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FACULDADE DE MEDICINA

DESIGUALDADES SOCIAIS NO CONSUMO ALIMENTAR DE BRASILEIROS

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DOUTORADO

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BARBARA VIRGINIA CAIXETA CREPALDI

DESIGUALDADES SOCIAIS NO CONSUMO ALIMENTAR DE BRASILEIROS

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

Área de concentração: Ciências da Saúde.

Orientadora: Profa. Dra. Catarina Machado Azeredo

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e ao meu companheiro Espírito Santo,
por toda liderança e graça.

"Não somos o que somos ou estamos onde estamos
devido a qualquer obra de nossa justiça. Fomos
posicionados pela graça divina e é isso que
deveríamos projetar e glorificar."

Dr. Sam Sasser e Dr. Judson Cornwall

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“Fale em favor daqueles que não podem se defender; garanta justiça para os que estão aflitos. Sim, fale em favor dos pobres e desamparados, e providencie que recebam justiça.”

Provérbios 31:8-9

RESUMO

Introdução: O Brasil é um país marcado por profundas desigualdades, mas a forma que as desigualdades educacionais, de sexo e raça/cor de pele interagem e atuam no consumo alimentar permanece incerta. **Objetivos:** Analisar a tendência da desigualdade social (educacional) no consumo de alimentos entre brasileiros de 2008 a 2019, e a desigualdade no consumo de alimentos *in natura*/minimamente processados e ultraprocessados por brasileiros com perspectiva interseccional entre sexo e raça/cor em 2019. **Métodos:** Utilizamos dados transversais do Sistema de Vigilância Telefônica (VIGITEL) de indivíduos ≥18 anos residentes nas capitais brasileiras e Distrito Federal e avaliamos a desigualdade (0-3, 4-8, 9-11 e ≥12 anos de estudo) no consumo alimentar segundo sexo e raça/cor da pele (brancos e pretos/pardos). Artigo 1: Séries temporais de 2008-2019 com 621.689 indivíduos. O consumo alimentar foi avaliado por meio de 1) Consumo ≥5 porções de frutas e hortaliças em ≥5 dias/semana; 2) Consumo de feijão em ≥5 dias/semana e 3) Consumo de refrigerantes ou sucos artificiais em ≥5 dias/semana. A desigualdade foi avaliada pelo índice de inclinação da desigualdade (SII) e índice de concentração (CIX). Valores positivos de SII e CIX indicam maior prevalência entre mais escolarizados e negativos entre menos escolarizados. Artigo 2: Incluímos dados de 2019 com 52.443 indivíduos. Avaliamos o consumo diário de alimentos *in natura*/minimamente processados e alimentos ultraprocessados, e consideramos como alto quando reportado consumo de ≥5 alimentos para cada grupo alimentar, referente ao dia anterior à pesquisa. A desigualdade foi avaliada pelo SII e índice relativo de desigualdade (RII). Valores de RII>1,0 indicam maior consumo alimentar entre os mais escolarizados. **Resultados:** Artigo 1: O consumo de frutas e hortaliças foi mais prevalente entre os mais escolarizados, enquanto o feijão foi consumido principalmente pelos menos escolarizados. A maior desigualdade absoluta foi encontrada para o feijão (SII_{2019} -25,9). O consumo de refrigerantes ou sucos artificiais reduziu em todos os níveis de escolaridade. Entre 2008-2019, a desigualdade absoluta aumentou para consumo de frutas e hortaliças (SII_{2008} 12,8 a SII_{2019} 16,2), manteve para feijão (SII_{2008} -23,1 a SII_{2019} -25,9) e diminuiu para refrigerantes ou sucos artificiais (SII_{2008} 8,7 a SII_{2019} 0,4). A desigualdade relativa era baixa e constante. Artigo 2: O consumo de alimentos *in natura*/minimamente processados e ultraprocessados

foi mais frequente no maior nível de escolaridade e escolaridade intermediária (9-11 anos), respectivamente. A desigualdade educacional absoluta para alimentos *in natura*/minimamente processados foi maior entre mulheres brancas (SII 21,8; IC95% 15,3-28,4) e homens pretos/pardos (SII 19,3; IC95% 12,5-26,1). No consumo de ultraprocessados, homens pretos/pardos (SII 7,3; IC95% 0,5-14,0) e mulheres pretas/pardas (SII 5,6; IC95% 1,0-10,2) apresentaram maior desigualdade educacional absoluta do que homens brancos (SII -3,3; IC95% -10,9-4,3; P=0,04). **Conclusões:** Entre 2008-2019, embora as desigualdades no consumo de refrigerantes ou sucos artificiais tenham reduzido, houve preocupante aumento da lacuna social para o consumo recomendado de frutas e hortaliças. Em 2019, as desigualdades educacionais impactaram mais o consumo de alimentos *in natura*/minimamente processados do que ultraprocessados, e as desigualdades foram maiores entre homens e mulheres pretos/pardos do que homens brancos para o consumo de ultraprocessados.

Palavras-chave: Desigualdades sociais, Consumo Alimentar, Alimentos ultraprocessados, NOVA, Interseccionalidade, Vigilância.

ABSTRACT

Introduction: Brazil is a country marked by deep inequalities. However, the way educational, gender and race/skin color inequalities interact and act on food consumption remains uncertain. **Objectives:** 1) To analyze the trend of social (educational) inequality in food consumption among Brazilians from 2008 to 2019, and 2) to analyze the inequality in the consumption of natural/minimally processed and ultra-processed foods by Brazilians with a sex and race/color intersection, in 2019. **Methods:** We used cross-sectional data from the Telephone Surveillance System (VIGITEL) of individuals ≥18 years old living in Brazilian capitals and the Federal District and assessed the inequality (0-3, 4-8, 9-11 and ≥12 years of study) in food consumption according to sex and race/skin color (White and Black/Brown). Article 1: Time series 2008-2019 with 621,689 individuals. Food consumption was evaluated through 1) Consumption of ≥5 portions of fruits and vegetables in ≥5 days/week; 2) Consumption of beans in ≥5 days/week and 3) Consumption of soft drinks or artificial juices in ≥5 days/week. Inequality was assessed by the slope index of inequality (SII) and concentration index (CIX). Positive values of SII and CIX indicate a higher prevalence among more educated citizens and negative among less-educated. Article 2: We included data from 2019 with 52,443 individuals. We assessed the daily consumption of natural/minimally processed and ultra-processed foods, and considered it high when reported consumption of ≥5 different foods from each food group, the day before the interview. Inequality was assessed by the SII and relative index of inequality (RII). Values of RII> 1.0 indicate higher food consumption among the most educated. **Results:** Article 1: Fruits and vegetable consumption was more prevalent among the more educated, while beans were mostly consumed by the less educated. The highest absolute inequality was found for beans (SII_{2019} -25.9). The consumption of soft drinks or artificial juices decreased in all education levels. In 12 years, the absolute inequality increased for fruit and vegetable consumption (SII_{2008} 12.8 to SII_{2019} 16.2), remained for beans (SII_{2008} -23.1 to SII_{2019} -25.9), and reduced for soft drinks or artificial juices (SII_{2008} 8.7 to SII_{2019} 0.4). Relative inequality was low and constant. Article 2: The consumption of natural/minimally processed and ultra-processed foods was more frequent at the highest level of education and intermediate education (9-11 years), respectively. The absolute educational inequality for

natural/minimally processed foods was greater among White women (SII 21.8; 95%CI 15.3-28.4) and Black/Brown men (SII 19.3; 95%CI 12.5-26.1). In the consumption of ultra-processed, Black/Brown men (SII 7.3; 95%CI 0.5-14.0) and Black/Brown women (SII 5.6; 95%CI 1.0-10.2) showed greater educational inequality absolute than White men (SII -3.3; 95%CI -10.9-4.3; P=0.04). **Conclusions:** From 2008 to 2019, inequalities in the consumption of soft drinks or artificial juices reduced, although there was a troublesome increase in the social gap for the recommended consumption of fruits and vegetables. In 2019, educational inequalities impacted the consumption of natural/minimally processed foods more than ultra-processed, and inequalities were greater between Black/Brown men and women than White men for the consumption of ultra-processed foods.

Keywords: Social inequalities, Food Consumption, Ultra-processed foods, NOVA, Intersectionality, Surveillance.

LISTA DE ABREVIATURAS E SIGLAS

a, b, c, d, e, f, *, †, ‡, §	Símbolos que indicaram informações específicas e notas de rodapé
CAAE	*Certificate of Presentation and Ethical Appreciation*
CI	*Confidence Interval*
CIX	*Concentration Index*
CNPq	*National Council of Scientific and Technological Development*
CNS	Conselho Nacional de Saúde
CONEP	Comissão Nacional de Ética em Pesquisa (*National Research Ethics Commission*)
COVID-19	*Coronavirus disease* 2019
et al.	e colaboradores
FBS	*Family Budget Surveys*
Fig.	*Figure*
IBGE	Instituto Brasileiro de Geografia e Estatística (*Brazilian Institute of Geography and Statistics*)
NCDs	*Chronic Noncommunicable Diseases*
n	Número absoluto
SD	*Standard deviation*
SII	*Slope Index of Inequality*
PAA	*Program for Food Acquisition*
PNS	Pesquisa Nacional de Saúde
POF	Pesquisa de Orçamentos Familiares
RII	*Relative Index of Inequality*
R$	Real
UMIC	*Upper-Middle-Income Country*
VIGITEL	Vigilância de Fatores de Risco e Proteção para Doenças Crônicas por Inquérito Telefônico (*Surveillance of Risk and Protective Factors for Chronic Diseases through Telephone Interviews*)
WHO	*World Health Organization*
%	Porcentagem
≥	Maior ou igual
=	Igual

SUMÁRIO

INTRODUÇÃO

1. INTRODUÇÃO

As expressivas desigualdades presentes em diversos países do mundo, inclusive no Brasil, são marcadas por um grande número de pessoas de baixa renda e pela concentração de recursos econômicos e políticos em uma pequena, porém muito rica, elite da sociedade (UNESCO, 2016). No Brasil, embora a desigualdade tenha permanecido estável entre 2006 e 2013 (UNESCO, 2016), a intensa crise econômica e política enfrentada pelo país desde 2014, ocasionou piora de indicadores sociais, como desemprego e renda, aumento do preço de alimentos (SOUSA et al., 2019; VASCONCELOS et al., 2019) e redução da segurança alimentar nos domicílios brasileiros (SOUSA et al., 2019). De modo agravante, as desvantagens associadas a desigualdade econômica podem interagir e serem intensificadas pelas discriminações com base no gênero e raça/cor dos indivíduos (UNESCO, 2016; VICTORA, 2016). É conhecido que a pobreza brasileira atinge principalmente mulheres e indivíduos autodeclarados pretos ou pardos, com destaque para mulheres de raça ou cor de pele preta ou parda (IBGE, 2020c).

Indivíduos vulneráveis e socialmente desfavorecidos ficam mais doentes e morrem mais precocemente do que os indivíduos mais favorecidos, principalmente em decorrência da maior exposição a fatores prejudiciais à saúde, como práticas alimentares não saudáveis (WORLD HEALTH ORGANIZATION, 2021). É fato que a posição socioeconômica, incluindo gênero e raça/cor, influenciam padrões alimentares, que por sua vez, estão associados ao desenvolvimento de doenças crônicas não transmissíveis (CANUTO; FANTON; LIRA, 2019; WORLD HEALTH ORGANIZATION, 2020). A associação entre menor nível socioeconômico, como menor escolaridade e renda, e dieta menos onerosa, porém mais calórica e menos nutritiva, está bem estabelecida em países desenvolvidos (DREWNOWSKI, 2010; MORRIS et al., 2014). No entanto, informações a respeito das desigualdades sociais no consumo alimentar em países de baixa e média renda, como o Brasil (THE WORLD BANK, 2021), ainda são limitadas (CANUTO; FANTON; LIRA, 2019; MAYÉN et al., 2014).

As evidências disponíveis em países de baixa renda e principalmente média renda mostram que tanto o consumo de alimentos mais calóricos e menos onerosos

quanto o consumo de alimentos de alta qualidade nutricional e maior preço, estão paradoxalmente associados ao alto nível socioeconômico (ALLEN et al., 2017; CANUTO; FANTON; LIRA, 2019; MAYÉN et al., 2014; MEDINA et al., 2019). Porém, as opções alimentares não saudáveis estão cada vez mais acessíveis nos países emergentes (OVERSEAS DEVELOPMENT INSTITUTE, 2015), e no Brasil, os alimentos ultraprocessados têm tido participação crescente ao longo das últimas décadas na dieta, em detrimento de alimentos *in natura* ou minimamente processados e preparações culinárias (MARTINS et al., 2013; MONTEIRO et al., 2016). O consumo de alguns alimentos ultraprocessados já têm sido mais frequente entre brasileiros de menor renda, se comparado aqueles de renda mais alta (IBGE, 2020a).

Ainda existem escassas informações a respeito da magnitude e evolução das desigualdades sociais no consumo de alimentos saudáveis e alimentos não saudáveis da população brasileira, especialmente avaliando mais de um indicador alimentar com base em desigualdades educacionais e dimensões de sexo e raça/cor de pele, simultaneamente (CANUTO; FANTON; LIRA, 2019). Considerar a interseção das desigualdades é de extrema relevância pois possibilita compreender as desigualdades sociais e, ao mesmo tempo, dar visibilidade aos indivíduos que são discriminados devido as suas identidades raciais e de gênero (ORAKA et al., 2020).

As desigualdades de renda no Brasil oscilam ao longo do tempo (UNESCO, 2016) e seu monitoramento contínuo viabiliza documentar tendências e disponibilizar informações robustas à sociedade civil e às autoridades governamentais (VICTORA, 2016), visando a redução sustentada dessas desigualdades (NIESSEN et al., 2018). Elucidar as desigualdades sociais no consumo alimentar, considerando sexo e raça/cor, se faz ainda mais imprescindível e urgente em um momento em que a crise sanitária, econômica e política brasileira tem sido agravada pela pandemia da COVID-19, afetando mais duramente grupos mais vulneráveis e contribuindo para aumentar as desigualdades em todo o mundo (PAREMOER et al., 2021).

FUNDAMENTAÇÃO TEÓRICA

2. FUNDAMENTAÇÃO TEÓRICA

2.1. Padrão de consumo alimentar da população ao longo do tempo e a classificação NOVA de alimentos

Historicamente, tem sido observadas intensas modificações no padrão alimentar populacional. Na primeira metade do século XX, o padrão de consumo alimentar da população era marcado pela presença intensa de alimentos *in natura* (como grãos inteiros, frutas e hortaliças) ou alimentos submetidos a processamento mínimo, além de pratos culinários preparados com tais alimentos. Em contraste, na segunda metade do século XX, houve um rápido crescimento na produção e consumo de produtos alimentícios industrializados prontos para consumir ou aquecer, de forma mais intensa e inicial nos países de alta renda (BRASIL, 2014; MONTEIRO et al., 2016). A partir da década de 1980, essa modificação do padrão alimentar se expandiu globalmente, e tem sido observada principalmente em países de baixa e média renda (CHEN; ANTONELLI, 2020; MONTEIRO et al., 2016, 2017), refletindo a industrialização dos sistemas alimentares, as mudanças tecnológicas e a globalização (BAKER et al., 2020; MOODIE et al., 2021).

Nesse sentido, em especial no século XXI, o processamento de alimentos tem sido uma questão fundamental para o entendimento da relação entre dieta e saúde pública (MONTEIRO et al., 2017). O tipo de processamento ao qual os alimentos são submetidos antes da sua aquisição, preparo e consumo, influencia aspectos como o perfil nutricional e sensorial desses alimentos, além do impacto social e ambiental em decorrência da sua produção (BRASIL, 2014). O Guia Alimentar para a População Brasileira publicado pelo Ministério da Saúde (2014), destaca estes aspectos no amplo conceito de alimentação saudável e adequada, como apresentado abaixo.

> A alimentação adequada e saudável é um direito humano básico que envolve a garantia ao acesso permanente e regular, de forma socialmente justa, a uma prática alimentar adequada aos aspectos biológicos e sociais do indivíduo e que deve estar em acordo com as necessidades alimentares especiais; ser referenciada pela cultura alimentar e pelas dimensões de gênero, raça e etnia; acessível do ponto de vista físico e financeiro; harmônica em quantidade e qualidade, atendendo aos princípios da variedade, equilíbrio, moderação e prazer; e

> baseada em práticas produtivas adequadas e sustentáveis (BRASIL, 2014, p. 8).

As Diretrizes Alimentares Brasileiras, compiladas no Guia Alimentar para a População Brasileira, são pioneiras no reconhecimento do impacto do processamento industrial de alimentos na saúde, considerando os aspectos sociais, culturais, econômicos, dentre outros aspectos da sustentabilidade (BRASIL, 2014; FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS, 2016; MONTEIRO et al., 2017) As orientações centrais estão embasadas na classificação NOVA de alimentos, que considera a natureza, extensão e a finalidade do processamento industrial a que são submetidos (MONTEIRO et al., 2017).

A NOVA foi elaborada (MONTEIRO, 2009) e, posteriormente adaptada, por Monteiro e colaboradores (2016) e classifica os alimentos e produtos alimentícios em quatro grupos: 1) Alimentos *in natura* ou minimamente processados; 2) Ingredientes culinários processados (como óleos, gorduras, açúcar e sal); 3) Alimentos processados (produtos fabricados com uso de substâncias do Grupo 2 adicionados aos alimentos do Grupo 1, como por exemplo, os pães e queijos); 4) Alimentos ultraprocessados. Nesse sentido, como forma de proteger e promover a saúde dos indivíduos, no tempo presente e no futuro, o Guia Alimentar para a População Brasileira incentiva com linguagem acessível à população, a adoção da regra de ouro “prefira sempre alimentos *in natura* ou minimamente processados e preparações culinárias a alimentos ultraprocessados” (BRASIL, 2014).

Os alimentos *in natura* são partes comestíveis de plantas, como sementes, frutos e folhas, ou de animais como ovos e leite, além de fungos, algas e água, após a separação da natureza. Os alimentos minimamente processados são aqueles alimentos *in natura* alterados por processos que incluem a remoção de partes não comestíveis ou indesejadas e secagem, moagem, filtragem, entre outros processos, que visam principalmente prolongar a vida útil dos alimentos, torná-los seguros, comestíveis ou até mesmo mais agradáveis para consumo, facilitar e diversificar o preparo, e torná-los adequados para o armazenamento. Exemplos incluem grãos secos, polidos e embalados ou moídos (farinhas) e raízes e tubérculos lavados (BRASIL, 2014; MONTEIRO et al., 2017, 2019b). Padrões alimentares tradicionais e saudáveis têm como base refeições preparadas com uma variedade de alimentos

vegetais *in natura* ou minimamente processados, adicionados de ingredientes culinários processados e complementado com alimentos processados (BRASIL, 2014; MONTEIRO et al., 2019b).

Em contraste, os alimentos ultraprocessados são formulações industriais de substâncias derivadas de alimentos, geralmente contêm pouco ou nenhum alimento inteiro do Grupo 1 (classificação NOVA), e são frequentemente adicionados de aditivos para imitar ou melhorar os aspectos sensoriais dos alimentos ou até mesmo para disfarçar aspectos não desejáveis do produto alimentício final. Os alimentos ultraprocessados devido a sua natureza são intrinsicamente não saudáveis, considerando que os ingredientes e processos utilizados na sua fabricação são habitualmente de uso industrial exclusivo. Além disso, os alimentos ultraprocessados são projetados para substituir o consumo de alimentos não ultraprocessados (MONTEIRO et al., 2017, 2019b).

No Brasil, dados da Pesquisa de Orçamentos Familiares (POF), realizadas em 2002-2003, 2008-2009 e 2017-2018, a respeito da participação relativa de alimentos no total de calorias determinado pela aquisição alimentar domiciliar, mostrou uma redução do percentual calórico a partir de alimentos *in natura* ou minimamente processados e ingredientes culinários processados, e aumento da contribuição calórica proveniente de alimentos processados e ultraprocessados. Entre 2017-2018, os alimentos ultraprocessados já contribuíram com cerca de um quinto das calorias consumidas (19,7%) pelos brasileiros (IBGE, 2020a). No ano de 2019, a Pesquisa Nacional de Saúde (PNS) do Brasil mostrou que 14,3% dos brasileiros com idade maior ou igual a 18 anos consumiram cinco ou mais grupos de alimentos ultraprocessados, como biscoito doce ou recheado ou bolo de pacote; salsicha, linguiça, mortadela ou presunto; entre outros, no dia anterior à data da entrevista (IBGE, 2020b).

Os alimentos ultraprocessados estão posicionados de forma estratégica no mercado, geralmente são palatáveis ou hiper palatáveis, apresentam *marketing* persuasivo, preço atraente, conveniência (longa vida útil e prontos para consumo em qualquer lugar) e acesso facilitado, incluindo produtos de marca disponíveis em todos os tipos de pontos de venda, geralmente 24 horas por dia (CHEN; ANTONELLI, 2020; LENG et al., 2017; MONTEIRO et al., 2017, 2019b; SANTANA et al., 2020). Dessa

forma, preocupantemente os alimentos ultraprocessados também fragilizam a vida social dentro e fora do domicílio. A cozinha, sala de jantar e as mesas de refeições e tudo o que as acompanha, configurando um espaço de comunhão e troca de conhecimentos, são utilizadas com menor frequência, ou sequer ainda são utilizadas. Como substituição, os indivíduos adquirem o hábito de comer sozinhos, em horários diferentes, sem atenção, e muitas vezes comem ao realizar outra atividade (MONTEIRO et al., 2017).

2.1.1 Alimentação e impactos na saúde humana, planetária e esfera social

A base para a alimentação adequada e saudável é constituída de uma variedade de alimentos *in natura* ou minimamente processados e de origem predominantemente vegetal, complementados com pequenas quantidades de alimentos de origem animal. A densidade calórica e teor nutricional desses alimentos variam amplamente. Os alimentos de origem vegetal geralmente são fontes de fibras e diferentes micronutrientes (vitaminas e minerais), em uma quantidade relativamente pequena de calorias. Os alimentos de origem animal são boas fontes de proteínas e micronutrientes, embora possam apresentar maior densidade calórica e teor excessivo de gorduras saturadas (BRASIL, 2014). O maior consumo de alimentos *in natura* e minimamente processados, especialmente de origem vegetal, como frutas, hortaliças e feijões, está inversamente associado ao risco de morbidades, incluindo doenças cardiovasculares e/ou câncer, e contribui com menor risco de mortalidade total (AUNE et al., 2017; MILLER et al., 2017; NAGURA et al., 2009).

De modo diferente, os alimentos ultraprocessados apresentam tipicamente alta densidade energética e desequilíbrio na oferta de nutrientes, como o alto teor de açúcares livres, gorduras, sódio e baixo teor de fibra alimentar, vitaminas e minerais (BRASIL, 2014; MONTEIRO et al., 2017). Nesse sentido, o consumo de alimentos ultraprocessados em detrimento de alimentos *in natura* ou minimamente processados, assim como preparações culinárias, está associado à intensa deterioração da qualidade nutricional das dietas (MONTEIRO et al., 2019a). O maior consumo de alimentos ultraprocessados, como refrigerantes e/ou bebidas adoçadas, salgadinhos de pacote e produtos de carne reconstituída, estão associados ao maior risco de

doenças crônicas não transmissíveis (DCNT) e mortalidade por todas as causas (HALL et al., 2019; LANE et al., 2021; LEVY et al., 2020; PAGLIAI et al., 2021). Por exemplo, o consumo elevado de alimentos ultraprocessados aumenta o ganho de gordura corporal (HALL et al., 2019), risco de sobrepeso/obesidade (PAGLIAI et al., 2021), doenças cardiovasculares (PAGLIAI et al., 2021), diabetes tipo 2 (LEVY et al., 2020), câncer de mama (FIOLET et al., 2018) e depressão (PAGLIAI et al., 2021). Além disso, os alimentos ultraprocessados também podem contribuir com o desenvolvimento de desnutrição e deficiências de micronutrientes (SWINBURN et al., 2019). Recentemente, o rastreio das tendências de consumo de 15 fatores de risco dietéticos em 195 países, mostrou que a baixa ingestão de frutas e grãos inteiros, e a alta ingestão de sódio, foram responsáveis por mais da metade de todas as mortes atribuíveis à dieta globalmente em 2017 (AFSHIN et al., 2019).

Para além dos impactos à saúde humana em decorrência do perfil nutricional da dieta, o consumo de alimentos *in natura* e minimamente processados está relacionado a uma alimentação culturalmente apropriada e promotora de um sistema alimentar socialmente mais justo e ambientalmente sustentável (BRASIL, 2014). Em contraste, os alimentos ultraprocessados, impactam negativamente a saúde planetária (BRASIL, 2014), impulsionando a Sindemia Global[1] (SWINBURN et al., 2019), e têm efeitos problemáticas na esfera cultural, política, social e econômica, de forma a contribuir para o desenvolvimento de desigualdades sociais, o que também afeta, indiretamente, a saúde humana (BRASIL, 2014; MONTEIRO et al., 2017).

O sistema alimentar baseado em alimentos ultraprocessados é desfavorável a distribuição social das riquezas e a geração de oportunidades de trabalho e renda (BRASIL, 2014). Está relacionado ao fortalecimento de monoculturas, que fornecem matérias-primas de alimentos ultraprocessados ou para rações utilizadas na criação intensiva de animais, em detrimento de sistemas alimentares centrados na agricultura familiar e no cultivo de uma diversidade de alimentos combinado à criação de animais (BRASIL, 2014; FARDET; ROCK, 2020). Consequentemente, o sistema alimentar baseado em alimentos ultraprocessados necessita de grandes extensões de terra e provoca rápido desmatamento, degradação do solo e perda intensa da biodiversidade,

[1] Sindemia Global consiste na sinergia das pandemias de obesidade, desnutrição e mudanças climáticas, que coexistem no tempo e no espaço, apresentam interação entre si, e compartilham determinantes comuns (SWINBURN et al., 2019).

além de potencializar as desigualdades sociais existentes (BRASIL, 2014; SWINBURN et al., 2019).

2.1.2 Determinantes de escolhas alimentares

As escolhas alimentares de cada indivíduo são influenciadas e limitadas pela natureza complexa de vários fatores que interagem entre si, como os fatores ambientais, sociais, econômicos, políticos, culturais e biológicos (CHEN; ANTONELLI, 2020; LENG et al., 2017; MARMOT; BELL, 2019). Considerando modelos conceituais existentes que abordam os fatores influenciadores da escolha alimentar, uma recente revisão sistemática apresentou os principais determinantes da escolha geral de alimentos e as possíveis interações entre esses fatores. Segundo os autores dessa revisão, os fatores determinantes das escolhas alimentares podem ser nivelados em três categorias principais, incluindo as características relacionadas aos alimentos, as diferenças individuais e à sociedade (socioculturais) (CHEN; ANTONELLI, 2020).

As características relacionadas aos alimentos incluem fatores internos e externos aos mesmos. Os fatores intrínsecos ao próprio alimento consideram as características sensoriais e perceptivas (por exemplo, sabor e tamanho da porção, respectivamente). Os fatores externos abrangem as informações dos alimentos (por exemplo, rótulos nutricionais, alegações de saúde e embalagem), e os ambientes alimentares, que por sua vez, compreendem tanto o ambiente social (como fator intrapessoal e normas sociais da família, colegas, amigos e mídia), quanto o ambiente físico (como disponibilidade física e acessibilidade dos alimentos nos locais de trabalho e lojas de varejo de alimentos) (CHEN; ANTONELLI, 2020).

Em relação às diferenças individuais, pode-se mencionar os fatores do estado pessoal e os fatores cognitivos. Os fatores do estado pessoal incluem as características biológicas (como os padrões alimentares pessoais), as necessidades fisiológicas (por exemplo, o apetite), os componentes psicológicos (como motivação e emoção), e os hábitos e as experiências dos indivíduos (composto simultaneamente pela memória e emoção, por exemplo). Os fatores cognitivos, englobam o conhecimento (principalmente conhecimento nutricional e relacionado a alimentos) e habilidades, atitude, gosto e preferência, consequências previstas em relação à saúde

e a identidade pessoal (características demográficas, como sexo, etnia, educação e idade, bem como as crenças e valores pessoais moldados pela cultura e sociedade) (CHEN; ANTONELLI, 2020).

Os fatores socioculturais consideram a cultura (incluindo normas e valores culturais), fatores econômicos (situação socioeconômica, renda e preço dos alimentos) e elementos políticos (políticas e regulamentações agrícolas e alimentares). Tais fatores socioculturais são importantes determinantes porque perpassam todos os demais (CHEN; ANTONELLI, 2020; LARSON; STORY, 2009).

A partir do momento em que se entende a influência dos fatores socioculturais nas escolhas alimentares, reforça-se que é moralmente injustificável atribuir a responsabilidade dos prejuízos à saúde em decorrência de uma alimentação inapropriada apenas aos indivíduos. Essa responsabilidade também deve ser atribuída ao governo e empresas, por exemplo (AZÉTSOP; JOY, 2013).

2.1.2.1 Educação e fatores econômicos como determinantes das escolhas alimentares

Como visto, a educação e a renda dos indivíduos são fatores que influenciam de modo importante as escolhas alimentares (CHEN; ANTONELLI, 2020). Em países de renda média, como o Brasil, é conhecido que quanto maior a escolaridade, maior o nível socioeconômico (SILVA et al., 2018), uma vez que a escolaridade impacta na empregabilidade e rendimento da população (IBGE, 2020c; WAGSTAFF, 2002). Até mesmo em população com renda mais baixa, maiores níveis educacionais têm influência nas escolhas de alimentos saudáveis (LINS et al., 2013). A educação aumenta o conhecimento das informações sobre saúde, tem efeito na utilização dos serviços de saúde e pode tornar mais fácil a adoção de comportamentos mais saudáveis pelos indivíduos (COMISSÃO NACIONAL SOBRE DETERMINANTES SOCIAIS DA SAÚDE, 2008; WAGSTAFF, 2002). Em adição, o preço dos alimentos é considerado um importante influenciador da presença ou não de escolhas alimentares mais saudáveis e sustentáveis pelos consumidores (CHEN; ANTONELLI, 2020), especialmente nos grupos com nível socioeconômico mais baixo (LARSON; STORY, 2009; MARMOT; BELL, 2019). O Guia Alimentar para a População Brasileira de 2014

considera o preço dos alimentos como uma barreira para a adoção de uma alimentação saudável (BRASIL, 2014).

Diferente do que tem sido observado em países desenvolvidos (DREWNOWSKI, 2010; MORRIS et al., 2014), no Brasil, a dieta baseada em alimentos *in natura* ou minimamente processados, como arroz e feijão, ainda é menos onerosa se comparada aquela baseada em alimentos ultraprocessados (CLARO et al., 2016). No entanto, convém mencionar que alguns alimentos saudáveis com baixo custo, nem sempre requerem pouco tempo de preparo, o que pode dificultar a adesão às práticas alimentares mais saudáveis pelos consumidores de baixa renda (LARSON; STORY, 2009). Além disso, alimentos frescos e saudáveis, como leite, carnes, frutas e hortaliças tendem a ser mais onerosos do que alimentos ultraprocessados (CLARO et al., 2016).

De maneira preocupante, em países em desenvolvimento, inclusive o Brasil, o preço de alimentos saudáveis, como as frutas e hortaliças, tem aumentado continuamente, enquanto os alimentos ultraprocessados apresentam tendência de redução dos seus preços, se tornando cada vez mais acessíveis (MAIA et al., 2020; OVERSEAS DEVELOPMENT INSTITUTE, 2015). Dessa forma, em situações de limitação de orçamento para aquisição de alimentos, os indivíduos tendem a escolher alimentos com menor preço, porém com alto teor de energia, para satisfazer suas necessidades energéticas e evitar a fome (LARSON; STORY, 2009).

Uma pesquisa estimou que as famílias no decil de renda mais baixa na Inglaterra teriam que gastar mais de 70,0% de sua renda disponível para atender às recomendações dietéticas do governo, enquanto menos de 10,0% seriam dispendidos pelas famílias no decil de maior renda (SCOTT; SUTHERLAND; TAYLOR, 2018). Um perfil semelhante pode ser observado em cenário internacional. Ao analisar dados sobre disponibilidade, acessibilidade e consumo de frutas e hortaliças em 18 países, o custo de duas porções de frutas e três porções de hortaliças diariamente por indivíduo exigiu aproximadamente 52,0% da renda familiar em países de baixa renda, 18,0% em países de renda média baixa, 16,0% em países de renda média alta, e apenas cerca de 2,0% em países de alta renda. Dessa forma, a aquisição de uma quantidade diária adequada de frutas e hortaliças por indivíduo representa uma proporção substancial da renda familiar, tornando esses alimentos inacessíveis para

consumo em quantidades adequadas em diversos países de baixa e média renda (MILLER et al., 2016).

No Brasil, dados de uma amostra representativa da população brasileira pela POF, realizada entre 2017 e 2018, mostram que as despesas com alimentação representou 14,2% da despesa total realizada mensalmente pelas famílias brasileiras. Porém, no recorte por classes de rendimento mensal das famílias, as despesas com alimentação apresentou proporcionalmente um peso maior nas classes de menor rendimento (até R$1.908,00), correspondendo a 22,0% da despesa média mensal. Na classe de rendimento superior (acima R$23.850,00), as despesas com a alimentação corresponderam apenas 7,6% da despesa média mensal familiar (IBGE, 2019b).

Dessa forma, evidências mostram que a presença de políticas públicas direcionadas ao subsídio de alimentos saudáveis, como a diminuição de 10,0% a 30,0% do preço de frutas e hortaliças (WORLD HEALTH ORGANIZATION, 2016), podem ser eficazes para aumentar o poder de compra e a ingestão desses alimentos-alvo pela população vulnerável (FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS, 2020; THOW et al., 2018; WORLD HEALTH ORGANIZATION, 2016). Além disso, a articulação conjunta de subsídios para alimentos saudáveis e de impostos sobre alimentos não saudáveis, como é o caso das bebidas açucaradas, pode ser eficaz para moldar o perfil de consumo alimentar da população para a direção desejada (FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS, 2020; THOW et al., 2018).

A tributação de bebidas adoçadas com açúcar tem sido uma das políticas fiscais mais comuns em uma série de países (FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS, 2020). Segundo dados sumarizados pela Organização Mundial da Saúde, a tributação de bebidas açucaradas é uma intervenção eficaz para reduzir a compra dessas bebidas, além de diminuir o desenvolvimento de DCNT, promover economia de custos com saúde e geração de receita para investimento em saúde (WORLD HEALTH ORGANIZATION, 2017). As estimativas mostram que um imposto destinado a aumentar o preço de varejo em pelo menos 20,0% pode gerar mudanças significativas no consumo, especialmente entre populações vulneráveis, incluindo consumidores de baixa renda, que são mais

responsivos aos preços e se beneficiam mais em termos de saúde (WORLD HEALTH ORGANIZATION, 2016).

O México introduziu um imposto nacional sobre bebidas açucaradas em 2014, representando um aumento de cerca de 10,0% no preço ao consumidor (COLCHERO et al., 2017; WORLD HEALTH ORGANIZATION, 2017). Consequentemente, foi observado uma redução média de cerca de 8,0% nas compras das bebidas tributadas durante os dois primeiros anos de sua implementação (2014-2015), e de maneira mais acentuada nas famílias de nível socioeconômico mais baixo, cuja redução média foi aproximadamente 12,0% (COLCHERO et al., 2017). No Brasil, a pauta de tributação de bebidas açucaradas ainda segue em andamento no contexto da proposta de Reforma Tributária do Governo (BRASIL, 2020a), e as empresas de bebidas adoçadas estão sendo beneficiadas por meio de reduções de impostos e isenções fiscais (CONSELHO NACIONAL DE SAÚDE, 2020).

De maneira concomitante à tributação de alimentos ultraprocessados, a regulação de estratégias de marketing de alimentos, incluindo medidas que visam reduzir a publicidade persuasiva desses alimentos na televisão, internet e outdoors, são importantes na tentativa de desestimular o consumo de ultraprocessados e melhorar a qualidade da alimentação da população (ANTÚNEZ et al., 2021; CASSADY; LIAW; MILLER, 2015; FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS, 2020; GUIMARÃES et al., 2020; SANTANA et al., 2020). A presença dessas medidas regulatórias podem possivelmente evitar a promoção de mais uma forma de discriminação de grupos vulneráveis socioeconomicamente, que são mais responsivos ao aumento no preço dos alimentos devido a redução da capacidade de compra dos mesmos (COLCHERO et al., 2017; WORLD HEALTH ORGANIZATION, 2016), mas ao mesmo tempo, podem estar sendo expostos a uma maior densidade de anúncios de alimentos e bebidas não saudáveis (CASSADY; LIAW; MILLER, 2015).

2.2 Desigualdades no consumo de alimentos

2.2.1 Desigualdades sociais

A estrutura conceitual de classe social e de posição socioeconômica foi proposta por Krieger e colaboradores em 1997. Classe social se trata de uma relação social forjada pela sociedade. Corresponde a uma categoria social que se refere a grupos sociais criados por relações econômicas interdependentes entre as pessoas e que se definem mutuamente (por exemplo, empregado e empregador). Por outro lado, de forma mais específica, o conceito de posição socioeconômica agrega medidas baseadas em recursos (materiais e sociais, incluindo renda, riqueza e credenciais educacionais) e medidas baseadas em prestígio (posição do indivíduo em uma hierarquia social). Em adição, tais autores destacaram a importância de mensurar a posição socioeconômica em nível individual, familiar e de vizinhança, com respeito ao tempo e em relação à gênero e raça/etnia (KRIEGER; WILLIAMS; MOSS, 1997).

Nesse sentido, o contexto social determina a posição de cada indivíduo, e esta posição determina as oportunidades de saúde segundo exposições a condições danosas ou saudáveis e de acordo com situações diferentes de vulnerabilidade. As desigualdades sociais aqui consideradas se referem a diferenças que são injustas porque estão associadas a características sociais (como educação, ocupação, riqueza, gênero e raça/etnia) que sistematicamente posicionam alguns grupos em uma situação desvantajosa com relação à oportunidade de ser e se manter saudável (BARATA, 2009).

A posição socioeconômica dos indivíduos exerce influência nas restrições às escolhas alimentares, o que ocasiona escolhas desiguais entre eles (DREWNOWSKI, 2012; MARMOT; BELL, 2019). Indivíduos socialmente desfavorecidos estão mais expostos a práticas alimentares não saudáveis se comparado aos indivíduos mais favorecidos (WORLD HEALTH ORGANIZATION, 2021). Em países desenvolvidos, a associação entre menor nível socioeconômico (como menor nível de escolaridade e renda) e dieta menos nutritiva, mais densa em energia e de menor custo está bem estabelecida (DREWNOWSKI, 2010; MORRIS et al., 2014). Porém, nos países de baixa e média renda, as evidências científicas a respeito da distribuição socioeconômica dos padrões alimentares ainda são limitadas (MARMOT; BELL, 2019; MAYÉN et al., 2014), inclusive no Brasil (CANUTO; FANTON; LIRA, 2019).

Uma revisão sistemática sobre associação entre nível socioeconômico e fatores de risco comportamentais para DCNT, incluindo dietas não saudáveis, em

países de renda baixa e média alta, identificou que os grupos menos favorecidos socioeconomicamente apresentaram menor consumo de alimentos saudáveis, como frutas, hortaliças e peixes, se comparado aos grupos mais favorecidos (ALLEN et al., 2017). Por outro lado, os grupos de alto nível socioeconômico apresentarem maior consumo de alimentos saudáveis, e paradoxalmente, também foram mais propensos a consumir alimentos não saudáveis, com maior teor de gordura, sal e açúcar, e baixos teores de fibras, proteínas de origem vegetal e carboidratos complexos (ALLEN et al., 2017). Esses resultados corroboram com achados documentados por outros pesquisadores (MAYÉN et al., 2014).

No Brasil, tem sido observado que as desigualdades sociais no consumo alimentar da população manifestam-se como um fenômeno complexo. As evidências disponíveis por meio de inquéritos nacionais mostram que os padrões alimentares mais saudáveis, incluindo o consumo de diferentes alimentos *in natura* ou minimamente processados, como frutas e hortaliças, têm sido associados com níveis socioeconômicos mais altos, embora estes apresentam menor consumo de alimentos saudáveis e tradicionais da dieta brasileira, como o feijão (BRASIL, 2020b; CANUTO et al., 2010; IBGE, 2020a, 2020b; MEDINA et al., 2019).

Além da presença de padrões alimentares mais saudáveis, paradoxalmente, uma maior ingestão de alimentos ultraprocessados, como refrigerantes e/ou sucos artificiais, também têm sido associados a maiores níveis socioeconômicos (BRASIL, 2020b; CANUTO et al., 2010; IBGE, 2020a; MEDINA et al., 2019). No entanto, à medida que o país se desenvolve economicamente, os alimentos menos onerosos, mais calóricos e menos nutritivos se tornam cada vez mais acessíveis (OVERSEAS DEVELOPMENT INSTITUTE, 2015), e se associam com níveis educacionais e renda mais baixos (CANUTO; FANTON; LIRA, 2019; DREWNOWSKI, 2010; MONTEIRO et al., 2017; MORRIS et al., 2014). Tal cenário já tem sido identificado no Brasil, com o consumo mais frequente de alguns alimentos ultraprocessados (como macarrão instantâneo e diferentes produtos de carne reconstituída) entre brasileiros mais desfavorecidos socioeconomicamente (IBGE, 2020a).

Por outro lado, e de maneira agravante, nos países em desenvolvimento os alimentos saudáveis, como frutas e hortaliças, têm apresentado aumento nos seus preços (OVERSEAS DEVELOPMENT INSTITUTE, 2015). No contexto brasileiro, o

país que já é marcado por uma expressiva distribuição desigual de renda (UNESCO, 2016), apresentou piora na renda da população e elevação no preço de alimentos, ou seja, desvantagens em diferentes determinantes de escolhas alimentares da população, devido a importante crise econômica e política enfrentada desde 2014 (SOUSA et al., 2019; VASCONCELOS et al., 2019). Diante da crise, o governo brasileiro implementou medidas de austeridade, incluindo redução orçamentária dos programas e metas do Plano Nacional de Segurança Alimentar e Nutricional, como a redução de 67% na Lei Orçamentária Anual para o Programa de Aquisição de Alimentos (PAA) entre 2014-2018 (VASCONCELOS et al., 2019). O PAA é uma importante política de apoio e incentivo à agricultura familiar que fomenta a produção de frutas e hortaliças e o acesso desses alimentos por indivíduos em situação de maior vulnerabilidade. Além disso, o PAA contribui para gerar renda aos agricultores familiares (BRASIL, 2020d).

O Brasil que é considerado um dos maiores produtores mundiais de alimentos (BELIK, 2020) apresentou, paradoxalmente, a pior situação de segurança alimentar[2] dos últimos 15 anos, e aumento da insegurança alimentar grave[3] nos últimos cinco anos, segundo os dados da POF nacional realizada em 2017-2018 (IBGE, 2020a). Mais de três milhões de domicílios brasileiros (4,6%) apresentaram insegurança alimentar grave em 2017-2018 (IBGE, 2020a), o que configura violação do seu direito constitucional à alimentação (BRASIL, 2010).

Além da crise econômica e a redução de investimento financeiro nas agendas de segurança alimentar e nutricional do governo federal brasileiro, no início de 2019, o atual governo extinguiu o Conselho Nacional de Segurança Alimentar e Nutricional (CONSEA), importante órgão de assessoramento direto da Presidência da República que dialogava entre governo e sociedade civil, de forma a mobilizar a pauta de segurança alimentar e nutricional (CASTRO, 2019). É previsível a piora das perspectivas gerais para a segurança alimentar e nutricional pelos desdobramentos

[2] Segurança alimentar é descrita como uma situação em que “A família/domicílio tem acesso regular e permanente a alimentos de qualidade, em quantidade suficiente, sem comprometer o acesso a outras necessidades essenciais” (BRASIL, 2010 apud IBGE, 2020a).

[3] Insegurança alimentar grave é descrita como uma situação em que existe “Redução quantitativa de alimentos também entre as crianças, ou seja, ruptura nos padrões de alimentação resultante da falta de alimentos entre todos os moradores, incluindo as crianças. Nessa situação, a fome passa a ser uma experiência vivida no domicílio” (BRASIL, 2010 apud IBGE, 2020a).

sanitários e econômicos da COVID-19, que já tem refletido no aumento do custo de alimentos básicos da dieta dos brasileiros, e afetará o acesso a alimentos nutritivos pela população, especialmente pelos grupos mais vulneráveis (FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS, 2020; NONNENBERG; MARTINS; CECHIN, 2020; PAREMOER et al., 2021).

De maneira preocupante, somado à histórica e expressiva desigualdade econômica, o Brasil apresenta importantes disparidades entre gênero e grupo étnico (VICTORA, 2016). Considerando que a posição socioeconômica dos indivíduos, incluindo gênero e raça/cor, influenciam os padrões alimentares, tais disparidades podem levar a desigualdades no consumo alimentar da população (CANUTO; FANTON; LIRA, 2019). Esse cenário pode ser exemplificado pela distribuição dos domicílios segundo a situação de segurança alimentar e insegurança alimentar, considerando o sexo ou cor de pele dos indivíduos que chefiam os domicílios no país (IBGE, 2020a).

Os dados da POF do Brasil, realizada em 2017-2018, também revelam que a maioria dos domicílios classificados como em situação de segurança alimentar eram chefiados por homens (61,4%). De maneira oposta, na medida que se passe do nível de segurança alimentar para insegurança alimentar, foi observado um aumento na frequencia de mulheres como chefes do domicílio. A maioria dos domicílios que apresentaram insegurança alimentar grave eram chefiados por mulheres (51,9%). No recorte de raça/cor autodeclarada, os domicílios que apresentaram segurança alimentar eram mais frequentemente chefiados por indivíduos com cor de pele branca (51,5%). A maioria dos domicílios que apresentaram diferentes graus de insegurança alimentar eram chefiados por indivíduos pardos, inclusive para a insegurança alimentar grave (58,1%). Também foi observado uma prevalência importante para domicílios que tiveram insegurança alimentar grave e eram chefiados por indivíduos de raça/cor preta (15,8%) (IBGE, 2020a). No Brasil, mulheres e indivíduos pretos ou pardos são aqueles que mais vivenciam a pobreza, especialmente as mulheres de raça/cor preta ou parda (IBGE, 2020c).

2.2.2 Desigualdades entre sexo

As evidências de grandes inquéritos nacionais realizados com a população brasileira corroboram mostrando de maneira descritiva que as mulheres tiveram maior consumo de alimentos *in natura* ou minimamente processados, incluindo maior frequência de consumo regular e/ou recomendado de frutas e hortaliças, embora tenham apresentado um consumo mais elevado de alimentos doces em relação aos homens (CANUTO; FANTON; LIRA, 2019; IBGE, 2020a, 2020b). Os homens apresentaram um consumo mais elevado de alimentos básicos e tradicionais brasileiros, com o arroz e feijão. No entanto, entre os homens também foi observado um consumo mais frequente de alimentos ultraprocessados, como refrigerantes e/ou sucos artificiais (BRASIL, 2020b; CANUTO; FANTON; LIRA, 2019; IBGE, 2020a, 2020b).

Considerando o nível socioeconômico, entre as mulheres, principalmente naquelas com maior nível de escolaridade e renda, têm sido descritos padrões alimentares ainda mais adequados e saudáveis (CANUTO et al., 2010; CANUTO; FANTON; LIRA, 2019; LENZ et al., 2009). Assim como exemplificado, se faz importante considerar a posição socioeconômica dos indivíduos, além do sexo, para melhor compreensão das desigualdades no consumo alimentar entre homens e mulheres (CANUTO; FANTON; LIRA, 2019).

2.2.3 Desigualdades raciais

A raça é conhecida como diferenças fenotípicas utilizadas para classificar e hierarquizar os indivíduos em um contexto social e, portanto, se refere a um produto das relações sociais para além das diferenças biológicas (LOVELL; WOOD, 1998; TELLES; PASCHEL, 2014). Dessa forma, a raça dos indivíduos perpassa tanto o aspecto físico quanto cultural. Considerando que a cor da pele dos indivíduos é utilizada socialmente para avaliar e posicioná-los na hierarquia social (DIXON; TELLES, 2017), em diferentes países da América Latina, a cor de pele tem sido considerada como o preditor mais importante de identificação racial e a principal maneira de descrever as categorizações etnorraciais (TELLES; PASCHEL, 2014). Em adição, evidências recentes mostram que a ancestralidade genômica é um forte

preditor de raça/cor autodeclarada na população brasileira. No entanto, os pesquisadores destacaram que a ancestralidade por si só não explica a raça/cor autodeclarada, e que as características tanto individuais quanto coletivas contribuem para predizer a raça/cor dos indivíduos (CHOR et al., 2019).

Inquéritos nacionais realizados com a população brasileira mostraram que o consumo de diferentes alimentos *in natura* ou minimamente processados, e inclusive, maior frequência de consumo regular e/ou recomendado de frutas e hortaliças foi maior entre a população de raça/cor de pele branca (BARROS et al., 2016; CANUTO; FANTON; LIRA, 2019; IBGE, 2020b; MEDINA et al., 2019). Indivíduos de cor de pele preta e/ou parda apresentaram maior consumo de feijão (CANUTO; FANTON; LIRA, 2019; IBGE, 2020b), e alimentos associados à maior risco para DCNT (CANUTO; FANTON; LIRA, 2019).

Considerando que a raça/cor de pele está relacionada a posição socioeconômica dos indivíduos (CANUTO; FANTON; LIRA, 2019), é conhecido que a população negra apresenta desvantagem na maioria dos indicadores sociais (LOVELL; WOOD, 1998). Por exemplo, a população brasileira de cor preta ou parda apresenta menores oportunidades educacionais e recebimento de remunerações inferiores àquela de cor branca, mesmo ajustando o número de horas trabalhadas e escolaridade (IBGE, 2020c). Devido ao racismo histórico vivenciado no Brasil (IBGE, 2020c), mesmo após ajustes realizados por fatores socioeconômicos como a escolaridade e/ou renda, persistiram diferenças de raça/cor em relação a fatores de risco e proteção para DCNT, como menor consumo de frutas e hortaliças entre indivíduos pardos, se comparado a brancos (MALTA; MOURA; BERNAL, 2015).

2.2.4 Desigualdades na perspectiva da interseccionalidade

As desigualdades sociais no consumo de alimentos saudáveis e alimentos não saudáveis disponíveis pela população brasileira, de um modo geral, foram descritas de forma fragmentada, carente de interseção com diferentes dimensões de desigualdades, como sexo e raça/cor de pele (CANUTO; FANTON; LIRA, 2019). A classe, raça/cor e gênero dos indivíduos, por exemplo, ao invés de serem analisadas de forma isolada, são mais claramente entendidas em termos relacionais (COLLINS, 2015). A natureza interseccional considera que a classe, raça/cor, gênero e outros

eixos de identidades sociais estão articuladas entre si e são interdependentes, sendo vivenciadas de maneira simultânea (DAVIS, 2011; LÓPEZ; GADSDEN, 2016).

Nesse sentido, a interseccionalidade é uma estrutura teórica usada para descrever como múltiplas categorias sociais medidas no nível individual (como gênero, raça, nível socioeconômico) refletem sistemas interligados de privilégio e opressão no nível social (como o racismo e sexismo) (BOWLEG, 2012). A interseccionalidade permite investigar as formas pelas quais as diversas identidades e posições sociais de um indivíduo estão inseridas em sistemas de desigualdade (LÓPEZ; GADSDEN, 2016), de forma a compreender, simultaneamente, as desigualdades sociais e as discriminações associadas a identidade racial e gênero dos indivíduos (ORAKA et al., 2020).

No Brasil, enquanto os homens de cor de pele autodeclarada branca apresentam vantagens em rendimentos de trabalho sobre os demais subgrupos populacionais, do outro lado, as mulheres pretas/pardas apresentam os piores rendimentos de trabalho (44,4% do valor dos rendimentos do homem branco). Dessa forma, é observada uma desigualdade salarial em favor dos indivíduos ocupados de cor de pele branca, colocando os homens brancos em maior vantagem, seguido das mulheres brancas (IBGE, 2019a).

Considerando que as identidades e posições sociais de um indivíduo são vivenciadas em conjunto, é de grande relevância a investigação de como essas categorias atuam juntas para impactar em comportamentos de saúde, como aquisição de alimentos e consumo alimentar (SINGLETON et al., 2020). Descobertas na perspectiva da interseccionalidade podem contribuir no avanço da investigação de desigualdades em saúde, dando visibilidade ao que até então era invisível, e interromper o fortalecimento de desigualdades (LÓPEZ; GADSDEN, 2016).

No entanto, há uma profunda carência na literatura científica sobre o consumo alimentar da população considerando a perspectiva da interseccionalidade. Um estudo utilizando dados representativos da população brasileira referente ao ano de 2012, mostrou a prevalência de alguns indicadores alimentares em homens e mulheres, na perspectiva raça/cor autodeclarada (branca, preta e parda), embora não tenha considerado o impacto do nível socioeconômico na comparação dos grupos. Os pesquisadores identificaram menor consumo regular de frutas e hortaliças em homens

e mulheres de cor parda, se comparado aos seus pares de cor branca, e maior consumo regular de feijão em homens pretos/pardos em relação aos homens de cor branca (MALTA; MOURA; BERNAL, 2015).

2.2.5 Monitoramento de desigualdades

Monitorar é um processo de observar repetidamente uma situação para verificar alterações ao longo do tempo. O monitoramento das tendências temporais de indicadores de saúde a nível populacional, contribui para verificar se a situação de saúde, incluindo as desigualdades em saúde, melhoraram, pioraram ou até se mantiveram iguais ao longo do tempo, elucidando se as desigualdades atuais são problemas emergentes ou persistentes (WORLD HEALTH ORGANIZATION, 2013). O monitoramento deve ser realizado em subgrupos da população, uma vez que as médias nacionais podem ocultar importantes desigualdades que existem dentro de uma população (BARROS; VICTORA, 2013).

Dessa forma, diante da comparação da situação de saúde entre subgrupos populacionais definidos por características socioeconômicas, demográficas ou geográficas relevantes, o monitoramento da desigualdade em saúde permite uma compreensão mais aprofundada de como a saúde é vivenciada de forma diferente pelos subgrupos. A partir de uma análise discriminada de indicadores de saúde entre subgrupos, o monitoramento da desigualdade em saúde pode indicar se os subgrupos da população menos privilegiada estão apresentando melhora do indicador de saúde no decorrer do tempo (HOSSEINPOOR; BERGEN, 2019).

A realização eficaz do monitoramento das desigualdades na saúde é útil e de extrema importância para fornecer informações que contribuem com a formulação e revisão de políticas, programas e práticas baseadas em evidências, visando reduzir as diferenças de saúde que são injustas e modificáveis na população. Os formuladores de políticas procuram evidências quantitativas para identificar a origem dos problemas ou as questões sociais, econômicos e políticos subjacentes às origens das desigualdades, as áreas prioritárias de ação e para instruir os processos de tomada de decisão (WORLD HEALTH ORGANIZATION, 2013).

Para a realização do monitoramento da desigualdade de saúde são necessários dados vinculados sobre indicadores de saúde que apresentam uma probabilidade razoável de refletir diferenças injustas entre os grupos, além dos estratificadores de equidade[4]. As fontes de dados podem ser baseadas na população, como pesquisas domiciliares, censos e sistemas vitais de registro; com base na instituição, como registros de recursos, registros de serviço e registros individuais; ou com base em sistemas de vigilância, constituídos de uma combinação de dados de base populacional e de instituição. Cada uma dessas fontes possui vantagens e desvantagens implícitas relacionadas à disponibilidade, escopo, qualidade e representatividade dos dados (WORLD HEALTH ORGANIZATION, 2013).

Dentre os sistemas de vigilância, destaca-se a vigilância de fatores de risco, termo utilizado para apresentar a coleta e análise de dados no monitoramento de doenças não transmissíveis (WORLD HEALTH ORGANIZATION, 2013). No Brasil, o Ministério da Saúde dispõe de um importante Sistema de Vigilância de Fatores de Risco e Proteção para Doenças Crônicas por Inquérito Telefônico (VIGITEL) (BRASIL, 2020c).

2.2.5.1 Sistema de Vigilância de Fatores de Risco e Proteção para Doenças Crônicas

O VIGITEL compõe o sistema de vigilância de fatores de risco de DCNT do Ministério da Saúde do Brasil, em conjunto com outros inquéritos, como os domiciliares e em populações escolares. A pesquisa VIGITEL é executada pela Secretaria de Vigilância em Saúde (SVS) do Ministério da Saúde do Brasil e foi implantado no ano de 2006, em todas as capitais dos 26 estados brasileiros e no Distrito Federal, pela SVS e com suporte técnico do Núcleo de Pesquisas Epidemiológicas em Nutrição e Saúde da Universidade de São Paulo (Nupens/USP) (BRASIL, 2020b).

O VIGITEL apresenta como objetivo o monitoramento anual da frequência e distribuição dos principais fatores de risco e proteção das DCNT como obesidade,

[4] Estratificadores de equidade são dimensões selecionadas de desigualdade, com nível econômico, nível de escolaridade, sexo, raça/etnia, região e local de residência (WORLD HEALTH ORGANIZATION, 2013).

diabetes, hipertensão arterial, doenças respiratórias crônicas e câncer, por meio de inquérito telefônico (BRASIL, 2020c). Dentre os indicadores avaliados pelo VIGITEL desde a primeira edição da pesquisa, incluem o tabagismo, excesso de peso e obesidade, consumo alimentar, atividade física, consumo de bebidas alcoólicas e morbidades referidas (BRASIL, 2007). Ao longo das edições, outros indicadores como a condução de veículo motorizado após consumo de bebidas alcoólicas; autoavaliação do estado de saúde e prevenção de câncer foram incluídos no questionário (BRASIL, 2020b). Além das questões relacionadas diretamente com a saúde da população, o questionário do VIGITEL engloba questões sobre o perfil sociodemográfico da população, como a idade, sexo, escolaridade, estado civil e raça ou cor de pele (BRASIL, 2020c). Dessa forma, o VIGITEL disponibiliza diferentes indicadores de saúde para o uso de maneira isolada ou agrupada em pesquisas científicas de relevância para a saúde pública, inclusive na área de desigualdades sociais.

A fim de exemplificar a importância desse Sistema de Vigilância, no período entre 2006 e 2019, o VIGITEL mostrou uma evolução favorável e significativa de indicadores relativos a tabagismo, consumo recomendado de frutas e hortaliças e consumo regular de refrigerantes, por exemplo. Em contraste, de maneira preocupante, foi observada uma evolução desfavorável e significativa em indicadores como excesso de peso e obesidade, consumo regular de feijão, consumo abusivo de álcool e diabetes (BRASIL, 2020b).

O VIGITEL realiza as entrevistas telefônicas em amostras da população adulta com idade maior ou igual a 18 anos e residente em domicílios que apresentam linha telefônica fixa. As ligações são realizadas das 9h às 21h (horário de Brasília) nos dias úteis e das 10 às 16h nos dias não úteis (sábado, domingo e feriado), em todos os meses do ano. O tempo médio de resposta ao questionário é de 12 minutos. A amostra do VIGITEL leva em consideração fatores de ponderação da amostra para a análise de dados, e devido ao desenho complexo de amostragem, a amostra é representativa das 26 capitais dos estados brasileiros e do Distrito Federal (BRASIL, 2020c).

O VIGITEL foi aprovado pela Comissão Nacional de Ética em Pesquisa (CONEP) do Conselho Nacional de Saúde (CNS), Ministério da Saúde, Brasil. Os aspectos éticos relacionados ao sigilo das informações são garantidos pela Lei nº

12.527, de 18 de novembro de 2011 (Lei de Acesso à Informação) e pela Resolução nº 466 de 12 de dezembro de 2012, do Conselho Nacional de Saúde do Brasil (BRASIL, 2020c).

2.2.6 Enfrentamento de desigualdades

Uma vez que o acesso aos alimentos pode ser consideravelmente impactado pela discriminação social, favoritismo étnico e desigualdade de gênero (PIETERS; GUARISO; VANDEPLAS, 2013), a falta de acessibilidade a alimentos saudáveis é mais um problema de injustiça estrutural do que uma questão de incapacidade de um indivíduo de acessar alimentos nutritivos (AZÉTSOP; JOY, 2013). De acordo com Saglio-Yatzimirsky (2006), “[...] são políticas de emprego e de educação maciça que poderão solucionar, em longo prazo, o desafio da nutrição em meio pobre”.

Nesse sentido, além da necessidade de investimento e fortalecimento em políticas públicas de alimentação e nutrição (VASCONCELOS et al., 2019), são de fundamental importância as políticas equânimes para o enfrentamento das desigualdades geradas na estrutura social, e que visem, portanto, buscar a igualdade de oportunidades de saúde para os diferentes grupos sociais (BARATA, 2009). O enfrentamento das desigualdades sociais em saúde pode incluir políticas mais abrangentes (macrossociais), como políticas econômicas e sociais que modifiquem a estratificação social, incluindo políticas de diminuição da desigualdade de renda e da pobreza (BARATA, 2009).

Considerando que em países de renda média, como o Brasil, uma maior escolaridade resulta em melhores salários (IBGE, 2020c), as iniciativas que garantam o acesso a melhores oportunidades educacionais também são importantes, principalmente pela população preta/parda. Embora tenha sido observada nos últimos anos, uma crescente participação da população preta/parda no ensino superior como consequência do aumento do número de vagas e das políticas de democratização do acesso ao ensino superior público, o percentual de pretos/pardos com ensino superior completo ainda é inferior em relação à população de cor de pele branca (32,0% vs. 66,0% em 2017) (IBGE, 2018; SILVA, 2020). Assim, uma mudança efetiva na sociedade perpassa a adoção de práticas antirracistas, como as leis de cotas raciais nas universidades federais e no serviço público (ALMEIDA, 2019).

OBJETIVOS

3. OBJETIVOS

3.1. Objetivo geral

- Analisar as desigualdades sociais no consumo alimentar de brasileiros.

3.2. Objetivos específicos

- Avaliar as tendências da desigualdade social no consumo recomendado de frutas e hortaliças, consumo regular de feijão, refrigerantes ou sucos artificiais entre indivíduos residentes nas capitais brasileiras e no Distrito Federal de 2008 a 2019.

- Identificar e quantificar a magnitude das desigualdades educacionais no consumo de alimentos *in natura*/minimamente processados e ultraprocessados entre brasileiros no ano de 2019, de acordo com a interseção entre sexo e raça/cor de pele.

ARTIGOS CIENTÍFICOS

4. CÓPIA DOS ARTIGOS CIENTÍFICOS

A seguir, serão apresentados os dois artigos científicos que compõe esta tese.

Artigo 1. "Social inequality in food consumption between 2008 and 2019 in Brazil".

Periódico: *Public Health Nutrition* (Fator de Impacto: 3.182). Submetido em 11/03/2021; Parecer recebido em 22/04/2021; Versão revisada do manuscrito submetida em 15/06/2021; Aceito em 08/07/2021.

Artigo 2. "Educational inequality in consumption of *in natura* or minimally processed foods and ultra-processed foods: the intersection between sex and race/skin color in Brazil".

Periódico-alvo: *British Journal of Nutrition* (Fator de Impacto: 3.334).

4.1 Artigo 1. Social inequality in food consumption between 2008 and 2019 in Brazil

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Ethical Standards Disclosure: This study was conducted according to the guidelines laid down in the Declaration of Helsinki and all procedures involving research study participants were approved by the National Research Ethics Commission (CONEP) obtained in accordance with the ethical standards of the normative of the National Health Council, of the Ministry of Health of Brazil. Verbal informed consent was obtained from all subjects/patients. Verbal consent was witnessed and formally recorded. The VIGITEL database does not allow the identification of participants, is in the public domain and is available at the electronic address: http://svs.aids.gov.br/download/Vigitel/.

Abstract

Objective: To analyze the trend of social inequality in food consumption among Brazilians from 2008 to 2019.

Design: Time series analyses using cross-sectional annual data from the Telephone Surveillance System (VIGITEL 2008-2019). Food consumption was evaluated through 1) Consumption of 5 or more portions of fruits and vegetables in ≥5 days/week; 2) Consumption of beans in ≥5 days/week and 3) Consumption of soft drinks or artificial juices in ≥5 days/week. Absolute inequality was assessed by the slope index of inequality (SII) and relative inequality by the concentration index (CIX). SII and CIX positive values indicate higher prevalence among more educated citizens and negative among less-educated ones. Time trend was assessed by linear regression using weighted least squares.

Setting: 26 Brazilian state capitals and the Federal District.

Participants: 621,689 individuals ≥18 years.

Results: Fruits and vegetable consumption was more prevalent among the more educated citizens, while beans were mostly consumed by the less educated, and soft drinks or artificial juices was more prevalent among individuals with intermediate education. The highest absolute inequality was found for beans (SII_{2019} -25.9). In 12 years, the absolute inequality increased for fruit and vegetable consumption (from SII_{2008} 12.8 to SII_{2019} 16.2), remained for beans (SII_{2008} -23.1 to SII_{2019} -25.9), and reduced for soft drinks or artificial juices (SII_{2008} 8.7 to SII_{2019} 0.4). Relative inequality was low and constant.

Conclusion: Despite the advances reducing inequalities in soft drinks or artificial juice consumption, the increase in the social gap for adequate consumption of fruits and vegetables is troublesome.

Keywords: Inequality, Education, Food Consumption, Foods, Surveillance.

Introduction

Adherence to a healthy diet throughout life contributes to the prevention of malnutrition, Chronic Noncommunicable Diseases (NCDs), and deaths [1]. The higher consumption of fruits, vegetables, and legumes, such as beans, is associated with lower total mortality risk [2]. In contrast, the increased consumption of ultra-processed foods, e.g., soft drinks and sweetened beverages, is linked to a higher risk of NCDs and all-cause mortality [3].

A healthy diet is influenced by socioeconomic factors [1]. In low-and middle-income countries, increased access to high-quality and expensive nutritional food in addition to energy-rich and low-cost foods have been associated with high socioeconomic status. In Brazil, unhealthy eating patterns have already been demonstrated in individuals with low socioeconomic status [4,5].

Brazil has significant economic inequality, in addition to ethnic and gender disparities [6], and poverty reaching mainly women and Black or Brown population [7]. A review conducted with data from Brazilian national surveys brought to light that individuals with higher income and higher education consume more fruits and vegetables, less traditional Brazilian foods, such as beans, and intake more ultra-processed food, such as soft drinks and/or artificial juices [4]. Descriptive outcomes based on sex and race/skin color indicated that women and White individuals had a higher consumption of fruits and vegetables. Although men consumed more beans, they ate more frequently foods associated with a higher NCDs risk, such as fat meats, whole milk, soft drinks and/or artificial juices. Elevated consumption of beans and other food markers for NCDs also correlated to Brown and Black skin colors [4].

A slight increase in the proportion of Brazilians achieving the recommended consumption of fruits and vegetables was identified in Brazil between 2008 and 2016, according to the World Health Organization (WHO) recommendation [1]; however, this consumption remained higher among women and citizens with higher schooling levels [8]. Between 2006 and 2008, there was a reduction in the regular consume of beans and low consumption was identified among individuals with higher schooling levels, women, and White individuals [9]. From 2007 to 2016, a reduction was observed in the regular consumption of sweetened drinks, mainly among more educated people and men [10]. These previous studies described food consumption according to sociodemographic characteristics without analyzing inequality measures and their tendency. They included isolated food indicators, which hampered the understanding of how social inequality would affect healthy and unhealthy food markers more broadly. Moreover, recent data were not shown in their time series. Hence, social inequalities magnitude and their trend in the consumption of food markers for each sex and race/color remain uncertain.

Therefore, the continuous monitoring of health inequalities is pivotal to record trends and provide relevant information to civil society and governmental authorities [6], thus tackling income, education, and gender inequalities within and between countries [11]. In light of the above, our objective was to evaluate social inequality trends in the recommended consumption of fruits and vegetables, regular consumption of beans, soft drinks or artificial juices among individuals dwelling in Brazil from 2008 to 2019.

Methods

Sampling and data source of the study population

This study used cross-sectional annual data from the Brazilian Surveillance of Risk and Protective Factors for Chronic Diseases through Telephone Interviews (VIGITEL) performed by the Brazilian Ministry of Health from 2008 to 2019. VIGITEL is a cross-sectional monitoring system for the frequency and distribution of the main NCDs determinants in individuals aged 18 years or older, residing in households with a fixed telephone line in Brazilian capitals and the Federal District [12].

The sampling process consisted of selecting one resident from each household, after drawing telephone lines by city, stratified according to the region or telephone lines prefix, and through the zip code after the 2012 edition. A final sample weight was assigned to each interviewee to minimize possible sampling biases derived from the partial populational coverage of the fixed telephone system and the difference in the probability of each individual being selected for the study. The final sample weight considered the inverse of the number of telephone lines, the number of adults living in the household of each interviewee, and the socio-demographic composition (sex, age range and education level). To adjust the socio-demographic distribution of the VIGITEL sample to the distribution of the adult population in each city, the 2000 demographic census provided by the Brazilian Institute of Geography and Statistics - IBGE was applied for 2008 to 2011 VIGITEL surveys. From 2012 VIGITEL surveys, in view of the availability of inter-census projections on the socio-demographic distribution of the total adult population in each city, the adjustment was made considering the 2000 and 2010 demographic censuses and their mean annual variation (geometric rate) in the inter-census period. This final weight attributed to each interviewed individual enables the statistical inference of VIGITEL results for the population of individuals aged 18 years or older in each city with and without fixed telephone line and each year of survey edition [12].

Data was acquired from 621,689 individuals interviewed between 2008 and 2019. Regarding the analysis of beans' regular consumption, 569,294 individuals were included since no data was available for 2018.

Individuals who were not aware of or were not willing to inform their education level (*n* 7,123 individuals; 1.2% of the initial sample) had their data imputed by VIGITEL, using the most frequently observed value based on age and sex [13]. To perform the sub-analysis of skin color and race, those who declared themselves Yellow (n 9,200; 1.5% of the initial sample) and Indigenous (n 6,514; 1.1% of the initial sample) were excluded due to low representation, which limits the power to detect significant differences within the group. In this sub-analysis, we also excluded all individuals with missing information about their skin color/race (e.g., who were not aware or did not want to inform) (n 33,658; 5.4% of the initial sample), totaling 572,317 participants included.

Variables of interest

Food consumption – dependent variables

An evaluation of food consumption was performed for the following items: 1) fruits/natural fruit juice and vegetables and 2) beans (healthy eating patterns markers), as well as, 3) soft drinks or artificial juices (unhealthy eating patterns marker). The questions format was: "How many days a week do you usually eat (or drink) [food or drink]? (1-2 days/week, 3-4 days/week, 5-6 days/week, every day, rarely or never)". Additional questions were performed to acquire the marker of recommended consumption of fruits and vegetables. Regarding fruits/natural fruit juices, questions were asked about the daily frequency in which they contemplated the options: 1, 2, 3, or more times (for fruits) or glasses (for fruit juice). For vegetables, the questions included raw and cooked options with some examples, such as lettuce, tomato, kale, carrots, chayote, eggplant, zucchini, but not potatoes, cassava, nor yams, and the daily frequency included the options: at lunch, at dinner, or lunch and dinner.

The consumption of a fruit or a glass of fruit juice was considered equivalent to one serving, limiting to three the maximum number of daily servings computed for fruits, with the possibility of including a maximum of one glass of fruit juice as a fruit portion. Similarly, the consumption of a vegetable in a meal was also considered equivalent to one portion, limiting the maximum number of daily portions to four, a situation observed among individuals who reported consumption of raw and cooked vegetables both at lunch and dinner. We assumed the estimated intake of 5 or more portions of fruits and vegetables per day, at least five days a week, as daily consumption of 400 grams/day

(i.e., five portions). These values are recommended by the WHO [1] and in line with the definition adopted by VIGITEL [12]. Consumption of beans and soft drinks or artificial juices was categorised as regular when the frequency of consumption was equal to 5 or more days of the week, regardless of the quantity and type, also following the definition adopted by VIGITEL[12].

Equity stratifiers – independent variables

Food consumption was described according to years of schooling (presented in 4 categories: 0-3 years; 4-8 years; 9-11 years; ≥ 12 years), sex (male; female), and skin color/race (White; Black/Brown).

Complex measures of inequality

Social inequality was estimated for schooling (educational inequality) by complex inequality measures, such as the slope index of inequality (SII) for absolute inequality and the concentration index (CIX) for relative inequality [14]. The SII assesses the absolute difference in a health indicator between the least favored groups (0-3 years of study) and the most favored groups (≥ 12 study years). CIX presents the relative difference among them. SII and CIX results, stratified by sex and skin color/race, considered all educational levels of the population and were calculated based on schooling levels.

Statistical analysis

Sociodemographic characteristics and food consumption prevalence in the samples (2008-2019) were expressed as either means or frequencies. SII was estimated through logistic regression, a more appropriate analysis of prevalence indicators, while CIX was calculated without corrections [15]. Outcomes found for SII and CIX were multiplied by 100, ranging from -100 and +100, to ease graphs comprehension. Results equal to zero represent a total equality situation, while ± 100 results express total inequality. Negative values indicate that the health indicator prevalence is more elevated in less-educated groups, while positive values underline a higher health indicator prevalence in the more educated group. CIX results inferior to -20 or superior to +20 indicate an expressive relative inequality [14].

SII and absolute CIX temporal trends for each food consumption indicator were analyzed through linear regressions using least squares weighted by variance, based on the mean value and the standard deviation of SII and CIX for each year. Temporal trends with a p-value <0.05 were considered statistically significant. To estimate the lines in the graphical representation of temporal evolution, predicted values of SII and CIX were obtained by the Prais-Winsten method with Durbin-Watson autocorrelation and adjusted for the standard error.

An equiplot was generated to present the food consumption inequalities according to schooling levels for each year (www.equidade.org/equiplot, Pelotas, Brazil). Statistical analyzes and graphs plotting were performed using STATA/SE software version 16 (StataCorp LLC, College Station, United States), considering the VIGITEL sample design for descriptive analysis (Stata survey prefix command) and the sample weights when estimating SII and CIX measurements.

Results

Individuals presented a similar distribution profile for age, sex, and skin color between 2008 and 2019. The mean age among participants was about 41 years old. In 2019, most individuals were female and Black/Brown, with a frequency equal to 54.0% and 50.6%, respectively. An expressive increase in populational schooling, from 21.6% in 2008 to 32.8% in 2019, was identified mainly among individuals with 12 or more years of study. The prevalence of individuals who reported the recommended consumption of fruits and vegetables (≥5 portions/day in ≥5 days/week) was minimal and presented a slight increase over the period (from 20.0% in 2008 to 22.9% in 2019). In contrast, regular consumption of beans (≥5 days/week) was noticed in about half of the population during the study period but a propensity to frequency reduction is noteworthy, varying from 65.6% in 2008 to 59.7% in 2019. The frequency of individuals who presented regular consumption of soft drinks or artificial juices (≥5 days/week) decreased expressively (from 26.4% in 2008 to 15.0% in 2019) (Table 1).

An important educational gradient was identified for the recommended consumption of fruits and vegetables, characterized by a lower prevalence among individuals with minor schooling levels (Fig. 1). The highest educational inequality was observed for regular consumption of beans, characterized by a expressively lower prevalence in individuals with 12 or more years of education than those with lower schooling levels. On the other hand, the educational discrepancy was small for soft drinks or artificial juices consumption and still presented an expressive long-term reduction among individuals from all educational strata, sharper among individuals with higher schooling

levels. A more pronounced frequency of regular consumption of these beverages among individuals with intermediate education (9-11 years of study) is noteworthy.

At the beginning of the period, the absolute and relative educational inequalities for the recommended consumption of fruits and vegetables, represented by positive values of SII and CIX, were similar between men and women and among White and Black/Brown individuals. Over time, there was an increase in absolute educational inequality in the group of all individuals (entire sample) and among White individuals. Relative inequality remained constant for the entire sample and the subgroups analyzed over time (Fig. 2). Women and White people presented a higher recommended consumption prevalence of fruits and vegetables in 2019 (Fig. 3).

In contrast, negative values of SII and CIX, representing the respective absolute and relative inequality, were observed for the regular beans' consumption over the study period. This indicates a higher frequency among less educated individuals. The absolute and relative inequalities were similar between women and men; however, the values were higher among White individuals than in Black/Brown individuals. Absolute and relative inequalities remained constant in all strata throughout the study (Fig. 2). In 2019, educational inequality was higher, and the prevalence of beans regular consumption was lower among White individuals than Black/Brown individuals. Men also presented more elevated prevalence of beans regular consumption than women (Fig. 3).

In 2008, the absolute educational inequality for soft drinks and artificial juices was similar between women and men as well as White and Black/Brown individuals, and showed a more frequent consumption among those with high level of education. During the 12 years period, a significant reduction of absolute inequality was identified in all strata, reaching negative SII values among women and White individuals in 2019, indicating that low educated women and White presented higher prevalence of consumption of soft drinks and artificial juices than highly educated ones. The relative inequality remained constant throughout the period in all subgroups, except for White individuals who presented a significant reduction, also attaining a negative CIX in 2019 (Fig. 2). At the end of the period, there was a higher prevalence of regular consumption of these drinks among men, and slightly higher values among White individuals (Fig. 3). We found no relevant relative inequality in whichever food consumption indicator assessed in the present study. Detailed information on characteristics of participants and food consumption according to educational level, sex and skin color/race are presented as supplementary material (Supplementary tables 1-4).

Discussion

This study has shown that social inequalities in the food consumption of the Brazilian population are manifested as a complex phenomenon. A less predominant recommended consumption of fruits and vegetables among low educated individuals, while regular consumption of beans was less frequent among the more educated. Regular consumption of soft drinks or artificial juices decreased at all schooling levels, between 2008 and 2019, especially among those with more schooling. The absolute educational inequality for the recommended consumption of fruits and vegetables increased in the entire sample and among White individuals. Regular bean consumption was the marker presenting the highest absolute educational inequality, remaining constant throughout the study for all strata. Although the relative education inequality for regular consumption of soft drinks or artificial juices has reduced only among White individuals, the absolute educational inequality reduced in all strata.

Over the period, a slight increase in the prevalence of recommended consumption of fruits and vegetables in Brazilian capitals was identified, reaching in 2015-2016 the target proposed for 2022 (24.3%) by the Brazilian Strategic Action Plan to Combat Chronic Non-communicable Diseases (NCDs) [16]. Nevertheless, we observed a gradual reduction from 2017 onwards in the prevalence of recommended consumption below the proposed target (22.9% in 2019). Considering that family income and food costs are factors influencing the acquisition of fruits and vegetables [17], an intense economic and political crisis in Brazil since 2014 has worsened several social indicators, such as income, unemployment rates, increased food prices [18,19], e.g., fruits and vegetables [20] and augmented food insecurity [18]. Thus, this crisis could justify the gradual reduction in the consumption of these foods.

Evidence on availability, accessibility and consumption of fruits and vegetables in 18 countries showed that the cost of two servings of fruit and three servings of vegetables per day per individual requires a substantial proportion of family income, that is, about 52.0% of family income in low-income countries, 18.0% and 16.0% in lower-middle-income countries and upper-middle-income countries (UMIC), respectively, making this consumption inaccessible in different countries [21]. Among those reaching the recommended consumption of fruits and vegetables in the present study, a higher prevalence among more educated individuals was noticed, corroborating previous studies [2,8,22]. The highest consumption of fruits and vegetables in the highest income strata was observed in a representative sample of the Brazilian population by the Brazilian Family Budget Surveys (FBS), performed in 2017-2018 [23].

There was an increase in education inequality for the recommended consumption of fruits and vegetables throughout time. In response to the above-mentioned the financial crisis, the Brazilian government adopted austerity measures, such as a budget reduction of an important support and

incentive policy for family farming known as The Program for Food Acquisition (PAA) [19]. This measure negatively impacts the production of fruits and vegetables and hinders the access to these foods by individuals in the most vulnerable situation [24]. Inequality increased among White individuals and remained constant among Black/Brown citizens. This possibly occurred due to persistent racial segregation observed in the Brazilian labor market, which hampers the life conditions of Black and Brown individuals, even the ones with higher education levels, grouping them with their less-educated peers. Economic activities resulting in lower average incomes, such as domestic services, construction, and agriculture, are proportionally more occupied by Black and Brown individuals, even after adjusting the data according to working hours and schooling [7]. Furthermore, the unemployment rate among Black or Brown people has been higher than among White individuals, even when adjusting for educational level [7].

Our outcomes endorse the need to create and strengthen public food policies to promote the availability and equal access to fruits and vegetables through broad and synergistic interventions in the food system, aiming to boost the production, distribution, and consumption of these foods and reduce their costs [21] and waste [25,26]. Price discounts added to nutritional education activities [27] as well as the presence of food environment with a higher density of healthy food establishments, such as shops specialized in the sales of fruits and vegetables, open markets [22], and community gardens [28], stand out as examples of potential strategies to enhance the current scenario.

Contrasting the recommended consumption of fruits and vegetables, we identified a regular consumption of beans in about half of the individuals, which tended to decline at the end of the period. FBS data also brought to light a reduction in the consumption frequency of traditional Brazilian foods, such as beans, between 2008-2009 and 2017-2018 (72.8% *v*. 60.0%), albeit it remains one of the most consumed foods in Brazil [23].

Over the study period, there was a noteworthy and constant educational inequality in the regular consumption of beans, characterized by a higher prevalence of this health protector food marker among the less educated, corroborating other studies on less educated people [4] and individuals with lower income [23]. Concerning Race/color, we also identified a significant educational inequality between White and Black/Brown individuals, highlighting that schooling played a key role in determining the differences in the regular consumption of beans among White individuals. The highest consumption of beans has been associated with Black or Brown race/color in the literature [4], and this profile remained among more educated Black/Brown individuals in our study. Access to basic food, such as beans, is pivotal to promote health and prevent diseases in the population [4].

Beans present a healthy nutritional profile and represent a traditional Brazilian diet [23], usually consumed together with other traditional culinary preparations, including unprocessed or minimally processed foods, such as rice, roots, tubers, corn, and other dishes with cereal and eggs [29]. Thus, maintaining beans' regular consumption by the least economically favored population and encouraging their adherence by the most favored is of utmost importance.

In these 12 years, we have identified an expressive reduction in the frequency of regular consumption of soft drinks or artificial juices by the population, a more pronounced decrease among the more educated, leading to a significant reduction in educational inequality. A temporal decrease in the consumption of soft drinks and artificial juices was observed in all income classes and, more intensely, in the higher income quarter between 2008-2009 and 2017-2018 in Brazil [23]. This aspect is noteworthy since these beverages are considered not healthy [25] and are associated with a higher morbimortality risk [25,30,31].

On the one hand, the Brazilian economic and political crisis impact on food prices and family income could have influenced the reduction in the regular consumption frequency of these beverages among the less educated [10]. In contrast, the enhancement of Brazilians education level may have contributed to the decrease in the regular consumption frequency among the most educated, considering that the higher education levels, regardless the income, play a role in healthy food choices [32]. The more frequent consumption of these drinks was observed among those with intermediate education and could have been resulted from the association of the greater purchasing power of these foods with insufficient knowledge on the relationship between nutrition and disease [33]. Furthermore, the considerable presence of individuals with intermediate schooling in the informal labor market, characterized by arduous activities and/or longer working time [34], is possibly an important limiting factor for healthier food choices, due to physical tiredness and/or limited time available for purchase and preparation of food/drinks at home [35].

In 2019, regular consumption of soft drinks or artificial juices became more frequent among some less-educated groups and subgroups of women and White individuals. Bearing in mind the current context, a more consistent and comprehensive inversion of the consumption prevalence of these beverages is potentially predictable among educational strata in the Brazilian population within few years. Thus, a regular consumption profile will tend to prevail among the less socioeconomically favored individuals, which has already been observed more clearly in developed countries [36,37].

Implementing strategies at a population level, such as sweetened drinks taxation, food marketing regulation, and nutritional education policies [38], could reduce the consumption of soft drinks or artificial juices among the least favored individuals and protect them. Estimates point out that a tax designed to increase the retail price of sugary drinks by at least 20.0% can generate

significant changes in consumption habits, especially among vulnerable populations, including low-income consumers, who are more responsive to prices and can benefit more in terms of health. Data from Mexico corroborates this positive taxation impact [39,40]. In Brazil, the debate on taxing sweetened beverages persists within the Brazilian tax reform proposal [41], although sweetened beverage companies are paradoxically receiving tax reductions and tax exemptions [42].

The present study reports the most vulnerable groups for the lowest consumption of fruits and vegetables, as well as beans, and the highest consumption of soft drinks or artificial juices. Recent evidence from 195 countries, including data from 1990 to 2017, showed that diets low in fruit, low in vegetables, and high in sodium (often found in sweetened beverages) [43], are among the main dietary risk factors for mortality, with each factor accounting for more than 2.0% of global deaths [25]. Thus, promoting universal and equitable access to healthy foods and reducing consumption of unhealthy foods, in order to avoid deaths attributable to dietary risk factors can be a global response to tackle inequalities and promote a socially and environmentally sustainable food system [44,45]. Brazil is an UMIC [46], and the social and racial inequalities found in food consumption can be used to guide policy makers and nutrition policies to promote healthier diets in Brazil and countries with similar economic and cultural characteristics in Latin America or other continents. Social inequalities in food consumption are a global issue, and even though these countries might have different magnitudes of inequalities, they sure face inequalities challenges like Brazil.

This study's strengths include the expressive sample size, the use of complex inequality measures, to analyze the extent of social inequality in food consumption, measured by educational gradients, and verify how social inequality changed over 12 years in a UMIC. Thus, our study provides evidence of the gap trend in food consumption over time, and it calls for further studies in other countries. Furthermore, educational inequality analyzes, stratified by sex and ethnicity, were performed due to their relevant inequality dimensions that overlap and can interact with socioeconomic differences [6].

However, our study also has some limitations. The VIGITEL sample includes individuals residing in Brazilian capitals and the Federal District with access to landlines, extrapolating that data through weighting measures to obtain representative data of this population. Nevertheless, some differences are expected in the prevalence of food consumption indicators [47], since the most socioeconomically favored Brazilian families are more likely to have a telephone landline [48], and the access to those has decreased since 2015 [49]. Thus, interviewees could have a higher socioeconomic level than the general population, especially in this period, albeit a significant social inequality was observed in food consumption. Due to the low representativeness, we did not include the data of those who self-declared to be Yellow and Indigenous in sub-analysis of skin color and

race. Despite this, our study innovates and advances in the discussion about racial or skin color inequalities in food consumption in Brazil, showing its trend in a 12-year period between Whites and Blacks/Browns. Only three food groups were evaluated in the study, due to modifications that were made to the VIGITEL questionnaire over time. However, the groups correspond to markers of a healthy (fruits and vegetables, and beans) and unhealthy diet (soft drinks or artificial juices). Furthermore, the information collected by VIGITEL is subject to self-reported classification errors, but it worth mentioning the reliable reproducibility and adequate validity of food and beverage consumption indicators obtained through a surveillance system based on telephone surveys [50]. Minute inaccuracies are also identified throughout the consumption evaluation, however, they remain over the entire study period without impacting on the temporal nature outcomes of this study.

In conclusion, the inequality challenge in the recommended consumption of fruits and vegetables has increased in these 12 years, leaving groups with less education more vulnerable. In contrast, the inequality in regular consumption of beans has remained, protecting these groups. Among the subgroups, the absolute inequality for fruits and vegetables increased among White individuals, and the values remained the same for beans and significantly decreased for soft drinks or artificial juices in all analyzed strata, albeit the relative inequality diminished only among White individuals. Even though the assessed data for the present study was up to 2019, and not until 2020, the health and economic crisis resulted from COVID-19 pandemic in 2020, will play a detrimental role in Brazilian markets, since it has already impacted food costs, including basic foods in the Brazilian diet [51]. Therefore, at this moment, significant and perennial investments in public policies are essential and even more urgent to promote the education of the population, as well subsidise as adequate access and consumption of fruits and vegetables, as well as beans and other legumes, and tackling the excessive consumption of soft drinks or artificial juices.

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Table 1
Sociodemographic characteristics, consumption prevalence of fruits and vegetables, beans and soft drinks or artificial juices in Brazil, VIGITEL 2008-2019.

Characteristics	Survey year											
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Individuals (n)	54353	54367	54339	54144	45448	52929	40853	54174	53210	53034	52395	52443
Mean age in years	40.5	40.7	40.9	41.1	41.3	41.6	41.7	42.0	42.2	42.4	42.6	42.7
Years of education, %												
0-3 years	09.9	09.1	08.3	09.0	08.1	07.6	07.1	06.8	06.7	06.1	06.1	06.3
4-8 years	33.7	32.9	32.3	29.8	28.6	29.0	28.8	27.8	25.8	24.7	24.2	22.5
9-11 years	34.7	35.8	35.8	36.7	38.5	37.5	38.1	38.1	35.9	37.3	38.0	38.4
≥ 12 years	21.6	22.2	23.5	24.5	24.7	25.9	25.9	27.3	31.6	31.9	31.8	32.8
Sex, %												
Male	46.1	46.1	46.1	46.1	46.1	46.1	46.1	46.0	46.0	46.0	46.0	46.0
Female	53.9	53.9	53.9	53.9	53.9	53.9	53.9	54.0	54.0	54.0	54.0	54.0
Skin color / race, %												
White	39.0	39.2	40.0	43.5	40.6	41.5	39.7	40.8	43.6	42.0	41.3	41.0
Black/Brown	60.0	60.1	59.4	51.2	47.3	46.2	46.5	53.1	46.2	47.9	48.9	50.6
Missing information	00.2	00.2	00.2	01.2	07.4	08.5	09.7	01.7	06.9	07.5	07.6	06.5
Food consumption, %												
Recommended consumption [*]												
Fruits and vegetables	20.0	20.2	19.5	22.0	22.7	23.6	24.1	25.2	24.4	23.7	23.1	22.9
Regular consumption [†]												
Beans [‡]	65.6	64.9	65.6	67.6	67.5	66.9	66.1	64.8	61.3	59.5	-	59.7
Soft drinks or artificial juice	26.4	26.0	26.8	27.5	26.0	23.3	20.8	19.0	16.5	14.6	14.4	15.0

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[*] Food consumption of 5 or more servings per day in 5 or more days of the week.
[†] Food consumption in 5 or more days of the week.
[‡] Lack of an available indicator in 2018.

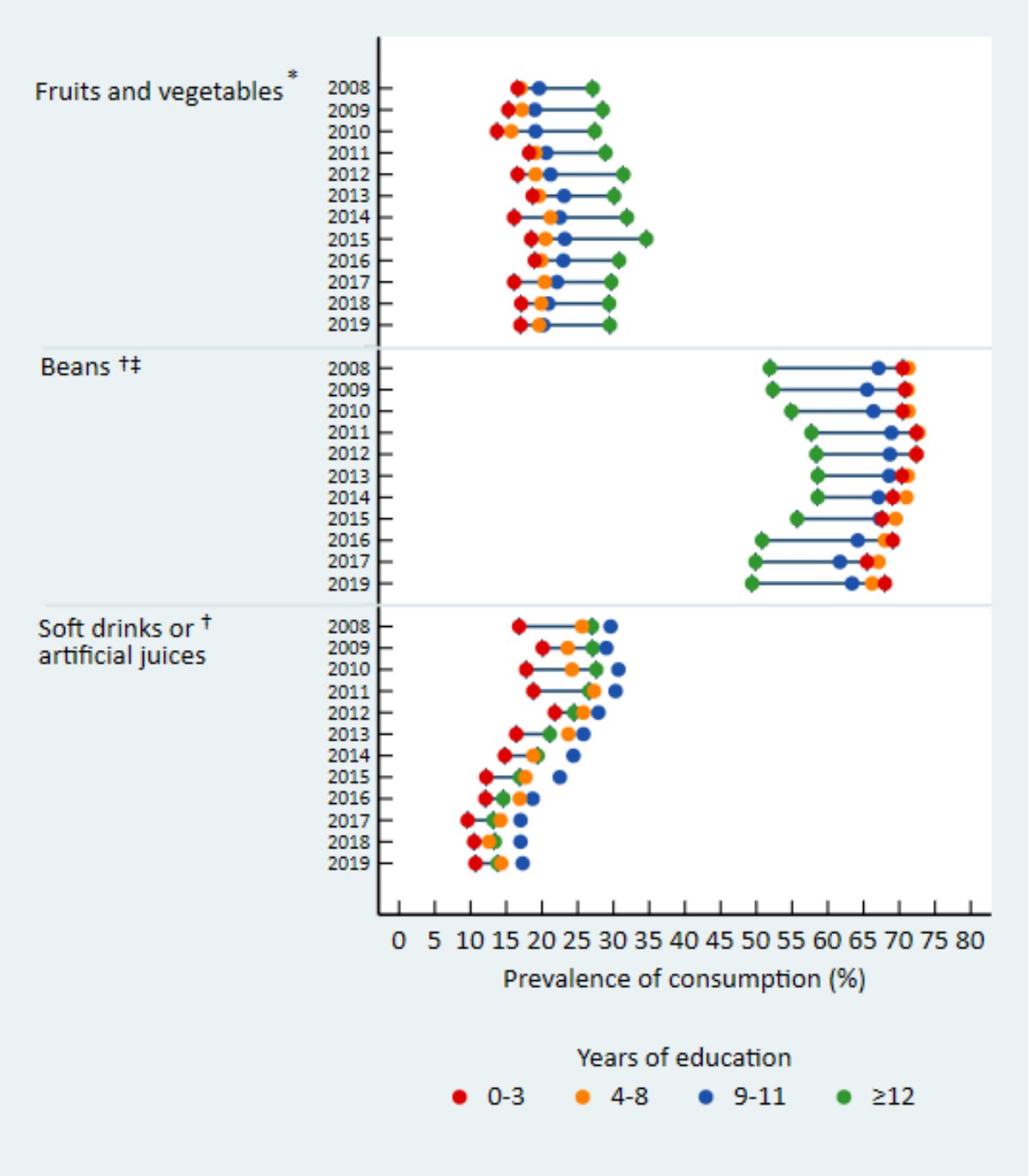

Fig. 1
Consumption prevalence of fruits and vegetables, beans and soft drinks or artificial juices in Brazil, by years of education and survey year, VIGITEL 2008-2019 (equiplot).
VIGITEL, Surveillance of Risk and Protective Factors for Chronic Diseases through Telephone Interviews.
* Food consumption of 5 or more servings per day in 5 or more days of the week.
† Food consumption in 5 or more days of the week.
‡ Lack of an available indicator in 2018.

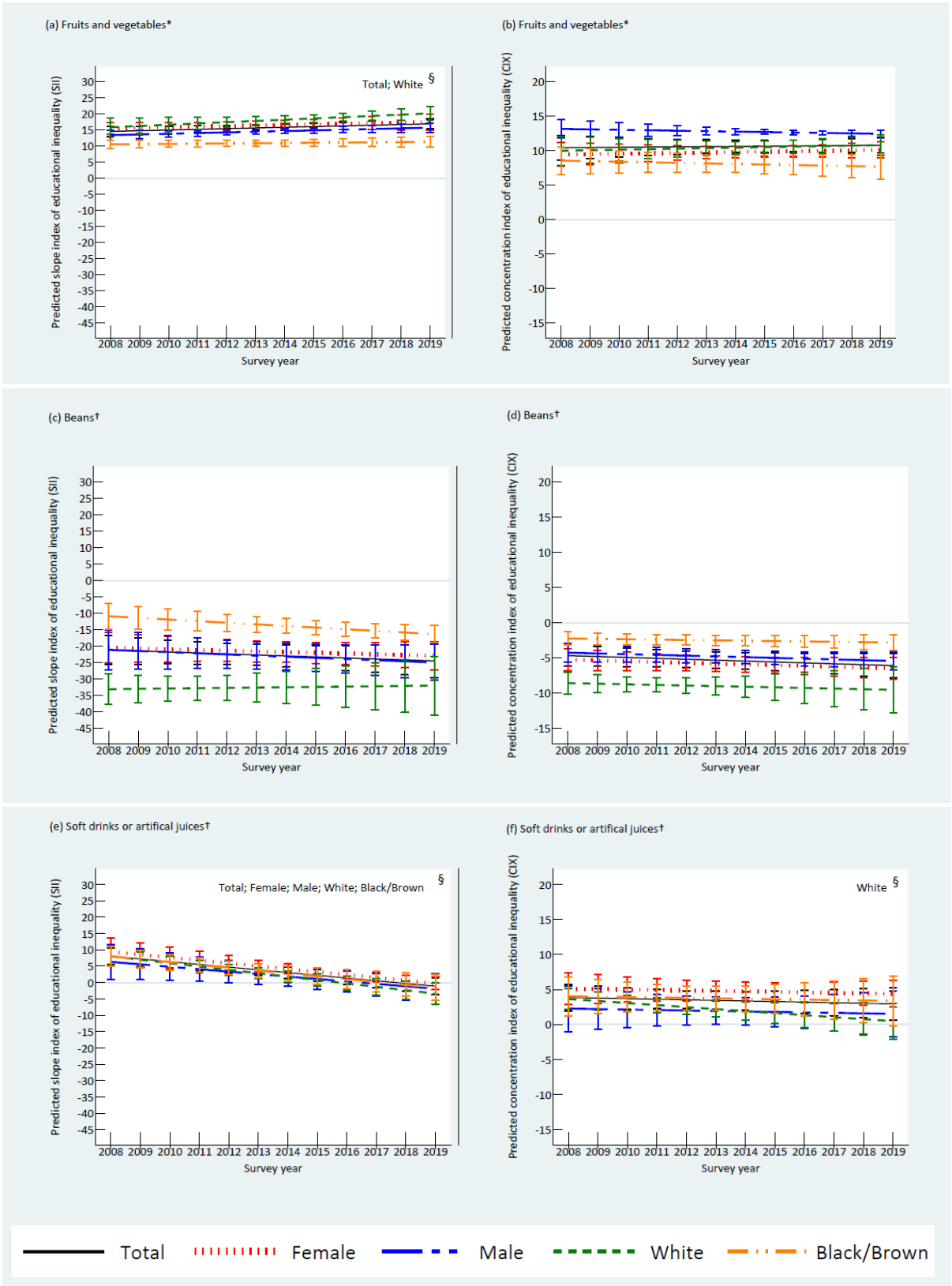

Fig. 2

Trends in the predicted slope index of educational inequality (SII) and predicted concentration index of educational inequality (CIX) for consumption prevalence of fruits and vegetables (a; b), beans (c; d) e soft drinks or artificial juices (e; f) in Brazil, by sex and skin color/race, VIGITEL 2008-2019.

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* Food consumption of 5 or more servings per day in 5 or more days of the week.

† Food consumption in 5 or more days of the week. § $p<0.05$ (p-trend).

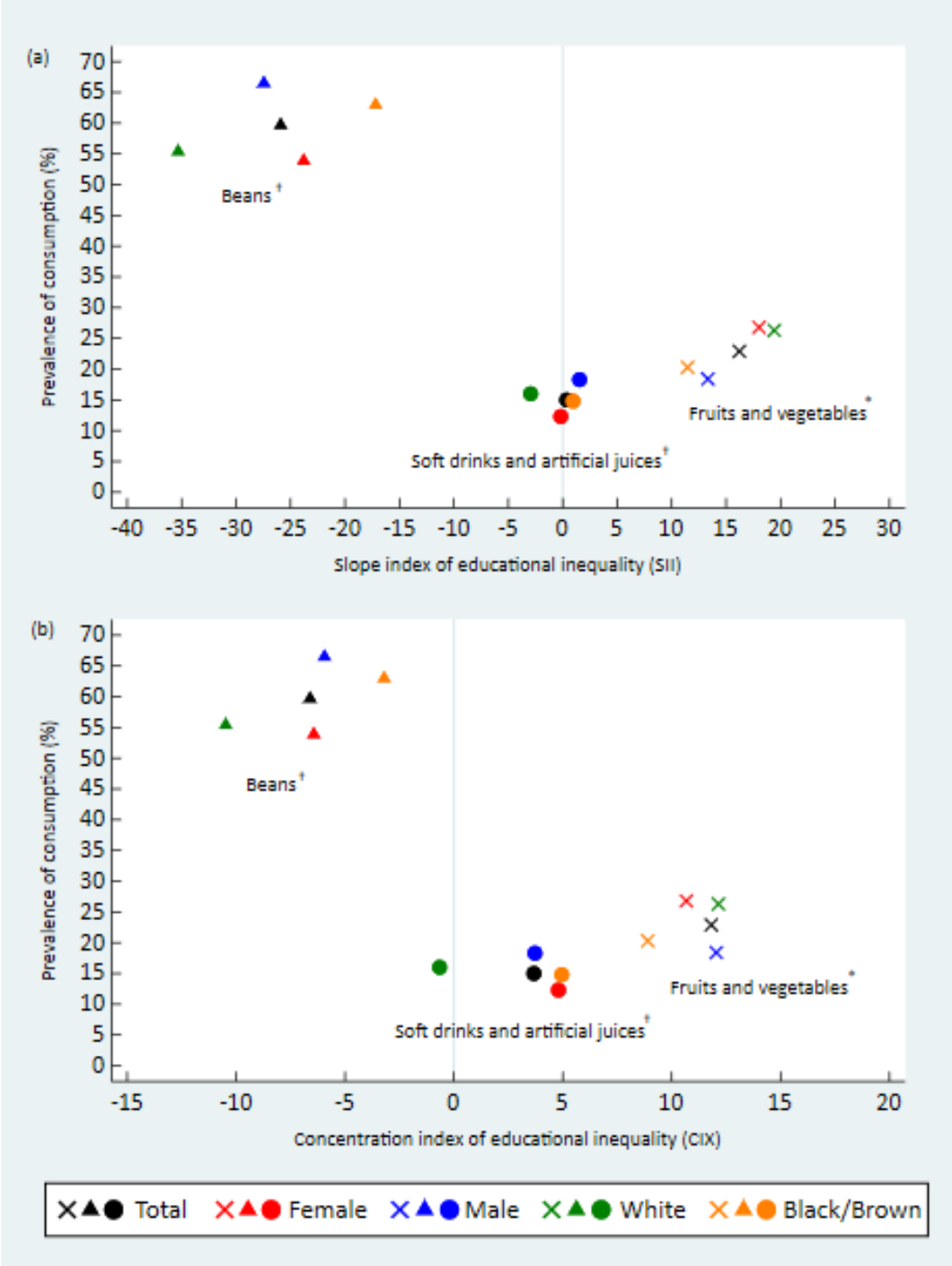

Fig. 3

Consumption prevalence of fruits and vegetables, beans and soft drinks or artificial juices in Brazil, by sex and skin color/race and the slope index of educational inequality (SII) (a) and concentration index of educational inequality (CIX) (b), VIGITEL 2019.

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* Food consumption of 5 or more servings per day in 5 or more days of the week.

† Food consumption in 5 or more days of the week.

Supplementary Table 1: Sociodemographic characteristics according to years of education, sex, skin color/race, and survey year in Brazil, VIGITEL 2008-2019.

Years of education	Survey year											
Sex and skin color / race	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
0-3 years												
Sex, %												
Male	42.0	45.5	46.0	42.9	42.4	44.5	45.5	43.4	41.7	42.4	46.4	43.6
Female	58.0	54.5	54.0	57.1	57.6	55.5	54.5	56.6	58.3	57.6	53.6	56.4
Skin color / race, %												
White	29.1	28.3	29.3	34.4	33.3	33.6	32.5	28.9	36.1	32.7	29.8	33.6
Black/Brown	70.0	70.9	70.0	58.5	43.1	42.2	40.3	61.6	37.3	39.1	42.9	44.7
Missing information	00.2	00.6	00.5	02.7	17.6	20.3	22.5	04.9	22.0	25.0	24.3	19.4
4-8 years												
Sex, %												
Male	47.6	46.5	46.6	47.5	47.9	47.3	46.8	46.9	47.4	46.7	46.1	46.8
Female	52.4	53.5	53.4	52.5	52.1	52.7	53.2	53.1	52.6	53.3	53.9	53.2
Skin color / race, %												
White	31.7	32.1	32.8	38.2	33.9	35.5	33.0	34.0	38.7	38.1	35.3	36.1
Black/Brown	67.5	67.3	66.6	55.8	49.3	47.2	46.9	59.5	46.0	46.6	50.3	50.6
Missing information	00.3	00.1	00.1	01.5	11.5	13.3	16.2	02.4	11.7	12.6	12.1	11.4
9-11 years												
Sex, %												
Male	45.9	46.2	46.0	46.5	46.4	46.9	46.4	47.0	47.6	47.9	47.0	47.8
Female	54.1	53.8	54.0	53.5	53.6	53.1	53.6	53.0	52.4	52.1	53.0	52.2
Skin color / race, %												
White	37.4	37.4	36.8	38.1	36.8	37.8	36.1	36.4	38.3	36.0	36.4	34.3
Black/Brown	61.9	62.1	62.9	56.8	53.3	52.1	52.5	57.3	54.0	56.2	55.9	58.8
Missing information	00.2	00.2	00.1	01.0	05.3	06.5	07.0	01.2	04.8	05.4	05.7	04.8
≥ 12 years												
Sex, %												
Male	46.1	45.7	45.5	44.9	44.6	43.9	44.9	44.4	44.1	44.0	44.6	43.7
Female	53.9	54.3	54.5	55.1	55.4	56.1	55.1	55.6	55.9	56.0	55.4	56.3
Skin color / race, %												
White	57.6	57.1	58.5	61.3	56.7	55.7	54.6	56.8	55.3	54.0	54.0	53.5
Black/Brown	40.8	41.7	40.4	34.5	36.8	37.8	38.7	38.6	39.6	40.9	40.7	42.1
Missing information	00.2	00.3	00.3	00.5	02.7	02.7	02.7	01.0	02.0	02.7	03.1	02.6

VIGITEL, Surveillance of Risk and Protective Factors for Chronic Diseases through Telephone Interviews.

Supplementary Table 2: Recommended consumption prevalence of fruits and vegetables by years of education, sex, skin color, and survey year in Brazil, VIGITEL 2008-2019.

Years of education	Fruits and vegetables* % Survey year											
Sex and skin color / race	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
0-3 years												
Sex, %												
Male	14.7	11.5	11.4	15.9	10.7	15.5	10.9	16.0	13.3	11.3	13.1	13.9
Female	17.9	18.4	15.7	19.9	20.9	21.2	20.5	20.4	23.0	19.6	20.6	19.3
Skin color / race, %												
White	19.9	16.5	14.3	18.4	20.2	18.5	17.9	20.1	20.3	16.8	19.1	15.1
Black/Brown	15.0	14.9	13.4	17.8	13.8	18.7	13.2	18.2	17.9	15.7	16.4	19.5
4-8 years												
Sex, %												
Male	11.8	13.0	12.9	14.7	14.0	15.2	16.0	17.7	15.0	14.7	14.4	15.5
Female	21.8	20.8	18.2	23.1	23.9	23.6	25.8	23.0	24.3	25.4	24.5	23.3
Skin color / race, %												
White	20.1	19.1	17.6	22.0	21.0	22.1	24.6	23.0	21.6	22.8	21.7	24.0
Black/Brown	15.6	16.1	14.8	17.2	18.2	18.6	19.7	19.3	18.4	19.1	19.4	16.7
9-11 years												
Sex, %												
Male	16.0	14.7	15.3	16.0	16.5	19.4	19.0	18.6	18.7	17.2	16.8	16.4
Female	22.6	22.6	22.3	24.6	25.2	26.4	25.5	27.3	27.0	26.7	24.6	23.7
Skin color / race, %												
White	21.2	20.9	21.7	23.6	24.3	26.7	24.6	25.7	25.4	25.4	24.0	21.3
Black/Brown	18.5	17.8	17.6	18.9	18.9	20.5	21.4	21.2	20.8	20.0	19.2	19.1
≥ 12 years												
Sex, %												
Male	22.2	23.6	23.2	23.9	25.9	25.3	26.0	29.3	25.4	24.5	24.5	23.9
Female	31.2	32.5	31.0	32.9	35.9	33.9	36.7	38.9	35.1	33.7	33.3	33.8
Skin color / race, %												
White	27.8	30.7	29.0	31.0	34.5	33.3	34.5	37.3	32.9	32.3	32.7	32.4
Black/Brown	25.5	25.0	24.8	25.5	26.0	25.1	27.8	30.4	27.3	26.3	25.3	25.6

VIGITEL, Surveillance of Risk and Protective Factors for Chronic Diseases through Telephone Interviews.
* Food consumption of 5 or more servings per day in 5 or more days of the week.

Supplementary Table 3: Regular consumption prevalence of beans by years of education, sex, skin color, and survey year in Brazil, VIGITEL 2008-2019.

Years of education	Beans[†‡] % Survey year											
Sex and skin color / race	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
0-3 years												
Sex, %												
Male	76.4	78.8	77.0	79.3	78.5	74.7	73.5	73.3	74.7	74.1	-	74.6
Female	66.2	64.1	65.1	67.2	67.9	67.0	65.4	63.2	65.2	59.2	-	62.8
Skin color / race, %												
White	72.4	68.6	67.3	74.6	72.4	71.6	66.5	58.2	68.9	65.0	-	68.5
Black/Brown	69.8	71.7	71.9	71.1	71.3	70.8	75.3	71.3	69.4	66.7	-	67.9
4-8 years												
Sex, %												
Male	78.3	77.6	76.3	79.7	79.6	77.3	77.7	74.7	75.6	73.1	-	73.4
Female	64.9	65.6	67.0	66.4	65.8	65.7	65.1	64.8	61.1	61.8	-	59.9
Skin color / race, %												
White	70.0	69.7	69.8	71.1	70.6	69.5	69.2	68.0	65.2	65.8	-	64.4
Black/Brown	72.0	71.9	72.1	74.3	74.1	73.1	72.4	71.1	69.7	68.0	-	67.9
9-11 years												
Sex, %												
Male	75.9	72.5	72.9	75.0	75.6	74.4	74.0	76.2	69.5	68.7	-	70.3
Female	59.7	59.5	60.9	63.5	62.7	63.4	61.1	59.5	59.5	55.3	-	57.1
Skin color / race, %												
White	63.6	61.8	63.9	66.5	66.6	67.6	64.1	66.6	62.0	58.2	-	62.5
Black/Brown	69.3	67.9	67.8	70.4	70.4	70.3	68.9	68.3	65.8	63.7	-	64.5
≥ 12 years												
Sex, %												
Male	57.0	58.6	61.4	62.6	64.0	65.1	64.8	60.4	57.8	56.4	-	55.0
Female	47.5	47.0	49.4	53.7	53.8	53.6	53.6	51.9	45.3	44.8	-	45.0
Skin color / race, %												
White	46.6	49.4	50.4	55.0	55.0	54.6	54.5	51.3	46.2	45.8	-	44.3
Black/Brown	59.5	56.6	61.3	62.6	65.0	65.2	66.0	62.1	57.6	55.8	-	55.4

VIGITEL, Surveillance of Risk and Protective Factors for Chronic Diseases through Telephone Interviews.
[†] Food consumption in 5 or more days of the week.
[‡] Lack of an available indicator in 2018.

Supplementary Table 4: Regular consumption prevalence of soft drinks or artificial juices by years of education, sex, skin color, and survey year in Brazil, VIGITEL 2008-2019.

Years of education	Soft drinks or artificial juices† % Survey year											
Sex and skin color / race	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
0-3 years												
Sex, %												
Male	19.7	25.7	21.2	23.1	27.0	20.8	16.3	12.1	15.8	11.3	14.0	12.9
Female	14.7	15.3	14.9	15.5	18.0	12.9	13.6	12.2	09.4	08.3	07.4	09.1
Skin color / race, %												
White	17.7	20.5	18.7	19.4	22.2	15.3	15.7	13.1	12.8	10.4	08.4	12.1
Black/Brown	16.5	19.8	17.4	18.4	23.1	18.0	17.3	11.0	12.8	10.8	08.4	09.6
4-8 years												
Sex, %												
Male	28.9	27.7	27.7	33.2	31.8	28.2	21.0	21.0	22.1	17.9	15.8	17.6
Female	22.6	20.0	21.2	22.0	20.2	19.6	17.0	14.9	12.2	10.9	09.9	11.3
Skin color / race, %												
White	25.3	23.1	22.7	25.4	24.2	22.3	17.4	18.5	16.5	15.4	11.3	16.4
Black/Brown	25.8	23.9	25.1	28.7	25.8	26.1	20.4	17.5	18.2	14.2	13.4	13.7
9-11 years												
Sex, %												
Male	34.6	32.2	34.4	33.3	30.4	29.4	27.9	26.8	20.9	19.8	20.5	20.1
Female	25.3	26.3	27.4	27.7	25.8	22.7	21.4	18.7	16.7	14.4	13.8	14.7
Skin color / race, %												
White	30.0	28.8	30.2	31.9	26.9	25.0	24.9	24.2	18.6	18.6	16.6	18.6
Black/Brown	29.4	29.0	30.9	29.3	28.8	26.8	24.6	21.9	19.2	16.2	17.2	16.9
≥ 12 years												
Sex, %												
Male	31.7	28.5	29.4	31.7	27.2	22.4	23.3	19.7	16.5	15.2	16.3	17.5
Female	22.9	25.9	26.2	22.5	22.3	20.2	16.2	14.7	13.0	11.6	11.0	10.9
Skin color / race, %												
White	28.1	27.6	28.8	27.4	24.2	20.5	19.9	17.0	14.6	13.9	13.2	14.3
Black/Brown	26.0	26.4	26.1	25.2	25.2	21.8	18.4	16.9	14.8	12.4	13.8	13.4

VIGITEL, Surveillance of Risk and Protective Factors for Chronic Diseases through Telephone Interviews.
† Food consumption in 5 or more days of the week.

4.2 Artigo 2. Educational inequality in consumption of in natura or minimally processed foods and ultra-processed foods: the intersection between sex and race/skin color in Brazil.

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Short title: Educational inequality in food consumption.

Keywords: Food consumption; NOVA; Ultra-processed foods; Social inequalities; Intersectionality

Abstract

It remains uncertain how the intersection between educational, gender, and race/skin color inequalities influences food consumption in Brazil. In this study, we examined the educational inequality in the consumption of *in natura*/minimally processed and ultra-processed foods by Brazilians with an intersectional perspective between sex and race/color. We used cross-sectional data from the Telephone Surveillance System (VIGITEL 2019), comprising 52,443 participants ≥18 years. Daily food consumption was considered high when consumption of ≥5 foods for each food group was reported the day before the survey. Educational inequality in food consumption was assessed by the slope index of inequality (SII) and the relative index of inequality (RII) according to sex and race/color (White; Black/Brown). Positive SII and RII values >1.0 indicate higher food consumption among more educated participants. The consumptions of *in natura*/minimally processed and ultra-processed foods were more prevalent in those with the highest level of education (≥12 years) and intermediate education (9-11 years), respectively. We found higher absolute educational inequality for *in natura*/minimally processed foods among White women (SII 21.8, 95% CI 15.3, 28.4) and Black/Brown men (SII 19.3, 95% CI 12.5, 26.1). Black/Brown men (SII 7.3, 95% CI 0.5, 14.0) and Black/Brown women (SII 5.6, 95% CI 1.0, 10.2) had higher absolute educational inequality than White men (SII -3.3, 95% CI -10.9, 4.3; *P*=0.04) in the consumption of ultra-processed foods. Educational inequalities influenced the consumption of *in natura*/minimally processed more than ultra-processed foods, and, for the latter, inequalities were greater among Black/Brown men and women than among White men.

Introduction

The participation of ultra-processed foods in diet has grown in the last few decades in different countries, especially in low- and middle-income countries[1]. Ultra-processed foods are formulations of ingredients, mainly of industrial use exclusively, which contain little or no intact food in their composition. These products are often added with a series of additives that provide attractive sensory attributes, such as sight, touch, smell, and/or taste[1,2]. Importantly, the consumption of ultra-processed foods is associated with unhealthy nutritional profiles, several non-communicable diseases (NCDs)[1,3], and contribute to the disturbance of the natural planetary balance in the world[1,4]. In Brazil, for example, *in natura* or minimally processed foods have being intensely replaced by ultra-processed foods[5,6]. Traditional foods in the Brazilian diet, such as rice and beans, are strong markers of healthy eating patterns and lower risk of NCDs[3,6].

The socioeconomic level, assessed mainly by income and educational attainment, is one of the major determinants of populational dietary patterns. In low- and middle-income countries, higher educational attainment and income have been associated both with healthier dietary patterns (with higher consumption of fruits and vegetables and whole foods), but also with a higher intake of unhealthy food products, such as sweets and candies, concomitantly and paradoxically[7–10]. In Brazil, despite the paradoxical pattern, the consumption of some ultra-processed foods, such as instant noodles and reconstituted meat products, is already more frequent among socially disadvantaged individuals[11].

Concomitantly, other sociodemographic characteristics, such as sex and/or skin color, also exert a great influence on populational dietary patterns[8]. Brown men and women have lower regular consumption of fruits and vegetables compared to their White counterparts, and Black/Brown men have a higher regular consumption of beans when compared to White men. However, these comparisons between sex-skin color groups have not properly considered differences in socioeconomic level[12]. Socioeconomic inequalities observed in Brazil may interact and overlap with the race/color and sex dimensions[13]. There is limited understanding of how the intersectional nature of sex and skin color/race determines the magnitude of socioeconomic inequalities in food consumption of individuals. The perspectives of intersectionality consider that the dimensions of inequality, such as race/color and sex, are interact and interdependent, and that these are experienced simultaneously[14,15]. Social inequalities in food consumption should be considered for NCDs prevention and control in low- and middle-income countries[9]. Monitoring of food consumption and the interaction of equity stratifiers (education, sex, and race/color) can contribute to the development of equitable health policies.

In this study, we aimed to identify and quantify the magnitude of educational inequalities in the consumption of *in natura*/minimally processed and ultra-processed foods among Brazilians in 2019, according to the intersection between sex and race/skin color.

Methods

Study population, sampling, and data source

We used data from 52,443 adults (18 years or older) participants from the Brazilian Surveillance of Risk and Protective Factors for Chronic Diseases through Telephone Interviews (VIGITEL 2019), residing in households with a landline in the 26 Brazilian state capitals and the Federal District. VIGITEL is a cross-sectional monitoring system for the frequency and distribution of the main determinants of NCDs, managed by the Brazilian Ministry of Health[3].

The sampling process consisted of drawing telephone lines by city, stratified by zip code, followed by drawing an individual residing in a selected household. The sample was weighted in order to minimize possible sampling biases, considering the non-universal coverage of the fixed telephone system and the difference in the probability of each individual being selected for the study. A final weight was assigned to each respondent, considering the inverse of the number of telephone lines in the respondent's household, the number of adults living in the household, and a third factor aiming to match the sociodemographic composition of the sample (sex, education, and age) in each city in 2019 to that of the entire population ((based on official projection (IBGE)) (Rake Method)[3]. The final weight assigned to each interviewed participant (Rake Method), allows the correspondence of the population of individuals aged 18 years or more in each city, with and without fixed telephone line, in 2019[3].

The participants who did not know or did not want to inform their educational level (*n* 743; 1.4% of the initial sample) had their data imputed by VIGITEL, from the most frequently observed value considering sex and age[16]. Information regarding self-declaration of race/skin color was audited for participants answering "others", in order to standardize the classification of synonyms, especially frequent in the case of Brown individuals (people who declared themselves, for example, *morenos*). At the end of the audit, the Black and Brown categories were grouped.

In the subgroup analysis by sex and race/skin color, participants who declared themselves Yellow (*n* 427; 0.8% of the initial sample) and Indigenous (*n* 617; 1.2% of the initial sample) were excluded due to the low frequency, which limits the power to detect significant differences within the

group. In these analyses, participants who did not know or did not want to declare their race/skin color (*n* 1.163; 2.2% of the initial sample) were also excluded, totaling 50,236 included participants.

Study variables

Consumption of in natura/minimally processed and ultra-processed foods

Consumption of *in natura*/minimally processed (fruits, vegetables, roots and tubers, grains, legumes, meat, eggs, milk, nuts, and seeds) and ultra-processed foods (soft drinks, artificial juices, powdered drink mixes, powdered chocolate milk mix, flavored yogurt, salty snacks, sweet cookies and cake, sweet desserts, reconstituted meat products, bread, sauces, margarine, and ready-to-heat products) were evaluated in relation to the day before the interview[3]. The two food groups relied on the *NOVA* classification, which categorizes foods according to the extent and purpose of their processing[2]. More details about the foods included in the *in natura*/minimally processed and ultra-processed food groups are provided in Supplementary Table 1.

Food consumption was assessed through the following question: "Now I am going to list some foods and I would like you to tell me if you ate any of them yesterday (from when you woke up to when you went to sleep)." In order to assess the consumption of *in natura*/minimally processed and ultra-processed foods, respectively, the instruction was followed by questions in the following format: "I will start with *in natura* or staple foods [specific foods mentioned in the interview, described in Supplementary Table 1] (yes or no)", and "Now I will list industrialized foods or products [specific foods mentioned in the interview, described in Supplementary Table 1] (yes or no)"[3].

A daily consumption equal to or higher than 5 different foods for each food group (*in natura*/minimally processed foods and ultra-processed foods) was considered as "high consumption", in compliance with the assessment parameter adopted by VIGITEL[3]. In the Brazilian context, a consumption equal to or greater than 5 groups of ultra-processed foods reflects a participation of about 44.0% of ultra-processed foods in the total caloric value of the diet[17].

Equity stratifiers

Food consumption was described according to years of schooling (0-3; 4-8; 9-11; ≥12 years) and the intersection between sex and race/skin color (White men; Black/Brown men; White women; Black/Brown women).

Statistical analysis

The sociodemographic characteristics and food consumption were expressed in means or relative frequencies for the total sample and subgroups with intersection between sex and race/color. For the presentation of inequalities in food consumption according to schooling in the total sample and subgroups, graphs of equiplot type were generated (www.equidade.org/equiplot, Pelotas, Brazil).

We calculated simple measures of inequality[18], such as absolute difference [most educated group (≥12 years of study) – least educated group (0-3 years of study)] and ratio (most educated group / least educated group) of the prevalence of consumption *in natura*/minimally processed and ultra-processed foods in the total sample and subgroups.

Complex measures of inequality

The magnitude of inequality in food consumption was estimated based on the level of education (educational inequality) through absolute (slope index of inequality - SII) and relative differences (relative index of inequality - RII)[18].

The SII represents the difference in the prevalence of food consumption between the more educated and less educated groups (difference in prevalence), whereas the RII represents the ratio of the prevalence between these groups. SII and RII consider all levels of schooling in the population instead of just comparing the two most extreme groups of schooling[19]. SII and RII were estimated based on education for the total sample of participants and the subgroups with the intersection between sex and race/skin color.

SII and RII were estimated through logistic regression, a more appropriate analysis in the presence of prevalence indicators[20]. The obtained SII values were multiplied by 100, ranging from -100 to +100, to facilitate visualization and understanding of results. Negative SII values indicate that food consumption is more prevalent in less educated groups, while positive values indicate a higher prevalence in more educated groups. SII values equal to ± 100 express total inequality, whereas zero represents a situation of total equality (absence of inequality)[18].

In general, the RII measures assume positive values[19], in which values farther from than 1.0 reflect higher levels of inequality[21]. Results higher than 1.0 indicate a concentration of food consumption among more educated individuals and values lower than 1.0, including negative values, indicate a gradient in favor of the less educated ones[19,21]. If there is no inequality, the RII assumes a value of 1.0[21].

SII and RII values were estimated with 95% confidence intervals. We performed the t-test to analyze whether educational inequality in food consumption assessed by SII and RII differed between subgroups (considering all possible comparisons). Associations with a value of $P<0.05$ were considered statistically significant.

Population attributable risk

In order to quantify inequality, we also calculated the population attributable risk, an absolute inequality measure that shows the possible improvement (in percentage points) in food consumption if all schooling categories had the same prevalence of food consumption as the most favored group (here considered ≥ 12 years of study)[18]. The population attributable fraction, a relative inequality measure, represents the possible proportional improvement if there was no inequality between the categories of schooling. Higher results indicate more pronounced inequalities[18,22].

Regarding population attributable risk, the prevalence of food consumption identified in the most favored group was subtracted from that in the total population (here considered for the total sample and the sample of each subgroup). The population attributable fraction was obtained by dividing the absolute population attributable risk by the prevalence of food consumption in the total population[18].

Statistical analyses and graphs were performed using the Stata/SE software version 16 (StataCorp LLC, College Station, United States), considering the VIGITEL sample design for descriptive analyzes (*Stata's survey* module) and the weights of the sample in the estimation of SII and RII values.

Ethical approval

This study was carried out in accordance with the guidelines established in the Declaration of Helsinki and all procedures involving human subjects were approved by the National Research Ethics Commission (CONEP) of the National Health Council / Brazilian Ministry of Health: Certificate of Presentation and Ethical Appreciation (CAAE) number 65610017.1.0000.0008. Considering that VIGITEL is not carried out in person, free and informed verbal consent was obtained at the time of telephone contact established with all interviewed subjects. Verbal consent was formally recorded.

The VIGITEL database does not allow the identification of participants, it is in the public domain, and is available at: http://svs.aids.gov.br/download/Vigitel/.

Results

Most participants were women (54.0%) and Black/Brown (55.2%). The mean age among total sample was about 43 years old (SD 16.7) and the most frequent education category was between 9 and 11 years of study (38.4%). The sociodemographic distribution of participants according to the intersecting subgroups between sex and race/color and the prevalence of consumption of each food group is presented in Table 1. We identified a higher prevalence of participants with education between 9 and 11 years of study among Black/Brown men and women. The most frequent education category among White men and women was 12 or more years of study. In general, the prevalence of high consumption of *in natura*/minimally processed foods (≥5 different foods on the previous day) was low (29.8%), especially among Black/Brown men (25.2%), White men (29, 6%), and Black/Brown women (29.7%). The high consumption of ultra-processed foods (≥5 different foods on the previous day) was observed in less than a fifth of the total sample (18.2%), with a higher frequency among Black/Brown men (23.8%) and White men (20.0%) (Table 1).

The consumption of *in natura*/minimally processed foods by the total sample and subgroups was lower among less-educated participants than the more educated ones. Although White men had a lower educational discrepancy, we observed an important educational gradient among White women. At the highest level of education (≥12 years of study), White and Black/Brown men had a similar consumption frequency (approximately 34.0%). However, the prevalence of consumption was higher in less educated White men compared to Black/Brown men with intermediate education. Among more educated women, White women had a higher consumption frequency than Black/Brown women, especially when considering the highest level of education (41.6% *vs.* 35.4%). However, at the highest level of education, Black/Brown women had a consumption frequency similar to that of men (Black/Brown and White) (Fig. 1a). In general, among the *in natura*/minimally processed foods included in this study, vegetables and nuts and seeds were the food categories that most clearly showed a pattern of consumption inequality favoring more educated individuals (Supplementary Table 2).

Differently, for the consumption of ultra-processed foods, a higher prevalence was identified among participants with intermediate education (9-11 years of study) in the total sample and subgroups. We observed a higher educational discrepancy between White and Black/Brown men. White men with intermediate education, and especially those with the highest level of education (≥12 years of study), had a lower frequency of consumption of ultra-processed foods compared to their respective Black/Brown counterparts (17.3% *vs*. 23.1% in the highest level of education). A slight educational discrepancy was observed between White and Black/Brown women (Fig. 1b). The ultra-

processed foods that were more frequently consumed by Brazilians were margarine and bread, with higher prevalence among participants with intermediate education and those with a higher level of education, respectively (Supplementary Table 3).

Among the most educated groups, the most frequent consumption of *in natura*/minimally processed foods and ultra-processed foods was also identified through positive SII results and RII results above 1.0. Educational inequality was higher for the consumption of *in natura*/minimally processed foods (SII 19.3, 95% CI 16.1, 22.5; RII 1.9, 95% CI 1.7, 2.1) than for ultra-processed foods (SII 3.6, 95% CI 0.7, 6.6; RII 1.2, 95% CI 1.0, 1.4), mainly identified by absolute measures. In general, the values found for the simple measures of inequality, difference, and ratio also confirmed that the consumption of these two food groups was more prevalent among more educated participants (Table 2).

The consumption of *in natura*/minimally processed foods remained concentrated among the most educated individuals in all intersectional subgroups of sex and race/skin color. The magnitude of absolute and relative inequalities was higher in Black/Brown men (SII 19.3, 95% CI 12.5, 26.1; RII 2.2, 95% CI 1.5, 2.8) and White women (SII 21.8, 95% CI 15.3, 28.4; RII 1.9, 95% CI 1.5, 2.2). The population attributable risk results indicate that, if educational inequality were eliminated, the consumption of *in natura*/minimally processed foods would increase by 9.0 percentage points and 35.7% for Black/Brown men and 5.7 percentage points and 19.2% among Black/Brown women (Table 2).

In the analysis of the magnitude of educational inequality in the consumption of ultra-processed foods, we identified a significant absolute inequality for Black/Brown men (SII 7.3, 95% CI 0.5, 14.0) and Black/Brown women (SII 5.6, 95% CI 1.0, 10.2), but not for White men and women. However, we observed among White men a possibly higher consumption of ultra-processed foods in the least educated individuals (SII -3.3, 95% CI -10.9, 4.3; RII 0.9, 95% CI 0.5, 1.2). In the comparison between subgroups, Black/Brown men and women showed a higher absolute inequality in relation to White men (P = 0.04, for both). If educational inequality ceased to exist among White men, there would be a reduction of 2.7 percentage points and 13.5% in the consumption of ultra-processed foods (Table 2).

Discussion

The present study showed that the consumption of *in natura*/minimally processed foods was more prevalent in participants with a higher level of education, while that of ultra-processed foods was more frequent among those with intermediate education in the total sample and all analyzed

subgroups with the intersection between sex and race/skin color. The consumption of *in natura*/minimally processed foods was the food group that showed the highest absolute educational inequality, especially between White women and Black/Brown men, while White men showed lower absolute and relative inequality. Elimination of educational inequality would result in increased consumption of *in natura*/minimally processed foods of 36.0% for Black/Brown men and 19.0% for Black/Brown women. In addition, the elimination of educational inequality among White men would reduce the consumption of ultra-processed food by 13.5% in this group. Black/Brown men and women had a significantly higher absolute inequality than White men in the consumption of ultra-processed food.

We identified that Black/Brown men with low to intermediate levels of education consumed less *in natura*/minimally processed foods than White men with lower levels of education. Considering that a higher level of education implies better wages in Brazil[23] and that having higher incomes increases the opportunity for adherence to the consumption of healthy foods[24], it would be expected that the intermediate education level of Black/Brown men would favor higher access to and consumption of these foods in relation to less educated White men. However, in a country marked by a historical and expressive racial inequality in social indicators, Black/Brown men only had the same prevalence of healthy food consumption as White men in the highest level of education. This result may be explained by the fact that, although the unemployment rate is higher among Black/Brown people than among White people, regardless of education, this difference is relatively smaller among those with a higher level of education, although the wage disadvantages remain expressive[23].

We identified that Black/Brown women with the highest level of education achieved the prevalence of consumption of *in natura*/minimally processed foods of their respective counterparts of White men and Black/Brown men, despite Black/Brown women having the worst work income in Brazil (for example, 44.4% of White men's earnings)[25]. Unequally, considering that education determined more the differences in the consumption of healthy foods among White women than among the other subgroups, we observed, in the highest level of education, an expressive lower frequency of consumption of healthy foods among Black/Brown women in relation to White women. Brazilian women have better educational indicators compared to men, and White women have higher work incomes than Black/Brown women[25]. Women's higher knowledge associated with higher income among White women may have contributed to the higher consumption of healthy foods in this group[10,26,27]. Healthy eating patterns among Brazilian women, especially those with higher education and income, have been identified in other epidemiological studies[7,8,28].

We also identified an important privilege of White skin among more educated men, favoring a lower frequency of consumption of ultra-processed foods in relation to their Black/Brown male

counterparts. While higher levels of education seem to facilitate the consumption of ultra-processed products among Black/Brown men and women, educational inequality among White men showed that the consumption of ultra-processed food already seems to reach the less socioeconomically advantaged population in a more concentrated manner. The White men's wage advantages in relation to all subgroups[25] may have contributed to this finding.

The consumption of ultra-processed foods reaching White men with less education in a more concentrated manner and a slighter educational discrepancy in the subgroups for this food group reinforce the occurrence of the food transition process in Brazil[8], which has already occurred in developed countries[29,30]. The progression of the dietary pattern transition is characterized by higher consumption of cheaper, more caloric, and less nutritious foods at lower educational and income levels[1,29,30]. In developing countries, such as Brazil, unhealthy food options are increasingly more accessible[31]. On the other hand, healthy foods such as fruits and vegetables observed continuous increases in its price[31].

Projections of the price of healthy and unhealthy foods from 2017 to 2030 in Brazil, using data from 1995-2017, showed that the price difference between these foods reduced over time and forecasted that ultra-processed foods will become cheaper than in natura/minimally processed foods as of 2026[32]. This would increase barriers to the consumption of healthy foods[33] and encourage the consumption of unhealthy foods, specially by people with lower incomes, as a way to control expenditures[24], widening dietary and health inequalities. The growing participation of ultra-processed foods in the diet of the Brazilian population has been observed in recent decades[5], including in the most vulnerable populations[11]. Data from the Brazilian Household Budget Surveys (HBS) 2017-2018, show that ultra-processed foods already contribute about one-fifth (19.7%) of the calories consumed by Brazilians, and that the consumption of some ultra-processed foods, such as instant noodles and reconstituted meat products, is more frequent in the lowest income quartiles of the population[11].

Robust epidemiological evidence on negative health effects associated with the consumption of ultra-processed foods has been described[34–36]. High consumption of ultra-processed foods has been associated with higher calorie intake, body fat gain[34], overweight/obesity risk[36], type-2 diabetes[35], breast cancer[37], cardiovascular diseases, depression, and mortality for all the causes[36]. Specifically for obesity, a study in the North American population showed that, for all levels of education, the age-adjusted prevalence of overweight/obesity was 44.0% higher in Black women than in White women and 2.0% higher in Black men than in White men[38]. Thus, the consumption of ultra-processed foods may increase overweight, especially in the Black population, with emphasis on women, accentuating health inequalities.

It is expected that the consumption of ultra-processed foods will become more frequent in more vulnerable populations within a few years, such as Black/Brown and less educated individuals, if intersectoral and effective interventions are not articulated and adopted quickly. The guidelines for promoting the consumption of healthy foods and discouraging the consumption of unhealthy foods must be accompanied by plausible strategies for population adherence, especially the less educated and poorer[24,36], because the ongoing COVID-19 pandemic enhances social, racial, and gender inequalities that already exist in Brazil[39]. Public policies aimed at subsidizing *in natura* or minimally processed foods[40], may be effective in increasing purchase and consumption power of these foods by the vulnerable population[40,41]. In addition, a favorable a food environment with a high density of healthy eating establishments, such as street markets, is needed[42].

In addition to subsidizing healthy foods, the taxation of ultra-processed foods may discourage their consumption, especially by the most vulnerable population[40,41]. In Brazil, the price of ultra-processed foods was inversely associated with the prevalence of overweight and obesity, especially protecting individuals with higher socioeconomic vulnerability[43]. In the same way, food marketing regulation can also contribute to improving the quality of the population's diet[41]. A new labeling system was recently approved in Brazil, encompassing frontal nutrition labeling and a magnifying glass design to identify high nutrient content, including added sugars[44]. Despite this, the Brazilian model differs from those adopted by other Latin American countries and jurisdictions in the United States, with scientific evidence of beneficial effects[45]. Complementary measures are needed to reduce the persuasive advertising of ultra-processed foods on television and the internet, identified in Latin American countries, including Brazil[46–48].

Our results show the importance of ensuring access to better educational opportunities, with emphasis on the Black/Brown population, as a way to improve the quality of food consumption. It is noteworthy that, despite the growing participation of the Black/Brown population in higher education in recent years, due to the increase in the number of places and the policies of democratization of access to public higher education, the percentage of Black/Brown individuals with complete higher education is still low compared to White population (32.0% *vs.* 66.0% in 2017)[49,50]. In addition to the benefit of education in the employability and income of the population[23], knowledge, including specific to health[27], such as information on types and characteristics of foods that contribute to making them more or less healthy, may also influence an adequate diet[33].

Our study has some limitations. VIGITEL collected data from individuals with access to a landline residing in Brazilian state capitals and the Federal District. Although weighting factors have been used to mitigate this limitation, the inclusion of the population without a landline in the System (having only a cell phone) has the potential to impact the estimates, such as a higher frequency of

consumption of some ultra-processed foods[51]. There is a possibility that respondents have a higher socioeconomic level than the population of capitals in general, because, in Brazil, access to fixed telephone lines has been reduced in recent years[52], and more socioeconomically privileged families are more likely to have a landline[53]. Nevertheless, we identified the presence of expressive educational inequalities with the intersection between sex and race/color in food consumption. We did not include participants who declared themselves either Yellow or Indigenous in the intersection analysis due to limited sample size. This study innovates and advances in the perspective of intersectionality, showing the overlapping of inequalities in food consumption in Brazil. Another limitation is that the self-reported information made available by VIGITEL is subject to misclassification. However, there is an indication of good reproducibility and adequate validity of indicators of food and beverage consumption obtained through telephone surveys[54]. Although VIGITEL used a method based on a list of foods (simplified food questionnaire) and not the open 24-hour dietary recall, the simplified version was based on instruments with satisfactory validity, and the lack of quantification of consumption did not impact the understanding of the quality of the diet in the healthy and unhealthy dimensions proposed by the instrument[17,55].

The strengths of the study are the analysis of the magnitude of social inequality in the consumption of two food groups (*in natura*/minimally processed and ultra-processed foods) of the *NOVA* classification, which has become a world reference for effective assessment of the quality of diets and their consequences in all forms of malnutrition[1,2,6]. We used complex measures of inequality that took into account all levels of education of the representative sample of the population of the state capitals and the Federal District of an upper-middle-income country (UMIC)[56]. Furthermore, our study fills a gap in the literature on the role of the intersectionality of sex and race/skin color in food consumption.

The present study has important implications for public health as it identifies the magnitude with which social inequality presents itself and the groups that are the most vulnerable to the consumption of foods classified according to the degree of processing. Our results can subsidize policies that equitably guarantee the possibility of adopting the golden rule: "always prefer *in natura* or minimally processed foods and freshly made dishes and meals to ultra-processed foods" presented in the renowned Dietary Guidelines for the Brazilian Population, which has a language accessible to less educated people[33]. A variety in the consumption of *in natura* and minimally processed foods and the reduction in the consumption of ultra-processed foods goes beyond the fundamental importance of promoting healthy eating for the population[55]. It implies the promotion of an environmentally sustainable and socially fairer food system[4,33], mitigating the deepening of social inequalities caused by the food system that produces ultra-processed products[33].

We conclude that the inequality in the consumption of *in natura*/minimally processed foods favors more educated individuals. The prevalence of consumption of ultra-processed foods is more concentrated among those with intermediate education. Educational inequalities influence more the consumption of healthy than unhealthy foods. Among the subgroups, Black/Brown men with intermediate education had lower consumption of *in natura*/minimally processed foods when compared to White men with lower education level, showing the impact of racism on diet. Absolute inequalities for the consumption of unhealthy foods presented a higher magnitude between Black/Brown men and women when compared to White men, which may drive inequalities in NCD. The increase in education could impact an expressive increase in the consumption of healthy foods in the Black/Brown population, and in the reduction in the consumption of unhealthy foods in White men, but without changes in Black/Brown women.

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Table 1
Sociodemographic characteristics, prevalence of consumption of each food group (natural/minimally processed foods and ultra-processed foods) in Brazil, by intersection of sex and skin color/race, VIGITEL 2019.

General characteristics of the sample	Total Sample		Subgroups							
			White men (38.7%)		Black/Brown men (55.8%)		White women (42.9%)		Black/Brown women (54.6%)	
	%	95% CI	%	95% CI	%	95% CI	%	95% CI	%	95% CI
Age (years)										
Mean	42.7		42.3		39.1		46.0		42.8	
SD	16.7		17.1		15.3		17.6		16.1	
Years of education										
0-3 years	06.3	05.9, 06.7	04.8	04.0, 05.7	06.1	05.2, 07.2	05.4	04.7, 06.2	07.2	06.5, 08.1
4-8 years	22.5	21.7, 23.4	18.5	16.7, 20.6	24.1	22.2, 26.1	20.8	19.4, 22.4	23.0	21.7, 24.4
9-11 years	38.4	37.5, 39.3	33.4	31.1, 35.8	45.3	43.2, 47.3	31.1	29.5, 32.8	42.0	40.4, 43.5
≥ 12 years	32.8	31.9, 33.7	43.2	40.8, 45.8	24.5	22.9, 26.3	42.6	40.8, 44.4	27.8	26.4, 29.2
Consumption of food groups*										
Natural/ minimally processed foods	29.8	28.9, 30.6	29.6	27.5, 31.8	25.2	23.5, 26.9	35.7	34.0, 37.4	29.7	28.3, 31.0
Ultra-processed foods	18.2	17.4, 19.0	20.0	18.0, 22.0	23.8	21.9, 25.7	14.8	13.3, 16.3	15.6	14.4, 16.9

VIGITEL, Surveillance of Risk and Protective Factors for Chronic Diseases through Telephone Interviews.
SD = Standard deviation; CI = Confidence Interval
* Consumption equal to or higher than 5 different foods from each food group, the day before the interview.

Table 2
Prevalence of consumption of each food group (natural/minimally processed foods and ultra-processed foods) in Brazil, as well as simple and complex measures of inequality and absolute and relative population attributable risk by intersection of sex and skin color/race, VIGITEL 2019.

Consumption of food groups*	Simple measures of inequality				Complex measures of inequality				Population attributable risk (percentage points)	Population attributable fraction
Subgroups of sex and skin color/race	% Lowest education (0-3 years of study)	% Highest education (≥ 12 years of study)	Absolute Difference	Ratio	SII	95% CI	RII	95% CI		
Natural/minimally processed foods										
Total sample	20.4	36.7	16.3	1.8	19.3	16.1, 22.5	1.9	1.7, 2.1	-6.9	-23.2
White men	26.7	34.0	7.3	1.3	14.7	5.8, 23.6	1.6	1.2, 2.1	-4.4	-14.9
Black/Brown men	17.0	34.2	17.2	2.0	19.3	12.5, 26.1	2.2	1.5, 2.8	-9.0	-35.7
White women	19.9	41.6	21.7	2.1	21.8	15.3, 28.4	1.9	1.5, 2.2	-5.9	-16.5
Black/Brown women	21.6	35.4	13.8	1.6	15.1	10.1, 20.1	1.7	1.4, 1.9	-5.7	-19.2
Ultra-processed foods										
Total sample	10.2	17.3	7.1	1.7	3.6	0.7, 6.6	1.2	1.0, 1.4	0.9	4.9
White men	12.2	17.3	5.1	1.4	-3.3	-10.9, 4.3	0.9	0.5, 1.2	2.7	13.5
Black/Brown men	12.7	23.1	10.4	1.8	7.3	0.5, 14.0 †	1.4	1.0, 1,7	0.7	2.9
White women	07.5	15.2	7.7	2.0	4.7	-1.1, 10.5	1.4	0.8, 1.9	-0.4	-2.7
Black/Brown women	08.9	15.6	6.7	1.8	5.6	1.0, 10.2 ‡	1.4	1.0, 1.8	0.0	0.0

VIGITEL, Surveillance of Risk and Protective Factors for Chronic Diseases through Telephone Interviews.
SII = Slope of inequality index; CI = Confidence Interval; RII = Relative inequality index.
Note. Difference = Highest education - Lowest education; Ratio = Highest education / Lowest education.
Consumption equal to or higher than 5 different foods from each food group, the day before the interview.
SII and RII values were significantly different according to t-test.
† Difference between White men and Black/Brown men (*P* value = 0.04).
‡ Difference between White men and Black/Brown women (*P* value = 0.04).

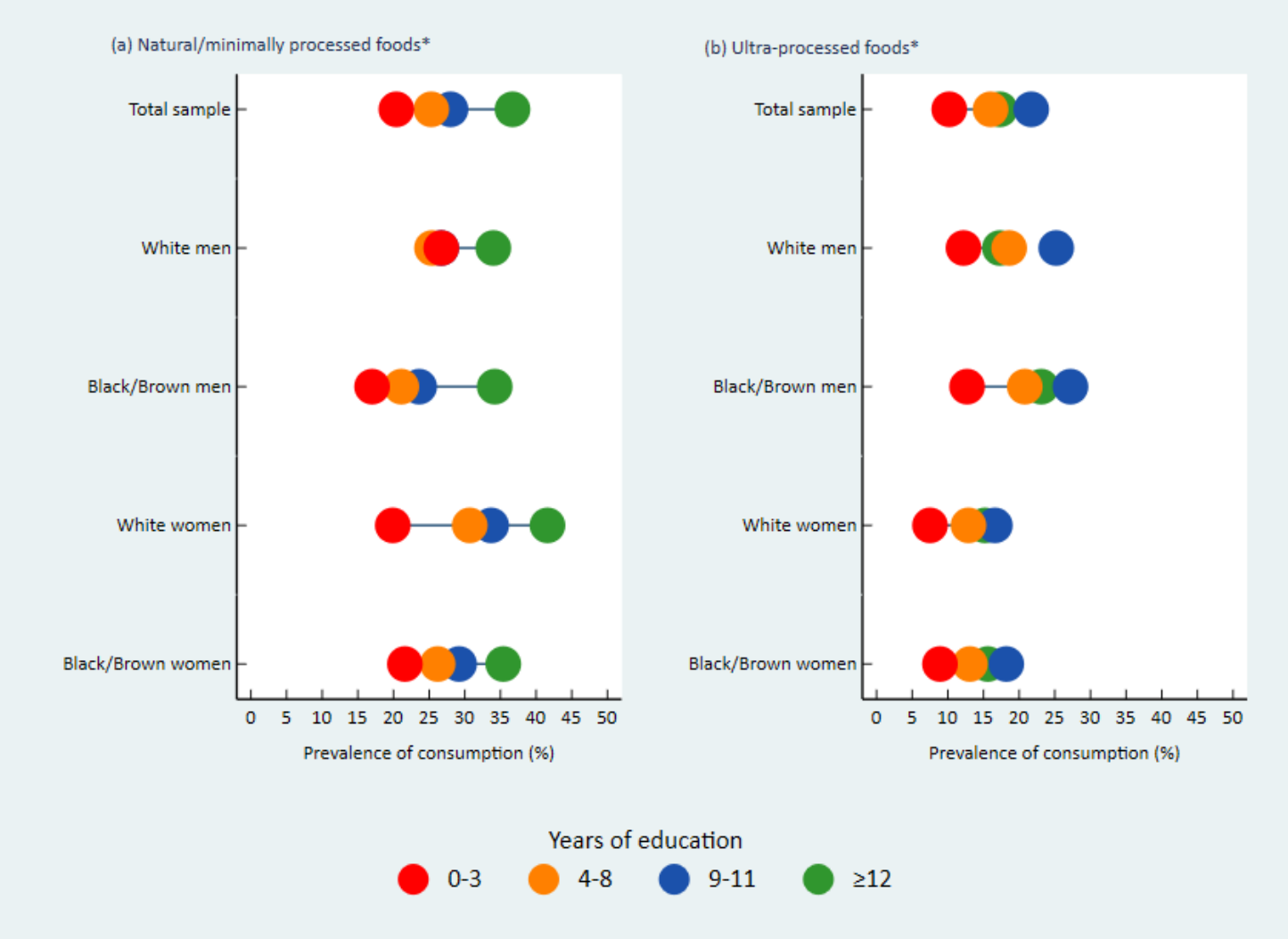

Fig. 1
Prevalence of consumption of each food group [natural/minimally processed foods (a) and ultra-processed foods (b)] in Brazil, by years of education and intersection of sex and skin color/race, VIGITEL 2019 (equiplot).
VIGITEL, Surveillance of Risk and Protective Factors for Chronic Diseases through Telephone Interviews.
*Consumption equal to or higher than 5 different foods from each food group, the day before the interview.

Supplementary Table 1: Description of the foods included in each food group (natural/minimally processed foods and ultra-processed foods) analyzed in the present study, VIGITEL 2019.

Group	Foods	Specific foods mentioned in the interview
Natural/ minimally processed foods	Fruits (group 1)	Papaya, mango, melon, or pequi
	Fruits (group 2)	Orange, banana, apple, or pineapple
	Vegetables (group 1)	Lettuce, kale, broccoli, watercress, or spinach
	Vegetables (group 2)	Pumpkin, carrots, sweet potatoes, or okra/caruru
	Vegetables (group 3)	Tomato, cucumber, zucchini, eggplant, chayote, or beetroot
	Roots and tubers	Potato, cassava, or yam
	Grains (cereal)	Rice, noodles, polenta, couscous, or sweet corn
	Legumes	Beans, pea, lentils, or chickpea
	Meat	Beef, pork, chicken, or fish
	Eggs	Fried, boiled, or scrambled eggs
	Milk	Milk
	Nuts and seeds	Peanut, cashew nut, or Brazilian nut
Ultra-processed foods	Soft drink	Soft drink
	Artificial juices	Fruit juice in box or can
	Powdered drink mixes	Powdered drink mixes
	Powdered chocolate milk mix	Powdered chocolate milk mix
	Flavored yogurt	Flavored yogurt
	Salty snacks	Potato chips or salty biscuits
	Sweet cookies and cakes	Sweet cookie, sandwich cookie, or industrialized cakes
	Sweet deserts	Chocolate, ice cream, jelly, flan, or other industrialized desserts
	Reconstituted meat products	Hot dog, sausage, mortadella, or ham
	Bread	Sliced, hot dog, or hamburger bread
	Sauces	Mayonnaise, catchup, or mustard
	Margarine	Margarine
	Ready-to-heat products	Instant noodles, packet soup, frozen lasagna, or other ready-to-eat dish purchased frozen

VIGITEL, Surveillance of Risk and Protective Factors for Chronic Diseases through Telephone Interviews.

Supplementary Table 2: Prevalence of consumption of natural/minimally processed foods in Brazil, by years of education, sex, and skin color/race, VIGITEL 2019.

Subgroups	Natural/minimally processed foods* Food category																					
Years of education, %	Fruits (group 1)		Fruits (group 2)		Vegetables (group 1)		Vegetables (group 2)		Vegetables (group 3)		Roots and tubers		Grains (cereal)		Legumes		Meat		Eggs		Milk		Nuts and seeds	
	%	95% CI	%	95% CI	%	95% CI	%	95% CI	%	95% CI	%	95% CI	%	95% CI	%	95% CI	%	95% CI	%	95% CI	%	95% CI	%	95% CI
Total sample																								
Total	34.4	33.5, 35.2	71.1	70.2, 72.0	50.9	50.0, 51.9	46.1	45.2; 47.0	67.6	66.7; 68.5	35.9	35.0; 36.8	84.9	84.1; 85.5	71.6	70.8; 72.5	88.5	87.8; 89.1	44.3	43.3; 45.2	56.5	55.5; 57.4	16.6	15.9; 17.3
0-3 years	35.2	31.9, 38.7	66.1	62.7, 69.3	37.8	34.5, 41.2	39.7	36.4; 43.0	55.5	52.0; 58.8	31.4	28.1; 34.9	82.5	79.9; 84.9	71.7	68.7; 74.6	85.6	83.2; 87.7	42.2	38.7; 45.7	62.2	58.8; 65.5	11.0	08.9; 13.5
4-8 years	35.0	33.1, 36.9	71.6	69.6, 73.5	43.6	41.5, 45.7	42.9	40.8; 44.9	62.7	60.6; 64.7	33.6	31.6; 35.6	84.4	82.7; 85.9	72.9	71.1; 74.7	86.0	84.3; 87.6	43.3	41.2; 45.5	58.9	56.8; 60.9	12.4	11.1; 13.9
9-11 years	32.2	30.9, 33.5	69.7	68.2, 71.1	48.0	46.5, 49.5	45.7	44.2; 47.2	66.5	65.0; 67.9	36.1	34.7; 37.6	87.2	86.1; 88.2	74.1	72.8; 75.3	88.1	87.0; 89.1	44.9	43.4; 46.4	55.9	54.4; 57.4	14.5	13.6; 15.6
≥ 12 years	36.3	34.8, 37.8	73.4	71.9, 74.8	61.8	60.2, 63.4	50.0	48.4; 51.7	74.6	73.1; 76.0	38.1	36.5; 39.7	82.9	81.6; 84.2	67.9	66.3; 69.4	91.1	90.0; 92.1	44.5	42.9; 46.2	54.4	52.7; 56.1	22.9	21.6; 24.3
Men																								
Total	28.9	27.6, 30.2	68.9	67.4, 70.4	47.8	46.3; 49.4	42.5	41.0; 44.0	66.1	64.6; 67.6	36.7	35.2; 38.2	87.7	86.6; 88.7	76.9	75.7; 78.2	88.7	87.5; 89.7	45.5	44.0; 47.0	54.1	52.5; 55.6	15.6	14.6; 16.7
0-3 years	33.0	27.5, 39.0	64.4	58.6, 69.9	37.0	31.5; 42.9	36.2	30.8; 41.9	54.0	48.1; 59.8	32.6	26.9; 38.8	88.0	84.5; 90.8	79.8	75.6; 83.5	87.1	83.5; 90.0	45.6	39.7; 51.7	54.7	48.7; 60.5	10.7	07.4; 15.2
4-8 years	28.8	25.9, 31.9	68.5	65.1, 71.7	39.3	35.9; 42.8	39.2	35.9; 42.6	61.8	58.2; 65.2	34.1	30.8; 37.5	86.5	83.7; 88.9	78.6	75.6; 81.3	84.3	81.1; 87.0	46.0	42.5; 49.6	55.0	51.4; 58.4	11.9	09.6; 14.5
9-11 years	27.8	25.8, 29.9	67.3	65.0, 69.6	44.5	42.2; 46.9	42.2	40.0; 44.6	64.2	61.8; 66.6	36.4	34.1; 38.7	89.7	88.2; 91.0	79.0	77.1; 80.7	88.4	86.7; 90.0	46.2	43.8; 48.5	53.8	51.4; 56.1	13.8	12.4; 15.4
≥ 12 years	29.6	27.2, 32.0	72.1	69.6, 74.4	60.3	57.6; 62.9	46.5	43.9; 49.2	74.1	71.7; 76.4	39.7	37.1; 42.4	85.9	83.8; 87.7	72.6	70.0; 74.9	92.4	90.9; 93.8	44.3	41.6; 47.0	53.7	51.0; 56.4	21.7	19.8; 23.8
Women																								
Total	39.0	37.9, 40.1	73.0	71.9, 74.0	53.6	52.4, 54.7	49.2	48.0; 50.3	68.8	67.7; 69.9	35.3	34.2; 36.4	82.4	81.5; 83.4	67.1	66.0; 68.2	88.3	87.4; 89.1	43.2	42.1; 44.4	58.5	57.4; 59.7	17.4	16.6; 18.3
0-3 years	36.9	33.1, 41.0	67.3	63.2, 71.1	38.4	34.5, 42.6	42.4	38.4; 46.4	56.6	52.6; 60.5	30.4	26.7; 34.4	78.4	74.5; 81.8	65.5	61.4; 69.4	84.5	81.2; 87.3	39.5	35.4; 43.7	68.0	64.2; 71.6	11.2	08.8; 14.2
4-8 years	40.5	38.2, 42.9	74.4	72.1, 76.5	47.3	44.8, 49.8	46.1	43.6; 48.5	63.5	61.1; 65.8	33.2	31.0; 35.5	82.4	80.4; 84.3	67.9	65.6; 70.2	87.5	85.7; 89.1	41.0	38.6; 43.4	62.3	59.9; 64.7	12.9	11.5; 14.4
9-11 years	36.2	34.5, 37.9	71.8	70.0, 73.6	51.2	49.3, 53.1	48.9	47.0; 50.8	68.5	66.7; 70.3	35.9	34.1; 37.7	84.8	83.3; 86.2	69.6	67.9; 71.3	87.8	86.3; 89.2	43.8	41.9; 45.6	57.9	56.0; 59.8	15.2	14.0; 16.6
≥ 12 years	41.5	39.5, 43.5	74.4	72.5, 76.2	63.1	61.1, 65.0	52.7	50.6; 54.8	74.9	73.1; 76.6	36.8	34.9; 38.7	80.6	78.8; 82.4	64.2	62.2; 66.2	90.0	88.6; 91.4	44.8	42.7; 46.8	55.0	52.9; 57.0	23.9	22.2; 25.6
White																								
Total	35.8	34.4, 37.2	73.2	71.8, 74.5	57.5	56.0, 59.0	46.4	44.9; 47.8	69.7	68.3; 71.1	36.5	35.1; 37.9	83.1	81.9; 84.3	68.7	67.4; 70.1	88.8	87.7; 89.7	43.6	42.1; 45.1	57.0	55.6; 58.5	18.9	17.8; 20.0
0-3 years	38.6	33.2, 44.2	66.6	61.2, 71.5	41.0	35.8, 46.5	36.9	31.9; 42.1	53.7	48.3; 59.1	30.3	25.3; 35.9	82.3	78.1; 85.8	70.4	65.4; 75.0	85.9	82.3; 88.9	41.7	36.4; 47.3	62.1	56.7; 67.2	10.5	07.3; 14.8
4-8 years	37.6	34.6, 40.8	74.4	71.3, 77.3	48.6	45.3, 51.9	43.6	40.4; 46.9	65.1	61.9; 68.2	33.4	30.4; 36.6	83.7	80.9; 86.1	71.8	68.8; 74.5	85.3	82.7; 87.6	43.0	39.7; 46.3	64.0	60.8; 67.1	12.9	10.9; 15.3
9-11 years	31.5	29.4, 33.6	72.3	69.7, 74.7	53.9	51.3, 56.4	46.0	43.5; 48.5	66.6	64.0; 69.1	37.5	35.1; 39.9	86.5	84.6; 88.2	72.9	70.8; 75.0	88.4	86.6; 90.1	43.7	41.2; 46.2	55.3	52.7; 57.8	15.9	14.3; 17.6
≥ 12 years	37.8	35.6, 40.1	74.0	71.9, 76.0	66.3	64.0, 68.5	49.1	46.7; 51.4	76.1	74.1; 78.0	37.9	35.6; 40.2	80.4	78.4; 82.3	64.0	61.6; 66.2	90.9	89.4; 92.3	43.9	41.6; 46.3	54.5	52.2; 56.9	24.8	23.0; 26.8
Black/Brown																								
Total	33.0	31.9, 34.2	70.0	68.8, 71.2	46.3	45.0, 47.6	46.0	44.8; 47.3	66.2	64.9; 67.4	35.6	34.4; 36.8	86.1	85.2; 87.0	73.8	72.7; 74.9	88.4	87.4; 89.3	44.6	43.3; 45.9	56.2	54.9; 57.5	15.1	14.3; 16.0
0-3 years	32.2	28.0, 36.7	66.2	61.4, 70.6	36.7	32.2, 41.4	41.8	37.2; 46.5	56.7	52.0; 61.3	31.4	27.0; 36.1	82.2	78.4; 85.5	72.5	68.3; 76.4	86.0	82.5; 88.9	42.1	37.3; 47.0	63.7	59.1; 68.1	11.8	09.0; 15.4
4-8 years	33.4	30.9, 36.0	70.8	68.1, 73.4	41.1	38.2, 44.0	43.0	40.2; 45.8	61.5	58.7; 64.3	34.1	31.4; 36.9	84.8	82.5; 86.8	73.2	70.6; 75.6	86.7	84.2; 88.8	43.2	40.3; 46.1	56.0	53.1; 58.9	12.4	10.6; 14.4
9-11 years	32.2	30.5, 33.9	68.3	66.5, 70.1	44.7	42.8, 46.6	45.4	43.5; 47.3	66.2	64.3; 68.0	35.6	33.8; 37.4	87.6	86.2; 88.8	74.8	73.2; 76.4	88.0	86.5; 89.3	45.3	43.4; 47.2	56.1	54.2; 58.0	13.8	12.5; 15.1
≥ 12 years	34.3	32.3, 36.4	73.2	71.0, 75.3	56.1	53.7, 58.4	51.0	48.6; 53.4	72.7	70.4; 74.8	37.9	35.7; 40.1	85.8	83.9; 87.5	73.1	71.0; 75.0	91.3	89.7; 92.6	45.3	43.0; 47.7	54.7	52.3; 57.0	20.7	19.0; 22.5

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*Food consumption the day before the interview.

Supplementary Table 3: Prevalence of consumption of ultra-processed foods in Brazil, by years of education, sex, and skin color/race, VIGITEL 2019.

Subgroups	Ultra-processed foods* Food category																							
Years of education, %	Soft drink		Artificial juices		Powdered drink mixes		Powdered chocolate milk mix		Flavored yogurt		Salty snacks		Sweet cookies and cakes		Sweet desserts		Reconstituted meat products		Bread		Sauces		Margarine		Ready-to-heat products	
	%	95% CI	%	95% CI	%	95% CI	%	95% CI	%	95% CI	%	95% CI	%	95% CI	%	95% CI	%	95% CI	%	95% CI	%	95% CI	%	95% CI	%	95% CI
Total Sample																										
Total	27.7	26.8; 28.6	15.0	14.3; 15.8	12.8	12.0; 13.5	11.9	11.2; 12.6	15.6	14.9; 16.3	23.9	23.1; 24.7	21.3	20.4; 22.1	25.6	24.8; 26.5	26.5	25.7; 27.4	32.8	31.9; 33.7	16.9	16.1; 17.6	42.6	41.7; 43.6	06.6	06.1; 07.2
0-3 years	18.7	15.7; 22.1	12.3	09.8; 15.3	13.7	11.3; 16.6	05.6	04.2; 07.5	10.0	08.3; 12.0	25.8	22.7; 29.2	16.6	14.4; 19.2	13.7	11.1; 16.7	19.4	16.4; 22.9	19.0	16.3; 22.0	09.3	07.2; 11.8	36.8	33.5; 40.3	06.3	04.7; 08.3
4-8 years	24.2	22.3; 26.3	14.3	12.7; 16.0	16.5	14.7; 18.4	09.3	07.9; 10.9	14.6	13.1; 16.2	27.3	25.3; 29.3	20.8	19.0; 22.7	18.3	16.6; 20.1	23.8	22.0; 25.8	26.0	24.1; 27.9	12.5	11.1; 14.1	47.7	45.6; 49.8	07.7	06.5; 09.2
9-11 years	30.7	29.3; 32.2	17.1	15.9; 18.3	15.2	13.9; 16.5	12.9	11.8; 14.1	15.1	14.0; 16.1	25.3	24.1; 26.7	24.3	23.0; 25.6	24.9	23.6; 26.3	29.3	27.9; 30.7	34.0	32.6; 35.4	19.0	17.8; 20.2	48.0	46.5; 49.5	07.4	06.6; 08.4
≥ 12 years	28.3	26.8; 29.9	13.6	12.4; 14.9	07.2	06.3; 08.1	13.7	12.5; 14.9	17.9	16.7; 19.3	19.6	18.3; 20.9	19.0	17.7; 20.4	33.8	32.2; 35.4	26.5	25.1; 27.9	38.7	37.1; 40.4	18.8	17.6; 20.1	34.1	32.5; 35.7	04.9	04.2; 05.9
Men																										
Total	33.0	31.5; 34.5	16.9	15.7; 18.2	14.9	13.7; 16.2	13.5	12.4; 14.7	14.2	13.1; 15.3	24.6	23.3; 26.0	24.0	22.7; 25.4	25.1	23.7; 26.5	31.6	30.2; 33.1	35.5	34.0; 37.0	20.3	19.1; 21.6	42.1	40.6; 43.7	07.8	06.9; 08.8
0-3 years	25.1	19.7; 31.5	14.0	09.8; 19.6	13.2	09.5; 18.1	04.7	02.8; 07.7	06.7	04.5; 09.8	26.3	21.0; 32.4	18.4	14.6; 23.1	15.7	11.2; 21.7	23.9	18.6; 30.2	20.5	16.1; 25.7	09.8	06.9; 13.8	35.4	29.9; 41.3	07.2	04.9; 10.5
4-8 years	29.1	25.9; 32.6	16.4	13.7; 19.6	20.5	17.4; 23.9	11.3	08.8; 14.4	12.6	10.4; 15.3	28.4	25.2; 32.0	24.1	21.0; 27.4	17.7	15.0; 20.8	28.4	25.2; 31.8	27.4	24.3; 30.8	15.1	12.6; 18.0	45.1	41.6; 48.7	09.4	07.3; 12.1
9-11 years	36.0	33.7; 38.3	19.6	17.7; 21.6	17.6	15.6; 19.7	14.4	12.7; 16.3	13.5	12.1; 15.2	26.3	24.3; 28.5	27.2	25.1; 29.3	24.5	22.5; 26.7	35.1	32.8; 37.4	36.5	34.3; 38.7	23.2	21.2; 25.3	47.8	45.5; 50.2	09.0	07.6; 10.6
≥ 12 years	33.5	31.0; 36.2	14.5	12.7; 16.5	07.8	06.5; 09.4	15.7	13.7; 17.8	17.6	15.6; 19.8	19.2	17.3; 21.3	21.0	18.8; 23.5	32.9	30.5; 35.5	31.1	28.7; 33.6	43.1	40.4; 45.8	22.5	20.5; 24.7	33.9	31.3; 36.6	05.1	03.9; 06.7
Women																										
Total	23.2	22.2; 24.3	13.3	12.5; 14.3	10.9	10.0; 11.8	10.5	09.7; 11.3	16.8	15.9; 17.7	23.3	22.3; 24.4	19.0	18.0; 19.9	26.1	25.1; 27.2	22.1	21.2; 23.2	30.5	29.4; 31.6	13.9	13.1; 14.8	43.1	41.9; 44.3	05.6	05.0; 06.3
0-3 years	13.7	10.9; 17.1	11.0	08.2; 14.4	14.1	11.1; 17.7	06.3	04.4; 09.1	12.6	10.3; 15.3	25.3	21.8; 29.2	15.2	12.6; 18.3	12.1	09.6; 15.1	16.0	12.8; 19.7	17.8	14.7; 21.4	08.8	06.3; 12.3	37.9	33.9; 42.1	05.5	03.6; 08.2
4-8 years	20.0	17.9; 22.2	12.4	10.8; 14.2	13.0	11.1; 15.1	07.5	06.1; 09.1	16.3	14.5; 18.2	26.2	24.1; 28.5	17.9	16.1; 19.9	18.8	16.8; 21.0	19.9	17.8; 22.1	24.7	22.7; 26.8	10.3	08.8; 12.0	50.0	47.5; 52.4	06.2	04.9; 07.7
9-11 years	25.9	24.2; 27.7	14.8	13.3; 16.3	13.0	11.5; 14.7	11.5	10.2; 13.0	16.5	15.1; 17.9	24.4	22.8; 26.1	21.6	20.0; 23.3	25.3	23.7; 27.0	23.9	22.3; 25.6	31.7	30.0; 33.5	15.1	13.8; 16.6	48.1	46.2; 50.0	06.0	05.1; 07.1
≥ 12 years	24.2	22.4; 26.1	12.9	11.3; 14.6	06.7	05.6; 07.9	12.1	10.8; 13.6	18.2	16.7; 19.9	19.9	18.2; 21.7	17.5	15.9; 19.1	34.4	32.5; 36.5	22.9	21.2; 24.7	35.4	33.4; 37.3	15.9	14.4; 17.5	34.2	32.2; 36.2	04.8	03.8; 06.0
White																										
Total	26.6	25.3; 28.0	14.0	12.9; 15.2	11.2	10.1; 12.3	11.9	10.9; 13.0	17.3	16.2; 18.5	21.1	19.9; 22.4	19.4	18.2; 20.6	29.3	27.9; 30.7	26.1	24.8; 27.5	34.9	33.5; 36.3	16.9	15.8; 18.1	37.5	36.0; 39.0	05.5	04.7; 06.4
0-3 years	16.1	12.8; 20.2	07.1	05.1; 09.7	14.8	10.8; 19.9	04.5	02.5; 07.8	11.0	08.1; 14.7	24.7	20.0; 30.1	17.0	13.5; 21.2	14.2	10.4; 18.9	20.2	16.1; 25.0	20.4	15.9; 25.6	08.3	05.6; 12.3	36.1	30.9; 41.6	04.9	02.9; 08.0
4-8 years	22.5	19.7; 25.6	14.1	11.6; 17.0	14.4	12.0; 17.2	09.9	07.7; 12.5	17.7	15.1; 20.6	25.0	22.2; 28.1	18.7	16.2; 21.6	21.0	18.3; 24.1	22.9	20.1; 26.0	26.7	23.9; 29.7	12.0	09.8; 14.6	46.0	42.7; 49.4	07.4	05.5; 09.9
9-11 years	30.0	27.6; 32.5	15.4	13.5; 17.4	14.5	12.5; 16.8	13.0	11.4; 14.9	16.7	14.9; 18.7	21.2	19.3; 23.3	21.3	19.4; 23.4	26.7	24.5; 29.0	29.0	26.6; 31.4	34.0	31.7; 36.4	20.1	18.1; 22.4	44.1	41.6; 46.7	06.2	05.1; 07.6
≥ 12 years	27.3	25.2; 29.5	13.9	12.1; 15.9	06.7	05.5; 08.2	12.9	11.3; 14.6	18.3	16.5; 20.2	18.7	16.9; 20.8	18.4	16.5; 20.6	36.8	34.5; 39.2	26.2	24.2; 28.3	41.1	38.7; 43.4	17.8	16.2; 19.6	28.8	26.6; 31.1	04.2	03.1; 05.7
Black/Brown																										
Total	28.9	27.7; 30.2	15.9	14.9; 17.0	14.0	13.0; 15.1	12.0	11.0; 13.0	14.5	13.7; 15.4	25.8	24.6; 26.9	22.9	21.8; 24.0	23.5	22.4; 24.6	27.1	25.9; 28.3	31.5	30.4; 32.8	16.9	15.9; 17.9	46.5	45.2; 47.8	07.4	06.6; 08.2
0-3 years	21.0	16.6; 26.3	14.3	10.8; 18.6	13.8	10.5; 17.8	06.1	04.2; 08.8	09.2	07.2; 11.8	26.3	22.0; 31.1	16.3	13.2; 19.9	13.7	10.2; 18.1	19.4	15.1; 24.6	18.2	14.8; 22.3	10.0	07.2; 13.8	36.3	31.8; 41.0	06.5	04.4; 09.4
4-8 years	25.5	22.8; 28.3	14.9	12.8; 17.3	17.8	15.3; 20.6	08.9	07.0; 11.2	13.1	11.3; 15.2	28.8	26.1; 31.6	22.6	20.1; 25.2	17.2	14.9; 19.7	25.4	22.7; 28.2	25.7	23.2; 28.3	12.9	11.0; 15.1	49.4	46.5; 52.3	07.6	06.0; 09.6
9-11 years	31.6	29.7; 33.5	18.3	16.8; 20.0	15.7	14.1; 17.4	12.8	11.3; 14.3	14.4	13.2; 15.8	27.2	25.5; 29.0	25.8	24.1; 27.6	24.2	22.6; 26.0	29.5	27.7; 31.4	34.1	32.4; 36.0	18.4	16.9; 20.0	50.1	48.2; 52.1	08.3	07.1; 09.6
≥ 12 years	29.7	27.5; 32.1	13.2	11.7; 15.0	07.9	06.6; 09.3	14.9	13.2; 16.9	17.4	15.7; 19.2	20.5	18.8; 22.4	19.9	18.2; 21.8	30.4	28.3; 32.6	26.5	24.5; 28.7	35.9	33.7; 38.2	19.8	18.0; 21.8	40.5	38.1; 42.9	05.9	04.8; 07.1

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ANEXO

ANEXO

ANEXO 1 - Ata de Defesa do Exame de Qualificação Doutorado

UNIVERSIDADE FEDERAL DE UBERLÂNDIA
Coordenação do Programa de Pós-Graduação em Ciências da Saúde
Av. Pará, 1720, Bloco 2H, Sala 09 - Bairro Umuarama, Uberlândia-MG, CEP 38400-902
Telefone: 34 3225-8628 - www.ppcsa.famed.ufu.br - copme@ufu.br

ATA DE DEFESA - PÓS-GRADUAÇÃO

Programa de Pós-Graduação em:	Ciências da Saúde				
Defesa de:	Exame de Qualificação Doutorado, Nº 008, PPCSA				
Data:	05.05.2020	Hora de início:	15:00	Hora de encerramento:	18:00
Matrícula do Discente:	11813CSD007				
Nome do Discente:	Bárbara Virgínia Caixeta Crepaldi				
Título do Trabalho:	Desigualdades sociais no consumo alimentar de brasileiros				
Área de concentração:	Ciências da Saúde				
Linha de pesquisa:	2: Diagnóstico, Tratamento e Prognóstico das Doenças e Agravos à Saúde				
Projeto de Pesquisa de vinculação:	Epidemiologia Nutricional-Consumo Alimentar de populações				

Reuniu-se em sala virtual, em web conferência pela plataforma Mconf-RNP, em conformidade com a PORTARIA Nº 36, DE 19 DE MARÇO DE 2020 da COORDENAÇÃO DE APERFEIÇOAMENTO DE PESSOAL DE NÍVEL SUPERIOR - CAPES, a Banca Examinadora, designada pelo Colegiado do Programa de Pós-graduação em Ciências da Saúde, assim composta: Professores Doutores: Maria Laura da Costa Louzada (USP), Ana Elisa Madalena Rinaldi (UFU) e Catarina Machado Azeredo (UFU) orientador(a) do(a) candidato(a).

Iniciando os trabalhos o(a) presidente da mesa, Dr(a). Catarina Machado Azeredo, apresentou a Comissão Examinadora e o candidato(a), agradeceu a presença dos membros da banca, e concedeu a Discente a palavra para a exposição do seu trabalho. A duração da apresentação da Discente e o tempo de arguição e resposta foram conforme as normas do Programa.

A seguir o senhor(a) presidente concedeu a palavra, pela ordem sucessivamente, aos(às) examinadores(as), que passaram a arguir o(a) candidato(a). Ultimada a arguição, que se desenvolveu dentro dos termos regimentais, a Banca, em sessão secreta, atribuiu o resultado final, considerando o(a) candidato(a):

Aprovado(a).

Esta defesa faz parte dos requisitos necessários à obtenção do título de Doutor.

O competente diploma será expedido após cumprimento dos demais requisitos, conforme as normas do Programa, a legislação pertinente e a regulamentação interna da UFU.

Nada mais havendo a tratar foram encerrados os trabalhos. Foi lavrada a presente ata que após lida e achada conforme foi assinada pela Banca Examinadora.

Documento assinado eletronicamente por **Catarina Machado Azeredo, Professor(a) do Magistério**

Superior, em 05/05/2021, às 18:03, conforme horário oficial de Brasília, com fundamento no art. 6º, § 1º, do Decreto nº 8.539, de 8 de outubro de 2015.

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