COVID-19 and its Impacts on Childhood Malnutrition and Nutrition-related Mortality

Virtual Seminar | September 23, 2020

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Economic Shocks and Child Wasting

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Introduction

- Although macroeconomic volatility is common in LMICs, C19 crisis is exceptional, largely because of C19 prevention measures
- IFPRI studies show that these measures can shrink economies by 20-40% during stringent lockdown periods
- As a result, projections of economic growth for 2020 have progressively gotten worse as the pandemic has worn on.
- June: World Bank estimated 90% of LMICs economies will shrink
- July: IFPRI global general equilibrium model estimates that 140 million people will fall into $1.90/day poverty in 2020
- August: ADB revised India’s forecast down to -10%

Introduction

- Young children are typically immune to direct effects of C19, but are very vulnerable to economic & health system disruptions
- In the short term, nutritional insults often manifest in the form of acute weight loss or wasting
- Wasting usually the result of severe reductions in food intake and/or recent or repeated episodes of infectious diseases
- Infants and young children at greatest risk of wasting – and of mortality due to wasting – because of immature immune system and their high nutrient requirements for growth and development.
- Wasting less prevalent than stunting, but a stronger predictor of child mortality.
- Pooled analysis of 10 prospective cohort studies estimated that severe wasting had a hazard ratio of 11.6 compared to 5.5 for severe stunting

Introduction

- Despite the serious health risks of wasting, the underlying economic causes of wasting are under-researched
- Many studies linking longer term economic growth to stunting, or examine the impacts of economic shocks on child mortality
  - Mortality studies often hypothesis poor nutrition as a mechanism, but rarely explore this mechanism empirically
- Moreover, while LMICs have made progress against stunting, progress in reducing wasting is uneven at best
- Globally, around 50 million under-5 children were wasted in 2019*
- Vast majority of wasted children reside in South Asia and sub-Saharan Africa, particularly Sahel, Horn of Africa
- Wasting in India was 20% in 2015-16 and India has close to half of the world's wasted children

Introduction

- In this study we explore the impacts of short-term economic growth and contraction on the risks of child wasting using historical data
- One motivation was to project impacts of C19 economic crisis on wasting, and then on mortality
  - sub-study as part of the ‘Standing Together for Nutrition’ consortium formed to provide evidence on C19’s impact on undernutrition and mortality
- To do so we use 177 Demographic Health Surveys (DHS) with data on 1.256 million children in 52 LMICs over 1990-2018
- Link child/household DHS data to national level macroeconomic estimates of Gross National Income per capita (hereafter GNI).
- With some modifications we follow the empirical strategies of previous papers to rule out a range of confounding factors
- We also explore mechanisms, by looking at short run economic growth and child diets and disease, as well as maternal BMI

Data and methods

- Our dataset comprises 177 DHS rounds that collected data on for children 0-59 months in 52 LMICs between 1990 and 2018
  - DHS has excellent coverage of sub-Saharan Africa and South Asia, the two regions with the highest rates of wasting, but under-represents South-East Asia Even so, the surveys are representative of approximately 400 million under-5s

Outcome variables

- We defined 3 standard measures of wasting: any wasting (WHZ<-1), moderate/severe wasting (WHZ<-2); severe wasting (WHZ<-3).
- Our key explanatory variable is lagged annual change in GNI from UN

Key Explanatory variable

We used the lagged GNI growth in wasting regressions for two reasons.

1. Lag ensures that growth shocks always precede measurement of wasting
2. When faced with major income shocks households can use various coping mechanisms to protect child nutrition, causing delayed effects

Data and methods

- Other control variables include:
  - Asset ownership
  - Maternal education
  - Maternal and child health care (ANC, medical facility births, vaccinations)
  - improved sanitation and water supplies
  - Demographics: teenage births, fertility, child sex and rural location.
- We also controlled for two national-level confounders:
  - climate, 1-year lag of total annual rainfall and average temperature
  - conflict, captured by battle-related deaths per 100,000 people
- Finally, we used several other indicators to explore mechanisms:
  - Morbidity symptoms: DHS measure of whether a child was reported to have had diarrhea or fever in past 2 weeks.
  - Diets: minimum dietary diversity (MDD): 4 or more of foods in past 24 hrs
  - Maternal nutrition: Whether mother had BMI<18.5

Data and methods

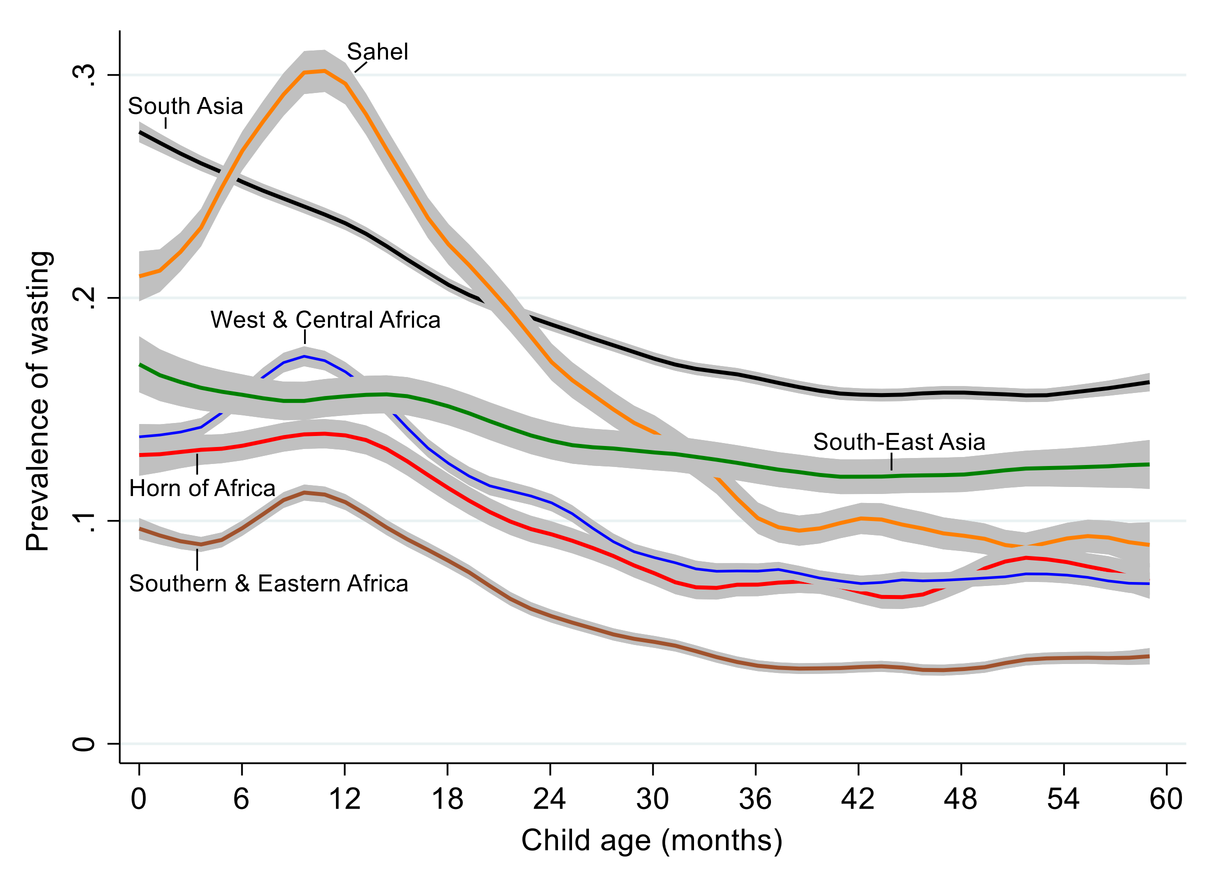
- We use weighted linear probability models to test GNI effects
- Weighting is important for several reasons:
  - DHS samples are unbalanced: weights needed for survey representation
  - DHS rounds within countries are unbalanced: weights needed to attach equal importance to each round within a country
  - DHS country populations are unbalanced (India vs Comoros): weights needed to balance across countries
- Without weighting GNIpc growth coefficient would remain implicitly weighted by number of observations in each survey
- To address this, we construct a three-step weighting metric
  1. Population data on 0-5y children to create a country-level population weight
  2. Re-weight observations within a country's DHS rounds to correct for imbalances in sample sizes.
  3. Apply DHS weights to make each DHS survey nationally representative

Data and methods

- Linear probability models interact lagged GNI shocks with each country’s average wasting prevalence to model effect of GNI as proportional: i.e. cab be interpreted as a wasting-growth elasticity
- This is biologically appropriate and mathematically appropriate:
  - countries with more wasting should have larger absolute changes in wasting
- Linear probability models also controls for other confounders:
  - Country fixed effects (climate, genetics, etc)
  - Regional wasting trends
  - Regional seasonality in wasting (e.g. Sahel, Horn of Africa, West Africa, etc)
  - Age-specific wasting trends (wasting may have different etiologies in different regions: e.g. more low birthweight in Asia)
- Finally, we test sensitivity to specifications, age ranges and rural/urban location – but not much sensitivity

Results

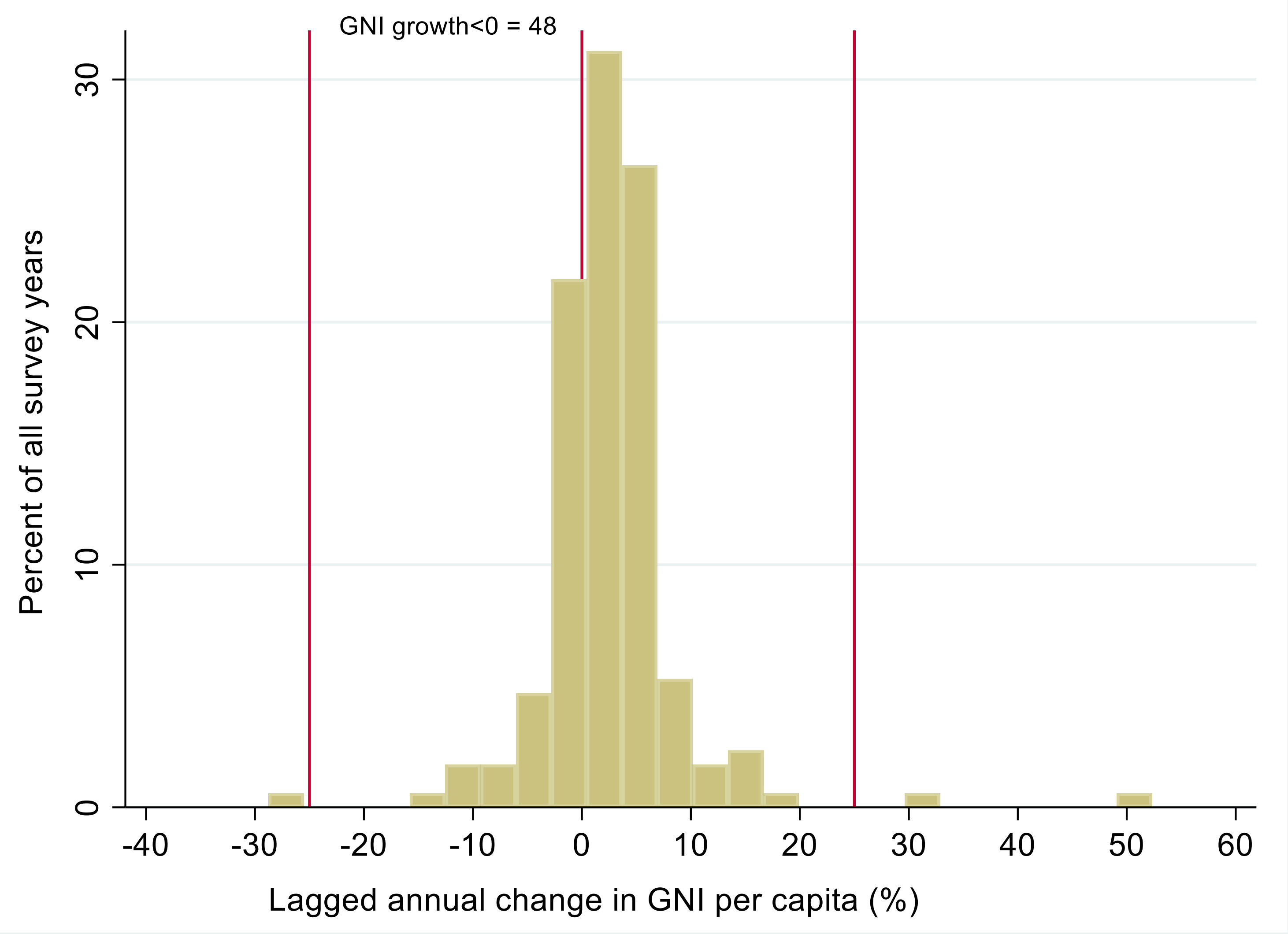
Figure 2. Local polynomial estimates of moderate/severe wasting (WHZ< -2) prevalence against child age for various regions in Asia and sub-Saharan Africa



Source: Authors' estimates from DHS data using the *lpolyci* command in STATA™. Sample sizes are as follows: South Asia = 402990; South-East Asia = 27,614; Sahel = 80,717; West and Central Africa = 248,204; Horn of Africa = 68,608; Southern and Eastern Africa = 228,818.

Results: Descriptives

Figure A1. A histogram of lagged annual changes in GNI across 177 surveys covering 1990-2018



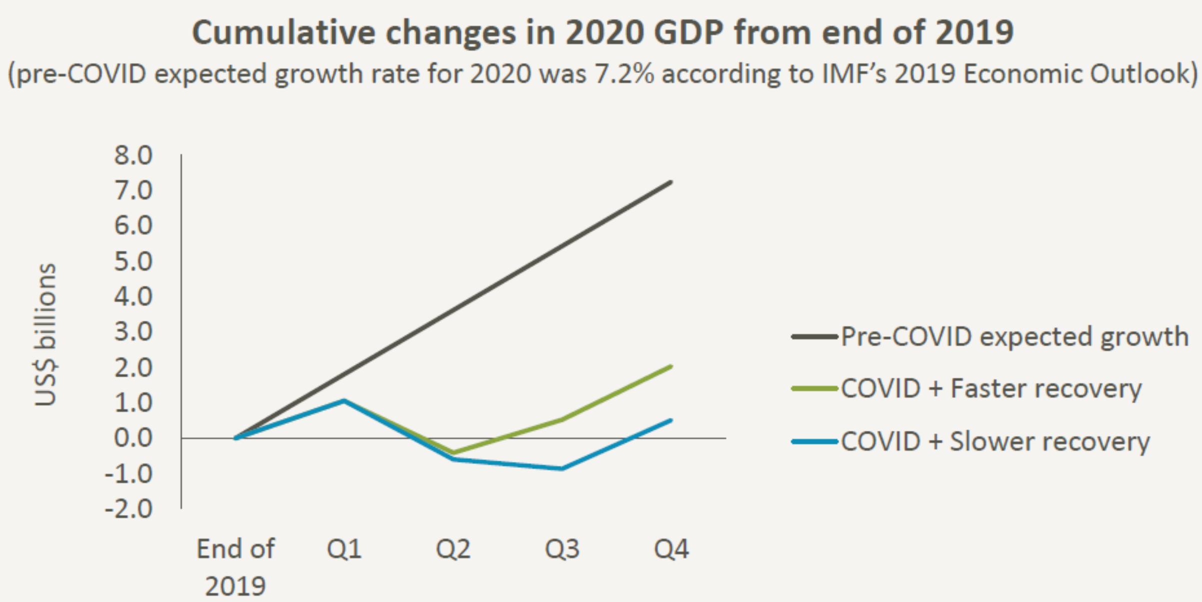
Results

- Elasticity of wasting with respect to economic growth is negative and significant for all three cut-off levels of wasting
- Magnitudes are also large: a 10% contraction in GNI could increase moderate or severe wasting prevalence by 14%
- In India alone the model suggests a 10% contraction would increase the number of wasted children by 4 million, including 2.5 million moderate/severe wasted

	(1)	(2)	(3)
	N=1,256,076	N=1,256,076	N=1,256,076
	Any wasting (WHZ < -1)	Moderate/severe (WHZ < -2)	Severe wasting (WHZ < -3)
Growth elasticity ($w.g^n$)	-0.071***	-0.144***	-0.222***
	(-0.092, -0.050)	(-0.185, -0.103)	(-0.293, -0.151)
R-squared	0.119	0.068	0.033

Results: Model predictions for Ethiopia

- What do these results imply for Ethiopia?
- IFPRI study found the following (Aragie et al. 2020):
  - GDP is estimated to fall by 14% during 7-week period of COVID-related restrictions
  - Incomes expected to decline by 14%, but 19% in urban areas, during C19 restrictions
  - Poverty rate expected to have increased by 9 percentage points
  - Food system mainly affected by declining food services & exports
  - Relative to no-COVID, GDP expected to decrease by -4.8% to -6.2%



Results: Model predictions for Ethiopia

- We apply these elasticities to Ethiopia to estimate additional wasted children due to COVID19, by comparing to 2020 GNI estimates without COVID19:
  - 5.5% decline in GNI in 2020 (average of pessimistic & economic predictions)
- Prior to C19, just under one third of u5 children had any wasting (5.34 million) while just over 10% (1.7 million) had moderate/severe wasting
- In % terms the changes are modest, but because Ethiopia has such a large population of u5 children, absolute numbers are large:
  - 134,000 moderately or severely wasted

		Specific categories of wasting		
	Any wasting (WHZ<-1)	Mild wasting (-2<WHZ<-1)	Moderate wasting (-3<WHZ<-2)	Severe wasting (WHZ<-3)
Pre-COVID19 wasting prevalence	31.80%	21.68%	7.04%	3.09%
Pre-COVID wasting numbers	5,340,478	3,640,290	1,181,447	518,741
Change due to 10% decline in GNI	1.24%	0.44%	0.42%	0.38%
Post-COVID wasting prevalence	33.05%	22.12%	7.46%	3.47%
Newly wasted Ethiopian children	***208,546***	***73,891***	***71,317***	***63,338***

Results: Model predictions for Ethiopia

Of course, there are lots of caveats to these projections:

- Urban populations more economically affected, but less wasting to begin with
- However, rural populations affected by locusts & agro-climatic shocks
- Projections are from a global model, not an Ethiopia-specific model
- Projections do not factor in additional health service disruptions due to either supply disruptions or demand disruptions (fear of contagion)
- Projections do not factor in protective or preventative actions
    - Social safety nets like PSNP
    - Prevention and treatment of severe acute malnutrition
    - C19 response measures

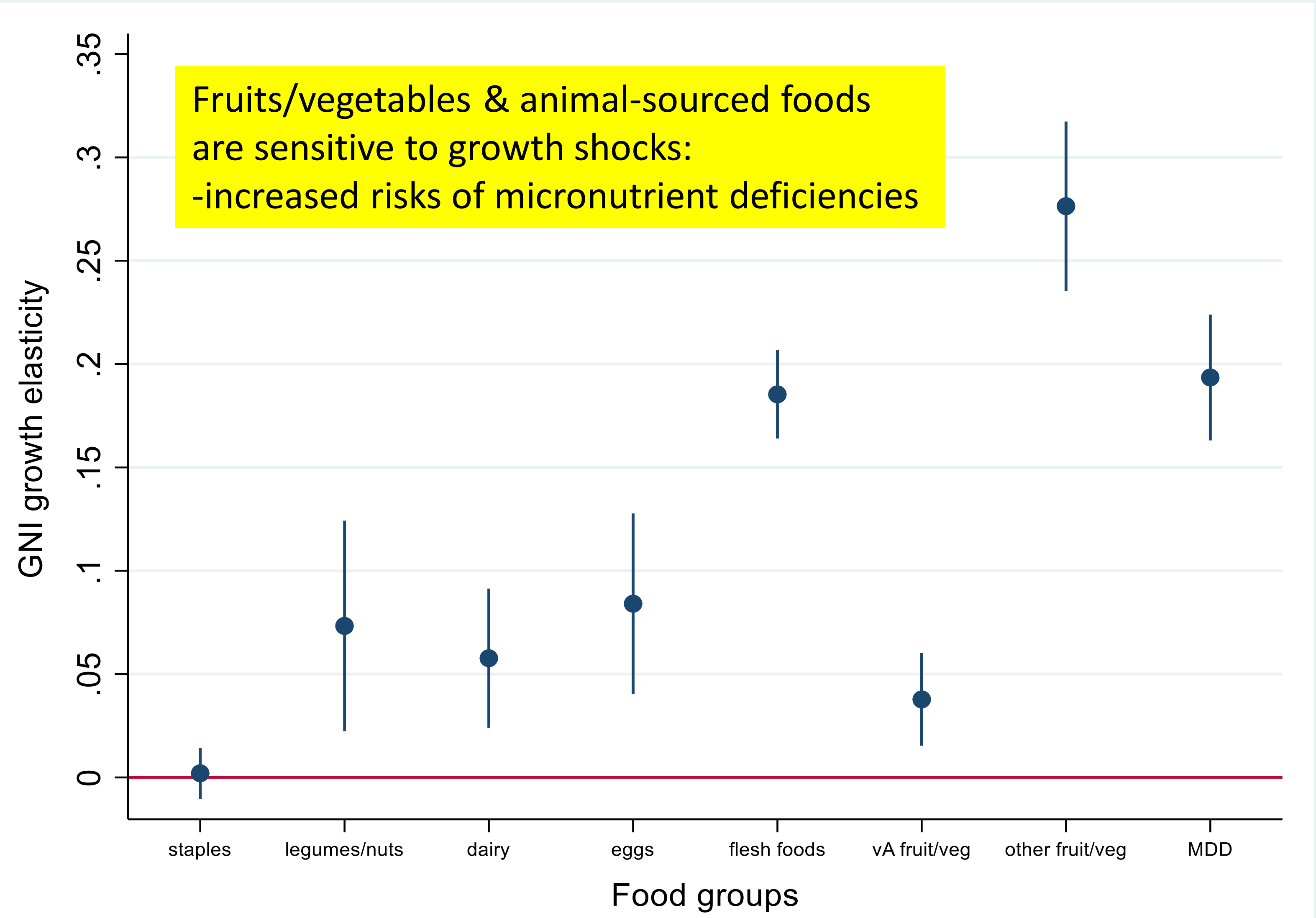
Results: mechanisms

- Results made more plausible by establishing mechanisms: poor diets, disease and poor maternal nutrition (which may affect birthweight especially)
- Growth shocks predict large same-year increased risks for all four measures
- Results are especially large for child minimum dietary diversity
- Dietary results consistent with household survey data evidence on C19 impacts

	(1)	(2)	(3)	(4)
	N=1,230,393	N=1,230,393	N=884,436	N=323,014
Dependent variable	Child diarrhea in past 2 weeks	Child fever-only in past 2 weeks	Maternal low BMI	Child minimum diet diversity
Age range	0-59m	0-59m	15-49 years	6-35m
Growth elasticity	-0.073***	-0.071***	-0.087***	0.194***
	(-0.101, -0.046)	(-0.104, -0.039)	(-0.126, -0.047)	(0.157, 0.230)
R-squared	0.063	0.065	0.164	0.156

Results: mechanisms

Figure A4. The elasticity of child food consumption with respect to GNI growth



Discussion: limitations

Important to understand **limitations of this study**:

1. Historical data: extrapolations to C19 situation are tricky:
   - C19 Health system disruptions
   - C10 Food system disruptions
   - Lots of altered C19 behaviors on food and health, labor markets, etc
2. We don't model government responses
   - Historical data includes observations with weak government SAM responses
3. We model average impacts across countries
   - Some countries may have more/less resilience to economic shocks
4. Difficult to distinguish between negative & positive growth shocks
   - No differences in our data, but we study relative few negative shocks
5. Point estimates of impacts are relatively imprecise: uncertainty
6. GNI is not the best measure of impacts on households

Discussion

- Wasting seems to be highly sensitive to recent growth shocks
- In a Lancet commentary we used economic growth projections from April (IFPRI) to estimate that COVID19 would increase the number of wasted children by **6.7 million** compared to a 2020 without C19
- The same Lancet study also shows that health service disruptions also have major effects on child mortality
- Government face difficult choices with tradeoffs between C19 prevention measures and economic growth, at least in short run
- Critical to protect children with :
  - Nutrition-sensitive social protection at unprecedented scale
  - Expanded programs to prevent and treat severe acute malnutrition
  - Policy emphasis on continuing safe maternal and child health care services
  - Expanded micronutrient supplementation programs

Discussion

- Very important role for M&E in C19 crisis, including phone surveys
  - *How are incomes and employment changing month to month?*
  - *How is household, maternal and child dietary diversity changing?*
  - *How is food insecurity changing?*
  - *What disruptions have been taking place in health systems?*
  - *Which populations are feeling the worst impacts?*
  - *How are other shocks affecting income, livelihoods and nutrition?*
  - *How effective is the targeting of social protection and emergency response measures? How effective are these measures at improving welfare.*
  - *What do nutrition surveillance systems tell us about trends in health-seeking behaviours and need for treatment?*
- IFPRI and others are implementing phone surveys
- These should be continued and triangulated with other measures, especially with ongoing risks of second waves of C19

Thank you!

Further readings available online (open access):

- Headey, D., Ruel, M., 2020. Economic shocks and child wasting. IFPRI Discussion paper No. 01941.
- Headey, D., et al., 2020. Impacts of COVID-19 on childhood malnutrition and nutrition-related mortality, The Lancet. **396**, 519-521.
- Headey, D., Ruel, M., 2020.
  - COVID-19: The virus will mostly spare young children; the economic crisis will not: Pandemic poses risk of rising child malnutrition and mortality
  - The COVID-19 nutrition crisis: What to expect and how to protect. IFPRI blog.

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MORE INFO

NIPN: www.nipn.ephi.gov.et

FSP: www.foodsecurityportal.org

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