

**Food security, health and well-being in times of
financial and political crisis in Brazil**

Luna Rezende Machado de Sousa

School of Human Nutrition
McGill University, Montreal, Canada

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LIST OF ABBREVIATIONS

EBIA	Food Insecurity Brazilian Scale
FI	Food insecurity
FIES	Food Insecurity Experience Scale
GDP	Gross Domestic Product
GWP	Gallup World Poll
HFSSM	Household Food Security Survey Module
MDG	Millennium Development Goals
NHANES	National Health and Nutrition Examination Survey
NHIS	National Health Interview Survey
PNAD	National Household Sample Survey
PNS	National Health Survey
SDGs	Sustainable Development Goals
SPSS	Statistical Package for the Social Sciences
UN	United Nations
WHO	World Health Organization

ABSTRACT

Background: Food security, health and well-being for all are the second and third Sustainable Development Goals (SDGs) of the 2030 Agenda set by the United Nations. Although global efforts have resulted in improvements in food security, health and well-being across the world, studies have shown that economic and political crises can rapidly undermine achievements in these areas and prevent countries from reaching both SDGs. However, the literature lacks continuous monitoring of food security, health, and well-being in affected countries; and despite Brazil's food security policies and universal healthcare system are recognized as a model for developing countries, no one has yet investigated the effects of the country's current financial and political crisis on its food security, health, and well-being. **Objectives:** To fill these gaps, this study aimed to assess the changes in food security status, health, and well-being before and during Brazil's current crisis, as well as to explore their associations with individual, economic, psychosocial and environmental factors. **Methods:** This is a cross-sectional study based on population-representative data (n= 356,667) from two different sources: the Brazilian National Household Sample Survey and the Gallup World Poll. Household food security status was measured by a shorter version of the Brazilian Food Insecurity Scale, consisting of the first 8 questions of the original scale. Health and well-being were measured by the Personal Life Index and the Life Evaluation Index. Descriptive analyses and logistic regression models were performed to assess the changes in food security, health status, and well-being and to investigate the factors associated with these changes. All tests were performed using the Statistical Package for the Social Sciences (SPSS), version 23, and evaluated at the 0.05 significance level. **Results:** There was deterioration in food security and well-being during the crisis. The percentage of households classified as food secure declined by 36% (76% in 2013 to 40% in 2017), severe food insecurity tripled (4% in 2013 to 12% in 2017) and the prevalence of respondents classified as "thriving" declined by almost 30% (63% in 2013 to 33% in 2017). This deterioration of food security status disproportionately affected the poor, increasing by six times the chances of being food insecure among the poorest strata. In addition, those who

reported a low job climate, lack of social support and low level of education were twice more likely to be food insecure. Rather than income, health status and well-being were most associated with food insecurity, increased age and lack of social support, followed by the low level of education, poor community environment and dissatisfaction with the healthcare system.

Conclusions: Despite its noteworthy social policy framework, during the crisis, Brazil suffered from a great deterioration of food security and well-being. These findings indicate the need for emergency policies, which should focus on strengthening access to food, healthcare, and education, improving community environment (quality of air, water, and infrastructure), and fostering social support.

Key-words: Food security; health status, well-being, socioeconomic factors, social determinants, Brazil.

RÉSUMÉ

Contexte: La sécurité alimentaire, la santé et le bien-être pour tous constituent les 2^e et 3^e Objectifs de Développement Durable (SDGs) étant fixés par les Nations Unies et devant être atteints avant 2030. Bien que les efforts mondiaux aient abouti à des améliorations de la sécurité alimentaire, de la santé et du bien-être dans le monde, des études ont montré que les crises économiques et politiques peuvent à la fois compromettre les prouesses accomplies dans ces domaines, ainsi qu'empêcher les pays d'atteindre ces deux SDGs. Cependant, il existe un manque d'information dans la littérature sur la surveillance continue de la sécurité alimentaire, de la santé et du bien-être dans les pays affectés par des crises économiques et politiques. Au Brésil, les politiques de sécurité alimentaire et le système de santé universel implémentés sont utilisés comme modèle de base, à l'échelle globale, pour les pays en voie de développement. Cependant, jusqu'à maintenant, aucune étude n'a été réalisée afin d'étudier les effets de la crise financière et politique actuelle du Brésil sur la sécurité alimentaire, la santé et le bien-être du pays. **Objectifs:** Afin de combler ces lacunes, cette étude visait à évaluer les changements intervenus dans la sécurité alimentaire, la santé et le bien-être avant et durant la crise brésilienne, ainsi qu'à explorer leurs associations avec des facteurs individuels, économiques, psychosociaux et environnementaux. **Méthodes:** Il s'agit d'une étude transversale basée sur des données représentatives de la population (n= 356 667) provenant de deux sources différentes: «l'Enquête Nationale Brésilienne» et le «Gallup World Poll». L'état de la sécurité alimentaire des ménages a été mesuré par le biais d'une version réduite de l'échelle Brésilienne d'Insécurité Alimentaire comprenant les huit premières questions de l'échelle originale. La santé et le bien-être ont été mesurés à l'aide de «l'Indice de Santé Personnelle» et de «l'Indice d'Évaluation de la Vie». Des analyses descriptives et des modèles de régression logistique ont été réalisés afin d'évaluer les changements intervenus dans la sécurité alimentaire, l'état de santé et le bien-être ainsi que d'examiner les facteurs reliés à ces changements. Tous les tests ont été effectués à l'aide du Progiciel Statistique pour les Sciences Sociales (SPSS), version 23, et ont été évalués utilisant un seuil de signification de 0,05. **Résultats:** La sécurité alimentaire et le bien-être se

sont détériorés au courant de la crise. Le pourcentage de sécurité alimentaire dans les ménages a diminué de 36% (76% en 2013 à 40% en 2017), l'insécurité alimentaire sévère a triplée (4% en 2013 à 12% en 2017) et la prévalence des répondants classés comme «prospères» a été réduite de près de 30% (63% en 2013 à 34% en 2017). Cette détérioration de la sécurité alimentaire a touché les pauvres de manière disproportionnée, multipliant par six les risques d'être en situation d'insécurité alimentaire au sein des ménages pauvres. En outre, les personnes ayant déclaré avoir de faibles perspectives économiques et professionnelles, un manque de soutien social et un faible niveau d'éducation étaient deux fois plus susceptibles d'être en situation d'insécurité alimentaire. De plus, l'état de santé et le bien-être étaient davantage liés à l'insécurité alimentaire, au vieillissement et au manque de soutien social, comparés au revenu, et étaient suivis par un faible niveau d'éducation, un environnement communautaire précaire et le mécontentement par rapport au système de santé. **Conclusions:** Malgré ses politiques sociales notables, le Brésil a connu une grave détérioration de la sécurité alimentaire et du bien-être durant la crise. Ces résultats indiquent la nécessité de mettre en place des politiques d'urgence axées sur le renforcement de l'accès à l'alimentation, au système de santé et à l'éducation, ainsi que sur l'amélioration de l'environnement communautaire et sur la favorisation du soutien social.

Mots-clés: Sécurité alimentaire; état de santé, bien-être, facteurs socioéconomiques, déterminants sociaux, Brésil.

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CONTRIBUTIONS OF AUTHORS

Both manuscripts of this thesis were developed in collaboration with all co-authors, who provided support and guidance through this process. As the first author, I developed the research questions and hypothesis, reviewed the literature, designed the methodology, conducted the data analysis and interpretation of results, wrote the first and subsequent drafts of the manuscripts, and submitted them to the scientific journals. Arlette Saint Ville and Ana Maria Segall-Corrêa helped with the data interpretation, edit, and revision of the manuscripts. Hugo Melgar-Quinónez supervised the development of the work and contributed to the concept of the research questions, data interpretation, and revision of the manuscripts.

CHAPTER 1: GENERAL OVERVIEW

1.1 INTRODUCTION

Combating hunger and promoting health and well-being have been the focus of major international commitments to global development in the light of human rights.^{1,2} From 1990 to 2015, global efforts around the 8 Millennium Development Goals (MDG) have resulted in the reduction of poverty and hunger and improvement of many health indicators across the world.¹ By the end of the MDG period, in the developing world, the prevalence of extreme poverty and under-five mortality rate had fallen by more than half; and the prevalence of undernourishment and the proportion of children under-five underweight had almost halved.¹

In an effort to amplify the progress achieved, the United Nations (UN) has set 17 Sustainable Development Goals (SDGs) aimed to end poverty, promote prosperity and guarantee inclusive societies, while protecting the environment, by the end of 2030.² Although the SDGs were built on the MDG, this new agenda is more ambitious, with a people-centered approach and a wider range of goals; and it brings special attention to food security, health, and well-being.²

While the MDG had targeted to halve the proportion of undernourishment in the world, the 2nd SDG aims to end undernourishment, moderate and severe food insecurity. Health also gained a broader perspective on this new agenda.^{1,2} Different from the health goals of MDG that were focused on child and maternal mortality, the 3rd SDG aims to “ensure healthy lives and promote well-being for all at all ages”.^{1,2} This goal is supported by the 16 other SDGs that tackle major social determinants of health and well-being, such as poverty, hunger, education, gender equality, clean water and sanitation, economic growth, peace, and justice.^{2,3}

While the world had made substantial progress around the MDGs, many of the achievements in food security, health and well-being have been attributed to periods of rapid economic growth that supported the establishment of political commitments to social equity in developing countries.^{1,2,4,5} This suggests a threat to the many countries that have experienced economic and political instability in recent years, as is the case in Brazil.⁶

During the MDG period, Brazil excelled in meeting all hunger targets and its successful social policies (e.g., conditioned cash transfer, school feeding program, popular restaurants, universal healthcare system) and legal framework in addressing food insecurity and social inequalities have become a model for developing countries.⁷⁻⁹ However, this period was underpinned by a great economic growth and political stability, which is not the country's current context.^{6,10-12}

The recent launching of the SDGs in 2016 takes place amidst an unfavorable scenario in Brazil, as over the past four years the country has faced its major economic crisis in a setting of political instability.^{6,11,12} This raises the question of whether a robust legislative framework coupled with successful social policies are capable of protecting people's food security, health and well-being during economic and political shocks.

1.2 STUDY RATIONALE

Food security, health status and well-being measurements are needed to raise awareness among decision-makers, support civil society organizations and guide the development and evaluation of interventions, especially now with global efforts around the Sustainable Development Goals number 2 and 3: “end hunger and achieve food security” and “health and well-being for all”.²

Although there is evidence of the adverse impact of financial and political crises on food security, health and well-being, current studies only provide snapshots of these issues in affected countries.^{4,13,14} Therefore, in order to improve our understanding of the effects of economic and political crises, research needs to provide continuous assessments of food security, health status, and well-being in affected countries. Such assessments are needed in Brazil because, despite its well-known food security policies and universal public healthcare system¹⁵⁻¹⁸, no one has yet investigated the effects of the country's ongoing economic and political crisis⁶ on its food security, health, and well-being.

1.3 OVERALL STUDY AIM

The purpose of this study is to explore the changes in food security, health status and well-being before and during the current financial and political crisis in Brazil, along with the factors associated with these changes.

1.4 STUDY OBJECTIVES

The research has six objectives. Objectives I, II and III are tackled in Chapter 3; and objectives IV, V and VI are addressed in Chapter 4.

- I. Assess the changes in food security status in Brazil before and during the financial and political crisis, covering three years before and three years during the crisis.
- II. Explore the associations between changes in food security status and socioeconomic and individual factors during the Brazilian financial and political crisis.

- III. Enhance the discussion on how policies food security in times of political and financial instability.
- IV. Assess the changes in health status and well-being in Brazil before and during the financial and political crisis, covering three years before and three years during the crisis.
- V. Explore the associations between changes in health status and well-being with socioeconomic and individual factors from the model of “Social Determinants of Health Inequalities” by the World Health Organization¹⁹, during the Brazilian financial and political crisis.
- VI. Enhance the discussion on how policies can protect people`s health and well-being in times of political and financial instability.

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CHAPTER 2: LITERATURE REVIEW

2.1 FOOD SECURITY

2.1.1 Definition and measurement

The concept of food security was first described at the World Food Conference in 1974 as the “availability at all times of adequate world supplies of basic foodstuffs to sustain a steady expansion of food consumption and to offset fluctuations in production and prices”.^{1,p.10} However, in the mid-1970 this original definition of food security focused on food availability was questioned by scholars and practitioners who claimed that an adequate food supply does not assure food access.² As a result of this new thinking, food security was redefined at the World Food Summit in 1996 as “when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life”.^{3,p.1} This most recent and widely recognized definition emphasizes the multidimensional nature of food security, which involves four pillars^{3,4}:

- **Food availability:** sufficient and adequate (i.e., safe nutritious) food supply at the local, regional and national level, ensured by domestic production and ability to import food.^{3,4}
- **Food access:** physical and economic access to adequate food, guaranteed by equitable and equal access to productive and financial resources.^{3,4}
- **Utilization:** efficient utilization of food, supported by the consumption of sufficient, safe (including clean water) and nutritious food.^{3,4}
- **Stability:** uninterrupted access to adequate food, resilient to cyclical and sudden shocks in food production and prices.^{3,4}

When these requirements are not met, it is called food insecurity, which can be chronic or transitory.⁴ Chronic food insecurity is a longstanding limited access to food, caused by structural poverty and/or persistent food shortage.⁴ Transitory food insecurity is usually a result of an economic shock, natural disaster and/or conflicts.⁴

In an effort to measure the multifaceted phenomenon of food security, several methods have been developed. The most common measures used are the prevalence of undernourishment; household food expenditure; dietary intake; anthropometry; experience-based food insecurity scales.⁵

The prevalence of undernourishment, an indicator developed by the FAO in the 1970s, estimates the prevalence of people whose food consumption is below the minimum energy requirement, based on national food balance sheets.^{5,6} This indicator focuses on food availability rather than food access since the national calorie supply per capita does not account for the unequal food distribution.^{5,6} In contrast to the undernourishment indicator that measures food availability at the national level, the household food expenditure measure assesses the food availability at the household level based on data from household expenditure surveys.⁵ However, the data on household food expenditure do not reflect the intra-household food distribution and do not account for foods consumed outside the household.⁵

The dietary intake measure assesses individual food consumption using dietary assessments, such as 24-hours food recall, food frequency questionnaire and food records, which heavily rely upon the respondent's memory.^{5,6} Nonetheless, due to its high cost, the dietary intake measure is rarely included in national surveys.^{5,6} Anthropometric indicators, such as the prevalence of children underweight, wasting and stunting have historically been used to evaluate food security status, however, they

rather measure nutritional status which is the outcome of food consumption and utilization.^{5,6}

The change in the concept of food security in the 1990s brought the need to build a measure encompassing the new and broader definition of food security.⁶ At that time, Radimer and colleagues, with the intent of deriving a socially appropriate meaning from the term hunger, conducted an ethnographic research on low-income families in upstate New York.⁷ The results of this research showed that food insecurity caused by the lack of financial resources begin with the concern of not having enough food, progressing to the food shortage at home, which when aggravated leads to a decrease in quality and quantity of diet, and finally to hunger experiences, such as not eating for a whole day.^{6,7}

The research of Ramider et al.⁷ contributed to the conceptual understanding of food insecurity experiences that served as the basis for the development of the first food insecurity experience-based scale, in the United States, called the Household Food Security Survey Module (HFSSM).⁶ Several validation studies have shown that the HFSSM is a relatively simple and inexpensive method, with high predictive validity and reliability, to measure food security status. As a result, other countries have developed their own food insecurity scales based on the HFSSM, such as the Brazilian Food Insecurity Scale (EBIA).^{5,6}

The process of adapting the HFSSM to the Brazilian context began in 2003 with a qualitative research carried out in four urban areas aimed to discuss the food insecurity experiences addressed by the HFSSM's questions.^{5,8} This study led to the development of the Brazilian Food Insecurity Scale, which was validated in a study conducted on a national representative sample of more than 1,800 households.^{5,8} This research concluded that the EBIA has an excellent internal consistency/reliability (i.e., how well

a test measures what it should), with a Cronbach's alpha greater than 0.90; and a strong criterion validity (i.e., the extent to which a measure is related to an outcome), with the level of food insecurity associated in a dose-response manner with income and consumption of nutritious foods such as fruits, vegetables, meat, and dairy products.^{5,8} The EBIA's internal consistency was also confirmed by a subsequent study, conducted in 847 households, using Rasch modeling.⁹ As a result of its outstanding performance, the EBIA has been included in the National Household Sample Survey (PNAD) since 2004.^{5,9}

The original EBIA had 15 question items but after a series of studies testing its psychometric performance it was reduced to 16 items (version used in the 2004 PNAD) and finally to a 14-items scale (applied in 2009 and 2013 PNAD).^{10,11} This refinement of the scale aimed to simplify its content by excluding redundant items, which reduced the costs of its application in national surveys without compromising its validity and reliability.¹⁰

Questions of EBIA (**Table 2.1**) use the reference period of three months prior to the interview and require “yes” or “no” responses.^{10,11} Each positive answer receives one point and the total points is used to classify the food security status into “food security”, “mild food insecurity (FI)”, “moderate FI” and “severe FI”, based on thresholds that vary according to household composition (Table 2.1).^{10,11} The first eight questions are applied to all households and the other six are only addressed to households with residents under 18 years old.^{10,11}

Table 2.1 – EBIA questions and thresholds.

1. During the past three months, were the residents of this household worried the food would run out before they could buy or receive more food?
2. During the past three months, did the food run out before residents of the household were able to buy more food?
3. During the past three months, did residents of this household not have money for a healthy and varied diet?
4. During the past three months, did residents of this household eat only a few kinds of food that they still had in the house because money ran out?
5. During the past three months, did any household member 18 years or older skip a meal because there was no money to buy food?
6. During the past three months, did any household member 18 years or older eat less than they should have because there was no money to buy food?
7. During the past three months, did any household member 18 years or older feel hungry and not eat because there was no money to buy food?
8. During the past three months, did any household member 18 years or older eat only one meal a day or go an entire day without eating, because there was no money to buy food?

Classification	Thresholds	
	Household without residents under 18	Household with residents under 18
Food Security	0	0
Mild FI	1-3	1-5
Moderate FI	4-5	6-9
Severe FI	6-8	10-14

Adapted from: Instituto Brasileiro de Geografia e Estatística (IBGE). Pesquisa Nacional por Amostra de Domicílios: Segurança Alimentar 2013. Rio de Janeiro: IBGE; 2014.

2.1.3 Food security during financial and political crises

Food security is strongly affected by stagnating growth, high food prices, low income and unemployment, as they jeopardize the financial access to food.^{12,13} Besides the economic factors, political stability also plays an essential role in the food security status, once it directly affects the economy and the government commitments towards food security.¹⁴ On this account, economic growth and political stability are considered macro determinants of food security.¹⁵

The association between financial crises and food insecurity has gained attention since the 2008 Global Crisis due to its deleterious impact on food access resulted from increases in unemployment and food prices.^{13,16-18} A report from the United Nations revealed that the 2008 Crisis led more than 40 million new people into hunger in 2008, due to the 83% increase in food prices.¹⁶

During international crises, developing countries that are highly dependent on exports and remittances are the most vulnerable.¹³ Brinkman and collaborators¹³, who explored the impact the 2008 Global Crisis on food consumption, found that increases in the food basket price led to a reduction in household food consumption in all developing regions. Based on a series of proxy measures, the researchers found that in 2008 half of households in Palestine reduced food expenditures by reducing food quantity and avoiding buying meat and milk; in Guinea almost one third of households reduced the number of meals; and in El Salvador almost 90% of households needed to reduce both quantity and quality of the diet.¹³ In Egypt the increase in food prices resulted in around 1/5 of the population consuming less than the average calorie requirements, while in Pakistan the prevalence of undernourishment increased from 25% to 30% in rural areas and from 21% to 27% in the urban population.^{13,17} Although developing economies are the most susceptible to economic shocks, the 2008 Crisis also affected food security in Europe.^{12,13} For instance, from 2003 to 2011 the percentage of households reporting not being able to afford meat/chicken/fish significantly rose in the United Kingdom (4 to 9%), Netherlands (0 to 2%), France (3 to 7%), Spain (2 to 6%), and Austria (2 to 4%).¹²

Households that spend a large share of their income on food are at higher risk of food insecurity during financial crises.^{19,20} As a coping strategy in times of economic hardship, these households end up prioritizing foods that are high in calories but nutritionally poor, resulting in a decline in diet quality, followed by a reduction in food intake as financial resources run out.^{19,20} As a result of the 2008 Crisis, increases in the share of household income spent on food were detected in countries such as Pakistan and Mexico, leading to an increased risk of household food insecurity.^{13,20}

In contrast with low income and high expenditures on food, a higher level of education and social support have a protect effector against food insecurity.^{20,21} In Mexico, although severe food insecurity increased (8-10%) from 2008 to 2010, in households where the head of household had completed high school, the likelihood of experiencing food insecurity was twice as low (Vilar-Compte et al, 2010). A study conducted by Martin²¹, on 300 low-income households in Connecticut, found an association between social support and decreased risk of food insecurity. The author concluded that social support might facilitate the access to economic resources and food, for example, the possibility to borrow food or money in case of shocks.²¹

Recently, the impact of political instability on food security, explained by its association with conflicts and economic instability, has brought attention to the international community.²² After decades of improvement, food insecurity has increased at the global level in the past four years, as a consequence of many economic and political crises that have happened across the world.²² In South America, from 2015 to 2017, the number of undernourished people increased from 19.3 to 21.4 million and the prevalence of severe food insecurity went from 7.6% to 9.8%, as a result of the political and financial crises faced by major Latin American economies, such as Venezuela, Argentina and Brazil.¹⁴ For these reasons, FAO states that the success of food security policies and interventions depends on fostering economic development and strengthening good governance and civil society organizations.¹⁴

2.1.4 Food security in the Brazilian context

As the world struggles with food insecurity, there is a need for countries with successful food security policies, such as Brazil, known for reducing food insecurity by improving food access, income generation, and strengthening smallholder farmers and civil societies organizations.²³⁻²⁵ For instance, the Zero Hunger Program, launched by

the Brazilian government in 2003, has been internationally recognized as a model for tackling poverty and hunger by involving large-scale public policies and diverse institutions.²³⁻²⁵

Along with these economic-related food policies, one of the most noteworthy initiatives taken by Brazil was to build a legal framework for food security.^{26,27} This initiative transformed the fight against hunger into a legal obligation on the state.²⁶ In 2006 the government enacted the Food and Nutrition Security Law (LOSAN).²⁷ Moreover, by 2010, Brazil became one of several countries to recognize the Right to Food in the national constitution²⁶, as recommended by the United Nations²⁸.

This period of high investments in food security policies was also marked by substantial economic growth, with a Gross Domestic Product (GDP) growth of 7.5% in 2010, reduction in unemployment and extreme poverty.^{29,30} These political and social commitments to end hunger, supported by a period of economic prosperity, substantially improved food security status and reduced severe food insecurity among Brazilian households, from 2004 to 2013.¹¹

However, the consequences of political and economic crises on food security seen across the world suggest a threat to food security in Brazil, as since 2014 the country has faced its major financial crisis along with political instability.³¹⁻³³ Since then, the country has suffered from a worsening of many social indicators, such as unemployment and income.³¹⁻³³ National food prices have increased 83% from 2010 to 2016, mostly affecting rice, beans, vegetables, fruits and meat.³⁴ Furthermore, the government has responded to the crisis with austerity measures and reduced the funding of social policies.^{31,32}

2.2 HEALTH AND WELL-BEING

2.2.1 Definition and measurement

The traditional definition of health as “a state of being free from illness”, although still found in dictionaries, was broadened in the concept proposed by the World Health Organization (WHO) in 1948, which defines health as “a state of complete physical, mental and social well-being, and not merely the absence of disease and infirmity”.³⁵⁻³⁸ This new and widely accepted concept, developed in the post-World War II context when health and peace seemed inseparable, recognizes health as a result of psychosocial, behavioral, and environmental factors, and focus on the need to achieve well-being.^{37,38} Empirical studies have shown that people`s well-being is strongly associated with health problems and life expectancy, which confirms the conceptual association between health status and well-being.^{39,40}

With wellness in the center of the conception of health, efforts aimed to define well-being resulted in two main theories, the hedonic and eudaimonic view of well-being.⁴¹ The hedonic view recognizes well-being as subjective happiness, understood by the experience of pleasure (i.e., positive affects) and absence of displeasure (i.e., negative affects).⁴¹ The understanding of well-being in the matter of pleasure versus pain is related to the idea that pursuing the maximum amount of joy is the ultimate goal of life and what drives the society.⁴¹ Measurements of hedonic well-being, also called experienced-well-being, are composed of questions about every day positive and negative feelings or experiences, such as sadness, worry, pain, enjoyment and respect.^{39,42} Such measurements intend to capture current or recent moods and emotions to avoid the effects of judgment and old memories.⁴²

In contrast, the eudaimonic view understands that not all pleasure moments lead to wellness so that happiness is not equal to well-being expectations.⁴¹ The eudaimonic

interpretation of well-being encompasses self-realization and life satisfaction, achieved when life aligns with one's values and aspirations.⁴¹ Eudaimonic well-being is often measured by life satisfaction, where individuals are asked to evaluate their lives based on a “ladder” scale with 10 steps, where 0 represents the worst and 10 the best possible life.^{39,42} When individuals are asked to evaluate their lives, it makes them reflect on their living conditions such as income, job, marriage and health condition (e.g., health problems), which are considered social determinants of health and well-being.^{42,43}

Although the WHO has widened the concept of health by bringing a more holistic view, most health indicators are still guided by the medical model based on the presence of diseases.^{37,44} Epidemiological research usually collects data on self-reported disease and functional status because of its lower cost and greater applicability compared to clinical measurements.^{45,46} Many studies have proved the validity of these self-reported health indicators against clinical measures, showing that they are good predictors of health problems (i.e., hypertension, diabetes, depression).⁴⁷⁻⁵²

As a result of the satisfying performance of self-reported disease and functional status measures, they have been included in national health surveys of several countries, such as the National Health Interview Survey (NHIS) in the United States and the National Health Survey (PNS) in Brazil, to evaluate the prevalence, incidence, and trends of disease.^{53,54} Assessments of self-reported disease and functional status use questions such as “Have you been diagnosed with diabetes/hypertension?” and “Do you have any difficulty on doing daily activities?”.^{42,53,54}

As an alternative to this fragmented mode of measuring health status built on its traditional concept of a state of being free of disease, the Gallup World Poll (GWP) developed the Personal Health Index (PHI) based on the WHO's broader concept of health.^{37,42} This index combines measures of self-reported disease and functional status

with assessments of hedonic well-being, using the questions: “Do you have any health problems that prevent you from doing any of the things people your age normally can do?”; “Did you feel well-rested yesterday?”; “Did you experience physical pain yesterday?”; “Did you experience worry yesterday?”; “Did you experience sadness yesterday?”.⁴² In country-level analyses, the Personal Health Index has shown high association with traditional health indicators and social determinants of health, such as maternal and under-5 mortality rate, life expectancy, GDP per capita, adult and children literacy rate, and improved sanitation facilities.⁴²

2.2.2 Health and well-being during financial and political crises

Socioeconomic and political contexts and their impact on living and working conditions are social determinants of health inequalities, according to the World Health Organization.⁴³ Consequently, political and economic crises negatively affect the foundation of health and well-being by hindering people`s access to basic needs, such as adequate housing and food.^{55,56}

In times of economic downturns, people reduce expenditure on health, which results in an increasing demand for public health services.^{57,58} However, during these periods, policy-makers often limit spending on healthcare, reducing human resources, services, drugs and medical devices.^{57,58} Therefore, while there is an increased demand for public health services, efforts by policymakers result in resource rationing, which serves to reduce the quality of healthcare, that is also a determinant for health and well-being.^{57,58}

Economic adversities have been widely reported as the cause of increases in infectious diseases, child mortality, malnutrition, and micronutrient deficiencies in low-income countries.⁵⁹ For instance, in Bangladesh increases in the prevalence of underweight (49% to 52%) and wasting (17% to 23%) among children ages 24 to 59

months were seen from 2006 to 2008 as result of the 2008 Global Crisis.⁶⁰ In Indonesia, an economic crisis in the late 1990s caused a high increase in childhood anemia, reversing a 20-year period of improving micronutrient deficiencies in the country.⁶¹

These findings are also relevant to countries with higher GDP but with some differences. In developed countries, financial crises have been shown to have a larger impact on mental health and alcohol use disorders.^{55,58,62} For example, in the United States, around 1,330 suicides were associated with job loss during the Great Recession.⁵⁶ From 2010 to 2011 many European countries registered increases in suicide rates, most of them driven by financial worries (Van Hal, 2015). In the case of Greece, suicides increased by 40%.⁵⁶ In Spain, results from a National Health Survey conducted before (2006) and after the crisis (2012) showed an increase in self-reported poor health status among men (16-18%), mainly in the age range between 45 and 59 years.⁶²

Across the world, economic crises have been shown to negatively affect people's health and well-being, especially among vulnerable groups, thus increasing health inequalities. While negative impacts have been found in both developed and developing countries, in countries where people benefit from public health services, social protection systems, and social support, the impact on health status tends to be lower.^{55,58}

2.2.4 Health and well-being in the Brazilian context

The model of Social Determinants of Health Inequalities proposed by the WHO, explains how people's health and well-being are a product of socioeconomic, psychosocial, environmental and individual factors.⁴³ Therefore, to explore the health status and well-being in a country is essential to evaluate the success of public policies focused on reducing social inequalities.⁴³ In the case of Brazil, only a few studies have

looked at the population`s health and well-being, and their results remain conflicting.⁶³⁻

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Although authors showed that having a higher level of education and social support, as well as being a man and married, increases life satisfaction, other studies found no association between these factors and life satisfaction.^{63-65,67} Generally, studies have shown a negative association between health problems and well-being.^{40,63-66}

Most researchers showed a significant association between higher income and well-being in Brazil.⁶⁴⁻⁶⁶ Bedran-Martins et al.⁶³, however, suggested that while money can improve well-being, its influence decreases once it is enough to provide basic needs. On a global level, well-being was found to be aligned with countries' economic growth.⁶⁸

Recent studies on health status in Brazil utilized data (n= 60,202) from the National Health Survey conducted in 2013.⁶⁹⁻⁷⁰ These data showed a high prevalence of self-reported chronic diseases (45%), mostly affecting women, seniors and people with low education, who were also more likely to report poor health status.⁵³ Many interviewees with chronic diseases, especially those with lower educational level and without private health insurance, reported having limited ability to perform daily activities.^{69,53} This type of physical limitation is associated with social inequalities since it is related to low access to healthcare and poor disease management.⁶⁹ Although Brazil provides a universal public health system, it suffers from long-term underfunding that affects the quality and efficiency of healthcare⁷¹, which may explain why people without private health insurance experience more physical limitations.

To conclude, all mentioned factors associated with health and well-being in Brazil, such as income, educational, gender, age, social support and healthcare, corroborate with the model of Social Determinants of Health Inequalities.⁴³

2.3 ASSOCIATION BETWEEN FOOD SECURITY AND HEALTH AND WELL-BEING

The association between food insecurity and health outcomes is not limited to nutritional status but also to many health problems and consequently to well-being.⁷²⁻⁷³ Moreover, studies show that there is a reverse causal relationship between food security and health, explained by several mechanisms.⁷²⁻⁷³

For example, food insecurity increases the risk for both infectious and chronic diseases because of exposure to a poor diet, reduction in medical expenditure, and changes in lifestyle.^{72,74} On the other hand, some symptoms of diseases and side effects of medication prescribed for their treatment, such as reduced appetite and food malabsorption, negatively affect food security status.⁷⁴ Moreover, high spending on medical care compromises funds available for food expenditure, which results in increased risk of food insecurity.⁷⁵⁻⁷⁶

The relationship between food insecurity status and infectious diseases is well-known because of its relationship with diarrhea and lower immunity.⁷⁷ More recently, authors have explored the connection between food insecurity and HIV.^{74,78,79} They have found a strong association between food insecurity and higher vulnerability to infection, low treatment adherence, poor outcomes and mortality by HIV.^{74,78,79} Higher prevalence of many chronic diseases has also been found among those who are food insecure.^{72,80,81} In a recent study by Gregory and Colesman-Jensen⁸⁰, many chronic diseases presented a stronger correlation with food insecurity than with income.

Apprehension, stress, and anxiety caused by the lack of access or the worry about not having food, accompanied by the social value attached to eating, also negatively affect mental health and well-being.⁷² Researchers found associations between food insecurity and feelings of shame, isolation, low mood, poor sleep quality and cognitive decline among adults.^{72,82,83} Furthermore, children and adolescents living

in food-insecure households are more likely to have behavioral, mental, academic and emotional disorders.^{84,85} A negative association between food insecurity and well-being, as well as physical problems, was also found in a large sample involving 138 countries.⁷³ For these reasons, food-insecure people are more likely to utilize mental health care services.⁸⁶

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Food security status in times of financial and political crisis in Brazil

¹Luna Rezende Machado de Sousa (LRMS), ²Arlette Saint Ville (ASV), ³Ana Maria Segall-Corrêa (AMSC), ⁴Hugo Melgar-Quiñonez (HMQ)

^{1,2,4}McGill University

Department of Human Nutrition

Sainte-Anne-de-Bellevue, H9X-2E5, Canada

³ Oswaldo Cruz Foundation- Brasília

Food, Nutrition and Culture Program-PALIN

Brasília, 70.904-130, Brazil

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3.1 ABSTRACT

Objectives: This study aimed to assess the annual changes in food security status in Brazil during its financial and political crisis (2015 to 2017) and compare them with previous measurements (2004 to 2013), as well as to explore associations between food security and socioeconomic factors. **Methods:** This is a cross-sectional study that analyzed data from two different sources, the Brazilian National Household Sample Survey for 2004 (n= 112,479), 2009 (n= 120,910), 2013 (n= 116,192), and the Gallup World Poll for 2015 (n= 1,004), 2016 (n= 1,002) and 2017 (n= 1,001). Household food security status was measured by a shorter version of the Brazilian Food Insecurity Scale, consisting of the first 8 questions of the original scale (which has 14 questions). Descriptive and logistic regression analyzes were performed to assess the changes in food security and their association with socioeconomic factors. **Results:** The percentage of households classified as food secure decline by 36% (from 76% in 2013 to 49% in 2017) and severe food insecurity tripled (from 4% in 2013 to 12% in 2017) during the crisis. While before the crisis 44% of the poorest households were food secure, in 2017 only 26% of them were food secure. Household income per capita was strongly associated with food security, increasing by six times the chances of being food insecure among the poorest strata. Those who reported a low job climate, social support and level of education were twice more likely to be food insecure. **Conclusions:** Despite significant improvements between 2004 and 2013, during the crisis Brazil suffered from a great deterioration of food security, indicating the need for emergency policies to protect and guarantee access to food.

Key-words: Food and Nutrition Security; Nutritional Epidemiology; Brazil; Socioeconomic Factors

3.2 INTRODUCTION

Food security, known as the stable access to adequate food, is directly affected by economic factors (such as stagnating growth, high food prices, low income, unemployment) and political instability.¹⁻⁵ Accordingly, in order to improve food access and guarantee the Right to Food, food security policies could address these issues, by raising income, strengthen food production by small farmers, managing risks of economic shocks and enhancing social justice.^{1,6} This has been pursued through various policies and programs across the world.³ For example: conditional cash transfer programs in Latin America; input subsidies for smallholder farmers in Africa, which helped to control food prices fluctuations; investments in physical infrastructure for food production and transportation (irrigation systems and roads) in Southeast Asia, which improved rural livelihoods; and public work programs that provide temporary work to unemployment people in India.^{2,3}

In the literature of food security, these initiatives/policies are expected to serve as social protection to protect vulnerable people against the consequences of economic stress, such as low income and unemployment.³ Nevertheless, due to the close relationship between food security and the economic and political environment, financial and political shocks can quickly undermine long-term achievements.^{2,4,7,8}

Economic-related food Security policies have been flagged because of their importance in the reducing poverty and managing economic risk, which consequently improves financial access to food.^{1,3} Brazil is highly regarded for its successful food security policies, such as the Zero Hunger Strategy.⁹⁻¹⁰ Launched in Brazil in 2004, this policy has been internationally recognized as a model for tackling poverty and hunger by involving large-scale public policies, a variety of institutions and the participation of civil society.⁹⁻¹⁰ Some of the programs that are part of the Zero Hunger Strategy, such as

the cash transfer program (*Bolsa Família*), the Food Acquisition Program and the Popular Restaurants, stand out for improving income generation and food access, and for strengthening and smallholder farmer livelihoods.¹⁰

The Zero Hunger strategy, launched in 2004, involves more than 30 programs to target food security in all its dimensions: food access, availability, utilization and stability.^{10,2} One of the most noteworthy of these initiatives is the *Bolsa Família*.¹⁰ It is considered the largest conditional cash transfer program in the world and covered a quarter of the Brazilian population in 2012.^{9,10} This program provides households with monthly payments conditioned to children school attendance and health care of children and pregnant women.^{9,10} Another central program is The Food Acquisition Program (PAA) improves the income of rural families and guarantees the quality of food programs, by purchasing food from smallholder farmers and donating it to the Popular Restaurants, Community Kitchens and Food Banks.¹⁰ In addition, in 2009 it was ruled that 30% of the School Feeding Program budget needs to be used to purchase food through the PAA program, which in 2012 reached 185,000 smallholder farmers¹⁰ The Popular Restaurants, located mainly in large cities and metropolitan areas, are state-funded/run restaurants that provide safe and nutritious meal to individuals at an affordable price (usually less than \$ 1).¹¹

Along with these economic-related food policies, Brazil build a legal framework for food security, transforming the fight against hunger into a state obligation.^{6,12} For instance, in 2006 the government enacted the Food and Nutrition Security Law (LOSAN).¹² Moreover, by 2010 Brazil recognized the Right to Food in the national constitution⁶, as recommended by the United Nations.¹³ This constitutional recognition requires the implementation of laws, policies and programs aimed at respecting, protecting and realizing the Right to Food, which can be understood as the right to food

security.¹³ In addition, it means that the food security policies and programs cannot be easily withdrawn by future governments in Brazil, since they are founded and supported by the constitution.¹³

From 2000 to 2012, the government expenditures on social programs increased by 120%, representing 17% of the country's GDP.¹⁴ This period of high investments in social policies was also marked by a dramatic financial growth (reaching a GDP growth of 7.5% in 2010) and reduction in unemployment.¹⁵ Poverty and extreme poverty were reduced by more than 60% from 2004 to 2014, and 58% of the decline in extreme poverty was associated to conditional cash transfer program.¹⁶

These political and social commitments along with the positive economic situation, which allowed the reduction of poverty and economic disparities, led to a drastic reduction in severe food insecurity from 2004 to 2013 in Brazil.^{10,18,19} Aligned with that, studies have demonstrated that economic growth, when associated with income distribution, increases food security.^{17,18}

While in time of economic prosperity food security improves, the reverse is observed during economic downturns.^{4,7} Researchers have shown that the 2008 Global Crisis caused large increases in domestic food prices and unemployment.²⁰⁻²⁵ As expected, it reduced household income and buying power due to the food price hikes, which consequently jeopardized food access.²⁰⁻²⁵ For instance, the increase of 83% in global food prices led more than 40 million people around the world into hunger in 2008.²³ Furthermore, based on a number of proxy measures, the World Food Programme found in Guinea 29% of rural households reduced the number of meals, while in El Salvador 85% of households reduced the quantity and quality of the diet, as consequences of such crisis.⁴ In Europe, the percentage of households unable to afford animal protein (meat/chicken/fish) doubled in France, UK, the Netherlands, Spain, and

Austria, during this period.⁷ Additionally, as political environments influence the stability of food economies and governmental commitments towards food security, political crises are negatively correlated with food security.¹⁷ Recently, the Food and Agriculture organization (FAO) reported that food insecurity, after years of decline, increased at the global level from 2015 to 2016 due to the many economic and political crises that happened across the world.⁸

The impact of economic downturns on food security, reported across the world, suggests a threat to food security in Brazil, as since 2014 the country has facing its major economic crisis.²⁶⁻²⁸ In addition to economic factors, political instability was one of the triggers of this crisis.²⁶⁻²⁸ As a results, in 2015 there was a presidential impeachment in Brazil, which along with many corruption revelations compromised the stability of the country.^{27,10} This crisis has caused a worsening of many social indicators, such as income and unemployment, which reached 12% of the population in 2016.^{15,26,27} Inflation affected the national food prices, which increased by 82% from 2010 to 2016, mostly affecting staple foods (rice, beans), vegetables, fruits and meat.^{15,29} The government responded with austerity measures and reduced the funding of social policies.^{26,28}

Regarding the programs previously mentioned, some Popular Restaurants were closed down, the Food Acquisition Program is suffering from a large budget constraint, and the cash transfer program is having difficulty to adjust to rising inflation.^{26,30,31} Moreover, the projections are not optimistic. Specialists believe that a significant economic recovery would only happen after 2020.²⁸

Although it is accepted that financial and political crises have a negative impact on food security,^{2,32,33} current studies provide snapshots rather than continuous assessments of food security status in affected countries.^{4,7,21,25,34} Regarding Brazil,

there are still no studies on the effects of this crisis on national food security status. To fill such gaps, this study presents annual changes in the food security status in Brazil, before (from 2004 to 2013) and during the crisis (from 2015 to 2017), in an effort to better understand the effects of economic and political instability. Therefore, the significance of this study lays in the fact that timely food security measurements are needed to raise awareness among decision-makers, in order to contribute to the development and evaluation of interventions in this area.⁶ Moreover, this case study may contribute to the discussion on how food security can be affected by economic and political instability even where there is a strong social policy framework. Thus, our first objective is to address food security status in Brazil during the crisis (from 2015 to 2017) and compare it with previous measurements (from 2003 to 2013). The second objective is to explore the associations of food security status with socioeconomic and individual factors.

3.3 METHODS

3.3.1 Data and design

In order to capture the period before and during the economic and political crisis in Brazil, a cross-sectional study was conducted based on data from two different sources. The first data source comes from Brazil's National Household Sample Survey (PNAD), which covered the period before the crisis: 2004 (n= 112,479), 2009 (n= 120,910) and 2013 (n=116,192). The second source of data is the Gallup World Poll (GWP), which covered the period during the crisis: 2015 (n= 1,004), 2016 (n= 1,002) and 2017 (n= 1,001).

The PNAD, held annually by the Brazilian Institute of Geography and Statistics (IBGE), is a population-based epidemiological survey that collects information on the

country's economic and social development.¹⁹ Special supplements that investigate other characteristics of the population are added to the PNAD with a variable periodicity, such as the food security assessment that was included in PNAD in the years 2004, 2009 and 2013.¹⁹ Food security status was assessed by PNAD using the Brazilian Food Insecurity Scale (EBIA). EBIA is a national psychometric scale consisting of 14 questions related to the direct experiences of food insecurity.¹⁹ The first eight questions of EBIA are addressed to all households; and the others six only deal with households with residents less than 18 years old.¹⁹

The GWP, created in 2005, is a survey conducted annually in more than 140 countries on an average sample of 1,000 households per country, which is designed to ensure national representativeness.³⁵ This research is rich in opinion and perception measurements, and also includes questions about demography, education, employment, and family income. More recently, in collaboration with the Food and Agriculture Organization (FAO), GWP included the assessment of food security in the survey.^{35,36} Food security was measured by the GWP using a shorter version of EBIA (EBIA-8), which consists of the first 8 questions of the original scale.

Due to the differences in how the EBIA was applied in Brazil by PNAD (14 questions) and GWP (8 questions), their data could not be directly compared. For this reason, the household food security status measured by PNAD (in 2004, 2009 and 2013) was recalculated according to the EBIA-8, through the PNAD microdata. Thus, in this study, all the data of food security status is based on EBIA-8.

3.3.2 Outcome and exposure variables

EBIA-8 was used as the dependent variable. This scale measures the limited access to adequate food to the lack of resources, using questions related to the quality,

variety, and quantity of food, as well as hunger experiences, such as skipping meals and not eating for an entire day because of the lack of resources.^{19,37}

This scale (**Table 3.1**) has eight questions with “no” and “yes” responses.^{19,37} Each positive answer receives one point and the total points are used to classify the food security status by these thresholds: 0 Food Secure; 1 to 3 Mild Food Insecurity (FI); 4 to 5 Moderate FI; and 6 to 8 Severe FI.^{19,37} EBIA-8 is based on household level and the questions refer to the three months prior to the interview.^{19,37}

Table 3.1 – Characteristics and questions of the EBIA-8.

Level reference	Household level
Time reference	3 months prior
Application	In 2004, 2009 and 2013 by PNAD; in 2015, 2016 and 2017 by Gallup.
Questions	<ol style="list-style-type: none"> 1. During the past three months, were the residents of this household worried the food would run out before they could buy or receive more food? 2. During the past three months, did the food run out before residents of the household were able to buy more food? 3. During the past three months, did residents of this household not have money for a healthy and varied diet? 4. During the past three months, did residents of this household eat only a few kinds of food that they still had in the house because money ran out? 5. During the past three months, did any household member 18 years or older skip a meal because there was no money to buy food? 6. During the past three months, did any household member 18 years or older eat less than they should have because there was no money to buy food? 7. During the past three months, did any household member 18 years or older feel hungry and not eat because there was no money to buy food? 8. During the past three months, did any household member 18 years or older eat only one meal a day or go an entire day without eating, because there was no money to buy food?
FS Status	Thresholds
Food Security	0
Mild FI	1-3
Moderate FI	4-5
Severe FI	6-8

Source: Instituto Brasileiro de Geografia e Estatística (IBGE). Pesquisa Nacional por Amostra de Domicílios: Segurança Alimentar 2013. Rio de Janeiro: IBGE, 2014.

The independent variables utilized to explore the associations of food security status with socioeconomic and individual factors were: household income per capita; Job Climate Index; perceptions of the political stability; social support; household size; age, educational level and gender of the respondent.

Household income per capita was analyzed in four strata based on the Brazilian minimum wage. The first stratum, which refers to people receiving up to ¼ of minimum wage, and the second stratum, people receiving from 1/4 to 1/2 of the minimum wage, are equivalent to the line of extreme poverty and poverty in Brazil, respectively.¹⁸

The Job Climate Index measures people's perceptions of job opportunities and the economic situation through the questions: "Thinking about the job situation in the city or area where you live today, would you say that it is now a good time or a bad time to find a job?"; "Right now, do you think that economic conditions in the city or area where you live, as a whole, are getting better or getting worse?".³⁶ Perception of the political stability was measured using the question "How stable do you see the political situation in this country nowadays?".³⁶

Social cohesion/capital was measured by the Social Life Index. This index assess perceived and integrative social support, respectively, using questions: "If you were in trouble, do you have relatives or friends you can count on to help you whenever you need them, or not?"; "In the city or area where you live, are you satisfied or dissatisfied with the opportunities to meet people and make friends?".^{36,38}

3.3.3 Data analysis

Descriptive analyses were used to assess the changes in food security, household income per capita, Job Climate Index and perception of the political stability throughout the period selected. Cross-tabulation was performed for household food security status and household income per capita. Linear-by-linear association test adjusted by Bonferroni-correction was applied to analyze significant differences between proportions.

Multiple logistic regression analysis was carried out to study the association of food security status with socioeconomic and individual related variables, using the data

from the GWP (2015 to 2017). For regression analysis, EBIA-8 was recoded into 0=food secure and 1=food insecurity. Statistical analyses were performed using SPSS software version 23.

3.4 RESULTS

Changes in food security, income, job climate and perception of political stability from 2004 to 2017 in Brazil are presented in **Table 3.2**. From 2004 to 2013, before the economic and political shock, an increasing trend was observed for food security (63% to 76%). Nevertheless, results point to a large decline in food security during the crisis (76% in 2013 to 49% in 2017).

Regarding severe food insecurity a decrease was found between 2004 and 2013 (from 10% to 4%). However, severe FI increased from 2015 to 2017, reaching a prevalence (12%) higher than all previous assessments. Findings for household income per capita indicate that about 46% of the sample lived with more than 1 minimum wage between 2004 and 2013, which declined to 26% in 2017. During the crisis only around 9% of the sample reported a high job climate and less than 10% considered the political situation very stable.

Table 3.2 - Changes in food security, income, job climate and perception of political stability before and during the crisis in Brazil.

Variables	Before the crisis ¹ (%)			During the crisis ² (%)		
	2004	2009	2013	2015	2016	2017
Household food security status	n= 112,479	n= 120,910	n= 116,192	n= 964	n= 989	n= 966
Food Secure	63.3 ^a	68.3 ^b	76.3 ^c	53.2 ^a	43.8 ^b	48.6 ^{a,b}
Mild FIS	13.9 ^a	16.1 ^b	13.0 ^c	26.9 ^a	32.7 ^b	28.5 ^{a,b}
Moderate FIS	12.5 ^a	8.5 ^b	6.3 ^c	11.6 ^a	12.3 ^a	11.0 ^a
Severe FIS	10.3 ^a	7.1 ^b	4.4 ^c	8.3 ^a	11.2 ^{a,b}	12.0 ^b
Household income per capita	n= 110,116	n= 117,579	n= 110,687	n= 1,003	n= 1,001	n=1,000
More than 1 mw	46.2 ^a	44.9 ^b	47.0 ^c	28.3 ^a	24.1 ^a	26.3 ^a
½ to 1 mw	27.2 ^a	29.2 ^b	29.3 ^b	35.1 ^a	32.5 ^a	32.3 ^a
¼ to ½ mw	17.0 ^a	16.5 ^b	15.3 ^c	23.3 ^a	25.4 ^a	24.5 ^a
No income to ¼ mw	9.5 ^a	9.4 ^a	8.5 ^b	13.3 ^a	18.1 ^b	16.9 ^{a,b}
Job climate	... ⁴	...	...	n= 1,004	n= 1,002	n= 1,001
High	...	...	...	9.0 ^a	8.3 ^a	10.6 ^a
Moderate	...	...	...	27.5 ^a	27.4 ^a	34.4 ^b
Low	...	...	...	63.5 ^a	64.3 ^a	55.0 ^b
Perception of political stability	...	...	...	n= 984	n= 974	n= 954
Very stable	...	...	...	4.3 ^a	6.5 ^{a,b}	9.2 ^b
Somehow stable	...	...	...	31.3 ^a	35.4 ^a	25.8 ^b
Not stable at all	...	...	...	64.4 ^a	58.1 ^b	65.0 ^a

¹Data analysis of the data from the PNAD, based on EBIA-8. ²Data analysis of the data from the GWP, based on EBIA-8. ³mw: minimum wage. ⁴The data were not collected by the PNAD. Different superscripts denote statistically significant differences at a 0.05 level within each period analyzed (before and during the crisis), except for “perception of political stability” that showed no statistically significant difference ($p=0.111$).

Results from cross-tabulation analysis (**Table 3.3**) show strong associations ($p<0.001$) between household income per capita and food security status from 2004 to 2017. In 2013, before the crisis, 44% of the poorest people were food secure, while in 2017 only 26% of the poorest were food secure.

Table 3.3 - Cross-tabulation analysis between household food security status and household income per capita during and after the crisis in Brazil.

Year and sample size	Household income per capita	Household food security status (%)				
		Food Secure	Mild FI	Moderate FI	Severe FI	
Before the crisis¹	2004 n= 110,116	More than 1 mw ²	85.0 ^a	9.1 ^b	4.0 ^c	2.0 ^d
		½ to 1 mw	58.9 ^a	17.7 ^b	15.0 ^c	8.5 ^d
		¼ to ½ mw	35.3 ^a	20.4 ^b	24.1 ^c	20.2 ^c
		No income to ¼ mw	18.9 ^a	15.5 ^b	27.1 ^c	38.5 ^d
	2009 n= 117, 579	More than 1 mw	84.9 ^a	11.1 ^b	2.6 ^c	1.4 ^d
		½ to 1 mw	65.0 ^a	19.2 ^b	9.6 ^c	6.2 ^d
		¼ to ½ mw	47.5 ^a	22.3 ^b	16.4 ^c	13.8 ^c
		No income to ¼ mw	33.1 ^a	19.8 ^b	20.6 ^c	26.5 ^d
	2013 n= 110,687	More than 1 mw	89.5 ^a	7.7 ^b	1.9 ^c	1.0 ^d
		½ to 1 mw	73.4 ^a	15.8 ^b	6.9 ^c	3.9 ^d
		¼ to ½ mw	56.9 ^a	20.8 ^b	13.1 ^c	9.1 ^c
		No income to ¼ mw	43.9 ^a	20.6 ^b	17.9 ^c	17.5 ^d
During the crisis³	2015 n= 964	More than 1 mw	74.7 ^a	18.9 ^b	3.4 ^c	3.0 ^{b,c}
		½ to 1 mw	58.4 ^a	27.9 ^{a,b}	7.9 ^c	5.9 ^{a,c}
		¼ to ½ mw	39.8 ^a	32.5 ^b	16.9 ^b	10.8 ^b
		No income to ¼ mw	18.9 ^a	31.5 ^b	29.1 ^c	20.5 ^c
	2016 n= 988	More than 1 mw	68.8 ^a	23.8 ^b	4.2 ^b	3.3 ^b
		½ to 1 mw	46.7 ^a	37.4 ^a	10.0 ^{a,c}	5.9 ^b
		¼ to ½ mw	32.7 ^a	36.3 ^b	15.7 ^b	15.3 ^b
		No income to ¼ mw	20.7 ^a	31.8 ^b	22.3 ^c	25.1 ^c
	2017 n= 966	More than 1 mw	68.5 ^a	21.9 ^b	4.6 ^c	5.0 ^b
		½ to 1 mw	53.2 ^a	32.6 ^a	9.8 ^a	4.4 ^b
		¼ to ½ mw	34.9 ^a	31.5 ^b	16.6 ^b	17.0 ^b
		No income to ¼ mw	26.3 ^a	26.9 ^b	15.4 ^b	31.4 ^c

¹Data from the PNAD. ²mw= minimum wage. ³Data from the GWP. Different superscripts denote statistically significant differences at a 0.01 level within each period analyzed (before and during the crisis).

Findings in **Table 3.4** reveal that household income per capita has the greatest association with food security status. Households with no income to ¼ minimum wage per capita were six times more likely to be food insecure (OR=6.42; p < 0.001). Further, those who reported a low job climate (OR=1.84; p<0.001), low social support (OR=2.37; p=0.001) and had the lowest educational level (OR=2.24; p<0.001) were two

times more likely to be food insecure. While elderly people were 40% (OR=0.63; p=0.001) more likely to be food secure.

Table 3.4 - Multiple logistic regression analysis of household food security status and independent variables in Brazil.

Variables		95% CI		
		Odds ratio	Low	High
Household income per capita	More than 1 mw ¹ (ref.)			
	½ to 1 mw	2.01**	1.63	2.49
	¼ to ½ mw	3.72**	2.91	4.74
	No income to ¼ mw	6.42**	4.71	8.75
Job climate	High (ref.)			
	Moderate	1.37*	1.01	1.87
	Low	1.84**	1.37	2.46
Perception of the political stability	Very stable (ref.)			
	Somehow stable	0.83	0.59	1.17
	Not stable at all	0.87	0.63	1.21
Household size	1 to 3 (ref.)			
	4 to 5	0.95	0.79	1.14
	6 or more	1.35*	1.00	1.83
Social support	High (ref.)			
	Moderate	1.51**	1.24	1.83
	Low	2.37*	1.44	3.89
Age	Youth (15 to 29 years) (ref.)			
	Adult (30 to 59 years)	0.94	0.78	1.13
	Elderly (60 years or more)	0.63**	0.48	0.84
Educational level	College/ university (Ref)			
	Secondary/high school	1.58*	1.11	2.24
	Elementary or less	2.24**	1.55	3.24
Gender	Men (ref.)			
	Women	0.90	0.77	1.06

¹mw= minimum wage. Data from the GWP. * p≤ 0.05; ** p≤ 0.001.

3.5 DISCUSSION

This paper shows, for the first time, food security status in Brazil during its financial and political crisis. As the literature lacks continuous monitoring of food security in times of economic and political instability, a gap in knowledge was filled by assessing the changes in food security status before (2004, 2009, 2013) and throughout the current Brazilian crisis (2015 to 2017).

As seen in other countries^{4,24,34}, the results revealed a major decline in food security caused by the crisis (from 76% in 2013 to 49% in 2017). Although there was a

large decline in food security when comparing one year before the crisis (2013) to the first year of the crisis (2015), during the crisis there was no statistical significance change in food security (53% in 2015 to 47% in 2017). A similar situation was found in Portugal, as there was no statistical significance change in food security during its economic crisis (47% in 2011 to 51% in 2017).³⁹ However, this study only showed the food security status during the crisis, due to the differences in the methodology applied to assess food security before the economic downturn.³⁹ Therefore, as it is not possible to compare the food security status before and during the crisis in Portugal, it is not possible to affirm that the crisis affected food security in the country.

Regarding severe food insecurity in Brazil, it tripled during the crisis (from 4% in 2013 to 12% in 2017). To illustrate the magnitude of this situation, in 2017 the prevalence of severe food insecurity (12%) was 2% higher than that found 13 years before (10%), at the time when the most important food security policies were initially implemented in the country. Similarly, a study assessing food security status in Mexico before (2008) and after (2010) its economic downturn showed an increase in severe food insecurity (8% to 10%) but also in food security (57% to 60%).²¹ Nonetheless, it is difficult to compare these results with the Brazilian situation, as in Mexico they analyzed the period before and after the crisis, while in Brazil the crisis is still ongoing. Moreover, the economic downturn in Mexico lasted less than two years, and the country showed a quick recovery in its GDP growth from 2009 (-4.7) to 2010 (5.1).^{21,15}

The distribution of the sample by household income per capita presented larger variations within this period. The percentage of people living in the lowest strata rose greatly from 2013 (8%) to 2017 (17%); while the highest strata decreased almost by half from 2013 (47%) to 2017 (26%). Results also showed a higher increase of severe food insecurity among the poorest strata. In contrast, the increase in mild food

insecurity was greater among the highest strata. This corroborates previous observations, indicating that political and financial crisis disproportionately affect people's food security status based on their income.^{2,21,24,32,34}

Household income per capita was the variable most associated with food security status. For instance, people living with no income to ¼ minimum wage were six times more likely to be food insecure than the ones living with more than 1 minimum wage. This strong association, between food security and income was also observed across many countries.^{5,20,21,24,34}

After income, social support and educational level were the variables most associated with food security. People with low social support were two times more likely to be food insecure. This negative association between perceived and integrative social support and food security was also found by Miller³⁸, who analyzed food security and social support in 107 countries. Many studies also showed that people with low level of education have greater risk to be food insecure, with is explained by the association between educational level and income.^{5,40} In 2008, in half of the households with elderly people, the income of the elderly, mainly coming from retirement, represented the greater part of the household income family, which shows the elderly contributes to the economic stability of the household.⁴⁰ A large family size, mostly households with more than five residents, has shown to be associated with food insecurity.^{5,18,22} In our study, the risk of being food insecure did not differ among households with 1 to 5 residents; however, households with more than five residents were 35% more likely to be food insecure. Job climate was also significantly associated with food security status. People with low expectations of job opportunities were two times more likely to be food insecure. As employment

generates income, this relationship of job climate with food security status is predictable.

In the diagram presented by Timmer¹⁷, economic growth and political stability are shown as macro determinants of food security. From this perspective, we can assume that economic stagnation and the subsequent recession played an important role in the increase of food insecurity in Brazil. Before the crisis, Brazil had a large GDP growth, however, since 2015 its growth rates have been among the worst in the nation's history (-3.8% in 2015 and -3.6% in 2016).¹⁵ This situation has been strongly felt by Brazilians, since around 60% of the sample had a pessimistic perspective on the economic and labor market situation. In short, the period of economic growth was aligned with improvements in food security in Brazil, and during its recession, there has been a marked deterioration of food security status.

Regarding the other macro determinant mentioned by Timmer¹⁷, the financial shock has been accompanied by political instability in Brazil, marked by a presidential impeachment in 2016.^{26,27} Accordingly, most of the people included in the sample reported that the current political situation was “not stable at all” (65% in 2017). Thus, we can assume that the critical situation of both macro determinants (political stability and economic growth) has contributed synergistically to the deterioration of food security in Brazil from 2015 to 2017.

Food security is considered to be a result of the political economy and social inclusion, according to that, although Brazil's food security policies are recognized as a model for developing countries^{1,2,6}, they seem to not be enough to protect food security status in times of financial and political crisis. The Brazilian legal framework for food security establishes the need for monitoring food security status to evaluate the impact of public policies.¹² Therefore, this study contributes to this nationally recognized demand.

In addition to being a legislative issue in Brazil, food security measurements are important for the country due to the biological, social and economic consequences of food insecurity, which are widely explored in the literature.⁴¹

3.6 LIMITATIONS

Regarding this study's limitations, the research would benefit from the inclusion of more socio variables, such as ethnicity, and demographic variables addressing area of residence (urban and rural) and the Brazilian regions separately. However GWP did not assess ethnicity and the methodology for classifying rural and urban areas differs greatly between PNAD and the GWP. Although PNAD provides representative data for each Brazilian region, GWP data is only nationally representative. Besides these factors, we could not include data from 2014, the first year of the crisis, because in this year, the GWP applied the Food Insecurity Experience Scale (FIES) instead of the EBIA-8 to measure food security status in Brazil. These scales present differences in their thresholds for Moderate and Severe FI, as well as in the order of the questions and time of reference (3 months versus 12 months prior to the interview); and FIES is based on an individual level while EBIA-8 is at a household level. Finally, as this is a cross-sectional study, it is not possible to infer causality, but only associations between the variables. Thus, further research could look into the differences between rural and urban areas in this context of economic downturn, or even apply a longitudinal design for a deeper comprehension of the impacts of financial and political shocks on food security.

3.6 CONCLUSIONS

As shown in this study, great deterioration of food security status was found in Brazil during the current financial and political crisis (2015 to 2017), severely affecting

the poorest strata. Low household income per capita was highly associated with food insecurity, increasing in six times the chances of being food insecure among those living with $\frac{1}{4}$ minimum wage or less. Low educational level, social support and job climate (poor perception of job opportunities and the economic situation) were also negatively associated with food security, increasing in 2 times the chances of being food insecure.

Overall, although Brazil achieved widely recognized improvements in food security between 2004 and 2013, the crisis has strongly affected Brazilians' food security status, with a great increase of severe food insecurity. From a policy perspective, these findings highlight the necessity for emergency public policies to protect and guarantee access to food, especially for the most vulnerable. Even though the current literature refers to a budgetary decline in the food security programs, they probably persist because they are supported by the legislation previously achieved.

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**Health inequalities and well-being in times of financial and political crisis in Brazil,
a case study**

¹Luna Rezende Machado de Sousa, ²Arlette Saint Ville, ³Ana Maria Segall-Corrêa,

⁴Hugo Melgar-Quiñonez

^{1,2,4}McGill University

Department of Human Nutrition

Sainte-Anne-de-Bellevue, H9X-2E5, Canada

³ Oswaldo Cruz Foundation- Brasília

Food, Nutrition and Culture Program-PALIN

Brasília, 70.904-130, Brazil

Submitted to Global Public Health

4.1 ABSTRACT

Background: Although global efforts have resulted in improvements in health and well-being across the world, economic downturns can rapidly undermine achievements in this area. **Methods:** Using Gallup World Poll data (n=7,084) this study assessed the changes in health status and well-being before (2009-2013) and during (2015-2017) the current financial and political crisis in Brazil and their association with the Social Determinants of Health Inequalities (SDHI). Health and well-being were measured by the Personal Life Index and the Life Evaluation Index. Descriptive analysis and logistic regression models were conducted. **Results:** A significant deterioration of well-being was found during the crisis, with a 29% decline (63-44%) in the prevalence of respondents classified as “thriving” in life. Food security, age and social support were the best predictors of health status and well-being, mitigating the association of health and well-being with income and unemployment. Education and community environment also showed strong association with well-being, and satisfaction with healthcare system played an important role in health status. **Conclusions:** In order to protect health and well-being during such crisis, policies should pay particular attention on enhancing the access to food, healthcare system, educational system, community environment (quality of air, water and infrastructure) and fostering social support.

Key-words: Public health; social determinants; socioeconomics factors.

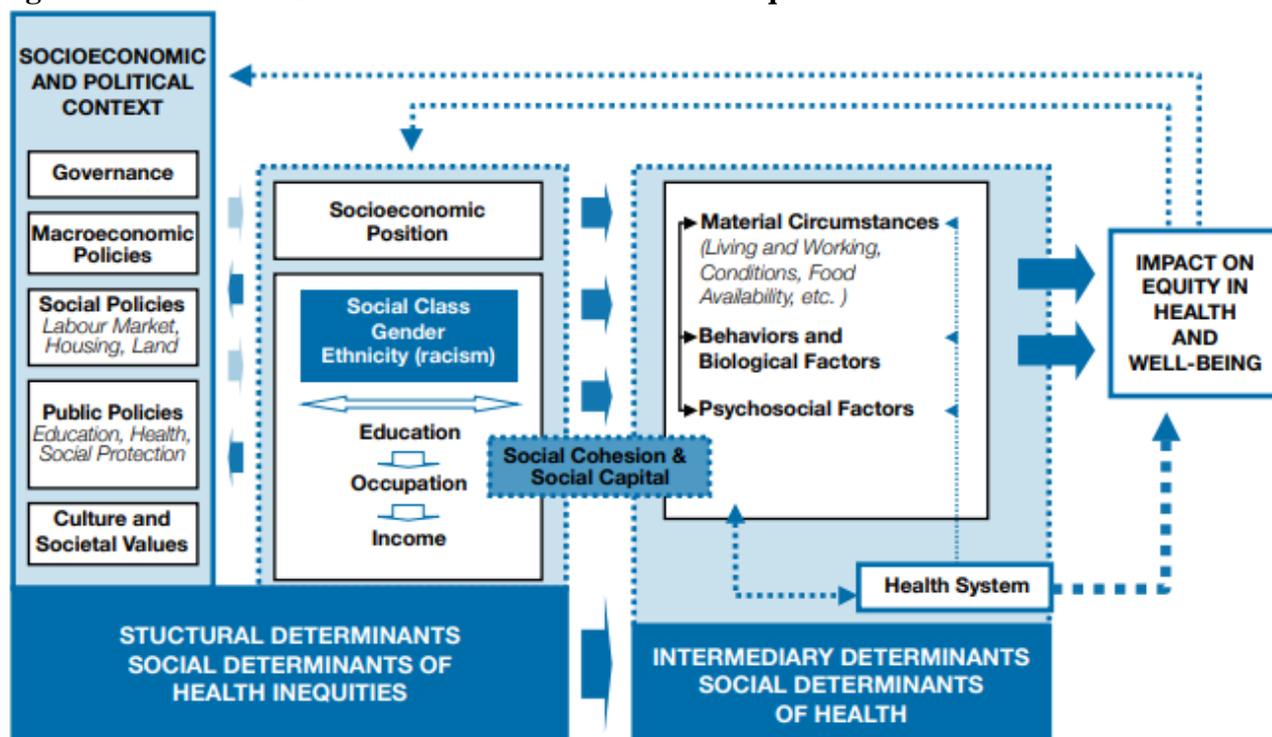
4.2 INTRODUCTION

Health status indicators and well-being measures are needed to raise awareness among decision-makers, support civil society organizations and guide the development of interventions, especially now with global efforts around the Sustainable Development Goal, Number 3, “good health and well-being for all”.¹ This quest to connect health, wellbeing and sustainability requires a broadening from traditional definitions of health. Previously defined as “a state of being free from illness”, the World Health Organization (WHO) has widened it to include “a state of complete physical, mental and social well-being, and not merely the absence of disease and infirmity”.^{2,3} A critical addition has been the concept of well-being which embraces life satisfaction, the presence of positive affects and absence of negative effects, and self-realization.^{4,5} With growing recognition that health includes consistent physical, mental and social wellbeing, research will need to look at a broader range of factors that influence health outcomes.

Studies have shown that health and well-being are strongly associated with socioeconomic and individual factors.⁶ The conceptual model of Social Determinants of Health Inequalities (SDHI) (**Figure 4.1**), developed by the WHO (2010), explains these factors and is used to guide research and policy action.⁶ According to this model, Structural Determinants (S-determinants) are the socioeconomic and political context, which influences socioeconomic position and social class, including income, education, occupation, gender and ethnicity discrimination.⁶ S-determinants impact the material circumstances, behavioral, biological and psychosocial factors, which are considered the Intermediary Determinants (I-determinants).⁶ Healthcare system is also considered an I-determinant due to its influence on health prevention, promotion and rehabilitation.⁶ A factor that has come under increasing scrutiny is that of social cohesion/capital, which is

considered a cross-cutting determinant of health. This is because it acts as support and protection of individual health and well-being.⁶ Together, Structural and Intermediary Determinants, along with social capita/cohesion, comprise the model of SDHS.⁶

Figure 4.1 - Model of Social Determinants of Health Inequalities



Source: Final form of the CSDH conceptual framework. Reprinted from “A conceptual framework for action on the social determinants of health”, by World Health Organization, 2010, p. 6.

Health and well-being are closely related to socioeconomic factors. As a result, financial and political shocks can quickly undermine long-term achievements.⁷ Studies have reported that economic and political instability lead to wide ranging negative effects on health and well-being that include: unhealthy lifestyles, diseases, stress and anxiety.⁸⁻¹² For example, the 2008 Global Crisis caused negative effects across the world, from increases in undernourishment and child wasting in developing countries¹³ to suicides in Europe.¹⁴⁻¹⁶

Economic downturn and shocks not only negatively affect individual health and wellbeing, but also national health systems. This results in an increasing demand on

public health services, while at these times policy-makers often limit spending.^{10,11} For example, there is usually a reduction in human resources, services, and funding for subsidized pharmaceuticals and medical devices.^{10,11} Consequently, while there is an increased demand for services, resource rationing may reduce the quality of healthcare, potentially worsening health outcomes.^{17,18,10} The opposite effect on health outcomes can be seen with social cohesion/capital. Studies suggest that in countries where people benefit from public health services, social protection systems, and social support, the impact of economic downturns on health and well-being tends to be lower.^{10,11,19,6}

A few studies that focused on the impact of financial and political crisis on well-being pointed to a reduction in life satisfaction and feelings of happiness, mostly associated with reduced income and unemployment.²⁰⁻²⁴ However, the relationship between income and well-being is still inconclusive.²⁵⁻³¹ While some authors^{32,19} found that GDP fluctuations affect happiness and life-satisfaction levels, Greve³³ failed to find this association looking at GDP fluctuations and happiness from 15 European countries. In Iceland, data from before and during the 2008 Global Crisis indicated that “perceived financial hardship” was associated with unhappiness, whereas income and unemployment showed no important association.²³ This has led to some studies suggesting that the influence of income on well-being decreases once basic needs are covered.²⁸⁻³¹

Although studies show that economic status, mostly income and unemployment, is the factor most associated with the deterioration of health and well-being, a limitation of their analysis is a focus on S-determinants and missing variables related to the others SDHI, such as social, environmental and psychological factors.^{19,25-31,34,35} As a result of this gap, further research is needed to examine hidden factors that may mediate the association of economic status with health and well-being. Moreover, most studies

conduct snapshots using data from one or two years, rather than continuous assessments of health and well-being in the countries affected by political and economic shocks.^{7,8,12,23,33} Thus, little is known about the magnitude of the influence of social-determinants on health inequalities, beyond economic factors, and the changes in health and wellbeing during such crises.

To bridge this gap, this study uses Gallup World Poll (GWP) data from Brazil, covering the period from 2005 to 2017, in order to: 1) assess changes in health, and well-being before and during its current political and economic crisis; 2) measure the relevance of the Structural (i.e.: political and economic context; and socioeconomic position) and Intermediary Determinants (i.e.: material circumstances, psychological, behavioral and biological factors), as well as social cohesion/ capital, on health and well-being outcomes; 3) discuss how social and health policies can respond in times of financial and political instability.

Brazil was chosen as a case study because since 2014 the country has been facing economic crisis and political instability, which led to a presidential impeachment in 2015.³⁶⁻³⁸ The country has experienced deterioration in many economic indicators, such as inflation, income and unemployment,^{36,37} with the latter affecting 12% of the population in 2016.³⁹ Although Brazilian social policies (e.g., conditioned cash transfer, school feeding program, popular restaurants, universal healthcare system, etc.) have been internationally recognized as models for tackling social and health inequalities, the government has implemented austerity measures, reducing funding to and availability of services.³⁶⁻³⁸

4.3 METHODS

4.3.1 Data and design

In order to capture the changes on health and well-being before and during the economic and political crisis in Brazil, a cross-sectional study was conducted using GWP data. The GWP is a survey conducted annually in more than 140 countries with an average national sample of 1,000 households, which is designed to ensure national representativeness.⁴⁰ The national sample for Brazil was selected through a multiple-stage cluster design, with data collected by face-to-face interviews with respondents aged 15 and older.⁴⁰ After collection, data were weighted by gender, age, education and socioeconomic status.⁴⁰ Data collected include opinion and perception measurements, socioeconomic and demographic variables, along with Indexes validated against external measures from the World Bank and the United Nations.⁴⁰ Data covered three years before, 2009 (n= 1,031), 2011 (n= 1,042) and 2013 (n= 2,006), and three years during the current crisis, 2015 (n= 1,004), 2016 (n= 1,001) and 2017 (n= 1,000). The years representing the period before the crisis (2009, 2011, 2013) were selected based on data availability and they cover a period of economic growth and reduction in unemployment in Brazil.³⁹

4.3.2 Outcome and exposure variables

Outcome variables were health status and well-being, measured by GWP's Personal Health Index (PHI) and Life Evaluation Index (LEI). The PHI measures health status using following questions: "Do you have any health problems that prevent you from doing things people your age normally can do?", "Yesterday, did you feel well-rested/physical pain/worry/sad?".⁴⁰ The LEI assesses two components of well-being, life satisfaction and eudaimonia, through the questions: "From 0 to 10, where 10 is the best

possible life for you, on which step do you feel you stand at this time?; “and on which step do you think you will stand in five years from now?”.⁴⁰

Exposure variables were selected to represent the SDHI.⁶ The S-determinants were addressed by the variables: perceptions of political stability; Job Climate Index; perceived racism; employment status; education; gender and income. Perception of the political stability was measured through the questions: “How stable do you see the political situation in this country nowadays: very stable, somehow stable or not stable at all?”.⁴⁰ The Job Climate Index measures perception of the economic situation using the questions: “Right now, is it a good or bad time to find a job in your city?”; “and do you think that economic conditions are getting better or getting worse in your city?”.⁴⁰ Perceived racism was assessed using a proxy question: “Is your city a good or a bad place to live for racial and ethnic minorities?”.⁴⁰ Household income per capita was classified into four strata based on the Brazilian minimum wage. The first (until $\frac{1}{4}$ minimum wage) and second stratum ($\frac{1}{4}$ to $\frac{1}{2}$ minimum wage) are equivalent to the line of extreme poverty and poverty in Brazil, respectively.⁴¹

The I-determinants were represented by the variables: food security status; Community Basics Index (CBI); household size; feelings of stress and anger; age; and quality of healthcare. Food security was measured by a shorter version (first eight questions) of the validated Brazilian Food Insecurity Scale (EBIA).⁴² This scale measures the limited access to adequate food due to the lack of resources, using questions related to the quality, variety, and quantity of food, as well as hunger experiences, such as skipping meals and not eating for an entire day.⁴² The CBI measures people`s satisfaction with the community environment, comprising the questions: “Where you live, are you satisfied with the quality of water/air/public transportation/educational system/roads/housing affordability?”.⁴⁰ The original CBI also

asks about the quality of healthcare, however, in this study this question was excluded from the index to be analyzed separately, as healthcare represents a key SDHI. To address psychosocial factors, participants were asked if they experienced stress and anger in the previous day.

Social cohesion/capital, the Cross-cutting determinant, was assessed by the Social Life Index, which addresses social support by asking: “If you were in trouble, do you have relatives or friends you can count on to help you?”, and ; “Are you satisfied with the opportunities to meet people and make friends where you live?”.⁴⁰

4.3.3 Statistical Analysis

Descriptive analyses were conducted to explore changes in health and well-being over the select period, using z-test adjusted by Bonferroni-correction to verify significant differences ($p \leq 0.05$) and chi-squared tests to examine the association between variables. Unadjusted and adjusted regression models were applied to explore associations between explanatory variables (SDHI) and outcomes (health status and well-being). Unadjusted odds ratios (OR) revealed associations between each explanatory and outcome variable, without controlling for covariates. While the adjusted OR presented the magnitude of association between explanatory and outcome variables after controlling for the covariance among explanatory variables. Only variables that showed significant OR in the unadjusted regression models were included in the adjusted models. Statistical analyses were performed using SPSS version 24.

4.4 RESULTS

Before the economic and political shock (2009-2013), an increasing trend was observed in respondents classified as “thriving” in life (58% to 63%) but this percentage decline by 29% during the crisis (2015-2017) (**Table 4.1**). Additionally, individuals

classified as “suffering” doubled during the crisis (2% to 4%). Although proportion of respondents with good health status decreased during the crisis (75%-72%), this change was not statistically significant.

Table 4.1 - Changes in health and well-being before and during the political and financial crisis in Brazil.

	Before the crisis (%)			During the crisis (%)		
	2009	2011	2013	2015	2016	2017
Well-being	n= 980	n= 1,001	n= 1,926	n= 942	n= 903	n= 901
Thriving	57.7 ^a	58.7 ^a	62.8 ^a	46.2 ^b	46.1 ^b	44.4 ^b
Struggling	40.4 ^a	40.9 ^a	35.4 ^a	50.8 ^b	50.7 ^b	51.5 ^b
Suffering	1.9 ^{a,b}	0.4 ^c	1.8 ^b	3.0 ^{a,b}	3.2 ^{a,b}	4.1 ^a
<i>Linear-by-linear association</i>				<i>p<0.001</i>		
Health status	n= 1,031	n= 1,042	n= 2,006	n= 1,004	n= 1,001	n= 1,000
Good	76.4 ^a	72.7 ^a	74.9 ^a	71.3 ^a	74.7 ^a	72.3 ^a
Poor	23.6 ^a	27.3 ^a	25.1 ^a	28.7 ^a	25.3 ^a	27.7 ^a
<i>Pearson Chi-square</i>				<i>p= 0.065</i>		

Source: Gallup World Poll.

In the unadjusted regressions analysis (Table 4.2), all SDHI showed significant association with health status. However, once controlling for the covariance, most of the S-determinants, such as job climate, educational level, employment status, perceived racism and income, no longer presented significant associations with health status. In order of magnitude, variables most related with poor health status were: age greater than 60 years old (OR= 5.8); stress (OR= 5.1); severe food insecurity (OR= 3.0); and low social support (0.2).

Table 4.2 - Unadjusted and adjusted OR for “poor health status” (ref.: “good health status”) from binary logistic regression models, for 2015 to 2017 in Brazil.¹

Social Determinants of Health Inequalities	Unadjusted OR (95% CI)	Adjusted OR (95% CI)
STRUCTURAL DETERMINANTS		
Job Climate		
Low	2.11 (1.53-2.91)**	1.06 (0.70-1.61)
Moderate	1.20 (0.85-1.69)	0.93 (0.60-1.44)
High (Ref.)		
Perception of political stability		
Not stable at all	2.25 (1.51-3.36)**	1.94 (1.19-3.14)*
Somehow stable	1.66 (1.10-2.53)*	1.79 (1.08-2.96)*

Very stable (Ref.)		
Perceived racism		
Yes	1.77 (1.44-2.22)**	1.23 (0.93-1.63)
No (Ref.)		
Employment status		
Unemployed	1.36 (1.02-1.80)*	1.20 (0.84-1.73)
Out of the workforce	1.54 (1.30-1.83)**	1.23 (0.96-1.56)
Employed (Ref.)		
Education		
Elementary	1.62 (1.14-2.31)*	1.34 (0.85-2.12)
Secondary/high school	0.99 (0.70-1.41)	1.13 (0.74-1.74)
College/ university (Ref.)		
Gender		
Woman	1.87 (1.59-2.21)**	1.44 (1.16-1.79)*
Man (Ref.)		
Household income per capita		
No income to ¼ mw	1.58 (1.23-2.03)**	1.07 (0.72-1.59)
¼ to ½ mw	1.28 (1.02-1.61)*	1.06 (0.77-1.47)
½ to 1 mw	1.10 (0.89-1.37)	0.95 (0.72-1.25)
More than 1 mw (Ref.)		
INTERMEDIARY DETERMINANTS		
Food security status		
Severe FI	4.35 (3.35-5.63)**	3.00 (2.10-4.29)**
Moderate FI	2.67 (2.07-3.44)**	1.59 (1.14-2.22)*
Mild FI	1.44 (1.18-1.76)**	1.31 (1.02-1.68)*
Food secure (Ref.)		
Quality of community basics services		
Unsatisfied	2.15 (1.74-2.66)**	1.42 (1.03-1.95)*
Somehow satisfied	1.60 (1.29-1.99)**	1.40 (1.04-1.88)*
Satisfied (Ref.)		
Household size		
6 or more	0.71 (0.54-0.94)*	0.60 (0.41-0.87)*
4-5	0.77 (0.65-0.92)*	0.82 (0.65-1.03)
1-3 (Ref.)		
Age		
60 or more – elderly	3.53 (2.74-4.54)**	5.79 (4.00-8.37)**
30 to 59 – adult	2.37 (1.95-2.90)**	2.82 (2.18-3.63)**
15 to 29 - youth (Ref.)		
Stress		
Experienced stress yesterday	6.43 (5.39-7.67)**	5.05 (4.03-6.33)**
Did not experienced stress yesterday (Ref.)		
Anger		
Experienced stress yesterday	4.86 (3.98-5.93)**	1.99 (1.54-2.59)**
Did not experienced stress yesterday (Ref.)		
Quality of healthcare		
Unsatisfied	1.69 (1.41-2.03)**	1.41 (1.08-1.83)*
Satisfied (Ref.)		
SOCIAL COHESION/SOCIAL CAPITAL		
Social support		
Low	5.01 (3.29-7.63)**	2.05 (1.19-3.52)*
Moderate	2.19 (1.82-2.63)**	1.32 (1.04-1.67)*
High (Ref.)		

*p-value <0.05; **p-value<0.001. Ref.: reference. Mw: minimum wage. ¹Independent (exposure) variables did not present high collinearity (r <0.7). Source: Gallup World Poll.

Adjusted regression analysis (**Table 4.3**) showed that low educational levels (OR= 10.2), lack of social support (OR= 6.5), age greater than 60 years old (OR= 5.8) and severe food insecurity (OR= 3.5) had the strongest association with suffering. Although being a woman was associated with a poorer health status, women presented a better life evaluation, compared to men. Moreover, living in a household with more than 3 people was found to be positively associated with health status and well-being. Regarding income, only extreme poverty was fairly associated (OR= 1.5) with a poor life evaluation.

Table 4.3 - Unadjusted and adjusted OR for “struggling” and “suffering” in live evaluation (ref.: “thriving”) from multinomial logistic regression models, for 2015 to 2017 in Brazil.¹

Social Determinants of Health Inequalities	Unadjusted OR (95% CI)		Adjusted OR (95% CI)	
	Struggling	Suffering	Struggling	Suffering
STRUCTURAL DETERMINANTS				
Job Climate				
Low	1.80 (1.38-2.34)**	3.98 (1.43-11.13)*	1.40 (1.04-1.88)*	1.67 (0.55-5.03)
Moderate	1.220 (0.92-1.62)	1.604 (0.53-4.83)	1.09 (0.80-1.48)	1.09 (0.34-3.46)
High (Ref.)				
Perception of political stability				
Not stable at all	0.83 (0.61-1.14)	3.75 (0.84-16.68)	-	-
Somehow stable	0.78 (0.56-1.09)	2.27 (0.49-10.51)	-	-
Very stable (Ref.)				
Perceived racismo				
Yes	1.03 (0.83-1.28)	2.53 (1.56-4.11)**	0.81 (0.63-1.04)	1.44 (0.82-2.52)
No (Ref.)				
Employment status				
Unemployed	1.13 (0.87-1.49)	1.38 (0.68-2.82)	-	-
Out of the workforce	0.994 (0.84-1.18)	1.39 (0.89-2.17)	-	-
Employed (Ref.)				
Education				
Elementary	2.00 (1.44-2.76)**	14.20 (2.02-100.04)*	1.85 (1.28-2.68)*	10.17 (1.37-75.62)*
Secondary/high school	1.80 (1.32-2.46)**	6.04 (0.85-45.66)	2.05 (1.46-2.89)**	7.75 (1.06-56.43)*
College/ university (Ref.)				
Gender				
Woman	0.78 (0.68-0.91)*	0.76 (0.50-1.16)	0.63 (0.53-0.75)**	0.72 (0.44-1.17)
Man (Ref.)				
Household income per capita				
No income to ¼ mw	1.54 (1.21-1.98)*	1.73 (0.89-3.38)	1.52 (1.10-2.10)*	1.30 (0.52-3.26)
¼ to ½ mw	1.21 (0.98-1.50)	1.33 (0.73-2.44)	1.20 (0.93-1.55)	0.97 (0.45-2.09)
½ to 1 mw	1.21 (0.99-1.47)	1.36 (0.78-2.37)	1.24 (1.00-1.55)	1.28 (0.67-2.47)
1 or more mw (Ref.)				
INTERMEDIARY DETERMINANTS				
Household food security status				
Severe FI	2.33 (1.75-3.10)**	7.68 (4.05-14.57)**	1.63 (1.17-2.26)*	3.50 (1.63-7.53)*
Moderate FI	1.98 (1.53-2.58)**	4.25 (2.14-8.44)**	1.60 (1.20-2.15)*	2.34 (1.06-5.12)*
Mild FI	1.57 (1.31-1.88)**	3.11 (1.79-5.40)**	1.49 (1.22-1.81)**	2.34 (1.27-4.32)*
Food secure (Ref.)				

Quality of community basics services				
Unsatisfied	1.70 (1.40-2.06)**	3.38 (1.88-6.09)**	1.60 (1.24-2.06)**	3.40 (1.53-7.57)*
Somehow satisfied	1.36 (1.12-1.65)*	1.76 (0.94-5.31)	1.35 (1.08-1.69)*	1.71 (0.78-3.73)
Satisfied (Ref.)				
Household size				
6 or more	1.03 (0.79-1.33)	1.05 (0.55-2.02)	0.90 (0.66-1.21)	1.13 (0.50-2.55)
4-5	0.81 (0.69-0.95)*	0.58 (0.36-0.93)*	0.76 (0.63-0.92)*	0.50 (0.28-0.91)*
1-3 (Ref.)				
Age				
60 or more - elderly	1.66 (1.29-2.13)**	4.62 (2.41-8.83)**	2.01 (1.49-2.71)**	5.78 (2.56-13.08)**
30 to 59 – adult	1.68 (1.42-1.99)**	2.84 (1.65-4.90)**	1.90 (1.57-2.29)**	3.07 (1.62-5.81)*
15 to 29 - youth (Ref.)				
Stress				
Experienced stress yesterday	1.53 (1.31-1.80)**	2.10 (1.38-3.20)*	1.41 (1.16-1.71)*	1.32 (0.75-2.30)
Did not experienced (Ref.)				
Anger				
Experienced stress yesterday	1.41 (1.14-1.73)*	2.85 (1.80-4.53)**	0.99 (0.77-1.28)	1.50 (0.82-2.77)
Did not experienced (Ref.)				
Quality of healthcare				
Unsatisfied	1.28 (1.09-1.51)*	1.64 (1.01-2.66)*	0.96 (0.78-1.19)	0.89 (0.47-1.68)
Satisfied (Ref.)				

SOCIAL COHESION/ SOCIAL CAPTAL

Social support				
Low	2.41 (1.40-4.13)*	15.29 (7.32-31.96)**	1.78 (1.00-3.19)	6.48 (2.71-15.47)**
Moderate	1.46 (1.22-1.76)**	2.48 (1.54-3.98)**	1.20 (0.98-1.48)	1.68 (0.97-2.89)
High (Ref.)				

*p-value <0.05; **p-value<0.001. Ref.: reference. Mw: minimum wage.¹Independent (exposure) variables did not present high collinearity (r <0.7). Source: Gallup World Poll.

4.5 DISCUSSION

A significant deterioration of well-being, measured by life evaluation, was found in Brazil during the crisis, with the prevalence of respondents classified as “thriving” declining by almost 30% from 2013 (63%) to 2017 (44%). Health status did not show statistically significant changes over the period. As such changes in health status, including the onset of disease, may be a long-term effect of such crises, significant changes would more likely be seen in a longer time-frame.⁴³

Increased age, stress, food insecurity and lack of social support were the SDHI variables most associated with poor health status. Similarly, education, increased age, food insecurity and lack of social support were the most associated with well-being. Literature has extensively shown that increased age, stress and low education are

associated with poor health and well-being.^{7,24,32,35,44-46} However, the association of food security⁴⁷⁻⁵² and social support⁵³⁻⁵⁶ has only been studied recently.

Studies have shown that food insecurity has a reverse causal relationship with health and well-being.^{48,49} For example, food insecurity leads to an insufficient or poor diet, reduction in medical spending, changes in activity and behavior, which increases the risk of both infectious and chronic diseases.^{49,50} On the other hand, some symptoms and treatments of diseases may cause side effects, such as reduced appetite and difficulties in food absorption, that further compromise an individual's food security status.⁵⁰ Moreover, higher costs of medical care may reduce the disposable income available for food expenditure.⁵⁷⁻⁵⁹ Interestingly, social cohesion/capital appears to alleviate the impact of financial strain on health and well-being in multiple ways.^{53,60} For example, social support can alleviate psychological issues (e.g., anger, stress), facilitate access to healthcare (e.g., rides to appointments) and adherence to healthy behaviors (e.g., exercising with friends).^{53,55}

As expected, gender played an important role in health status and well-being. Women were 44% more likely to report poor health status, which aligns with findings of previous studies in Brazil.^{46,61,62} The opposite effect was found for life evaluation, with women 37% more satisfied with life than men. These positive associations between women and life satisfaction was also seen in European countries.⁵ Dissatisfaction with the community environment increased by 42% reporting by respondents of poor health status and they were more than 3 times likely to be characterized as "suffering". Research conducted on the influence of community environment on human life has shown that housing, food, water, transport and air pollution have a significant impact on health and well-being.⁶³⁻⁶⁶ Healthcare was significantly associated with health status. Respondents dissatisfied with the health

system were 41% more likely to report poor health status. These findings may highlight perceived decline in the quality of the healthcare system by those who use these services the most (i.e., people with poor health). Studies also show that investments and improvements in the healthcare system are directly associated with improved health outcomes.^{45,64,67}

Overall, I-determinants along with social cohesion/capital were found to be the strongest social determinants associated with both health and well-being. This means that material circumstances, biological, psychosocial factors and social support lessened the association of economic factors with health and well-being. This may explain why previous studies,^{19,25-31} which did not control for I-determinants and social cohesion/capital, found that income and unemployment (S-determinants) were most associated with health and well-being during economic constraints.

4.6 LIMITATIONS

As this study used secondary data, it was limited to variables available in the GWP. Due to the self-reported nature of the data, reporting bias may be an issue. Moreover, the sample did not cover the homeless and institutionalized, who may be among the most vulnerable groups during economic downturns. Also, there was no available data on behavior/lifestyle factors, which are also I-determinants of health inequalities. Finally, this study does not imply causal inference given its cross-sectional design.

4.7 CONCLUSIONS

Political and economic crises negatively affect human health and well-being by jeopardizing socioeconomic, psychological and behavioral factors.⁷⁻¹³ The majority of

research efforts have focused mainly on economic factors, such as income and unemployment with inconclusive results²⁵⁻³¹, rather than the broader range of factors that influence health and wellness. While most studies show income as the best predictor of health and well-being,²⁰⁻²⁴ others suggest that the influence of income decreases once basic needs are covered.²⁸⁻³¹

This study is one of the few to explore changes in health and well-being throughout economic and political crises and their association with the SDHI.⁶ Another major theoretical contribution of this study is that rather than focusing on socioeconomic factors, it looked into a broader range of social determinants, such as social support, material circumstances, environmental, individual and psychological factors. As a result, it fills in a critical research policy gap by being the first to assess the changes in health status and well-being in Brazil during its current crisis.

Regression analyses performed with a wide range of variables showed that food security, age, and social support were the best predictors of health and well-being rather than income and unemployment. This allowed us to use the conceptual model of SDHI⁶ to empirically show that: I-determinants along with social cohesion/capital directly affect health status and well-being, and mitigate their association with the S-determinants (i.e.: economic factors).

Therefore, this study highlighted the importance of looking at a broader range of factors when looking for predictors of health and well-being during economic downturns. From a policy perspective, these results indicate that in order to protect health and well-being during an economic and political crisis, policies should pay particular attention to enhancing the access to food, healthcare system, educational system, community environment (quality of air, water and infrastructure) and fostering social support.

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CHAPTER 5: FINAL CONCLUSIONS

Food security, health status and well-being measurements are needed to raise awareness among decision-makers, support civil society organizations and guide the development and evaluation of interventions, especially now with global efforts around the SDG 2 and 3: “end hunger and achieve food security” and “health and well-being for all”.¹ Although in the past decades social policies and programs, supported by economic growth, have reduced poverty and hunger as well as improved health indicators in many countries², studies have shown that political and economic crises can rapidly undermine achievements in these areas, preventing countries from achieving these both SDGs.³⁻⁶

As the literature lacks continuous monitoring of food security, health and well-being in times of economic and political instability, this study filled a gap in knowledge by using a population-representative data (n= 356,667) to assess the changes in food security, health status and well-being throughout three years prior to and three years during the current economic and political crisis in Brazil.

Results showed that, although Brazil has been internationally recognized for its successful social policies⁷⁻¹⁰, the crisis has strongly affected Brazilians` food security status and well-being. During the crisis, the percentage of households classified as food secure declined from 76% in 2013 to 49% in 2017 and severe food insecurity increased from 4% in 2013 to 12% in 2017. This worsening of food security status has disproportionately affected the poor, increasing by six times the chances of being food insecurity among the poorest strata. Along with income, those who reported a low job climate, lack of social support and low level of education were twice more likely to be food insecure.

The deterioration of Brazilians' well-being was flagged by the almost 30% decline in the prevalence of respondents classified as "thriving" over the course of the crisis (63% in 2013 to 44% in 2017). Regression analysis carried out with a wide range of variables, representing the social determinants of health inequalities, showed that during the crisis poor health status and ill-being were most associated with food insecurity, increased age and lack of social support, rather than income and unemployment. Low level of education, poor community environment and dissatisfaction with healthcare system also played an important role in people's health status and well-being.

From a policy perspective, these findings highlight the necessity for emergency public policies to protect Brazilians' food security and well-being, especially for the most vulnerable. Furthermore, this research indicates that these policies should pay particular attention to enhancing the access to food, educational system, public healthcare and community environment (quality of air, water and infrastructure), and fostering social support in order to promote and protect food security, health and well-being.

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