

Marginal productivity of health care expenditure and its evolution over time

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What do we know about marginal productivity in the present year?

- MP of the HCS is informed by the effect of an increase/decrease in health expenditure on health outcomes
 - Informs a cost per unit of health outcome (e.g., quality adjusted life year - QALY, or disability adjusted life year - DALY)
 - Research from the UK estimated appx £13,000 per QALY (Claxton et al 2015)
 - Elasticities estimated by disease area
 - Exploiting variation in expenditure and mortality outcomes by geographic area
 - Accounted for sources of endogeneity

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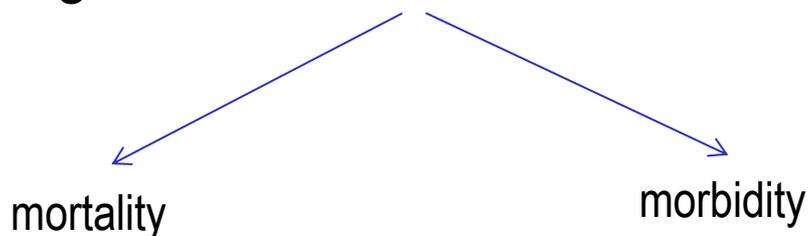
- Within country estimation ideal, but data demands potentially insurmountable in many settings
- Large literature on mortality effects across countries (Gallet and Doucouliagos 2017), but subject to challenges
 - Omitted variable bias
 - Reverse causality
 - Aggregation bias

What do we know about marginal productivity in the present year?

- Bokhari et al (2007) applies an IV approach to cross-sectional data using data on neighbours' military expenditure and institutional quality as IVs
- The elasticity is allowed to differ by country according to the level of infrastructure and a variable reflecting a change in the amount of donor funding received by employing interaction terms
- Outcomes: under-5 and maternal mortality

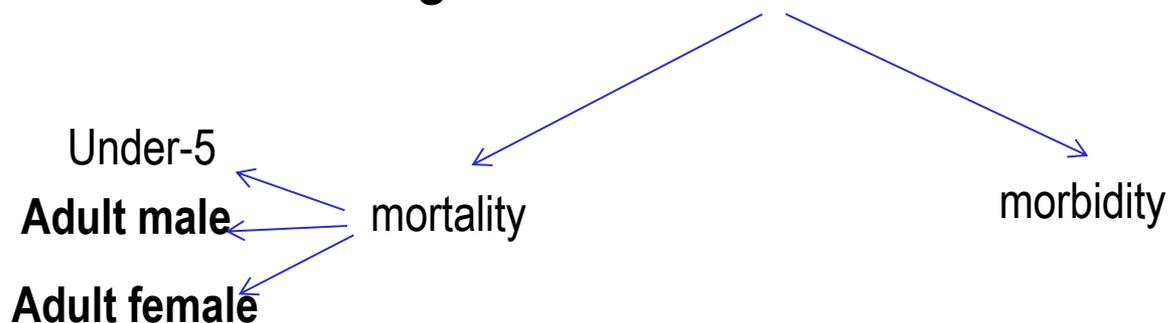
What do we know about marginal productivity in the present year?

- How to get to the **health** effects of changes in spending



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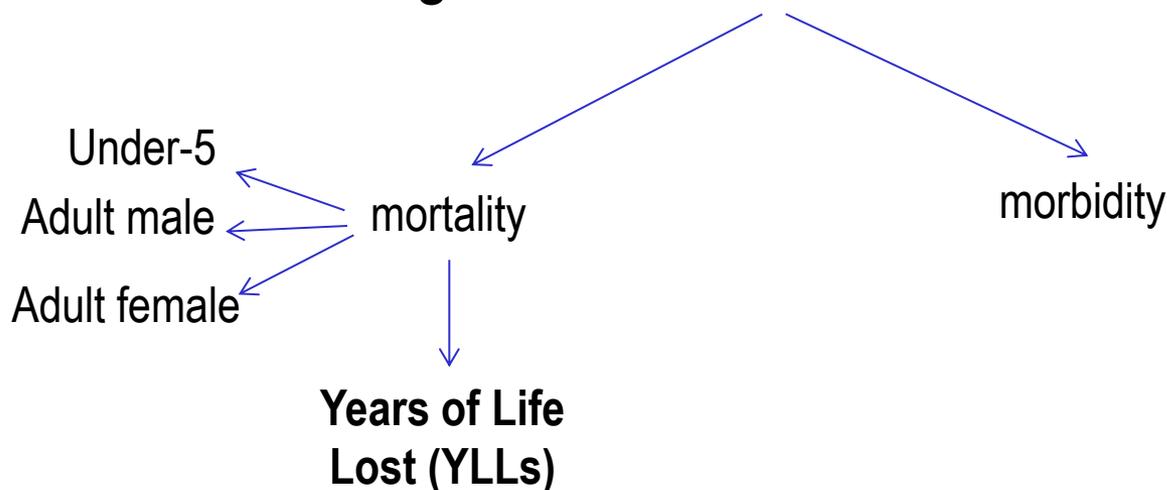
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Available from the
World Bank

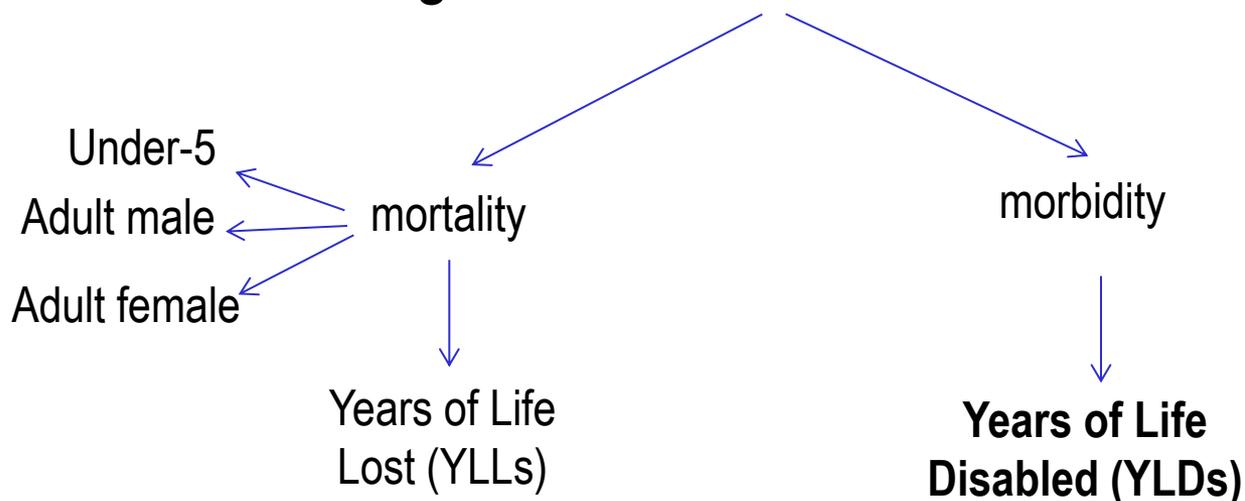
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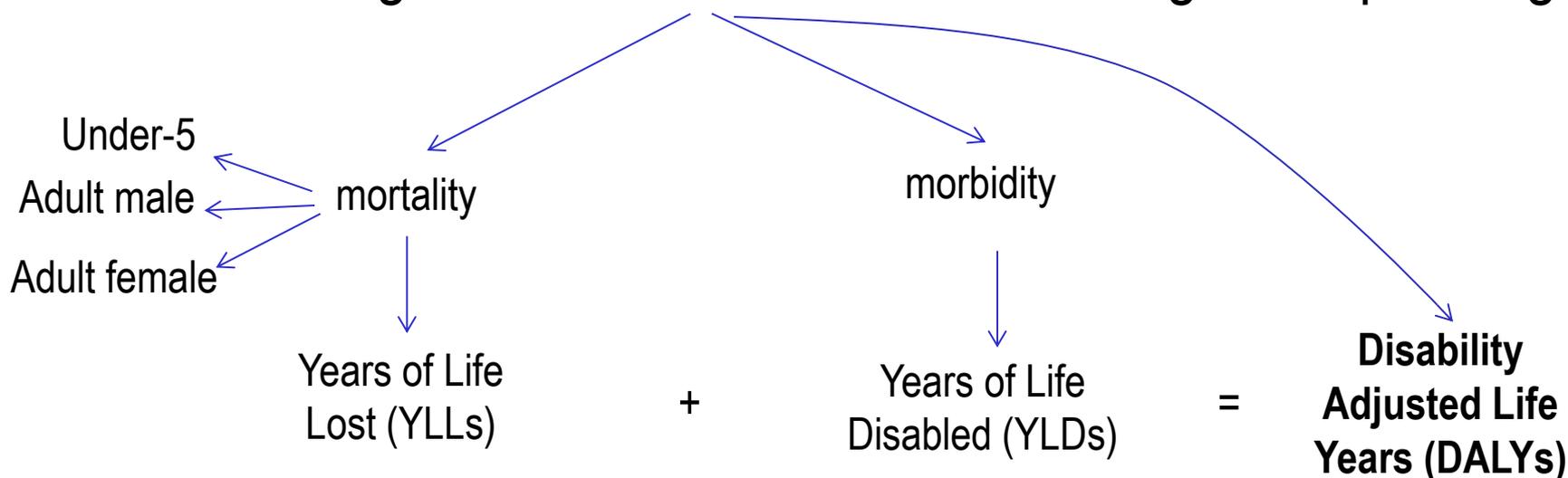
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Based on estimates from World Health Organization and Global Burden of Disease

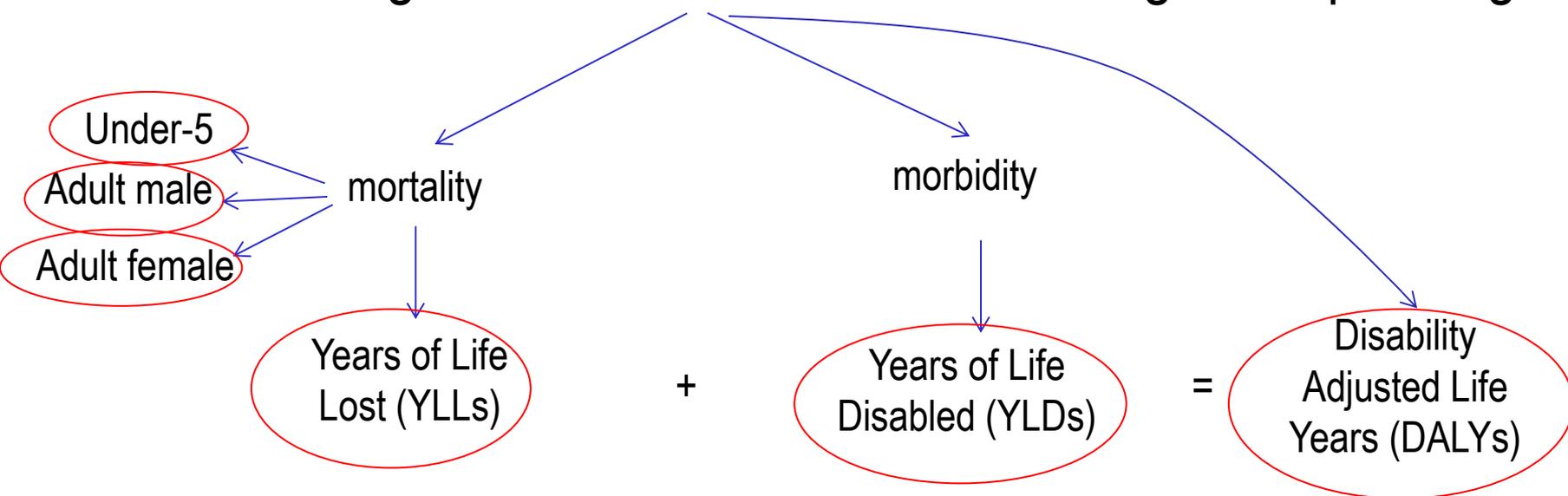
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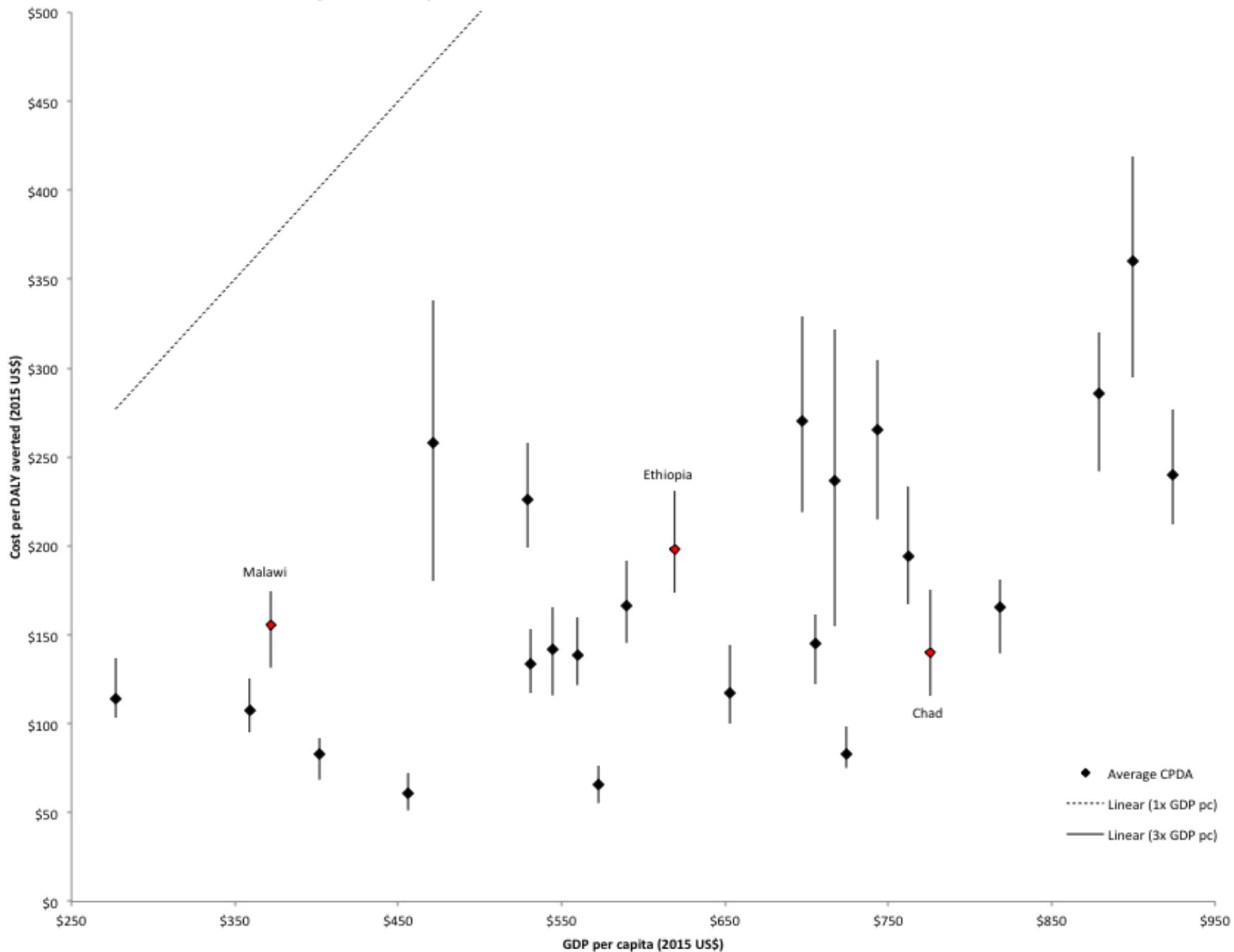


- Extend Bokhari et al (2007) to estimate effect of a change in expenditure on 6 outcome variables

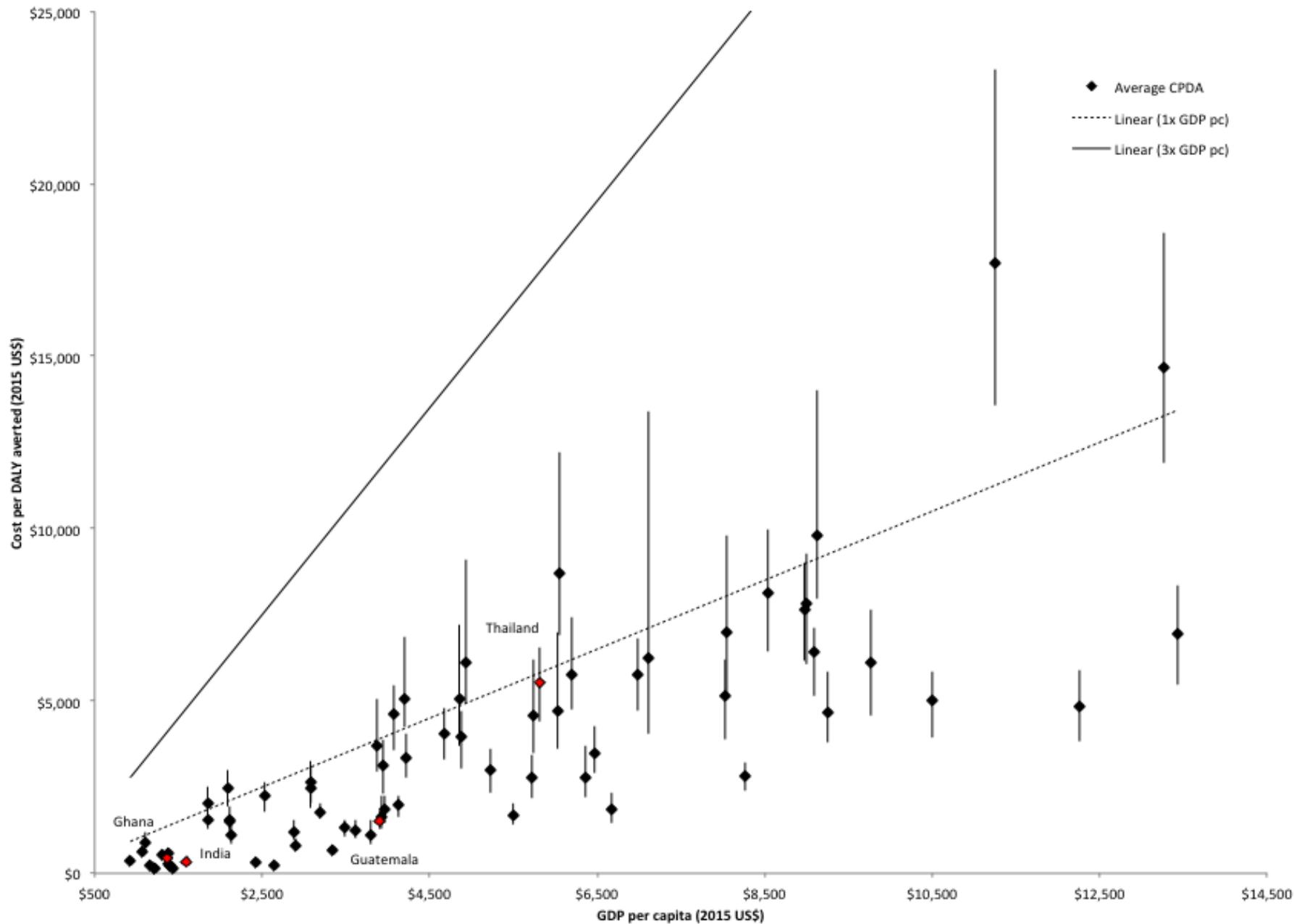
Different methods for estimating and calculating DALYs averted (Ochalek et al 2015)

		DALY 1	DALY 2	DALY 3	DALY 4
YLL averted		Based on indirectly estimating effects on survival from mortality	Directly estimated	Directly estimated	
YLD averted	Direct effect	Uses indirectly estimated effects on survival from mortality as a surrogate for morbidity effects	Uses directly estimated survival effects as a surrogate for morbidity effects		Directly estimated
	Indirect effect	Uses average overall population health as a surrogate for increase in YLD burden associated with increase in YLLs averted	Uses average overall population health as a surrogate for increase in YLD burden associated with increase in YLLs averted	Directly estimated	

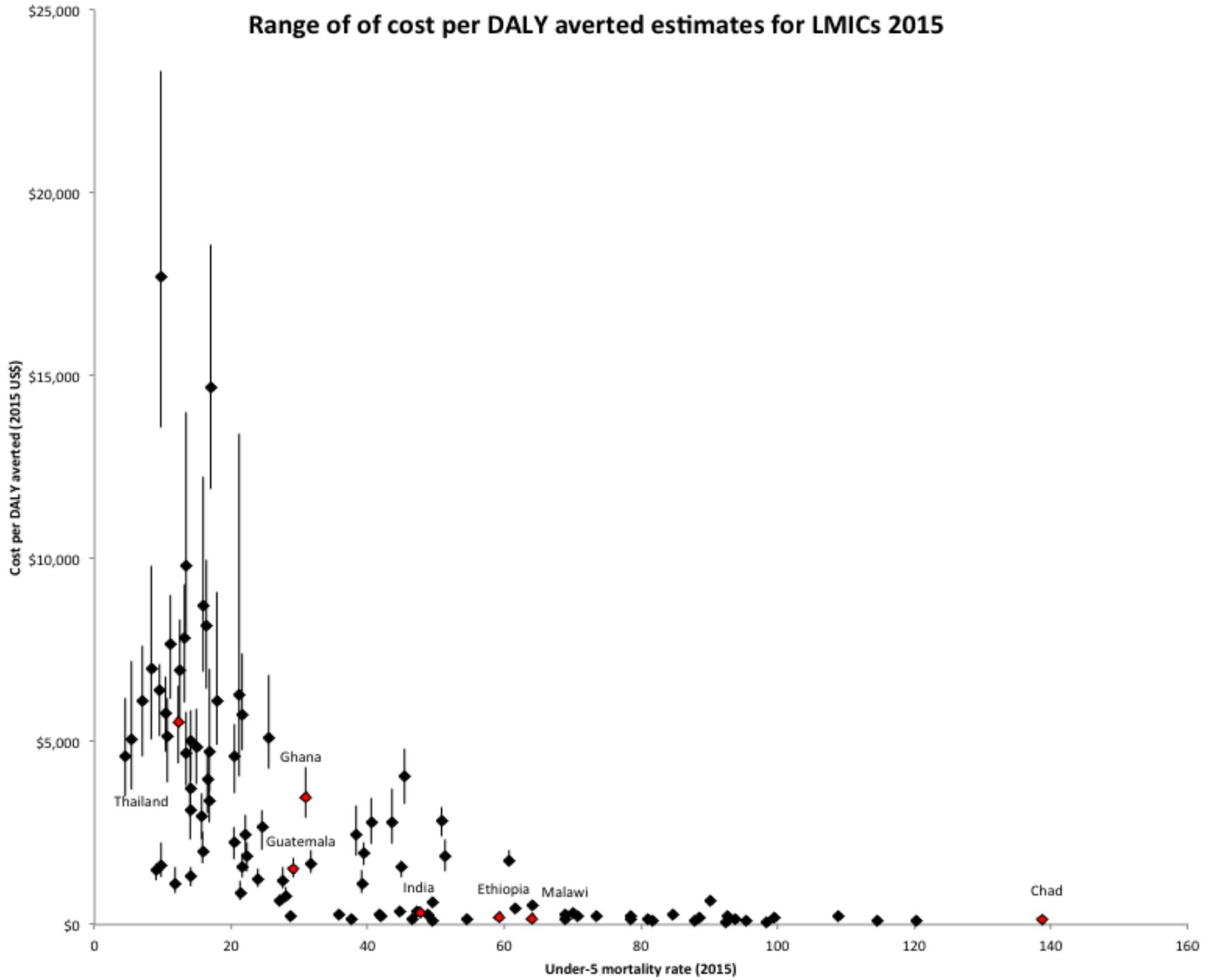
Range of cost per DALY averted of estimates for LICs 2015



Range of cost per DALY averted estimates for MICs 2015



Range of cost per DALY averted estimates for LMICs 2015



Inputs

Single Country Analysis

Country
 Malawi

Change in expenditure \$ 1,000,000

Elasticities

Mortality (deaths per 1,000)	
Children under-5	-0.3365
Adults females	-0.1862
Adult males	-0.1881
DALYs	-0.2124
YLLs	-0.3011
YLDs	-0.0297

Restore original elasticities

Update the Results Table with data using elasticities in cells D13:D18

Outputs

Range of cost per DALY averted estimates (2015 US\$)

Range	\$132-\$174
GDP per capita	\$372
Range as a % of GDP per capita	35% - 47%

Estimate 1

DALYs averted for a \$1mn change in expenditure	5,733
Cost per DALY averted	\$ 174

Estimate 2

DALYs averted for a \$1mn change in expenditure	7,603
Cost per DALY averted	\$ 132

Estimate 3

DALYs averted for a \$1mn change in expenditure	6,643
Cost per DALY averted	\$ 151

Estimate 4

DALYs averted for a \$1mn change in expenditure	5,754
Cost per DALY averted	\$ 174

Average

DALYs averted for a \$1mn change in expenditure	6,433
Cost per DALY averted	\$ 155

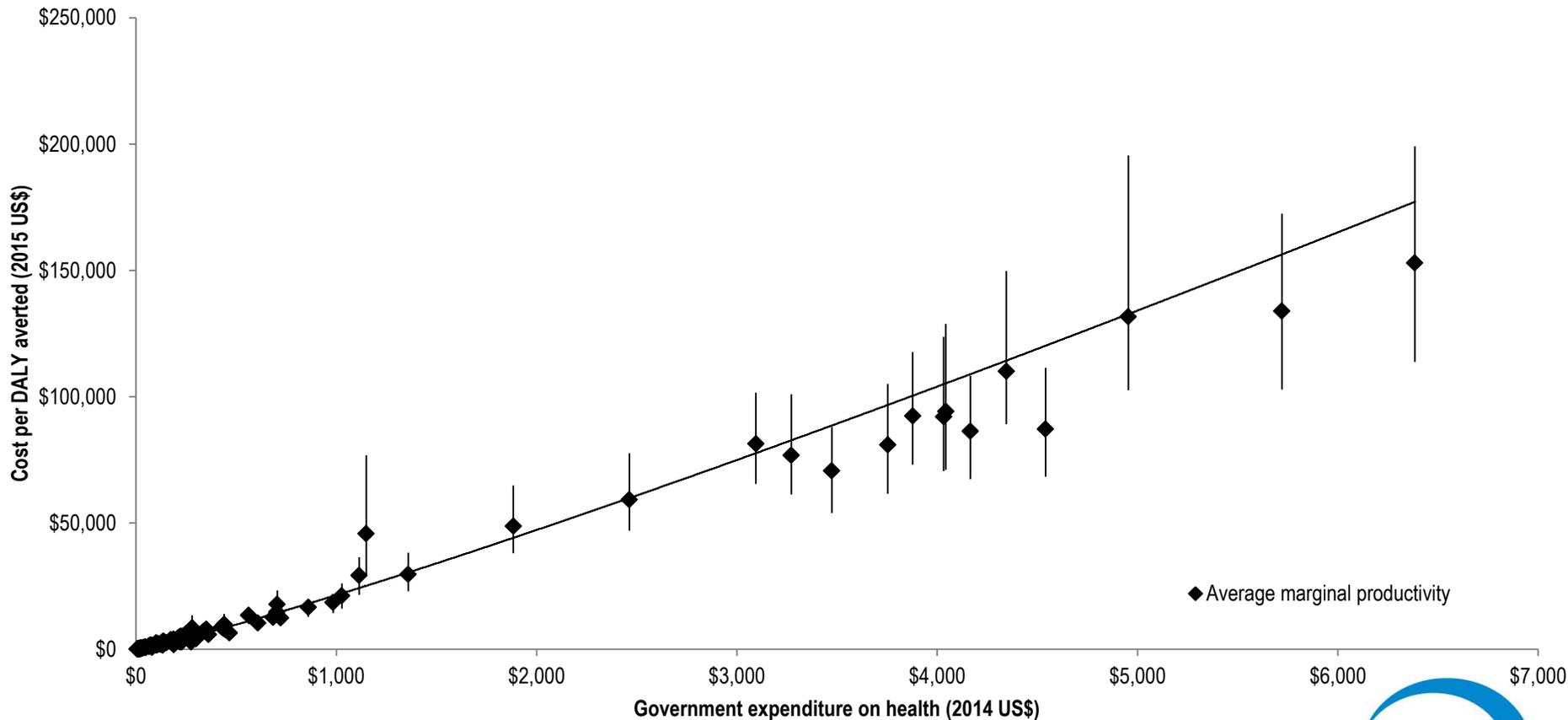
Why might the marginal productivity of health care expenditure change over time?

- Growth rate may be affected by various factors (see Paulden et al, 2017 for more), e.g.,
 - \uparrow in health care expenditure, then \downarrow due to diminishing marginal returns
 - \uparrow in demand for existing interventions, then \uparrow or \downarrow
 - \uparrow in productivity of the HCS, then \uparrow
- Little evidence of a decline in the marginal productivity of the HCS in the short run from research in the UK over 10 years

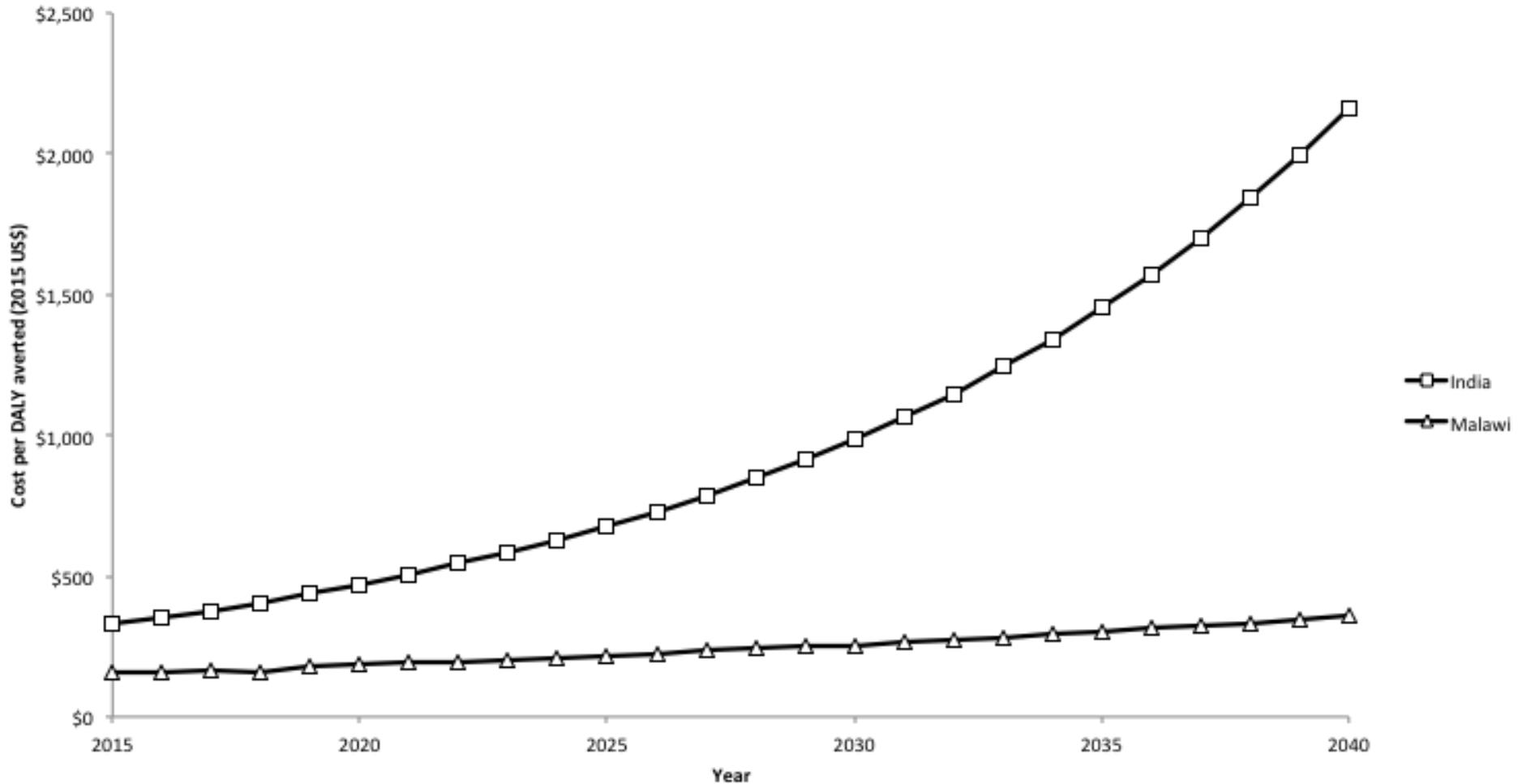
Projecting the marginal productivity of health care expenditure

- Obtain projected estimates for all of the data inputs used
 - Elasticities: no strong evidence of changes by time, income or health care expenditure
 - Demography (population, age, gender)
 - Epidemiology (mortality and morbidity)
 - Health expenditure: Published projections available from IHME for 2015-2040 (Dieleman et al 2017)
- Use observed association between health expenditure and its marginal productivity
 - Health care expenditure continues to be correlated with determinants of marginal productivity

Association between marginal productivities and government expenditure on health in 2015 using Ochalek et al (2015)



Projected evolution of the marginal productivity of expenditure on health over time



Summary

- Some global evidence of the marginal productivity of health care expenditure for LMICs
- Can be linked to projected growth in health care expenditure
- Projected health care expenditure can be linked to projections of consumption growth