

Food Insecurity and Self-Reported Cholera in Haitian Households

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An Analysis of the 2012 Demographic and Health Survey

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Background

- ❑ **Food insecurity**
 - ❑ A persistent lack of access to food in adequate quantity or quality
 - ❑ Associated with
 - ❑ Increased risk of death¹
 - ❑ Poor health outcomes in variety of conditions including HIV, cardiovascular disease^{2,3}
 - ❑ Relationship between food insecurity and health outcomes is bi-directional³
 - ❑ Malnutrition pathways
 - ❑ Behavioral pathways
 - ❑ Mental health pathways
- ❑ **Cholera**
 - ❑ Major cause of morbidity and mortality worldwide
 - ❑ Now endemic in Haiti since inadvertent introduction in 2010
- ❑ Cholera outbreaks and food insecurity tend to occur in impoverished communities where poor access to food, inadequate sanitation, unsafe water supply often co-exist
 - ❑ The relationship between the two has not been well-studied
 - ❑ We recently found food insecurity and cholera risk to be independently associated in HIV-affected households⁴
 - ❑ However, food insecurity and HIV-related outcomes are closely linked

Goal of Study

Explore the relationship between risk of cholera and food insecurity in a general population using data from the 2012 Demographic and Health Survey (DHS) in Haiti

Methods

- ❑ **Data**
 - ❑ Secondary analysis of 2012 DHS in Haiti⁵
 - ❑ Nationally and sub-nationally representative cross-sectional household survey
 - ❑ Two-stage cluster sampling design
 - ❑ Systematic sampling
 - ❑ Primary survey respondent: female head of household
 - ❑ **Outcomes** (cholera)
 - ❑ Self-reported episodes of cholera in the household since 2010
 - ❑ Self-reported deaths from cholera in the household since 2010
 - ❑ **Exposure** (food insecurity)
 - ❑ Household Hunger Scale⁶
 - ❑ Validated subset of three items from the Household Food Insecurity Access Scale (HFIAS)
 - ❑ Culturally invariant
 - ❑ Classifies food security into three categories:
 - ❑ Little to no hunger in household
 - ❑ Moderate hunger in household
 - ❑ Severe hunger in household
- ❑ **Analysis**
 - ❑ Multivariable logistic regression
 - ❑ Association between food security and
 - ❑ Reported history of cholera by any person in household
 - ❑ Reported death from cholera by any person in household (among households with 1+ case)
 - ❑ Included covariates correlating with outcome and exposure with p<0.2
 - ❑ Survey commands to apply sampling weights and account for clustering and stratification

Results

Table 1. Household characteristics

		Reported History of Cholera in Household	No Reported History of Cholera in Household	p-value ⁹
		Weighted N=2104 ⁹	Weighted N=11077 ⁹	
Rural		1503 (71.4)	6264 (56.6)	<.0001
Number household members, median (IQR)		4.4 (2.7-6.2)	3.5 (2.0-5.2)	<.0001
Wealth quintile	Poorest	579 (27.5)	1763 (15.9)	<.0001
	Poorer	567 (27.0)	2114 (19.1)	
	Middle	468 (22.2)	2406 (21.7)	
	Richer	361 (17.2)	2422 (21.9)	
	Richest	128 (6.1)	2371 (21.4)	
Owens usable land for agriculture (Weighted N=13180)		1567 (74.5)	6687 (60.4)	<.0001
Owens livestock, herds, or farm animals		1294 (61.5)	5407 (48.8)	<.0001
Improved drinking water source ⁸ (Weighted N=13102)		1088 (51.8)	7925 (72.0)	<.0001
Time required to get drinking water, median (IQR)		19.8 (9.5-55.7)	18.3 (9.1-42.6)	0.2943
Access to latrine (Weighted N=13146)		1271 (60.6)	8385 (75.9)	<.0001
Number of rooms for sleeping, median (IQR)		1.15 (1.00-1.79)	1.02 (0.51-1.74)	0.01
Primary floor material	Earth	1154 (54.8)	3895 (35.2)	<.0001
	Cement/Concrete/Carpet	901 (42.8)	6406 (57.8)	
	Ceramic/Wood	49 (2.3)	775 (7.0)	
Primary roof material	Cement	187 (8.9)	2266 (20.5)	<.0001
	Metal	1578 (75.0)	7471 (67.4)	
	Other	339 (16.1)	1339 (12.1)	
Household Hunger Scale (Weighted N=13179)	Little to no hunger	570 (27.1)	4728 (42.7)	<.0001
	Moderate hunger in household	959 (45.6)	4182 (37.8)	
	Severe hunger in household	576 (27.3)	2165 (19.5)	
Number of household members with reported history of cholera, mean (SD)		1.35 (1.02)	n/a	
One or more reported death from cholera in household (Weighted N=13180)		151 (1.1)	n/a	

Table 2. Unadjusted and adjusted relationships between food insecurity and cholera

		(1) Any reported history of cholera in the household					
		Unadjusted			Adjusted ^a		
		OR	95% CI	p-value	AOR	95% CI	p-value
Household Hunger Scale	Little to no hunger in household	ref			ref		
	Moderate hunger in household	1.90	1.66-2.19	<.0001	1.51	1.30-1.76	<.0001
	Severe hunger in household	2.21	1.85-2.63	<.0001	1.73	1.45-2.08	<.0001
		(2) Any reported history of death from cholera in the household (among households reporting at least one cholera case)					
		Unadjusted			Adjusted ^b		
		OR	95% CI	p-value	AOR	95% CI	p-value
Household Hunger Scale	Little to no hunger in household	ref			ref		
	Moderate hunger in household	1.03	0.61-1.75	0.91	1.02	0.60-1.71	0.95
	Severe hunger in household	1.87	1.05-3.34	0.03	1.85	1.05-3.26	0.03

^aThe multivariable model includes the Household Hunger Scale, urban or rural setting, number of children age five or less in the household, wealth index, and number of rooms in the house for sleeping.
^bThe multivariable model includes the Household Hunger Scale and wealth index.

Discussion

- ❑ Moderate and severe household food insecurity independently associated with reported history of cholera
- ❑ Severe household food insecurity independently associated with reported death from cholera among households with at least one case
- ❑ Temporality and directionality of these associations are unknown
 - ❑ In other settings, food insecurity both upstream and downstream of disease morbidity and mortality, in a vicious cycle
- ❑ Potential mechanisms
 - ❑ Food insecurity => increased cholera risk
 - ❑ Malnutrition => impaired immune and gut barrier function
 - ❑ Hunger => higher risk behavior (drinking unsafe water sources, consuming unsafe food)
 - ❑ Worse mental health => impact on response to acute illness
 - ❑ Cholera => increased risk of food insecurity
 - ❑ Direct and indirect costs of healthcare
 - ❑ Despite short duration, cholera has substantial household costs⁷⁻⁹
 - ❑ Costs are magnified when household member dies
 - ❑ Funeral expenses, permanent loss in contribution to household income
- ❑ Limitations
 - ❑ Cross-sectional
 - ❑ Unmeasured confounders
 - ❑ Recall bias
 - ❑ No micro confirmation

References

1. Gunderson. PLoS one 2018
2. Ivers. CRC Press 2015
3. Weiser. Am J Clin Nut 2011
4. Richterman. OFID 2018
5. Deitchler. Food Nut Tech Assistance 2011
6. Cayemittes. HEMMUS 2012.
7. Poulos. Epi & Infection 2012
8. Sarker. BMC ID 2013
9. Ilboudo. PLoS one 2017.