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Impact of cash transfer programs on birth and child growth outcomes: systematic review

Impacto dos programas de transferência de renda nos desfechos de nascimento e crescimento infantil: revisão sistemática

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Abstract *To investigate the impact of cash transfer (CTs) on birth outcomes, including birth weight, low birth weight and prematurity, as well as child physical growth were included, as assessed by anthropometric indices in children under five years of age. Searching was performed using the PubMed/Medline, Embase, LILACS, Cochrane Library, Scopus and Web of Science databases. Quantitative observational, experimental and quasi-experimental.* Eleven studies were included in the review. The majority (81.8%) were carried out in low-and middle-income countries and most involved conditional CTs (63.6%). Four were clinical trials and seven were observational studies. Conditional CTs were found to be associated with a reduction in height-for-age (-0.14; 95%CI -0.27, -0.02); (OR 0.85; 95%CI 0.77-0.94); (OR = 0.44; 95%CI 0.19-0.98), a significantly reduced chance of low weight-for-age (OR = 0.16; 95%CI -0.11-0.43), low weight-for-height (OR = -0.68; 95%CI -1.14, -0.21), and low weight-for-age (OR = 0.27; 95%CI 0.10; 0.71). Unconditional CTs were associated with reduced birth weight (RR = 0.71; 95%CI 0.63-0.81; p < 0.0001) and preterm births (RR = 0.76; 95%CI 0.69-0.84; p < 0.0001). *Conditional CTs can positively influence birth outcomes and child growth.*

Key words *Infant, Nutritional status, Public policy*

Resumo *Investigar o impacto dos programas de tranferência de renda (CTs) nos desfechos ao nascer, incluindo peso ao nascer, baixo peso ao nascer e prematuridade, e crescimento físico infantil, avaliado pelos índices antropométricos de crianças menores de cinco anos. Revisão sistemática realizada nas bases de dados PubMed/Medline, Embase, LILACS, Cochrane Library, Scopus e Web of Science. Foram incluídos estudos quantitativos observacionais, experimentais e quasi-experimentais, com um total de 11 estudos na revisão. A maioria (81,8%) foi realizada em países de baixa e média rendas. Também na modalidade CT condicionais (63,6%). Quatro eram ensaios clínicos, e sete observacionais. Os CT condicionais estiveram associados a uma redução nos índices de altura-para-idade (-0,14; IC95% -0,27, -0,02); (OR 0,85; IC95% 0,77-0,94); (OR = 0,44; IC95% 0,19-0,98), redução significativa na chance de baixo peso-para-idade (OR = 0,16; IC95% -0,11-0,43), baixo peso-para-altura (OR = -0,68; IC95% -1,14, -0,21), e redução de peso para idade (OR = 0,27; IC95% 0,10; 0,71). CTs não condicionais foram associados à redução do baixo peso as nascer (RR = 0,71; IC95% 0,63-0,81; p < 0,0001), e de prematuros (RR = 0,76; IC95% 0,69-0,84; p < 0,0001). Os CTs condicionais podem influenciar positivamente os desfechos ao nascer e o crescimento infantil.*

Palavras-chave *Infância, Estado nutricional, Políticas públicas*

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Introduction

An estimated 90-117 million children live in poverty worldwide[1], a condition which reduces a family's capability to provide children with the care and attention necessary to ensure adequate growth and development in the first five years of life. Poverty is considered a social determinant of health with multidimensional consequences[2,3]. Previous studies have highlighted relationships between poverty and increases in infectious and parasitic diseases, protein-calorie malnutrition and micronutrient deficiencies, as well as higher rates of hospitalization and death among children[3-5].

Social protection policies are important interventions to reduce poverty and protect nutritional status and health of children and newborns, especially considering the strength of relationships between poverty and negative nutritional outcomes, e.g., low birth weight, premature birth and delayed growth[3,6,7].

In this context, cash transfer programs (CT) have been implemented in several countries, especially those considered as low- or middle-income. A form of public policy aimed at reducing poverty and social inequality, cash transfers provide a source of monthly income to previously registered eligible beneficiaries. Among the main advantages of CTs are the improved well-being of families, income redistribution and the promotion of social inclusion[8,9].

Consequently, CTs have been linked to improvements in health indicators, such as increased access to health services[10], food[11], hygiene[12], community services and education for the most vulnerable families[13-15]. Some CTs have also positively impacted infant nutritional outcomes[4,16-18].

CTs can be classified according to the presence or absence of eligibility conditions. In unconditional income transfer programs (UCT), monetary transfer occurs with no action required from beneficiaries[19], while in conditional income transfer programs (CCT), monthly benefits are linked to the fulfillment of specific education and/or health stipulations[13,20].

To date, no systematic reviews have attempted to evaluate the effectiveness of these strategies on child health and nutrition in different economic contexts. Thus, in light of the relevance of providing consistent evidence on the impact of CTs on child health and nutrition, while also considering CT type (conditional/unconditional), here we endeavored to systematically analyze studies evaluating the effects of these programs on prematurity, low birth weight and other indicators of physical growth among children aged five years or less. Knowledge on these effects serves as a strategic tool for public policymakers to administer social programs aimed at ensuring the healthy development of babies from birth through infancy.

Methods

The present review was developed in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement[21], and has been registered with the International Prospective Register of Systematic Reviews (PROSPERO): CRD42021255570

Search strategy

Searching was performed on the PubMed/Medline, Embase, LILACS (Virtual Health Library), Cochrane Library, Scopus and Web of Science electronic databases. Additionally, grey literature was consulted by an expert on the topic of this review (Figure 1).

No language, geographic or publication date restrictions were applied. Results were obtained through July 2021 and update until November 8th, 2022. The keywords employed when performing searches were identified using Medical Subject Headings (MESH) vocabulary and adapted to each database using the Health Sciences Descriptors (DeCS) thesaurus and Embase Subject Headings (Emtree) (Chart 1).

Participants, exposure, comparisons and outcomes

To answer the guiding question: "What are the impacts of cash transfer programs on birth outcomes and physical growth in children aged under five years?", the acronym PICO (population/problem, intervention/exposure, comparison, outcome) was developed jointly with specialists in the field, as delineated in Chart 2. The exposure/intervention of interest was conditional and/or unconditional income transfer programs targeting socioeconomically vulnerable families or individuals. Children of families who were not beneficiaries of CTs were considered as controls.

The following outcomes were considered: The nutritional status of children under five years, as assessed by the anthropometric measures weight-

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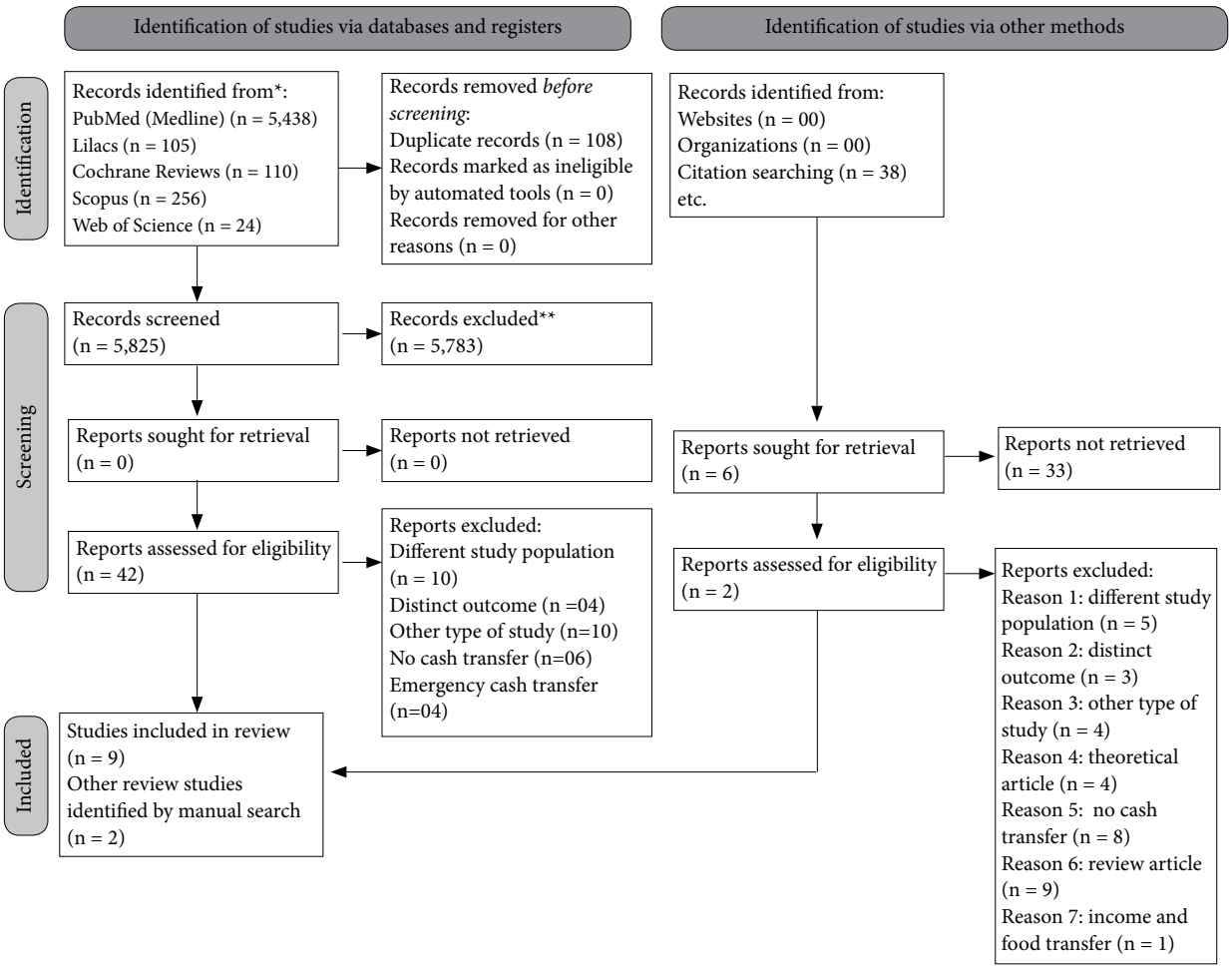

Figure 1. Flowchart detailing study search results and articles selected for systematic review.

Excluded reports: Reason 1: different study population (n = 5): studies involving children aged over five years; Reason 2: distinct outcome (n = 3): studies investigating other health and nutritional outcomes, e.g., breastfeeding, vaccination; Reason 3: other type of study (n = 4): Studies not experimental in design;
Reason 4: theoretical article (n = 4): studies lacking epidemiological approach; Reason 5: no cash transfer (n = 8): studies in which food or dietary supplements were offered; Reason 6: review article (n = 9); Reason 7: income and food transfer (n = 1): studies on programs offering cash as well as supplemental food; Reason 8: emergency cash transfer (n = 4).

Source: Page *et al.*, 2021[21].

for-height (W/H), weight-for-age (W/A), height-for-age (H/A) and body mass-for-age (BMI/A)[22]; birth weight and low birth weight (< 2,500 g); preterm birth, defined as birth occurring before the 37th week of pregnancy (< 259 days, or 36 weeks and 6 days)[23] (Chart 2).

Due to substantial heterogeneity among the obtained results, a narrative synthesis was adopted to present our findings (Charts 3 and 4).

Eligibility criteria

Quantitative observational and experimental studies, as well as quasi-experimental published articles, were included regardless of country income classification (low, middle or high income).

The present systematic review excluded qualitative research, books or chapters of narrative and scientific books, editorials, opinion articles, literature reviews (narrative, integrative, and systematic, with or without meta-analysis, scoping review/rapid review), studies in which food and/

Chart 1. Search strategy employed for PubMed (by Medline), EMBASE, Lilacs (by Virtual Health Library), Cochrane Library, Scopus and Web of Science (2021).

#1 "Infant" [Mesh Terms] OR "Infants" OR "Infant, Newborn" [Mesh Terms] OR "Infants, Newborn" OR "Newborn Infant" OR "Newborn Infants" OR "Newborns" OR "Newborn" OR "Neonate" OR "Neonates" OR "Child, Preschool" [Mesh Terms] OR "Preschool Child" OR "Children, Preschool" OR "Preschool Children" OR "Child" [Mesh Terms] OR "Children"
#2 "Public Policy" [Mesh Terms] OR "Policies, Public" OR "Policy, Public" OR "Public Policies" OR "Social Protection" OR "Protection, Social" OR "Population Policy" OR "Policies, Population" OR "Policy, Population" OR "Population Policies" OR "Social Policy" OR "Policies, Social" OR "Policy, Social" OR "Social Policies" OR "Government Programs" [Mesh Terms] OR "Government Program" OR "Program, Government" OR "Programs, Government" OR "Government Sponsored Programs" OR "Government Sponsored Program" OR "Government-Sponsored Programs" OR "Government-Sponsored Program" OR "Social Welfare" [Mesh Terms] OR "Welfare, Social" OR "Services, Community" OR "Community Service" OR "Service, Community" OR "Community Services" OR "cash transfer" OR "conditional cash transfer" OR "cash transfer program" OR "in-kind" OR "financial incentive" OR "safety nets" OR "economic policy"
#3 "Nutritional Status" [Mesh Terms] OR "Status, Nutritional" OR "Nutrition Status" OR "Status, Nutrition" OR "Anthropometry" [Mesh Terms] OR "Body Weights and Measures" [Mesh Terms] OR "Body Measures" OR "Body Measure" OR "Measure, Body" OR "Measures, Body" OR "Nutrition Assessment" [Mesh Terms] OR "Nutrition Indexes" OR "Indexes, Nutrition" OR "Nutrition Indices" OR "Nutritional Index" OR "Index, Nutritional" OR "Indices, Nutritional" OR "Nutritional Indices" OR "Nutrition Index" OR "Index, Nutrition" OR "Indices, Nutrition" OR "Premature Birth" [Mesh Terms] OR "Birth, Premature" OR "Births, Premature" OR "Premature Births" OR "Preterm Birth" OR "Birth, Preterm" OR "Births, Preterm" OR "Preterm Births" OR "Infant, Premature" [Mesh Terms] OR "Infants, Premature" OR "Premature Infant" OR "Preterm Infants" OR "Infant, Preterm" OR "Infants, Preterm" OR "Preterm Infant" OR "Premature Infants" OR "Neonatal Prematurity" OR "Prematurity, Neonatal" OR "Birth Weight" [Mesh Terms] OR "Birth Weights" OR "Weight, Birth" OR "Weights, Birth" OR "Growth" [Mesh Terms] OR "newborn weight"

Source: Authors.

Chart 2. Study inclusion criteria according to the PICO structure.

Components	Definitions
Population	Children under 5 years whose families were beneficiaries of conditional or unconditional cash transfer programs
Intervention	Conditional or unconditional cash transfers
Comparison	Children belonging to non-beneficiary families (i.e., those who did not receive conditional or unconditional cash transfers)
Outcomes	Child growth assessed by anthropometry [weight-for-height (W/H), weight-for-age (W/A), height-for-age (H/A), body mass index-for-age (BMI/A)] and birth outcomes (birth weight, low birth weight and preterm birth)

Source: Authors.

or nutritional supplements were offered, as well as those investigating food vouchers or emergency cash transfers.

Study selection and data extraction

All articles identified in the searched databases were entered into the Rayyan application[24] to assist in screening. Four reviewers determined eligibility through the analysis of titles and abstracts. Discrepancies between reviewers were resolved by discussion and in collaboration with a fifth reviewer. The reasons for exclusion of all full-text articles are detailed in Figure 1.

Full texts were reviewed using a standardized form to determine final inclusion in the present review. A data extraction template enabled the collection of information on first author, year of publication, manuscript title, study location, population (study size and description of groups), design, exposure variables (type of CT, monthly transfer value, presence/absence of con-

Chart 3. Characteristics of all studies included in the systematic review (2016-2022).

Author(s)/ year	Country	Study				Nutritional indicators
		Cash transfer program (type)	Intervention period	Design	Population	
Hamad R, Rehkopf DH, 2015[34]	USA	Earned income tax credit (EITC)	168 months	Retrospective cohort; quasi-experimental	Sample consisted of 2,985 women and 4,683 children. Exposures: term pregnancy (1,799) and birth weight (1,803); non-exposed group: term pregnancy (2,884) and birth weight (2,880)	Birth weight
Brownell M. et al., 2016[35]	Canada	(UCT)	84 months	Retrospective cohort; quasi-experimental	Sample consisted of 14,591 women: 10,738 were exposed and 3,853 were not exposed	Birth weight
Kandpal E et al., 2016[33]	Philippines	Healthy Baby Prenatal Benefit (HBPB)	3 months	Randomized clinical trial	Sample of 1,418 families randomly assigned to treatment (714 poor families) or control (704 poor families).	H/A W/A
Lopez-Arana S et al., 2016[32]	Colombia	(UCT)	48 months	Quasi-experimental	Sample consisted of 2,874 children under 7 years of age. The study was divided into 2 segments: 1st follow-up period: 2002 (N = 1,814 exposed; 2,283 controls) 2nd follow-up period: 2006 (N = 1,290 exposed; 1,584 controls)	H/A BMI/A
Labrecque J et al., 2018[26]	Brazil	Pantawid Pamilya (CCT)	16 months out of 24 months post-childbirth	Cohort	1,703 families eligible for cohort inclusion, divided into 3 groups according to household income level: 1- No Bolsa Família (N = 110) at 12 months and (N = 291) at 24 months 2- Low Bolsa Família (< 1,000 reais) (N = 110) at 12 months and (N = 291) at 24 months 3- High Bolsa Família (> 1,000 reais household) (N = 319) at 12 meses and (N = 355) at 24 meses	H/A W/A

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ditionalities, duration of transfers) and variable outcomes (anthropometric indices or measures, birthweight or gestational age).

Data from the selected articles were extracted and entered into MS Excel. In cases of incomplete or missing data, the authors of the selected studies were contacted by email and asked to provide the requested information, or offer other clarification regarding the metrics evaluated.

Evaluation of methodological quality

The methodological quality of the selected studies was assessed using the Quality Assessment Tool for the Dictionary of Quantitative Studies[25], which classifies study quality according to risk of bias ("Strong", "Moderate" or "Weak"). Two independent research authors assessed the risk of bias in each selected study. Disagreement was resolved by consensus or by consulting a third researcher (Table 1).

Chart 3. Characteristics of all studies included in the systematic review (2016-2022).

Author(s)/ year	Country	Study				Nutritional indicators
		Cash transfer program (type)	Intervention period	Design	Population	
Adubra L et al., 2019	Mali	Santé Nutritionnelle à Assise communautaire dans la région de Kayes (SNACK-CNA) (CCT)	Minimum 18 months; maximum 30 months	Controlled, randomized clinical trial	Sample consisted of 4,970 children for H/A assessment N = 1,202 in study group of interest.	H/A
Briaux J et al., 2020[9]	Togo	Cash Plus (UCT)	24 to 30 months	Controlled, randomized clinical trial	Study divided into 2 segments: Follow-up 1 (2014) Treated: 1,357 Controls: 1,301 Follow-up 2 (2016) Treated: 1,035 Controls: 996	H/A W/A
Sudfeld C et al., 2021[28]	Tanzania	CCT	18 months	Cluster-controlled, randomized clinical trial	Study divided into 3 groups for anthropometric assessments: Group 1- Only exposed to community actions (N = 185) Group 2- Exposed to community actions and cash transfers (N = 188) Group 3- Control (N = 174)	H/A W/A W/H
Chakrabarti S, Pan A, Singh P, 2021[29]	India	Mamata Scheme (CCT)	60 months	Retrospective cohort; quasi-experimental	Sample size: 200,000 mothers & children, divided as follows: Group CG1: all Indian states except Uttar Pradesh, Bihar, Jharkhand and Uttarakhand CG2: Odisha neighboring states (West Bengal, Chhattisgarh, Jharkhand and Andhra Pradesh) Odisha N = 11,558 CG1 N = 168,580 CG2 N = 35,702	H/A
González L, Trommlerová S., 2022[30]	Spain	Universal Benefit for Children (UCT)	16 weeks	Retrospective cohort; quasi-experimental	The sample was made up of 147.913 people: 57.998 poor people (40%) and 89.900 non-poor people (60%); 36.267 poor people (25%) and 111.631 poor people (75%).	Birth weight
Lucas A, 2022[31]	Brazil	Programa Bolsa Família (CCT)	48 months	Retrospective cohort	The sample was made up of children born between 2011 and 2015 (n = 5,246,874).	Birth weight

CCT: conditional cash transfer; UCT: unconditional cash transfer; H/A: height-for-age; W/A: weight-for-age; W/H: weight-for-height; BMI/A: body mass index-for-age.

Source: Authors.

Chart 4. Characteristics of cash transfer programs and child growth and birth outcomes of studies included in systematic review (2016-2022).

Cash transfer programs			
Author(s)/ year	**Objective(s)**	**Monthly value (US$)**	**Main results**
Observational studies			
Hamad R, Rehkopf DH, 201534	Reduce poverty for low-income families.	Amount received varied between US$ 500 and US$ 2,000.	Birthweight: EITC payments were not statistically significant regarding increased birth weight at family income level of $1,000 [β=65.1 (95%CI–0.46,130.6) p<0.05]. Family income did not affect perinatal health in association with EITC: Term pregnancy [β= 0.0056 (95%CI -0.013,0.024) p>0.05]; Birthweight [β= 18.0 (95%CI –17.8,53.8) p>0.05].
Brownell M et al., 201635	Improve prenatal health and birth outcomes.	HBPB provided prenatal income support (up to $63.91 per month) for low-income women during the second and third trimesters	Gestational age: HBPB was associated with a reduction in preterm birth [RR=0.76 (95%CI 0.69–0.84) p<0.0001] and small-for-gestational age [RR= 0.90 (95%CI 0.81–0.99) p=0.05], as well as increased large-for-gestational age [RR= 1.13 (95%CI 1.05-1.23) p=0.001]. Birthweight: The program was associated with reduced birth weight [RR=0.71 (95%CI 0.63–0.81) p<0.0001].
Labrecque J et al., 201826	Combat poverty through cash transfers to low-income and very low-income families.	US$ 2.68 to US$ 16.97 monthly, depending on family income level per capita and number of children.	Anthropometric outcomes: a difference of β= -0.14 [95%CI -0.27, -0.02] was identified in the H/A index among children aged up to 2 years with income < 1,000 reais, and β= -0.20 [95%CI -0.33, -0.88] among those with income > 1,000 reais. Regarding W/A, differences were β= -0.04 [95%CI -0.17-0.08] for the group with < 1,000 reais in income and β= -0.18 [95%CI -0.30, -0.05] for those with > 1,000 reais.
Chakrabarti S, Pan A, Singh P, 202129	Improve maternal and child health outcomes through the promotion of health care utilization.	Financial incentive of US$66.60 offered to women who met specified conditions regarding the use of maternal and childcare services.	Anthropometric outcomes: the chance of stunting in Odisha was lower following the implementation of Mamata compared to other Indian states. CG1: All Indian states except Uttar Pradesh, Bihar, Jharkhand and Uttarakhand [OR=0.89 (95%CI 0.81-0.98)] poor and [OR=1.17 (95%CI 1.04-1.32)] not poor. CG2: Odisha neighboring states (West Bengal, Chhattisgarh, Jharkhand and Andhra Pradesh) [OR=0.85 (95%CI 0.77-0.94)] poor and [OR=1.15 (95%CI 0.86-1.53)] not poor.
Lucas A, 202231	Assess the long-term benefits of cash transfers through intergenerational transmission of health and poverty, by assessing the relationship between program aid received by the mother during childhood and newborn health, controlling for a set of socioeconomic and health variables.	US$ 17 e US$34, limit of values 2020.	Birthweight: that children born in a household where the mother received program were less likely to have low birth weight [OR= 0.93 (CI95% 0.92-0.94)], very low birth weight [OR=0.87 (CI95% 0.84-0.89)], as well as to be born after 37 weeks of gestation [OR= 0.98 CI95% 0.97-0.99)] or 28 weeks of gestation [OR=0.93 CI95% 0.88-0.97)].
Intervention Studies			
Kandpal E et al., 201633	Eradicate extreme poverty in the Philippines, promote healthy practices, improve child nutrition and increase use of health services.	Maximum monthly cash transfer value: $27.80, targeting poor families with children aged between 0 to 14 years and/or pregnant women	Anthropometric outcomes: with each additional amount of income, increases in H/A [β= 0.284 (95%CI -0.034; 0.600) p=0.08] and W/A [β= 0.140 (95% CI -0.161; 0.438) p>0.05] were observed, yet without statistical significance. However, the program was associated with a significant reduction in severe short stature [β = -10,189 (95%CI -18,769; -1,607) p<0.05].

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Chart 4. Characteristics of cash transfer programs and child growth and birth outcomes of studies included in systematic review (2016-2022).

Cash transfer programs			
Author(s)/ year	**Objective(s)**	**Monthly value (US$)**	**Main results**
Observational studies			
Lopez-Arana S et al., 201632	Provide subsidies for investments in education, nutrition and health in poor areas.	US$ 32–US$ 38 for each child.	Anthropometric outcomes: FA was associated with a reduction in thinness [OR=0.21 (95%CI 0.05-0.82)] and increased BMI [β= 0.12; (95%CI -0.05-0.29) p <0.05], but also impacted H/A [β=0.00 (95%CI -0.09; 0.10)], short stature [OR= 1.0 (95%CI 0.82-1.23)], overweight [OR=1.39 (95%CI 0.86-2.25)] and obesity [OR=0.31 (95%CI 0.09-1.06)] among children aged 2 to 5 years.
Adubra L et al., 201927	Improve nutrition during the first 1000 days of life.	US$ 4.30 monthly	Anthropometric outcomes: no associations were observed among any of the treatment groups regarding W/A or delayed growth (SNACK + CASH: [β=0.03 (95%CI -0.15.0.2) p=0.75]. Similarly, compared to the SNACK group, changes in stunting prevalence over time were not statistically significant in the intervention groups (SNACK + MONEY: [OR=0.87 (95%CI 0.66-1.14) p=0.32]. Birthweight: no impact on birth weight [β= -180.1 (95%CI -559, 199)] or low birth weight [OR=1.58 (95%CI 0.29-8.50)].
Briaux J et al., 20209	Improve child nutrition and offer community activities (sensitization meetings and home visits targeting child health, nutrition and social protection, as well as integrated community case management of childhood illness and acute malnutrition targeting mother-child pairs during the "first 1,000 days".	Approximately US$ 8.40/month.	Anthropometric outcomes: the program exerted a protective effect on H/A among children aged 6-29 months [DiD= 0.25 (95%CI 0.01-0.50) p= 0.039]. H/A remained stable prior to intervention in 2014 compared to after intervention in 2016 [β=0.03 (95%CI -0.14-0.21) p=0.728]. Birthweight: Women receiving benefits were less likely to have children with low birth weight (<2,500g) [DiD= -11.8; 95%CI 0.10-0.82) p=0.020].
Sudfeld C et al., 202128	Increase access to and utilization of prenatal and child health services, including monitoring child growth, treating health conditions, and other interventions not provided by community health workers.	US$ 4.34 per prenatal care visit, or US$2.17 per routine visit to monitor child growth and health.	Anthropometric outcomes: no significant effects of CHW + CCT intervention on HAZ [β=1.16 (95%CI 0.59-1.93)]. Significant effects were found on short stature [β=0.44 (95%CI 0.19-0.98)], W/A [β=0.16 (95%CI -0.11 – 0.43)]; W/H [β=-0.68 (95%CI -1.14, -0.21)]. CHW + CCT reduced the risk of overweight [β= 0.27 (95%CI 0.10-0.71)].
González L, Trommlerová S, 202230	Assessing the impact of a wage transfer directed toward me on the outcomes of my children's birth.	Families received a fixed payment of US$ 2.623,45 for each child born or adopted	Birthweight and gestacional age: the women who received the benefit had a much lower chance of having low-weight children in the future, while their proclivity to have another child (or the time of birth) remained unchanged. The effect is generally fueled by disfavored families (poor women, unmarried women, and women with low education. The transfer of earnings resulted in a drop of 0.9% and 0.7% in the category of children born with less than 2.000 and 1.500 g in low-income households over the next five years, representing a reduction of 49% and 83%, respectively. The effect on birth weight is pushed by premature babies, but there is no effect on the fracture of premature children.

CCT: conditional cash transfer program; UCT: UNCONDITIONAL CASH TRANSFER program; H/A: height-for-age; W/A: weight-for-age; W/H: weight-for-height; BMI/A: body mass index-for-age; OR: odds ratio; RR: relative risk; DiD: difference-in-differences; SNACK-CNA: Santé nutritionnelle à assise communautaire dans la région de Kayes; CHW: Integrated Community Health Worker Intervention; US$: US dollars; *monthly values converted to US$ on November 15, 2021 and December, 2022.

Source: Authors.

Table 1. Quality assessment of studies included in the present systematic review, in accordance with the Quality Assessment Tool for Quantitative Studies (2021-2022).

Number	Author(s)/ year	Selection Bias	Study design	Confounders	Blinding	Data collection methods	Withdrawals and drop-outs	Global study rating*
1	Kandpal E et al., 2016[33]	1	1	1	3	3	1	3
2	Lopez-Arana S et al., 2016[32]	1	1	3	3	1	1	3
3	Brownell M et al., 2016[35]	1	2	3	1	1	1	3
4	Labrecque J et al., 2018[26]	1	2	3	1	1	1	2
5	Adubra L et al., 2019[27]	1	1	3	1	1	2	2
6	Hamada R, Rehkopf DH, 2015[34]	1	2	3	3	1	3	3
7	Briaux J et al., 2020[9]	1	1	1	1	1	1	1
8	Sudfeld C et al., 2021[28]	1	1	1	1	1	1	1
9	Chakrabarti S, Pan A, Singh P, 2021[29]	1	2	2	1	1	1	1
10	González L, Trommlerová S. 2022[30]	1	1	3	1	1	2	2
11	Lucas A, 2022[31]	3	2	3	1	1	1	3

* Global classification of study quality: 1 (strong), 2 (moderate) or 3 (weak).

Source: Authors.

Patient and public involvement

No patient involved.

Results

Searching performed in the literature returned 5,933 published studies. Of these, after removing duplicates, 5,825 articles were selected for title and abstract examination. In all, 42 studies were selected for textual analysis, with seven deemed eligible for inclusion. Additional manual searching involving the reading of other review articles produced two additional studies, resulting in a total of nine included studies (Figure 1). The search was updated on November 8, 2022 in all databases. 615 new titles and abstracts were cheked. Of these, 3 texts were fully evaluated and there 2 studies met the inclusion criteria.

Study characteristics

Chart 3 lists the characteristics of all studies included in the present systematic review. Most articles (63.6%) were published within the past five years[9,26-31], conducted primarily in low- and middle-income countries (Colombia, Brazil, India, Spain and the Philippines)[26,29,30,32,33], notably countries in Africa (Mali, Togo and Tanzania)[9,27,28], with just two originating from high-income countries (United States and Canada)[34,35].

With regard to study design classification, four were randomized clinical trials (RCT) [9,27,28,33], while seven were observational; six involved cohorts[26-33] and one was quasi-experimental in design[32] (Chart 3).

Ten different social protection programs[9,26-30,32-35] were evaluated, the majority (n = 7; 63.6%) being CCTs[26-30,32,33]. Of these, six investigated cash transfers[26,29,30-33]. Another analyzed a

benefit paid exclusively in cash, which also provided food and preventive care activities to beneficiaries[27]; finally, another paid a benefit exclusively in cash kind, and also involved integrated intervention by community health workers[28].

With respect to UCTs (n = 4; 36.3%)[9,33-35], while all three evaluated programs implemented direct cash transfers[9,33-35], one also provided health-related services[9] involving awareness activities and home visits targeting child health and nutrition, as well as community surveillance of childhood illness and acute malnutrition of mother-child pairs during each newborn's first 1,000 days of life.

Sample sizes ranged from 188[28] to 11,558[29] children under five years in seven studies focused on child development. As for four studies[30,31,35,34] investigating gestational age and birth weight, one[30] had a sample size of 55,998, the study[31] had 5,246,874 births; the study[35] had 14,591 births; and the study[34] had 19,274 births (Chart 3).

Analytic strategies

The included studies employed diverse methods of analysis. Seven studies (63.6%) used linear regression and logistic regression models[9,26-28,31,32,34], while three (27.2%) utilized Difference-in-Differences (DiD) estimation[9,29,32] and one (9.0%) adopted a propensity score matching (PSM) technique[26] and one adopted regression discontinuity design (RDD).

Methodological quality assessment

Both high (n = 3; 27.2%) and low (n = 4; 36,3%) methodological quality were identified in the evaluated studies, which were also categorized according to the following criteria: selection bias, study design, confounders, blinding, data collection method, and withdrawals and drop-outs (Chart 4).

Main results

Of the eleven included articles, seven analyzed CTs in low- and middle-income countries and evaluated child growth via anthropometry[9,26-29,32,33]. All of these studies reported H/A ratio; W/H were reported in three[26,28,33], while BMI/A[32] and W/A (Sudfeld C. et al. 2021)[28] were evaluated in one each (Figure 2 and 3).

Three studies[33-35], both investigating UCTs in high-income countries, investigated the effects of social protection programs on birth weight; two of these also considered prematurity[33,35].

A 16-month intervention cohort study conducted in Brazil on the CCT program denominated *Bolsa Família*[26] identified differences of β = -0.14 [95%CI -0.27, -0.02] in H/A ratio among children up to two years of age whose mothers received monthly payments less than R$1,000 (1,000 Brazilian reais = US$ 184.86 in July 2022), and β = -0.20 [95%CI -0.33, -0.88] among children whose mothers received more than R$1,000, when compared to non-beneficiaries. Regarding W/A, the respective differences reported were β = -0.04 [95%CI -0.17-0.08] in association with receiving less than R$1,000 and β = -0.18 [95%CI -0.30, -0.05] for more than R$1,000. Although the authors also assessed gestational age and birth weight, these estimates were not reported[26].

Another study in Brazil, conducted by the Center for Data and Knowledge Integration for Health, assessed the benefit of intergenerational transmission of health and poverty, as well as the relationship between PBF received by the mother and health and the health of the newborn. The authors present their findings that children born in a household where the mother received BF were less likely to have low birth weight (OR 0.93, CI; 0.92-0.94), very low birth weight (0.87, CI; 0.84-0.89), as well as to be born after 37 weeks of gestation (OR 0.98, CI; 0.97-0.99) or 28 weeks of gestation (OR 0.93, CI; 0.88-0.97)[31].

A cohort study carried out in India over an intervention period of 60 months evaluated the odds of stunting, as assessed by H/A among poor children under five years of age. The authors reported a reduction [from OR 0.89 (95%CI 0.81-0.98) to OR 0.85 (95%CI 0.77-0.94)] following the implementation of the Mamata CCT program across all Indian States (except Uttar Pradesh, Bihar, Jharkhand and Uttarakhand), as well as in the neighboring states of Odisha (West Bengal, Chhattisgarh, Jharkhand and Andhra Pradesh).

Among the four RCTs evaluated, one carried out in Togo (intervention time of 24-30 months) observed that the UCT Cash Plus program exerted a protective effect on H/A among children aged 6-29 months (DiD = 0.25; 95%CI 0.01-0.50; p = 0.039). This same study reported that female beneficiaries were also less likely to have children with low birth weight (< 2,500g) (DiD = -11.8; ROR = 0.29; 95%CI 0.10-0.82; p = 0.020). Similar results were reported by a study by Brownell M et al.[35], carried out in Canada, in which an 84-month interventional UCT program was associated with reductions in LBW (RR = 0.71;

95%CI 0.63-0.81; p < 0.0001) and premature births (RR = 0.76; 95%CI 0.69-0.84; p < 0.0001).

Research carried out in Tanzania[28] evaluated associations between a CCT program and H/A, W/A, W/H and BMI/A indicators, as well as overweight and LBW. After adjusting for sociodemographic variables (area of residence, income, maternal education, basic sanitation, child age), significant reductions in the odds of stunting (H/A) (OR = 0.44; 95%CI 0.19-0.98), low W/A (OR = 0.16; 95%CI -0.11-0.43), LBW (OR = 0.14; 95%CI 0.04-0.55), low W/H (OR = -0.68;

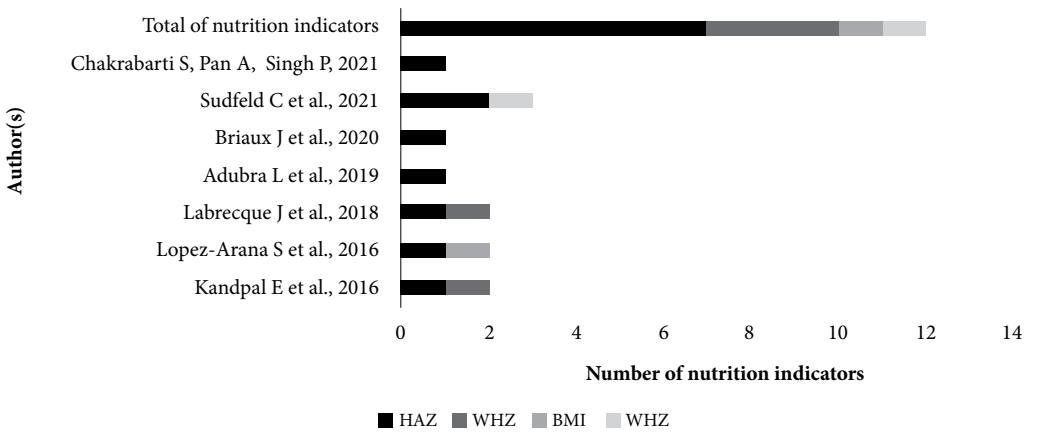

Figure 2. Number of nutritional indicators extracted from studies, 2016-2021.

Source: Authors.

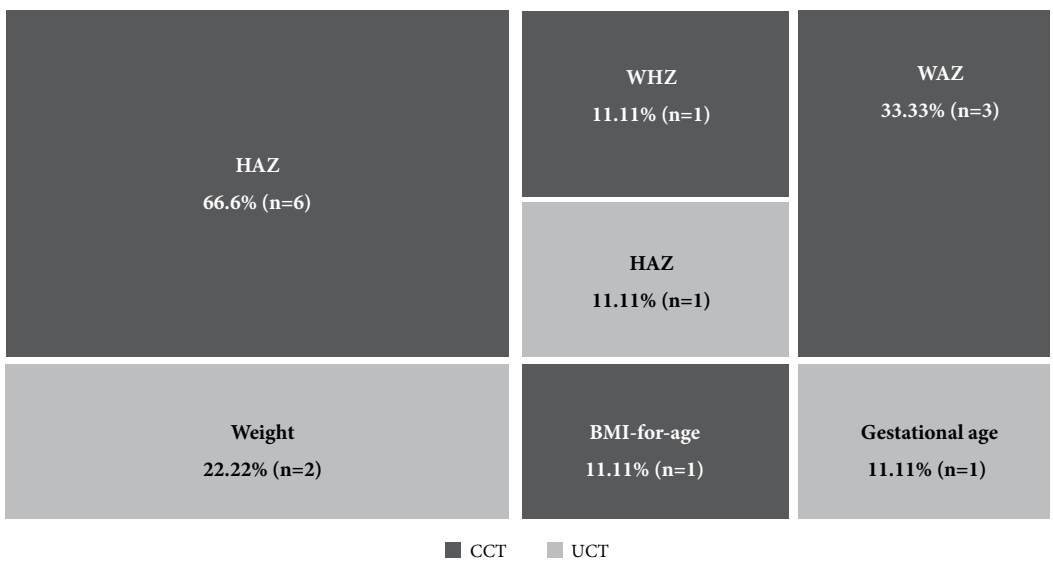

Figure 3. Results of growth and birth outcomes extracted from studies according to the type of cash transfer program, 2016-2021.

Source: Authors.

95%CI -1.14, -0.21) and overweight (OR = 0.27; 95%CI 0.10; 0.71) were identified among beneficiary children.

In a study carried out in Colombia[32] among children aged two to five years, the CCT program *Familias en Acción* was associated with reduced stunting (H/A) (OR = 0.21; 95%CI 0.05-0.82) and increased BMI/A (β = 0.12; 95%CI -0.05-0.29; p < 0.05); however, no associations were observed with respect to short stature (OR = 1.0; 95%CI 0.82-1.23), overweight (OR = 1.39; 95%CI 0.86-2.25) or obesity (OR = 0.31; 95%CI 0.09-1.06).

Discussion

The present systematic review synthesized the available evidence investigating the effects of CTs on child health outcomes in high-, low-, and middle-income countries. Our findings indicate that cash transfers are associated with reduced prematurity, low birth weight and improved nutritional status, as assessed by anthropometric indicators (W/A, H/A, W/H and BMI/A). The influence of CTs on the outcomes studied was mainly derived from CCTs whose effects were more pronounced among low- and middle-income countries.

Despite differences in scope, other reviews have also described positive effects on child health and nutrition outcomes resulting from CTs. Indeed, a recent review carried out by Anne E. Fuller et al.[36] reported better child health outcomes in families with children in Canada that received a CT.

Four studies evaluating birth outcomes (preterm birth, birth weight and hospital admissions during the neonatal period) provide evidence of the protective effects of UCTs on these outcomes[35]; however, none evaluated the impact of CT on child growth.

A recent meta-analysis estimating the effect of CTs on diverse nutritional outcomes, as well as the proximal determinants of those outcomes, including diet quality and infant morbidity, concluded that after systematizing the results of 74 articles CTs were positively associated with higher H/A z-scores (HAZ) (p < 0.03) and a 2.1% reduction in stunting (p < 0.01). However, a similar effect was not observed for W/H (WHZ) (p < 0.42) and low weight z-scores (p < 0.07)[37]. The authors argued that the relatively short durations of the studies analyzed may not have been sufficient to evidence relevant changes in growth. When analyzed by region, significant impacts of CTs on W/A z-scores (WAZ) were only identified in Sub-Saharan Africa[37], which is similar to the results of another study by Sudfeld C et al.[28]

Two systematic reviews[37,38] suggest that UCTs positively impact child weight. The present review found that most studies examining the influence of CTs on child health demonstrated positive associations with birth weight, including a study by Briaux J et al.[9], an RCT that combined monthly cash transfers with community activities targeting 1,035 mother-infant pairs during the first 1,000 days of life. These authors observed that female beneficiaries were less likely to have children with low birth weight (DiD = -11.8; ROR = 0.29; 95%CI 0.10-0.82; p = 0.02). However, Hamada R and Rehkopf D.H. 34 also evaluated UCTs and found no significant associations between cash transfers and birth weight (β = 18.0; 95%CI -17,8,53,8; p > 0.05). Nonetheless, the UCTs evaluated did appear to be positively associated with reductions in childhood illness, improved child weight and food consumption[37].

With regard to assessment of the impact of CCTs on child nutritional outcomes in Latin America, such as linear growth, delayed child growth, and improvements in child health and nutritional status[39], these programs were found to alleviate both poverty and food insecurity, in addition to bolstering school attendance and enhancing access to health services for beneficiaries[33,40,41].

Among the recipients of CCTs in African countries, discordant results were reported[27,28], as no significant effects on H/A were observed; however, the data did evidence positive effects on short stature, W/A, W/H and low weight.

A study by Kandpal E et al.[33] found a significant reduction in severe short stature in 6-36-month-old beneficiaries of the Philippine CT entitled *Pantawid Pamilyang*. Moreover, a study by Chakrabarti, Pan and Singh[29] identified a lower chance of stunting among children under five following the implementation of the Mamata Scheme in India. However, it is important to note that the nutritional findings reported in metanalyses and systematic reviews are not considered decisive, as no definitive evidence has been presented to conclusively document these effects[42,43].

The impacts of CCTs on improved child health have been attributed to interventions related to health, nutrition and education. This has contributed to the success of these programs over time by enhancing beneficiaries' knowledge of important childcare practices and reinforcing the idea that, in the context of greater vulnerability,

the provision of social benefits aims to contribute to improvements in child nutritional indicators[12,28,41].

We additionally highlight that, despite potential improvements in populational health through the targeting of poor and vulnerable groups, the observed impacts of CCTs on child growth are not conclusive. Thus, it will be necessary to conduct studies examining the mechanisms underlying CCTs, especially in West Africa, where definitive evidence of program impact is lacking; moreover, the success seen in Latin America may not be replicable due to specific differences in CCT characteristics that may influence the effects of the studied results[9,27,28,35].

According to studies, it is not possible to separate the reasons for which the CCTS is associated with better infant health outcomes. Suggestions are made that it is likely that women from families who receive benefits have received more appropriate prenatal care, which is linked to better outcomes[31,35].

Regarding programs without conditionalities, three of the included studies[9,34,35] found UCTs to be associated with reduced low birth weight. Importantly, only one RCT by Briaux et al.[9] demonstrated a protective effect on H/A.

The present findings globally reinforce the impact of CT programs and suggest that attempting to mitigate short stature by means of a single interventional approach may prove difficult in at-risk communities that face a variety of contextual factors[9]. The positive results observed in H/A[9] in the Togo study may be explained by the fact that the CT evaluated stunting and other forms of malnutrition in the mother-child binomial during the first 1,000 days of life, which likely maximized impact[16,44].

The present review evidenced that child beneficiaries of the Columbian CT *Familias en Acción* presented increased BMI and a reduced the chance of being underweight; however, no impacts were observed on H/A, short stature, overweight or obesity among children aged two to five years[32]. In families benefiting from the *Bolsa Família* program in Brazil, this CT was negatively associated with H/A and W/A during the 24-month period studied[26].

The authors argue that their findings can be explained by low participation in *Bolsa Família,* and probable errors in measurement of family income. Moreover, they maintain that, despite the lack of a direct association, the prevalence of short stature has progressively decreased in Brazil, particularly among poor families[26]. Another explanation may be that the relatively short duration of some studies may not have been sufficient to detect changes in linear growth, thus making it difficult to interpret the obtained results[9,37,39].

Factors related to poverty, such as economic crises, austerity policies, food and nutrition insecurity and cutbacks in social protection programs, directly affect the health of children under five and impact infant mortality rates. A study carried out in Brazil found that the municipal level coverage of *Bolsa Família* was associated with significantly decreased mortality due to malnutrition (RR = 0.35; 95%CI 0.24-0.50)[5,10].

A strength of the present study was the adoption of a broad search strategy entailing the identification of published studies, reports employing robust methodologies and the absence of any language restrictions. In contrast to the focus of previous systematic reviews, the present work aimed to review the available evidence on the impact of CTs on child health outcomes, including anthropometry and prematurity.

Concomitantly, data in recent studies points to increasing rates of infant mortality in high-income countries[45-47]. The authors further speculate that this unusual finding is likely to be generalizable to other high-income nations in Western Europe and the US where associations between income and infant mortality have been evidenced[46,47].

A study performed in England reported increased infant mortality mainly among socioeconomically disadvantaged children[47]. Academics have postulated that these increases may be due to recent cuts in health services and reductions in social benefits available to families[48,49].

The present systematic review suffers from some limitations. First, a high degree of heterogeneity in eligible populations was observed, mainly in relation to the age of the children studied. Second, the CTs evaluated are highly variable in terms of design and duration, time of implementation and target population, which explains the inconsistencies in the estimated results, thus preventing the performance of a meta-analysis. Lastly, we excluded any studies that did not present results separately from those evaluating the effects of other social programs offering income, food and/or nutritional supplementation.

The results of the present systematic review indicate that cash transfer programs exert a positive effect on child growth as assessed by anthropometry and birth outcomes, thus affirming the use of CTs as a valuable social policy instrument for the promotion of child health. However, due

to the small number of included studies herein, the body of evidence on this topic should be considered limited.

Accordingly, further study is needed to obtain additional clarification/confirmation and to allow for comparisons that would enable meta-analysis among studies. It would be interesting to elucidate, for example, whether specific positive findings identified among populations were linked to the effect of direct cash transfers, or whether these improvements resulted from the use of health services and/or by offering food and nutritional supplementation provided by other social programs.

The development of research aimed at analyzing and enhancing our understanding of nutritional dilemmas and the role of social policy interventions is important to protecting maternal and child nutrition and enhancing quality of life for future generations. It is therefore essential for forthcoming investigations to not only fully characterize the populations studied, but also to account for socioeconomic and demographic differences, as well as consider social determinants of health.

We must assume that these factors can impart differences in the magnitude and severity of nutritional status during childhood, and that the findings reported in the studies included herein are relevant, thereby affirming the notion that carrying out impact assessments on the effects of CTs on nutritional outcomes among more vulnerable populations continues to be necessary, further reinforcing the need for additional evidence on the role of social protections to mitigate short- and long-term consequences of malnutrition.

Collaborations

CS Lisboa, NS Guimarães, AJF Ferreira, FJO Alves, AS Rocha, N Ortelan, CSS Teixeira, IR Falcão, NJ Silva, RC Ribeiro-Silva, DB Santos and ML Barreto conceptualized and designed the study, drafted the initial manuscript, carried out the analysis plan, and reviewed and revised the manuscript. CS Lisboa, NS Guimarães, AJF Ferreira, KBB Silva, AS Rocha, N Ortelan, CSS Teixeira, NJ Silva, RC Ribeiro-Silva, DB Santos and ML Barreto conceptualized and designed the study and critically reviewed the intellectual content of the manuscript. All authors approved the final submitted version of this manuscript and accept accountability for all aspects of the work.

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