The Impact of Adult Deaths on the Elderly in Tanzania

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1 Introduction

- Adult mortality in prime age is a prevalent phenomenon in sub-Saharan Africa
- A large percentage of adult mortality in Kagera region is HIV/AIDS related (using KHDS data):
  - 368 prime age deaths (out of 2004 prime age individuals in KHDS wave 1; 18.4%) in 14 year span of panel
  - 98/228 (43%) of deaths by illness which were diagnosed by health professionals were reported to be HIV/AIDS
  - 2nd, 3rd most common causes of death were opportunistic illnesses:
    * malaria (22/228, 10%), tuberculosis (16/228, 7%)

2 Our question

- What is the impact of adult mortality on the remaining household members?
- Focus on impacts on the elderly population
  - Ainsworth and Dayton (2003) show a small effect on BMI of elderly persons prior to adult death, and quick BMI recovery after, using 1991-1994 KHDS
  - We focus on longer term impact of adult deaths on labor supply and health outcomes, using 1991-2004 KHDS

3 Economic framework

- Rosenzweig (1988) builds on Sen's (1966) static model of HH labor supply to show that when income earned by adult who dies is sufficiently high, adult death leads to increases in labor supply for remaining HH members
- Kochar (1999) shows in a dynamic setting that HH in India smooth consumption by adjusting labor income in response to crop shocks

4 Data: KHDS Panel 1991-2004

- LSMS panel of 915 households, surveyed four times from 1991-1994
- Follow-up survey tracking panel individuals to their new households in 2004
- Prime age defined as $15 \leq \text{age} \leq 50$, elderly as > 50

Table 1: 2004 elderly sample, Reinterview status and Living Arrangements

Panel A: **Result of 2004 interview**		
Re-interviewed	613	(58%)
Deceased	403	(38%)
Not located	44	(4%)

Panel B: **Living arrangements of sample**

	Baseline		**2004**
	All (N=1,060)	**Subset re-interviewed (N=613)**	**(N=613)**
Widowed	26.9%	21.2%	38.5%
Household size	6.7	7.0	5.1
Any child age (0-15) in household	85.8%	89.9%	73.6%
Relationship to head			
Head	58.9%	55.8%	74.1%
Spouse	23.5%	29.9%	17.9%
Father/mother	8.2%	6.5%	4.9%
Other relative	9.4%	7.8%	3.1%
Living with a grandchild	34.3%	33.1%	54.3%

Note: Living with a grandchild is inferred based on the adult being the head and someone reporting being the grandchild of the head, or being the parent of the head and a child of the head residing in the household.

Table 2: Summary Statistics for 2004 Elderly Sample

	(1) All		(2) Reinterviewed in 2004	
	Mean	SE	Mean	SE
Female	0.543	0.498	0.586	0.493
Education (years)	2.746	2.907	2.838	2.874
Age at baseline	56.341	13.121	52.485	10.136
Baseline				
Farm hours	14.741	13.281	16.659	13.501
Hours collecting firewood and water	2.122	4.137	2.280	4.188
Wage employment hours	4.097	12.914	3.952	12.624
Self-employment, non-farm hours	1.864	8.564	1.654	7.627
Body Mass Index	20.484	3.094	20.768	3.077
Acute illness	0.556	0.497	0.514	0.500
Chonic illness	0.428	0.495	0.376	0.485
2004				
Farm hours			15.321	14.398
Hours collecting firewood and water			1.457	3.271
Wage employment hours			2.715	12.072
Self-employment, non-farm hours			1.987	9.508
Body Mass Index			20.357	3.072
Acute illness			0.652	0.477
Chronic illness			0.530	0.499
Living with PHHM who died from ages 15-50				
1991-1995			0.086	0.281
1996-1999			0.072	0.258
2000-2004			0.101	0.302
Any child living outside HH aged 15-50 (in 1991) who died			0.134	0.341
Number of observations	1,060		613	

Note: Hours refer to hours in the last 7 days.

5 What we find

- Labor hours per week of elderly persons increases by nearly 50% (above the mean) 5-8 years after adult death
- Depletion of assets is used to buffer the impact on labor supply in first 5 years after adult death
- Labor hours of elderly men respond more than labor hours of elderly women
- Policy implications

6 Empirical strategy

- We estimate the impact of adult death in HH j (D_j) on outcome y_{ij} by date of death, using cross section of elderly individuals in 2004
- We split the 14 year span of the panel into three (1991-1995, 1996-1999, and 2000-2004) to estimate longer term impacts of adult death on elderly outcomes:

$$y_{ij} = \alpha + \beta_1 D_j^{91-95} + \beta_2 D_j^{96-99} + \beta_3 D_j^{00-04} + \gamma X_{ij} + \mu_i + \mu_j + \epsilon_{ij}$$

7 Controls (X_{ij})

- Demographic variables (gender, education, quadratic in age)
- History of shocks to crops and health (1991 to 2004)
- Individual and HH endowments
  - Computed using residuals from health production functions in past waves (Rosenzweig and Schultz, 1983)
- Initial HH characteristics from 1991 (assets, household size)

8 Attrition

- High attrition in the 14 year span of the panel, mostly due to death of elderly individuals
  - 614 of 1062 elderly individuals from 1991 remain in 2004
  - 404/1062 (38%) died in these years
  - Only 44/1062 (4%) were not located

9 Attrition bias: selection on observables and unobservables

- Sample re-weighting corrects for attrition bias based on selection on observables (Fitzgerald et al. 1998)
  - Regression weights: $w(z,x) = (\frac{Pr(A=1|z,x)}{Pr(A=1|x)})^{-1}$
  - Test for selection on observables in attrition using $w(z,x)$ shows evidence for selection on observables: χ^2 test for joint significance of baseline y variables has p-value of 0.034
- Two-step selection correction to correct for bias due to selection on unobservables leads to similar results for labor hours and health outcomes
  - Labor and health outcomes from 1991 used as excluded regressors in selection (attrition) probit

Table 4: The Impact of Adult Death on Labor Participation and Hours by date of event using Tobit regression with sample reweighting

	(1) Labor Force Participation	(2) Total hours	(3) Farm hours	(4) Chore hours	(5) Self-Emp hours	(6) Wage emp hours
Living with PHHM who died ages 15-50						
1991-1995	0.070	1.824	3.766	-1.827	-0.048	-16.923
	(0.230)	(3.207)	(3.027)	(1.864)	(8.389)	(16.220)
1996-1999	0.139	10.005**	5.206	5.264***	11.831	10.029
	(0.278)	(3.937)	(3.212)	(1.778)	(11.735)	(13.120)
2000-2004	-0.102	-2.103	-0.369	-0.785	-7.638	20.922
	(0.209)	(3.175)	(2.507)	(1.622)	(10.721)	(16.704)
Any child living outside HH aged 15-50	-0.044	-0.515	1.242	-0.433	3.471	-34.713
(in 1991) who died	(0.220)	(2.953)	(2.583)	(1.569)	(9.906)	(23.944)
Female	-0.150	-5.508**	-2.796	0.607	-1.945	6.747
	(0.196)	(2.669)	(2.266)	(1.345)	(8.224)	(11.196)
Education (years)	-0.037	0.154	-0.128	0.015	1.938	3.770**
	(0.028)	(0.379)	(0.331)	(0.191)	(1.208)	(1.606)
Age (/10)	-0.062	-0.713	9.548	-4.352	-21.052	90.456
	(0.831)	(10.740)	(9.536)	(6.446)	(37.401)	(61.065)
Age squared (/100)	-0.013	-0.291	-0.762	0.132	0.827	-7.213*
	(0.050)	(0.652)	(0.584)	(0.402)	(2.300)	(4.054)
Own health endowment	-0.006	-0.165	-0.275	-0.352***	2.054**	-0.448
	(0.014)	(0.228)	(0.188)	(0.096)	(0.943)	(0.922)
Household health endowment	0.041*	0.593*	0.592**	0.235	-1.037	1.656
	(0.021)	(0.338)	(0.292)	(0.145)	(1.557)	(1.650)
Number of observations	535	566	566	566	566	566

Notes: PHHM is a "previous household member", someone residing in the baseline household. Standard errors in parentheses. * significant at 10%, ** significant at 5%, *** significant at 1 %. Includes controls for number of children 15-50 living outside household in baseline, seasons of interview, asset values, household size and sample enumeration classification (used to stratify the baseline sample). Also included are illness and crop shock variables. Weights are constructed using the ratio of predicted probabilities of attrition based on Table 3. For details on the weights, see the discussion in the appendix.

Table 5: Asset Buffering and the Impact of Adult Death on Labor Hours by date of event using Tobit regression with sample reweighting

	(1) Total hours	(2) Farm hours	(3) Total hours	(4) Farm hours	(5) Livestock value
Living with PHHM who died from ages 15-50					
1991-1995	8.699*	6.569	5.532	6.482**	-0.172*
	(4.462)	(4.697)	(3.523)	(3.284)	(0.100)
1996-1999	5.006	6.136	8.918**	3.915	-0.142
	(5.571)	(4.850)	(4.260)	(3.328)	(0.122)
2000-2004	2.191	7.730**	-0.556	1.334	-0.224**
	(3.627)	(3.655)	(3.236)	(2.514)	(0.093)
1991-1995 * value of physical assets	-2.021*	-0.506			
	(1.112)	(1.071)			
1996-1999 * value of physical assets	2.349	-0.611			
	(2.010)	(1.709)			
2000-2004 * value of physical assets	-0.975*	-2.504**			
	(0.508)	(1.035)			
1991-1995 * value of livestock			12.424	8.812	
			(7.982)	(6.942)	
1996-1999 * value of livestock			-27.818*	-22.931	
			(15.296)	(16.135)	
2000-2004 * value of livestock			20.629	16.711	
			(27.002)	(29.139)	
Any child living outside HH aged 15-50	-0.346	-0.374	-2.335	-0.149	-0.048
(in 1991) who died	(3.239)	(2.713)	(3.174)	(2.735)	(0.091)
Asset position at baseline	-0.148	-0.106	-0.234	-0.160	0.042***
	(0.211)	(0.130)	(0.175)	(0.130)	(0.014)
Number of observations	566	566	566	566	566

Notes: PHHM is a "previous household member", someone residing in the baseline household. Standard errors in parentheses. * significant at 10%, ** significant at 5%, *** significant at 1 %. Includes controls for number of children 15-50 living outside household in baseline, seasons of interview, asset values, household size and sample enumeration classification (used to stratify the baseline sample). Also included are illness and crop shock variables, female, education, age, age squared, own health endowment and household health endowment. Weights are constructed using the ratio of predicted probabilities of attrition based on Table 3. For details on the weights, see the discussion in the appendix.

Table 6: The Impact of Adult Death on Health by date of event with sample reweighting

	(1) BMI	(2) Acute illness	(3) Chronic illness	(4) Days of restricted activity last week	(5) Days of no activity last week	(6) Per Cap Food Consumption (Tsh)
Living with PHHM who died from ages 15-50						
1991-1995	1.130	0.054	0.063	1.400	0.591	-3,047.600
	(0.994)	(0.072)	(0.073)	(1.227)	(1.296)	(15,696.853)
1996-1999	0.536	-0.130	-0.091	-6.327**	-2.614	22,656.967
	(0.970)	(0.085)	(0.074)	(2.516)	(2.036)	(25,867.968)
2000-2004	0.756	0.026	-0.027	-0.305	-0.952	9,858.026
	(1.000)	(0.068)	(0.069)	(1.352)	(1.345)	(16,205.197)
Any child living outside HH aged 15-50 (in 1991) who died	-1.262	-0.064	-0.099	-0.897	0.946	-6,730.638
	(1.024)	(0.070)	(0.069)	(1.326)	(1.334)	(17,587.781)
Female	-0.651	0.094	0.062	0.972	0.693	23,586.629*
	(0.870)	(0.057)	(0.060)	(1.075)	(1.173)	(13,772.114)
Education (years)	-0.019	0.003	-0.010	0.006	-0.027	4,318.193**
	(0.132)	(0.009)	(0.009)	(0.158)	(0.169)	(2,112.010)
Age (/10)	11.824***	0.071	0.269	3.181	2.121	80,160.871
	(4.097)	(0.243)	(0.262)	(4.616)	(4.922)	(55,694.916)
Age squared (/100)	-0.787***	-0.002	-0.015	-0.140	-0.057	-4,812.532
	(0.255)	(0.015)	(0.016)	(0.283)	(0.298)	(3,380.929)
Own health endowment	0.259***	0.003	0.017***	-0.022	-0.085	725.041
	(0.064)	(0.005)	(0.005)	(0.081)	(0.087)	(1,122.864)
Household health endowment	-0.142	0.001	-0.013*	-0.066	0.044	-7,852.793***
	(0.100)	(0.007)	(0.007)	(0.121)	(0.130)	(2,261.664)
Number of observations	566	566	566	566	566	558

Notes: PHHM is a "previous household member", someone residing in the baseline household. Standard errors in parentheses. * significant at 10%, ** significant at 5%, *** significant at 1 %. Includes controls for number of children 15-50 living outside household in baseline, seasons of interview, asset values, household size and sample enumeration classification (used to stratify the baseline sample). Weights are constructed using the ratio of predicted probabilities of attrition based on Table 3. For details on the weights, see the discussion in the appendix.

10 Conclusions and future work

- Adult death does not affect long term health outcomes and food consumption for elderly individuals
- In response to adult death, elderly individuals seem to be depleting livestock in first four years, and then increasing labor hours by about 50% (above the mean) 5-8 years after the death occurs
- Future work:
  - Same gender effects
  - Role of network size in buffering impact of adult death