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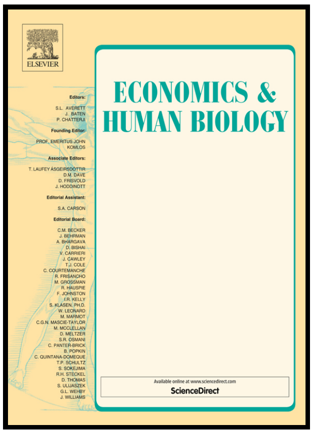

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Abstract

Women's decision-making is a phenomenon in children's nutritional outcomes. This study investigated the causal effect of women's decision-making on child nutritional outcomes using a panel dataset from the South African National Income Dynamic Survey (NIDS) from 2014/15 to 2017. The child's nutritional outcomes comprised three anthropometric measurements, which included weight-for-height, weight-for-age, and height-for-age. The study used variables, which include daily expenditure, large purchases, where children attended school, who lived with the family, and where the household lived, to create a decision-making index using Multiple Correspondence Analysis (MCA). A control function approach (CFA) was used to control for endogeneity issues. Using this approach, the findings suggested that women's decision-making had a significant positive effect on the child's nutritional outcomes. . While women's decision-making improves a child's weight-for-age and weight-for-height, the result was inconclusive on the child's height-for-age. The policy implications of these findings indicate that the role of women's empowerment is important and could significantly help in achieving better child nutritional outcomes. Overall, the findings suggest the evaluation of policies that ameliorate gender inequality and children's health and well-being.

Keywords: Women's Decision-making, Child Nutritional Outcomes, Control Function Approach

1. Introduction

Child malnutrition can be referred to as the effect of not being fed a balanced diet during early childhood, which could result in adverse health outcomes (Smith and Haddad, 2000; Ge and Chang, 2001). Approximately half of the world's children are at risk of malnutrition, and scholars have revealed that child malnutrition remains a challenge in sub-Saharan African countries (Lartey, 2008; Fanzo, 2012; Adedokun and Yaya, 2021). The existing literature suggests that many African countries are experiencing an increase in the prevalence of childhood stunting and wasting (Adedokun and Yaya, 2021), even though they are still contending with the persistence of child malnutrition. In other words, many children under the age of five are susceptible to numerous risks, including malnutrition, poor health, and unhealthy environments that are detrimental to their intellectual, physical, and expressive growth in developing countries (Grantham-McGregor et al., 2007). The existing literature on children's health issues has reported that South Africa is one of the nations affected by the high burden of child malnutrition (Doherty et al., 2006; Madiba et al., 2019).

Madiba et al.'s (2019) study revealed that child birthweight, age, gender, and preschool attendance might contribute to undernutrition such as stunting and underweight. In addition, the study suggested that a mother's education might reduce the child's underweight, in the case of the Tshwane district in South Africa. Existing studies have revealed that the prevalence of children's undernutrition is 29.1% for stunting, 13.7% for underweight, and 6.3% for wasting in low and middle-income countries (Ssentongo et al., 2021; Amadu et al., 2021). According to the 2016 South Africa Demographic Health Survey (SADHS), 15.7% of children under five years were underweight, 13% were overweight, and 27.4% were stunted (NDoH, Stats SA, SAMRC, and ICF, 2019). Hence, the current study focuses on the three anthropometric measurements: weight-for-height, weight-for-age, and height-for-age. While certain initiatives such as the Roadmap for Nutrition, Scaling Up Nutrition, Early Childhood Development Policy, and the 2030 National Development Programme (NDP) have focused on reducing child malnutrition in South Africa (National Development Commission [NPC] 2013), children's malnutrition still remains a challenge.

This may be due to societal challenges that the parents are facing, such as unemployment, poor health, a lack of income, and a lack of education (De Onis et al., 1993; Black et al., 2003; Gordon et al., 2003), and, reflecting on gender, a lack of women's decision-making. Existing studies have revealed that some South Africans live in poverty (Francis and Webster, 2019), inequality, and unemployment (Van der Berg, 2014). Thoughtfully, the living conditions of the mother or caregiver, whether poor or rich, may affect the nutritional outcome of the child under her care. Poverty and inequality may influence child nutrition (Sahn and Younger, 2005; Taghizade Moghaddam et al., 2015 Despite the importance of child nutrition in health policymaking (Zere and McIntyre, 2003), there has been a scarcity of empirical evidence on the effect of women's decision-making on child nutritional outcomes in South Africa. Women's decision-making refers to the ability of women to make decisions relative to their partner in the household (Anderson and Eswaran, 2009). Evidence in the literature shows that women's decision-making can be identified using different variables as proxies. Some studies have associated women's decision-making with empowerment[1]. Other scholars have argued that women's property rights (Allendorf, 2007), access to credit (Kabeer, 2005; Pahl, 2008), status (Smith et al., 2003; Urke et al., 2011), and decision-making ability (Chakraborty and De, 2011;

[1] For a further discussion on women's empowerment and the prevalence of stunted and underweight children in the case of rural India, Imai et al. (2014).

Lépine and Strobl, 2013) are forms of empowerment. This current study used various decision-making variables such as day-to-day household expenditure, the decision on large-unusual purchases, where the child goes to school, who is allowed to live, and where the household should live. These variables are available in the NIDS dataset. In the current study, the mechanism through which women's decision-making influences child nutritional outcomes is the decision about income constraints (Shafiq et al. 2019) and finances (Alaofè et al. 2017) for food consumption.

Shafiq et al. (2019) suggested that the involvement of women in income-generating activities is likely to enhance finance-related decision-making. Income may influence women's ability to make financial decisions. The study hypothesised that the ability to decide on both daily income and non-income-related activities is likely to influence a child's nutrition. Further, it is commonly found that women are given few decision-making opportunities in the household because of African cultural beliefs regarding patriarchy. The consequences of patriarchy may result in an asymmetric power relationship between adult males and females in South Africa. The asymmetric power relationship could also be due to unequal earnings between men and women (Casale, 2004; Posel and Rogan, 2009). For example, because women earn less than men, they are likely to have less decision-making, giving men room to dominate household decision-making. Studies have shown that income is a critical factor in women's empowerment (Batool and Batool, 2018; Barnett et al., 2021).

Aside from labour income and non-labour income, cash-transfer programmes (such as child support grants) could influence children's nutrition (de Groot et al., 2017) and human capital investment (Duflo, 2003; Aguero et al., 2006). It is noted in a strand of the literature that the income transfer (old-age pension) received by a grandmother has a positive influence on the children's nutrition (wasting and stunting), especially on the granddaughters, but with little effect on the grandsons (Duflo, 2003). Existing studies have revealed that women's decision-making is important for child nutrition (Brunson et al., 2009; Dancer and Rammohan, 2009; Chakraborty and De, 2011; Lépine and Strobl, 2013; Arulampalam et al., 2016). Studies have found a positive association between women's empowerment and child nutritional outcomes (Chisadza et al., 2020; Yaya et al., 2020). Rahman et al. (2015) noted in the literature that women's decision-making tends to reduce childhood stunting in Bangladesh. According to a recent study, a mother's ability to make her own decisions or be in control of her income is likely to reduce children's malnutrition (Kamiya et al., 2018). Unfortunately, there is a paucity of studies on a related topic in the South African context.

This study contributes to the existing literature in some ways. At the same time, previous studies have used various economic-related measurements of women's empowerment. This current study created an index of women's decision-making using a restructuring tool called multiple correspondence analysis (MCA). More so, the study answers the question of the causal effect of women's decision-making on child nutritional outcomes. A causal effect of unobserved characteristics can be identified using the control function approach (CFA) and controlling for endogeneity. The study controlled for differences across the waves, women's characteristics, inflation in household income, and clustering issues using standard cluster-robust error. The study show that women's decision-making has an influence on child nutritional outcomes. The remainder of the study is structured as follows: Section 2 is the overview of the literature; Section 3 comprises the data, summary statistics and econometrics strategy; Section 4 presents the empirical results; and finally, Section 5 discusses and concludes the study.

2. Overview of the literature

It is essential to note that one can explain the empirical literature on women's decision-making in an intra-household context within the bargaining model (Becker, 1964). The study concisely reviews relevant empirical studies to present the importance of women's decision-making in improving children's nutritional outcomes (Lepine and Strobl, 2013; Carlson et al., 2015). The current study is more empirical than theoretical. Therefore, empirical studies on the effect of women's decision-making on child nutrition are reviewed. An existing study has employed logistic regression to examine the association between maternal autonomy and child stunting (Shroff et al., 2009). The study suggested that maternal autonomy allows her to visit the market anytime she wants and has chances to interact and exchange information with other people. Invariably, she is likely to have access to information that could benefit the child's wellbeing. When women's autonomy to visit the marketplace is reduced, the opportunity to interact with others aside from immediate family members is denied, and this may reduce access to vital information that could enhance children's development.

Also, a study in India attempted to answer whether women's decision-making promoted better child nutrition (Arulampalam et al., 2016). The authors adopted a logit model and found that women with greater autonomy could contribute to the child's height-for-age within the first two years. Family characteristics are an essential determinant of maternal autonomy. The study found that women with greater autonomy experienced delayed marriages and pregnancies and had fewer children, with the children's births well-spaced. These contribute to better nutritional outcomes for children. In addition, Dancer and Rammohan (2009) argued that maternal autonomy is inadequate for improving child nutrition. Instead, they found that household wealth positively influenced child nutrition in rural Nepal. Furthermore, maternal autonomy produced a different result based on a child's gender. Using the ordinary least squares (OLS) method, women's autonomy in their daily household purchases improved the child weight-for-age for boys but showed no effect on girls. Another study examined the impact of women's autonomy on child nutrition (Brunson et al., 2009).

The study revealed that women's autonomy did not affect child nutrition for children under three years old. The reason was that most children under three years of age would receive breast milk directly from their mothers. This implies that if a child lives on breast milk alone, he or she is likely to benefit less from the mother's ability to provide additional food and any family economic changes. Hence, there is no general acceptance concerning the influence of women's decision-making on child nutrition. Existing studies on this topic have primarily used cross-sectional data, but there is a scarcity of studies related to South Africa. At the same time, some studies found mixed and inconclusive results about women's empowerment and child nutrition (Cunningham et al., 2015; Santoso et al., 2019). Kamiya et al. (2018) found that in semi-urban communities in Lao PDR located in northeast-central mainland Southeast Asia, there is a significant reduction in child malnutrition when the mother is allowed to choose her health or control her economic resources. The study employs logistic regression. The study suggests that the children are likely not to experience stunting when a mother can make a personal decision on their income.

Similarly, Saaka (2020) investigates the relationship between women's decision-making and child nutrition in the Bawku West District of Ghana. The child's age ranges from six to twenty-four months, creating an index of women's decision-making and employing a cross-sectional dataset and multivariate regression model. The study argued that women with higher decision-making tend to improve their children's nutritional outcomes better than those with lower decision-making. Essilfie et al. (2020) studied the effect of women's empowerment on child nutrition using the Ghana Demographic Health Survey (DHS) 2014, OLS, and quantile regression. The study noted that the mother's educational level may improve the child's nutritional status. Also, household assets (e.g., health insurance and radio) may likely improve the child's nutritional outcome. However, most of the studies have used a cross-sectional dataset (Essilfie et al., 2020; Saaka, 2020), and studies are typically unable to draw a causal inference using a cross-sectional dataset. At the same time, fewer studies have used longitudinal monthly datasets (Shoff et al., 2011). A strand of recent literature has suggested longitudinal or panel studies (Santoso et al., 2019). The current study employs a panel dataset.

Lepine and Strobl (2013) investigated the impact of bargaining power on child nutrition in rural Senegal. The study accounts for the endogeneity issue. After using relative ethnicity as an instrumental variable to control for endogeneity, the study found that bargaining power significantly positively affected child nutrition. Their study improves one's understanding of possible econometric problems that similar studies may face. One of the challenges that this study addressed was the issue of endogeneity. The thinking behind the endogeneity issue is that women’s decision-making correlates with idiosyncratic errors. Another challenge is that women's decision-making may influence that child's nutritional outcomes in the preceding period. Therefore, there is a need to find an exogenous variable that controls for potential unobserved characteristics in women's decision-making empowerment (Imai et al., 2014).

Pérez-Mesa et al. (2022) examined the determinants of child health inequality in selected countries in Sub-Saharan Africa (SSA) using the Demographic and Health Survey from 2009 to 2016. The study employed a Shapley decomposition approach and mean log deviation (MLD) to estimate socioeconomic, demographic, and geographical factors affecting child height. There were more improvements in child health outcomes for older children (4-5 years old) compared to younger children (0–1 year old). Child health inequality is lower for older children than for younger children. The authors discovered that a mother's education, household wealth, height, birth type, and region of residence contribute significantly to child health outcomes. However, if those factors are lacking, understanding the dynamics of child health inequality is essentially important to understanding the dynamic of the issue. According to the author, there is an improvement in the child height of educated mothers as compared to non-educated mothers. This shows the link between education and income, which ultimately affects the nutrition of the child.

While other factors could influence child nutrition, there is a need to examine education as a predictor of welfare at the household level. Similarly, the study also found that male child health outcomes improved more than female outcomes. This speaks to gender-specific findings, which are largely cultural in many African countries. Whether male children have access to better nutrition may not necessarily be a factor of the education of their mothers or their income. There is a need to evaluate what it means to be a male child in an African context to bring out deeply rooted gender inequality that may have also spilled over into how female children are fed. Finally, the finding of this study is similar to the report in the study of Fourie et al., (2022), which found that males in the African region were taller than their counterparts from other regions of the world. What is lacking in the literature, and perhaps the aspect findings are not articulated well, is what these results mean for broader issues affecting the social-cultural dynamic of African development.

Fourie et al. (2022) investigated the trend analysis of Southern African resident living standards between 1865 and 1920 based on military attestation records. The data used are from sources in Australia during World War 1, Canada during World War 1 and 11, and New Zealand during World War 1 and 2. These data were used to construct living standards for white South Africans. As evidenced by their height and stature, South African white men have an impressive living standard compared to other countries. Also, the study found that being a farmer and educated contributes to a high standard of living. As we are all aware, rural areas are attributed to lower material forms of wealth. In spite of this, living in rural areas means higher biological living standards, while those with lower living standards move to urban areas to meet their needs. This result is expected and historical in the context of South Africa. Race is a problematic issue when discussing social phenomena in post-apartheid South Africa or after 1994. However, whether the nutrition of mothers in urban and rural areas is significantly similar or different will provide another understanding of how households spend their income, not the factor of where their locations are.

Furthermore, Bridgman and Fintel (2022) examined the association between health outcomes (stunting), public service provision, and children without parents, called double orphans. The study employs orphaned and vulnerable children in South Africa (OVCSA) data that was extracted from the 2011 South African community census and spatial econometric analysis to control for unobserved components. The study found that double orphans are likely to be stunted. Orphans in South Africa are living in poor neighbourhoods with limited access to water and sanitation (WASH) and high stunting rates. However, it appears that other factors, like poor access to health care (Beal et al. 2018), early childhood development facilities (Kang et al. 2018), and social welfare programmes (Muhtar et al. 2022), can contribute to stunting reduction elsewhere. However, those factors are insufficient to reduce stunting for orphans in South Africa. What this study does not reveal is the racial factors of the orphans, but it can provide an understanding of the level of resources or how orphans in historically disadvantageous communities can be affected due to inequality related to the allocation and utilisation of resources. This factor is important because it is a possible cause of malnutrition for certain categories of orphans based on their communities and/or race.

3. Data

The study uses a dataset from the South African National Income Dynamic Survey (NIDS), which is a nationally representative survey. NIDS has collected about five waves from 2008–2017. The data collection for NIDS started in 2008, and it was structured to collect the dataset every two years (Argent 2009 and Leibbrandt et al., 2009). . The current study uses two most recent dataset from the NIDS Wave 4 (2014–15) (dataset retrieved from https://www.datafirst.uct.ac.za/dataportal/index.php/catalog/570/get-microdata) and Wave 5 (2017) (dataset downloadable from https://www.datafirst.uct.ac.za/dataportal/index.php/catalog/712/download/9901). The nutritional outcomes focus on children aged 0 to 5 years. The study uses two waves (4 and 5) to have repeated respondents (children); otherwise, the children's age is likely to be more than 5 years if we consider more waves. Therefore, panel data was used to explore the causal effect of women's decision-making on child nutrition.

3.1 Prevalence of child nutritional outcomes in the sample

The research question in the study is, "What is the causal effect of women's decision-making on child nutritional outcomes?" The study includes child nutritional outcomes as the outcome variables and women's decision-making as the primary independent variables to answer the research question of interest. The nutritional outcomes focus on children aged 0 to 5 years (or ages below 6 years) (WHO, 2006; Onis et al., 2007). Motivation for the child's nutritional outcomes is discussed in the next paragraph.

The child's nutritional outcomes are anthropometrical measurements such as height-for-age z score (stunting), weight-for-age z score (underweight), and weight-for-height z score (wasting) using the World Health Organisation (WHO) international growth standard (WHO, 2006; Onis et al., 2007; Ardington and Gasealahwe, 2012; Casale, 2016). Weight-for-height measures weight (or body mass) associated with height and indicates acute child malnutrition in the short term. The weight-for-age measure measures weight (or body mass) to age, reflecting deprivation in a child's nutritional status in the short term (Ardington and Gasealahwe, 2012; Khan et al., 2019). In addition, many factors could lead to children being underweight (or at a low weight-for-age). These include the children's weight at birth, the parent's education, the mother's health and vulnerability when giving birth (Rayhan and Khan, 2006), and parental income (Ardington and Gasealahwe, 2012), among other factors.

Another child nutrition indicator, height-for-age, is a long-run growth measurement (Casale, 2016). The height-for-age measures height to age, reflecting severe child malnutrition and significant lifelong health consequences. One of the significant effects is that it may affect cognitive development, especially in early childhood. The height-for-age effects are mostly associated with poor socioeconomic conditions in society (Skoufias, 1998; Zere and McIntyre, 2003). The child nutrition measurement is in alignment with the World Health Organisation's (WHO) child early development stage chart (see Appendix B for the model of child nutrition indicator and the kernel density estimates of the children's nutritional outcomes).

3.2 Women's decision-making: Multiple Correspondence Analysis

The study selected females between 15 and 44 years old as the sample for analysis. The selection for the minimum age is motivated by the least age in the adult dataset and the active labour age. The maximum age of the mother is 44 years. The literature informed the choice of 44 years because the fertility risk increases as the women's age increases (Cavazos-Rehg et al., 2015; Glick et al., 2021) and the baseline age for maternal fertility (Kovac et al., 2013). Only women have a birth history; therefore, males are not included in the estimation. The study identifies women’s decision-making from related questions in the NIDS dataset.

The study employed restructuring tools (MCA) to create an index of women’s decision-making from all five relevant categorical questions. In other words, an index of the women's decision-making variable was created from five decision-making variables: who decides on the day-to-day expenditure, who decides on large, unusual purchases, who decides on where children go to school, which members are allowed to live in the household, and who decides on where the family should live. The study was concerned with all the decision-making variables, irrespective of whether they were income-related[2]. It is important to note that the responses to various questions regarding decisions were "yes" or "no" to identify the person who was the main or single decision-maker. The study uses decision-making variables as one (1) for a single decision and zero (0) otherwise. This is appropriate when using multiple correspondence analysis (MCA) (Fotuhi et al., 2019). "When the records are 0 or 1, MCA is accomplished by expending standard correspondence analysis on the indicator matrix (Fotuhi et al., 2019). The study constructed a decision-making index by employing multiple correspondence analysis (MCA) following Booysen et al.'s (2008) and Fotuhi et al.'s (2019) studies. The index interpretation involves a positive value representing primary decision-making and a negative value representing the inability to make personal decisions.

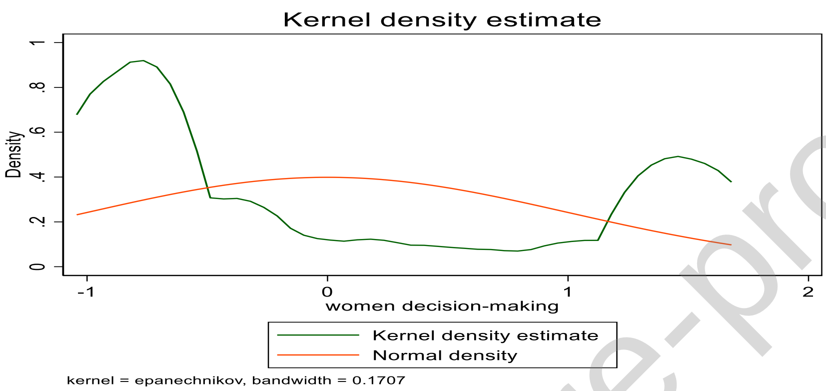

Figure 1 Kernel density estimate of women's decision-making

Figure 1 presents the kernel density of the decision-making index. The index was constructed using MCA, as earlier mentioned. The value ranges between -0.89 and 1.48. The women's decision-making index explains the difference between the lower (negative) and upper (positive) levels of decision-making. This implies that those in the lower part of the distribution of decision-making are likely to lack decision-making, and those in the upper distribution are likely to have decision-making. Other control variables and how some of them are constructed are included in Appendix A.

3.3 Summary Statistics

Table 1 summarises the number of children allotted to each anthropometric measure (z-score) of child nutritional outcomes by waves in the sample. The observations in Wave 4 are lower than those in Wave 5. Weight-for-age has 1737 and 1839 observations; weight-for-height consists of 1578 and 1644 observations; and height-for-age comprises 1707 and 1792 observations in Waves 4 and 5, respectively. While approximately 6.3% are underweight (weight-for-age), 3.3% are wasted (weight-for-height), and 22% are stunted (height-for-age) in the overall sample, the percentage of children who are not malnourished (above -2 SD) is relatively higher. The sample shows an increase in the number of those who are not malnourished from one wave to another, evident in Waves 4 and 5. A plausible reason for

[2] Schultz's (1984) study noted that non-economic or economic decision-making could affect child nutrition.

increased nutritional outcomes could be the effect of a policy or a carer's unobserved characteristics.

Table 1 Details of children nutritional outcomes by Waves

	Wave 4	Wave 5	Total	Percentage
Weight-for-age - underweight (z-score				
Less than -2 (0)	100 (5.8%)	126 (6.9%)	226	6.3
Greater than -2 (1)	1637 (94.2%)	1713 (93.1%)	3350	93.7
Total	1737	1839	3576	
Weight-for-height – wasting (z-score)				
Less than -2 (0)	51 (3.2%)	55 (3.3%)	106	3.3
Greater than -2 (1)	1527 (96.8%)	1589 (96.7%)	3116	96.7
Total	1578	1644	3222	
Height-for-age – Stunting (z-score)				
Less than -2 (0)	407 (23.8%)	358 (20%)	765	21.9
Greater than -2 (1)	1300 (76.2%)	1434 (80%)	2734	78.1
Total	1707	1792	3499	

Compiled by the Author

Table 2 presents the child's nutritional outcomes by age. A reduction in malnourished children was highlighted in the sample, but child weight-for-age is still a problem. Mkhize and Sibanda (2020) have noted in a recent study that there is persistent child malnutrition in South Africa. It was documented that South Africa has a triple burden of malnutrition that includes undernutrition, over-nutrition, and micronutrient deprivations. The children in the age cohort of 0–11 months are less likely to experience malnutrition. The plausible reason may be that the mothers can decide on the child's expenditure and food choice because the children are likely to be receiving breast milk within that period.

Table 2 Details of child nutritional outcomes by age

Child age (Years)	0	1	2	3	4	5
Weight-for-age - underweight (z-score)						
Less than -2 (0)	5/%	5.92%	5.88%	5.25%	7.41%	7.04%
Total	60	524	629	800	796	767
Weight-for-height - wasting (z-score)						
Less than -2 (0)	16.7%	6.52%	2.98%	2.17%	2.55%	1.97%
Total	54	491	604	782	783	508
Height-for-age – Stunting (z-score)						
Less than -2 (0)	12.28%	24.03%	32.30%	24.62%	19.67%	14.03%
Total	57	491	610	784	793	764

Data source: NIDS Wave 4 & 5. Note: Age 0 – 5 years which could mean 0 years may indicate (1-11 months), 1 year may indicate (12-23 months), 2 years may indicate (24-35months), 3 years may indicate (36-47 months), 4 years may indicate (48-59months) and 5 years may indicate (60-71 months).

Table 3. Description statistics

Variables	Obs	Mean	Std.Dev.	Min	Max
Outcome variables					
Height-for-age (stunting)	3499	-1.043	1.391	-5.898	5.785
Weight-for-age (underweight)	3576	-0.266	1.21	-5.975	4.849
Weight-for-height (wasting)	3222	0.463	1.305	-4.959	4.835
Endogenous regressor					
Women's decision-making index	4077	0	1	-.872	1.509
Decision on daily household expenditures	4077	0.434	0.496	0	1
Decision on large, unusual purchases	4077	0.344	0.475	0	1
Decision on where household should live	4077	0.313	0.464	0	1
Decision on who lives in a household	4077	0.319	0.466	0	1
Decision on where the child goes to school	4077	0.458	0.498	0	1
Female Total Assets (Log) (IV)	3861	9.161	1.65	0	16.213

Note: See Appendix C Table 1C for a complete descriptive statistics

Appendix C Table 1C presents a complete summary of the statistics of other variables. As far as child gender is concerned, it is represented by a categorical variable. Zero (0) is for a female child, and one (1) represents a male child. Approximately 48.6% of children were males, and 51.4% were females. The employment status shows that approximately 32.6% had participated in some form of labour, and the remainder had not participated in any form of labour activities. Since labour market participation is lower among females (Casale and Posel, 2002; Casale, 2004), one may expect low income and bargaining power among females. Low labour participation is likely to hurt the children's nutritional outcomes if there is no maternity or medical leave.

Further, the levels of their educational attainment varied in the sample. Starting with the lowest percentage, those who had other levels were 0.2%, and those with no form of education were 1%. Those with university-level education had 1.8%, primary-school-level education had 5.4%, post-matric had 17.3%, and approximately 20.8% had obtained a matric certificate. About 53.5% had education below the matriculation level. Most of the individuals in this sample had a below-matriculation level of education or above. Therefore, the majority are likely to have access to information that could enhance child nutritional outcomes. Approximately 74.5% lived in a well-built flat or townhouse; living in a sturdy building with a pleasant environment may likely improve the child's nutritional outcomes. Africans (blacks) constituted approximately 85.8% of the sample, while other racial groups made up 14.2% of the data. However, the focus of the study is not on comparing the child's nutritional outcome by racial group.

In addition, the relationships between the caregivers and the children were grouped into four categories: parent (father or mother), grandparent (grandparent and great-grandparent), uncle and aunt, and others. The 'others' category consisted of sons or daughters, foster children, stepparents, adoptive parents, foster parents, brothers or sisters, grandchildren, fathers- or mothers-in-law, brothers- or sisters-in-law, nephews or nieces, cousins, and other family and non-family members. In the sample, 93.4% were direct parents, likely mothers or caregivers, who may influence a child's nutritional outcome positively. In the next paragraph, the study presents the methodology. In the next paragraph, the study presents the econometric strategy.

3.4 Econometric strategy

To examine the causal effect of women's decision-making on child nutrition outcomes, the study uses panel data. Endogeneity may occur when there is a correlation between the women's decision-making and the error term. Let us assume that a variable that is not measured, like a woman's specific ability to take care of the child, is in the error term. A woman's specific ability to take care of the child or household welfare may be correlated with the child's nutritional outcome and women's decision-making. When unobserved specific characteristics influence child nutritional outcomes and women's decision-making, the estimation is likely biased. Hence, the study accounted for the endogeneity that occurs in the effect of women's decision-making on child nutritional outcomes by using a control function approach (CFA) following Wooldridge's (2015) and Lin and Wooldridge's (2019). Notably, the CFA required the endogenous explanatory variable to be continuous (Wooldridge, 2015), so the decision-making variable is also continuous. The CFA is relevant in the panel analysis and is an alternative to the two-stage least squares (2SLS) techniques. Intuitively, the control function has two steps similar to the 2SLS techniques, and an instrumental variable (IV) is required. The validity of IV relies on some assumptions, such as relevance and exclusion restriction conditions. The IV is correlated with the regressor (or endogenous variable) but uncorrelated with the error term. Also, the IV is correlated with the dependent variable through its relationship with the endogenous regressor. This study followed the literature to identify a potential instrument. Melesse's (2021) study suggested assets brought into marriage and asset ownership as an IV for women's empowerment. The study uses individual female total assets (logged) comprising real estate, business, vehicle, financial, and superannuation assets from the individual folder available in the NIDS dataset.

Further, the endogenous explanatory variable is regressed on the IV and exogenous variables in the first stage. The 2SLS approach holds under the assumptions of relevance and exclusion restriction. In the reduced form of the equation, or first stage, the covariates in the model get regressed on endogenous variables, such as:

$$A_{it} = \alpha_i + \beta_2 X_{it} + \gamma_i Z_{it} + \varepsilon_{it} \quad i = 1, 2\ldots, N; t=1,\ldots T. \tag{1}$$

Where A_{it} represents the women's decision-making index; α_i denotes intercept (the unobserved individual); X_{it} comprises the vector of household characteristics, such as child gender, child age, household size, religion, and dwelling, among others; β_2 is a vector of control variables; Z_{it} denotes the IV (female total assets); and γ_i is a parameter of the IV and ε_{it} is the error term. The endogenous variable is regressed on the instrument and explanatory variables. The CFA involves controlling for the predicted residual in the second stage. The last estimation includes the predicted residual (v_{it}) for all the child's nutritional outcomes (or the child the anthropometric measurements) as follows:

$$C_{it}^{u} = \alpha_i + \beta_1 A_{it} + \beta_2 X_{it} + \beta_3 v_{it} + \varepsilon_{it} \tag{2}$$

$$C_{it}^{w} = \alpha_i + \beta_1 A_{it} + \beta_2 X_{it} + \beta_3 v_{it} + \varepsilon_{it} \tag{3}$$

$$C_{it}^{h} = \quad \alpha_i + \beta_1 A_{it} + \beta_2 X_{it} + \beta_3 v_{it} + \varepsilon_{it} \qquad (4)$$

Where C_{it}^{u} measures the weight-for-age, C_{it}^{w} measures the weight-for-height, and C_{it}^{h} measures the height-for-age of the child.

Furthermore, the validity of IV depends on the satisfaction of some assumptions, as mentioned earlier. Notwithstanding, IV estimates may be misleading even if the assumptions are satisfied (Pizer, 2016), which can make econometricians or scholars doubt the empirical results. To remove doubt, falsification tests are essential for IV because they help to affirm the validity of the exclusion restriction assumption (Pizer, 2016). The model is specified as follows:

$$C_{it}^{health} = \quad \alpha_i + \beta_2 X_{it} + \beta_3 v_{it} + \varepsilon_{it} \qquad (5)$$

Where C_{it}^{health} denotes child health (as the alternative outcome). We perform a falsification test (Pizer's, 2016) using an alternative outcome in the current study. The study selected child health, which is relatively close to child nutritional outcomes. Some of the control variables or potential confounders that are likely to correlate with the IV may affect the alternative outcome. The estimation excluded women’s decision-making and included predicted residuals following the CFA pathway instead of the IV approach.

3.5 How to resolve attrition and clustering issues

The study is concerned with attrition bias and a clustering problem. Attrition means failure to include some respondents present in the initial wave in subsequent waves (Durrant and Goldstein, 2010). For instance, the NIDS data were collected over many waves. Wave 1 was conducted in 2008, and some may drop out entirely in subsequent waves. The drop may affect the dataset's quality and pose severe consequences for the reliability of the estimation. Interestingly, NIDS does not provide a balanced panel (Branson and Wittenberg, 2018). The NIDS complex survey design provides weight to the account for attrition bias[3]. This study is based on this important assumption, and one of the concerns is whether a woman's specific ability to take care of the child or household welfare is associated with her decision-making in the model. One of the challenges is that there may be a natural correlation within the household (cluster). Child nutrition may be correlated with household characteristics. Hence, children clustered within the same household may suffer similar shocks; they are likely to have similar household characteristics, suggesting that error terms may correlate within each cluster.

One of the limitations of this study is that it is a short panel analysis. This study controls for women's individual characteristics (such as ability), since those are likely to influence their decision-making. The study finally set the data into an unbalanced panel using a merged child

[3] For a depth of understanding of how to handle attrition bias (see Branson and Wittenberg, 2018) for more detail.

and mother identification in the dataset. Existing studies have used an unbalanced panel and accommodated the heterogeneity attributed to unobserved factors (Xu et al. 2018; Xiao et al. 2019), such as women's individual ability to care for their child or children. Wooldridge's (2015) study explains that the inclusion of cluster standard error in a panel analysis is encouraged to control the serial correlation of unknown form (or unobserved ability of women in the case of the current study) and heteroskadasticity. However, a recent study suggested bootstrapping standard errors for the control function approach (CFA) to obtain a more accurate variance in the estimation (Tiwari, 2022).

4. Empirical Results

This section presents the results of the multivariate analysis and discusses substantive points emerging from these results. The results are presented in sequential order for each anthropometric measure: weight-for-age, weight-for-height, and height-for-age. As mentioned earlier, the study is concerned that child nutrition might depend on the time effect and unobserved characteristics that could influence decision-making. For instance, the caregiver's decision-making may be lower at one time (e.g., in wave 4) and high at another time (e.g., in wave 5) or vice versa over the two waves. Petersen (2009) noted in the literature that the clustered standard errors rightly account for the reliability of the panel data set and yield unbiased estimates. The study follows Wooldridge's (2015) and Lin and Wooldridge's (2019) studies and runs panel regression (Papke and Wooldridge, 2008), predicts the residual, and plugs the residual into the estimation in the second stage (with bootstrap).

Table 4, column (1), presents the first stage results of the regression of female total assets (IV) on women's decision-making. The results show that IV has a significant positive relationship with women's decision-making at a 1% confidence level. The significance of the IV suggests that relevance assumptions are met, and the IV is a good instrument. As earlier mentioned, the study identified the IV from the literature (Melesse 2021). This implies that women's total assets are likely to influence their decision-making and are not correlated with the child's nutritional outcomes.

Table 4 Women's decision-making on children nutritional outcomes using *CFA*

	(1)	(2)	(3)	(4)	(5)
	First stage	Second stage	Second stage	Second stage	Falsification
Variables	Women decision-making	Weight-for-age	Weight-for-height	Height-for-age	Child health
Women's decision-making		0.158**	0.216**	0.127	
		(0.0725)	(0.104)	(0.107)	
First stage residual		-0.219**	-0.257*	-0.212	0.000840
		(0.101)	(0.156)	(0.149)	(0.00449)
Female age	0.0501***	-	-0.0180**	-0.0119	6.44e-05

		-0.0146**			
	(0.00258)	(0.00594)	(0.00836)	(0.00777)	(0.000440)
Child sex	-0.0211	-0.114***	0.0291	-0.191***	-0.0113***
	(0.0279)	(0.0363)	(0.0387)	(0.0519)	(0.00422)
Child age	0.00631	-0.131***	-0.0997***	-0.0142	-0.00180
	(0.00877)	(0.0173)	(0.0191)	(0.0182)	(0.00153)
Reference educational attainment: No schooling					
Primary level	0.193	-0.331	-0.220	-0.217	-0.0274**
	(0.149)	(0.285)	(0.371)	(0.306)	(0.0109)
Below matric level	0.0729	-0.101	-0.0653	-0.149	-0.0297***
	(0.140)	(0.256)	(0.350)	(0.270)	(0.00665)
Matric level	-0.00344	0.0643	0.0815	0.0230	-0.0267***
	(0.142)	(0.262)	(0.360)	(0.272)	(0.00789)
Post-matric	-0.0479	0.151	0.0605	0.119	-0.0238***
	(0.143)	(0.266)	(0.350)	(0.284)	(0.00867)
university level	-0.0177	-0.0156	-0.0786	-0.0887	-0.0184
	(0.178)	(0.301)	(0.404)	(0.339)	(0.0197)
Other levels of education	-0.241	-0.178	-0.272	-0.0448	-0.00513
	(0.301)	(0.351)	(0.563)	(0.385)	(0.0138)
Household size	-0.0755***	-0.00853	-0.00846	-0.0102	0.000589
	(0.00539)	(0.00977)	(0.0141)	(0.0114)	(0.000721)
Deflated Household Income	-0.236***	0.0954**	0.126***	0.131**	-0.00504
	(0.0268)	(0.0456)	(0.0455)	(0.0559)	(0.00394)
Life satisfaction	0.00247	0.0385	0.0753*	0.0791	-0.00728
	(0.0264)	(0.0370)	(0.0448)	(0.0545)	(0.00489)
Health status	-0.0558	-0.00703	0.143	0.0636	0.0690***
	(0.0618)	(0.0894)	(0.0986)	(0.0974)	(0.0203)
Employment status	0.275***	0.0810	0.0541	0.0108	-0.0109*
	(0.0316)	(0.0543)	(0.0602)	(0.0623)	(0.00659)
Reference for religion: No religion					
Christianity	0.0372	0.0302	0.222*	-0.245**	-0.00310
	(0.0596)	(0.0738)	(0.114)	(0.115)	(0.00949)
Jewish	-0.170	0.341	1.025***	-0.0505	0.00616
	(0.260)	(0.240)	(0.373)	(0.270)	(0.0111)
Muslim	-0.157	0.0940	-0.127	0.457	0.00953
	(0.203)	(0.469)	(0.373)	(0.436)	(0.0134)
Hindu	-0.613**	-0.0422	0.0207	0.0681	-0.00418
	(0.267)	(0.322)	(0.428)	(0.486)	(0.0106)
Africa traditional	0.0197	-0.0203	0.214*	-0.365***	-0.00762
	(0.0747)	(0.0954)	(0.123)	(0.118)	(0.00954)
Other religion	-0.0123	-0.181	-0.0361	-0.386	0.0122
	(0.171)	(0.236)	(0.379)	(0.409)	(0.0124)
Dwelling	-0.0566*	0.0725	-0.0462	0.167***	0.00303
	(0.0323)	(0.0545)	(0.0630)	(0.0520)	(0.00508)
African	0.0393	0.296***	0.325***	0.0752	0.00401

	(0.0572)	(0.0918)	(0.0999)	(0.114)	(0.0115)
Indian	0.124	-0.190	-0.282	-0.228	0.0167
	(0.221)	(0.288)	(0.316)	(0.363)	(0.0130)
White	-0.232	0.324	-0.125	0.518	-0.0258
	(0.202)	(0.232)	(0.282)	(0.324)	(0.0577)
Parent	-0.204*	0.202	0.0585	0.107	0.0167
	(0.115)	(0.226)	(0.308)	(0.392)	(0.0244)
Grandparent	-0.374***	0.268	0.0263	0.262	0.0120
	(0.142)	(0.245)	(0.369)	(0.382)	(0.0273)
Uncle and ant	-0.0282	0.207	0.0930	0.126	0.0200
	(0.141)	(0.257)	(0.357)	(0.404)	(0.0287)
Other relatives	0.247	-0.443	-0.727	-0.115	-0.287
	(0.488)	(0.729)	(0.536)	(0.890)	(0.317)
Reference Province: Western Cape					
Eastern Cape	-0.0510	0.0846	0.353***	-0.119	-0.0155
	(0.0728)	(0.119)	(0.137)	(0.147)	(0.0105)
Northern Cape	-0.00187	-0.498***	-0.531***	-0.105	-0.0210**
	(0.0727)	(0.150)	(0.158)	(0.128)	(0.0102)
Free State	-0.0474	-0.308**	-0.0162	-0.280*	-0.0249*
	(0.0829)	(0.120)	(0.153)	(0.159)	(0.0147)
KwaZulu-Natal	0.0627	0.131	0.321**	-0.0239	-0.0134
	(0.0683)	(0.0959)	(0.135)	(0.141)	(0.0100)
North West	-0.163**	-0.466***	-0.358**	-0.143	-0.0646***
	(0.0817)	(0.113)	(0.158)	(0.168)	(0.0176)
Gauteng	0.0310	-0.172*	-0.150	0.0143	-0.0180*
	(0.0733)	(0.104)	(0.134)	(0.160)	(0.0109)
Mpumalanga	-0.0573	-0.0971	-0.0171	0.0326	-0.0270**
	(0.0793)	(0.111)	(0.144)	(0.168)	(0.0122)
Limpopo	-0.0934	-0.371***	-0.229	-0.260	-0.0274**
	(0.0760)	(0.0976)	(0.153)	(0.164)	(0.0109)
Reference Marital status: married					
Cohabiting	-0.00510	-0.160**	-0.0845	-0.178**	-0.0230**
	(0.0508)	(0.0737)	(0.0851)	(0.0778)	(0.00896)
Widow	0.106	-0.280*	-0.0397	-0.436**	0.00691
	(0.107)	(0.153)	(0.193)	(0.211)	(0.0168)
Divorce	0.0944	0.0612	-0.0873	0.154	-0.00657
	(0.134)	(0.201)	(0.263)	(0.194)	(0.0322)
Single	0.0298	-0.0912	-0.0451	-0.123*	-0.00287
	(0.0384)	(0.0564)	(0.0547)	(0.0732)	(0.00441)
Poverty status	-0.0507	-0.0113	0.0861	0.00979	-0.0101
	(0.0424)	(0.0672)	(0.0688)	(0.0759)	(0.00650)
Child Support Grant	0.0823**	-0.1000*	-0.0839	-0.135**	0.00811
	(0.0336)	(0.0536)	(0.0690)	(0.0664)	(0.00635)
Stratified weight	Yes	Yes	Yes	Yes	Yes
Wave dummy	Yes	Yes	Yes	Yes	Yes

Female total asset (IV)	0.0750***				
	(0.00989)				
Constant	0.333	-0.355	-0.320	-1.422**	1.002***
	(0.317)	(0.502)	(0.759)	(0.725)	(0.0468)
Observations	3,860	3,385	3,041	3,313	3,860
Number of id	3,147	2,842	2,582	2,800	3,147
sigma_u	0.492	0.899	0.682	0.890	0.0454
sigma_e	0.652	0.741	1.036	1.046	0.128
rho	0.363	0.595	0.302	0.420	0.111

Standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1; second stage estimation used bootstrapped standard errors

Table 4, column (2), shows that women's decision-making has a significant positive influence on child weight-for-age. This implies that a woman's decision-making is likely to improve the child's weight-for-age by 16%. The result is expected because mothers are the primary caregivers (Shroff et al., 2009), and their unobserved ability as caregivers is likely to contribute to the improvement in the child's weight for age. Household income has a significant positive effect on a child’s weight-for-age. Also, the African group has a significant positive effect on a child’s weight-for-age compared to the coloured group, ceteris paribus. The black (African) racial groups are noted for experiencing income inequality and being marginalized. Notwithstanding, the finding shows that some black groups are transitioning from the historical antecedent of apartheid, and that is reflected in the improvement of children's weight-for-age. Other control variables have a certain degree of effect on child nutrition outcomes that is different from the effect of women’s decision-making.

The study finds that child gender (where male = 1, female = 0) has a significant negative influence on weight-for-age. This implies that male children have poor nutritional outcomes as a measure of weight-for-age. The study is compatible with a previous study by Chirwa and Ngalawa (2008), which noted that female children have a better nutritional outcome. The findings in the current study show that cohabiting and being a widow (in the household structure) as compared to being married have a significant negative effect on child weight for age, all things being equal. Child support grant, child age, and mother’s age have a significant negative influence on the child’s weight-for-age. In addition, those living in the Northern Cape, Free State, North West, and Limpopo, compared to those living in the Western Cape, are likely not to have an improvement in child weight-for-age, all things being equal.

Column (3) shows that women's decision-making has a significant positive influence on child weight-for-height. The finding is consistent with the existing literature, which found that women’s decision-making empowerment has a significant positive impact on the child's nutritional outcome (Rahman et al., 2015; Chilinda et al., 2021). An increase in household income influences the child’s weight-for-height and it is statistically significant at a 99% confidence level. Also, life satisfaction has a significant positive effect on child weight-for-height. The results have found that an increase in the share of household income in the hands of women is likely to benefit children (Alami et al. 2020), and that will invariably improve the child’s weight-for-height. Mother's life satisfaction has a significant positive effect on child weight-for-height. The estimation shows that being a Christian, Jewish, or African is likely to improve the child's weight-for-height significantly as compared to having no religion affiliation.

A recent study found that children of Christian family affiliation are likely to have a better nutrition outcome, and they also have better cognitive development in the case of Benin (Ekholuenetale et al. 2020). When women belong to the African group, it has a significant positive effect on weight-for-height compared to coloured women, ceteris paribus. While those living in the Eastern Cape and KwaZulu-Natal as compared to the Western Cape have a significant positive impact on their child's weight-for-height compared to the Western Cape, women living in provinces such as the Northern Cape and Northwest as compared to the Western Cape are found to have a significant negative effect on the child's weight-for-height (see column (3)). Other control variables have a unique effect on child weight-for-height. Female age and children's age have a significant negative effect on child weight-for-height.

Column (4) shows that women's decision-making has a positive effect on children's height-for-age, but it is not statistically significant. The current finding may be compatible with some studies, such as those of Santoso et al. (2019) and Mckenna et al. (2019) in the case of DR Congo, where they found that women's empowerment shows no relationship with child height-for-age. The household income in the hands of women is likely to improve the child's height for age. Dwelling has a significant positive influence on the child's height for age (CHFA). This implies that a well-structured home (or dwelling) will probably improve the children's height-for-age (Pongou et al., 2006).

The current study finds that, a child's gender has a significant negative effect on a child's height-for-age. Also, a mother's age has a significant negative effect on a child's height-for-age. The findings are incompatible with the study by Borooah (2005), whose results show a mother's age has a significant association with height-for-age. The contrary effect might be due to the cohort effect and lifestyle. Those living in Free State and Limpopo have a significant negative effect on their child's height for their age. The current study found that being a widow, a single parent, or a cohabitant significantly negatively affects nutritional outcomes, unlike the study of Tian and Wang (2019), where they found that being a single parent improves the children's nutritional outcomes.

Based on the results, it is clear that women's decision-making has no conclusive effect on long-term (child height-for-age) nutritional outcomes. Women's decisions significantly influenced short-term nutritional outcomes for children (child weight-for-height and child weight-for-age). Despite the obvious importance of women's decision-making on child nutrition, inadequate resources and a lack of investment in early childhood development may deter improvements in height-for-age child nutrition. It is noteworthy that a strand of the literature has indicated that inadequate financial or infrastructure resources are likely to affect household decision-making (Jones et al., 2019), and invariably, it may affect child nutrition outcomes. The finding in the current study is compatible with an existing study, which found that women's decision-making empowerment has an insignificant relationship with child height-for-age in the Democratic Republic of the Congo (McKenna et al., 2019).

Column (5) presents the falsification test by examining the effect of the predicted residual (instead of the female total asset as IV) on child health. The predicted residual has no significant effect on the alternative outcome; hence, the exclusion restriction is satisfied and may be accepted. From the literature, the study identified assets brought to marriage and asset ownership as instrument variables for women's empowerment (Melesse et al. 2018; Melesse

2021). The Women's Empowerment in Agriculture Index (WEAI) was introduced in a study in Nepal to measure empowerment related to nutrition (Malapit et al., 2015). The WEAI has five domains of women's empowerment indicators that measure the involvement of the agricultural sector, which include production, resources (ownership of assets as an indicator), income, leadership, and time (Alkire et al., 2013; Malapit et al., 2015). According to Daniels and Khan (2019), material assets primarily consist of financial assets, real assets, and retirement annuities. Since they have a future value, the assets may be equilateral against economic constraints, increasing the owner's bargaining power. With or without ownership of an asset, women make decisions that influence their child's nutritional outcomes. Also, there is a probability that women, with or without an asset, will go into marriage before giving birth to a child. Hence, the female total asset does not directly relate to the child's nutritional outcomes.

Furthermore, the study reduces the number of control variables added to the estimation. In appendix D, Table D1 presents the estimation of women's decision-making on child nutritional outcomes with the inclusion of some selected control variables such as child gender, child age, female age, household size, household income, dwelling, poverty status, child grants, and religion affiliation. The results (in Appendix D, Table 1D) are consistent with the main results in Table 4. In this case, we cannot conclude that the battery of control variables has influenced the results.

4.1 Sensitivity analysis

For sensitivity analysis, the study examines the effects of decision-making categorical variables on children's nutritional outcomes.

Table 5. Child nutritional outcomes by decision-making variables categories

	(1)	**(2)**	**(3)**
Decision-making variables	WFA	WFH	HFA
Decision on daily household expenditures	0.443***	0.586***	0.272
Decision on large, unusual purchases	0.450*	0.676***	0.313
Decision on where household should live	0.376*	0.445*	0.382*
Decision on who lives in a household	0.431*	0.435	0.423*
Decision on where the child goes to school	0.389	0.486	0.577*

Computed by the Author: extracted from full analysis in Appendix 3; WFA denote weight-for-age; WFH denote weight-for-height; HAF denoted height-for-age; CFA second stage estimation used bootstrapped standard errors

Table 5 presents the estimation of various women's decision-making variables on the child nutrition measurements (see Tables 1E–4E extracted from the full analysis in Appendix E). Column (1) shows that women's decisions on large and unusual purchases have the highest degree of contribution (about 45%) to the improvement in the standard deviation of child weight-for-age. Followed by a decision on daily household expenditure (44.3%). The result is linked to the fact that resources (income) are essential to the child's nutritional outcomes (Kirk et al. 2018). The decision on whether a relative can live with the family influences the improvement in child weight-for-age by 43.1%. Also, the decision on where the family should live has a significant positive effect on the child's weight-for-age. Whereas the decision on where the children attend school has an insignificant positive effect on weight-for-age. Women's decision-making can be classified as economic (monetary-related) or non-economic (or non-monetary-related) (Kadić et al. 2020). The non-economic contribution of women includes looking after the children, taking and fetching them from school, helping the children with homework, making a choice of a balanced diet, and satisfying the emotional needs of the family in general (children and spouse). Women's decision-making empowerment is vital to be considered because women are homekeepers, and their importance in the household's achievement or prospect cannot be overemphasised.

Column (2) displays that women’s decisions on large and unusual purchases have the highest degree of contribution to the improvement in the standard deviation of child weight-for-height. The women’s decision on daily household expenditure improves the standard deviation of child weight-for-height by 59%. While women’s decisions on where the family should live have a significant positive influence on child weight-for-height by 45%, their decisions on the choice of relative that can live with the family and where the children attend school have a positive effect on the child's weight-for-height, but it is not statistically significant.

In Column (3), while women's decisions on expenditures and purchases have an insignificant positive effect on the child's height-for-age. Where the children go to school (58%) has the highest influence on child height-for-age. Women’s decisions on who is allowed to live with the family (42%), and where the family lives (38%), have a significant positive effect on the child's height-for-age. There is a clear indication that all decisions are essential for improving child nutritional outcomes, irrespective of whether they are income-related or non-economic-related.

5. Discussion and conclusion

This current study investigates the causal effect of women's decision-making on children's nutritional outcomes in South Africa, where the case is less researched. Many studies have used cross-sectional datasets in the empirical examination of women's empowerment and child nutrition. Some studies investigated women's empowerment and child nutrition outcomes using logistic regression (Shroff et al., 2009; Rahman et al., 2015; McKenna et al., 2019; Salman et al., 2020; Chilinda et al., 2021; Paul and Saha, 2022), while others used fixed effects (Adjaye-Gbewanyo et al., 2019) and IV (Lepine and Strobl, 2013; Melesse, 2021). There is a paucity of studies that use a panel dataset and employ the CFA method to control for endogeneity issues (Altonji and Matzkin, 2005; Wooldridge, 2015) and unobserved factors like women's ability in the case of South Africa. The study selected appropriate methodology to control for the endogeneity issue. A control function approach is similar to two-stage least squares (2SLS). The study used the female total asset as an instrumental variable (IV). In the first stage, the IV satisfied the relevance assumption as the real asset has a significant positive relationship with the women's decision-making. The residuals were predicted and plugged into the second stage.

The results revealed that women's decision-making had a significant positive effect on children's weight-for-age and weight-for-height (which are short-run anthropometric measurements of child nutrition). The results are compatible with existing studies that examine the effect of women's autonomy on child nutrition (Dancer and Rammohan, 2009; Carlson et al., 2015). The finding in this current study is compatible with the findings of some authors, such as Saaka (2020) in the case of Bawke West District of Ghana and Onah (2021) in the study of South-Central Asia. The results mean that women are likely to make personal decisions on childcare, starting with breastfeeding for infants (0–24 months) and based on their abilities as caregive. This finding is compatible with Dancer and Rammohan's (2009) study and Alaofe et al. (2017). There is a possibility that the mother's unobserved ability might have influenced the child's nutritional outcomes through the mother's decision-making. The current study improves our understanding of how women's decision-making is likely to improve child nutritional outcomes through mechanisms such as empowerment and the individual's unobserved ability to care for the household. However, women's decision-making has an insignificant positive effect on children's height-for-age (which is a long-run anthropometric measurement of child nutrition).

Women's decision-making empowerment is essential because they have a heartfelt commitment to household welfare, which is not quantified in monetary or economic terms. They make a desirable scale of preference when the resources are not sufficient or scarce for daily purchases, durable commodities, an affordable location to live, and who can benefit from living with the household. Without wise decision-making contributions from women, available resources are likely to be insufficient for the household's needs. When the price of daily consumption increases, the mothers can make personal or primary decisions to purchase alternative commodities (substitution effect) that are required to improve the child's nutritional outcomes. Also, if the price of durable commodities increases, mothers can decide to reduce disposable income (the income effect) to influence the child's nutritional outcomes. Therefore, the dynamics of individuals might have played a significant role in improving child nutritional outcomes. This is not to say that enhancing child nutritional outcomes is solely a woman's affair. Men's contributions may be direct (such as purchasing food among other family needs) or indirect (by supporting women emotionally and financially). It is not only women's decision-making that contributes to the improvement in child nutritional outcomes.

The findings further indicate that household income is likely to improve child nutritional outcomes (Burchi, 2010; Lepine and Strobl, 2013; Imai et al., 2014; Kirk et al., 2018). In addition, household resources are likely to reduce malnutrition outcomes in children (Yaya et al., 2022). Lee et al.'s (2013) study reported that caregivers might determine children's weight. Hence, it will be a risk for childhood development if the caregivers are overweight or otherwise have a deficiency in nutrition due to being underprivileged. Similar to the findings in an existing study, the current study found that being a Christian influences a child's nutritional outcomes positively (Agadjanian and Jansen, 2018). At the same time, the dwellings are likely to positively influence the child's height-for-age (Ghazi et al., 2014). However, there is a need for further research to investigate whether single or joint household decision-making improves the child's nutritional outcomes. It might be necessary to also investigate whether women's decision-making without household income could enhance child nutritional outcomes.

The findings show that household size has a significant negative effect on children's nutritional outcomes. Studies have shown that household composition influences child nutritional outcomes (Gribble et al., 2009; Yaya et al., 2022). Such a child can be stunted and underweight if the household size is relatively large, especially if the household is on a lower-income quantile (Gribble et al., 2009). The study envisages that the increase in the number of children will likely worsen child nutritional outcomes. Existing studies have found that the number of siblings (household size) hurts the children's nutritional status (Kumar & Ram, 2013). Similarly, a more recent study has found that the number of children is likely to reduce the nutritional quality (Feng and He, 2021) in China. Also, the current study found that cohabiting may reduce the improvement in child weight-for-age and height-for-age significantly. In a previous study, it was reported that cohabiting is likely to influence child malnutrition based on child height-for-age (Bronte-Tinkew and DeJong, 2004). Female age has a significant negative effect on child weight-for-age and weight-for-height. The negative effect may be due to the cohort effect (Horton 1986) and subjective lifestyle. Also, a child's age has a significant negative effect on their weight-for-age and weight-for-height. The result implies that there is a possibility of an unequal age cohort effect.

It is expected that the female education level is likely to improve the child's nutritional outcomes (Dancer and Rammohan, 2009; Alderman and Headey, 2017). Surprisingly, female education has a mixed and inconclusive effect on children's nutritional outcomes (weight-for-age). Education attainment is categorically measured, and there is the possibility of unequal levels of educational attainment. We found that an above-average proportion of women (53%) have below-matriculation levels. Studies have remarked that women with low education (Abuya et al. 2012), who may be living in rural areas (Smith et al. 2005), are likely not to improve their child nutrition outcomes. Frost et al.'s (2005) study revealed that mother's labour participation may not intervene in the education effect and may not influence child nutrition outcomes. Women's labour participation has an insignificant positive influence on a child's nutritional outcome. We argue that time allocated to work (Debela et al., 2021) might contribute to the insignificant effect. While mothers with infants and preschool-aged children are likely to participate less in the labour market because of childcare, some women may delay childbearing to participate in the labour market and contribute to better child nutritional outcomes (Melesse et al., 2018).

For policy recommendations, the study suggests a developmental policy that will increase women's decision-making empowerment in the household through participation in the labour market (Sheikh et al., 2016). Furthermore, the study suggests gender-responsive policies for policymakers (Cairns et al., 2022). The study suggests that the government and stakeholders should offer possible solutions to child health. We suggest that the government intensify efforts to achieve education for all, especially females. Existing studies have argued that educational attainment may improve women's decision-making (Batool and Batool, 2018) and empowerment. Education is likely to increase self-esteem and the opportunity to participate in the labour market (Heaton et al., 2005) to earn income and increase household income. There is a need for public awareness of gender equality and women's empowerment (women's decision-making) to improve child nutritional outcomes in South Africa.

The study suggests that it is necessary to raise compelling awareness of gender equality and women's empowerment. To empower women, the government and stakeholders may establish a Self-Help Group (SHG) linkage (microfinance) programme, as suggested in the study of Swain and Wallentin (2008) in the case of India. "The SHG may consist of 10–20 fewer privileged women who formed a group for financial services. The SHGs are mostly formed and managed by the members with the external support of staff from a microfinance institution, a non-governmental organization, or government agencies. The group may start by saving and lending out members' resources for the first six months after the establishment. Then, SHG involves periodic saving, loans, training, education, and other social services, according to the suggestion of Swain and Wallentin (2008)". According to Melesse et al. (2018), some (cooperative) bargaining models suggest that granting women access to assets is likely to empower them. The findings in the study suggest development and health policies that would enhance human development, reduce income inequality, and empower women in decision-making to improve child nutrition and health outcomes.

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Appendix A

Data: Variables construction

The variables are identified and fetched from the National Income Dynamic Survey (NIDS) Waves 4 and 5. The variables are located and fetched from each of the NIDS dataset folders, such as the adult, household-derived, individual-derived, child, household questionnaire, and household roster folders. There were several binary variables. These included the child's gender, the caregiver's gender, racial group, health status, educational level, life satisfaction, dwellings, religious affiliation, marital status, race, relationship with the carer, and decision-making variables. The continuous variables include child nutritional outcome variables, the mother's age, the child's age, household size, household income, poverty, and the constructed decision-making index.

This current study uses the log of real labour income (log labour income divided by the deflator), and the base year is 2017. The study computed real labour income, or deflated household income, by utilising a deflator (for a technical application of how a deflator is calculated, see Leibbrandt et al. 2013) to divide the nominal labour income. The study followed the definition of labour income in the NIDS user manual (Brophy et al., 2018). Poverty status is a per-capita household expenditure, which is a better measure of consistent household income than recorded income (Schotte et al., 2018). The study divided household income by household size to estimate household per capita income. Then, determine whether there are poor or non-poor individuals based on the upper-bound poverty line set at R963 per person per month. If the household per capita income is less than R963, the household is poor, and if it is more than R963, it is non-poor.

Appendix B

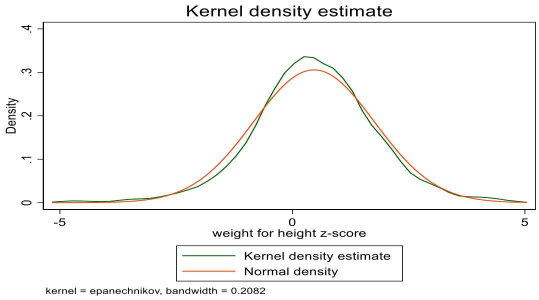
Child nutrition model and the kernel density estimates of the children's nutritional outcomes

Following Khatab (2010), the study measures child nutritional outcomes indicated by z scores as;

$$C_i = \frac{AI - MAI}{\sigma} \quad (1)$$

Where AI is the individual anthropometric indicator, such as height at a certain age, σ is the standard deviation of the reference population, and MAI is the median of the reference population. Each indicator measures different aspects of the child's nutrition status. The higher values of a z score indicate better nutritional outcomes for children. For example, if the child's height-for-age z score is less than -2 standard deviation (SD), it is stunting. Likewise, a child's weight for age z score and weight-for-height z score are less than -2 SD as underweight and wasting, respectively (Ardington and Case, 2009; Frison et al., 2016). As earlier mentioned, the study presents a summary of anthropometric (z-score) measures of children's nutritional outcomes using global measurement (WHO, 2006).

The current study focused on the short- and long-term consequences of child nutritional deprivation. The kernel density of the outcome variables is presented below.



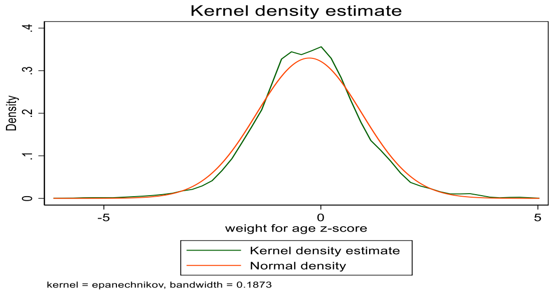


Figure 2. Kernel density of weight-for-height and weight-for-age computed by the Author

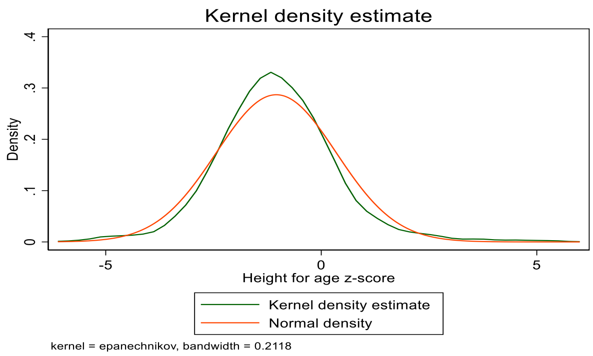


Figure 3 Kernel density of height-for-age computed by the Author

Figures 2 and 3 present the kernel density estimates of the children's nutritional outcomes. The outcome variables are normally distributed in the dataset. The outcome variables range from -5 to 5 for weight-for-height, -6 to 6 for height-for-age, and -6 to 5 for weight-for-age.

Appendix C

Summary statistics

Table 1C. Description statistics

Variables *Other control variables*	**Obs**	**Mean**	**Std.Dev.**	**Min**	**Max**
Child health	4077	0.980	0.138	0	1
Mother's Age (in years)	4077	28.961	6.581	15	44
Child Sex (Male = 1, otherwise = 0)	4077	0.486	0.5	0	1
Child Age	4077	2.887	1.548	0	5
Household size	4077	6.767	3.465	2	31
Child Support Grant	4062	0.762	0.426	0	1
Household income Deflated (Log)	4077	8.469	0.86	5.278	11.8
Life satisfaction	4062	0.559	0.497	0	1
Health status	4077	0.95	0.219	0	1
Labour market status	4062	0.326	0.469	0	1
Poverty status (poor = 1, non-poor =0)	4077	0.591	0.492	0	1
Dwelling	4076	0.746	0.435	0	1
Education attainment					
No education	4077	0.010	0.101	0	1
Education primary level	4077	0.054	0.226	0	1
Education below matric level	4077	0.535	0.499	0	1
Education matric level	4077	0.208	0.406	0	1
Education post-matric	4077	0.173	0.378	0	1
Education university level	4077	0.018	0.132	0	1
Education vocational level	4077	0.002	0.049	0	1
Education other levels	4077	0.001	0.001	0	1

Race					
African	4077	0.858	0.349	0	1
Indian	4077	0.008	0.091	0	1
White	4077	0.005	0.072	0	1
Coloured	4077	0.129	0.335	0	1
Relationship with the caregivers					
Parent	4077	0.934	0.249	0	1
Grandparent	4077	0.027	0.161	0	1
Uncle Aunt	4077	0.026	0.161	0	1
Other relatives	4077	0.001	0.027	0	1
Marital status					
Married	4077	0.214	0.41	0	1
Cohabiting	4077	0.113	0.316	0	1
Widow	4077	0.017	0.128	0	1
Divorce	4077	0.01	0.101	0	1
Single	4077	0.646	0.478	0	1
Religion					
No religion	4062	0.052	0.222	0	1
Christianity	4062	0.852	0.354	0	1
Jewish	4062	0.002	0.050	0	1
Muslim	4062	0.005	0.072	0	1
Hindu	4062	0.005	0.072	0	1
Africa	4062	0.077	0.267	0	1
Others	4062	0.006	0.077	0	1
Provinces					
Western Cape	4077	0.09	0.286	0	1
Eastern Cape	4077	0.106	0.308	0	1
Northern Cape	4077	0.075	0.264	0	1
Free State	4077	0.058	0.233	0	1
KwaZulu-Natal	4077	0.307	0.461	0	1
North West	4077	0.069	0.253	0	1
Gauteng	4077	0.113	0.317	0	1
Mpumalanga	4077	0.078	0.269	0	1
Limpopo	4077	0.104	0.305	0	1

Appendix D

Analysis with reduced control variables

Table D1 Estimation of children nutritional outcomes with reduced control variables

	(1)	**(2)**	**(3)**	**(4)**	**(5)**
	First stage	Second stage	Second stage	Second stage	Falsification
Variables	Women decision-	Weight-for-age	Weight-for-height	Height-for-age	Child health

	making				
Women's decision-making		0.169**	0.225**	0.127	
		(0.0731)	(0.0971)	(0.111)	
First stage residual		-0.213**	-0.246*	-0.210	0.000682
		(0.103)	(0.141)	(0.158)	(0.00389)
Female age	0.0534***	-0.0135**	-0.0185***	-0.00927	-0.000186
	(0.00234)	(0.00540)	(0.00676)	(0.00772)	(0.000383)
Child sex	-0.0146	-0.121**	0.0177	-0.198***	-0.0121***
	(0.0282)	(0.0480)	(0.0502)	(0.0451)	(0.00417)
Child age	0.0141	-0.134***	-0.105***	-0.0163	-0.00205
	(0.00881)	(0.0167)	(0.0196)	(0.0194)	(0.00139)
Household size	-0.0740***	-0.00608	0.00457	-0.0166	0.000679
	(0.00517)	(0.00978)	(0.0126)	(0.0136)	(0.000822)
Deflated Household Income	-0.222***	0.115**	0.0928*	0.171***	-0.00420
	(0.0256)	(0.0449)	(0.0536)	(0.0460)	(0.00369)
Reference for religion: No religion					
Christianity	0.0513	0.0494	0.224*	-0.211**	-0.00295
	(0.0596)	(0.0545)	(0.132)	(0.0950)	(0.0102)
Jewish	-0.127	0.427	1.115***	0.0124	0.0144
	(0.262)	(0.300)	(0.412)	(0.234)	(0.0102)
Muslim	-0.137	-0.0817	-0.391	0.427	0.0195*
	(0.192)	(0.378)	(0.333)	(0.347)	(0.0103)
Hindu	-0.559***	-0.163	-0.144	-0.0955	0.0197**
	(0.203)	(0.410)	(0.352)	(0.515)	(0.00950)
Africa traditional	0.0610	0.125	0.414***	-0.295**	0.000326
	(0.0746)	(0.0838)	(0.143)	(0.142)	(0.0100)
Other religion	0.0207	-0.0697	0.0724	-0.335	0.0196*
	(0.173)	(0.269)	(0.284)	(0.261)	(0.0118)
Dwelling	-0.0920***	0.0363	-0.105*	0.160***	0.000891
	(0.0319)	(0.0473)	(0.0585)	(0.0559)	(0.00510)
Poverty status	-0.0894**	-0.0311	0.0544	-0.00472	-0.0103
	(0.0422)	(0.0688)	(0.0914)	(0.0607)	(0.00638)
Child Support Grant	0.0859***	-0.133***	-0.0857	-0.175**	0.00906
	(0.0332)	(0.0491)	(0.0709)	(0.0709)	(0.00618)
Stratified weight	Yes	Yes	Yes	Yes	Yes
Wave dummy	Yes	Yes	Yes	Yes	Yes
Female total asset (IV)	0.0720***				
	(0.00958)				
Constant	0.0664	-0.261	0.451	-1.766***	1.028***
	(0.229)	(0.391)	(0.447)	(0.395)	(0.0334)
Observations	3,860	3,385	3,041	3,313	3,860
Number of child_mother ID	3,147	2,842	2,582	2,800	3,147
sigma_u	0.512	0.939	0.751	0.876	0.0467

sigma_e	0.652	0.744	1.038	1.065	0.130
rho	0.381	0.614	0.343	0.403	0.115

Standard errors in parentheses: *** p<1%, ** p<5%, * p<10%; second stage estimation used bootstrapped standard errors

Appendix E

Analysis for each decision-making variable

Table 1E. Child Weight-for-age and Women decision-making by categories

	(1)	(2)	(3)	(4)	(5)	(6)
	FS	SS	FS	SS	FS	SS
Variables	DDHE	WFA	DLUP	WFA	DWHL	WFA
DDHE		0.443***				
		(0.170)				
DLUP				0.450*		
				(0.231)		
DWHL						0.376*
						(0.204)
First stage residual		-0.562**		-0.628**		-0.490*
		(0.232)		(0.308)		(0.265)
Female age	0.0221***	-0.0167***	0.0204***	-0.0162**	0.0180***	-0.0135**
	(0.00127)	(0.00534)	(0.00127)	(0.00701)	(0.00126)	(0.00606)
Child sex	-0.00862	-0.114***	-0.0171	-0.109**	-0.000308	-0.118**
	(0.0137)	(0.0404)	(0.0136)	(0.0439)	(0.0136)	(0.0516)
Child age	0.00142	-0.131***	0.00198	-0.130***	-0.00150	-0.129***
	(0.00434)	(0.0139)	(0.00436)	(0.0141)	(0.00432)	(0.0154)
Primary level	0.0743	-0.333	0.0959	-0.344	0.0857	-0.331
	(0.0733)	(0.240)	(0.0729)	(0.217)	(0.0727)	(0.237)
Below matric level	0.0466	-0.110	0.0555	-0.116	0.00179	-0.0908
	(0.0688)	(0.227)	(0.0684)	(0.193)	(0.0683)	(0.214)
Matric level	0.0237	0.0535	0.0226	0.0511	-0.0244	0.0733
	(0.0701)	(0.239)	(0.0697)	(0.207)	(0.0696)	(0.230)
Post-matric	-0.00734	0.146	-0.00633	0.145	-0.0408	0.159
	(0.0705)	(0.228)	(0.0701)	(0.203)	(0.0700)	(0.232)
university level	0.0358	-0.0341	0.0271	-0.0382	0.0110	-0.0266
	(0.0875)	(0.279)	(0.0872)	(0.236)	(0.0869)	(0.260)
Other levels of edu.	-0.153	-0.133	-0.167	-0.137	-0.0493	-0.200
	(0.149)	(0.411)	(0.150)	(0.368)	(0.148)	(0.421)
Household size	-0.0406***	-0.00237	-0.0325***	-0.00545	- 0.0342***	-0.00787
	(0.00266)	(0.0110)	(0.00266)	(0.0109)	(0.00265)	(0.00960)
Household Income	-0.0947***	0.0992***	-0.123***	0.110**	-0.102***	0.0989**
	(0.0133)	(0.0383)	(0.0134)	(0.0468)	(0.0132)	(0.0431)
Life satisfaction	-0.0101	0.0426	-0.00820	0.0437	0.0119	0.0342
	(0.0131)	(0.0470)	(0.0132)	(0.0384)	(0.0131)	(0.0417)
Health status	0.0142	-0.0180	-0.0112	-0.0118	-0.0518*	0.000498

	(0.0307)	(0.0860)	(0.0309)	(0.0937)	(0.0305)	(0.0912)
Employment status	0.126***	0.0682	0.135***	0.0630	0.110***	0.0826
	(0.0157)	(0.0579)	(0.0157)	(0.0557)	(0.0156)	(0.0579)
Christianity	0.0125	0.0312	0.0134	0.0298	0.0281	0.0263
	(0.0296)	(0.100)	(0.0299)	(0.0971)	(0.0295)	(0.0836)
Jewish	-0.117	0.366	-0.104	0.364	0.0403	0.300
	(0.129)	(0.320)	(0.130)	(0.259)	(0.128)	(0.243)
Muslim	-0.00783	0.0709	-0.0131	0.0726	-0.0881	0.107
	(0.100)	(0.474)	(0.101)	(0.514)	(0.0998)	(0.426)
Hindu	-0.332**	0.00201	-0.237*	-0.0327	-0.179	-0.0697
	(0.132)	(0.262)	(0.133)	(0.284)	(0.131)	(0.390)
Africa traditional	0.0353	-0.0307	0.0159	-0.0226	0.0172	-0.0227
	(0.0371)	(0.104)	(0.0374)	(0.104)	(0.0369)	(0.105)
Other religion	0.0423	-0.208	0.0456	-0.204	-0.104	-0.152
	(0.0851)	(0.278)	(0.0862)	(0.270)	(0.0848)	(0.216)
Dwelling	-0.0142	0.0688	-0.0216	0.0722**	-0.0370**	0.0767*
	(0.0160)	(0.0468)	(0.0160)	(0.0360)	(0.0159)	(0.0456)
African	0.0572**	0.277***	0.0232	0.292***	-0.000509	0.303***
	(0.0282)	(0.0752)	(0.0280)	(0.105)	(0.0280)	(0.0842)
Indian	0.150	-0.234	0.00788	-0.174	-0.0409	-0.157
	(0.109)	(0.308)	(0.109)	(0.332)	(0.108)	(0.320)
White	-0.109	0.334	-0.103	0.337	-0.108	0.323
	(0.0996)	(0.223)	(0.0990)	(0.265)	(0.0988)	(0.201)
Parent	-0.102*	0.217	-0.0996*	0.214	-0.0985*	0.208
	(0.0570)	(0.194)	(0.0573)	(0.209)	(0.0567)	(0.217)
Grandparent	-0.143**	0.275	-0.166**	0.282	-0.146**	0.263
	(0.0702)	(0.238)	(0.0705)	(0.252)	(0.0698)	(0.255)
Uncle and ant	0.0383	0.185	-0.0131	0.207	-0.0449	0.218
	(0.0699)	(0.243)	(0.0701)	(0.258)	(0.0695)	(0.249)
Other relatives	0.307	-0.539	-0.208	-0.310	0.173	-0.469
	(0.241)	(0.755)	(0.241)	(0.851)	(0.239)	(0.744)
Eastern Cape	-0.0585	0.102	-0.0203	0.0847	-0.00751	0.0775
	(0.0358)	(0.115)	(0.0356)	(0.117)	(0.0356)	(0.0986)
Northern Cape	0.0167	-0.506***	-0.00353	-0.496***	-0.0221	-0.491***
	(0.0358)	(0.130)	(0.0356)	(0.110)	(0.0356)	(0.143)
Free State	-0.00813	-0.312**	-0.0281	-0.304**	-0.0453	-0.300**
	(0.0408)	(0.143)	(0.0405)	(0.120)	(0.0405)	(0.139)
KwaZulu-Natal	0.0322	0.127	0.00787	0.137	0.0331	0.128
	(0.0337)	(0.101)	(0.0335)	(0.0919)	(0.0334)	(0.117)
North West	-0.0711*	-0.461***	-0.0868**	-0.454***	-0.0806**	-0.462***
	(0.0402)	(0.131)	(0.0400)	(0.123)	(0.0399)	(0.130)
Gauteng	-0.0234	-0.158	-0.00646	-0.164	0.0304	-0.181
	(0.0361)	(0.113)	(0.0359)	(0.102)	(0.0358)	(0.126)
Mpumalanga	-0.0672*	-0.0770	-0.0255	-0.0973	0.00492	-0.110
	(0.0391)	(0.149)	(0.0388)	(0.121)	(0.0388)	(0.121)
Limpopo	-0.0549	-0.362***	-0.0737**	-0.355***	-0.0389	-0.373***
	(0.0375)	(0.123)	(0.0373)	(0.111)	(0.0372)	(0.117)
Cohabiting	0.0368	-0.175**	-0.00297	-0.163**	-0.0137	-0.154*
	(0.0252)	(0.0749)	(0.0252)	(0.0727)	(0.0250)	(0.0795)

Widow	-0.0642	-0.236*	0.0596	-0.288**	0.100*	-0.300**
	(0.0529)	(0.133)	(0.0530)	(0.114)	(0.0526)	(0.131)
Divorce	-0.0437	0.0901	0.0317	0.0642	0.0835	0.0488
	(0.0662)	(0.173)	(0.0664)	(0.205)	(0.0658)	(0.189)
Single	-0.0989***	-0.0411	0.0271	-0.0968	0.0542***	-0.105
	(0.0190)	(0.0543)	(0.0190)	(0.0602)	(0.0188)	(0.0656)
Poverty status	-0.00708	-0.0157	-0.0343	-0.00751	-0.0101	-0.0117
	(0.0210)	(0.0573)	(0.0212)	(0.0661)	(0.0209)	(0.0659)
Child Support Grant	0.0153	-0.0926*	0.0368**	-0.101*	0.0274*	-0.0972**
	(0.0166)	(0.0504)	(0.0167)	(0.0528)	(0.0166)	(0.0486)
Stratified weight	Yes	Yes	Yes	Yes	Yes	Yes
Wave dummy	Yes	Yes	Yes	Yes	Yes	Yes
Total asset (IV)	0.0318***		0.0357***		0.0335***	
	(0.00491)		(0.00495)		(0.00488)	
Constant	0.564***	-0.570	0.651***	-0.598	0.602***	-0.555
	(0.157)	(0.529)	(0.157)	(0.472)	(0.156)	(0.519)
Observations	3,860	3,385	3,860	3,385	3,860	3,385
Number of id	3,147	2,842	3,147	2,842	3,147	2,842
sigma_u	0.232	0.899	0.207	0.899	0.226	0.899
sigma_e	0.331	0.741	0.347	0.741	0.330	0.741
rho	0.330	0.596	0.263	0.595	0.319	0.596

Standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1; FS means first stage; SS means second stage; WFA denote Weight-for-age; DDHE denotes decision on daily household expenditures; DLUP denotes decision on large, unusual purchases; DWHL denotes decision on where household should live

Table 2E. Weight-for-age (WFA) and women decision-making by categories

	(7)	**(8)**	**(9)**	**(10)**
	FS	SS	FS	SS
Variables	DWLH	WFA	DWCS	WFA
DWLH		0.431*		
		(0.237)		
DWCS				0.389
				(0.262)
First stage residual		-0.571*		-0.398
		(0.298)		(0.315)
Female age	0.0196***	-0.0153**	0.0267***	-0.0169**
	(0.00126)	(0.00681)	(0.00140)	(0.00863)
Child sex	0.00716	-0.121***	-0.0354**	-0.104**
	(0.0136)	(0.0445)	(0.0150)	(0.0440)
Child age	0.000377	-0.130***	0.0147***	-0.136***
	(0.00433)	(0.0124)	(0.00483)	(0.0141)

Primary level	0.0647	-0.327	0.0896	-0.337
	(0.0725)	(0.237)	(0.0803)	(0.240)
Below matric level	-0.0117	-0.0863	0.0776	-0.120
	(0.0681)	(0.212)	(0.0754)	(0.233)
Matric level	-0.0451	0.0818	0.0340	0.0517
	(0.0694)	(0.218)	(0.0768)	(0.228)
Post-matric	-0.0573	0.166	0.0173	0.136
	(0.0698)	(0.215)	(0.0772)	(0.225)
university level	-0.0294	-0.0136	-0.101	0.0258
	(0.0867)	(0.282)	(0.0961)	(0.265)
Other levels of edu.	-0.0777	-0.182	-0.0322	-0.198
	(0.149)	(0.482)	(0.166)	(0.453)
Household size	-0.0318***	-0.00672	-0.0141***	-0.0148
	(0.00265)	(0.0119)	(0.00294)	(0.00924)
Household Income	-0.117***	0.109**	-0.0457***	0.0748
	(0.0133)	(0.0440)	(0.0148)	(0.0495)
Life satisfaction	0.0159	0.0326	-0.00914	0.0415
	(0.0131)	(0.0437)	(0.0147)	(0.0444)
Health status	-0.0562*	0.00835	0.00701	-0.0147
	(0.0306)	(0.111)	(0.0342)	(0.107)
Employment status	0.114***	0.0762	0.0907***	0.0905*
	(0.0156)	(0.0656)	(0.0174)	(0.0492)
Christianity	0.0513*	0.0143	-0.0408	0.0550
	(0.0296)	(0.111)	(0.0332)	(0.0898)
Jewish	-0.132	0.378*	-0.0312	0.322
	(0.129)	(0.223)	(0.144)	(0.243)
Muslim	-0.0138	0.0802	-0.234**	0.157
	(0.100)	(0.466)	(0.112)	(0.522)
Hindu	-0.225*	-0.0389	-0.312**	-0.00548
	(0.132)	(0.328)	(0.147)	(0.342)
Africa traditional	0.0339	-0.0298	-0.0723*	0.0134
	(0.0371)	(0.118)	(0.0416)	(0.107)
Other religion	-0.0281	-0.166	0.0553	-0.201
	(0.0854)	(0.259)	(0.0959)	(0.255)
Dwelling	-0.0321**	0.0767**	-0.0119	0.0684*
	(0.0159)	(0.0356)	(0.0177)	(0.0409)
African	0.0149	0.296***	-0.0210	0.308***
	(0.0279)	(0.0761)	(0.0309)	(0.0877)
Indian	0.00700	-0.174	0.168	-0.245
	(0.108)	(0.278)	(0.120)	(0.305)
White	-0.105	0.335*	-0.0434	0.303
	(0.0985)	(0.192)	(0.109)	(0.258)
Parent	-0.112**	0.220	0.00372	0.164
	(0.0569)	(0.211)	(0.0636)	(0.213)
Grandparent	-0.198***	0.295	-0.130*	0.252
	(0.0700)	(0.222)	(0.0780)	(0.257)
Uncle and ant	-0.0487	0.226	0.0176	0.191
	(0.0696)	(0.229)	(0.0777)	(0.289)
Other relatives	0.162	-0.472	0.0839	-0.444

	(0.240)	(0.713)	(0.267)	(0.745)
Eastern Cape	-0.00671	0.0785	-0.0254	0.0866
	(0.0354)	(0.101)	(0.0392)	(0.101)
Northern Cape	-0.0154	-0.490***	0.0302	-0.512***
	(0.0354)	(0.146)	(0.0392)	(0.119)
Free State	-0.0305	-0.301**	0.0277	-0.325***
	(0.0403)	(0.144)	(0.0445)	(0.115)
KwaZulu-Natal	0.0268	0.130	0.0293	0.130
	(0.0333)	(0.104)	(0.0369)	(0.0924)
North West	-0.0777*	-0.458***	-0.00590	-0.487***
	(0.0398)	(0.121)	(0.0440)	(0.108)
Gauteng	0.0174	-0.175*	0.0510	-0.186*
	(0.0357)	(0.104)	(0.0395)	(0.104)
Mpumalanga	-0.0141	-0.101	-0.0292	-0.0938
	(0.0386)	(0.138)	(0.0428)	(0.114)
Limpopo	-0.0425	-0.368***	0.0313	-0.396***
	(0.0371)	(0.100)	(0.0410)	(0.102)
Cohabiting	-0.00191	-0.159**	-0.0227	-0.149**
	(0.0251)	(0.0712)	(0.0279)	(0.0739)
Widow	0.0770	-0.298**	0.0362	-0.274**
	(0.0526)	(0.144)	(0.0585)	(0.139)
Divorce	0.0345	0.0613	0.0804	0.0408
	(0.0659)	(0.182)	(0.0735)	(0.179)
Single	0.0551***	-0.108*	0.0146	-0.0953
	(0.0188)	(0.0619)	(0.0210)	(0.0615)
Poverty status	-0.0290	-0.00467	-0.0225	-0.0104
	(0.0210)	(0.0517)	(0.0235)	(0.0703)
Child Support Grant	0.0250	-0.0971*	0.0751***	-0.118**
	(0.0166)	(0.0549)	(0.0185)	(0.0488)
Stratified weight	Yes	Yes	Yes	Yes
Wave dummy	Yes	Yes	Yes	Yes
Total asset (IV)	0.0333***		0.0252***	
	(0.00491)		(0.00549)	
Constant	0.682***	-0.621	-0.191	-0.204
	(0.156)	(0.528)	(0.174)	(0.498)
Observations	3,860	3,385	3,860	3,385
Number of id	3,147	2,842	3,147	2,842
sigma_u	0.211	0.899	0.209	0.900
sigma_e	0.341	0.741	0.395	0.739
rho	0.277	0.595	0.218	0.597

Standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1; FS means first stage; SS means second stage; WFA denote Weight-for-age; DWLH denotes decision on who lives in a household; DWCS denotes decision on where the child goes to school

Table 3E. Weight-for-height (WFH) and women decision-making by categories

	(1)	(2)	(3)	(4)	(5)
	SS	SS	SS	SS	SS
Variables	WFH	WFH	WFH	WFH	WFH
DDHE	0.586***				
	(0.211)				
DLUP		0.676***			
		(0.237)			
DWHL			0.445*		
			(0.258)		
DWLH				0.435	
				(0.311)	
DWCS					0.486
					(0.308)
First stage residual	-0.639**	-0.841***	-0.528	-0.510	(0.308)
	(0.309)	(0.305)	(0.361)	(0.418)	-0.515
Female age	-0.0203***	-0.0214***	-0.0151**	-0.0155*	-0.0198*
	(0.00736)	(0.00829)	(0.00647)	(0.00869)	(0.0105)
Child sex	0.0290	0.0373	0.0246	0.0214	0.0406
	(0.0504)	(0.0524)	(0.0386)	(0.0548)	(0.0476)
Child age	-0.0992***	-0.0994***	-0.0974***	-0.0983***	-0.106***
	(0.0203)	(0.0210)	(0.0196)	(0.0157)	(0.0173)
Primary level	-0.223	-0.243	-0.216	-0.205	-0.223
	(0.282)	(0.360)	(0.405)	(0.373)	(0.307)
Below matric level	-0.0784	-0.0867	-0.0506	-0.0440	-0.0861
	(0.262)	(0.355)	(0.381)	(0.337)	(0.280)
Matric level	0.0642	0.0636	0.0927	0.102	0.0678
	(0.284)	(0.363)	(0.383)	(0.327)	(0.298)
Post-matric	0.0517	0.0523	0.0685	0.0754	0.0444
	(0.268)	(0.371)	(0.388)	(0.327)	(0.298)
university level	-0.103	-0.112	-0.0866	-0.0657	-0.0228
	(0.299)	(0.413)	(0.398)	(0.347)	(0.340)
Other levels of edu.	-0.221	-0.205	-0.309	-0.293	-0.306
	(0.519)	(0.416)	(0.548)	(0.450)	(0.533)
Household size	-0.000654	-0.00231	-0.00982	-0.0110	-0.0176*
	(0.0132)	(0.0125)	(0.0128)	(0.0131)	(0.0107)
Household Income	0.129**	0.155***	0.123**	0.127*	0.0960**
	(0.0538)	(0.0541)	(0.0481)	(0.0692)	(0.0463)
Life satisfaction	0.0806*	0.0835**	0.0704*	0.0691	0.0795*
	(0.0441)	(0.0337)	(0.0375)	(0.0466)	(0.0422)
Health status	0.129	0.133	0.151	0.156	0.132
	(0.0868)	(0.119)	(0.129)	(0.116)	(0.124)
Employment status	0.0390	0.0205	0.0648	0.0658	0.0703
	(0.0626)	(0.0716)	(0.0614)	(0.0630)	(0.0535)
Christianity	0.222**	0.220**	0.219**	0.209	0.253**
	(0.0933)	(0.112)	(0.105)	(0.136)	(0.124)
Jewish	1.048*	1.066**	0.982**	1.047***	1.004**

	(0.587)	(0.426)	(0.425)	(0.388)	(0.450)
Muslim	-0.161	-0.158	-0.112	-0.145	-0.0474
	(0.356)	(0.370)	(0.305)	(0.289)	(0.341)
Hindu	0.0698	0.0486	-0.0249	-0.00527	0.0505
	(0.417)	(0.425)	(0.382)	(0.467)	(0.362)
Africa traditional	0.196	0.209	0.212*	0.205	0.253*
	(0.125)	(0.145)	(0.127)	(0.136)	(0.136)
Other religion	-0.0645	-0.0723	0.00212	-0.0225	-0.0534
	(0.346)	(0.369)	(0.417)	(0.323)	(0.268)
Dwelling	-0.0505	-0.0459	-0.0423	-0.0442	-0.0518
	(0.0670)	(0.0404)	(0.0470)	(0.0616)	(0.0582)
African	0.300***	0.318***	0.333***	0.326***	0.344***
	(0.0998)	(0.100)	(0.110)	(0.116)	(0.104)
Indian	-0.339	-0.262	-0.239	-0.262	-0.340
	(0.338)	(0.256)	(0.313)	(0.383)	(0.305)
White	-0.110	-0.113	-0.130	-0.133	-0.160
	(0.325)	(0.319)	(0.266)	(0.323)	(0.318)
Parent	0.0729	0.0849	0.0586	0.0645	0.0158
	(0.330)	(0.264)	(0.337)	(0.323)	(0.299)
Grandparent	0.0338	0.0601	0.00991	0.0324	0.0105
	(0.363)	(0.241)	(0.382)	(0.332)	(0.322)
Uncle and ant	0.0618	0.0966	0.106	0.111	0.0805
	(0.344)	(0.314)	(0.393)	(0.362)	(0.332)
Other relatives	-0.865	-0.528	-0.759	-0.758	-0.739
	(0.676)	(0.585)	(0.685)	(0.672)	(0.550)
Eastern Cape	0.377***	0.351***	0.345**	0.344***	0.354***
	(0.128)	(0.106)	(0.136)	(0.121)	(0.108)
Northern Cape	-0.542***	-0.529***	-0.522***	-0.525***	-0.548***
	(0.145)	(0.108)	(0.155)	(0.132)	(0.131)
Free State	-0.0241	-0.00846	-0.00728	-0.0131	-0.0382
	(0.150)	(0.133)	(0.183)	(0.152)	(0.153)
KwaZulu-Natal	0.316**	0.328***	0.319**	0.322**	0.319***
	(0.133)	(0.0978)	(0.143)	(0.131)	(0.116)
North West	-0.353**	-0.338**	-0.357**	-0.357**	-0.389***
	(0.149)	(0.143)	(0.175)	(0.163)	(0.133)
Gauteng	-0.130	-0.141	-0.158	-0.152	-0.168
	(0.151)	(0.113)	(0.163)	(0.130)	(0.136)
Mpumalanga	0.00870	-0.0189	-0.0305	-0.0217	-0.0142
	(0.149)	(0.122)	(0.125)	(0.127)	(0.124)
Limpopo	-0.218	-0.204*	-0.231*	-0.230	-0.263**
	(0.152)	(0.118)	(0.134)	(0.158)	(0.115)
Cohabiting	-0.104	-0.0844	-0.0797	-0.0846	-0.0721
	(0.0977)	(0.105)	(0.115)	(0.0732)	(0.0909)
Widow	0.0209	-0.0547	-0.0605	-0.0513	-0.0330
	(0.191)	(0.164)	(0.215)	(0.162)	(0.150)
Divorce	-0.0469	-0.0848	-0.0996	-0.0847	-0.107
	(0.272)	(0.244)	(0.259)	(0.247)	(0.258)
Single	0.0217	-0.0523	-0.0633	-0.0630	-0.0502
	(0.0557)	(0.0622)	(0.0669)	(0.0619)	(0.0657)

Poverty status	0.0796	0.0957	0.0819	0.0883	0.0837
	(0.0937)	(0.0748)	(0.0903)	(0.0789)	(0.0748)
Child Sup. Grant	-0.0749	-0.0867	-0.0794	-0.0788	-0.106
	(0.0734)	(0.0615)	(0.0514)	(0.0689)	(0.0703)
Stratified weight	Yes	Yes	Yes	Yes	Yes
Wave dummy	Yes	Yes	Yes	Yes	Yes
Constant	-0.589	-0.714	-0.527	-0.541	-0.123
	(0.693)	(0.642)	(0.568)	(0.781)	(0.543)
Observations	3,041	3,041	3,041	3,041	3,041
Number of id	2,582	2,582	2,582	2,582	2,582
sigma_u	0.680	0.682	0.682	0.683	0.683
sigma_e	1.036	1.036	1.035	1.035	1.035
rho	0.301	0.303	0.303	0.303	0.303

Standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1; FS means first stage; SS means second stage; WFH denote Weight-for-height; FS from Table 1C and 2C are applicable

Table 4E. Height-for-age (HFA) and Women decision-making by categories

	(1)	**(2)**	**(3)**	**(4)**	**(5)**
	SS	SS	SS	SS	SS
Variables	HFA	HFA	HFA	HFA	HFA
DDHE	0.272				
	(0.238)				
DLUP		0.313			
		(0.289)			
DWHL			0.382*		
			(0.230)		
DWLH				0.423*	
				(0.236)	
DWCS					0.577*
					(0.339)
First stage residual	-0.427	-0.487	-0.550*	-0.612*	-0.703*
	(0.343)	(0.357)	(0.319)	(0.318)	(0.419)
Female age	-0.0114*	-0.0120*	-0.0126**	-0.0141**	-0.0212*
	(0.00668)	(0.00723)	(0.00580)	(0.00595)	(0.0115)
Child sex	-0.192***	-0.188***	-0.193***	-0.196***	-0.173***
	(0.0424)	(0.0482)	(0.0468)	(0.0452)	(0.0470)
Child age	-0.0141	-0.0139	-0.0128	-0.0136	-0.0223
	(0.0236)	(0.0144)	(0.0179)	(0.0182)	(0.0149)
Primary level	-0.211	-0.223	-0.224	-0.219	-0.248
	(0.264)	(0.262)	(0.247)	(0.274)	(0.273)
Below matric level	-0.151	-0.157	-0.141	-0.137	-0.188
	(0.271)	(0.254)	(0.250)	(0.253)	(0.229)
Matric level	0.0185	0.0152	0.0303	0.0388	-0.000735

	(0.264)	(0.275)	(0.254)	(0.294)	(0.241)
Post-matric	0.116	0.115	0.127	0.133	0.0978
	(0.271)	(0.254)	(0.243)	(0.287)	(0.232)
university level	-0.0964	-0.100	-0.105	-0.0909	-0.0406
	(0.320)	(0.315)	(0.300)	(0.353)	(0.314)
Other levels of edu.	-0.0227	-0.0227	-0.0576	-0.0410	-0.0522
	(0.403)	(0.372)	(0.432)	(0.365)	(0.477)
Household size	-0.00879	-0.00942	-0.00700	-0.00624	-0.0110
	(0.0125)	(0.0151)	(0.0120)	(0.0124)	(0.0122)
Household Income	0.126***	0.138**	0.143***	0.150**	0.124**
	(0.0473)	(0.0660)	(0.0486)	(0.0662)	(0.0603)
Life satisfaction	0.0819*	0.0822*	0.0746	0.0734	0.0848**
	(0.0492)	(0.0458)	(0.0553)	(0.0597)	(0.0425)
Health status	0.0559	0.0604	0.0727	0.0804	0.0532
	(0.106)	(0.0920)	(0.109)	(0.107)	(0.102)
Employment status	0.0119	0.00372	0.00243	-0.00263	-0.00859
	(0.0657)	(0.0709)	(0.0813)	(0.0692)	(0.0724)
Christianity	-0.242*	-0.244**	-0.251**	-0.262**	-0.218**
	(0.133)	(0.118)	(0.116)	(0.115)	(0.103)
Jewish	-0.0347	-0.0364	-0.0908	-0.0120	-0.0701
	(0.261)	(0.271)	(0.320)	(0.270)	(0.302)
Muslim	0.440	0.437	0.474	0.447	0.560
	(0.330)	(0.432)	(0.501)	(0.367)	(0.367)
Hindu	0.0798	0.0669	0.0552	0.0845	0.172
	(0.533)	(0.445)	(0.551)	(0.483)	(0.595)
Africa traditional	-0.370**	-0.365**	-0.368***	-0.374***	-0.322***
	(0.161)	(0.165)	(0.136)	(0.127)	(0.122)
Other religion	-0.405	-0.402	-0.359	-0.373	-0.420
	(0.343)	(0.279)	(0.364)	(0.275)	(0.295)
Dwelling	0.163***	0.165***	0.172***	0.172***	0.165***
	(0.0527)	(0.0599)	(0.0511)	(0.0578)	(0.0562)
African	0.0631	0.0721	0.0819	0.0742	0.0915
	(0.126)	(0.106)	(0.104)	(0.117)	(0.133)
Indian	-0.252	-0.217	-0.198	-0.215	-0.311
	(0.398)	(0.339)	(0.340)	(0.386)	(0.434)
White	0.517*	0.525*	0.524**	0.536**	0.506*
	(0.283)	(0.315)	(0.235)	(0.255)	(0.270)
Parent	0.110	0.111	0.120	0.130	0.0782
	(0.400)	(0.313)	(0.326)	(0.326)	(0.359)
Grandparent	0.256	0.264	0.270	0.298	0.285
	(0.450)	(0.357)	(0.352)	(0.386)	(0.373)
Uncle and ant	0.112	0.124	0.139	0.145	0.110
	(0.430)	(0.321)	(0.360)	(0.300)	(0.378)
Other relatives	-0.166	-0.0200	-0.150	-0.153	-0.138
	(0.988)	(1.013)	(0.927)	(0.789)	(0.934)
Eastern Cape	-0.108	-0.120	-0.124	-0.124	-0.110
	(0.147)	(0.137)	(0.152)	(0.132)	(0.127)
Northern Cape	-0.110	-0.105	-0.0966	-0.0977	-0.123

	(0.144)	(0.161)	(0.143)	(0.130)	(0.154)
Free State	-0.283	-0.278*	-0.270	-0.272	-0.299*
	(0.178)	(0.156)	(0.185)	(0.185)	(0.160)
KwaZulu-Natal	-0.0240	-0.0184	-0.0292	-0.0273	-0.0319
	(0.145)	(0.130)	(0.153)	(0.137)	(0.140)
North West	-0.143	-0.136	-0.135	-0.132	-0.162
	(0.170)	(0.176)	(0.179)	(0.155)	(0.150)
Gauteng	0.0251	0.0210	0.00484	0.00986	-0.0115
	(0.144)	(0.149)	(0.153)	(0.155)	(0.128)
Mpumalanga	0.0452	0.0327	0.0203	0.0285	0.0391
	(0.134)	(0.133)	(0.161)	(0.153)	(0.124)
Limpopo	-0.255*	-0.249*	-0.259	-0.256	-0.290**
	(0.154)	(0.139)	(0.158)	(0.159)	(0.136)
Cohabiting	-0.188	-0.180*	-0.171**	-0.175**	-0.161**
	(0.120)	(0.0956)	(0.0810)	(0.0860)	(0.0788)
Widow	-0.405**	-0.440**	-0.460***	-0.456**	-0.439**
	(0.206)	(0.191)	(0.171)	(0.206)	(0.190)
Divorce	0.173	0.157	0.140	0.152	0.121
	(0.198)	(0.173)	(0.189)	(0.204)	(0.150)
Single	-0.0926	-0.127	-0.137**	-0.139**	-0.128**
	(0.0583)	(0.0848)	(0.0632)	(0.0653)	(0.0527)
Poverty status	0.00525	0.0124	0.0117	0.0181	0.0155
	(0.0567)	(0.0861)	(0.0756)	(0.0864)	(0.0694)
Child Sup. Grant	-0.129**	-0.135**	-0.134**	-0.134*	-0.167**
	(0.0604)	(0.0681)	(0.0629)	(0.0725)	(0.0772)
Stratified weight	1.54e-06	2.03e-06	1.10e-06	1.58e-06	3.23e-06
	(1.43e-05)	(1.51e-05)	(1.24e-05)	(1.45e-05)	(1.43e-05)
Wave dummy	-0.00255	-0.0106	-0.0147	-0.0152	-0.00340
	(0.0450)	(0.0575)	(0.0508)	(0.0443)	(0.0397)
Constant	-1.531**	-1.579**	-1.655**	-1.705**	-1.276
	(0.712)	(0.766)	(0.685)	(0.818)	(0.785)
Observations	3,313	3,313	3,313	3,313	3,313
Number of id	2,800	2,800	2,800	2,800	2,800
sigma_u	0.890	0.890	0.891	0.890	0.889
sigma_e	1.046	1.046	1.046	1.046	1.046
rho	0.420	0.420	0.420	0.420	0.420

Standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1; FS means first stage; SS means second stage
HFA denote height-for-age; FS from Table 1C and 2C are applicable

Author Statement

(Dr. Olanrewaju Adewole Adediran) confirm sole responsibility for the study conception and design, data collection, analysis and interpretation of results, and manuscript preparation.

Highlights

- Studies on the causal effects of women's decision-making on children's nutrition in South Africa are rare.
- A control function analysis controlled for the endogeneity issue and found that women's decision-making significantly influenced the nutritional outcomes of their children.
- The study used an alternative outcome and a predicted residual for the falsification test and the exclusion restriction was satisfied.
- While women's decision-making contributed to improving short-run anthropometric measurements of child nutrition (weight-for-age and weight-for-height), the effect of women's decision-making on long-run anthropometric measurements of child nutrition (height-for-age) was inconclusive.
- Policies are required to address gender inequality and women's empowerment to improve child nutritional outcomes.