

Additional file 1: Review Protocol¹

Summary	Assessing needs-based supply of physicians: A criteria-led methodological review of international studies in high-resource settings
Aim	The aim is to apply a set of criteria to review methodological approaches to estimate needs-based physician requirements.
Inclusion criteria	• Empirical studies • Publication dates: starting January 1980 • Language: English, German
Exclusion criteria	• No quantification of need • Forecasting supply • Inpatient care • Non-physicians • Language restrictions • Low- and middle-income countries
Information sources	Scientific database: • Social, life and health sciences: Web of Science Core Collection, Science Direct • Biomedical: PubMed Grey literature: complementary search in OpenGrey Searches on predefined, international websites (full list including links, see 2.2) Hand search of relevant sources in published studies and author searches
Selection process	The review process was conducted by two independent reviewers; disagreements were resolved through discussion until consensus was reached.

¹ Adapted from Shamseer L, Moher D, Clarke M, Ghersi D, Liberati A, Petticrew M, Shekelle P, Stewart L, PRISMA-P Group. Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015: elaboration and explanation. BMJ. 2015 Jan 2;349 (jan02 1):g7647.

Supplementary Table 1: Reporting Search History

1.1. Electronic Database

Database, provider		Web of Science Core Collection, Thomson Reuters	Update
Search date (dd/mm/yyyy)		05/04/2017	09/03/2020
Period or update status		1963-05/04/2017	05/04/2017-09/03/2020
#	Search	Results	Results
1	TOPIC: ("workforce planning")	680	/
2	TOPIC: ("capacity planning")	2,024	/
3	TOPIC: ("human resource*")	27,379	/
4	TOPIC: ("planning")	343,331	/
5	TOPIC: ("service requirement*")	2,857	/
6	TOPIC: ("health")	1,545,733	/
7	TOPIC: ("physician*")	252,153	/
8	#7 AND #6	80,602	/
9	#8 AND #5	8	/
10	#8 AND #1	66	/
11	#8 AND #2	7	/
12	#8 AND #4 AND #3	70	/
14	#13 OR #12 OR #11 OR #10 OR #9	132	91

Database, provider		PubMed, U.S. National Library of Medicine	Update
Search date (dd/mm/yyyy)		16/05/2017	09/03/2020
Period or update status		1980-16/05/2017	16/05/2017-09/03/2020
#	Search	Results	Results
1	TOPIC: ("need")	391,069	/
2	TOPIC: ("capacity planning")	83	/
3	TOPIC: ("health human resource")	104	/
4	TOPIC: ("demand")	67427	/
5	TOPIC: ("healthcare")	166,724	/
6	TOPIC: ("workforce planning")	511	/
7	TOPIC: ("forecast") / ("projection")	4,400 / 48,535	/
8	#6 AND #5	85	/
9	#6 AND #5 AND #1	25	/
10	#6 AND #5 AND #4	24	/
11	#6 AND #5 AND #7	2	/
12	#6 AND #3	4	/
13	#6 AND #7	8	/
14	#3 AND #1	25	/
15	#3 AND #4	13	/
16	#9 OR #10 OR #11 OR #12 #13 OR #14 OR #15	186	3

Database, provider		Science Direct, Elsevier	Update
Search date (dd/mm/yyyy)		20/09/2017	09/03/2020
Period or update status		1980-20/09/2017	20/09/2017-09/03/2020
#	Search	Results	Results
1	TOPIC: ("need")	6,016,181	/
2	TOPIC: ("capacity planning")	5,326	/
3	TOPIC: ("health human resource")	403	/
4	TOPIC: ("demand")	1,537,913	/
5	TOPIC: ("healthcare")	392,618	/
6	TOPIC: ("workforce planning")	1,344	/
7	TOPIC: ("forecast") / ("projection")	244,797 / 698,167	/
8	#6 AND #3	26	/
9	#6 AND #5 AND #4 AND #1	298	/
10	#6 AND #7 AND #5 AND #4 AND #1	65	/
11	#6 AND #7 AND #3	10	/
12	#2 AND 5 AND #7	117	/
13	#8 OR #9 OR #10 OR #11 OR #12	516	187

Summary: full search history

Database, provider	Search date (dd/mm/yyyy)	Period or update status	Results	Update
Web of Science Core Collection, Thomson Reuters	04/04/2017	1963 – 05/04/2017	132	91
PubMed, U/S/ National Library of Medicine	16/05/2017	1980 – 16/05/2017	186	3
Science Direct, Elsevier	16/05/2017	1980 – 20/09/2017	516	187
Overall including duplicats			834	281
Overall no duplicats			790	203

1.2. List of websites included in the identification process²

International:

- Andean network of Observatories for human resources for health <https://www.emro.who.int/entity/health-workforce/index.html>
- European Commission on Public Health, health workforce http://ec.europa.eu/health/workforce/policy/index_en/htm
- European Observatory on Health Systems and Policies <http://www.euro.who.int/en/about-us/partners/observatory>
- GHWA <https://www.who.int/teams/health-workforce/network>
- Health Cluster EU <http://healthclusternet.eu>
- HRH Global Resource Centre <http://www/hrhresourcecenter.org/>
- Joint Action on Health Workforce Planning and Forecasting <http://www.euhwforce.eu/>
- KIT <http://www/kit/nl/kit/en/>
- The Health Systems and Policy Monitor
 - <http://www/hspm/org/mainpage.aspx>
- OECD <http://www/oecd/org/>
- World Bank <http://www/worldbank/org/>
- WHO Health Workforce <https://www.who.int/health-topics/health-workforce>
- WHO EURO Health Evidence Network (HEN)
 - <http://www/euro/who/int/en/data-and-evidence/evidence-informed-policy-making/health-evidence-network-hen>
- WHO Collaborating Centers focusing on HRH
 - University of Western Cape <http://www/uwc/ac/za/Faculties/CHS/soph/Pages/WHO-Collaborating-Center-/aspx>
 - University of Illinois at Rockford <http://ncrhp/uic/edu/index/cfm?id=1031&b=1003&page=World%20Health%20Organization%20%28WHO%29%20Collaborating%20Centre>
 - McMaster University http://nursing/mcmaster/ca/WHO_collaborating_centre/html
 - WHO Collaborating Center on Health Workforce Policy and Planning - <http://whoccworkforce/ihmt/unl/pt/>

Country specific:

- Canada
 - Health Canada (human resources strategy) <http://www/hc-sc/gc/ca/hcs-sss/hhr-rhs/strateg/index-eng/php>
 - CHHRN <http://www/hhr-rhs/ca/>
- Netherlands
 - NIVEL <http://www/nivel/nl/en>
 - Advisory Committee on Medical Manpower Planning <http://www/capaciteitsorgaan/nl/Publicaties/tabid/68/language/en-US/Default.aspx>
- Austria
 - Gesundheitsportal <https://www/gesundheit/gv/at/Portal/Node/ghp/public>
 - Hauptverband der österreichischen Sozialversicherungsträger <http://www/hauptverband/at/portal27/hvbportal/content?contentid=10007/752050&viewmode=content>
- Sweden
 - Ministry of Health and Social Affairs <http://www/government/se/sb/d/2061>
 - National Board of Health and Welfare <http://www/socialstyrelsen/se/english>

² Adapted from Tomblin Murphy, G., Birch, S., MacKenzie, A. *et al.* A synthesis of recent analyses of human resources for health requirements and labour market dynamics in high-income OECD countries. *Hum Resour Health* **14**, 59 (2016). <https://doi.org/10.1186/s12960-016-0155-2>

- UK
 - Centre for Workforce Intelligence <http://www/cfwi/org/uk/>
 - Department of Health
[https://www.gov.uk/government/publications?departments\[\]=department-of-health](https://www.gov.uk/government/publications?departments[]=department-of-health)
 - Health Education England <https://hee/nhs/uk/>
- Germany
 - IGES Institut GmbH <https://www/iges/com/>
 - Zentralinstitut für die kassenärztliche Versorgung <http://www/zi/de/>
 - GKV Spitzenverband <https://www/gkv-spitzenverband/de/>
 - Wissenschaftliches Institut für Gesundheitsökonomie und Gesundheitssystemforschung <http://www/wig2/de/>