

**Universidade de São Paulo  
Faculdade de Saúde Pública**

**Padrões alimentares de indivíduos em situação de  
pobreza**

**Roberta de Oliveira Santos**

**Tese apresentada ao Programa de Pós-  
Graduação Nutrição em Saúde Pública para  
obtenção do título de Doutora em Ciências.**

**Área de concentração: Nutrição em Saúde  
Pública**

**Orientadora: Prof<sup>a</sup> Dr<sup>a</sup> Valéria Troncoso Baltar**

**São Paulo  
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**Versão Corrigida**

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*Dedico este trabalho às pessoas mais especiais  
da minha vida...*

*Aos meus pais, Carlos e Lucia, meus grandes  
exemplos de vida, pelo apoio, incentivo e amor  
incondicional.*

*À minha irmã, Regina, pela grande admiração  
e orgulho.*

*Ao meu grande amor, Wal, sempre presente  
com palavras de carinho e incentivo.*

## ***Agradecimentos***

Agradeço primeiramente a Deus por ter me dado força e inteligência para enfrentar essa etapa tão importante da minha vida.

À Coordenação de Amparo à Pesquisa (CAPES) pela concessão da bolsa de estudos no Brasil e bolsa sanduíche no Exterior, que muito contribuíram para a realização desse estudo.

Aos meus pais pelo incentivo, paciência, amor, carinho, orgulho e por estarem sempre presentes na minha vida.

À Regina, minha irmãzinha preferida, que sente tanto orgulho dessa irmã mais velha.

Ao meu companheiro de todas as horas, meu amor para vida inteira Walbert, que sempre esteve do meu lado, me apoiando, me fazendo companhia, me dando acalento.

À minha querida orientadora Valéria Baltar, que mais que uma orientadora se tornou uma amiga, com muita paciência, discussões e construção dessa tese.

À minha orientadora na Inglaterra, professora Petra Wark pelo acolhimento, orientação, aprendizado e amizade.

À professora Dirce Marchioni, que foi minha co-orientadora não oficial, me auxiliando nas questões nutricionais desse estudo e com grandes apontamentos na revisão desse trabalho.

Às professoras Diana Barbosa Cunha, Flávia Mori Sarti e Rosely Sichieri pelo auxílio, disponibilidade e grandes contribuições na revisão desse trabalho.

À querida Bartira Gorgulho pela amizade e grandes discussões acerca da importância de estudarmos refeições.

Aos amigos Adélia Pereira, Alex e Juliana Teixeira pela amizade, companhia e grandes diversões na realização das críticas.

A todo pessoal do GEIAS, grande grupo de pesquisa, que me proporcionou tanto aprendizado, amizade e festinhas divertidas.

Ao acolhimento de todos na Coventry University e na Faculdade de Saúde Pública, minha segunda casa.

E a todos aqueles que de alguma forma fizeram parte dessa minha longa jornada e que torceram por mim.

Enfim, a todos o meu muito obrigada.

“O começo de todas as ciências é o espanto de  
as coisas serem o que são”

(Aristóteles)

## RESUMO

Santos RO. Padrões alimentares de indivíduos em situação de pobreza [tese]. São Paulo: Faculdade de Saúde Pública da USP; 2019.

**Introdução** – Os padrões alimentares de refeições, comparados aos padrões diários, discriminam com mais acuidade a alimentação dos indivíduos, que por sua vez é muito influenciada pela renda, no entanto há poucos estudos. **Objetivos** – Realizar uma revisão sistemática da literatura sobre as definições de café da manhã, almoço e jantar. Adaptar um índice de qualidade do café da manhã. Estudar os padrões de refeições de indivíduos em situação de pobreza. **Métodos** – Foi realizada uma extensiva busca em base de dados online. *Breakfast Quality Meal Index* (BMQI) foi baseado e adaptado do *Main Meal Quality Index* e recomendações internacionais para avaliar a qualidade do café da manhã. Foram utilizados dados brasileiros da Pesquisa de Orçamentos Familiares e britânicos do *National Diet and Nutrition Survey* para comparar os padrões de refeições de indivíduos em situação de pobreza através de três parâmetros: frequência alimentar, omissão das refeições e qualidade da refeição. Foram considerados em pobreza relativa os indivíduos com renda equivalente, em dólar, abaixo de 60% da mediana da renda nacional anual equivalente, perfazendo uma amostra final de 3073 brasileiros e 464 britânicos. As análises estatísticas foram efetuadas no STATA®, sendo considerado o nível de significância de 5%. **Resultados** – A revisão sistemática encontrou 21 definições distintas de refeições que variaram de um a quatro critérios usados simultaneamente. As definições mais utilizadas foram “pre-



*determined eating events*” (61.5% dos estudos), “*self-report*” (13.1%) e “*time-of-day*” (7.8%). O BMQI foi positivamente associado com carboidrato (g), proteína (g), fibra (g), vitaminas e minerais (mg) e negativamente associado com gordura total (g), gordura saturada (g), colesterol (mg), e açúcar de adição (g). O BMQI foi positivamente associado com idade, renda, área rural e qualidade da dieta; e negativamente associado com o índice de massa corpórea. Na comparação dos padrões de refeições de brasileiros e britânicos em situação de pobreza, estes últimos realizaram mais refeições (4,7 versus 3,8) ( $p<0,001$ ), no entanto, os brasileiros pularam menos o café da manhã, almoço e jantar. Não houve diferença entre os países para a qualidade geral do café da manhã, porém, em relação aos componentes, os britânicos apresentaram melhores pontuações para proteína, cálcio e frutas e os brasileiros para fibra, gordura saturada, açúcar de adição e carne processada ( $p<0,001$ ). Os brasileiros apresentaram melhores pontuações para almoço e jantar (69,2 e 62,1 respectivamente) quando comparados aos britânicos (45,9 e 48,3, respectivamente). As pontuações de gordura saturada e gordura total do almoço e jantar dos brasileiros superaram o dobro dos indivíduos britânicos.

**Conclusões** – Levando em consideração o número de diferentes definições de refeições, um consenso é necessário na sua padronização. O BMQI identificou a qualidade do café da manhã, mostrando um papel protetor contra o excesso de peso nos brasileiros. Brasileiros em situação de pobreza apresentaram melhores padrões de refeições, pularam menos refeições e apresentaram melhor qualidade de almoço e jantar e melhor escore para marcadores de dieta saudável quando comparados aos britânicos.

**Descritores:** população de baixa renda, dieta, refeições.

## ABSTRACT

Santos RO. **Eating patterns of individuals in poverty's situation** [thesis]. São Paulo: Faculdade de Saúde Pública da USP; 2019.

**Introduction** – Meals patterns more accurately than daily patterns distinguish individuals' diet and are strongly influenced by income levels; however, there are only few studies. **Objectives** – To perform a systematic review about breakfast, lunch and dinner definitions. To adapt for breakfast a meal quality index. To study the meals' pattern of individuals in poverty situation. **Methods** – Extensive search in online databases was performed. The Breakfast Meal Quality Index (BMQI) was adapted from Main Meal Quality Index including also international nutritional recommendations to evaluate the breakfast quality. Data from two cross-sectional population-based studies, one from Brazil, the National Diet Survey, and one from the UK, the National Diet and Nutrition Survey rolling programme were used to compare the meals' patterns of individuals in poverty situation through three parameters: eating frequency, meals omission and meals' quality. Individuals with equivalised income, in dollar, 60% below of the national annual equivalised median income were considered as in relative poverty, performing a final sample of 3,073 Brazilians and 464 British. All analyses were performed using the software Stata, and it was considered a significance level of 5%. **Results** – The present review showed twenty one distinct definitions of meals that ranged from one to four criteria used simultaneously. The three most used meal definitions were “pre-determined eating events” (61.5% of the studies), “self-report” (13.1%) and “time-of-day” (7.8%). The BMQI was positively associated with the

following nutrients: carbohydrate (g), protein (g), fiber (g), vitamins and minerals (mg) and negatively associated with total fat (g), saturated fat (g), cholesterol (mg) and added sugar (g). BMQI score was positively associated with age, income, rural residence area and diet quality; and negatively associated with body mass index. Adults in relative poverty situation in the UK had higher eating frequency (4.7 versus 3.8 of Brazilians) ( $p<0.001$ ), however, Brazilians skipped less breakfast, lunch and dinner. There was no difference between the countries for breakfast quality, but British presented better score for protein, calcium and fruits components ( $p<0.001$ ), and Brazilians for fiber, saturated fat, added sugar and processed meat at breakfast ( $p<0.001$ ). For lunch and dinner qualities, Brazilians in relative poverty presented better score (69.2 e 62.1, respectively) when compared to British in similar situation (45.9 e 48.3). Saturated and total fat components scores of Brazilian's lunch and dinner surpassed the double of British in relative poverty. **Conclusions** – Taking into consideration the number of different meals definitions, a consensus is needed on their standardization. The BMQI adequately discriminated the breakfast, showing a protective role against overweight in Brazilians. Brazilians in relative poverty situation presented better meal patterns, skipped fewer meals, and had better lunch and dinner quality and better scores for unhealthy diet markers when compared to British.

**Keywords:** low income population, diet, meals

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## **ABREVIATURAS e SIGLAS UTILIZADAS**

BMQI – Breakfast Meal Quality Index

CI – Confidence Interval

IBGE – Instituto Brasileiro de Geografia e Estatística

HBS - Household Budget Survey

IMC – Índice de Massa Corporal

INA – Inquérito Nacional de Alimentação

MMQI – Main Meal Quality Index

MSM – Multiple Source Method

NDNS – National Diet and Nutrition Survey

OECD – Organization for Economic Cooperation and Development

PNAD – Pesquisa Nacional de Amostra por Domicílios

POF – Pesquisa de Orçamentos Familiares

SD – Standard Deviation

SES - Socioeconomic Status

UK – United Kingdom

WHO - World Health Organizations

## **APRESENTAÇÃO**

Esta tese está estruturada em formato de artigos científicos, sob o respaldo das diretrizes promulgadas pela Comissão de Pós-Graduação da Faculdade de Saúde Pública da Universidade de São Paulo em sua sessão 9<sup>a</sup>/2008 de 05/06/2008, e atende às normas de apresentação das dissertações contidas no Guia de Apresentação de Teses desta instituição (CUENCA et al., 2006).

A tese está organizada nas seguintes seções: (1) Introdução; (2) Justificativa do trabalho; (3) Objetivos, que descrevem os propósitos gerais e específicos do estudo; (4) Materiais e Métodos, que contempla a contextualização, delineamento, casuística, análise dos dados e aspectos éticos; (5) Resultados e Discussão, que apresentam três manuscritos resultantes do projeto de pesquisa; (6) Considerações Finais, que sumariza as principais contribuições do estudo; (7) Referências.

## 1. INTRODUÇÃO

Apesar dos estilos de vida não saudáveis, tais como, o fumo, o consumo excessivo de álcool e a inatividade física, a nutrição também é um importante determinante de várias doenças crônicas, dentre elas, as doenças cardiovasculares, diabetes e vários tipos de câncer (KHAZRAI *et al*, 2014; KOHLER *et al*, 2016; POTTER *et al*, 2016; SCHWINGSHACKL *et al*, 2017). Além disso, uma dieta pobre em nutrientes é o maior contribuinte para a morte prematura em todo o mundo (FOROUZANFAR *et al*, 2015). Particularmente em países em desenvolvimento, os problemas de saúde, incluindo susceptibilidade aumentada a doenças infecciosas e desordens fisiológicas, são muitas vezes um resultado direto da desnutrição ou da má nutrição (LANGE e VOLLMER, 2017). Desse modo, os dados de consumo alimentar têm um importante papel para o desenvolvimento de políticas em Nutrição e Saúde Pública (BRASIL, 2014a).

Um dos reconhecidos fatores que determinam a escolha alimentar e os padrões de consumo é a renda (MAYEN *et al*, 2014). As dietas tendem a ser inadequadas especificamente em populações de baixa renda, pois muitas vezes há problemas na variedade e no acesso a alimentos de qualidade (ROBERTSON, 2001), fatores diretamente associados à renda familiar (COTTA e MACHADO, 2013).



## 1.1 CONSUMO ALIMENTAR DE INDIVÍDUOS EM SITUAÇÃO DE POBREZA

Entre os mais pobres, sejam eles indivíduos ou nações, as dietas tendem a ser compostas principalmente por alimentos ricos em carboidrato tais como trigo, arroz, batata e mandioca, sendo a contribuição de gordura pequena (POLEMAN e THOMAS, 1995; GERBENS-LEENES *et al*, 2010). Por outro lado, indivíduos em países de alta renda derivam a energia principalmente de carboidratos e gordura com contribuição substancial de carne e laticínios (GERBENS-LEENES *et al*, 2010).

Apesar das taxas globais de pobreza terem reduzido em mais da metade desde os anos 2000, uma em cada dez pessoas nos países em desenvolvimento ainda vive com suas famílias em situação de extrema pobreza, com uma renda inferior à linha internacional de pobreza de US\$ 1,90 por dia (UNITED NATIONS, 2018). No entanto, essa questão também afeta os países desenvolvidos, sendo que atualmente há 30 milhões de crianças crescendo em situação de pobreza nos países mais ricos do mundo (UNITED NATIONS, 2018).

Pode-se compreender a pobreza como uma situação de vulnerabilidade na qual parte da população não é capaz de gerar ou obter renda suficiente para ter acesso aos recursos básicos que garantam a qualidade de vida das pessoas, como o acesso à água tratada, saúde, educação, moradia, cidadania e alimentação (GOMES e PEREIRA, 2005). Essas dificuldades não se restringem apenas à ausência de renda, mas refletem problemas complexos e multidimensionais, contemplando aspectos estruturais,

históricos, políticos, econômicos, sociais e culturais (BURLANDY, 2007; SILVA *et al*, 2007).

Um país é considerado pobre em duas situações distintas, naquela em que exista escassez ou naquela em que exista má distribuição de recursos (GOMES e PEREIRA, 2005). No caso do Brasil, a pobreza é decorrente de um quadro de grande desigualdade social, marcado por uma profunda concentração de renda, situação essa responsável por colocar o Brasil entre os países de maior concentração de renda do mundo (SILVA, 2010).

Dollar e colaboradores (2002; 2016) encontraram em uma amostra de 92 países, que se confirmou posteriormente em uma amostra de 121 países, que a renda média do quintil mais pobre cresce proporcionalmente com a renda média geral da população, demonstrando um importante elo na cadeia causal do crescimento econômico para a saúde da população (LANGE & VOLLMER, 2017). Entende-se como crescimento econômico o crescimento contínuo da renda per capita ao longo do tempo e é comumente medido pela mudança percentual no Produto Interno Bruto de um país e não deve ser confundido com desenvolvimento econômico, um conceito mais qualitativo, que mensura as melhorias dos padrões de vida dos seres humanos através de indicadores de bem-estar econômico e social (pobreza, desemprego, desigualdade, condições de saúde, nutrição, educação e moradia), sendo medido, por exemplo, pelo Índice de Desenvolvimento Humano (BERLINCK e COHEN, 1970).

Embora o aumento da renda seja geralmente associado com a melhora da saúde, esta condição pode levar ao aumento inesperado do número de doenças associadas à prosperidade, com o aumento de bens associados ao risco à saúde, incluindo consumo de álcool e uso de cigarro (LANGE e VOLLMER, 2017), além do

aumento da disponibilidade per capita de alimentos, dos quais tem sido diretamente relacionada à maior prevalência de obesidade (ZOBEL *et al*, 2016).

Estimativas globais, baseadas no balanço energético indicam que a disponibilidade de alimentos per capita nos países desenvolvidos aumentou de 3.138 kcal/pessoa/dia em 1969/1971 para 3.360 kcal/pessoa/dia entre 2005 e 2007. Nos países em desenvolvimento o aumento foi de 2.055 para 2.613 kcal/pessoa/dia para os mesmos períodos de tempo (ALEXANDRATOS e BRUINSMA, 2012). Muitas áreas do mundo têm mostrado um desenvolvimento econômico que tem resultado no poder de compra aumentado, sendo este um importante fator que explica o aumento no consumo calórico (GERBENS-LEENES *et al*, 2010). Além disso, o desenvolvimento econômico pode ser associado concomitantemente com a troca da estrutura alimentar e hábitos de estilo de vida e isto pode promover um estilo de vida sedentário e hábitos alimentares adversos, resultando em um aumento nas doenças crônicas não transmissíveis (LANGE e VOLLMER, 2017). O desenvolvimento econômico resulta em um aumento do poder de compra, causando não apenas uma demanda para mais alimentos (LATHAM, 2000), mas também para diferentes alimentos (GERBENS-LEENES *et al*, 2010), assim, a mudança global no sistema alimentar tem levado à mudança dos tipos de alimentos consumidos, onde os alimentos ultra-processados são os maiores contribuintes de calorias (ZOBEL *et al*, 2016).

Para os países de menor renda, como o Brasil, o crescimento econômico é especialmente importante, pois permite a prosperidade econômica, diminuindo assim, a questão da pobreza, no entanto, em países de maior renda o crescimento econômico pode não significar uma melhora na qualidade de vida, uma vez que a população passa a ter acesso a qualquer tipo de produto (EGGER e SWINBURN, 2010). Dessa maneira, o

efeito da renda adicional à saúde dependerá de como essa renda é gasta, podendo ser gasta em bens e serviços que tem ou não um efeito negativo na saúde (LANGE & VOLLMER, 2017).

## 1.2 DEFINIÇÕES DE LINHAS DE POBREZA

Para classificar os indivíduos em pobres e não pobres faz-se necessário o uso de uma linha de corte que costuma ser influenciada por critérios científicos, administrativos, políticos, disponibilidade de dados ou por preferências dos pesquisadores (IBGE, 2017). No Brasil não há uma linha oficial de pobreza, no entanto, usam-se linhas chamadas de administrativas, que são utilizadas pelas políticas públicas, como por exemplo, as linhas do Programa Brasil sem Miséria (BRASIL, 2014b; IBGE, 2017), sendo R\$85,00 per capita por mês, para classificação de pobreza extrema e R\$170,00 para pobreza, em seus valores para o ano de 2016 (IBGE, 2017).

Dentre os pontos de corte de pobreza extrema internacional tem-se a classificação de pobreza absoluta, construída a partir dos 15 países mais pobres, estabelecida como indicador global e calculada pelo Banco Mundial, envolve o estabelecimento de uma renda mínima absoluta que é necessária para a sobrevivência e é medida através de pontos de corte de dólar por dia por pessoa (IBGE, 2017; WORLD BANK, 2018). O valor atual é de US\$ 1,90/dia e, apesar de ser calculada a partir dos países mais pobres, há uma relevância a nível mundial dessa linha, visto que o relatório global de acompanhamento da Agenda 2030 estimou que ainda haviam 767 milhões de

pessoas vivendo na pobreza extrema em 2013 (UNITED NATIONS, 2017). Aplicando esse critério nos dados da Pesquisa Nacional de Amostra por Domicílios (PNAD) Contínua indicaram que em 2016 aproximadamente 6,5% dos moradores de domicílios permanentes estavam em situação de pobreza extrema (IBGE, 2017).

Por outro lado, alguns países de nível de vida mais elevado, utilizam medidas de pobreza relativa, que é relacionada à posição do indivíduo em relação à sociedade que ele vive (FRITZELL *et al*, 2015), isto é, uma renda familiar 60% abaixo da média ou mediana (WORLD BANK, 2018). Esse tipo de medida geralmente varia pouco no tempo, sendo interpretada por alguns especialistas mais como uma medida de desigualdade do que de pobreza (FERES e VILLATORO, 2013).

A fim de complementar a linha de pobreza internacional de US\$ 1,90/dia, o Banco Mundial desenvolveu duas novas linhas, uma linha internacional de pobreza para países de renda média-baixa, fixada em US\$ 3,20/dia; e uma linha internacional de pobreza para países de renda média-alta, fixada em US\$ 5,50/dia (WORLD BANK, 2018). A partir da PNAD Contínua, utilizando a linha de US\$ 5,50/dia, que correspondia a R\$ 387,07 em 2016, observou-se 25,4% da população brasileira na situação de pobreza, com a menor incidência no Sul (12,3%) e maior no Nordeste (43,5%) (IBGE, 2017).

### 1.3 PADRÕES DE REFEIÇÕES

O interesse no campo da saúde pública em avaliar as tendências do consumo das refeições, tais como frequência, composição, combinação de alimentos e omissão vem aumentando ao longo dos anos (GATENBY, 1997; OLTERSDORF *et al*, 1999; SJÖBERG *et al*, 2003; BISOGNI *et al*, 2007; DESHMUKH-TASKAR *et al*, 2010; SCHOLDERER *et al*, 2013; DE OLIVEIRA SANTOS *et al*, 2015; BALTAR *et al*, 2018; DE OLIVEIRA SANTOS *et al*, 2018; GORGULHO *et al*, 2018). Essa abordagem se mostra útil em complementar o aconselhamento dietético, pois quando os indivíduos se alimentam, a combinação de alimentos é feita dentro de refeições com composições específicas, de modo que os indivíduos de diferentes culturas e diferentes grupos etários dão diferentes significados às suas refeições (ANDERSSON *et al*, 2003; HEARTY e GIBNEY, 2008; LEECH *et al*, 2015a; SANTOS *et al*, 2015). Além disso, muitos estudos indicam que a não realização de refeições traz prejuízos à saúde, pois vai de encontro com evidências de que o aumento do sobrepeso/obesidade é maior nos países pobres, segmento da população em que o acesso aos alimentos não é contínuo, muito menos é caracterizado como um padrão regular de refeições (MENDONÇA e ANJOS, 2004).

Neste âmbito, nota-se uma tendência das diretrizes alimentares se pautarem em refeições, como é o caso do mais recente Guia Alimentar para a população Brasileira, que traz exemplos de café da manhã, almoço, jantar e lanches intermediários (BRASIL, 2014a), facilitando a visualização de combinações de alimentos de maneira equilibrada ao nível de uma refeição e também o programa “*choose myplate*” do Departamento de

Agricultura dos Estados Unidos da América (*United States Department of Agriculture - USDA*) que ilustra a composição de um prato de uma maneira saudável com cinco grupos de alimentos (USDA, 2015), o que facilita a escolha dos alimentos nas refeições.

Em epidemiologia nutricional a análise do padrão alimentar é uma técnica reconhecida para avaliação do consumo como um todo (HU, 2002; KANT, 2004; HEARTY e GIBNEY, 2009; WILLIAMS *et al*, 2013). Dentre suas vantagens está a possibilidade da análise simultânea dos alimentos, que apresentam complexas combinações de nutrientes que interagem facilitando ou dificultando a absorção de outros nutrientes (NEWBY e TUCKER, 2004; MARCHIONI, 2007; OLINTO, 2007).

O padrão alimentar pode ser avaliado de maneira teórica ou empírica (NEWBY e TUCKER, 2004). Na abordagem empírica a análise é baseada nos dados obtidos da dieta (TRICHOPOULOS e LAGIOU, 2001; NEWBY e TUCKER, 2004) e técnicas estatísticas multivariadas para a identificação dos padrões são utilizadas (HU, 2002; OLINTO, 2007). De Oliveira Santos e colaboradores (2015) utilizando a abordagem empírica, tradicionalmente usada para avaliar a dieta como um todo, avaliaram as refeições café da manhã, almoço e jantar em uma amostra de base populacional da cidade de São Paulo e os autores encontraram diferentes padrões para cada refeição avaliada, mostrando de maneira mais detalhada como os alimentos foram combinados. Além disso, padrões separados por refeições também se mostraram associados a desfechos em saúde, tais como a associação positiva do padrão tradicional Brasileiro do almoço com o índice de Massa Corporal (IMC) (DE OLIVEIRA SANTOS *et al*, 2018) e papel protetor de alguns padrões de café da manhã na síndrome metabólica (MIN *et al*, 2012; YOO *et al*, 2014).

Na abordagem teórica as variáveis nutricionais (os alimentos, por exemplo) são agrupadas de acordo com o conhecimento prévio dos efeitos favoráveis e desfavoráveis dos constituintes da dieta à saúde (TRICHOPOULOS e LAGIOU, 2001; NEWBY e TUCKER, 2004). Assim, propõem-se índices de avaliação da qualidade da dieta baseados em critérios conceituais de alimentação saudável e de diretrizes nutricionais, a fim de classificar a dieta como mais e menos saudável (HU, 2002; NEWBY e TUCKER, 2004; OLINTO, 2007).

#### 1.4 QUALIDADE DAS REFEIÇÕES

Até o presente momento, foram elaborados nove índices de qualidade da refeição. Gorgulho e colaboradores (2016a) fizeram um levantamento dos índices desenvolvidos para avaliar a qualidade das refeições, e encontraram sete índices distintos, dois desenvolvidos para avaliar o café da manhã, três desenvolvidos para o almoço, um para o jantar e um destinado para todas as refeições e lanches intermediários. Os índices encontrados foram destinados para populações específicas, tais como crianças, adolescentes (SABINSKY et al, 2012; MONTEAGUDO et al, 2013), trabalhadores (BANDONI e JAIME, 2008; LASSEN et al, 2010), consumidores da dieta mediterrânea (VAN DEN BOOM et al, 2006) ou para populações de países específicos tais como Suécia (WISSING et al, 1998) e Estados Unidos (FULKERSON et al, 2012). Dessa maneira os autores da revisão sistemática alertaram sobre a necessidade da elaboração de um indicador único para a avaliação da qualidade da



refeição que permita a comparação do consumo de alimentos a nível populacional de países distintos (GORGULHO et al, 2016a).

A fim de preencher a lacuna da falta de índices que possam ser aplicados em diferentes populações, pesquisadores desenvolveram um índice baseado em recomendações internacionais, o *Main Meal Quality Index* (MMQI) (GORGULHO et al, 2016b). Este índice foi aplicado e validado em amostra representativa de adultos de dois países com nível de desenvolvimento distintos, Brasil e Reino Unido, e encontraram que a qualidade da refeição principal do Brasil foi superior à qualidade do Reino Unido (GORGULHO et al, 2017).

No entanto, o MMQI foi desenvolvido para avaliar a qualidade do almoço e do jantar (GORGULHO et al, 2016b), sendo assim, faz-se necessário o desenvolvimento de um índice similar para avaliar a qualidade do café da manhã de populações distintas, tendo em vista que se trata de uma importante refeição e é comumente relacionada na literatura com estilo de vida mais saudável protegendo contra efeitos adversos à saúde (SMITH et al, 2010; BI et al, 2015; DHURANDHAR, 2016). Vale ressaltar, que Pereira e colaboradores (2017) propuseram um índice de qualidade do café da manhã, no entanto, o índice foi desenvolvido e destinado apenas à população brasileira.

## 1.5 DEFINIÇÃO DE REFEIÇÃO

Apesar da reconhecida importância do estudo das refeições há uma complexidade na sua terminologia, significado e definição. Originalmente são descritas

de maneira neutra como ocasiões alimentares, ou eventos alimentares, que integram qualquer ocasião onde são ingeridos alimentos ou bebidas, sem distinção de horário, frequência e quantidade (LEECH *et al*, 2015a).

Os pesquisadores ocidentais tem usado o termo “refeições” de tal forma que significa um evento alimentar regular ou planejado que envolve múltiplos alimentos mais uma bebida, que tem uma estrutura ou sequência de pratos, e que geralmente envolve uma dimensão social (DOUGLAS e NICOD, 1974; MURCOTT, 1982; MEISELMAN, 2008), sendo dividida em café da manhã, almoço e jantar (LEECH *et al*, 2015a). Em contraste, os “lanches” são refeições de pequeno porte (LEECH *et al*, 2015a) e geralmente têm sido caracterizados como não planejado, envolvendo tanto um alimento, como um indivíduo (MARSHALL e BELL, 2003). Mas na literatura científica a definição de refeição ainda é controversa, não havendo uma definição única que possa ser utilizada nos estudos epidemiológicos, que por sua vez acabam utilizando definições variadas, dificultando a comparação entre populações.

Entre as definições mais comuns estão àquelas elaboradas a partir do horário de consumo, dos alimentos consumidos, do valor energético e do auto-relato (GATENBY, 1997; ANDERSSON *et al*, 2003; BELLISLE *et al*, 2003; LEECH *et al*, 2015b). Um estudo recente agrupou estudos que demonstraram o impacto da definição da refeição no consumo dos nutrientes e na qualidade da dieta. Os autores concluíram que dependendo da definição escolhida se podem encontrar resultados distintos (LEECH *et al*, 2015a). Os mesmos autores compararam o impacto de oito diferentes definições de refeições na geração de padrões de refeições, e encontraram diferenças nos resultados, concluindo que se faz necessário o estudo de especificidade entre as definições de refeições (LEECH *et al*, 2015b).

## 2. JUSTIFICATIVA

Os padrões alimentares dos indivíduos são amplamente estudados, e muitos estudos demonstram o efeito que a renda tem na nutrição da população. É sabido que indivíduos de baixa renda realizam menos refeições por dia, não chegando muitas vezes a realizar o mínimo de três refeições diárias, além disso, o crescimento econômico pode ter impactos negativos na dieta de indivíduos de baixa renda com um possível acesso a alimentos com elevados teores de gordura e açúcar. Assim, investigar o consumo em países de diferentes níveis socioeconômicos pode elucidar questões relacionadas principalmente ao acesso aos alimentos.

Visto que as refeições discriminam com mais acuidade o padrão alimentar dos indivíduos, a comparação dos padrões de refeições entre Brasil e Reino Unido pode gerar subsídios para facilitar a modificação da dieta dos brasileiros em situação de pobreza, uma vez que o aconselhamento dietético baseado em refeições gera ao indivíduo um melhor direcionamento na modificação do seu padrão alimentar, sendo mais fácil modificar refeições específicas do que incluir alimentos soltos no dia alimentar. No entanto, para isso é necessário o desenvolvimento de um índice de qualidade do café da manhã aplicável a populações distintas que possibilite a comparabilidade entre eles, além de um levantamento das definições de refeições existentes na literatura.

### **3. OBJETIVOS**

#### **3.1 OBJETIVO GERAL**

Estudar os padrões de refeições de indivíduos adultos em situação de pobreza no Brasil (2008-2009) e no Reino Unido (2008-2009).

#### **3.2 OBJETIVOS ESPECÍFICOS**

- a) Realizar revisão sistemática das definições de café da manhã, almoço e jantar;
- b) Adaptar um índice de qualidade do café da manhã;
- c) Comparar o padrão de refeições de adultos em situação de pobreza do Brasil e Reino Unido.

## 4. MATERIAIS E MÉTODOS

### 4.1 MATERIAIS

Para alcançar os objetivos propostos, a presente tese utilizou dados de dois estudos transversais de base populacional, um estudo Brasileiro e um Britânico: 1º) Inquérito Nacional de Alimentação (INA), realizado durante a Pesquisa de Orçamentos Familiares – POF 2008/09 e 2º) *National Diet and Nutrition Survey (NDNS 2008/09)*.

#### 4.1.1 INA/POF 2008/09

Os dados do “Inquérito Nacional de Alimentação/Pesquisa de Orçamentos Familiares – INA/POF 2008/09: Análise do consumo alimentar pessoal do Brasil”, realizado pelo Instituto Brasileiro de Geografia e Estatística (IBGE) foram utilizados no segundo e terceiro artigos (IBGE, 2011). A POF 2008/09 visa, principalmente, mensurar as estruturas de consumo, gastos, rendimento e parte da variação patrimonial das famílias, incluindo dados de consumo alimentar individual, os quais foram coletados em uma subamostra (INA).

A POF foi realizada durante um período de 12 meses, com início em 19 de Maio de 2008 e término em 18 de Maio de 2009, tendo como população de estudo os

residentes no Brasil, com dez anos ou mais de idade. Do total de 55.970 domicílios selecionados para a POF 2008/09, uma subamostra de 24,3% (13.569) dos domicílios da amostra original foi selecionada de forma aleatória para participar do INA. A subamostra permitiu a construção de resultados segundo o sexo (masculino e feminino), grupo etário (de 10 a 19 anos de idade: adolescentes; de 20 a 59 anos de idade: adultos; 60 anos de idade e mais: idosos), grandes regiões (Norte, Nordeste, Centro-Oeste, Sudeste e Sul), situação do domicílio (urbano ou rural) e estratos de renda familiar (IBGE, 2011). As informações sobre o consumo alimentar individual foram obtidas de forma direta, através de entrevista, junto aos moradores residentes nos domicílios selecionados.

O consumo alimentar foi estimado por meio de dois dias não consecutivos de registros alimentares, nos quais o indivíduo relatava todos os alimentos e bebidas consumidos nos dias pré-determinados, o horário, as quantidades consumidas em unidades de medidas caseiras, a forma de preparação, bem como a fonte do alimento (dentro ou fora do domicílio). Adicionalmente, foram coletadas informações sobre o consumo de açúcar e/ou adoçante. Quando o informante estava impedido de preencher os seus registros alimentares, estes foram completados com o auxílio de outro morador do domicílio ou uma pessoa indicada pelo entrevistado (IBGE, 2011).

Um total de 34.003 indivíduos, de ambos os sexos e acima de dez anos de idade, participaram da avaliação do consumo alimentar individual e preencheram os dados de ingestão de alimentos e/ou bebidas.

#### 4.1.2 Inquérito Nacional de Alimentação e Nutrição 2008/09

(*National Diet and Nutrition Survey*, NDNS)

Para avaliar a qualidade das refeições no Reino Unido, disposto no terceiro artigo, foram utilizados dados do “*National Diet and Nutrition Survey*” (NDNS). O NDNS realizado entre os anos de 2008/09 e 2011/12 é uma pesquisa para avaliar a dieta, o consumo de nutrientes e o estado nutricional da população do Reino Unido.

O estudo coletou dados representativos do Reino Unido, com amostra de 1000 pessoas por ano, 500 adultos (com 19 anos ou mais) e 500 crianças (com idades entre 1,5-18 anos), sendo o primeiro ano de coleta em 2009, segundo em 2010 e terceiro em 2011 e quarto em 2012. A amostragem foi realizada por conglomerados em dois estágios, sendo o primeiro formado pelos setores censitários (unidades primárias de amostragem) determinados com base no arquivo de códigos postais de todos os endereços do Reino Unido, e o segundo pelos domicílios (unidades secundárias de amostragem), que foram selecionados por sorteio aleatório em cada setor. Considerando os quatro anos de coleta, a amostra final foi composta 9.990 domicílios, distribuídos em 370 setores censitários. Detalhes da metodologia do NDNS foram descritos e publicados pelo Departamento de Saúde do Reino Unido (DEPARTMENT OF HEALTH, 2013).

O consumo alimentar foi medido por meio do autopreenchimento de registros alimentares, sendo quatro medidas (dois dias de semana e dois de final de semana). Orientou-se a anotação sob a forma de medidas caseiras, o preenchimento dos horários e locais das refeições (dentro ou fora do lar), e a descrição detalhada de todos os alimentos e bebidas consumidos; incluindo o modo de preparo, os ingredientes e as

marcas comerciais. O controle de qualidade na coleta dos dados dietéticos foi realizado pelos entrevistadores treinados, que revisaram as informações contidas nos registros alimentares a fim de detectar falhas no preenchimento e proceder às correções necessárias. Itens comumente omitidos como balas e doces em geral, além de bebidas como cafés e refrigerantes, tiveram seu consumo investigado pelo entrevistador.

## 4.2 MÉTODOS

Para atingir os objetivos propostos foram realizados três artigos. No primeiro foi feita uma revisão sistemática com o levantamento das definições de refeições (café da manhã, almoço e jantar) mais utilizadas na literatura; em seguida foi adaptado um índice para avaliação da qualidade do Café da Manhã, o *Breakfast Meal Quality Index*, e por último foi feita uma comparação da qualidade das refeições de indivíduos em situação de pobreza do Brasil e Reino Unido.

Detalhes sobre os métodos utilizados em cada estudo estão elucidados em cada artigo na seção Resultados.

O presente trabalho foi aprovado pelo Comitê de Ética em Pesquisa da Faculdade de Saúde Pública da Universidade de São Paulo pelo parecer número 2.728.290.



## 5. RESULTADOS E DISCUSSÃO

Os resultados e discussões da presente tese são apresentados na forma de três manuscritos. A seguir estão os principais achados em cada manuscrito.

O primeiro manuscrito foi intitulado *“How main meals are defined? a systematic review of breakfast, lunch and dinner’s definitions”*. Dentre os principais achados foram o levantamento de vinte e uma definições de refeições diferentes, das quais utilizaram desde um critério a quatro critérios simultaneamente na determinação da refeição. As três definições de refeição mais frequentemente usadas nos estudos foram “eventos pré-determinados” (61,5% dos estudos incluídos), “auto-relato” (13,1%) e “hora do dia” (7,8%). Dentre as considerações finais do presente estudo estão de que levando em consideração o grande número de definições distintas, é necessário um consenso sobre qual a melhor definição, a fim de tornar os resultados dos estudos comparáveis.

O Segundo manuscrito foi intitulado *“Design of quality index for breakfast meal”*. Dentre os principais achados do artigo, o BMQI foi associado positivamente com nutrientes marcadores de uma dieta saudável, tais como fibras, vitaminas e minerais e negativamente com marcadores de uma dieta não saudável, dentre eles gorduras, colesterol e açúcar de adição. O índice apresentou associação inversa com o IMC, demonstrando sua habilidade de se associar com importantes desfechos em saúde. Com relação às conclusões, o BMQI identificou a qualidade do café da manhã, e se mostrou útil para avaliar, monitorar e comparar a qualidade dessa refeição.

O terceiro e último manuscrito foi intitulado “*Meal patterns of individuals in relative poverty: a comparison between Brazil and the United Kingdom*”. Os principais achados foram que os brasileiros em situação de pobreza relativa omitiram menos refeições, apresentaram menor frequência alimentar, e apresentaram melhor qualidade do almoço e do jantar, além de melhores escores para marcadores de dietas não saudáveis, quando comparados aos indivíduos do Reino Unido. Desse modo, os resultados sugerem o possível impacto do nível de desenvolvimento em cada país.

## 5.1 PRIMEIRO MANUSCRITO

### HOW MAIN MEALS ARE DEFINED? A SYSTEMATIC REVIEW OF BREAKFAST, LUNCH AND DINNER'S DEFINITIONS

#### ABSTRACT

**Background:** Meal definition on scientific literature is still controversial and inconsistent. There is no unique definition that is used in all epidemiological studies.

**Objectives:** The purpose of this systematic review was to examine the published literature for breakfast, lunch and dinner definitions. **Method:** Computer-assisted searches for Portuguese and English language publications in the PubMed, The

Cochrane Library, Lilacs, SciELO and Google Scholar databases were conducted and references cited in related publications were reviewed. After searching in databases, duplicated articles were removed. **Results:** The present review showed twenty one

distinct definitions of meals ranging between one to four criteria used simultaneously.

The most used meal definitions were “pre-determined eating events” (61.5% of the studies), “self-report” (13.1%) and “time-of-day” (7.8%). **Considerations:** Taking into

consideration the number of different meals definitions, a consensus is needed on their standardization. Furthermore, more studies are necessary to determine the best meals' definitions avoiding the use of new criterions for each new study on meal.

**Keywords:** meal definition; breakfast; lunch; dinner; meals; Systematic review.

## **INTRODUCTION**

The number of studies of the meals has increased rapidly in the last years<sup>1-7</sup> and despite its importance; there is a complexity in meals' terminology, meaning and definition<sup>2</sup>. Western researchers have used the term "meals" with the meaning of a regular or planned eating event involving multiple foods plus a beverage, which has a structure or sequence of dishes, and generally involves a social dimension<sup>8,9</sup>. The main meals are usually divided in breakfast, lunch and dinner, taking into account the temporal distribution<sup>2,10</sup>. However, meal definition on scientific literature is still controversial and inconsistent. There is no unique definition that is used in all epidemiological studies, resulting in a variety of definitions available which may result in different inferences<sup>10</sup>.

Lech et al<sup>2</sup> reviewed the literature on adults' meal patterns, including how meal patterns have been defined and found four criteria that were used frequently: time-of-day, participant-identified, food-based classification and neutral. The authors concluded that further studies are needed to standardize these classifications. It is necessary to emphasize that the search was not systematic and may have missed some definition, thus it is important to know all definitions used in literature. The purpose of this systematic review is to help researchers on the decision-making, based on what was done in other studies.

## **METHODS**

### **Search strategy and search terms**

The systematic steps outlined in the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA)<sup>11</sup> guidelines were followed in this review (Additional file 1).

A systematic literature search was performed to identify how breakfast, lunch and dinner are defined using a priori specified inclusion and exclusion criteria. An electronic literature search was performed in four databases: PubMed, The Cochrane Library, Lilacs, SciELO. Google Scholar was searched to identify any relevant tools or papers in the grey literature. The keywords searched were: “meal definition” OR “meal classification” OR “meal timing” OR “breakfast definition” OR “breakfast classification” OR “breakfast timing” OR “lunch definition” OR “lunch classification” OR “lunch timing” OR “dinner definition” OR “dinner classification” OR “dinner timing” OR “eating event” OR “eating definition” OR “eating classification” OR “eating occasion” OR “eating timing” OR “neutral event” OR “times slot of consumption”. Furthermore, the reference lists of all identified studies were hand searched individually by the reviewers to supplement the electronic search, and they were subsequently checked for eligibility.

### **Inclusion and exclusion criteria**

For studies to be included, the following inclusion criteria were used: (1) studies evaluating breakfast and/or lunch and/or dinner; indeed, (2) the studies needed to report how these meals were defined; (3) involving only human research; (4) observational studies, cohort studies and experimental studies; (5) studies written in English or Portuguese languages; (6) studies published between 1965 and August 2018. The following exclusion criteria were used: (1) studies that meal time was imposed; (2) studies involving institutional meals; (3) studies that analyzed main meals without differentiation between breakfasts, lunch or dinner; (4) systematic review, meta-analysis, letters to the editor, and conference proceedings/abstracts.

## **Study selection process**

After searching in databases, duplicated articles were removed. All studies identified through database search were screened to assess whether inclusion criteria were met in the review based on the information contained in the title and abstract by two independent reviewers (ROS and BMG). The process for selecting studies for inclusion in this review is detailed in Figure 1. Study methodology were retrieved when title and abstract was unclear to make conclusions about inclusion. In any cases of uncertainty concerning the inclusion of a study, a third independent reviewer (VTB) was consulted until a consensus. For all studies that meet the inclusion criteria, the full articles were retrieved.

## **Data extraction and tabulation of studies**

To systematize the data extraction for the present review, standardized spreadsheets were developed. Summary of the findings is shown in Tables 1.

## **Assessment of study quality**

All identified studies that meet inclusion and exclusion criteria were assessed for methodological quality by two independent reviewers. The criteria taken into account were: the authors described the definition clearly, the paper was published in an indexed magazine and the articles were properly classified. A third independent reviewer assessed studies when there was disagreement about the quality of the data extracted. In order to check the quality of data extraction a spreadsheets containing detailed information from each article was developed, in order to allow a comprehensive analysis of the meal definitions. The following information was extracted from each

included study: country where the study was conducted, study population, instrument of data collection, type of meal and meal definition.

### **Definitions classification**

The meal definitions were classified based on the number of different criteria reported by the authors.

## **RESULTS AND DISCUSSION**

### *Studies included in the systematic review / Summary of studies and their characteristics*

The flow diagram of the systematic search is presented in Figure 1. The literature search resulted in 4,684 citations. In the initial screening 1,136 duplicated articles and 3,103 references based on title were excluded. The second screening removed 141 references based on the contents of the abstract and 100 references based on methods section. New studies were identified (n=79) after hand-searching the list of references from the selected papers and these were included in the review. A total of 283 studies were included in this review.

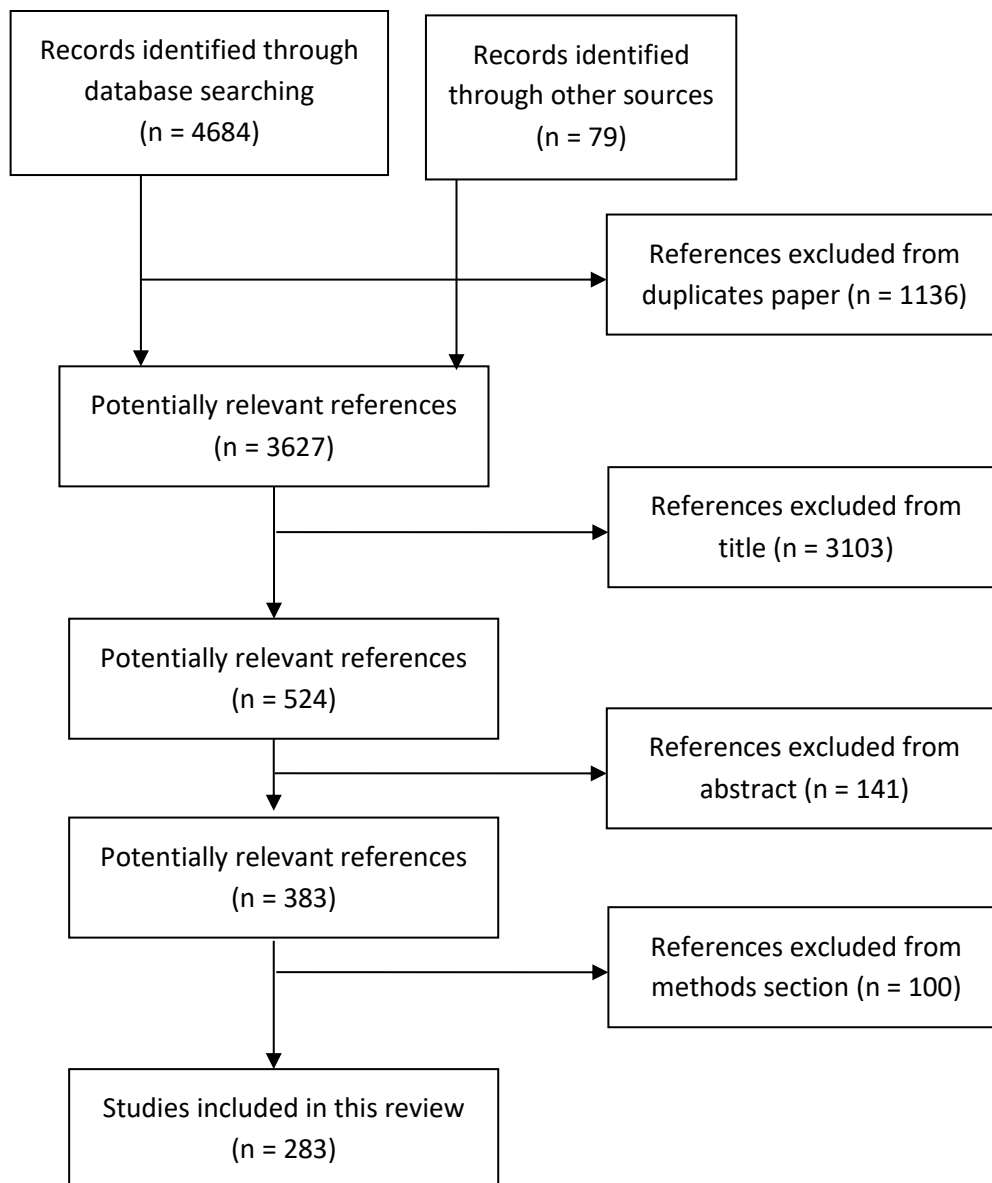


Figure 1. Flow diagram illustrating the study selection process in the systematic review.

## Principal findings

The present review showed twenty one distinct definitions of meal, that range among one to four criteria and “pre-determined eating events” was the definition more frequently used. The meal with a higher number of studies was the breakfast, followed



by dinner and lunch, respectively (Table 1). All the identified definitions will be discussed below.

Table 1. Summary of findings for the type of definition with type of meal (n=283 studies)

Number of criteria	Definition	Total studies		Type of Meal					
				Breakfast		Lunch		Dinner	
		n	%	n	%	n	%	n	%
One criterion	Pre-determined eating events (PDEE)	174	61.5	153	59.5	66	64.1	89	71.8
	Self-report (SR)	37	13.1	36	14.0	22	21.4	20	16.1
	Time-of-day	22	7.8	22	8.6	6	5.8	6	4.8
	Period of the day	8	2.8	8	3.1	0	0.0	0	0.0
	Composition	1	0.4	1	0.4	0	0.0	0	0.0
Two criteria	PDEE + Composition	10	3.5	10	3.9	1	1.0	1	0.8
	Time-of-day + Period of the day	5	1.8	5	1.9	0	0.0	0	0.0
	Time-of-day + Energy	4	1.4	4	1.6	0	0.0	0	0.0
	Time-of-day + Largest occasion of the day	3	1.1	0	0.0	2	1.9	2	1.6
	Time-of-day + Solid item	2	0.7	2	0.8	0	0.0	0	0.0
	Time-of-day + Composition	2	0.7	2	0.8	1	1.0	1	0.8
	Time-of-day + PDEE	2	0.7	1	0.4	0	0.0	1	0.8
	Time-of-day + SR	1	0.4	1	0.4	1	1.0	0	0.0
	SR + Interval between occasions (IBO)	1	0.4	1	0.4	1	1.0	1	0.8
	PDEE + Period of the day	1	0.4	1	0.4	0	0.0	0	0.0
Three criteria	Time-of-day + Period of the day + Solid item	1	0.4	1	0.4	0	0.0	0	0.0
	Time-of-day + Period of the day + Energy	1	0.4	1	0.4	0	0.0	0	0.0
	Time-of-day + Energy + IBO	1	0.4	1	0.4	1	1.0	1	0.8
	Time-of-day + Energy + Largest occasion	1	0.4	1	0.4	0	0.0	0	0.0
Four criteria	SR + Largest occasion + IBO + Time-of-day	1	0.4	1	0.4	1	1.0	1	0.8
	SR + Largest occasion + IBO + Energy	1	0.4	1	0.4	0	0.0	0	0.0
Different definitions		4	1.4	4	1.6	1	1.0	1	0.8
<b>Total</b>		<b>283</b>	<b>100.0</b>	<b>257</b>	<b>100.0</b>	<b>103</b>	<b>100.0</b>	<b>124</b>	<b>100.0</b>

PDEE: Pre-determined eating events;

SR: Self-report;

IBO: Interval between occasions

### One criterion definition

#### *Pre-determined eating events*

More than half of the studies retrieved (61.5%) used the definition of “pre-determined eating events”<sup>12-185</sup>. This approach is chosen prior to data collection, that is, studies that

were designed to evaluate a specific meal, once closed ended questions are used to ask participants' characteristics of meals<sup>12,13,30-32,38-42,97,98</sup>. The names of the meals are pre-defined and closed questions are asked, as for example, "number of days per week they ate breakfast and/or lunch"<sup>45</sup> or "how often they usually eat breakfast"<sup>25</sup>. Another way to investigate meals using this definition is to ask participants to identify in their day which eating occasions fit into a particular nomenclature, a list of names is presented and the participant should choose which name is the best for their eating occasion<sup>127,171,185</sup>: "in the 24-hour recalls, participants were asked to nominate the meal at which each food item was consumed, from a list of seven options which included breakfast"<sup>37</sup>. With this definition, the researcher assumes a priori that all interviewees name the meals in the same way. It is possible to use it if the decision by this definition is taken in the study design.

### *Self-report*

We identified 37 studies (13.1%) that used self-report question to identify the meal. In these studies, the participant gave a name to meal that usually is reported in studies as breakfast, lunch or dinner<sup>1,6,7,186-219</sup>. Only two studies reported the question used: "What name would you give to this meal?"<sup>1,7</sup>. In this method, is avoided the imposition of a nomenclature and the participants are free to give a name that they considerate their meal. It was possible to observe that the names given are the same usually used in studies that used the approach "pre-determined eating events".

### *Time-of-day*

This approach (found in 7.8% articles) is usual in studies that did not have intention a priori to evaluate meals, but the time of consumption was collected in 24 hour recall or

questionnaires<sup>220-241</sup>. The choice of the time slot of consumption varied among the studies. For the breakfast some studies used different time slots for weekdays and weekend as “between 6:00-10:00 during weekdays and between 6:00-11:00 for the weekends and holidays”<sup>223</sup>, “between 5:00-10:00 weekdays and between 5:00-11:00 during weekends”<sup>226,227,229</sup>, “foods and/or beverages consumed within the first 2 hours after waking up in the morning on weekdays and anything consumed before 11:00 on weekends”<sup>241</sup>.

Or time-of-day without differentiation of weekdays or weekend, was also used: “between 05:00-9:00”<sup>220</sup>, “between 05:00-9:30”<sup>238</sup>, “between 05:00-10:00”<sup>222,237</sup>, “between 05:00-11:00”<sup>240</sup>, “between 06:00-8h59”<sup>224,239</sup>, “between 06:00-9:00”<sup>228,230,231</sup>, “between 06:00-10:00”<sup>232</sup>, “between 06:00-11:00”<sup>221</sup>, “before 9:30”<sup>225</sup>, “before 10:00”<sup>234</sup>, “any food consumed within two hours of waking”<sup>236</sup>. Some researchers considered only energy food as in “energy containing food or beverage between 05:00 and 09:30”<sup>223</sup> and “any food or beverage, excluding water, before 10:00”<sup>235</sup>.

For the lunch there was no differentiation between weekdays or weekends: “between 11:00-13:59”<sup>224</sup>, “between 11:00-14:00”<sup>230</sup>, “between 11:00-15:00”<sup>221,237</sup>, “between 12:00-13:59”<sup>239</sup> and “between 12:00-16:00”<sup>240</sup>. And for the dinner: “between 16:00-19:59”<sup>224</sup>, “between 17:00-19:59”<sup>239</sup>, “between 17:00-21:00”<sup>221</sup>, “between 17:00-22:00”<sup>237</sup>, “between 17:00-23:00”<sup>240</sup>, “between 18:00-21:00”<sup>230</sup>.

This approach is useful for studies that were not designed to evaluate meals, but the time information is available. It is important to considerate that cut-point of the time is a subjective choice, some researchers used the own database to get the cut-point of time of the meals<sup>242</sup>. On the other hand, if the researcher use only this approach, it is possible to find more than one eating occasion in this time range, and beyond that, if the

interviewed got their meal out of this time range, the meal will be misclassified as skipped.

### *Period of the day*

The definition “Period of the day” was used by eight studies (2,8%)<sup>243-250</sup> with different statements. Three of them considered breakfast as “the first meal of the day after waking”<sup>243-245</sup>. Sun et al<sup>248</sup> put a limit in this definition “any food or beverage consumption between awakening and 45 minutes after the start of school”, and Radcliffe et al<sup>246</sup> established the final point as “the commencement of morning school classes (approximately 9.00)”. Min et al<sup>249</sup> considered the breakfast the meal eaten in the morning: “any food or beverages consumed in the morning were classified as breakfast” e Raaijmakers et al<sup>250</sup> reported that “Breakfast was defined as any foods or drinks consumed before the first school break”.

### *Composition*

Only one study defined the meal, breakfast, based on composition and the authors considered as reference a serving of milk: “a breakfast meal should constitute a mixture of foods or a food that approximately yields or exceeds the macronutrient values of 1 serving of milk”<sup>251</sup>

### *Two criteria definition*

#### *Pre-determined eating events plus Composition*

Ten studies (3.5%) used “pre-determined eating events plus composition” definition<sup>252-262</sup>. In this approach the researcher has a priori an idea of how the meal is composed and it was used in studies that were designed to evaluate meals, since it uses pre-determined

eating events in closed questions; and the participant needs to identify the name of the meal based on composition. Two studies determined a well-balanced breakfast and considered a complete meal that was composed by carbohydrate, protein and vitamins and minerals sources<sup>255,258</sup>, as it was observed in this question: “How frequently does your child take a nutritionally well-balanced breakfast that consists of carbohydrates, a main dish (protein resources) and a side dish (vitamin and minerals)”<sup>258</sup>. Breakfast was, also, defined “as having more than a glass of milk or fruit juice” in six studies<sup>252,254,256,257,260,261</sup> and “more than coffee or tea” in one study<sup>259</sup>. Levin et al<sup>254</sup> studied the changes in daily breakfast consumption among adolescents in Scotland, and used data from 1994-2010, and the way that breakfast consumption was collected changed through the years, between 1994 and 1998, this information was collected using the single question “During a normal week, how often do you usually have breakfast (with cereal, bread or cooked food)?”, and in the following years, 2002-2010, the question was “How often do you usually have breakfast (more than a glass of milk or fruit juice)?”.

Lunch and dinner was evaluated in one study and the composition considered was “a proper meal in the middle of the day” and “a proper meal in the evening”, respectively<sup>256</sup>.

Studies that were designed to evaluate frequency of meals used this approach, and its use ensures that meals which did not reach the composition considered as meal by the researcher is not considered meal by the participant.

#### *Time-of-day plus Period of the day*

The definition “Time-of-day plus period of the day” was used to define breakfast and considered the first occasion of the day plus a cut-points of the time that varied

between weekdays and weekends: “first meal of the day, at whatever hour but always before 11:00”<sup>262</sup>, “first eating occasion that occurred after waking up and before 10:00 during weekdays and before 11:00 on the weekends”<sup>263</sup>, “the first meal of the day that has been taken in the morning, before going to school (i.e., before 9:00)”<sup>264</sup>, “first things the participant ate and/or drank within 2h after getting up in the morning. During the weekend, breakfast was considered as anything the participant drank and/or ate before 11.00”<sup>265</sup>, “first meal of the day eaten after waking up and before 11:00 (on weekdays) or 11:30 (on weekends)”<sup>266</sup>. The association of the time interval in definition of “first occasion of the day” avoids considering the meals taken in the late period, which might be lunch.

#### *Time-of-day plus Energy*

The difference of definition “Time-of-day plus energy” is the use of energy (>100kcal) as a determinant in time interval: “any food or beverage consumed between 5:00 and 10:00 with a combined total energy  $\geq 100$  kcal”<sup>267,268</sup>, “consuming >418.4 kJ (>100 kcal) in the first time slot of the food diary”<sup>269</sup> and “at least 418 kJ (100 kcal) consumed between 06.00 and 08.59”<sup>270</sup>. According to Pot et al<sup>269</sup>, this approach avoids the inclusion of only a cup of tea or coffee with milk.

#### *Time-of-day plus Largest occasion*

In order to avoid taking more than one eating occasion at the time slot, authors have used the definition “Time-of-day plus largest occasion”. This definition was used in two distinct way, as the largest occasion of the day<sup>271</sup>: “Meals were named in according to the time slot, and the main meal of the day was defined as the meal that most contributed with energy during the day: in this case, dinner (18:00–21:00)” and as the

largest occasion occurred between the time slot<sup>4,5</sup>: “lunch was defined as the food event with the highest energy content that occurred between 11:00 and 15:00”.

#### *Time-of-day plus Solid item*

Two studies did not consider beverages to define breakfast: “breakfast, defined as a solid item of food taken before attending school or before 11.00 hours at weekends”<sup>272</sup> and “Breakfast was defined as all food used between 5:00 and 10:00 (without inclusion of drinks)”<sup>273</sup>. If the participant took only one cup of milk, breakfast was considered absent.

#### *Time-of-day plus Composition*

In studies that were not designed to evaluate meals, the researchers combine hour and composition assuming that a meal containing determined foods are breakfast, lunch or dinner in a time range: “Breakfast: A meal eaten between 06:00- 10:00 consisting of a breakfast food (eg. Cereal, toast, bread, bacon, egg, fruit etc.). Lunch: A meal eaten between 11:00-15:00 consisting of 2 or more foods. Dinner: A meal eaten between 16:00-22:00 consisting of 2 or more foods”<sup>274</sup>.

Lazzarou & Matalas<sup>275</sup> studied breakfast and used the time of school classes on weekdays and two hours after wake up on weekends: “any food eaten and drunk before the commencement of school classes. On weekends, breakfast was considered to be anything eaten and drunk within two hours after rising in the morning. Examples of typical breakfasts were given, having just a glass of milk or juice was considered a breakfast, whereas having only a cup of tea was not accepted as breakfast”.

### *Time-of-day plus Pre-determined eating events*

Two studies used a closed question with pre-determined eating events (breakfast, lunch and dinner) and included an explanation based on the hour of consumption to exemplify the meal: “‘how many schooldays per week [0–5] and how many weekend days [0–2] they normally had breakfast’, that was defined as items consumed within two hours after getting up in the morning during school days and before 11:00 on weekends”<sup>276</sup> and “‘to list foods eaten at breakfast, lunch, dinner’. An instruction sheet defining each meal was given together with the food record: breakfast was defined as the meal consumed after waking up; lunch as the meal consumed from 12:00 to 15:00; dinner as the meal consumed from 19:00 to 22:00”<sup>277</sup>.

### *Time-of-day plus Self-report*

Codon et al<sup>278</sup> considered the breakfast and lunch based on self-report of the participant in specific times range: “All foods reported between 5:00 and 9:30, and foods reported between 9:30 and 10:30 that were reported as being part of breakfast, were counted as breakfast foods. ‘Lunch’ included all foods reported between 10:00 and 14:00, unless reported as breakfast; all foods reported between 9:30 and 10:00 that were reported as lunch, supper, or dinner; and all foods reported between 14:00 and 15:30 that were reported as being part of lunch”.

### *Self-report plus Interval between occasions (IBO)*

Definition that combines “self-report plus interval between occasions” was used by Piernas & Popkin<sup>279</sup>: “Eating occasions are defined as a combination of self-reported breakfast, lunch and dinner. Items consumed within a 15-min period were combined as



a single eating occasion”. This definition solves the problem with multiple eating occasions in a short time.

*Pre-determined eating events plus Period of the day*

Similar to the previous definition, this approach considered breakfast “as any food or drinks consumed before the first school break”, but the authors used closed questions with the label breakfast: “how many days per week they habitually ate breakfast at home” and one asking on “how many days per week they took breakfast with them, when not consuming breakfast at home”<sup>280</sup>.

Three criteria definition

*Time-of-day plus Period of the day plus Solid item*

Macdiarmid et al<sup>281</sup> used three criteria to define breakfast: “Breakfast was defined as the first eating event of the day that included a solid food item up to and including 9:00 on school days or 11:00 on weekend days or during school holidays”. The authors did not consider beverages.

*Time-of-day plus Period of the day plus Energy*

One study determined the time range based on the individuals consumption and defined breakfast combining it with two other parameters: “An eating occasion was defined as all food and beverages containing >0 kcal; breakfast was defined as the first eating occasion between 6:00 and 9:59 (consumed by majority of individuals - 96%)”<sup>242</sup>.

*Time-of-day plus Energy plus Interval between occasions*

Definition combining “Time-of-day plus energy plus interval between occasions” was used by one study: “In order to be classified as an individual, meal at least 50 Kcal had to be consumed, or more stringently 150 or 250 Kcal. Also, there had to be at least 15 minutes since the termination of the prior meal; to investigate meals occurring during the breakfast period (6:00-11:00) lunch period (11:00-15:00), and dinner period (17:00-23:00)”<sup>282</sup>.

*Time-of-day plus Energy plus Largest occasion*

Baltar et al<sup>283</sup> decided to use “Time-of-day plus energy plus largest occasion to study breakfast patterns: “was defined as the eating occasion between 5:00 and 10:00 with the highest usual food consumption (exceeding 50Kcal/209.2kJ)”.

*Four criteria definition*

*Self-report plus Largest occasion plus Interval between occasions plus Time-of-day*

Definition using “self-report plus largest occasion plus interval between occasions plus Time-of-day” was used by Huang et al<sup>284</sup>: “Subjects reported the type of eating occasion at which each food was consumed. If two or more meals (breakfast, lunch or dinner) of the same eating occasion were reported within 59 minutes of each other, they were considered one meal and combined, using the average of the consumption times. Otherwise, the occasion with the largest energy content was coded as a meal. Brunch was coded as breakfast if it occurred before 11:00 and lunch if it occurred between 11:00 and 16:00”.

*Self-report plus Largest occasion plus Interval between occasions plus Energy*

Smith et al<sup>285</sup> used four criteria to define breakfast: “Participants were classified as a breakfast consumer if they defined an eating occasion as ‘breakfast’ and the energy intake for that eating occasion was at least 210kJ. If two breakfast meals were consumed within 15 minutes, they were combined and counted as the same meal. If two eating occasions identified as breakfast were consumed more than 15 minutes apart, the meal with the highest energy intake was used to calculate the percentage of daily energy provided by breakfast”.

*Multiples definitions*

Four studies evaluated meals by different ways, so they used more than one definition<sup>3,286-288</sup>. Alexy et al<sup>286</sup> evaluated the quality of breakfast and considered “any eating occasion between 05:00 and 08:59 with >10 min between them” and evaluated, also, the breakfast frequency, for the calculation of it “a total food consumption at breakfast <15g, normally a piece of candy or cracker, was not accepted as a breakfast”. A study of influence of different definitions of eating occasions of eating patterns compared eight definitions: self-report, Time-of-day, interval between occasions (15, 30 and 60 minutes) and interval between occasions plus energy (15, 30 and 60 minutes plus 210 kJ)<sup>3</sup>. Another study compared eleven definitions, both of them referred to the first eating episode of the day, taking into consideration the Time-of-day, location, daily activities, types of food or beverages consumed or amount of energy provided<sup>287</sup>.

Uzhova et al<sup>288</sup> joined a quantitative definition “the first meal of the day that breaks the fast after the longest period of sleep, eaten before or at the start of daily activities (e.g., errands, travel, work), within 2 h of waking, typically no later than 10:00 in the

morning, and of an energy level between 20 and 35% of total daily energy need” and a qualitative definition “a food or beverage from at least one food group, and may be consumed at any location. Coffee, water and nonalcoholic beverages are not included in a food group”. Authors studied, also, breakfast that contributed with less than 5% of total energy (considering participants that took only beverages as a glass of coffee with milk, orange juice), thus they created 3 major groups: “those having <5% of total energy intake (EI) in the morning; those having >20% of total EI in the morning as breakfast consumers; and those participants in between 5% and 20% were called low energy breakfast consumers”.

## **CONSIDERATIONS AND RESEARCH RECOMMENDATIONS**

Most studies were designed to evaluate meals and used one criterion to define them. On the other hand, authors who used databases that were not designed to evaluate meals had the challenge of defining them and used a combination of criteria to determine breakfast, lunch and dinner. Using studies that were not designed to study meals has the bias of not selecting the meal that was previously taken by the participant. However, the use of pre-determined eating events and self-report has the advantage of capturing the meal from the participant’s point of view, despite the subjectivity of choice. Policies to improve diet and nutrition should take into account what people do on an individual or family level and how dietary advice may fit or conflict with established patterns of behavior<sup>289</sup>.

The comparison of results from studies that used distinct definition should be done with caution; Leech et al<sup>3</sup> examined the influence of differing definitions of eating occasion on the characterization of eating patterns and found that different definitions affected

how eating patterns were characterized. In this way and taking into consideration the number of different meals definitions, a consensus is needed on their standardization. Furthermore, more studies are necessary to determine the best meals' definitions avoiding the use of new criteria for each new study in this field.

## CONCLUSION

Of the twenty one different definitions that were found, more than half of the studies used the definitions “pre-determined eating events” and “self-report”. The great variability of different definitions makes the comparison between studies difficult. It is therefore necessary to standardize the definitions used in order to avoid the emergence of new definitions and facilitate the comparison between them.

## ACKNOWLEDGEMENTS

All authors read and approved the final manuscript.

This study was financed in part by the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior – Brasil (CAPES) - Finance Code 001

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(Additional file 1)

## **Systematic Review Protocol: Breakfast, Lunch and Dinner Definitions**

### **1. Background**

The number of studies of the meals has increased rapidly in the last years (de Oliveira Santos et al, 2015; Leech et al, 2015; Gorgulho et al, 2017) and despite its importance; there is a complexity in meals' terminology, meaning and definition. The main meals are usually divided in breakfast, lunch and dinner, taking into account the temporal distribution (Leech et al, 2015; Berg et al, 2015). However, meal definition on scientific literature is still controversial and inconsistent. There is no unique definition that is used in all epidemiological studies, resulting in a variety of definitions available (Berg et al, 2015). The purpose of this systematic review is to help researchers on the decision making, based on what was made by the others studies.

### **2. Research Question**

How are the breakfast, lunch and dinner defined?

### **3. Review Team**

- a) Roberta de Oliveira Santos: PhD Student
- b) Bartira Mendes Gorgulho: PhD and professor

### **4. Search Strategy**

Search for all studies relating the keywords predefined (Table 1).

**Chart 1. Key words that will be used in the systematic review. Brazil, 2018.**

<b>Keywords</b>	
<b>Portuguese</b>	<b>English</b>
<b>Definição de refeição</b>	<b>Meal definition</b>
<b>Classificação de refeição</b>	<b>Meal classification</b>
<b>Hora da refeição</b>	<b>Meal timing</b>
<b>Definição de café da manhã</b>	<b>Breakfast definition</b>
<b>Classificação do café da manhã</b>	<b>Breakfast classification</b>
<b>Hora do café da manhã</b>	<b>Breakfast timing</b>
<b>Definição de almoço</b>	<b>Lunch definition</b>
<b>Classificação do almoço</b>	<b>Lunch classification</b>
<b>Hora do almoço</b>	<b>Lunch timing</b>
<b>Definição de jantar</b>	<b>Dinner definition</b>
<b>Classificação do jantar</b>	<b>Dinner classification</b>
<b>Hora do jantar</b>	<b>Dinner timing</b>
<b>Evento alimentar</b>	<b>Eating event</b>
<b>Ocasião alimentar</b>	<b>Eating definition</b>
<b>Evento neutro</b>	<b>Eating classification</b>
	<b>Eating occasion</b>
	<b>Eating timing</b>
	<b>Neutral event</b>
	<b>Times slot of consumption</b>

## **5. Selection on Articles**

Articles that match the inclusion criteria will be include in the database.

## 5.1. Inclusion Criteria

### 5.1.1. Step 1

The articles that will be included in the systematic review:

- a) Present results for any of the keywords in the title;
- b) Are original articles published in indexed journals;
- c) Are published in English or Portuguese language;
- d) Are published after 1965;
- e) Are performed in humans.

### 5.1.2. Step 2

The articles that will be included in the systematic review:

- a) Present results for any of the keywords in the abstract;

## 5.2. Exclusion Criteria

The following exclusion criteria were used:

- a) Studies that meal time was imposed;
- b) Studies involving institutional meal;
- c) Studies that analyzed main meals without differentiation between breakfasts, lunch or dinner;
- d) Systematic review, meta-analysis, letters to the editor, thesis paper, dissertations and conference proceedings/abstracts

## 6. Databases

An electronic literature search will be performed in four databases: PubMed, The Cochrane Library, Lilacs, SciELO. Google Scholar was searched to identify any relevant tools or papers in the grey literature.

## **7. Hand Searching**

The reference list and bibliographies of the selected articles will be hand searched.

## **8. Data Collection**

- a) Duplicates Articles will be identified and eliminated using as key terms the first author name, publication year, journal name, volume, starting page number of the article.
- b) The complete relevant articles and potentially relevant references that cannot be excluded upon reading the title and abstract will be reviewed.
- c) The assessments of inclusion of articles will be done in duplicate by two independent reviewers.

## **9. Information of be Extracted**

For this review it will be added the variables: authors, years, place, title, sample, population, instrument of measurement, meal definition (if existing).

## **10. Dissemination of the Findings**

The items of the systematic review and its results will be reported in according to the PRISMA statement and checklist (Appendix I).

## **11. References**

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## Appendix I

Section/topic	#	Checklist item	Reported on page #
<b>TITLE</b>			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	
<b>ABSTRACT</b>			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	
<b>INTRODUCTION</b>			
Rationale	3	Describe the rationale for the review in the context of what is already known.	
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	
<b>METHODS</b>			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.	
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	
Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	
Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	
<b>Section/topic</b>			<b>Reported on page #</b>
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	
<b>RESULTS</b>			
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations.	
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).	
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.	
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency.	
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	
<b>DISCUSSION</b>			
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).	
Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	
<b>FUNDING</b>			
Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review.	

## 5.2 SEGUNDO MANUSCRITO

### DESIGN OF QUALITY INDEX FOR BREAKFAST MEAL

#### ABSTRACT

**Introduction** – Breakfast is considered an important eating event. A single index to assess and compare the quality of this meal across different populations is needed.

**Objectives:** To adapt for breakfast a meal quality index proposed for different populations and verify its association with sociodemographic and lifestyle characteristics in a Brazilian population based sample. **Methods** - The Breakfast Meal Quality Index (BMQI) was based and adapted from Main Meal Quality Index and international nutritional recommendations. It consists of ten components (fruits, calcium, fiber, energy density, processed meat, carbohydrate, protein, total fat, saturated fat and added sugar) with a score ranging from 0 to 100 points. We applied the index in a sample of 29,544 adolescents and adults from the Brazilian Household Budget Survey (2008-2009). To estimate the effect of breakfast quality on lifestyle and sociodemographic characteristics, gamma generalized linear model (link identity), considering sample complex design was used. **Results** - The BMQI was positively associated with the following nutrients: carbohydrate (g), protein (g), fiber (g), vitamins and minerals (mg) and negatively associated with total fat (g), saturated fat (g), cholesterol (mg), and added sugar (g). The Cronbach's alpha for all BMQI items was 0.69, indicating adequate internal consistency. The BMQI score was positively associated with age, income, rural residence area and diet quality; and negatively associated with body mass index. **Conclusions** - The BMQI adequately discriminated the breakfast quality, showing a protective role against overweight in Brazilians.



**Keywords:** meals, breakfast, eating index; BMI

## INTRODUCTION

Breakfast is usually the first meal of the day and it is responsible for breaking the prolonged fast of the previous night <sup>1</sup>. The intake of breakfast is associated with a healthier lifestyle and seems to protect against adverse health problems such as insulin resistance, type 2 diabetes mellitus, large waist circumference, dyslipidemia, overweight, and hypertension <sup>2-5</sup>. The type of breakfast may be more important determinants of health effects than the act of simply not skipping breakfast <sup>5</sup>. Thus, it is necessary to focus not on single beverages or foods during the meal, but to consider combinations of foods, such as foods rich in protein, carbohydrate, vitamins, and minerals, mainly calcium <sup>6</sup>. Knowing the quality of this meal might help in the early detection of unhealthy eating habits and a timely prevention of undesirable health consequences <sup>7,8</sup>.

There are some indexes to analyze the quality of breakfast <sup>9-10</sup>. However, most of them were developed for specific population groups such as children, adolescents, and Mediterranean diet consumers, or are limited to specific countries <sup>9-10</sup>. In a systematic review developed by the United States Department of Agriculture (USDA, 2015), authors concluded that a single dietary index applicable across populations and health outcomes is needed to evaluate the diet <sup>11</sup>. This would facilitate comparability of data across different populations. To bridge this gap, more recently, an international index (the Main Meal Quality Index (MMQI)), to analyze the quality of meals, was developed <sup>12</sup>. This index is based on ten components with a scoring system based on international guidelines <sup>13-16</sup>. However, the components of the MMQI were designed to evaluate the

quality of lunch and dinner <sup>12,17</sup>; thus, it was timely to have a similar index to assess breakfast, that take into consideration typical items specific for this meal like, for example, the dairy products. In several cultures, dairy products are present on breakfast <sup>15</sup>, in addition to bread, fruits, cocoa powder, coffee, biscuits, juices, butter, margarine, and ready-to-eat-cereal <sup>7, 8, 18-20</sup>. This emphasizes the need for a single breakfast index that considers the breakfast component in particular. The aim of this study was to adapt for breakfast a meal quality index proposed for different populations and associate it with lifestyle and sociodemographic characteristics in a Brazilian sample.

## **MATERIALS AND METHODS**

### **Study population**

We used data from the National Dietary Survey (NDS) that was conducted as part of the Brazilian Household Budget Survey (HBS). The HBS is a large cross-sectional survey conducted in Brazil from 2008 to 2009 by the Brazilian Institute of Geography and Statistics (IBGE) <sup>21</sup>. NDS was used to obtain data from individuals on their food intake.

The HBS sample, representative of Brazil, was carried out by conglomerates in two stages. In the first stage, the census tracts or primary sampling units were randomly selected. In the second stage, permanent households were randomly selected without replacement within each census tract selected in the first stage. The sample size of the HBS consisted of 4,696 census tracts, 59,548 selected households with 13,569 households and 34,003 individuals randomly selected for inclusion in the NDS.

Food consumption was measured by self-reporting in two intake records on nonconsecutive days. Participants were instructed on how to complete information on

household measures, fill out the times and locations of meals (at home or away from home), as well as on how to complete a detailed description of all foods and beverages consumed. The method of preparation, ingredients, and brands were also recorded. Quality control in the dietary data collection processes was performed by trained interviewers, who reviewed and ensured that information contained in food records were devoid of errors, and where necessary, corrections were made. Items commonly omitted, such as candies and sweets, as well as beverages such as coffee and soda were further investigated by the interviewer.

For this study, breakfast was defined as the food event that occurred between 6 A.M. and 10 A.M. with more than 50 kcal. Whenever more than one food consumption episode was reported within this time interval, the one with the highest energy contribution was accepted as the breakfast while the episodes with smaller energy value were disregarded. In order to consider the place of meal preparation in the analysis, only the data of the first food record were considered in this study. However, once individual questionnaires were obtained for every day of the week and throughout all four seasons of the year, mean usual intake among the population can be estimated. The final sample consisted of 29,544 adolescents and adults (aged  $\geq 10$  years) who had at least one food consumption episode during this time slot in the first food record. Pregnant and lactating woman were excluded.

### **Breakfast Meal Quality Index (BMQI)**

The BMQI was made from ten components: fruits (in grams), calcium (in milligrams), total dietary fiber (in grams), energy density (energy/grams), processed meats (in portions), carbohydrate (% of energy), protein (% of energy), total fat (% of energy),

saturated fat (% of energy) and added sugar (% of energy). The rationale of each component is described as follows.

### **Fruits**

Based on the daily-recommended intake of 400 g/day of fruit and vegetables (equivalent to five portions per day) <sup>14</sup> and since breakfast should contribute to about 20% of daily requirements<sup>7</sup>, it is expected that individuals take equal to or greater than 80 grams of fruit or fresh fruit juice in this meals to get the highest score.

### **Calcium**

Breakfast has a very important role as a good source of calcium, through milk and dairy products, in Western countries <sup>22, 23</sup>. However there are no global recommendations for dairy consumption, the majority of the countries recommend at least one serving of milk daily, with some countries recommending up to three servings per day <sup>16</sup>. It is important to highlight that many countries also include other dairy products such as cheese, yoghurt, ferment milk, but their portion sizes are not always specified <sup>16</sup>. Based on this, it was considered that at least 295 mg of calcium <sup>24-26</sup> from any source should be consumed for breakfast. This content was considered taking into account the calcium content of 1 cup milk (240 ml) <sup>24, 27</sup>.

### **Fiber, energy density and processed meat**

Fiber content, energy density and presence or absence of processed meat in the breakfast were considered. Seeing that the breakfast should contribute to about 20% of nutrients daily requirements <sup>7</sup>, it was estimated that this meal should provide at least 5 g

of total dietary fiber, since the intake of at least 25 g/day of non starch polysaccharides is recommended <sup>13</sup>. The need to avoid diets with higher energy density has been recommended; hence, it is expected that the energy density of the breakfast should not exceed 1.25 kcal/g <sup>13</sup>, and the score range considered for this component is the same established on MMQI <sup>(12)</sup>. Also, it is recommended to avoid significant intake of processed meats <sup>13</sup>, for this recommendation, it is not clear how to consider a zero score, because there is no scientific evidence that clearly specifies how high an intake deserves a score of zero <sup>28</sup>. Thus it was considered that breakfast should provide a maximum of half-portion of processed meat. The processed meat portion was considered in kcal as suggested by Philippi et al <sup>29</sup>, in which one portion is equivalent to 190 kcal.

### **Carbohydrate, protein total fat, saturated fat and added sugar**

Carbohydrate, protein, total fat, saturated fat, and added sugar components indicate the percentage of calories obtained through the consumption of these nutrients in relation to the total energy consumed in the overall meal. Ideally, a balanced diet should provide 55–75% of carbohydrate, 10-15% of protein, 15–30% of total fat and <10% of saturated fat of the total energy intake <sup>13</sup>. The score range for these nutrients were the same used in MMQI <sup>12</sup>. It is recommended to reduce the intake of free sugars to less than 10% of total energy intake and suggested a further reduction of the intake of free sugars to below 5% of total energy intake <sup>15</sup>, in this way, the score ranged from equal to and more than 10% for zero points and less than 5% for ten points.

### **BMQI component scores**

The scoring system was patterned after the World Health Organization <sup>14, 15</sup>, the World Cancer Research Fund <sup>13</sup> and Food and Agriculture Organization <sup>16</sup> recommendations. The scores of each BMQI component ranges between 0 to 10 points and final score ranges from 0 to 100 points. The closer to 100 points, the healthier the breakfast, and the closer to zero the less quality it has. For unhealthy diet markers, as energy density, processed meat, total fat, saturated fat and added sugar: higher intakes reach fewer points. On the other hand, fruits, calcium, fiber, carbohydrate and protein presents a directly proportional score, thus if the component of the evaluated diet reaches or exceeds the recommendation, that component gets the highest point. The cut-off points for intermediate scores are proportional to reference values of the maximum and minimum score according to the equation (1).

$$Score = \frac{10(O-R_{Min})}{(R_{Max}-R_{Min})}, \quad (1)$$

where O, R<sub>Min</sub>, and R<sub>Max</sub> are the observed value, reference values for the Minimum and Maximum scores, respectively. Summarize of BMQI is present in Table 1.

Table 1. Breakfast Meal Quality Index (BMQI) components and the score criteria.

Component	Recommendation <sup>a</sup>	Score range	
		0 points	10 points
Fruit or fresh fruit juice	400g of fruits and vegetables per day	0g	≥ 80g
Calcium	At least one cup of milk per day	0 mg	≥ 295 mg
Fiber	25g per day	0g	≥ 5g
Energy density	≤ 1.25 kcal/g	≥ 1.65 kcal/g	≤ 1.25 kcal/g
Processed meat	Avoid	≥ 0.5 portion	0 portion
Carbohydrate	55 – 75% of total energy	≤ 40%	≥ 55%
Protein	10 – 15% of total energy	≤ 10%	≥ 15%
Total fat	15 – 30% of total energy	≥ 40%	≤ 30%
Saturated fat	< 10% of total energy	≥ 13%	< 10%
Added sugar	< 5% of total energy	≥ 10%	< 5%

<sup>a</sup> World Health Organization, 2003; World Cancer Research Fund, 2007, Food and Agriculture Organization of the United Nations, 2013; World Health Organization, 2015

## Statistical analysis

The performance of BMQI was measured using statistical analysis as it was made in other studies <sup>12, 30</sup>. Among the analysis are the Cronbach's Alpha coefficients <sup>31</sup> that were used to determine internal consistency of BMQI items, the higher the alpha, the greater the reliability of the scale, while correlation coefficients (Pearson correlation coefficient) were used to assess the relationship between BMQI components and energy, low correlations between energy and the score items suggests that the index evaluates diet quality independent of diet quantity <sup>30</sup>.

The relationship between BMQI and all selected nutrients of the breakfast were evaluated using Gamma generalized linear models (link identity) adjusted by gender and age, considering sample expansion. Nutrients analyzed were: fat (g), protein (g), carbohydrate (g), fiber (g), saturated fat (g), cholesterol (mg), vitamin C (mg), vitamin E (mg), riboflavin (mg), niacin (mg), vitamin B6 (µg), vitamin B12 (µg), total folate (µg), iron (mg), phosphorus (mg), zinc (mg), potassium (mg), sodium (mg), and added sugar (g).

Gamma generalized linear models (link identity) considering sample complex design (survey module) were used to investigate relationships between BMQI and sex (male and female), age (in years), income per capita (BRL per month), place of residence (urban area and rural), place of breakfast preparation (home and away from home), nutritional status (without overweight and overweight), body mass index (in kg/m<sup>2</sup>) and Brazilian Healthy Eating Index Revised (BHEI-R) <sup>32</sup>. These linear models were used to assess the effect of different population groups on the dietary quality, measured by the BMQI.

The analyses were performed using the statistical software Stata (Stata Corp., version 13, College Station) considering a significance level of 5%. NDS was conducted in consonance with the Brazilian Federal Law number 5878 from 11th May, 1973 which guarantees confidentiality of the collected information by all Brazilian census and surveys. Local ethical approval for the current analysis was given by the Committee of Ethics and Research of the School of Public Health of the University of Sao Paulo (approval number 2.728.290).

## RESULTS

The mean BMQI of general population was 50.20 (SD=15.5) points and the breakfast quality of men (50.66 points) was slightly higher than women (49.82 points) (Table 2). Correlation between BMQI components and energy varied from very weak (0.05) for fruit, to moderate (0.57) for fiber (Table 3). The correlations among BMQI components and the total score were moderate for fiber (0.51), energy density (0.54), saturated fat (0.59), carbohydrate (0.62) and total fat (0.75). The inter-component correlations were weak ( $<0.50$ ), except among total fat, saturated fat and carbohydrate ( $|0.59|$  to  $|0.89|$ ). Moreover, the Cronbach's Alpha for all components was 0.69, indicating adequate reliability.



Table 2. Summary of Breakfast Meal Quality (BMQI) Index and its components score of general population and by sex. Brazil, 2008.

Components	All	Men	Women
	(n=29,544; 100%)	(n=13,473; 45.6%)	(n=16,071; 54.4%)
	Mean (SD)	Mean (SD)	Mean (SD)
BMQI score (total)	50.20 (15.5)	50.66 (15.4)	49.82 (15.6)
Fruit	1.15 (3.2)	1.10 (3.1)	1.19 (3.2)
Calcium	3.92 (3.4)	3.99 (3.5)	3.86 (3.4)
Fiber	4.70 (2.8)	5.01 (2.9)	4.43 (2.7)
Energy density	1.26 (3.2)	1.20 (3.1)	1.30 (3.2)
Processed meat	9.63 (1.7)	9.57 (1.9)	9.69 (1.6)
Carbohydrate	7.24 (3.9)	7.20 (3.9)	7.27 (3.8)
Protein	3.76 (4.2)	3.80 (4.2)	3.72 (4.1)
Total fat	6.02 (4.5)	6.03 (4.5)	6.02 (4.5)
Saturated fat	5.26 (4.7)	5.37 (4.7)	5.17 (4.7)
Added sugar	7.27 (4.3)	7.39 (4.3)	7.17 (4.4)

Table 3. Spearman's Correlations between Breakfast Meal Quality Index (BMQI) components and breakfast energy. Brazil, 2008.

Components	Fruit	Calcium	Fiber	Energy density	Processed meat	Carbohydrate	Protein	Total fat	Saturated fat	Added sugar	BMQI
Fruit	1.00										
Calcium	0.00*	1.00									
Fiber	0.29	0.17	1.00								
Energy density	0.36	0.08	0.37	1.00							
Processed meat	0.00*	-0.06	-0.04	0.04	1.00						
Carbohydrate	0.19	-0.28	0.23	0.18	0.12	1.00					
Protein	-0.15	0.49	0.00*	0.15	-0.15	-0.27	1.00				
Total fat	0.19	-0.24	0.23	0.27	0.08	0.89	-0.05	1.00			
Saturated fat	0.17	-0.48	0.19	0.21	0.12	0.59	-0.22	0.65	1.00		
Added sugar	0.04	-0.14	0.06	0.09	-0.05	-0.23	0.20	-0.14	0.05	1.00	
BMQI	0.42	0.06	0.51	0.54	0.13	0.62	0.26	0.75	0.59	0.21	1.00
Breakfast energy	0.05	0.49	0.57	0.02	-0.12	-0.11	0.06	-0.13	-0.15	-0.06	0.08

\*no significant ( $p>0.05$ )

The BMQI scores were positively correlated with the following nutrients: carbohydrate, protein, fiber, vitamins E, C, B6 and B12, thiamin, riboflavin, niacin, folate, iron,

phosphorus, magnesium, zinc, selenium, calcium and potassium. Total fat, saturated fat, cholesterol and added sugar were negatively correlated with BMQI score (Table 4).

Table 4. Breakfast Meal Quality Index (BMQI)  
Regression standardized coefficients for nutrients  
consumed at breakfast. Brazil, 2008.

Nutrient	$\beta$	95% CI		<i>p</i>
Carbohydrate (g)	0.21	0.20	0.22	<0.001
Protein (g)	0.38	0.34	0.43	<0.001
Total fat (g)	-0.43	-0.45	-0.40	<0.001
Cholesterol (mg)	-0.01	-0.01	0.00	<0.05
Saturated fat (g)	-0.76	-0.81	-0.72	<0.001
Fiber (g)	3.73	3.57	3.90	<0.001
Vitamin E (mg)	3.55	2.95	4.14	<0.001
Vitamin C (mg)	0.16	0.132	0.193	<0.001
Thiamin (mg)	10.73	9.09	12.36	<0.001
Riboflavin (mg)	3.34	2.37	4.32	<0.001
Niacin (mg)	1.67	1.47	1.86	<0.001
Vitamin B6 (mcg)	7.02	5.81	8.22	<0.001
Vitamin B12 (mcg)	0.71	0.36	1.06	<0.001
Total folate (mcg)	0.10	0.09	0.11	<0.001
Iron (mg)	2.77	2.48	3.07	<0.001
Phosphorus (mg)	0.02	0.01	0.02	<0.001
Magnesium (mg)	0.27	0.25	0.29	<0.001
Zinc (mg)	1.88	1.54	2.21	<0.001
Selenium (mcg)	0.14	0.12	0.17	<0.001
Calcium (mg)	0.01	0.01	0.01	<0.001
Potassium (mg)	0.03	0.03	0.03	<0.001
Sodium (mg)	0.000	-0.001	0.000	0.469
Added sugar (g)	-0.08	-0.10	-0.07	<0.001

\* Generalized linear regression considering sample complex design between BMQI and each nutrient adjusted by gender and age.

In the bivariate models, the BMQI score showed a significant positive association with age, income, residence (rural area) and diet quality ( $p < 0.001$ ) (Table 5). In the adjusted model, the association between BMQI and age, income, rural area residence and diet

quality ( $p<0.001$ ) persisted. The negative but significant association between BMQI score and BMI ( $p=0.033$ ) was identified (Table 5).

Table 5. Association between BMQI and lifestyle and sociodemographic variables. Brazil, 2008.

	Bivariate Model <sup>a</sup>				Adjusted Model <sup>b</sup>			
	$\beta$	95% CI		p	$\beta$	95% CI		p
Sex (ref male)	-0.548	-1.053	-0.044	0.033	0.262	-0.240	0.763	0.306
Age (years)	0.059	0.042	0.076	<b>&lt;0.001</b>	0.037	0.019	0.055	<b>&lt;0.001</b>
Family income per capita (dollar)	0.001	0.001	0.002	<b>&lt;0.001</b>	0.002	0.001	0.002	<b>&lt;0.001</b>
BMI (kg/m)	0.006	-0.054	0.067	0.839	-0.066	-0.126	-0.005	<b>0.033</b>
Area (ref urban)	3.694	2.705	4.684	<b>&lt;0.001</b>	2.498	1.579	3.416	<b>&lt;0.001</b>
Breakfast consumption (ref from home)	-0.310	-1.338	0.718	0.555	0.400	-0.581	1.380	0.424
BHEI-R	0.241	0.222	0.261	<b>&lt;0.001</b>	0.237	0.217	0.256	<b>&lt;0.001</b>

<sup>a</sup> Generalized Linear model, sample complex design, between BMQI and each variable.

<sup>b</sup> Generalized Linear model, sample complex design, by energy, sex, age, income, BMI, living in urban area, place of breakfast consumption and BHEI-R.

## DISCUSSION

This study aimed to adapt for breakfast (the Breakfast Meal Quality Index (BMQI)) a meal quality index proposed for different populations and associate it with lifestyle and sociodemographic characteristics in a Brazilian sample. The main findings were that the BMQI was positively associated with carbohydrate, protein, fiber, vitamins and minerals and negatively associated with total fat, saturated fat, cholesterol, and added sugar.

The development of the ten components of the BMQI took into account the MMQI components as well as the breakfast composition. Seeing that De Oliveira Santos et al <sup>20</sup> studied Brazilian food patterns for different meals and found that vegetables and meat were more likely to be consumed during lunch or dinner, the vegetables and animal protein/total protein components, presented on MMQI were replaced by the calcium and

protein components in the BMQI. Besides, from the MMQI, five items (total fat, saturated fat, carbohydrate, energy density, and fruits) were preserved and three items (fiber, processed meat, and sugary beverages and desserts) were modified. Thus, we guarantee that the BMQI takes breakfast quality into special consideration.

With a Cronbach's alpha value of 0.69, BMQI showed adequate internal consistency (reliability) of the components included <sup>31</sup>. There is significant evidence of the capability of BMQI to identify nutrients usually present in breakfast <sup>8, 10, 33, 34</sup>, showing a positive association with healthy diet markers intake (fiber, vitamin E, C and B6, thiamine, riboflavin, niacin, folate, iron, phosphorus, magnesium, zinc, selenium, and potassium) while showing negative association with unhealthy diet markers (fat, saturated fat, cholesterol and added sugar) <sup>14, 35</sup>.

Other findings of BMQI score included a negative association with BMI. Thus, there is evidence about the capability of BMQI to be a good health marker. Our results are in line with the healthy eating index, which was inversely associated with obesity in a systematic review of relation between diet quality indexes and obesity<sup>36</sup>.

Gorgulho et al <sup>9</sup>, conducted a systematic review of indicators used to evaluate meal quality and retrieved just two published breakfast indexes <sup>37, 38</sup>. In both of these publications, Mediterranean diet in children and adolescent was the focus. After these review, Pereira et al <sup>10</sup> proposed a new index for evaluating Brazilian breakfast based on Monteagudo <sup>38</sup>. These three indexes used a similar score system which attributed a score of 'one' for each component that met the recommendations and 'zero' if the component was disagreed <sup>10, 37, 38</sup>. However, as observed in previous studies <sup>12</sup> a scoring system that considers proportional measures, as we did with BMQI, instead of a simple

cut-off (zero or one), is preferred to allow a better reflection about the distribution of the population. Thus, differences in the intake of diet between individuals can be identified. Also, none of these three indices was previously validated.

The major strength of the BMQI is that it can be applied across different populations and age groups because it is based on general international dietary guidelines <sup>13-16</sup>, for all health population, that recommend a diet rich in fruits, vegetables, and whole grains, and poor in fat and sugar <sup>14</sup>.

The study has some limitations. The general limitation lies with the subjective approach used in choosing the BMQI components, the cut-off values, and the scoring of diet quality, however to minimized such subjectivity these choices were based in international guidelines recommendations <sup>(13-16)</sup>. Another limitation refers to the non-standardized meal definitions from various scientific literatures <sup>39</sup>. Hence, further studies are needed for a more standardized definition for breakfast. Moreover, further investigations are needed to assess the performance and validity of BMQI across different social-cultural contexts, since it was applied only in a Brazilian sample.

## **CONCLUSION**

The BMQI was adapted in line with international dietary guidelines. Using a Brazilian representative population sample, the index adequately discriminated the breakfast, showing a protective role against overweight. Further studies are needed to verify the role of BMQI in other population groups.

## ACKNOWLEDGMENTS

This research was funded by Coordination for improvement of higher education personnel (CAPES). On behalf of all authors, the corresponding author states that there is no conflict of interest.

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### 5.3 TERCEIRO MANUSCRITO

## **MEAL PATTERNS OF INDIVIDUALS IN RELATIVE POVERTY: A COMPARISON BETWEEN BRAZIL AND THE UNITED KINGDOM**

### **ABSTRACT**

**Introduction** – Poverty can be understood as a situation of vulnerability in which part of the population is not able to generate or obtain enough income to have access to the basic resources such as food. Individuals with lower income are less likely to eat three meals a day compared to individuals with higher income. Thus, comparing two different populations regarding the degree of development can elucidate issues related mainly to food access. **Objective** – The aim of this study was to compare the meals patterns of adults in poverty situation of Brazil and United Kingdom (UK). **Methods** – Data from two cross-sectional population-based studies, one from Brazil, the National Diet Survey, and one from UK, the National Diet and Nutrition Survey rolling programme were used. Three parameters were considered and compared among the two countries to analyze the meal patterns of adults in poverty situation: eating frequency, meals omission and meals' quality. Individuals with equivalised income in dollar 60% below of the national annual equivalised median income were considered in relative poverty, performing a final sample of 3,073 Brazilians and 464 British. Man Whitney U test to verify median differences of continuous variables and the Chi-squared test to evaluate the association between categorical variables were used. All the analyses were performed using the software Stata. **Results** – Adults in relative poverty situation in the UK had higher eating frequency (4.7 versus 3.8 of Brazilians) ( $p < 0.001$ ), however, Brazilian skipped

less breakfast, lunch and dinner. There was no difference between the countries for breakfast quality, but British presented better score for protein, calcium and fruits components ( $p < 0.001$ ), and Brazilians for fiber, saturated fat, added sugar and processed meat at breakfast ( $p < 0.001$ ). For lunch and dinner qualities, poor Brazilians presented better score (69.2 e 62.1, respectively) when compared to British (45.9 e 48.3). Saturated and total fat components score of Brazilian's lunch and dinner surpassed the double of British in relative poverty. **Conclusions** – Brazilians in relative poverty situation presented better meal patterns, skipped fewer meals, and had better lunch and dinner quality and better scores for unhealthy diet markers when compared to British. The results suggest the impact of developing level in each country, with possible choices based on food prices.

**Key words:** meal patterns, poverty situation, inequality

## INTRODUCTION

Data of population dietary patterns are important to developing of programs and policies in nutrition and public health (Brasil, 2014), once a poor and unbalanced diet is the greatest contributor of premature death in the world (Forouzanfar et al, 2015). The malnutrition can be caused by several factors, including problems in absorb nutrients, or conditions or diseases which affects individuals' ability to feed normally (McGuinness et al, 2016), among these conditions is the socioeconomic status. Low-income people are at great risk of being food insecure, which has three severity levels: at the mild level there is a concern about ability to obtain food, at the moderate level there is a

compromise of quality and variety of food, beside the reduction of quantities and skipping of meals, and at the severe level the individuals experience the hunger (FAO, 2016).

Data from Food and Agriculture Organization of the United Nations (FAO) revealed that 10.1% (CI  $\pm 2.9\%$ ) of people aged 15 or over were in food insecure situation in 2014 in the United Kingdom (UK) and 8.3% (CI  $\pm 0.2\%$ ) in 2013 in Brazil. Despite the relative low rate of food insecurity in Brazil presented by the FAO, it's noteworthy that Brazilian rate was calibrated to become comparable to other countries with withdraw of the questions about children's food insecurity (FAO, 2016). The official statistics for Brazil are that 22.6% of households experienced some level of food insecurity in 2013 (IBGE, 2014), which means that these people do not eat enough or well enough, with regularity or dignity (Amaral & Peduto, 2010). However the food availability in Brazil is more than enough for its entire population, in as much as the Brazilian agricultural sector is able to meet all domestic needs and still generate profit through exports (Meade et al, 2004; Amaral & Peduto, 2010). Among the answers for this paradox are the extreme social and economic inequalities in the country that affects mainly poorer population, who often simply cannot afford to buy enough food (Meade et al, 2004; Amaral & Peduto, 2010).

Around 22.1% of Brazilian population and 0.5% of UK population are below the poverty line, living with less than 5.50 dollars a day (The World Bank, 2017). The poverty can be understood as a situation of vulnerability in which part of the population is not able to generate or obtain enough income to have access to the basic resources that guarantee people's quality of life, such as access to treated water, health, education, housing, citizenship and food (Gomes and Pereira, 2005). These difficulties are not

restricted to lack of income, but reflect complex and multidimensional problems, encompassing structural, historical, political, economic, social and cultural aspects (Silva et al., 2007).

Considering the different consumption profile of distinct social groups, the food demand is not always possible to be reached in an equitable way considering the access inequities (Das et al., 2005; Burlandy, 2007). Studies suggest that individuals with lower income are less likely to eat three meals a day compared to individuals with higher income, and the proportion of individuals consuming 3 meals a day increases with higher income levels (USDA, 2015). Around 700,000 households in the UK in 2015 were destitute and among the six parameters that define destitution was having less than two meals a day for two or more days (Fitzpatrick et al, 2016).

Many studies indicate that skipping meals is harmful to health. There are evidences showing the increase in overweight / obesity is greater in poor countries, where the access to food is not continuous, much less it is characterized as a regular meal pattern (Mendonça & Anjos, 2004). The insurance hypothesis postulates that the storage of body fat is an adaptive strategy used by humans and other vertebrates to survive in periods during which food is unavailable (Nettle et al, 2017). Thus food insecurity represents a complex paradox because it can lead not only under-nutrition and hunger but also to over-nutrition, which may lead to overweight and obesity (Tanumihardjo et al., 2007).

Compare two different populations regarding the degree of development can elucidate issues related mainly to food access. It is noteworthy that despite the cultural differences between Brazil and the United Kingdom, the current nutritional

recommendations are the same, that is, increase the consumption of whole grains, fruits and vegetables, and the reduction of fatty and sugary foods (Scottish Government, 2006; Food Standards Agency, 2010; Public Health Agency, 2010; Brazil, 2014). Thus the aim of this study was to compare the meals patterns of individuals in poverty situation of Brazil and the United Kingdom.

## **METHODS**

To achieve the proposed objective, the present study used data from two cross-sectional population-based studies, one from Brazil, the National Diet Survey (NDS), and one from the UK, the National Diet and Nutrition Survey rolling programme (NDNS). In order to minimize the difference between the two studies, efforts to harmonize the measures were made.

### **Study Population**

#### *National Diet Survey*

The NDS was carried out along with the 2008-2009 Household Budget Survey (HBS) conducted by the Brazilian Institute of Geography and Statistics (IBGE), using a representative sample of Brazilian households. A subsample of 24.3% of households from the original 2008-2009 HBS sample was randomly selected to participate of the NDS to evaluate food consumption of 34,003 individuals over 10 years old (7,613 adolescents and 26,390 adults). Food consumption was collected through two food records of non-consecutive days, filled by the participants with information about all foods and beverages consumed (except water), the consumed amount, place of the meal (at home or away from home), time of intake and preparation method. In addition,

information about consumption of sugar and / or sweetener was collected. Instructions on how to properly complete the records were provided to participants and all food records were reviewed by trained interviewers jointly with study participants in order to clarify food details and avoid missing items before entering food records into the study database (IBGE, 2011). For the present study, of those 26,390 adults (over 19 years old) with food intake information, excluding pregnant and lactating women (N=1,066) and individuals outside of relative poverty classification (N=22,251), performing the Brazilian final sample of 3,073 participants.

#### National Diet and Nutrition Survey

The NDNS is the only source of high quality dietary data set available for the general UK population and is designed to evaluate the food consumption, nutrient intakes and nutritional status of individuals aged 1.5 years and older living in private households (Public Health, 2014). This study will use data from the first four years (2008-2012) collected (NatCen Social Research, 2018). The full sample for this period was 6,828 individuals (3,415 adults and 3,413 adolescents and children) with three or four days. Food consumption was measured by un-weighed food diary conducted over a period of four consecutive days. Participants received a manual with instructions about how to fill the intake form and were asked to give information detailed of all foods and beverages consumed (both at home and away from home), including the method of preparation, date and time of consumption, portion size, brand name, ingredients and quantities of the homemade dishes and how much was eaten. Quality control in the collection of dietary data was performed by trained interviewers, who reviewed the information contained in the food records in order to detect failures in filling and to perform the necessary corrections (Lennox et al, 2014). Details of the NDNS

methodology have been described and published by the UK Department of Health (Department of Health, 2013). From 3,415 adults (over 19 years old) with food intake information, we excluded pregnant and lactating women (N=1), individuals without income data (N=900) and individuals not classified in relative poverty (N=2,050), performing the UK final sample of 464 individuals.

### **Equivalised household income**

Household income from Brazilian study was self-reported and collected as continuous variable, however in the UK study was collected in income ranges. To manage the UK's household income, the average of the ranges was calculated as suggested by NatCen Social Research (2018) and this value was considered as the household income. The household income of both countries was adjusted according to the purchasing power parity rate (derived from World Bank) and expressed in dollar. The rates of study year, and the total income for the household was equivalised according to the Organization for Economic Cooperation and Development (OECD) modified equivalence scale (Anyaegebu, 2010; Office for National Statistics, 2013, OECD, 2018). With the use of equivalence scales each household composition is considered and the factors commonly taken into account to assign these values are the size of the household and the age of its members (whether they are adults, adolescents or children) (OECD, 2018). It is assigned a value of 1 to the household head, of 0.5 to each additional adult (more than 19 years old) member or adolescents (aged 14 and 19 years) and of 0.3 to each child (less than 14 years old) (Anyaegebu, 2010; Horsfield, 2013, OECD, 2018). The sum of the values generates a score that is used to divide the household income resulting in the equivalised household income.



## **Poverty definition**

There is a long discussion about poverty definitions, mainly between relative and absolute poverty (Laderichi et al, 2003; Fritzell et al, 2015). Absolute poverty involves establishment of an absolute minimum income that is necessary for survival, it is measured through cut-points of dollar a day, that actually are 1.90, 3.20 and 5.50 dollars a day defined by World Bank (The World Bank, 2017). On the other hand, relative poverty is related to the individual's position in relation to society in which one lives (Fritzell et al, 2015), so a family income 60% below of the average or median is designated as relative poverty (World Bank, 2018). According to Townsend (1979), poverty measurements must be taken on the basis of overall living standards and lifestyles of society; furthermore to be poor is to lack the opportunity to fully participate of the society that is embedded (Fritzell et al, 2015). Based on this, for the Brazilian households with equivalised income in dollar 60% below of the national annual equivalised median income were considered in relative poverty. For the UK, households with equivalised upper range in dollar 60% below of the national annual equivalised median income and that with the cut point of 60% below national annual equivalised median income between their upper and lower income range were considered in relative poverty.

## **Meals patterns**

Three parameters were considered and compared among the two countries to analyze the meal patterns of individuals in poverty situation: eating frequency, meals omission and meals' quality. The first step was estimate the usual dietary intake of the food groups and nutrients through Multiple Source Method (MSM), a statistical method

developed to estimate the usual intake of nutrients and foods and attenuate the intrapersonal variability (Efcoval, 2011; Haubrock et al, 2011), considering that people's diet are different day by day. Eating frequency was calculated as the average number of the eating occasions performed per day per each individual. Eating occasions were defined as any food and/or beverage consumed at time-slots reported by the participant with more than 50 kcal (209.2 kJ) of usual energy content and with at least 15 minutes since the end of the prior eating occasion. The interval of intake was considered only for British data, since the hour of intake was collected in exact hours and minutes.

The meals studied were breakfast, lunch and dinner, and they were defined as the eating occasion between 6-10 am, 11-15 pm and 17-21pm respectively. If in the time-slot there was more than one occasion with more than 50 kcal, the eating episode with the highest energy contribution was considered the meal. Meals skippers were the individuals that did not take the meal at least one food record/diary.

The breakfast quality was evaluated through the Breakfast Meal Quality Index (BMQI) (Santos et al, 2017). This index was based on international nutritional recommendations. It consists of ten components (fruits, calcium, fiber, energy density, processed meat, carbohydrate, protein, total fat, saturated fat and added sugar) with a score ranging from 0 to 100 points. Lunch and dinner quality was evaluated through the Main Meal Quality Index (MMQI) (Gorgulho et al, 2016). This indicator was developed to assess meal quality in different populations, and is composed of 10 components: fruit, vegetables (excluding potatoes), ratio of animal protein to total protein, fiber, carbohydrate, total fat, saturated fat, processed meat, sugary beverages and desserts, and energy density, resulting in a score range of 0-100 points.

## **Statistical analyses**

Man Whitney U test to verify median differences of continuous variables and the Chi-squared test to evaluate the association between categorical variables were used.

Stata® software (version 13) was used for the statistical treatment of the data. A significance level of 5% was considered for all analyzes.

Ethical approval for the NDNS was obtained from the Multi-centre Research Ethics Committee and National Health Service Local Research Ethics Committee covering each of the 152 postcodes areas in the sample. NDS was conducted in consonance with the Brazilian Federal Law number 5878 from 11<sup>th</sup> May, 1973 which guarantees confidentiality of the collected information by all Brazilian census and surveys. Local ethical approval for the current analysis was given by the Committee of Ethics and Research of the School of Public Health of the University of Sao Paulo (approval number 2.728.290).

## **RESULTS**

### **Poverty characterization**

Table 1 shows the proportion of individuals in poverty situation considering two definition approaches. Brazil and the UK presented the same proportion of individuals on relative poverty, however, when it evaluates absolute poverty, Brazilian rates are much larger than the UK considering the three cut-points recommended by World Bank. The mean per capita income of the UK population was three times larger than Brazilian.

Table 1 – Proportion of individuals in poverty situation considering two poverty definitions.

	<b>Brazil<sup>†</sup></b> <b>(n=34003)</b>	<b>UK<sup>‡</sup></b> <b>(n=6828)</b>
Relative Poverty <sup>a</sup> (n, %)		
No	28,970 (85.2)	4,924 (72.1)
Yes	5,033 (14.8)	1,004 (14.7)
Without data	0	900 (13.2)
Cut-point of annual income for relative poverty (dollar)	1,863.69	9,517.71
Absolute Poverty <sup>b</sup> (n, %)		
> 1.90 dollar a day	31,631 (93.0)	5,900 (86.4)
≤ 1.90 dollar a day	2,372 (6.98)	28 (0.4)
Without data	0	900 (13.2)
> 3.20 dollar a day	27,890 (82.0)	5,830 (85.4)
≤ 3.20 dollar a day	6,113 (18.0)	98 (1.4)
Without data	0	900 (13.2)
> 5.50 dollar a day	21,500 (63.2)	5,745 (84.1)
≤ 5.50 dollar a day	12,503 (36.8)	183 (2.7)
Without data	0	900 (13.2)
Annual equivalised income in dollar (mean, SD)	7,224.90 (10288.46)	22,491.31 (16080.0)
Per capita income per day in dollar (mean, SD)	12.94 (20.85)	41.93 (34.78)

<sup>†</sup>Individuals aged 10 years and over.

<sup>‡</sup>Individuals aged 1.5 years and over.

<sup>a</sup> Relative Poverty: less than 60% of national median household equivalised income according to the OECD.

<sup>b</sup> Absolute Poverty: cut-points of dollar a day established by World Bank.

## Characteristics of studied samples

Adults in relative poverty situation from the UK were older, with higher BMI and eating frequency and presented annual equivalised income 8.2 times higher compared to Brazilians. Also, poor people from the UK were mostly white skin, female and presented families with lower number of individuals than Brazilian. In contrast Brazilian poor people were nonwhite skin, with more men than expected and skipped fewer meals than British (Table 2).

Table 2 – Characteristics of adults in relative poverty situation in Brazil and in the UK.

	<b>Brazil</b> <b>(n=3,073)</b>	<b>UK</b> <b>(n=464)</b>	<b><i>p</i></b>
	Mean (SD)	Mean (SD)	
Age (years)	38.2 (13.0)	50.8 (19.0)	<0.001
Annual equivalised income (dollar)	1,265.1 (414.8)	6,347.6 (2690.7)	<0.001
BMI (kg/m <sup>2</sup> ) <sup>‡</sup>	24.6 (4.3)	26.6 (6.6)	<0.001
Eating frequency	3.8 (1.1)	4.7 (1.7)	<0.001
Sex (n, %)			<0.001
Male	1,486 (48.4)*	164 (35.3)	
Female	1,587 (51.6)	300 (64.7)*	
Skin color <sup>†</sup> (n, %)			<0.001
White	745 (24.4)	422 (90.9)*	
Non white	2,315 (75.6)*	42 (9.1)	
Breakfast skippers (n, %)			<0.001
No	2,838 (92.4)*	283 (61.0)	
Yes	235 (7.6)	181 (39.0)*	
Lunch skippers (n, %)			<0.001
No	3,049 (99.2)*	368 (79.3)	
Yes	24 (0.8)	96 (20.7)*	
Dinner skippers (n, %)			<0.001
No	3,002 (97.7)*	384 (82.8)	
Yes	71 (2.3)	80 (17.2)*	
Family composition (mean, SD)			
Total members	4.5 (2.1)	2.2 (1.6)	<0.001
Adults	2.2 (1.0)	1.5 (0.7)	<0.001
Children	1.6 (1.5)	0.5 (0.9)	<0.001
Adolescents	0.6 (0.9)	0.3 (0.6)	<0.001

\* Significant difference between groups

‡ 41 missing data on UK sample

† 13 missing data on Brazilian sample

### Characteristics of meals

Accordingly to Table 3, poor people from Brazil presented higher intake of carbohydrate when compared to the UK from all meals, while individuals from the UK showed higher fat content from all meals when compared to individuals from Brazil. At lunch and dinner, the Brazilian individuals consumed more protein than people from the UK; however the UK breakfast of poor people presented higher levels of protein than

those from Brazilians ( $p<0.05$ ). Regarding the energy intake, Brazilian lunch was more caloric than the British, while the UK dinner was more caloric than the Brazilian ( $p<0.001$ ).

Table 3 – Intakes' Means and standard deviations of energy and macronutrients by meal of population in relative poverty in Brazil and the UK.

	<b>Brazil</b>	<b>UK</b>	<b><i>p</i></b>
	Mean (SD)	Mean (SD)	
Breakfast			
Energy (kcal)	312.8 (159.2)	311.2 (121.4)	0.212
Carbohydrate (% Energy)	61.0 (13.1)	58.1 (10.9)	<0.001
Protein (% Energy)	11.8 (4.6)	12.8 (3.7)	<0.001
Fat (% Energy)	27.2 (11.4)	29.1 (10.1)	0.004
Lunch			
Energy (kcal)	692.8 (231.9)	481.0 (137.8)	<0.001
Carbohydrate (% Energy)	50.1 (9.8)	46.9 (8.3)	<0.001
Protein (% Energy)	23.5 (6.3)	16.3 (4.3)	<0.001
Fat (% Energy)	26.3 (6.5)	36.7 (7.2)	<0.001
Dinner			
Energy (kcal)	495.5 (209.8)	594.1 (169.2)	<0.001
Carbohydrate (% Energy)	51.5 (11.4)	44.7 (7.1)	<0.001
Protein (% Energy)	20.9 (7.2)	19.3 (4.9)	0.001
Fat (% Energy)	27.6 (8.1)	35.9 (6.0)	<0.001

There was no difference between the UK and Brazil for breakfast general quality ( $p=0.086$ ), however regarding the components, poor people in the UK presented better scores for protein, calcium and fruit and Brazilians presented higher scores for fiber, saturated fat, added sugar and processed meat ( $p<0.001$ ) (Figure 1). Brazilians in relative poverty had better lunch and dinner qualities than poor people from the UK; and Brazilians presented higher scores for all components, except for vegetable, when compared to lunch of poor British ( $p<0.001$ ). The fiber component score from Brazilians' lunch was twice of the UK's ( $p<0.001$ ). At dinner, vegetable and fruit

components were better for the UK than Brazil ( $p<0.001$ ), and on the other hand, Brazilians in relative poverty presented higher scores for the others components, except for energy density that it had no difference ( $p=0.641$ ).

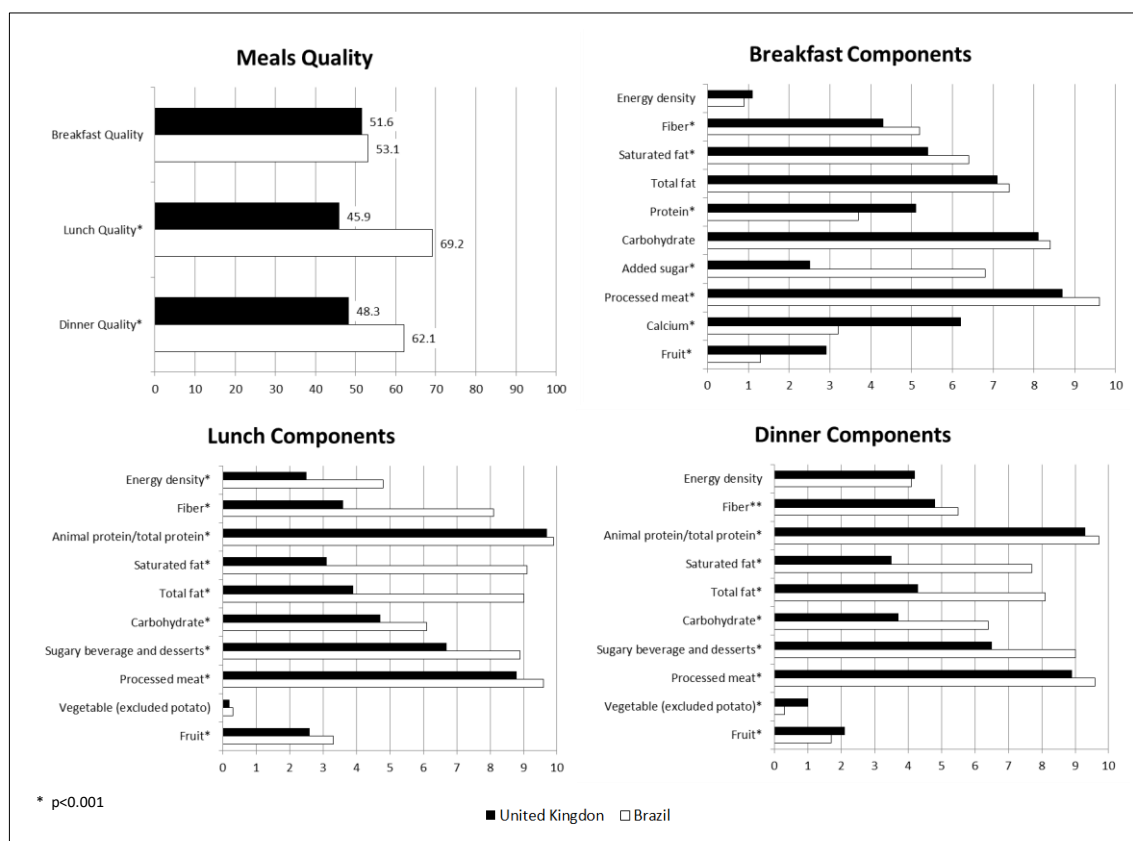


Figure 1 – Meals qualities and Breakfast, Lunch and Dinner components of individuals in poverty situation in Brazil and the UK.

## DISCUSSION

To our knowledge this is the first paper that compares the meals patterns of individuals in poverty situation of Brazil and the United Kingdom and it was shown that poor Brazilians, in general, presented better meal patterns, skipped less meals, had better lunch and dinner qualities and better scores for unhealthy diet markers comparing

to poor British. On the other hand, British in poverty situation had higher eating frequency, presented better scores for protein, calcium and fruits at breakfast; and vegetables and fruits at dinner.

The annual equivalised income for Brazilians in relative poverty situation was three times lower than for British, this difference may explain part of our results. Claro et al (2007) investigated the influence of income and food prices on household consumption of fruit and vegetables in a Brazilian population based study, and their results suggest that the increase in family income or the reduction of the relative prices of fruits and vegetables as possible ways to increase participation of these foods in the diet. Although the scores for fruits and vegetables of British were higher than for Brazilians, it did not reach at least five points for both of them, it means that these poor people did not reach the World Health Organizations (WHO) recommendations that is the intake of 400 grams of fruit and vegetables (equivalent to five portions per day) daily (WHO, 2003). These results are consistent with Grimm et al (2012) study that evaluated the household income disparities in fruit and vegetable consumption of 353,005 adults of 54 states and territories in the United States. They found that individuals living with high level of poverty were less likely to report fruit consumption at least two times daily compared to individuals living with least poverty (OR 0.78, 95% CI 0.74 to 0.81), and the authors also observed that in 43 states and territories, a lower proportion of adults living at greatest poverty had consumed vegetables at least three times daily compared with those living at least poverty (Grimm et al, 2012). Furthermore, a systematic review of studies that assessed the relation between socioeconomic status (SES) and dietary intake and low and middle income countries found that high SES was associated with higher fruit and/or vegetable



consumption (Mayen et al, 2014). Low intake of these items by people on income disadvantage can be explained as a lack of knowledge regarding fruit and vegetable health benefits (Darmon & Drewnowski, 2008; Salehi et al, 2010; Higgs & Thomas, 2016), lack of availability (Ramirez-Silva et al, 2009) and cost (Claro et al, 2007; Darmon & Drewnowski, 2008; Ramirez-Silva et al, 2009; Salehi et al, 2010).

People in poverty situation in the UK presented worse scores for sugar, fat and salt markers as for saturated and total fat, processed meat, desserts and sugared beverages, these results may be explained by the high contribution (56.8%) of ultra-processed foods on total daily energy in the UK (Rauber et al, 2018); these products are more fatty, sugary, salty and energy-dense than are unprocessed or minimally processed foods combined with processed culinary ingredients (Monteiro et al, 2011). Analysis of household expenditure surveys showed that the relative cost of ready-to-eat products was 43% lower in the UK than in Brazil and the lower the relative cost of these products in the UK, compared to Brazil, the higher was their relative consumption (Moubarac et al, 2013). In this way these foods are more assessable for poor people in the UK than in Brazil. Other questions that may be, also, explained by income levels are the higher scores for calcium and protein in the UK than in Brazil at breakfast, once studies in Brazil have shown a positive relationship among income and dairy products intake/availability (Levy-Costa et al, 2005; IBGE, 2010; Muniz et al, 2013). And, when dairy products intake of Brazil were compared with a developed country, their intake frequency was twice of the Brazilians (Bezerra et al, 2014).

Although the eating frequency of British was higher than Brazilian, they skipped more meals. Our hypothesis is that poorer Brazilians eat less frequently, but they choose to take the main meals. On the other hand, the poor British eats more frequently, but

they used to take more snacks. Murakami & Livingstone (2014) found for British general adults an eating frequency based on all eating occasions, that was defined as eating occasions occurred in >15 minutes, of 7.8, and eating frequency based on all eating occasions except for those providing <210 kJ of energy of 5.6, the authors did not separate in main meals and snacks. A study evaluated the association of restrained eating with the frequency on intake occasions among 1,213 British adults, the authors found meal frequency of 2.7 for male and 2.6 for female, and the overall intake frequency were 6.8 for male and 7.3 for female; both prevalence were for high restrained eating categories and the authors identified meals using food-based classification (López & Johnson, 2016). To date there is no data that support our statement, more research are needed.

The main meal in the UK is dinner, and in Brazil is lunch (Gorgulho et al, 2017), this patterns was the same for population in relative poverty as suggested by our results that showed higher energy mean intake at dinner in the UK and higher energy mean intake at lunch in Brazil. It supports the maintenance of the country's cultural habits in different income strata.

In the characterization of poorer individuals in the two countries, the UK's population in poverty situation were older than Brazilian, mostly white, against mostly no white in Brazil and British presented on average of overweight, while in Brazil prevailed normal weight. Developed countries as the UK has had the tendency of high proportions of elderly (United Nations, 2015); and has experienced the paradox of obesity and poverty (Zukiewicz-Sobczak et al, 2014). Regarding skin color differences between the countries, there is a substantial evidence of disadvantage and exclusion among non-white individuals, in relation to whites, in Brazil (Heringer, 2002; Batista et

al, 2004; Leal et al, 2005). Brazilian studies show non-white individuals are the most frequent in the lowest strata of family income (Olinto & Olinto, 2000; Bastos et al, 2008).

Analyzing the whole sample both countries without income selection, it is possible to observe a higher proportion of poor in Brazil, through absolute poverty definition, that is, almost half (47.5%) of Brazilians lived with less than 5.50 dollars, against 2.5% of Britain. Although population from developed countries has higher purchasing power, including individuals in poverty situation, the results of our study suggests a negative impact of economic development and consequent nutritional transition with trade liberalization, global advertising, fast-food consumption and cheaper and high-calorie foods containing larger amount of fat, sugar and salt (Popkin, 2001; Egger & Swinburn et al, 2011). These changes may cause the worsening of meals patterns of poorer British.

In order to improve the diet of poor individuals and reduce dietary inequalities, studies suggest to put in place more population-level interventions, which reduce the need for individual decisions (Capewell S & Graham, 2010; Adams et al, 2016), such as fortification, fiscal measures with government actions to ensure that selected healthy foods remain available at reasonable prices (Capewell S & Graham, 2010), the subsidization of fruit and vegetables (Herman et al, 2008) and the reformulation of manufactured foods by the food industry (Ferrante et al, 2011) with reduction of salt, saturated fat, and sugar contents.

The present study had some limitations. Different methods were used to collect dietary and income data in each country. In Brazil the collect of hour was in slots

of time, it may have caused an under-estimation of Brazilian eating frequency, so the results should be taken with care. To manage the income ranges of UK, we compared the results of upper and lower range, when the cut-point of relative poverty was in the middle of the range, and we found no difference among the main results (data not shown). In general, the studies that compare two countries using different collection methods have the challenge of making them misaligned, and efforts are made for that purpose in our study. Another point that should be taken into account was about the 900 individuals without income data on British data, which made impossible to classify them.

Regarding the strength of our study is the first to use national dietary surveys to compare meals patterns of adults in poverty situation in Brazil and the UK, the results can provide insights into how to confront the current epidemiological reality. In our point of view, the choice of relative poverty to compare the countries was the best approach, since it considers the individual in relationship of the society that they live. Thus,

to be in a developed or developing country, individuals will suffer the same impact, since it presents a deficit of income in relation to the general population.

## **CONCLUSIONS**

Brazilians in relative poverty situation presented better meal patterns, skipped fewer meals, and had better lunch and dinner qualities and better scores for unhealthy diet markers compared to British. The results suggest the impact of economic growth in these countries, with possible choices based on food prices.

## ACKNOWLEDGMENTS

ROS received a fellowship from the Brazilian Federal Agency for the Improvement of Higher Education (CAPES) – Process number: 88881.134385/2016-01. In behalf of all authors, the corresponding author states that there is no conflict of interest.

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## 6 CONSIDERAÇÕES FINAIS

A presente tese trouxe como objetivos o levantamento das definições de refeições mais utilizadas na literatura bem como a adaptação de um índice para avaliação da qualidade do café da manhã com o intuito de preencher lacunas existentes na literatura e subsidiar a comparação dos padrões de refeições de indivíduos em situação de pobreza do Brasil e Reino Unido.

A presente revisão sistemática encontrou vinte e uma definições distintas demonstrando que é necessário um consenso para a padronização de definições a fim de ser possível a comparação dos resultados entre os estudos e evitar a criação de novos critérios a cada novo estudo realizado.

O *Breakfast Meal Quality Index* foi adaptação para avaliar o café da manhã e complementar o estudo das refeições, visto que foi baseado nas mesmas metodologias utilizadas no *Main Meal Quality Index*, destinado a avaliar apenas almoço e jantar. O escore apresentou associação positiva com nutrientes marcadores de dietas saudáveis e negativas com marcadores não saudáveis, além de mostrar um efeito protetor contra o excesso de peso, indicando um bom desempenho nos dados dietéticos brasileiros, mostrando-se útil na avaliação, monitoramento e comparação da qualidade do café da manhã. No entanto, mais estudos são necessários para validar o BMQI em outras populações.

Ao comparar os padrões de refeições de indivíduos em situação de pobreza entre duas nações com diferentes estágios de desenvolvimento esperava-se elucidar questões relacionadas principalmente ao acesso aos alimentos. Os brasileiros apresentaram

melhores padrões de refeições, com melhor pontuação para a qualidade do almoço e jantar, pulando menos refeições e melhores escores para marcadores de dieta não saudável. Por outro lado, os britânicos apresentaram maior frequência de refeições e melhores pontuações para proteína, cálcio e frutas no café da manhã. Esses resultados sugerem um possível impacto do nível de desenvolvimento em cada nação estudada, resultando em possíveis escolhas baseadas nos preços dos alimentos. Dessa maneira, além da imensa importância de retirar os indivíduos da situação de extrema pobreza, esforços são requeridos para melhorar o conhecimento da população sobre escolhas alimentares com intervenções de saúde pública, educação e campanhas de informação para evitar, nos primeiros estágios do crescimento econômico dos países, a troca de uma dieta tradicional por uma dieta baseada em alimentos ultra-processados, além da melhora ao acesso a frutas, verduras e legumes.

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## **ANEXO**

## Anexo 1 – Aprovação do Presente Estudo pelo Comitê de Ética em Pesquisa da Faculdade de Saúde Pública (COEP/FSP)

USP - FACULDADE DE SAÚDE  
PÚBLICA DA UNIVERSIDADE  
DE SÃO PAULO - FSP/USP



### PARECER CONSUBSTANCIADO DO CEP

#### DADOS DO PROJETO DE PESQUISA

**Título da Pesquisa:** PADRÃO ALIMENTAR E SITUAÇÃO DE RENDA

**Pesquisador:** Roberta de Oliveira Santos

**Área Temática:**

**Versão:** 1

**CAAE:** 91192818.2.0000.5421

**Instituição Proponente:** Faculdade de Saúde Pública da Universidade de São Paulo - FSP/USP

**Patrocinador Principal:** Financiamento Próprio

#### DADOS DO PARECER

**Número do Parecer:** 2.728.290

#### Apresentação do Projeto:

o presente estudo utilizará dados de dois estudos transversais de base populacional, um estudo Brasileiro e um Britânico: 1º) Inquérito Nacional de Alimentação (INA), realizado durante a Pesquisa de Orçamentos

Familiares – POF 2008/09 e 2º) National Diet and Nutrition Survey (NDNS). As duas bases de dados utilizadas são de domínio público.

#### Objetivo da Pesquisa:

Objetivo Primário:

Estudar a relação dos padrões alimentares com variáveis sócio demográficas

Objetivo Secundário:

a) Elaborar e aplicar índice de qualidade do café da manhã em diferentes populações;b) Realizar revisão sistemática das definições de refeições;c)

Comparar o consumo de alimentos e nutrientes das definições de refeições mais utilizadas na literatura com o auto-relato;d) Comparar a frequência,

omissão e o índice de qualidade das refeições (café da manhã, almoço e jantar) entre os indivíduos de baixa renda do Brasil e do Reino Unido. e)

Comparar a frequência, omissão e o índice de qualidade das refeições (café da manhã, almoço e jantar) entre os indivíduos em situação de extrema

**Endereço:** Av. Doutor Arnaldo, 715

**Bairro:** Cerqueira Cesar

**CEP:** 01.246-904

**UF:** SP

**Município:** SAO PAULO

**Telefone:** (11)3061-7779

**Fax:** (11)3061-7779

**E-mail:** coep@fsp.usp.br

USP - FACULDADE DE SAÚDE  
PÚBLICA DA UNIVERSIDADE  
DE SÃO PAULO - FSP/USP



Continuação do Parecer: 2.728.290

pobreza com e sem o benefício Bolsa Família.

**Avaliação dos Riscos e Benefícios:**

O projeto apresenta risco mínimo, uma vez que serão utilizados dados secundários. Para minimizar riscos relacionados à confidencialidade dos dados, os pesquisadores não terão acesso a informações que possam levar a identificação dos indivíduos da pesquisa, uma vez que os participantes serão sinalizados com números de identificação (ID). Não há acesso a nomes, endereços, telefones ou quaisquer informações confidenciais.

Dentre os benefícios, destaca-se que a pesquisa disponibilizará dados sobre os benefícios da renda e dos programas de transferência de renda na alimentação.

**Comentários e Considerações sobre a Pesquisa:**

Projeto de pesquisa com objetivos bem definidos e metodologia adequada.

**Considerações sobre os Termos de apresentação obrigatória:**

Os termos de apresentação obrigatória estão adequados.

**Conclusões ou Pendências e Lista de Inadequações:**

Aprovado o projeto no formato atual.

**Considerações Finais a critério do CEP:**

**Este parecer foi elaborado baseado nos documentos abaixo relacionados:**

Tipo Documento	Arquivo	Postagem	Autor	Situação
Informações Básicas do Projeto	PB_INFORMAÇÕES_BÁSICAS_DO_PROJETO_985199.pdf	08/06/2018 16:04:27		Aceito
Projeto Detalhado / Brochura Investigador	Projeto_pesquisa_Roberta.pdf	08/05/2018 12:42:11	Roberta de Oliveira Santos	Aceito
Folha de Rosto	folhaDeRosto_Roberta.pdf	08/05/2018 12:36:44	Roberta de Oliveira Santos	Aceito

**Situação do Parecer:**

Aprovado

**Necessita Apreciação da CONEP:**

Não

Endereço: Av. Doutor Arnaldo, 715  
Bairro: Cerqueira Cesar CEP: 01.246-904  
UF: SP Município: SAO PAULO  
Telefone: (11)3061-7779 Fax: (11)3061-7779 E-mail: coep@fsp.usp.br



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DE SÃO PAULO - FSP/USP



Continuação do Parecer: 2.728.290

SAO PAULO, 21 de Junho de 2018

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Assinado por:

**Kelly Polido Kaneshiro Olympio**  
(Coordenador)

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**Endereço:** Av. Doutor Arnaldo, 715

**Bairro:** Cerqueira Cesar

**CEP:** 01.246-904

**UF:** SP

**Município:** SAO PAULO

**Telefone:** (11)3061-7779

**Fax:** (11)3061-7779

**E-mail:** coep@fsp.usp.br

## CURRÍCULO LATTES



### Valéria Troncoso Baltar

Endereço para acessar este CV: <http://lattes.cnpq.br/9774872677279673>  
Última atualização do currículo em 09/08/2018

Graduada em Estatística pela UNICAMP (1999), fez seis meses de curso intensivo de demografia no CELADE (ONU-Chile, 1999). Concluiu o mestrado em Estatística pelo IME/USP (2005), com período sanduíche na Universitat Pompeu Fabra (Barcelona, 2004) e doutorado em Saúde Pública, na área de Epidemiologia, pela USP (2011), com período sanduíche na Imperial College London (2009-2010). Trabalhou de 2001 a 2007 como estatística do Laboratório de Epidemiologia e Estatística do Instituto Dante Pazzanese de Cardiologia. Tem experiência na área de Estatística, com ênfase em Análise Multivariada, atuando principalmente nos seguintes temas: bioestatística, epidemiologia e nutrição. Fez pós-doutorado em Nutrição e Saúde Pública na Faculdade de Saúde Pública da USP e foi pesquisadora associada (honorária) da Faculdade de Saúde Pública da Imperial College London. Atualmente é professora de Bioestatística da Universidade Federal Fluminense (UFF). (Texto informado pelo autor)

### Identificação

<b>Nome</b>	Valéria Troncoso Baltar
<b>Nome em citações bibliográficas</b>	BALTAR, Valéria Troncoso;BALTAR, Valéria Troncoso;Baltar, V. T.;Baltar, V.;Baltar, Valeria T.;Baltar, Valéria T.;Baltar, Valéria Troncoso;Baltar, Valéria T.;Baltar, Valeria Troncoso;Baltar, Valéria Troncoso;BALTAR, VAL?RIA TRONCOSO

### Endereço

<b>Endereço Profissional</b>	Departamento de Epidemiologia e Bioestatística, Departamento de Epidemiologia e Bioestatística. Travessa Marquês de Paraná, 303 / 3 andar Centro 24030210 - Niterói, RJ - Brasil Telefone: (021) 26299342 URL da Homepage: <a href="http://www.uff.br/">http://www.uff.br/</a>
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### Formação acadêmica/titulação

<b>2007 - 2011</b>	Doutorado em Saúde Pública (Conceito CAPES 6). Universidade de São Paulo, USP, Brasil. com <b>período sanduíche</b> em Faculty of Medicine - Imperial College London (Orientador: Paolo Vineis). Título: Equações Estruturais aplicadas a modelos causais de câncer de pulmão, Ano de obtenção: 2011. Orientador:  Julio Cesar Rodrigues Pereira. Bolsista do(a): Conselho Nacional de Desenvolvimento Científico e Tecnológico, CNPq, Brasil. Palavras-chave: Equações Estruturais; Modelo Causal; câncer de pulmão; cotinina; vitaminas B. Grande área: Ciências da Saúde Grande Área: Ciências da Saúde / Área: Saúde Coletiva / Subárea: Epidemiologia.
<b>2002 - 2005</b>	Mestrado em Estatística (Conceito CAPES 6). Universidade de São Paulo, USP, Brasil. com <b>período sanduíche</b> em Universitat Pompeu Fabra (Orientador: Michael Greenacre). Título: Análise Fatorial Múltipla para Tabelas de Contingência, Ano de Obtenção: 2005. Orientador:  Lúcia Pereira Barroso. Bolsista do(a): Programa de Bolsas de Alto Nível para América Latina (sanduíche), ALBAN, Espanha. Palavras-chave: Análise de Correspondência; Análise de Correspondência Interna; Análise Fatorial Múltipla; Análise Fatorial Múltipla para Tabelas de Contingência. Grande área: Ciências Exatas e da Terra Graduação em Estatística.
<b>1995 - 1999</b>	Universidade Estadual de Campinas, UNICAMP, Brasil. Título: Estudo de Semelhança e Diferenças entre os Municípios dos Rios Piracicaba, Capivai e Jundiá.



## Roberta de Oliveira Santos

Endereço para acessar este CV: <http://lattes.cnpq.br/0148902663368239>

Última atualização do currículo em 03/11/2018

Possui graduação em Nutrição pela Universidade Federal de São Paulo, Campus Baixada Santista (2011), aprimoramento em Nutrição Clínica pela Faculdade de Saúde Pública/USP (2012) e Mestrado em Nutrição em Saúde Pública FSP-USP (2014). É atualmente doutoranda do programa de Nutrição em Saúde Pública pela FSP/USP, com realização de estágio sanduiche na Coventry University (UK). (Texto informado pelo autor)

## Identificação

<b>Nome</b>	Roberta de Oliveira Santos
<b>Nome em citações bibliográficas</b>	SANTOS, R. O.; DE OLIVEIRA SANTOS, ROBERTA; SANTOS, ROBERTA DE OLIVEIRA

## Endereço

<b>Endereço Profissional</b>	Universidade de São Paulo, Faculdade de Saúde Pública. Faculdade de Saúde Pública Pacaembu 01246904 - São Paulo, SP - Brasil Telefone: (11) 1130617856 Fax: (11) 30617856
------------------------------	--

## Formação acadêmica/titulação

<b>2014</b>	Doutorado em andamento em nutrição em saúde pública. Faculdade de Saúde Pública da Universidade de São Paulo, FSP/USP, Brasil. com <b>período sanduiche</b> em Coventry University (Orientador: Petra Wark). Título: Padrão alimentar de indivíduos em situação de pobreza, Orientador: ☺ Valéria Troncoso Baltar. Bolsista do(a): Coordenação de Aperfeiçoamento de Pessoal de Nível Superior, CAPES, Brasil. Palavras-chave: refeição; padrão alimentar; bolsa família.
<b>2012 - 2014</b>	Mestrado em Nutrição em Saúde Pública. Faculdade de Saúde Pública da Universidade de São Paulo, FSP/USP, Brasil. Título: CARACTERIZAÇÃO DA POPULAÇÃO ADULTA E IDOSA DO MUNICÍPIO DE SÃO PAULO SEGUNDO PADRÕES ALIMENTARES DE REFEIÇÕES ? ESTUDO DE BASE POPULACIONAL ISA CAPITAL 2008., Ano de Obtenção: 2014. Orientador: ☺ Valéria Troncoso Baltar. Bolsista do(a): Coordenação de Aperfeiçoamento de Pessoal de Nível Superior, CAPES, Brasil. Palavras-chave: consumo usual; padrão alimentar; refeições; ISA-Capital; análise fatorial; análise de agrupamento. Grande área: Ciências da Saúde
<b>2011 - 2012</b>	Aperfeiçoamento em Aprimoramento Profissional em Nutrição Clínica. (Carga Horária: 1800h). Faculdade de Saúde Pública da Universidade de São Paulo, FSP/USP, Brasil. Título: Perfil nutricional de crianças e adolescentes atendidos em Unidade Básica de Saúde de 2009 a 2011. Ano de finalização: 2012. Bolsista do(a): Fundação do Desenvolvimento Administrativo, FUNDAP, Brasil.
<b>2007 - 2011</b>	Graduação em Nutrição. Universidade Federal de São Paulo, UNIFESP, Brasil. Título: Catálogo Fotográfico com Modelos de Apresentação de dieta geral de forma lúdica para crianças e adolescentes portadores de doença oncológica em regime de internação: uma estratégia de humanização hospitalar. Orientador: Lília Zago Ferreira dos Santos.