Projection Models of Human Resources in Health
Econometric Approach

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Workshop Health Workforce Planning and Predictive Models

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Outline

1. Defining terms: need, demand, and supply
2. Labor market framework
3. Regression equations to estimate
4. Results
5. Limitations of this approach
6. Adapting the approach to other contexts

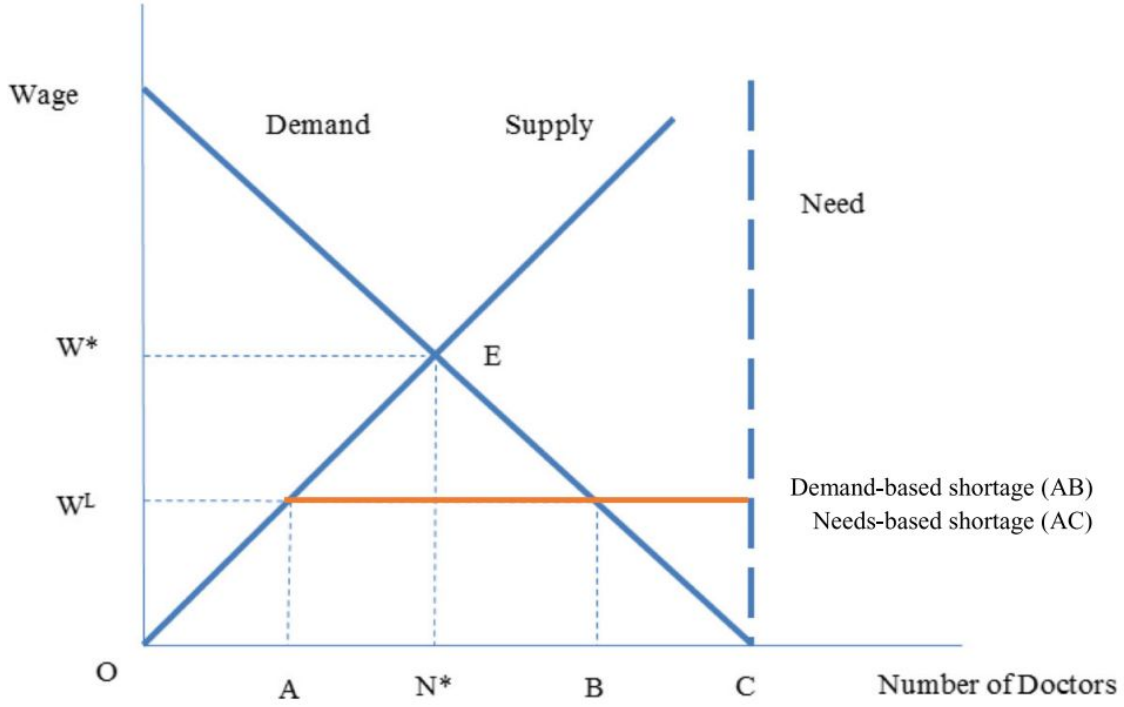
Defining Terms

1. **Need** - # of health workers required to attain the objectives of a health system

2. **Demand** - # of health workers that a health system can support in terms of funded positions or economic demand for services

3. **Supply** - # of health workers available in a country

A graphical depiction of need, demand, and supply



[1] Scheffler RM, Campbell J, Cometto G, Maeda A, Liu J, Bruckner TA, Arnold DR, Evans T. Forecasting imbalances in the global health labor market and devising policy responses. Human resources for health. 2018 Dec 1;16(1):5.

Need

- Often estimated based on the minimum number of health workers needed to address priority population health issues

- **Example:** Recent WHO report [2] defined need as the number of health workers needed to achieve the median level of attainment (25%) for a composite index of 12 tracer health indicators.
  - Led to a need estimate of **4.45** doctors/nurses/midwives per 1000 population

[2] Scheffler R, Cometto G, Tulenko K, et al. Health workforce requirements for universal health coverage and the sustainable development goals—background paper n.1 to the WHO global strategy on human resources for health: workforce 2030. Geneva: World Health Organization; 2016. Available from: http://www.who.int/hrh/resources/health-observer17/en/

SDG composite index

Table 1 The 12 selected tracer indicators in the SDG composite index threshold and their primary classifications

SDG tracer indicator	Classification
Antenatal care	MNCH
Antiretroviral therapy	ID
Cataract	NCD
Diabetes	NCD
DTP3 immunization	ID
Family planning	MNCH
Hypertension	NCD
Potable water	ID
Sanitation	ID
Skilled birth attendance	MNCH
Tobacco smoking	NCD
Tuberculosis	ID

Source: [1]
Abbreviations: *MNCH* Maternal, Newborn, Child Health, *ID* Infectious Disease, *NCD* Non-communicable Disease

1. Each country received 1 point for each indicator where the % of the population covered was over 80% (score 0-12)
2. Indicators weighted by global burden of disease (tobacco smoking 12x burden of DTP3 vaccination)
3. Score normalized to be between 0 and 1
    a. Median country had a score of 0.25

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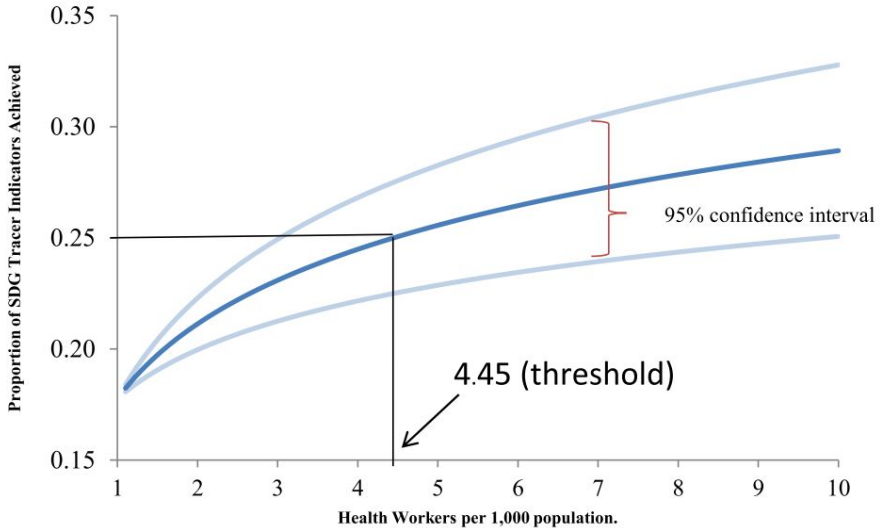
Note: SDG = Sustainable Development Goals

Need regression equation

$$\text{SDG composite score}_i = \beta_0 + \beta_1{}^{*} \ln(\text{health workers per 1000 population}_i) + \xi_i$$



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Demand

- National income is known as the major predictor of health care spending and hence the demand of health workers (see e.g. [3],[4])

[3] Scheffler RM, Liu JX, Kinfu Y, Dal Poz MR. Forecasting the global shortage of physicians: an economic-and needs-based approach. Bull World Health Organ. 2008;86(7):516–23B.

[4] Scheffler RM, Mahoney CB, Fulton BD, Dal Poz MR, Preker AS. Estimates of health care professional shortages in sub-Saharan Africa by 2015. Health Aff (Millwood). 2009;28(5):w849–w62.

Demand

$$\ln(\text{physicians per 1000 population}_{it})$$

i=country, t=year

$$= \beta_0 + \beta_1^* \ln(\text{GDP per capita}_{it-1}) + \beta_2^* \ln(\text{GDP per capita}_{it-4}) + \beta_3^* \ln(\text{GDP per capita}_{it-5}) + \beta_4^* \ln(\text{OOPPC}_{it-2}) + \beta_5^* \ln(Pop65_{it-3}) + \mu_i + \xi_{it}$$

Out of pocket spending per capita

% of population over 65

country fixed effects

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Supply

- Supply of health workers is a function of the training capacity in a country and the net migration, deaths, and retirements of health workers.

Supply

WHO separately estimated the growth rate of physician and nurses/midwives density for each country from 1990 to 2013 using the following equations:

$$\text{Physicians per 1000 population}_t = \alpha_0 + \alpha_1{}^{*}\text{year}_t + \varepsilon_t$$

$$\text{Nurses/midwives per 1000 population}_t = \beta_0 + \beta_1{}^{*}\text{year}_t + \varepsilon_t$$

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Table 5 Estimated and projected global needs-based and demand-based shortages of health workers, by World Bank income group and WHO region, 2013 and 2030 [shortages are positive, surpluses are negative]

	Needs-based shortages (Need-Supply)		Demand-based shortages (Demand-Supply)	
	2013	2030	2013	2030
World Bank Income Group (# of countries)				
Low (29)	4 202 379	5 746 161	– 55 173	15 498
Lower-middle (44)	9 003 163	6 495 262	1 029 616	3 723 638
Upper-middle (46)	3 658 626	1 746 981	5 276 413	11 929 697
High (46)	81 361	74 838	305 367	– 167 623
WHO Region (# of countries)				
Africa (43)	4 194 741	6 088 186	– 768 647	– 661 859
Americas (28)	708 021	503 870	441 453	2 545 754
Eastern Mediterranean (15)	1 569 814	1 508 924	367 081	1 590 107
Europe (50)	78 394	57 749	1 485 608	1 355 508
South-East Asia (8)	6 661 765	4 547 443	192 068	2 038 195
Western Pacific (21)	3 732 794	1 357 071	4 838 663	8 633 507
World (165)	16 945 529	14 063 242	6 556 224	15 501 211

Sources: [1, 2]

Notes: Health worker refers to physicians, nurses/midwives, and other health workers. For demand-based shortages, positive totals represent shortages while negative totals represent surpluses. The total needs-based shortages reported in this table are lower than the totals reported by the WHO report because this table computes needs-based shortages for 165 countries (to correspond with the demand estimates) whereas the WHO report computed needs-based shortages for 210 countries

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Limitations of this approach

Demand

- Doesn't include
  - Increased productivity (technology)
  - Changes in the organization of health care delivery

Supply

- Assumes no change in either entry or exit of workers into the market
  - Recent policy and programmatic changes intended to augment the production of health workers not accounted for (supply underestimated)

Data Availability

- Best data typically on physicians. Data on other health care professionals not as comprehensive.

Adapting the approach to other contexts

- Regions within a country can replace countries as the unit of analysis
  - Data availability the most common hurdle
    - Are health worker data available over time for the regions you are interested in studying?
    - Do you have data on the region's health spending budget over time?
  - "Need" needs to be defined
    - WHO report was one example, but the priorities of a particular country (region) should go dictate how need is defined

References

[1] Scheffler RM, Campbell J, Cometto G, Maeda A, Liu J, Bruckner TA, Arnold DR, Evans T. Forecasting imbalances in the global health labor market and devising policy responses. Human resources for health. 2018 Dec 1;16(1):5.

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