The economic determinants of Venezuela's hunger crisis

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This paper argues that Venezuela's hunger crisis was caused by the collapse of the country's import capacity. I show evidence supporting the hypothesis that the key driver of the decrease in caloric intake was the decline of more than nine-tenths in oil revenues, which sparked an economic contraction and forced the economy to undertake massive cuts in imports of food and agricultural inputs. Econometric estimates using cross-national panel data show that Venezuela's performance in health and nutrition indicators is in line with, and in many cases significantly better, than what we should expect given the magnitude of its contraction in per capita incomes over the past two decades.

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1. Introduction

During the past decade, Venezuelans' ability to access adequate and affordable nourishment has deteriorated sharply. Venezuelans today consume many less calories than in the recent past and are more likely to become ill and die as a result. Venezuelan mothers are more likely to develop anemia and newborns are less likely to survive. The overwhelming majority of Venezuelans face severe uncertainty as to how they will feed themselves in a day-to-day basis and have significantly altered their lifestyles to cope with severe scarcity of affordable food.

In this paper, I argue that this deterioration is caused by the sharp reduction in the country's capacity to acquire imported goods. Between 2012 and 2020, Venezuela's oil exports – which had previously accounted for 95% of the country's export revenue – fell by 93%, sparking one of the largest economic contractions experienced in modern world economic history. The country's per capita income shrank by 72%, poverty rates skyrocketed, and nearly one-fifth of the population left the country.

I argue that the decline in oil exports severely circumscribed the ability of a traditionally import-dependent economy to buy imports of food as well as intermediate and capital goods for its agricultural sector. As I show, even if Venezuela were devoting all its foreign currency earnings to food imports, it would still not be able to purchase as much food in international markets as it bought in 2012. Although the collapse of the oil sector is driven by multiple factors, there is substantial evidence that trade and financial sanctions played a key role in its demise by restricting access to world markets and crucial inputs (Rodríguez, 2022a,b; Oliveros 2021).

This paper also discusses the role that food policies launched by the Venezuelan government played in this crisis. The data clearly shows a major government effort to increase food deliveries to families in need, with the resources channeled to food assistance amounting to almost half of food imports. An increase in the share of food in total imports allowed food imports to stabilize despite a continued economic contraction and decline in total imports.

This is the first systematic investigation of the causes behind the decline in Venezuelan caloric intake and related health conditions. Prior research has documented the magnitude of the collapse and described the resulting policy challenges (Doocy et al., 2019; Grillet et al., 2019; Correa-Salazar and Amon, 2020; ENCOVI, 2021). Nevertheless, analytical studies of the causal channels underlying the country's humanitarian emergency remain absent.

The next section surveys the existing evidence on the evolution of food security and nutrition indicators, discussing data produced by government institutions, international agencies and private sector institutions. Next, I discuss the two key determinants of the evolution of hunger conditions: the collapse of the economy's capacity to pay for essential imports, and changes in the government's food assistance policies. I then go on to present econometric estimates that assess whether the evolution of key results indicators can be accounted for as a result of the economy's contraction. I close by providing some final reflections.

2. Nutrition and Health Security Amid Economic Collapse

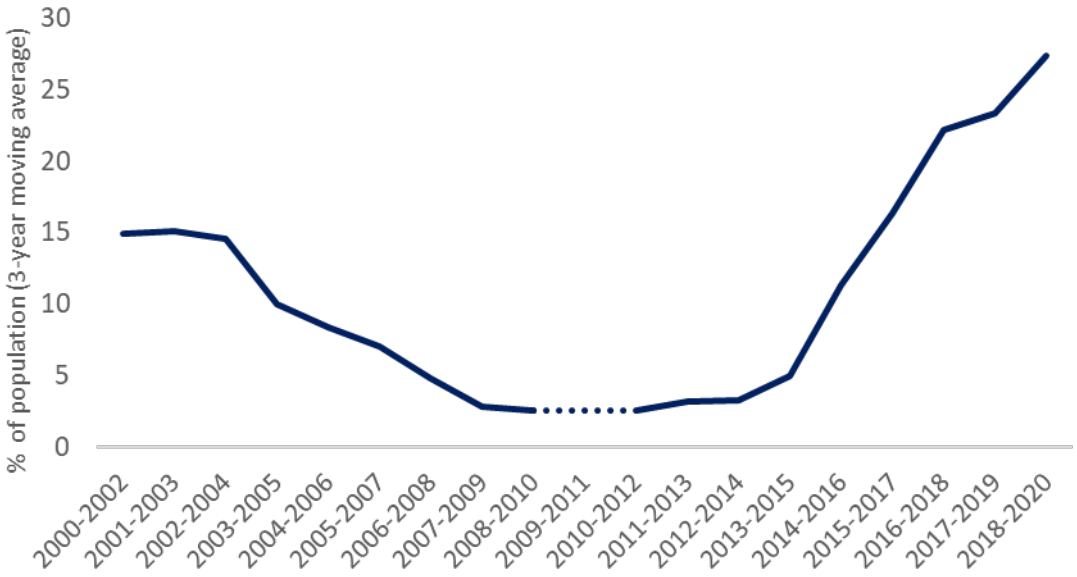
Due to the dearth of official statistics, assessing the recent evolution of food security and nutrition in Venezuela is not easy. The little data that is published or mentioned by officials tends to be only that which can be presented as giving relatively positive results, suggesting that there is at the very least a strong bias in the selection of indicators, if not outright manipulation of official series. In the absence of data published by national official agencies, there remain three sources of information on Venezuela's health and nutrition statistics: global databases maintained by international organizations, sometimes with limited official input and direct data collection efforts by international organizations, private sector institutions and non-governmental organizations. We discuss each of these sources in turn.

2.1 Malnutrition and Health Data

Several international organizations maintain global databases that report Venezuelan health and nutrition indicators. Among these, the indicator most directly relevant to assess the country's food situation is the estimate of the prevalence of undernourishment produced by the Food and Agriculture Organization (FAO) of the United Nations (Figure 1). The indicator shows a staggering increase, with undernourishment rates rising from 3.2 percent of the population in 2012 to 27.4% in 2019.[2] The evolution of the series as a whole tracks the GDP data, with undernourishment declining strongly in periods of high economic growth (2004-2012) and increasing strongly in periods of contraction (2013-2020). The series appears to accelerate strongly in 2015. Because of the moving-average nature of the data, this could reflect an increase that starts in 2016, when the economy suffered its first year of double-digit contraction.

[2] For ease of exposition, we refer to the middle-year of the moving average when referring to the time of a specific observation.

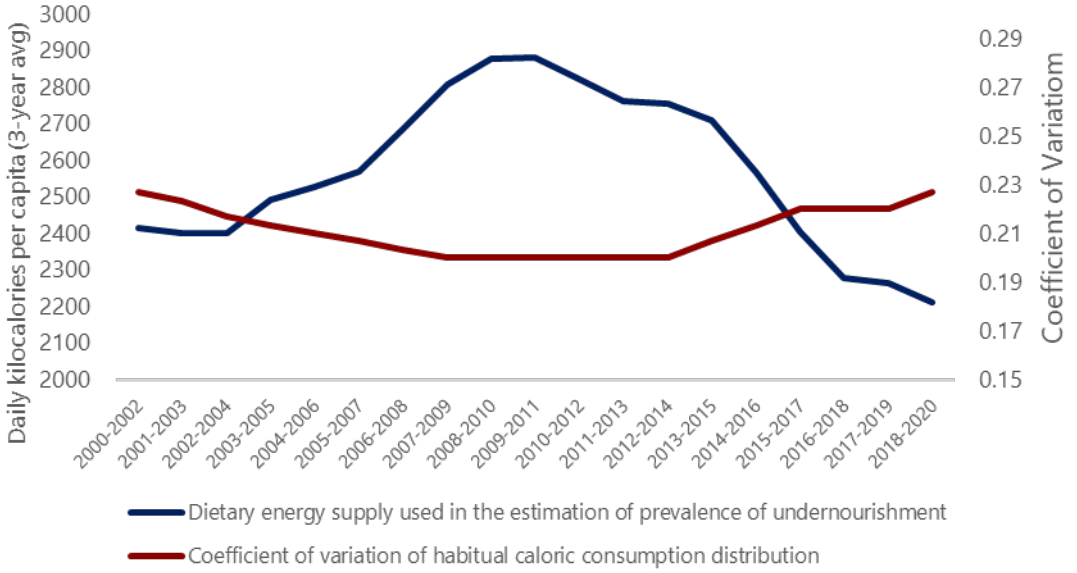
Figure 1: Prevalence of Undernourishment, 2000-2020



Sources: FAO

Note: Series represents three-year moving average. Dotted line corresponds to the periods for which FAO reports the series as being less than or equal to 2.5%. FAO does not report point estimates lower than 2.5%, but instead indicates only the fact that the estimate falls below such a threshold.

Figure 2: Level and Distribution of Dietary Energy Supply, 2000-2020



Sources: FAO.

Figure 2 shows the FAO estimates of dietary energy supply and variability across persons of habitual caloric distribution. The data suggests that lower aggregate supply is the main contributing factor to the decline of undernourishment, although increasing variability across persons played some role. Venezuela has suffered an acute drop of 23 percent in its average energy supply, which fell from a peak of 2880 daily calories per person to a low of 2210 calories per person. In contrast, the coefficient of variation rose moderately, from 0.20 to 0.23 during the same period.

The data on dietary energy supply used to construct the FAO's undernourishment indicator is drawn from the FAO's Food Balance Sheets (FBS). Table 1 presents the evolution of the main components of Venezuela's FBS from 2010-2019. The data show a 29% decline in the volume of food available for consumption between 2010 and 2019, a number that is broadly in line with the measured 23% decline in caloric intake. The decline is largely concentrated in the 2015-2019 period, during which food available for consumption fell by 27 percent. Both declining domestic production – which fell by 25% - and net imports – which fell by 35% - contributed to the decline in availability for consumption.

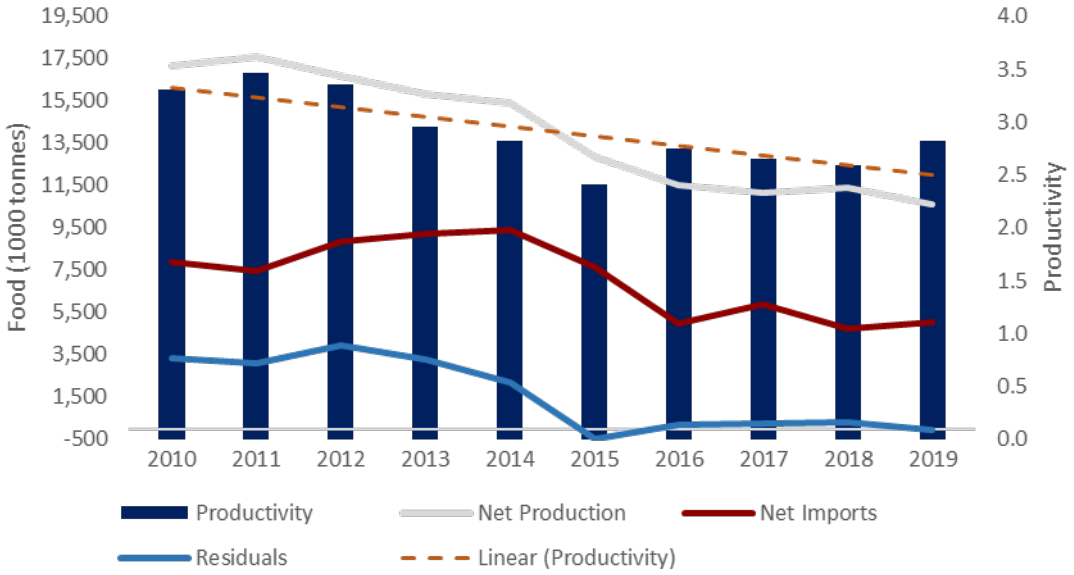
Table 1: FAO Food Balance Sheets, 2010-2019

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2015-19
Production	24,566.08	24,752.23	23,764.39	23,926.79	23,874.43	22,027.63	18,098.26	17,895.57	18,578.57	16,430.57	-5,597.06
Net Imports	7,904.70	7,448.34	8,831.72	9,187.64	9,396.57	7,655.92	4,997.13	5,884.18	4,723.18	5,014.18	-2,641.74
Intermediate Inputs	7,424.65	7,157.54	7,095.26	8,089.52	8,472.13	9,158.55	6,586.12	6,733.98	7,186.98	5,831.98	-3,326.57
Other	1,495.99	1,270.25	1,763.52	2,077.47	1,913.28	1,521.16	-35.82	1,187.09	1,063.09	1,399.09	-122.07
Residuals	3,310.00	3,077.00	3,966.00	3,296.00	2,167.00	-452.00	206.00	247.00	306.00	-69.00	383.00
Food Available for Consumption	20,240.14	20,695.78	19,771.33	19,651.44	20,718.59	19,455.84	16,339.09	15,611.68	14,745.68	14,282.68	-5,173.16
Net Production	17,141.43	17,594.69	16,669.13	15,837.27	15,402.30	12,869.08	11,512.14	11,161.59	11,391.59	10,598.59	-2,270.49
Productivity	3.31	3.46	3.35	2.96	2.82	2.41	2.75	2.66	2.59	2.82	0.41

Sources: FAO, own calculations.

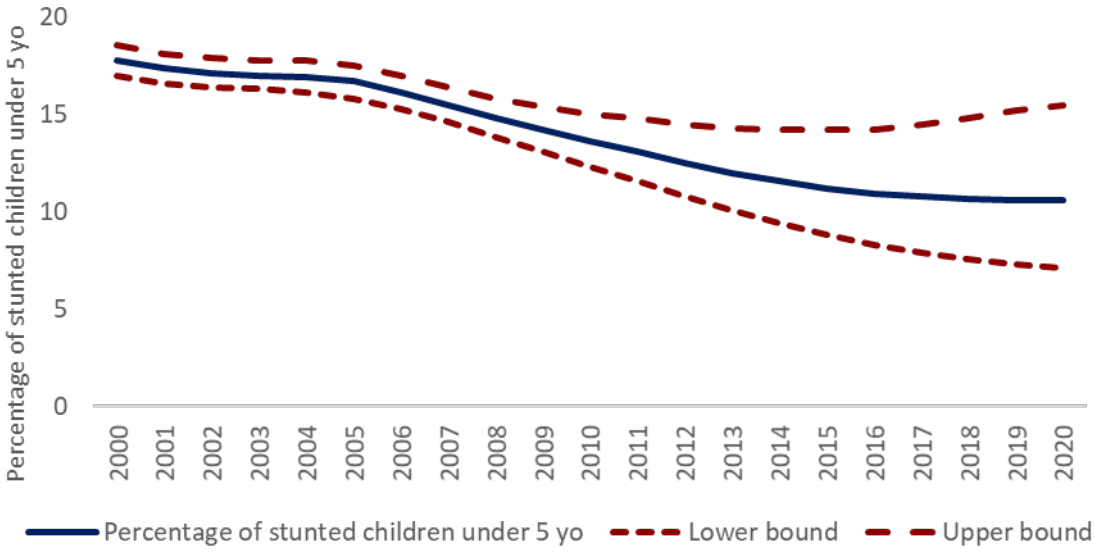
Declining production can itself be the consequence of lower imports of capital goods and intermediate inputs. A variable that allows us to disentangle homegrown as opposed to external sources of the decline is the evolution of the food sector's productivity. I calculate productivity as the ratio of agricultural production to inputs using FBS data. The series shows a moderate rate of decline over this period (Table 1 and Figure 3). The cumulative decline over the 2010-19 period of 14.9%, is well below the decline in production (33.1%), net imports (36.6%) or availability for consumption (29.4%). The decline takes place before 2015, with productivity recovering 17% in the 2015-19 period, at the same time at which food availability was rapidly falling. These facts suggest that while declining productivity may have contributed to falling production, it is unlikely to have been its primary driver.

Figure 3: Food Production and Trade Indicators, 2010-2019



Sources: FAO, own calculations.

Figure 4: Child Stunting, 2000-2020

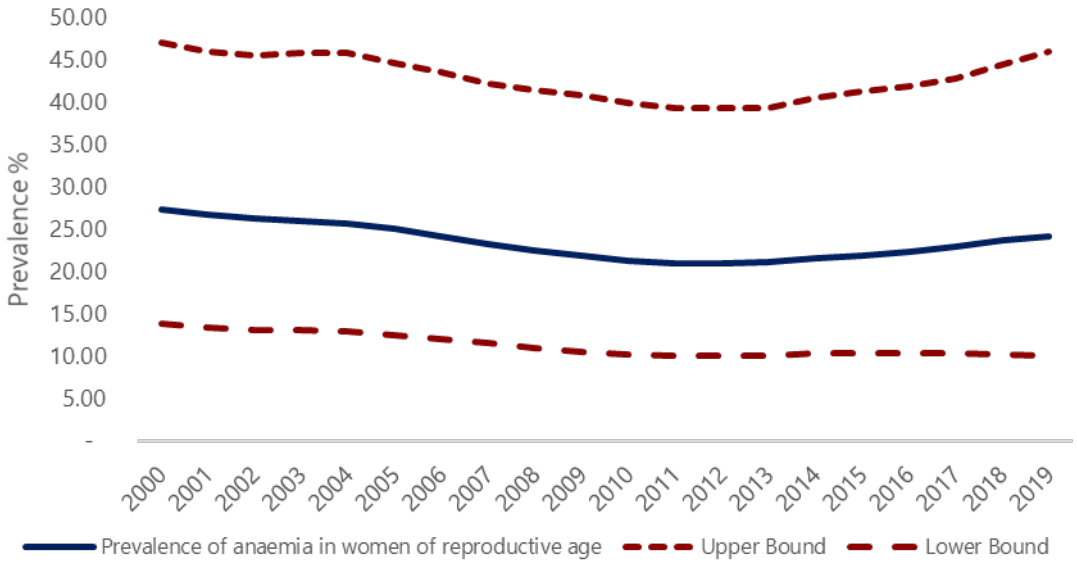


Sources: FAO.

Other indicators published in global databases are directly relevant to assessing food security. One is the percentage of children stunted published as part of the Joint Child Malnutrition Estimates constructed cooperatively by UNICEF, the World Health Organization, and the World Bank. The estimates show a continued decline in the prevalence of stunting even through 2020 – albeit with growing confidence intervals (Figure 4).

The WHO also reports an estimate of prevalence of anemia among women of reproductive age (15-49). Anemia, frequently caused by iron deficiencies or other nutritional causes, is associated with poor cognitive and motor development and decreased work capacity and may lead to adverse reproductive outcomes such as low-birthweight infants. The estimate shows an increase in anemia prevalence since 2011, which breaks with a prior trend of decline (Figure 5).

Figure 5: Prevalence of Female Anemia, 2000-2019



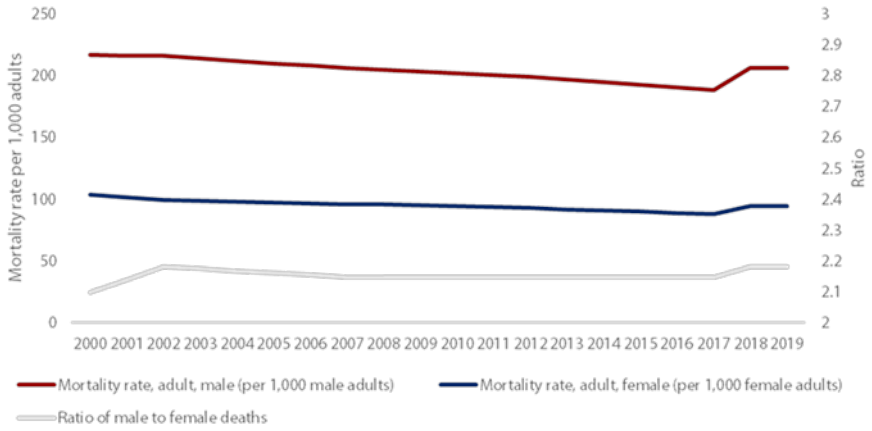
Sources: FAO, own calculations.

Acute malnutrition can manifest itself in increased mortality rates. The World Bank reports estimates of adult mortality constructed by the United Nations Population Division from its life tables, which are updated biennially for all member countries using a combination of vital registration statistics and other estimates. The series, which had shown a steady trend of decline between 2000 and 2017, experiences a discrete upward jump in 2018 both for women and men (Figure 6). The series shows an increase in the ratio of male to female mortality, consistent with the pattern observed during famine situations (Zarulli et al, 2018).

Figure 7 displays the time series for neonatal, infant, and under-five mortality rates from the United Nations Inter-Agency Group for Child Mortality Estimation (UN IGCME). All show discrete increases towards the end of the sample, with an across-the-board rise around 2016. The fact that the series remain

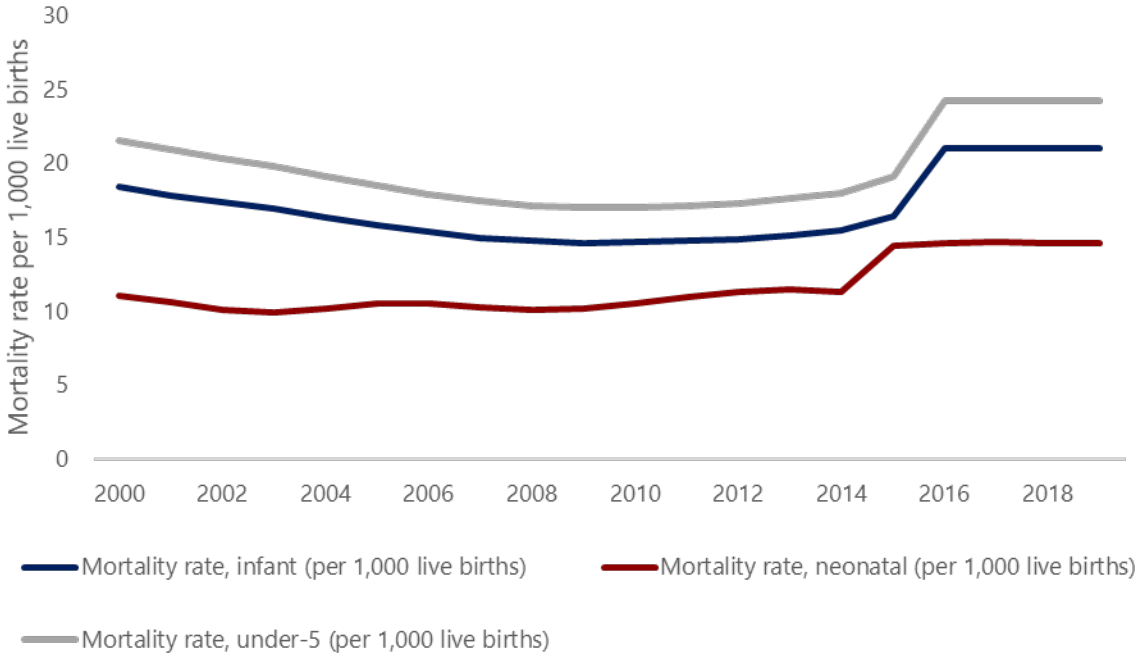
stable after that jump reflects the absence of information considered reliable enough by the UN IGCME to help establish a more precise trend.

Figure 6: Adult Mortality Indicators, 2000-2019



Sources: World Bank, own calculations.

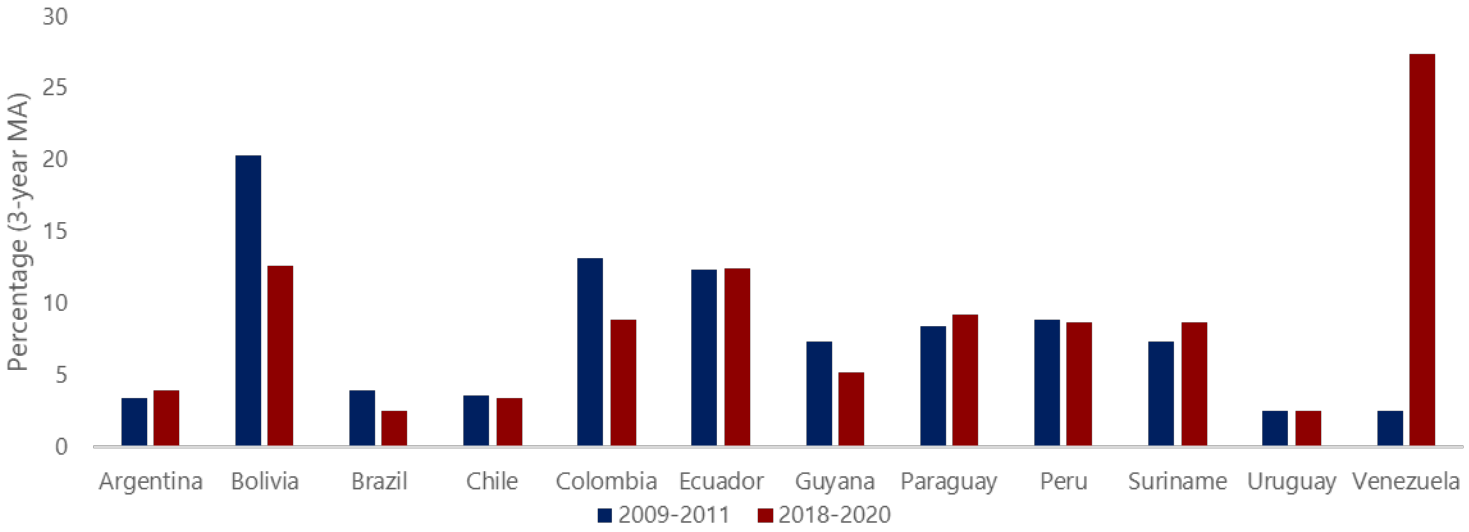
Figure 7: Infant, Neonatal, and Under-5 Mortality, 2000-2019



Source: UN-IGCME

How bad is Venezuela's situation compared with other nations? Venezuela today has the 15th highest rate of undernourishment globally. Among the top 20 countries, 13 are in Africa, 3 in the Middle East, and only 2 in Latin America (Haiti and Venezuela). Venezuela's current rate of undernourishment of 27.4% is similar to those of Botswana (29.3%) and Sierra Leone (26.2%). The increase is also staggering, having risen from less than 2.5% of the population to the highest level in the region (Table 2).

Figure 8: Prevalence of Undernourishment, South American countries, 2009/11 and 2018/20.



Source: FAO.

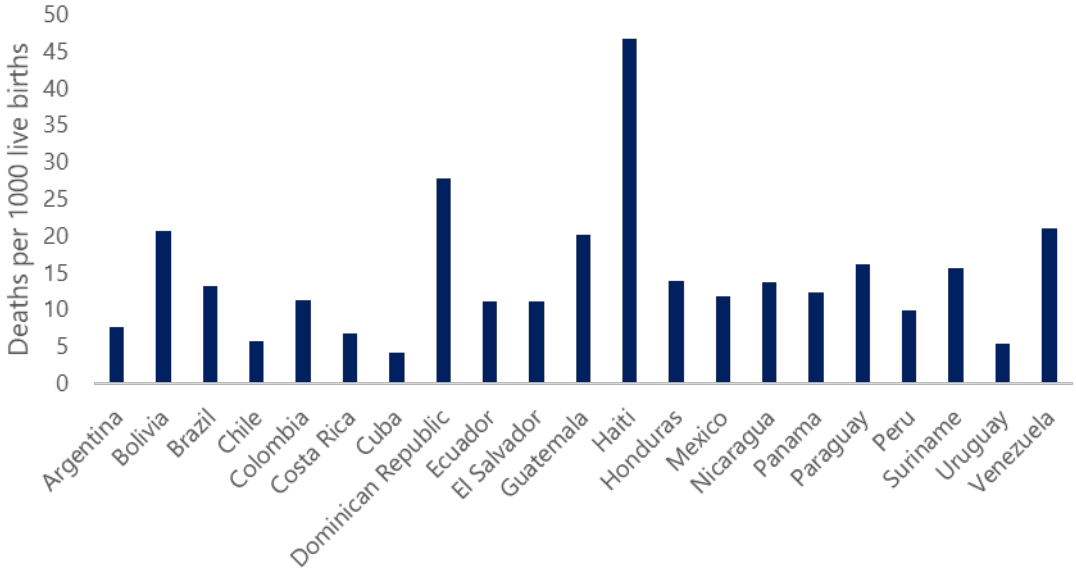
Table 2: 20 Countries with Highest Prevalence of Undernourishment, 2009/11 and 2018/20

Country	2009-2011	2018-2020	Rank 2009-11	Rank 2018-20
Somalia	75.6	59.5	1	1
Central African Republic	29.1	48.2	14	2
Haiti	47.5	46.8	2	3
Yemen	26.4	45.4	18	4
Madagascar	29	43.2	15	5
Democratic People's Republic of Korea	42.6	42.4	3	6
Democratic Republic of the Congo	38.8	41.7	4	7
Liberia	34.6	38.9	7	8
Congo	36.5	37.7	5	9
Iraq	31.6	37.5	10	10
Rwanda	31.3	35.2	12	11
Chad	36.3	31.7	6	12
Mozambique	24.1	31.2	21	13
Botswana	31.5	29.3	11	14
Venezuela (Bolivarian Republic of)	<2.5	27.4	114*	15
Sierra Leone	28.8	26.2	16	16
Afghanistan	23.7	25.6	22	17
United Republic of Tanzania	29.5	25.1	13	18
Kenya	24.2	24.8	20	19
Papua New Guinea	22.7	24.6	24	20

Source: FAO.

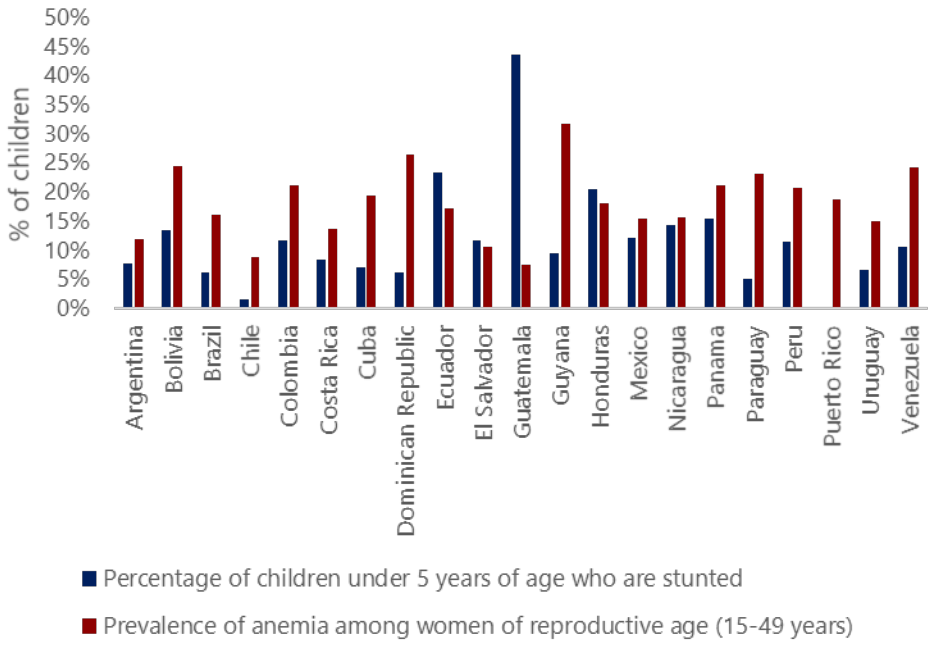
Not all current indicators are so dire. Venezuela's 2021 infant mortality rate for 2020 of 21.1 deaths per 1000 live births is the 75th highest out of 195 countries estimated by the UN IGME, i.e., in the 61st percentile of the distribution ranked from lowest to highest. Its levels of stunting and female anemia are, respectively, the 11th and 4th highest (of 21 countries) in Latin America and the Caribbean.

Figure 9: Infant Mortality Rate, Latin American Countries, 2021.



Source: UN ICGME.

Figure 10: Child Stunting and Female Anemia, Latin American countries, 2019.

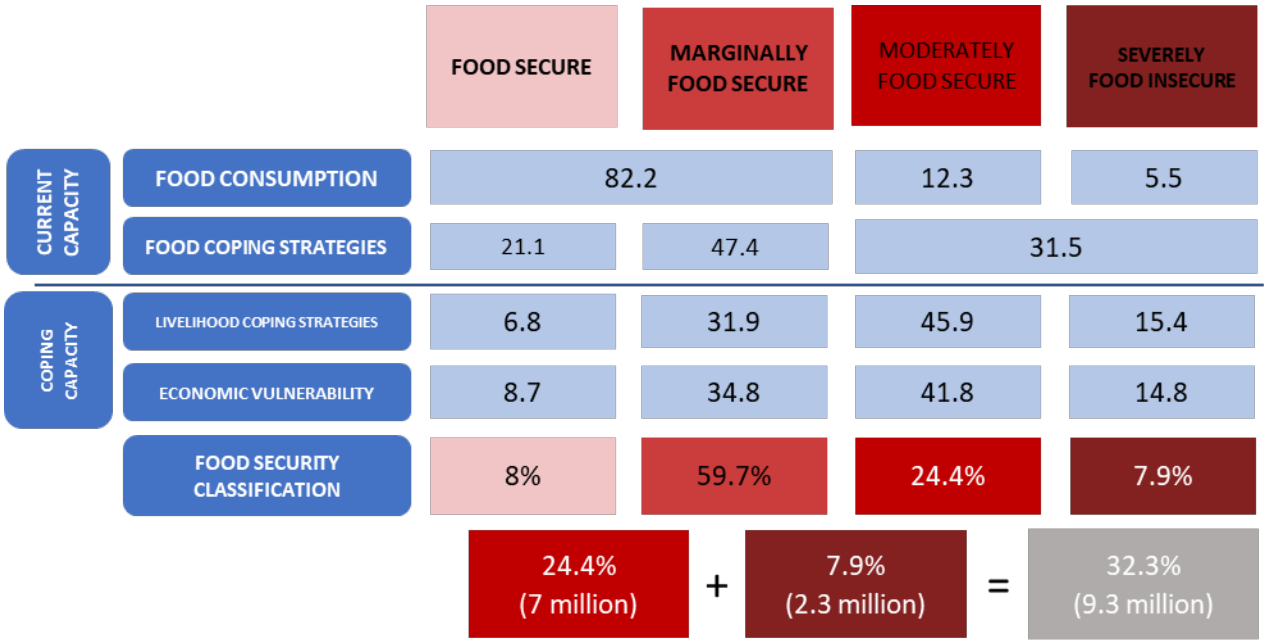


Source: FAO.

2.2 Food Security Assessments

Venezuela is not among the countries for which FAO collects survey data through the Food Insecurity Experience Scale (FIES) survey modules (FAO, 2022). The only international agency food security data collected in the country come from an Emergency Food Security Assessment (EFSA) carried out by the World Food Program between July and September of 2019. According to this assessment, which is based on a sample of 8,375 questionnaires collected nationwide, 32% of the country's population is food insecure, while another 60% is only marginally food secure. That is, only 8% of the population was found to be completely food secure in this assessment (WFP, 2019).

Figure 11: WFP Food Security Assessment for Venezuela, 2019

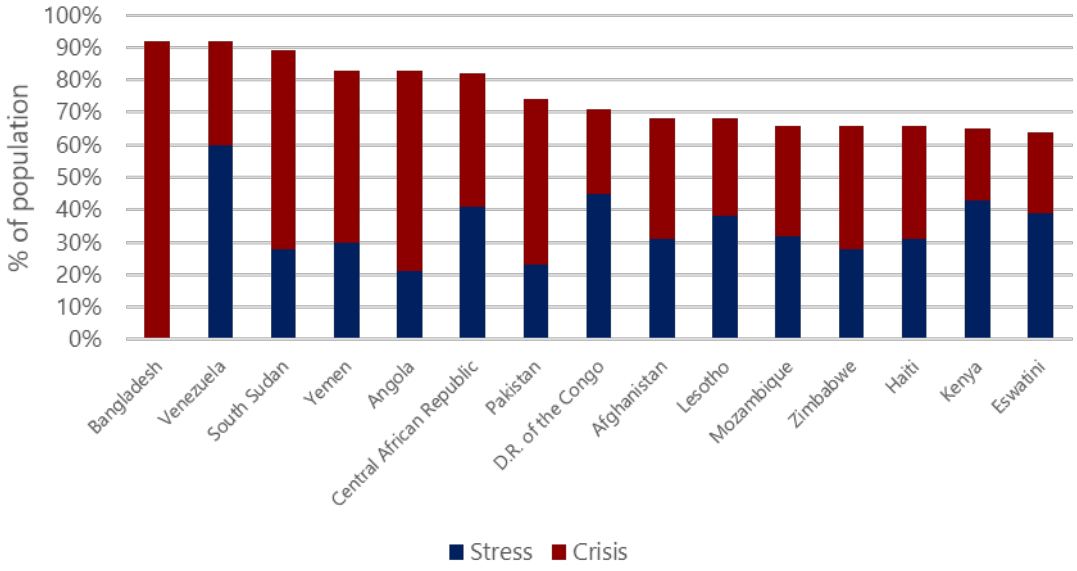


Source: WFP.

The WFP assessment was the main source of information used by the Global Network Against Food Crises (GNAFC), an alliance of humanitarian and development actors, to classify Venezuela as one of the world's ten worst (largest) food crises in 2019 (IPC, 2021; GNAFC, 2020). Venezuela's 32% of the population classified as living in food crisis (acute food insecurity in the WFP terminology) was reported as being the 13th largest share among 56 populations assessed in the 2020 GNAFC report, while its 60% of the population

under stress (marginally food secure as per WFP) was the highest reported in the sample.[3] The 60 % food stress figure is comparable to that seen among Syrian refugee populations in Lebanon (63%) or Turkey (58%).[4] If we sum the percentage of the population under food stress and in food crisis, Venezuela and Bangladesh had the highest numbers of the whole sample, at 92% of the population (Figure 12).

Figure 12: Food Crises Ranked by Population in Crisis or Stress Conditions, 2019.



Sources: GNAFC, own calculations.

However, Venezuela is the only country in the GNAFC database for which the assessment of food security is based on a WFP EFSA. The bulk of assessments in the database are carried out using the Integrated Food Security Phase Classification or the Cadré Harmonisé, which are based not only on survey-based information but also on direct measurements of weight-for-height ratios, mid-upper arm circumference, or crude and under-5 death rates, none of which are measured in the WFP EFSA assessment (IPC, n.d.).

While no integrated database of WFP assessments exists, existing examples point to substantial differences between WFP and IPC/CH assessments. For example, in the cases of Rwanda (2018), Libya (2019) and Sierra Leone (2020), the WFP assessments find that respectively, 19%, 17% and 61% of the population is food insecure. Yet the IPC, CH and OCHA assessments cited by GNAFC for these countries find that only 1%, 5% and 4%, respectively, of the population is in crisis situation or worse. Since the WFP's 32% estimate of food insecurity in Venezuela was used to conclude by GNAFC that 32% of Venezuelans are in IPC crisis mode, this conclusion must be taken with a grain of salt. When measured against comparable

[3] We count only the surveys that cover countries or regions of countries, and not those that refer exclusively to migrant subpopulations.
[4] The GNAFC uses WFP's Emergency Food Security Assessment to measure food insecurity in countries like Venezuela that did not conduct the IPC or the CH classifications analyses during the studied years.

WFP assessments, Venezuela's situation appears similar, and possibly better, than those of countries that are not classified as being among the world's worst food crises by GNAFC.

2.3 National Surveys

Venezuelan vital registration statistics are not published by authorities, though some of them are reported to international agencies and reflected in the data discussed in the previous subsections. Consolidated results have not been published for the bi-annual Households Survey since 2015, and for the National Expenditure survey since 2008-09.

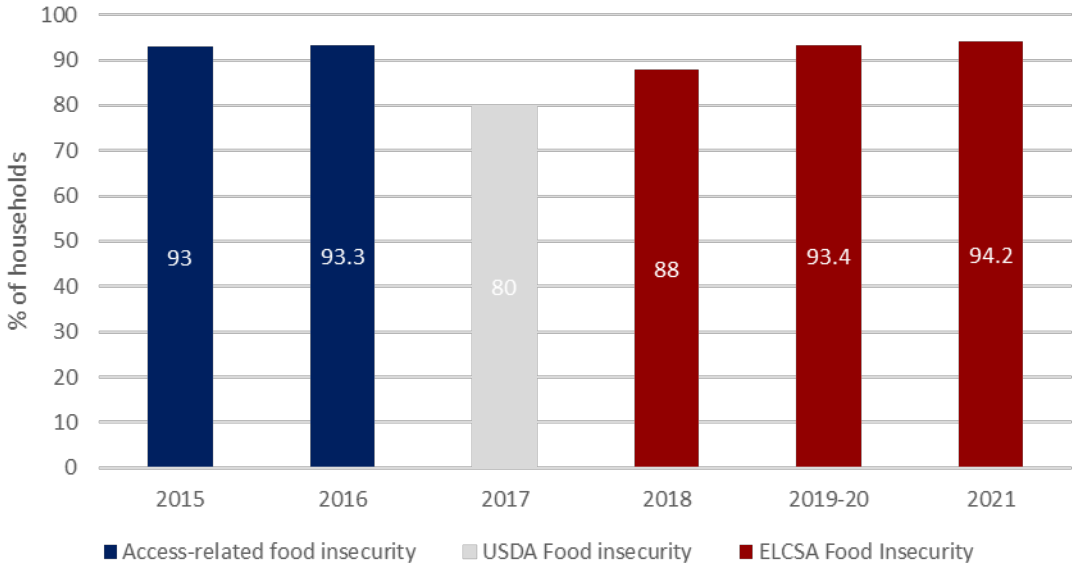
In 2014, a consortium of national universities and non-governmental organizations began conducting the National Survey of Living Conditions (Encuesta Nacional de Condiciones de Vida, ENCOVI), in part with the intention of filling gaps in the reporting of government statistics. The project is currently completely run by the Institute of Economic and Social Research at *Universidad Católica Andrés Bello* (UCAB), a private educational and research institution.

ENCOVI measures a wide array of indicators on education, health, nutrition and food access, poverty, unemployment, and migration. Nutrition data includes measures of food insecurity, access to food distribution programs, and average per capita household expenditures on food. The latest survey, carried out between February and April 2021, is based on information from 14 thousand households (ENCOVI, 2021).

While ENCOVI has become the most cited source of data on living conditions in Venezuela, it is not always easy to interpret the variations over time in its results. ENCOVI does not publish an integrated suite of adequately revised time series. Only data from the two most recent surveys (2019/20 and 2021) can be downloaded from the ENCOVI site, and UCAB does not make available microdata or past time series to outside researchers. For surveys prior to 2019/20, the only source of information are ENCOVI's annual power point presentations made during the launches of the respective reports. ENCOVI's 2021 technical annex suggests that there are serious comparability issues between the more recent surveys and the earlier ones, as surveys up to 2018 were based on a non-probabilistic sample while the 2019/20 and 2021 surveys were made with a probabilistic design and a sample large enough to be representative at the state level, yet ENCOVI researchers regularly present comparisons across these survey periods.

In the case of food security, the problem is exacerbated by changes in definitions. The 2015/16 indicators are based on respondents' answer to the question of whether they had sufficient income to purchase all the food they needed. In 2017, ENCOVI shifted to using a USDA scale (USDA Economic Research Service, 2012); then in 2018 it began using the FAO scale for Latin America (ELCSA, 2012). Despite varying methodologies, the three measures coincide in classifying more than four-fifths of Venezuelans as suffering from food insecurity – a figure that is also consistent with the WFP assessments discussed in the previous section (Figure 13).

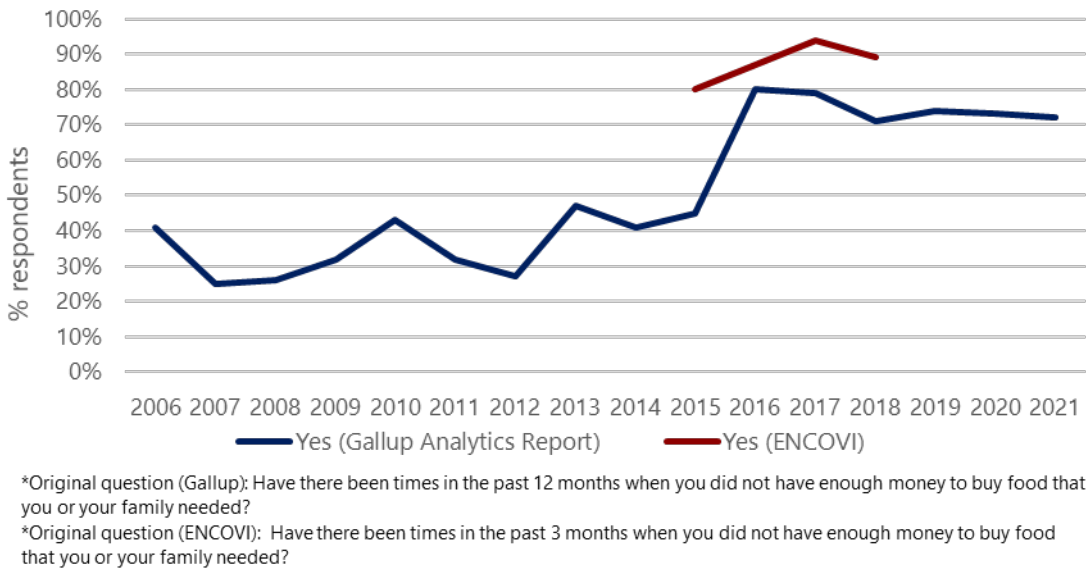
Figure 13: Food Insecurity in ENCOVI Surveys with Varying Metrics



Source: ENCOVI

One source of comparable data on food security since 2006 is the Gallup World Poll, which is also used to update the FAO's undernourishment estimates (Figure 14). Survey sizes range from 1000 to 1080 respondents with margins of error ranging from 3.2 to 4.1%. Gallup asks respondents whether there have been times in the past 12 months when they have not had enough money to purchase food for themselves or their families. ENCOVI also reports a comparable series for this indicator, although only for 2015-18. Both series show a significant increase in food insecurity up to 2016. Interestingly, the Gallup series peaks in 2016 and has remained below that peak for all subsequent years. ENCOVI has the series peaking in 2017 and falling in 2018 yet does not report it for subsequent years.

Figure 14: Respondents Who Say They Lack Sufficient Money to Buy Food, Gallup and ENCOVI



*Original question (Gallup): Have there been times in the past 12 months when you did not have enough money to buy food that you or your family needed?
*Original question (ENCOVI): Have there been times in the past 3 months when you did not have enough money to buy food that you or your family needed?

Sources: Gallup Analytics Report.

To a limited extent, these series support the hypothesis that food insecurity has not deteriorated from 2016/17 on.[5] This is worth highlighting since, as we pointed out above, both GDP and total imports declined significantly in the 2016-2020 period. The data thus suggest that changes in food policies subsequent to 2016 may have contributed to helping the country to avoid the further deterioration in food security that could have been expected given that its economy had entered a tailspin.

In sum, the data indicates a deep deterioration in Venezuelans' ability to access adequate and affordable nourishment. Nevertheless, there are reasons to be concerned about the comparability and reliability of some of the most alarming data estimates, which naturally tend also to be the ones most likely to capture headlines.

3 Determinants of Hunger and Food Insecurity

3.1 Economic Contraction, Import Capacity and Sanctions

The deterioration of Venezuela's health, nutrition and food security indicators correlates almost perfectly with the more general collapse of its economy. Between 2012 and 2020, the country suffered a massive economic contraction in which per capita Gross Domestic Product (GDP) declined by 71.8%. This

[5] Rafalli and Villalobos (2021) use anthropometric records from local NGO Caritas Venezuela for 2017-19 yet warn that they are not strictly representative because of negative self-selection. They estimate that stunting grew steadily from 28% in 2017 to 32% in 2019 while wasting fell from 15% in 2017 to 11% in 2019 and simultaneous prevalence also fell from 4.5% to 3.9%.

marks the 6th largest contraction in world history and the largest one in Latin American history since 1950. It is also the second-largest contraction in the world outside of war, with a magnitude equivalent to that of more than three Great Depressions.[6]

The proximate cause of the country's economic contraction is the decline in its capacity to import caused by plummeting oil revenues (Rodríguez, 2022a). Oil exports, which accounted for 96% of all exports before the crisis, declined by 93% between 2012 and 2020. This decline was caused both by lower international oil prices and lower domestic oil output, with the latter strongly impacted by financial and trade sanctions.[7]

Table 3: GDP Per Capita Recession Episodes World Ranking, 1950-2020

Rank	Country	Trough-to-peak ratio (percentage decline)	Period	Years	Average percentage decline	Years of initial GDP lost	Armed Conflict
1	Liberia	-89.2%	1974 - 1995	21	-8.7%	-733.7%	Intrastate conflict
2	Kuwait	-86.8%	1970 - 1991	21	-8.1%	-1134.3%	Interstate conflict
3	Iraq	-77.2%	1979 - 1991	12	-8.2%	-365.5%	Interstate conflict
4	D.R of the Congo	-75.7%	1974 - 2002	28	-4.8%	-1190.9%	Interstate conflict
5	United Arab Emirates	-73.4%	1970 - 2010	40	-3.0%	-1726.9%	Peacetime
6	Venezuela	-71.8%	2012 - 2020	8	-14.1%	-258.6%	Peacetime
7	Tajikistan	-71.4%	1990 - 1996	6	-18.6%	-289.9%	Intrastate conflict
8	Lebanon	-70.7%	1974 - 1976	2	-44.3%	-102.1%	Intrastate conflict
9	Georgia	-70.6%	1990 - 1994	4	-25.2%	-214.8%	Intrastate conflict
10	Iran	-66.6%	1969 - 1988	19	-4.5%	-793.4%	Inter and intrastate conflicts
11	Djibouti	-66.2%	1971 - 1991	20	-5.1%	-827.2%	Peacetime
12	Yemen	-65.6%	2010 - 2019	9	-10.6%	-386.5%	Intrastate conflict
13	Republic of Moldova	-64.8%	1990 - 1999	9	-10.1%	-474.5%	Peacetime
14	Azerbaijan	-61.0%	1990 - 1995	5	-16.8%	-187.5%	Intrastate conflict
15	Saudi Arabia	-59.9%	1974 - 1987	13	-6.1%	-358.9%	Intrastate conflict

Sources: Penn World Table, World Bank, own calculations.

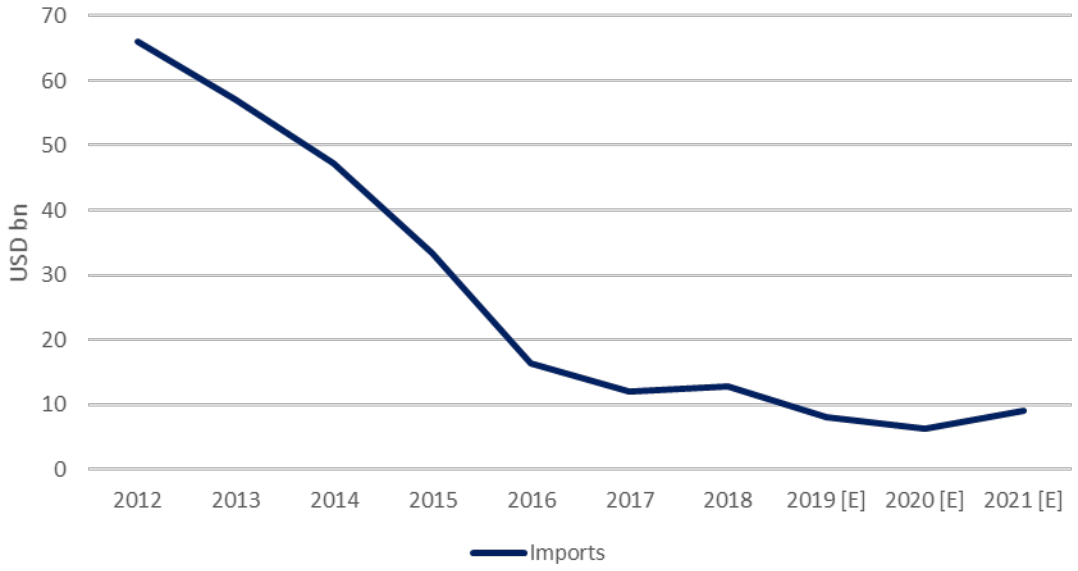
Reduced capacity for imports was also at the root of Venezuela's humanitarian catastrophe. Figures 15 and 16 show the resulting contraction in the country's imports and its food imports during 2012-20. Total imports of goods declined by 91% during this period, while food imports declined by 77.7%.[8] The decline in the economy's capacity to import made it impossible to maintain past levels of imports of essential goods. Even if the only the economy was importing only food (i.e., if it had decided to reduce to zero all other imports including other essentials such as medicines as well as capital and intermediate goods for its oil industry) it would still be able to pay for only 82% of the food it imported in 2012.

The data show a stabilization in food imports in the 2016-2020 period, despite a continued decline in total imports and a general economic contraction. Food imports in 2020 are similar to those in 2016 ($1.9bn in 2020, 2.1bn in 2020) despite total imports falling by 29% and GDP by 59% during that period.[9] The decline

[6] See Rodríguez (2022a) for the methodology used to define and estimate growth collapses.
[7] See Rodríguez (2022b) and Rodríguez (2021) for in-depth discussions of the economic effects of recognition decisions.
[8] Figure 15 is drawn from balance of payments data published by the Central Bank of Venezuela (BCV) updated with own estimates from the second quarter of 2019 on. Figure 16 is drawn from data published by the United Nations COMTRADE database, constructed using information provided by the country's trading partners. Because of the difference in sources as well as differences in definitions and coverage, the data do not coincide perfectly, although the general picture is consistent.
[9] Decline in total imports cited refers to the COMTRADE data. In the BCV series updated with our estimates, they fell by 62.2% in the same period.

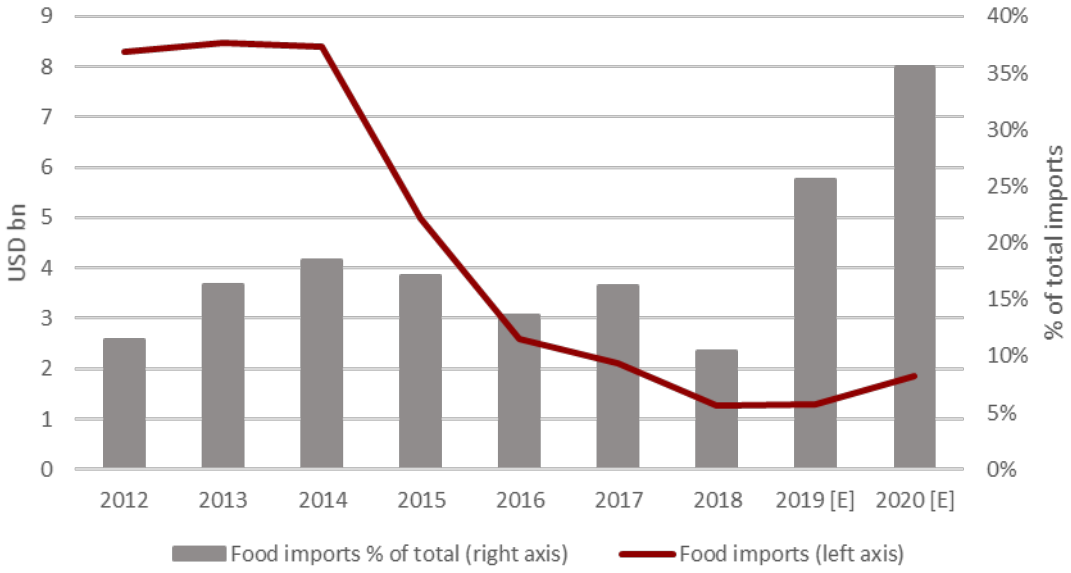
in import capacity that occurred after 2016 did not lead to lower food import levels because the economy found a way to prioritize food imports.

Figure 15: Total Merchandise Imports, 2012-2021.



Sources: BCV, own calculations.

Figure 16: Food Imports, 2012-2020.



Source: Comtrade, own calculations

The conclusion that the massive contraction in GDP is associated with the deep deterioration in living conditions, including indicators of health, nutrition and food security, is consistent with the results of the literature on the determinants of living standards. An extensive literature has investigated the links between GDP per capita and a vast array of health and broader living standards indicators (Pritchett and Summers, 1996; UNDP, 2010). Nearly all the cross-national variation in health outcomes can be explained because of per capita income and other socioeconomic variables that do not vary over short periods of time (Filmer and Pritchett, 1999). Past time-series data on socio-economic indicators for Venezuela also shows a very strong correlation of health and nutrition indicators with income.

3.2 Government Food Policies

Prior to 2016, Venezuelan food policies consisted primarily in the distribution through market channels of large amounts of subsidized food. The government maintained a strongly overvalued official exchange rate and rationed access to foreign currency, guaranteeing access at a preferential rate for imports of food and inputs for agricultural production. The government also sold subsidized food items through government-owned stores, initially created in 2003 under the label Mercal (an acronym for *Mercado de Alimentos* or Food Markets). The program was later expanded to include retail stores funded directly by the state-owned oil company and government-operated supermarkets, all grouped under the program *Misión Alimentación* (Food Mission). At their peak, more than 70% of Venezuelan households reported buying products in Mercal (Aponte, 2018).

Starting in 2013, oil export revenues began to decline due to a combination of lower export prices, high domestic fuel consumption and (from 2016 on) declining oil production. In response, the government maintained the exchange rate virtually unadjusted due to concerns that a depreciation would pass through to inflation. In the face of sustained domestic inflation, the official rate became increasingly overvalued, and the black-market premium skyrocketed Arbitrage of products sold through price controls became particularly prevalent in the food sector, to which the government directed a large share of foreign exchange allocation.

Not surprisingly given the large arbitrage incentives, corruption plagued the program. In February 2016, President Maduro announced that he would restructure the Food Mission after ordering the arrest of 55 managers and employees of the Bicentenario Hypermarkets for diverting regulated food items for resale in the black market (Telesur, 2016). One month later, he announced the creation of the Local Supply and Production Committees (*Comités Locales de Abastecimiento y Producción*, CLAP). The new program sought to replace the government bureaucracy of the food stores system with local food distribution committees run by community leaders.

In January of 2017, Maduro also announced the creation of the Fatherland Card (*Carnet de la Patria*), a government-issued card entitling the holder to receipt of cash transfers. All Venezuelans aged 15 and older who have a national ID card (for which everyone is eligible) can receive the Fatherland Card (La República, 2020). The government claims that 18.4 million Venezuelans have registered for a Fatherland Card, approximately 87.1 percent of the eligible population.

The CLAP program works through the direct distribution of food packages[10] by local committees to participant families. The committees, which are meant to come from and represent the community, work alongside the food ministry to distribute the packages sold at subsidized prices to program participants. They are integrated into the structure of local government associations known as communal councils, a form of community self-organization that works parallel to the elected structure of local governments and are funded by transfers from the central government (García and Torrealba, 2019).

In contrast to the elected communal councils, CLAP members are primarily designated by pro-government political organizations. Of each committee's nine members, eight are designated either by other organizations (6) or elected in local assemblies (2) – with the ninth elected by the first eight members from a set of candidates proposed by the communal council. Of the six designated members, four are appointed by pro-government social or political movements which are not formally part of the structure of the state, though are known or believed to receive significant government funding.[11] The other two are appointed respectively by the communal councils and the Bolivarian militias, which is formally affiliated with the armed forces.

Once a CLAP committee is established in the community, it carries out a house-by-house census in cooperation with the communal council to determine how many families will receive food boxes. In principle, all families in the community are eligible to receive one box with every delivery. Some families are eligible to receive more than one box depending on their needs (e.g., families with a pregnant member or families with members who show symptoms of undernourishment). Families must designate a head of household who is entitled to receive the subsidized food box and is in charge of paying for it.

In principle, the government has said it intends CLAP packages to reach recipients twice a month (Banca y negocios, 2019). In practice, the frequency is lower and highly variable across communities. Once they arrive at a central distribution system, representatives from the local committee pick them up and deliver them to the community using military-escorted trucks. Upon delivery to the community, the committee assigns the boxes to *manzaneros* -community members in charge of distributing packages among families in areas close to their households (a *manzana* is a street block) (Transparencia Venezuela, 2017). The *manzaneros* deliver the boxes and collect cash payments or tallies of bank deposits made in payment of the boxes by the family member. Typically one *manzanero* will oversee distribution for no more than 15 families.

Accusations of political bias in the distribution of CLAP boxes are frequent. According to a Caracas opposition community organizer cited in a report published by local human rights group PROVEA, the government systematically targets distribution to pro-government strongholds (PROVEA, 2016). Another resident cited in the same study denounced that the local head of the communal council in his district would single out opposition supporters in food distribution lines and ordered that they not receive food bags. A

[10] These take the form of either food boxes or bags. The main distinction is that food boxes come pre-packaged from government suppliers, while food bags tend to be put together by local committees with the items that they receive from providers.

[11] These are the National Women's Union (UNAMUJER), a feminist organization created by Maduro; the Francisco de Miranda Front, an organization created by former-president Hugo Chavez and former Cuban leader Fidel Castro to support and survey social programs, and the Units of Battle Hugo Chávez (which appoints two members), civilian groups created to "defend the revolution" affiliated to the governing Socialist Party.

CLAP committee member interviewed by another NGO defended the allocation to Maduro supporters as a reasonable rationing mechanism in the presence of insufficient supplies.

The government has denied claims of political discrimination, alleging that they form part of disinformation campaigns designed by the opposition. Freddy Bernal, who served as National Coordinator of the CLAP system from 2016 to 2020, said that the claim that opposition supporters were excluded from distribution "a complete lie." (Correo del Orinoco, 2016). Data from national polling company Datanálisis shows that 69% of self-declared opposition supporters are program beneficiaries. The share is lower than that of unaligned respondents (81%) or government supporters (88%), though this could be due to the well-known negative correlation between socio-economic status and government support in Venezuela or even to self-selection by government supporters into the program.[12]

Some scholars have claimed that the use of CLAP boxes has allowed the government to improve the effectiveness of its mobilization of voters, though the use of this technique is inconsistent over time and across jurisdictions (Penfold, 2018; Rodríguez and Navarro, 2018). Accusations have also been made that the Card of the Fatherland system was used to condition votes, though hard evidence on this remains scant.[13]

There have also been numerous accusations of corruption related to the CLAP program, particularly regarding the procurement of goods. In August 2017, former Attorney General Luisa Ortega Díaz – a prior government loyalist who had become estranged from Maduro - claimed she had proof of serious corruption cases involving high government officials related to the CLAPs. Three months later, the Venezuelan investigative news site Armando.info published an investigation alleging that Grand Group Limited Mexico, a company that exported food products for the CLAPs, was a subsidiary of Grand Group Limited Hong Kong, related and probably owned by Colombian businessman Alex Saab (Armando.Info, 2017). Saab was later arrested in Cape Verde and extradited to the U.S. in 2021 on money-laundering charges. The Armando.info investigation claimed that an increase in prices charged by GGL from USD4.75 per kilogram of regular milk powder in January 2019 to USD6.95 in November of the same year was inexplicable, noting that sites specialized in commodities' prices estimated regular milk powder to be priced at USD3 during that month.

According to the Venezuelan government, U.S. sanctions targeted against CLAP suppliers have significantly impaired its capacity to maintain food distribution. CLAP National Coordinator Freddy Bernal argued that the government was unable to pay Mexican providers directly with USD due to the sanctions,

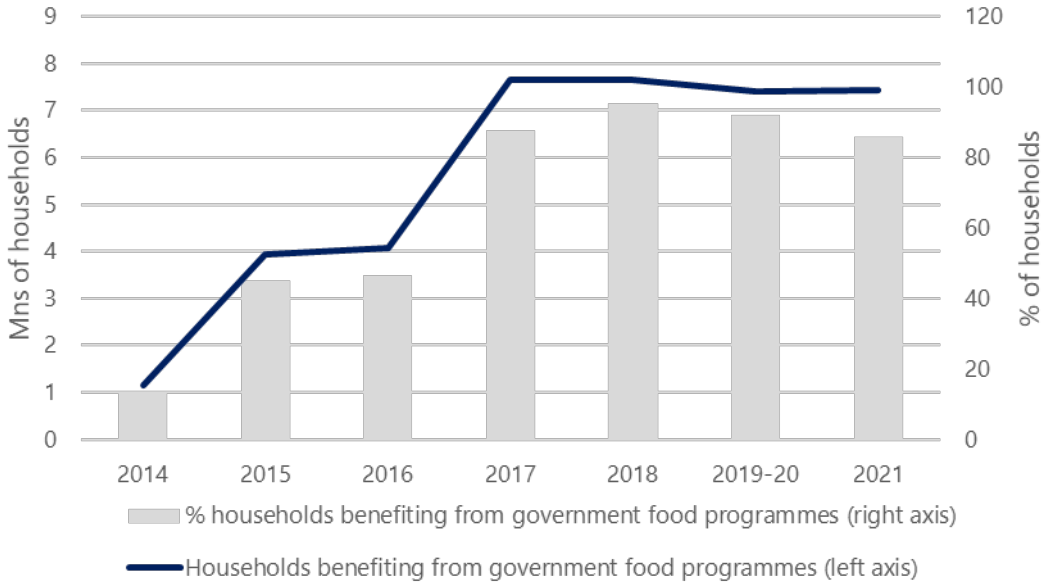
[12] These numbers correspond to averages for the October 2016-October 2021 surveys, calculated directly from the Datanálisis database.

[13] In the December 2017 elections, a video of electricity minister Luis Motta Dominguez not depositing his paper tally was speculated to provide evidence of the use of the carrousel system. Motta responded by showing that the video in question was a promotional video that he had taken before reporters and not that of his actual vote (which he also provided a video of) which had been cast before reports arrived. See Motta (2017). A Torino Economics December 2017 field study found no evidence of use of the carrousel method (Rodríguez and Navarro, 2017)

imposing transactional costs and raising the average time for completing international transactions from 20 days to 60 days, thus affecting food distribution among subscribed Venezuelans (Últimas Noticias, 2019).

Given the massive amounts of resources channeled through the CLAP system and the levels of opacity of the Venezuelan state at all levels, the corruption allegations are unsurprising. Nevertheless, since overpricing compared to international standards is likely to emerge in any transaction with the Venezuelan state as a reflection of implied regulatory, reputational and financial risks, it cannot be taken as direct evidence of graft. The fact that any firm providing goods or services to the Venezuelan government runs the risk of being accused of materially assisting the Maduro regime and being targeted with sanctions by the U.S. Office of Foreign Assets Control (OFAC) as a result implies that the prices of the goods and services they provide will include a large risk premium that could well explain the difference with international prices. Price increases may be driven by many factors and cannot in and of themselves be taken as evidence of corruption – particularly if they happen at the same time at which the risks of doing business with the Venezuelan government are increasing sharply (as was the case in 2019). Furthermore, the fact that OFAC decisions are taken as part of a political strategy to put pressure on the Maduro regime and that there is no legal burden on OFAC to prove its allegations in a court of law further complicates interpreting its designations as evidence of large-scale corruption.

Figure 17: Food-Related Government Program Beneficiaries, 2014-2021.



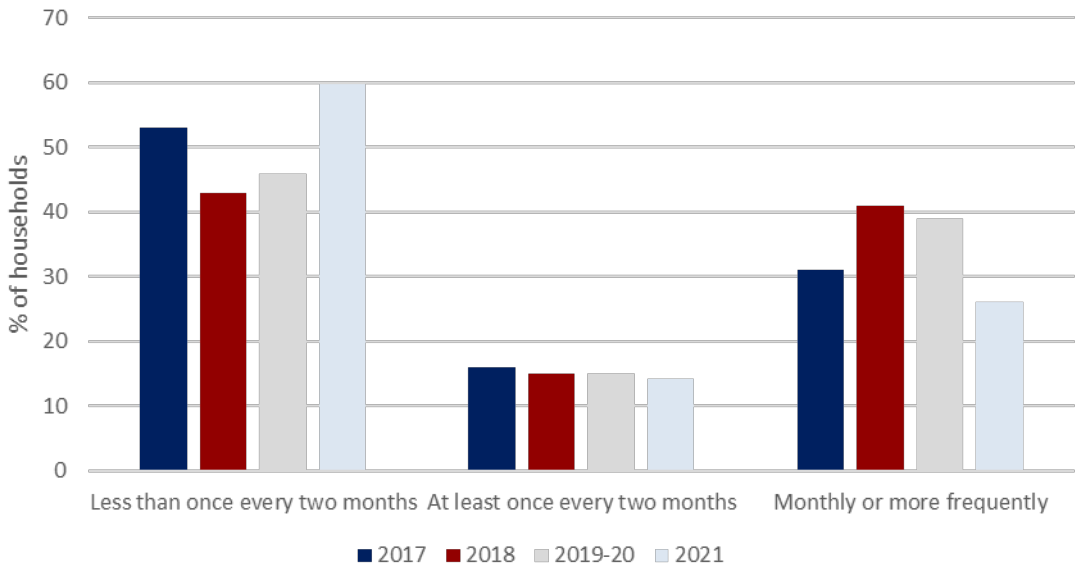
Sources: ENCOVI, own calculations.

Figure 17 shows ENCOVI estimates of the share of the population that received access to subsidized food through government programs from 2014 to 2021. Between 2014 and 2016, the data capture respondents who purchased products in the government-run food stores; from 2017 on, it includes recipients of CLAP packages. The data show a massive increase in food assistance, rising from less than 20% of households in

2014 to more than 80% in 2018-21. The rise occurs in two stages: a tripling of assistance between 2014 and 2015, associated with greater provision of subsidized food items through government-run stores, followed by a more than doubling of assistance with the transition from food stores to the CLAP system (ENCOVI, 2017). As a percentage of all families, ENCOVI finds that around 90 percent of households receive boxes through the CLAP system, although participation has declined somewhat from the peak of 95% in 2018 to 86% in the most recent 2021 survey.

ENCOVI estimates the number of beneficiary families at 7.5 million, or 90% of all households, on average for the 2017-2021 period. This estimate is broadly similar – in fact slightly higher – than official numbers, according to which the CLAPs currently reach some 7 million families (Primicia, 2021; Chávez, 2022). Some NGOs have published lower numbers which may reflect somewhat more stringent criteria for determining whether families are counted as participants.

Figure 18: Receipt of CLAP Packages by Frequency, 2017-2021



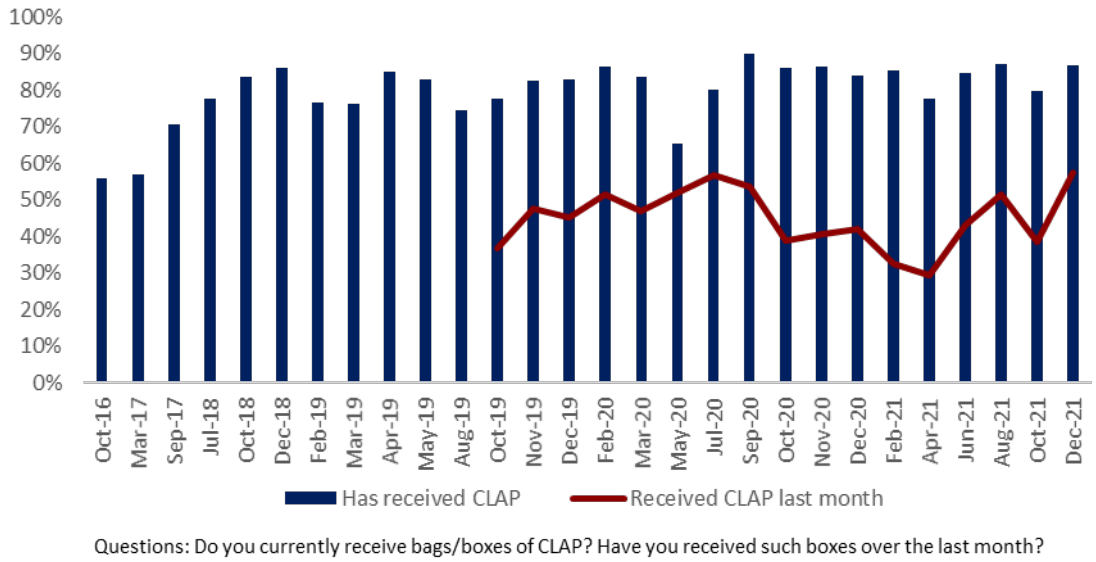
Source: ENCOVI.

Figure 18 shows the evolution of the frequency of receipt of CLAP packages among the families that claim to benefit from the program. Around half of the recipients receive the packages less than once every two months, and only a third receive them at least once a month. On average, this would imply that families receive 4.4 packages a year or one package every 2.7 months[14] Ninety-five percent of respondents claim to pay one dollar or less per package, with an average payment of $1.2. ENCOVI uses an estimate of $20 as the value of each package, implying an effective subsidy of 94%. Combining this information with the average frequencies reported above, we derive an estimate of $854 mn a year in CLAP subsidies. This estimate is

[14] Our estimate using midpoints of ENCOVI ranges.

equivalent to 16% of imports of all goods and 46% of imports of food in 2020. It is also equal to 8% of estimated 2021 central government spending. Note that this subsidy estimate does not count administrative expenditures or losses due to wastage, arbitrage, or corruption so that the actual cost of the program to the Venezuelan government could be much higher.

Figure 19: Received CLAP Packages in Past and Last Month, 2016-21.



Source: Datanálisis.

An additional source of data on the reach of the CLAP program comes from the periodic opinion surveys carried out by Datanálisis, a local firm with a long tradition in the measurement of Venezuelan public opinion (Figure 19). These aggregate numbers are consistent with the big picture shown by the ENCOVI data but also show some interesting differences. The number of respondents that claim to receive CLAP packages in the 2018-21 period averages 82.0% - as opposed to 91.1% in ENCOVI – while those that claim to have received packages during the last month average 46.5%, as opposed to 35.4% in ENCOVI.

3.3 Econometric Estimates

This section assesses whether the deterioration of Venezuela's nutrition and related health indicators can be accounted for based on the economy's contraction. To do this, I generate cross-national panel data estimates of the elasticity of nutrition and health indicators to economic performance, and compare them with the evolution of these indicators for Venezuela during the period of interest. One way to interpret these results is as separating policy-specific and idiosyncratic causes from the effect of the broader economic collapse.

I thus estimate the following equation:

$$x_{it} = \eta_i + \theta_t + \beta y_{it} \quad (1)$$

on the cross-national data, where x_{it} denotes the outcome variable of interest (e.g., undernourishment, mortality), y_{it} is per capita income at constant prices, η_i is a country-specific effect θ_t is a time-specific effect, and all variables expressed in natural logarithms. β can be interpreted as the income-elasticity of the health or nutrition indicator, telling us the magnitude of the proportionate change that we could expect to see in the outcome variable given a certain proportionate change in per capita income.[15] Data coverage varies according to indicator, ranging from 106 countries for undernourishment to 187 for infant mortality. Both infant and adult mortality are available for the 1960-2019 period, while the remaining indicators are available from 2000.

Note that this exercise is different from the more ambitious task of identifying the causal effect of changes in income on the outcome variables. Such identification would require disentangling the channels of causation through which income and health and nutrition indicators could affect each other and finding exogenous sources of variation in cross-national measures of income. The objective of this less ambitious task of describing whether Venezuela's performance in these indicators given its economic contraction was better or worse than what occurred in other countries that faced changes in per capita incomes.[16]

Table 4 shows the results. I find that a log-point increase in per capita incomes leads to a 0.77 log point decline in undernourishment rates, a 0.09 log point decrease in female anemia, a 0.22 log point decrease in stunting, a 0.08 log point increase in male mortality and a 0.29 log-point rise in infant mortality. All results are significant at conventional levels.

The lower panel of Table 4 compares the change over time in the outcome indicators with what we would expect to have seen based on these estimated elasticities. I find that two of the indicators (undernourishment and female anemia) see higher increases than those predicted by the model, while the remaining three indicators (stunting, male and infant mortality) see changes that are lower than predicted by the model. Two indicators (male and infant mortality) are inside the 95% confidence interval predicted by the model, while one (stunting) is below and two (undernourishment and anemia) are above the interval.

Of the variables that exceed the model prediction, one (anemia) is only marginally above the confidence interval (3.3 ppt, as opposed to an upper bound of 3.1 ppt). The one variable that seems widely out of range is undernourishment, where the 24.2 ppt rise in rates is substantially above the model prediction of 4.1 ppt or the upper bound of 6.1 ppt.

There are two important caveats about the undernourishment result. One of them is that the FAO estimate depends strongly on the imputed FAO estimates of the distribution of food consumption. Given the large increase in CLAP program coverage relative to its predecessors, it is likely that distribution has

[15] More formally, β is the change in log points of x_{it} for every log point increase in y_{it}.

[16] Although I control for time-specific effects, I do not include an estimate from these in the Venezuela counterfactual exercise. This is because the time-specific effects likely capture the effect of a global time trend in income which could also be affecting outcome indicators. In other words, a likely reason why indicators of health and nutrition across the world are improving is that world incomes are improving, and including them in the forecast would defeat the purpose of constructing a counterfactual to measure the expected evolution of these outcomes in an economy that is collapsing. I
.t is reasonable to assume that a country suffering a 72% collapse in per capita income would not have been in condition to benefit from global technological advances in health and nutrition amid the economic disruption caused by such a collapse.

evolved differently from what FAO assumes; if it became less unequal, recent FAO series would be biased upwards. The other one is that 2012 undernourishment rates may be underestimated as a result of overinvoicing of imports.[17] In fact, Venezuelan experts strongly disputed the FAO numbers in 2013 arguing that they relied on highly distorted government surveys (CENDES, 2014).

A way to partially address these concerns is by measuring changes over a longer time span with a start date that is less contaminated by relative price distortions. Using longer time spans broadens the period of inquiry beyond that of the recent collapse but may be able to better capture changes in variables that change slowly over time.

I provide this calculation in the last two rows of Table 2 and in Figure 8, which compare the change in the five indicators for the 2000-2019 period. All five indicators now show smaller increases than those predicted by the model, while in four of the five cases the increase falls below the lower bound of the 95% confidence interval. In other words, Venezuela's performance in nutrition and related health indicators is better than what would be expected given its decline in per capita incomes, with the difference being statistically significant in all but one case (undernourishment).

Table 4: Predicted and Observed Changes in Health and Nutrition Indicators

	Undernourishment (per 100)	Female anemia (per 100)	Stunting (per 100)	Male mortality (per 1000)	Infant mortality (per 1000)
Per capita GDP	-0.77***	-0.09***	-0.22***	-0.08**	-0.29***
	(0.14)	(0.02)	(0.06)	(0.04)	(0.05)
N	1955	3380	2720	8824	8734
R-squared	0.37	0.35	0.62	0.57	0.85
Venezuela changes					
Observed (2012-2019)	24.2	3.3	-1.9	6.9	6.1
Predicted (2012-2019)	4.1	2.1	3.3	17.8	5.4
	(2.2 6.6)	(1.2 3.1)	(1.4 5.4)	(0.3 36.7)	(3.4 7.6)
Observed (2000-2019)	12.5	-2.5	-6.8	-10.5	3.2
Predicted (2000-2019)	14.3	2.2	3.8	15.7	5.3
	(8.1 22.2)	(1.2 3.3)	(2.6 9.4)	(0.3 32.2)	(3.4 7.4)

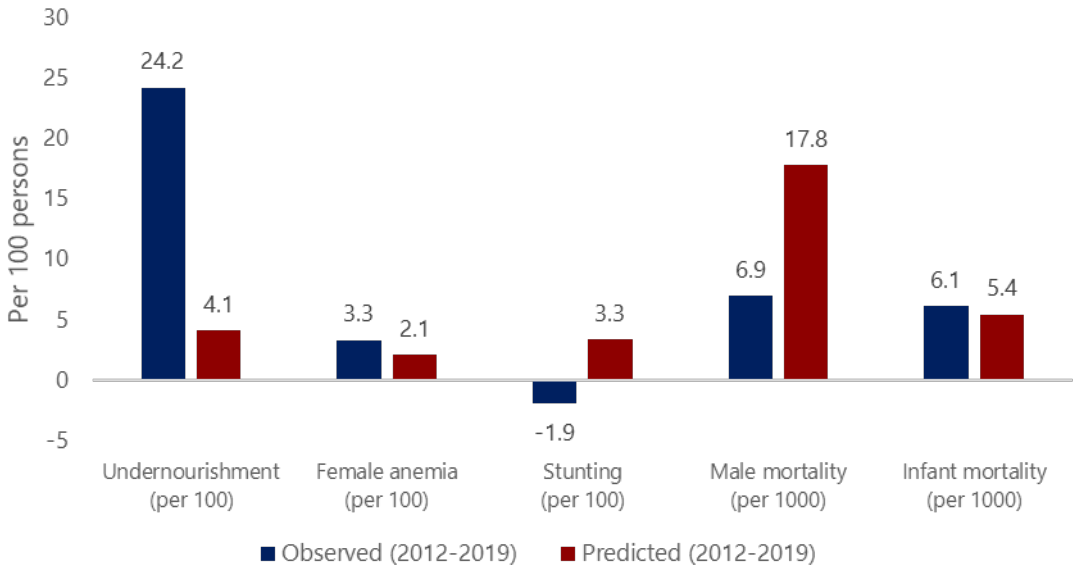
Sources: Project Maddisson, FAO, World Bank, own calculations.

In sum, the deterioration in Venezuelan nutrition and health indicators is in line with what would be expected given the magnitude of its collapse. In some indicators (undernourishment, anemia and infant mortality), the recent deterioration is worse than predicted by the collapse, yet in others it is better (stunting

[17] As shown in Table 2, residuals – i.e., changes in food stocks unaccounted for – peaked in 2012 at 4 million metric tons, or nearly half of the volume of all imports, suggesting serious measurement issues at the time.

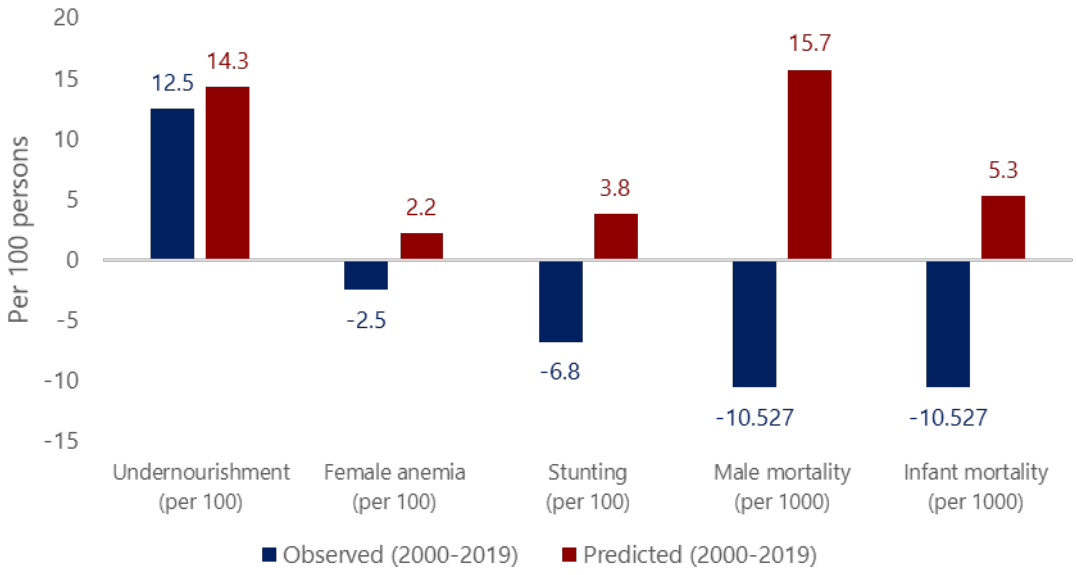
and male mortality). Yet if we broaden the picture to consider the 2000-2019 period, we find that Venezuela's changes in nutrition and health indicators are in all cases better than expected given its economic contraction, and in four of the five cases assessed the difference between the observed and expected change is statistically significant. One interpretation of this is that recent underperformance has not been enough to offset the overperformance observed during the pre-2012 period; another interpretation is that measurement of these trends at the country level is only meaningful along sufficiently long time spans.

Figure 20: Predicted and Observed Changes in Health and Nutrition, 2012-2019



Sources: Project Maddisson, FAO, World Bank, own calculations.

Figure 21: Predicted and Observed Changes in Health and Nutrition, 2000-2019



Sources: Project Maddisson, FAO, World Bank, own calculations.

4 Concluding Comments

This paper has provided evidence that Venezuela's deterioration in nutrition and related health indicators over the last decade was driven by its collapsing import capacity. Venezuela's 72% contraction in per capita incomes was set off by a massive decline in the country's export revenues. Lower exports, combined with the loss of access to international lending, brought about a huge import contraction that affected the country's capacity to pay for imports of food and intermediate inputs and capital goods for domestic food production. Although the share of essential goods in imports rose, the increase was insufficient to offset the effect of lower aggregate import capacity.

I have argued that the deterioration in nutrition and health indicators correlates almost perfectly with the reduction in import capacity. These indicators saw strong improvements in the 2000-2012 period of rising export revenues and deteriorated strongly as exports plummeted in the 2012-2020 period. We have also shown that the observed deterioration is in general of a similar magnitude to that which would be expected based on the cross-national data given the decline in the country's income. In fact, Venezuelan performance in all of the indicators that we evaluated is better than what the cross-national data predicts we would see for a country suffering an income collapse of the magnitude that it faced.

The evidence suggests that changes in Venezuelan food policies, and in particular an overhaul of its food subsidies carried out in 2016, could be behind this performance. These changes contributed to a stabilization of food imports after 2016 and an increase in the relative share of food in total imports. They

are also the most likely explanation for why survey-based food security measures do not show a deterioration in the post-2016 period, despite the continued overall decline in GDP and total imports. We estimate that the subsidy received by families through the CLAP system in 2021 had a value of $855 million, or almost 50 percent of the country's food imports. Venezuela's food crisis would almost certainly have been much worse in the absence of these policies, which have implied a major redirection of government resources.

These conclusions should in no way be used to ignore or sidestep the serious allegations of corruption and political manipulation of the CLAP program, both of which merit deep and rigorous empirical investigation. A redesign of the program that increases transparency and limits the state's ability to condition access for political reasons would do much to address these concerns and could significantly improve Venezuelans' current living conditions. Many proposals for recovering import capacity in the context of actual sanctions policies have centered on the idea of programs designed to be conditional on reforms that eliminate the political bias in access to benefits that characterizes current programs (Oil for Venezuela, 2019; Atlantic Council, 2022; Rodríguez, 2022c).

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