAMANIAN et al., 2011).

No Brasil, por exemplo, os gastos alimentares com frutas e hortaliças, são diretamente proporcionais ao nível socioeconômico das famílias (BRASIL, 2015). Dessa forma, um estudo transversal realizado em São Luís, Maranhão, Brasil, desenvolvido com estudantes de 9 a 16 anos de idade, mostrou maior consumo de frutas e hortaliças, além de alimentos proteicos de origem animal, pelos alunos de escolas privadas, com maior poder aquisitivo. Ademais, os alunos de escolas particulares também consumiram mais lanches não saudáveis, como refrigerantes, guloseimas e *fast food* (CONCEIÇÃO et al., 2010).

Ainda, um estudo transversal conduzido em Pelotas-RS, com pré-adolescentes de 11 anos de idade, mostrou que o aumento do nível socioeconômico aumenta a proporção de consumo de frutas e hortaliças, mas aumenta ainda o consumo de lanches rápidos e quitandas (NEUTZLING et al., 2010). O consumo de guloseimas e fast food, foi maior entre os quintos médios de renda nesse mesmo estudo (NEUTZLING et al., 2010).

Já um estudo desenvolvido em Pelotas-RS, Brasil, com crianças de 6 anos de idade, mostrou relação inversa do nível socioeconômico e o consumo de frutas, vegetais, guloseimas, lanches rápidos, pão e café, arroz e feijão (SANTOS et al., 2016). Uma hipótese, para essa diferença encontrada nesse estudo, é que o Brasil,

por ser um país de dimensões continentais, tenha diferenças regionais de consumo em diferentes estágios da transição nutricional (POPKIN et al., 2012).

Por outro lado, em um estudo realizado no Equador, as crianças de baixo nível socioeconômico tiveram um menor consumo de refrigerante. Em relação aos outros hábitos de consumo não houve diferença pelo nível socioeconômico nesse mesmo estudo (VERSTRAETEN et al., 2016).

Um estudo de revisão com adultos de países de média e baixa renda, incluindo o Brasil, concluiu que o nível socioeconômico tem influência direta positiva no hábito alimentar mais saudável (MAYÉN et al., 2014).

Há uma explicação fisiológica sobre o estresse social e o consumo de alimentos tais como guloseimas e fast food, bem como sua associação à obesidade (DALLMAN et al., 2003). O estresse ativa o eixo hipotálamo-hipofisário, liberando glicocorticoides, incluindo o cortisol. Essas altas concentrações crônicas dos glicocorticoides aumentam a expressão do fator liberador de corticotropina no núcleo central da amígdala, que desempenha um papel importante no processamento da emoção. Isso permite o recrutamento de uma "rede de resposta ao estresse crônico", que induz uma elevação crônica dos glicocorticóides, que por sua vez aumentam a preferência por atividades prazerosas ou compulsivas como a ingestão de açúcar, gordura ou outros "alimentos de conforto". Ademais, os glicocorticoides promovem o desenvolvimento de tecido adiposo central, resultando em um aumento da adiposidade visceral, resistência à insulina e síndrome metabólica (DALLMAN et al., 2003).

Assim, para melhorar a dieta da população, é necessário implementar políticas de saúde públicas, visando sobretaxar alimentos não saudáveis, concomitante a um subsídio para preços mais acessíveis de frutas e hortaliças (TIFFIN, SALOIS, 2012). Ademais, é necessário um controle sobre as propagandas de guloseimas, fast food e refrigerantes (FISMEN et al. 2014). Adicionalmente, é importante implementar medidas educacionais nas escolas para que a escolha alimentar não seja somente influenciada pelo poder aquisitivo (NEUTZLING et al. 2010).

3 OBJETIVO

3.1 Objetivo Geral

Avaliar a desigualdade social no estado nutricional e no consumo alimentar de escolares brasileiros, de acordo com o sexo.

3.2 Objetivos específicos

Identificar a prevalência de déficit de peso, sobrepeso e obesidade nos escolares brasileiros;

Avaliar o estado nutricional em relação ao nível socioeconômico dos escolares brasileiro, de acordo com o sexo;

Identificar o consumo de alimentos marcadores de alimentação saudável e não saudável entre escolares brasileiros;

Avaliar o consumo alimentar em relação ao nível socioeconômico dos escolares brasileiros, de acordo com o sexo.

4 ARTIGO

Social inequalities regarding the nutritional status and food consumption of Brazilian students

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Abstract

Objective: To assess social inequalities regarding the nutritional status and food consumption of Brazilian students. *Methods*: The sample consisted of male and female students aged 13 to 17 years of public and private schools, whose data was obtained in the 2015 National Adolescent School-based Health Survey. We created a wealth score based on answers about the ownership of goods and access to services by means of the principal component analysis, later divided into quintiles. We calculated the *Slope index of inequalities* and the *Concentration index*, along with simple inequality measures based on differences and ratios. The t-test identified statistically significant differences in sex inequality. *Results*: Male students were more prone to obesity in the wealthiest quintile. The SII of +7.79 and CIX of +15.23 showed that inequality favored the richest students. Regarding consumption, the inequality indices had similar positive values for all foods analyzed, showing that inequality favored the richest individuals. *Conclusion*: Social inequality among adolescents fostered unequal consumption and nutritional deviations. For both sexes, the wealthiest ones were more affected by a higher consumption of healthy and unhealthy foods. Furthermore, the richest male participants were more affected by obesity, while the female did not present this correlation.

Keywords: Social inequality. Nutritional status. Food consumption. Adolescents.

Introduction

Social inequality is defined as the systematic difference between groups, such as the poor and the wealthy, which is considered unfair and avoidable by appropriate policies (Braveman and Gruskin, 2003). This

difference influences many aspects of health, negatively affecting economically disadvantaged groups (Carey et al., 2015). Access to food, and hence the nutritional status of individuals, is one of the health aspects unequally distributed in society (Dowler, 2001).

Worldwide data have shown that overweight and obesity have almost tripled since 1975 in adults, children, and adolescents (WHO, 2017). In Brazil, analyses of secular trends have shown that, from 1974-1975 to 2008-2009, underweight among 10 to 19-year-old adolescents decreased from 10.1% to 3.7%, and from 5.1% to 3% in males and females, respectively. Overweight increased from 3.7% to 21.7% in males and from 7.6% to 19.4% in females, and obesity from 0.4% to 5.9% and from 0.7% % to 4% in males and females, respectively (Brasil, 2010b).

Although trend data have shown a decrease in underweight and an increase in overweight and obesity among adolescents, evaluating global prevalence may be misleading, since nutritional deviations and the access to healthy and unhealthy foods are unevenly distributed among the wealthy and the poor (Black et al., 2008, Frederick et al., 2014).

A study conducted in Illinois (USA) showed that lower socioeconomic statuses were associated with a higher prevalence of obesity, and that girls were more affected by social inequality (Zahnd et al., 2015). Other studies conducted in high-income countries have shown that cumulative social risks were related to an increased risk of obesity in students (Springer et al., 2015, Suglia et al., 2013). In Brazil, though, a study carried out in Pelotas/RS (Rio Grande do Sul) showed that the increase in obesity was directly proportional to the socioeconomic status, and that boys were more affected. Furthermore, it revealed that underweight was positively associated with a lower socioeconomic status (Araújo et al., 2010).

In terms of food consumption, studies have shown that the socioeconomic status has a strong influence over the pattern of food consumption by children and adolescents (Craig et al., 2010). In high-income countries, for example, adolescents of lower socioeconomic statuses have a higher intake of fats, salt, and sugars (Darmon and Drewnowski 2008). On the other hand, in low-income countries, such as India, China, Mexico, and sub-Saharan Africa, this correlation is reversed, and adolescents of higher socioeconomic statuses intake more fats, salt, and sugars (Popkin et al., 2012; Subramanian et al. , 2011).

More studies on inequality in middle-income countries are yet to be carried out (Kelishadi et al., 2017; Verstraeten et al., 2016). Monitoring health inequality is essential to identify vulnerable groups and implement

changes when necessary, so that relevant policies, programs and practices can be improved (WHO, 2013). Moreover, the results from high-income countries may not be transposable, considering the wide variation of inequality, concentration income, and sociocultural aspects. In Brazil, the prevalence of obesity and overweight have increased every year (Brasil 2010), and social inequalities have slowly decreased (WHO, 2013). The few studies carried out in Brazil have only assessed social inequality in nutritional statuses and neglected food consumption (Araújo et al., 2010). Moreover, most of the studies are regional and may not reflect the reality of Brazilian adolescents in such a large country, with so many different social contexts (Araújo et al., 2010; Santos et al., 2016). Therefore, this study aims to assess the social inequality in the nutritional status and food consumption of Brazilian students regarding the sex.

Methods

Data source

The data used in this study was collected from the 2015 National Adolescent School-based Health Survey (PeNSE – Pesquisa Nacional de Saúde do Escolar). They comprise sample 2, consisting of students aged from 13 to 17 years, mostly distributed from the 6th to the 9th year of elementary school and from the 1st to the 3rd year of high school in public and private schools in representative urban and rural areas of Brazil (Brasil, 2015).

The sample was gathered in conglomerates, sized to estimate the parameters of interest in Brazil as a whole and in each of the five large regions of the country (North, Northeast, Southeast, South and Center-West), which constituted the sample strata. In each stratum, schools (primary sampling units) and classes (secondary sampling units) were randomly selected. All the students of the classes selected were invited to take part in the research.

Data was collected in 371 schools in 179 cities (26 capitals, the Federal District and non-capital cities) of all Brazilian states (Brasil, 2015).

Data Collection

PeNSE used a self-administered questionnaire installed in smartphones and applied in class. All the students present in the classroom on the day of collection answered the questionnaire. The questionnaire had questions regarding socioeconomic aspects, eating habits and level of physical activity, use of tobacco, alcohol

and other drugs, issues related to bullying and depression, sexual activity, behavior towards parents, hygiene habits and personal care, safety habits, and questions about demographic data, such as sex, age, geographic region, grade, and school type.

These questions were based on international questionnaires, using the methodology of the *Global School-based Student Health Survey* (GSHS) (WHO, 2004).

Trained interviewers measured the weight and height of the students after the application of the questionnaire. The body weight was measured with a portable electronic scale. Students were barefoot and were wearing light clothes. The height was measured using a portable stadiometer fixed to a smooth wall. Adolescents were measured barefoot, with their feet together, heels leaning against the wall, standing erect, staring at the horizon, without flexing or extending their heads. Previous publications provide further details on anthropometry (Oliveira et al., 2017, Brasil, 2015).

PeNSE planned on collecting 19,558 questionnaires, but the number of students enrolled exceeded their expectation by 4.9%, which corresponded to 20,516 students from 11 to 19 years old. From these students, 19,402 regularly attended school, and 16,608 answered the survey. Out of this, 52 questionnaires were considered invalid because they did not contain the information of age or sex or because the student refused to take part in the survey. The response rate was of 85.3% in relation to the frequent students.

For the present study, we analyzed 10,926 questionnaires, corresponding to adolescents between 13 and 17 years old. Students younger than 13 and older than 17 years old were excluded.

Socioeconomic Status

We evaluated the socioeconomic conditions based on a wealth score created from the principal components analysis (PCA). This method allows the use of variables without specific distributions and dismisses income data, which often have questionable quality. The PCA synthesizes the variance of a set of variables. The derived indicator is not arbitrary. The first component captures the largest possible amount of data variability with a single linear combination (Barros and Victora, 2005).

In order to calculate the PCA, we used the following variables: the schooling of the interviewees' mothers ("incomplete elementary school", "complete elementary school", "complete secondary school" and "complete higher education"); the school type (public or private); the existence of household goods, such as

telephone, cellphone, computer, internet, car, the number of bathrooms with shower, and if they had housemaids (Levy et al., 2010).

After analyzing the components of the PCA, we calculated the load of each variable and its respective standard deviation using the first component. Then, we calculated the coefficient of each variable by dividing the load by the standard deviation. The sum of the coefficients of each variable resulted in the wealth index. Based on the wealth index, the sample was divided into wealth quintiles.

Nutritional Status

PeNSE divided the weight by the squared height (weight in kg/height in m²) to calculate the Body Mass Index (BMI).

After the BMI calculation, the z-score distribution of BMI was used to evaluate the nutritional status. The following categories were adopted: underweight (BMI z-score <-2), eutrophy (-2 ≥ BMI z-score ≤ +1), overweight (+1> BMI z-score ≤ + 2), and obesity (BMI z-score> +2), according to age and sex following the recommendations of the WHO (World Health Organization) (Onis et al., 2007).

Food Consumption

We evaluated food consumption based on the frequency of consumption of fruits, vegetables, soft drinks, treats and fast food in the past 7 days. The consumption was classified as regular for adolescents who responded consuming at least 5 times a week each of the foods mentioned (Levy et al., 2010).

Sociodemographic Characteristics

We evaluated the variables sex (male and female), color/race (white, black, brown, indigenous, and yellow), school situation (urban and rural), school type (public and private) and region (North, Northeast, Center-West, South, and Southeast).

Statistical Analysis

Initially, we imputed the data on mothers' schooling, since 38.2% of the students did not answer this question in the questionnaire or answered "I do not know". We used the following variables as auxiliaries in the imputation model: sex, age, nutritional status, school situation (urban or rural), school type (public or private), and school sphere (municipal, state, federal, or private).

Subsequently, we performed descriptive analyses with the following measures: mean, standard deviation, and frequency of the variables of interest. We stratified all the analysis according to sex and considered the weighting for the complex sample structure in order to represent the population of enrolled students who were attending elementary and high school in 2015 in Brazil.

The following inequality indices were calculated: *Slope index of inequality* (SII) and *Concentration index* (CIX). SII measures the absolute inequality and CIX measures the relative inequality. SII is an absolute measure of inequality obtained with the logistic regression of the wealth index. It shows the health gradient through multiple subgroups, valuing the intermediate points and not only the ends. On the other hand, CIX uses an approach analogous to the Gini Index, which classifies individuals according to the socioeconomic position in the x-axis, and the cumulative fraction of the index in the y-axis, showing the extent to which a health indicator is concentrated in groups with socioeconomic advantage and disadvantage. The concentration index is twice the area between the hypothetical equality curve at 45° and the concentration curve (WHO, 2013). The two indices ranged from -100 to +100. The negative values show that the variable is concentrated in the most disadvantaged group, and the positive values indicate a concentration in the most advantaged group. When there is no inequality, the CIX and SII are zero (Barros and Victora, 2013).

We calculated a simple measure of relative and absolute inequality of nutritional deviations and food consumption among wealth quintiles. The absolute measure of inequality was calculated by subtracting the lowest quintile from the highest wealth quintile (Q5 - Q1), for both consumption and nutritional status. The relative inequality measure was calculated by the ratio between the highest and the lowest wealth quintiles (Q5/Q1) also for nutritional status and food consumption. The t-test identified statistically significant differences between sexes for the inequality indices (SII and CIX). The value of $p \leq 0.05$ was considered statistically significant.

All statistical analyses were performed using the *Software* Stata SE version 13.1 (StataCorp, 2009).

Ethical Considerations

The National Commission for Research Ethics (CONEP) (Registration no. 1,006,467, as of March 30, 2015), of the National Health Council (CNS) (Brasil, 2015) approved the PeNSE. The students who agreed with the Informed Consent Form (IFC) participated in the research. The information about the student and the school is confidential.

Results

From the 10,926 students, the sex distribution was similar (50.29% male). Most students declared themselves brown (43.56%) or white (36.21%). Regarding mothers' schooling, the majority did not complete the elementary school (34.54%), followed by the ones who completed high school (30.65%). (Table 1)

Table 1 Sociodemographic characteristics of the sample of the 2015 National Adolescent School-based Health Survey (PeNSE 2015) according to sex

Characteristics	Male (%) (50.29)	95% CI	Female (%) (49.71)	95% CI	Total (%)	95% CI
Color/Race						
White	36.9	34.6 - 39.2	35.5	33.2 - 37.9	36.2	34.3 - 38.2
Black	16.0	14.1 - 17.9	10.4	9.1 - 11.7	13.2	11.9 - 14.6
Yellow	3.5	2.7 - 4.2	4.7	4.0 - 5.5	4.1	3.5 - 4.6
Brown	40.3	37.7 - 43.0	46.9	44.6 - 49.1	43.6	41.5 - 45.6
Indigenous	3.3	2.6 - 4.1	2.5	1.9 - 3.1	2.9	2.4 - 3.4
Mothers' schooling						
Incomplete elementary school	32.7	29.9 - 35.5	36.4	33.4 - 39.5	34.5	32.0 - 37.1
Complete elementary school	19.2	17.3 - 21.1	17.0	15.1 - 18.9	18.1	16.7 - 19.5
Complete high school	30.6	28.2 - 32.9	30.8	28.5 - 33.0	30.7	28.7 - 32.5
Complete higher education	17.6	15.1 - 20.1	15.8	13.1 - 18.5	16.7	14.3 - 19.1
Nutritional status						
Underweight	3.8	3.2 - 4.4	2.5	1.8 - 3.1	3.1	2.7 - 3.6
Eutrophia	72.5	70.8 - 74.2	73.8	72.2 - 75.3	73.1	72.0 - 74.3
Overweight	15.4	14.1 - 16.6	16.5	15.1 - 17.9	15.9	15.0 - 16.8
Obesity	8.3	7.3 - 9.4	7.3	6.3 - 8.3	7.8	7.0 - 8.6
School situation						
Urban	94.1	91.5 - 97.0	94.8	92.0 - 97.6	94.5	92.0 - 97.0
Rural	5.9	3.2 - 8.5	5.2	2.4 - 8.0	5.5	3.0 - 8.0
School type						
Public	87.5	83.7 - 91.3	86.6	82.4 - 90.9	87.1	83.1 - 91.0
Private	12.5	8.7 - 16.3	13.4	9.1 - 17.6	12.9	9.0 - 17.0
Geographic region						
North	9.5	7.4 - 11.7	8.8	6.8 - 10.8	9.2	7.2 - 11.2
Northeast	29.0	24.9 - 33.2	28.1	23.8 - 32.4	28.6	24.7 - 32.5
Southeast	40.4	35.6 - 45.1	41.7	36.5 - 46.9	41.0	36.4 - 45.7
South	13.6	11.7 - 15.5	13.6	11.3 -15.8	13.6	11.7 - 15.5
Central-west	7.5	6.3 - 8.7	7.8	6.3 - 9.3	7.6	6.4 - 8.9

CI Confidence Interval

Most of the schools were public and located in the urban area, primarily in the Southeast region (41.03%). Compared to boys, girls were more overweighed. In terms of obesity and underweight, males represented a higher proportion (Table 1).

When analyzing the nutritional status and the wealth quintiles, the underweight was higher in the lowest wealth quintiles for both sexes. Overweight increased with the wealth index, while obesity showed a progressive increase only with males in the wealth quintile (Figure 1).

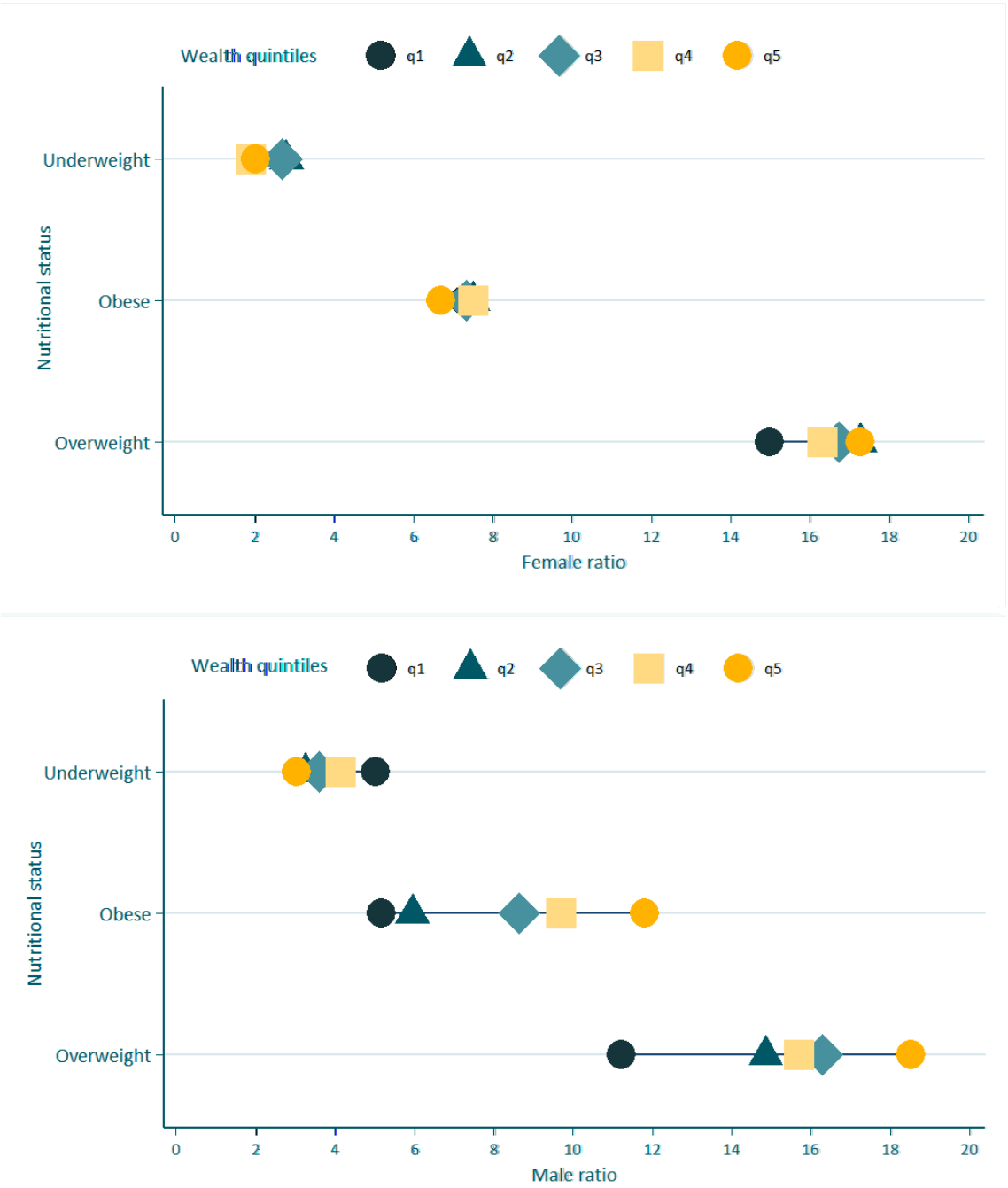

Fig 1 Nutritional status of female and male students per wealth quintile in the 2015 National Adolescent School-based Health Survey (PeNSE, 2015).

Table 2 shows that underweight presented a similar behavior in both sexes. Total SII and CIX were -1.04 and -5.44, respectively, which means that inequality was in favor of the poorest. Simple measures of relative inequality (0.67) and absolute inequality (-1.29) confirmed this association. Regarding obesity, for both SII and CIX, the p-value was statistically significant, which indicates that inequality had different influence on boys and girls. SII for males was +7.79 and CIX was +15.23, showing that inequality was in favor of the richest. On the other hand, values were close to zero for females, meaning that no inequality was observed regarding obesity. Overweight presented similar behavior in both sexes, with higher occurrence among the richest students.

Table 2 Student distribution per nutritional status, sex, wealth quintile and inequality indices in the 2015 National Adolescent School-based Health Survey (PeNSE, 2015).

	WEALTH QUINTILES				INEQUALITY INDEX					
Sex	Q1 (poorest)	Q5 (wealthiest)	Absolut value (Q5-Q1)	Relative value (Q5/Q1)	SII	SII Standard error	p-value	CIX	CIX Standard error	p-value
Underweight										
Male	5.02	3.03	-1.99	0.60	-1.31	0.01		-5.66	0.04	
Female	2.72	2.04	-0.68	0.75	-0.93	0.01	0.77	-6.16	0.06	0.96
Total	3.86	2.57	-1.29	0.67	-1.04	-0.01		-5.44	0.03	
Overweight										
Male	11.23	18.52	7.28	1.65	6.97	0.02		7.46	0.02	
Female	14.99	17.28	2.29	1.15	1.71	0.02	0.08	1.71	0.02	0.07
Total	13.13	17.94	4.82	1.37	4.32	0.02		4.46	0.02	
Obesity										
Male	5.17	11.81	6.64	2.29	7.79	0.02		15.23	0.04	
Female	7.28	6.70	-0.57	0.92	-0.43	0.02	0.00	-0.64	0.04	0.00
Total	6.23	9.45	3.22	1.52	3.78	0.01		8.08	0.03	

SII Slope index of inequality, CIX Concentration index.

Regarding food consumption, both female and male students consumed fruits and vegetables more regularly in the highest wealth quintile. Nevertheless, there was a higher consumption of soft drinks, treats, and fast food among students of both sexes in this same wealth quintile. The inequality indices presented similar positive values for all foods used as diet markers for both sexes, showing that inequality was in favor of the richest and affected both male and female (Table 3).

For the regular consumption of fruit, the simple absolute measure of inequality was 8.53, which means that the higher the wealth quintile, the higher the fruit consumption. The relative inequality measure of 1.32 also showed that the highest wealth quintile presented 32% higher regular consumption of this food (Table 3).

Regarding the regular consumption of vegetables, the absolute inequality measure was 15.27 and the relative was 1.49, which means that the wealthiest quintiles had 49% higher regular consumption of vegetables (Table 3).

Table 3 Student distribution per regular consumption, sex, wealth quintile, and inequality indices in the 2015 National Adolescent School-based Health Survey (PeNSE, 2015).

	WEALTH QUINTILES				INEQUALITY INDEX					
Sex	Q1 (poorest)	Q5 (wealthiest)	Absolut value (Q5-Q1)	Relative value (Q5/Q1)	SII	SII Standard error	p-value	CIX	CIX Standard error	p-value
Fruits										
Male	27.16	36.19	9.03	1.33	8.74	0.03		4.47	0.02	
Female	26.53	34.42	7.89	1.30	10.12	0.03	0.81	5.59	0.01	0.36
Total	26.84	35.37	8.53	1.32	9.59	0.02		5.10	0.01	
Vegetables										
Male	31.97	45.57	13.60	1.43	13.84	0.03		6.19	0.01	
Female	29.89	46.91	17.02	1.57	17.74	0.03	1.00	7.85	0.01	1.00
Total	30.92	46.19	15.27	1.49	15.66	0.02		6.97	0.01	
Soft drinks										
Male	21.19	30.14	8.96	1.42	11.48	0.03		6.53	0.02	
Female	19.00	24.19	5.18	1.27	6.68	0.03	1.00	4.47	0.02	0.31

	Total	20.09	27.39	7.30	1.36	9.38	0.02		5.74	0.01	
Treats											
	Male	31.98	34.80	2.82	1.09	4.65	0.03		2.32	0.02	
	Female	42.22	50.18	7.96	1.19	10.18	0.03	1.00	3.66	0.01	0.00
	Total	37.15	41.93	4.78	1.13	6.70	0.02		2.79	0.01	
Fast food											
	Male	4.31	7.65	3.34	1.78	3.39	0.02		8.96	0.04	
	Female	3.25	6.83	3.57	2.10	2.91	0.01	0.64	9.36	0.04	1.00
	Total	3.78	7.27	3.49	1.92	3.23	0.01		9.35	0.03	

SII *Slope index of inequality*, CIX *Concentration index*.

Figure 2 shows that, for females, the wealthiest quintile consumed less soft drinks than the average wealth quintiles. Among boys, though, the consumption of soft drinks and treats had a higher proportion among the average wealth quintiles, according to Figure 2.

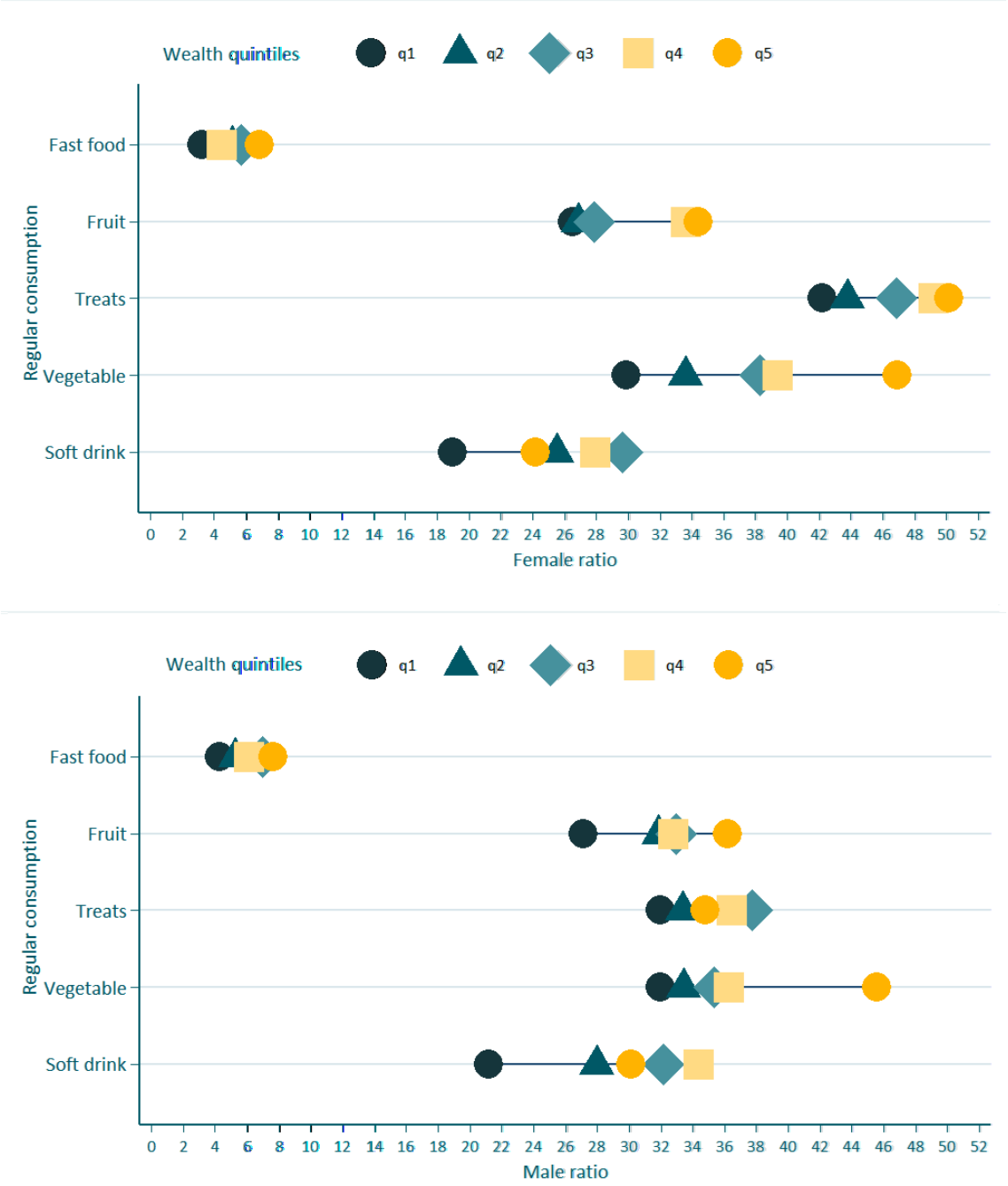

Fig 2 Regular consumption of food among female and male students per wealth quintile in the 2015 National Adolescent School-based Health Survey (PeNSE, 2015).

Discussion

The outcomes of the present study showed that there is inequality in underweight among Brazilian adolescents. The poorest students are more affected by underweight, while overweight affects the richest ones, with no difference between sexes. Regarding obesity, only males presented inequalities: adolescents from the wealthiest quintiles are more affected. Furthermore, the wealthiest quintiles presented greater consumption of

fruits and vegetables. However, they also consumed more soda drinks, can dies and fast food, without differences between sexes.

A study by Araújo et al. (2010) with 11-year-old preadolescents from a cohort in Pelotas/RS, Brazil, found that underweight was related to the less wealthy quintiles and with mothers with lower educational levels, corroborating the results of the present study. Nevertheless, the aforementioned study showed that girls had a higher prevalence of underweight (7.7%) when compared to boys (6.4%), different from the outcomes of the present study. Although uncommon in high-income countries, underweight is still frequent in low-income countries and exists in a lower proportion in middle-income countries, such as Brazil (Black et al., 2008).

Studies have shown that the socioeconomic level worldwide has different influences on the nutritional status (Matijasevich et al., 2009). The present study, for example, observed that there was a higher prevalence of overweight in the wealthiest quintiles for both sexes. Obesity was more prevalent in the wealthiest quintiles only among males. Moreover, the cohort study conducted by Araújo et al. (2010) in Pelotas/RS, Brazil, found that, among 11-year-old boys, there is a direct relationship between socioeconomic status and prevalence of overweight and obesity. This relationship was only observed in girls regarding overweight, corroborating the present study. Another study of this same cohort, conducted with 18-year-old adults, found that there was a direct relationship between overweight, obesity, and wealth quintiles among men; for women, this relationship was the opposite (Victora and Barros, 2006). Furthermore, a cross-sectional study carried out in Spain, which assessed children, adolescents and young adults from 2 to 24 years old, showed that adolescents of a high socioeconomic level had a greater chance of obesity, corroborating the present study (Serra- Majem et al., 2006).

On the other hand, a cross-sectional study conducted in Texas, USA, with adolescents with average age of 13.88 years (8th grade) found that male adolescents had a higher proportion of obesity. Such nutritional deviation was even more frequent in economically disadvantaged schools (Springer et al., 2015). A different cross-sectional study in Illinois, with children from the 1st to the 4th grade, found that obesity increased proportionally over the years, and girls with socioeconomic disadvantage were more likely to develop this nutritional deviation (Zahnd et al., 2015). Another cohort study conducted in England with 11-year-old preadolescents found an inverse relationship between obesity, and overweight and socioeconomic status for both sexes (Golding et al., 2001).

The relationship between nutritional status in adolescence, sex and socioeconomic status is complex and yet to be better understood (Zahnd et al., 2015). The difference in the influence of family socioeconomic levels between the sexes is probably due to specific gender behavior and psychological factors (Hernandez and Pressler, 2014). Women are biologically more adapted to adverse conditions in childhood, which can be confirmed by the higher morbidity and mortality among boys (Wells, 2000). Besides, there is a more evident social pressure for weight loss among female adolescents (Kelishadi et al., 2017).

In terms of food consumption, the wealthiest quintiles consumed more fruits and vegetables, but also more soft drinks, treats, and fast food. The literature is inconsistent on this subject. Data from the 2008-2009 Brazilian Family Budget Survey (POF) showed that the highest wealth quarters consumed more fruits, raw salad, soft drinks, pizza and fried and roasted finger food (Brasil, 2010a), similar to the results found in our study. In contrast, a study carried out in Pelotas/RS, Brazil, with 6-year-old preadolescents, showed that fruit and vegetable intake was inversely proportional to wealth quintiles (Santos et al., 2016). Additionally, in a study carried out in Ecuador, children with a low socioeconomic status had a lower consumption of soft drinks, with no differences in the consumption of other foods according to income (Verstraeten et al., 2016). Studies carried out in rich countries have shown that adolescents from lower socioeconomic levels consumed fewer fruits and vegetables and more treats and snacks with high saturated fat (Fischer et al., 2011; Fismen et al., 2012).

Students are probably more likely to develop nutritional disorders, since they have a significant physical development and, hence, an increase in their energy needs. Besides, they are more vulnerable to the advertising messages of food industries and nutritional fads (Serra-Majem et al., 2003). A study carried out in Ecuador showed that high-fat and high-sugar foods, such as soft drinks, treats, and fast food, are associated with an image of greater purchasing power, generating a higher status among adolescents (Verstraeten et al., 2014).

Furthermore, families in the highest socioeconomic levels reward their children with treats after consuming fruits and vegetables, associating healthy food with punishment (Ritchie et al., 2005). Besides, the media does not emphasize the nutritional value of food and presents processed foods as tastier than the natural ones. It may influence wealthy families to choose fast snacks rich in saturated fat (Verstraeten et al., 2014).

A possible limitation of the present study is the memory bias for consumption, since the data were collected by a questionnaire of consumption frequency considering the past 7 days. This may have also affected the proportions of regular consumption reports for all foods studied. Nevertheless, adolescents from different social strata are not expected to have reported consumption in a different way, which constitutes non-differential

misclassification. Besides, the socioeconomic status was calculated by an estimated wealth score, which may not represent exactly the family income. Nonetheless, the estimate of a wealth score is more accurate than asking an adolescent the family income, and, therefore, it is the best way to measure the socioeconomic level in this age group (Barros and Victora, 2005). Moreover, the present study did not include the most vulnerable adolescents, which are not enrolled in schools. However, it is known that there is a wide coverage of basic education in Brazil, 98.6% of the population between 6 and 14 years old and 85.0% among adolescents between 15 and 17 years old (Instituto Brasileiro de Geografia e Estatística, 2016). In addition, PeNSE has a representative sample of Brazilian schoolchildren enrolled in the 6th to 9th grade of elementary school and in the 1st to 3rd grades of high school in public and private schools (Brasil, 2015). Thus, we can assume that the sample represented Brazilian adolescents.

On the other hand, the present study has important positive points. It limited data losses by imputing the data of mothers' schooling, which could cause selection bias. Another positive remark was the measurement of the students' weight and height by trained evaluators, ensuring greater reliability of data on nutritional status. Most surveys have used self-reported weight and height (Frederick et al., 2014; Hernandez and Pressler, 2014), which may lead to errors in the nutritional status, a limitation that our study overcame.

Data from the present study were collected at a time of economic growth and public health policies with the aim to reduce health inequalities, such as the increase in the coverage of the family health program (PSF) and Bolsa Escola Program (Mayén et al. 2016; OXFAM BRASIL, 2017). The Brazilian trend, though, is to increase social inequalities due to the economic and political crisis and structural changes in the labor reform (OXFAM BRASIL, 2017). Thus, the results observed and reported in the present study may suffer a negative impact in the near future. Therefore, monitoring studies on inequality trends is fundamental to assess the impact of recent changes in the health and behavior of Brazilian students. Furthermore, the results of this study can support public health policies for both sexes concerning consumption, but with different approaches for each sex regarding the nutritional status, in order to extend government strategies to promote health among Brazilian schoolchildren.

Conclusion

Our findings showed that the wealthiest ones were more affected by a higher consumption of healthy and unhealthy foods in both sexes. Furthermore, the richest male participants were more affected by obesity, while the female did not present this correlation. Therefore, social inequality leads to unequal food consumption among Brazilian students, which favors the development of nutritional deviation and results in loss of quality of life.

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