

Agarwal, Neha; Kohler, Hans-Peter; Mani, Subha

**Working Paper**

## Dynamics in Physical Functioning Limitations

IZA Discussion Papers, No. 11101

**Provided in Cooperation with:**

IZA – Institute of Labor Economics

*Suggested Citation:* Agarwal, Neha; Kohler, Hans-Peter; Mani, Subha (2017) : Dynamics in Physical Functioning Limitations, IZA Discussion Papers, No. 11101, Institute of Labor Economics (IZA), Bonn

This Version is available at:

<https://hdl.handle.net/10419/174011>

**Standard-Nutzungsbedingungen:**

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

**Terms of use:**

*Documents in EconStor may be saved and copied for your personal and scholarly purposes.*

*You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.*

*If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.*

DISCUSSION PAPER SERIES

IZA DP No. 11101

**Dynamics in Physical Functioning Limitations**

Neha Agarwal  
Hans-Peter Kohler  
Subha Mani

OCTOBER 2017

## DISCUSSION PAPER SERIES

IZA DP No. 11101

# Dynamics in Physical Functioning Limitations

**Neha Agarwal**

*University of California, Riverside*

**Hans-Peter Kohler**

*University of Pennsylvania*

**Subha Mani**

*Fordham University, University of Pennsylvania,  
IZA and CDEP, Columbia University*

OCTOBER 2017

Any opinions expressed in this paper are those of the author(s) and not those of IZA. Research published in this series may include views on policy, but IZA takes no institutional policy positions. The IZA research network is committed to the IZA Guiding Principles of Research Integrity.

The IZA Institute of Labor Economics is an independent economic research institute that conducts research in labor economics and offers evidence-based policy advice on labor market issues. Supported by the Deutsche Post Foundation, IZA runs the world's largest network of economists, whose research aims to provide answers to the global labor market challenges of our time. Our key objective is to build bridges between academic research, policymakers and society.

IZA Discussion Papers often represent preliminary work and are circulated to encourage discussion. Citation of such a paper should account for its provisional character. A revised version may be available directly from the author.

## ABSTRACT

---

### Dynamics in Physical Functioning Limitations

The extent to which physical functioning limitations result in permanent job loss, lowered lifetime income and assets, in part, depends upon the extent to which onset of these limitations becomes permanent. This paper uses five rounds of data from Malawi to examine path dependence in physical functioning limitations. We do so using a dynamic linear panel data model where the coefficient on the one-period lagged health outcome captures path dependence in functional limitations. Our preferred estimates indicate – (a) partial recovery from onset of functional limitations for males, (b) there is less recovery in severe limitations than moderate limitations for males, (c) perfect recovery from both moderate and severe functional limitation for females.

**JEL Classification:** J14, I15, I10

**Keywords:** activity of daily living, functional limitation, panel data, Malawi

**Corresponding author:**

Subha Mani  
Department of Economics  
Fordham University  
441 East Fordham Road  
Dealy Hall, E 520  
Bronx, New York 10458  
USA  
Email: [smani@fordham.edu](mailto:smani@fordham.edu)

## **1. Introduction**

Global aging is transforming the age structure of the working population not only in high- and middle-income countries, but increasingly also in low-income countries where older individuals have very high rates of economic activities. Because intergenerational transfers within families are an important mechanism through which individuals and families insure against risk and smooth life-cycle consumption, any impact on the working age adult's ability to be economically active will have substantial welfare implications for not just the working adults, but for all dependents in their household.

Physical functioning limitations are one such deterrent that impedes adult's ability to be economically active, either in the labor market or own farm or similar self-employment. The relationship between the ability to be economically active and health becomes particularly important as individuals get older and poor health and functional limitations become more common. Physical functioning limitations are generally captured using difficulties in Activity of Daily Living that have found to be associated with reduced hours worked, loss in employment, and lower household earnings (Mani, Mitra and Sambamoorthi (2017), Payne et al. (2013), Mizunoya and Mitra (2013), Genoni (2012), Gertler and Gruber (2002)). The extent to which physical functioning limitations result in permanent job loss, lowered lifetime income, and reduced assets, in part, depends on the extent to which functional limitations remain permanent. If functional limitations were not permanent then some of the negative impact associated with functional limitations could be reversed.

This paper examines whether physical functioning limitations are transitory or permanent among mature and old individuals in Malawi using a dynamic linear panel data model allowing us to address the endogeneity concern in lagged health. Overall, we find that functioning limitations are largely transitory with greater persistence in severe than moderate limitations and for males more than females.

## 2. Empirical Specification

We estimate the following model:

$$H_{it} = \beta_0 + \beta_1 H_{it-1} + \sum_{j=2}^R \beta_j X_{jit} + \sum_{j=1}^R \delta_j Z_{ji} + \varepsilon_i + \varepsilon_{it} \quad (1)$$

where  $H_{it}$  is the functional limitation of individual  $i$  at time  $t$ . We use four measures of functional limitations: severe limitations, moderate limitations, number of severe limitations, and number of moderate limitations.<sup>1</sup> The  $X$ 's and  $Z$ 's capture all time-varying and time-invariant regressors respectively<sup>2</sup>. We include village-time fixed-effects to control for both time-varying observables and unobservables at the village level (ex: changes in local labor market conditions, access to health centers, and transportation). The regressions also include year dummies to capture time trends. There are two sources of unobservables:  $\varepsilon_i$  and  $\varepsilon_{it}$ . Adult's inherent healthiness is captured by  $\varepsilon_i$ , and  $\varepsilon_{it}$  includes individual specific time-varying unobservables. To account for any unobserved correlation among individuals living in a village, we cluster our standard errors at the village level.

The main coefficient of interest is  $\beta_1$  that captures path dependence (over two survey rounds) in physical functioning limitations. A coefficient of *one* on  $\beta_1$  indicates perfect path dependence, that is, no recovery from a functional limitation. Note that a coefficient of *zero* suggests perfect recovery from a functional limitation between survey rounds, and a coefficient between *zero* and *one* indicates partial recovery from a functional limitation. The OLS estimate on the lagged dependent variable does not result in an unbiased estimate for  $\beta_1$  as the condition of zero

---

<sup>1</sup> We use the following two questions to construct our dependent variables. Severe limitations takes a value 1 if the individual responds saying "yes, limited a lot" to either of the following two questions: (1) "Do you have any health problems that limit you in carrying out moderate activities? (For example, cooking and cleaning, walking to meetings in the village, or tending to cattle and livestock. If so, how much?), and (2) "Do you have any health problems that limit you in carrying out strenuous activities? (For example carrying heavy loads, working on the farm, pounding maize, or digging a pit latrine. If so, how much?)", 0 otherwise. Similarly, moderate limitations takes a value 1 if the individual responds saying "yes, limited a little" to either of the above two questions, 0 otherwise. No. of severe and moderate limitations is the sum of times the respondent says "yes, limited a lot" and "yes, limited a little" respectively.

<sup>2</sup> We control for age, age squared, primary and secondary education, religion, ethnic group, gender, marital status, and indicator for metal roof.

correlation between the error term and  $H_{it-1}$  is never satisfied in dynamic models (Wooldridge 2002). We use the Arellano-Bover (1995) estimation strategy to deal with the endogeneity bias in  $H_{it-1}$ , wherein, change in  $H_{it-1}$  serves as an instrument for  $H_{it-1}$ .

### 3. Data

This study uses data from the 2006-2013 rounds of the Malawi Longitudinal Study of Families and Health (MLSFH). The survey covers three districts in rural Malawi: Rumphi, Mchinji, and Balaka (see Kohler et al. 2015 for more details).

Our sample includes individuals age 30+ in each round. The 2012-13 MLSFH rounds were administered to 45+ individuals as a result of limited project funding, and consequently, the last two waves have different age-composition than the first three waves.<sup>3</sup> We include an indicator variable to account for this changing age-composition. Descriptive statistics are presented in Table 1. Both the incidence and no. of moderate limitations is greater than severe limitations in all five waves.

### 4. Results

The persistence of gender-differential investments in human capital as well as gender-segregation in economic activities in developing countries suggest that males and females are likely to experience differential levels of path dependence in functioning limitations. Further, persistence in functioning limitations is also likely to vary by the type of limitation – moderate or severe. Hence, we present our results for males and females separately and by type of limitation – severe as well as moderate.

---

<sup>3</sup> The main results reported in the paper are robust to restricting all fives of the survey rounds to only 45+ years individuals.

The results for males and females are presented in Tables 2 and 3 respectively. The OLS estimate of  $\beta_1$  are reported in Column 1 and preferred Arellano-Bover estimates are reported in Column 2 of Tables 2 and 3. OLS estimates suffer from endogeneity concerns that are likely to generate upward bias in  $\beta_1$ . A comparison of the coefficients reported in Columns 1 and 2 of Tables 2 and 3 indicate that this is indeed a concern. The preferred estimates in Column 2, Table 2 suggest that the presence of severe (moderate) functional limitation in one period increases the probability of reporting a severe (moderate) functional limitation again by 14 (9) percentage points. Both these coefficient estimates are significantly different from zero rejecting the null of perfect recovery indicating partial recovery in both moderate and severe functional limitations for males. We find similar partial recovery in the number of both severe and moderate functional limitations with less recovery for severe than moderate limitations. These results suggest that even though fewer people in the sample experience severe functional limitations, among those who do there is substantial path dependence in these limitations.

Our preferred estimates for females reported in Column 2, Table 3 suggest there is no evidence of path dependence in both moderate and severe limitations, as we cannot reject the null of perfect recovery at even the 10 percent significance level. A functional limitation among females is therefore transient, that is, there is no persistence. Payne et al. (2013) study transition between different states of disabilities using the 2006-2010 waves of the MLSFH. In line with our findings, the authors find high transition probability between different disability states. However, their analysis does not account for unobserved correlation between current and lagged disability states.

## 5. Conclusion

The long-term economic cost of physical functioning limitations can be projected based on the extent to which these functional limitations remain permanent; this is particularly relevant for an agricultural setting like rural Malawi. If functional limitations were transitory then some of the negative impact associated with a functional limitation could be reversed. This paper is the first



to examine persistence in physical functioning limitations using a dynamic linear panel data model that can account for endogeneity concerns in the lagged dependent variable. We find that for males, there exists partial recovery in severe and moderate functional limitations with greater persistence in severe than moderate limitations. We also find perfect recovery in both moderate and severe limitations among females, decreasing the projected long-term cost of functional limitations for females.

## References

- Arellano, B. and O. Bover. (1995). 'Another look at the instrumental variable estimation of error-components models', *Journal of Econometrics*, Vol. 68, pp. 29-51.
- Genoni, M. (2012). Health Shocks and Consumption Smoothing: Evidence from Indonesia. *Economic Development and Cultural Change*, 60(3): 475-506.
- Gertler, P. and Gruber, J. (2002). Insuring Consumption Against Illness. *American Economic Review*, 92: 51-70.
- Kohler, H.-P., S.C. Watkins, J.R. Behrman, P. Anglewicz, I.V. Kohler, R.L. Thornton, J. Mkandawire, H. Honde, A. Hawara, B. Chilima, C. Bandawe, V. Mwapasa, P. Fleming, and L. Kalilani-Phiri. 2015. "Cohort Profile: The Malawi Longitudinal Study of Families and Health (MLSFH)." *International Journal of Epidemiology*, 44(2): 394-404.
- Mizunoya, S. and Mitra, S. (2013). Is there a Disability Gap in Employment Rates in Developing Countries? *World Development* Vol. 42; pp.28-43.
- Mani, S., Mitra, S. and Sambamoorthi, S. (2016), "Dynamics in Health and Employment: Evidence from Indonesia." IZA Discussion Paper No. 10256.
- Payne CF, Mkandawire J, Kohler H-P (2013) Disability Transitions and Health Expectancies among Adults 45 Years and Older in Malawi: A Cohort-Based Model. *PLoS Med* 10(5): e1001435.
- Wooldridge, J. (2002). *Econometric Analysis of Cross Section and Panel Data*, MIT Press, Cambridge, MA.

**Table 1: Descriptive Statistics**

	<b>Mean (sd)</b>				
	<b>2006</b>	<b>2008</b>	<b>2010</b>	<b>2012</b>	<b>2013</b>
% Severe limitation	0.040 (0.20)	0.048 (0.21)	0.096 (0.29)	0.114 (0.32)	0.108 (0.31)
% Moderate limitation	0.201 (0.40)	0.199 (0.40)	0.303 (0.46)	0.350 (0.48)	0.366 (0.48)
No. of severe limitations	0.041 (0.27)	0.055 (0.31)	0.160 (0.52)	0.172 (0.54)	0.161 (0.53)
No. of moderate limitations	0.278 (0.62)	0.316 (0.62)	0.511 (0.81)	0.517 (0.78)	0.535 (0.78)
% Male	0.476 (0.50)	0.418 (0.49)	0.418 (0.49)	0.428 (0.49)	0.424 (0.49)
% Primary education	0.587 (0.49)	0.575 (0.49)	0.615 (0.49)	0.575 (0.49)	0.551 (0.50)
% Secondary education	0.087 (0.28)	0.076 (0.27)	0.097 (0.30)	0.063 (0.24)	0.062 (0.24)
% Muslim	0.245 (0.43)	0.238 (0.43)	0.241 (0.43)	0.268 (0.44)	0.261 (0.44)
% Christian	0.695 (0.46)	0.641 (0.48)	0.674 (0.47)	0.653 (0.48)	0.659 (0.47)
% Married	0.914 (0.28)	0.828 (0.38)	0.795 (0.40)	0.768 (0.42)	0.755 (0.43)
% with metal roof	0.154 (0.36)	0.206 (0.40)	0.252 (0.43)	0.307 (0.46)	0.333 (0.47)
Age in years	43.898 (10.47)	49.570 (14.22)	49.643 (14.42)	58.926 (11.62)	59.762 (11.64)
Observations	1913	2731	2686	1264	1254

**Table 2: Dynamics in Functional Limitations for Males**

	<b>OLS (1)</b>	<b>Arellano-Bover (2)</b>
<b>Panel A: Severe</b>		
Lagged severe	0.219*** (0.04)	0.140** (0.06)
Observations	2332	1429
R-squared	0.36	0.38
F-statistic from first-stage regression		345.80
<b>Panel B: No. of severe</b>		
Lagged no. of severe	0.483*** (0.12)	0.456** (0.22)
Observations	1344	641
R-squared	0.57	0.56
F-statistic from first-stage regression		11.34
<b>Panel C: Moderate</b>		
Lagged moderate	0.153*** (0.03)	0.091* (0.05)
Observations	2332	1429
R-squared	0.31	0.32
F-statistic from first-stage regression		1678.14
<b>Panel D: No. of moderate</b>		
Lagged no. of moderate	0.176*** (0.04)	0.057 (0.06)
Observations	1866	1058
R-squared	0.37	0.37
F-statistic from first-stage regression		512.97

**Notes:** Robust standard errors adjusted for clustering at the village level in parentheses. Other controls include full set of socioeconomic characteristics described in Table 1 and dummy for 2012/13 rounds. P<0.01\*\*\*, P<0.05\*\*, P<0.10\*.

**Table 3: Dynamics in Functional Limitations for Females**

	<b>OLS (1)</b>	<b>Arellano-Bover (2)</b>
<b>Panel A: Severe</b>		
Lagged severe	0.225*** (0.04)	0.050 (0.05)
Observations	3079	1849
R-squared	0.31	0.31
F-statistic from first-stage regression		1039.84
<b>Panel B: No. of severe</b>		
Lagged no. of severe	0.480*** (0.09)	0.083 (0.15)
Observations	1227	468
R-squared	0.64	0.65
F-statistic from first-stage regression		12.39
<b>Panel C: Moderate</b>		
Lagged moderate	0.100*** (0.02)	0.006 (0.04)
Observations	3079	1849
R-squared	0.24	0.24
F-statistic from first-stage regression		6130.01
<b>Panel D: No. of moderate</b>		
Lagged no. of moderate	0.121*** (0.03)	0.010 (0.04)
Observations	2363	1281
R-squared	0.30	0.31
F-statistic from first-stage regression		1810.91

**Notes:** See Table 1.