Supplemental materials for:

Goodyear-Smith F, Bazemore A, Coffman M, et al. Primary care research priorities in low- and middle-income countries. *Ann Fam Med*. 2019;17(1):31-35.

Supplemental Appendix

Additional methods

The team's global networks approached included WONCA regional membership and its Working Parties; the Besrour Centre; the American Board of Family Medicine; the Robert Graham Center; Primafamed;, the North American Primary Care Research Group; the South Pacific Community; Global Health at the School of Population Health, University of Auckland; and the International Council of Nurses. LMIC were determined from the World Bank list of economies.[1] We used a modified Delphi technique whereby sequential surveys are answered anonymously by a range of relevant experts, with summarized feedback to enable reaching a consensus.[2] The first round was qualitative, aiming to generate as many ideas as possible, with the remaining two following a modified method, providing anonymized summaries of experts' responses to facilitate group convergence. Respondents had one week to complete each round.

In Round 1, participants were asked to generate research questions addressing gaps in knowledge in organization (e.g. workforce, models of care, use of teams, scope of care, transitions of care, government policy), and financing (e.g. equity, quality, safety, contracting of services, payment systems, scaling up / implementing best practice, essential and cost-efficient commodities). Enrolled participants were invited to respond through individual survey links. Questions generated by the panelists were extracted, collated and coded into domains and sub-domains for both key areas using a general inductive thematic approach. Two researchers independently coded the first 25 respondent replies and calculated Cicchetti-Allison kappa co-efficients to check for consistency in coding. Data were sorted by codes, collapsed, and synthesized to lists of questions for the key areas of organization and financing. Similar questions from a number of participants were combined into representative questions for Round 2.

In Round 2, all enrolled participants were invited to rate each question on a four-point Likert scale for level of importance to be researched in their country. Both the two key areas and the question lists were randomly presented to each participant to prevent response bias from the order of presentation.

The participants' responses were used to calculate agreement, which was indicated by mean score, where a larger mean demonstrated more agreement. Collated responses were ordered in degree of importance, and the top 16 research questions were selected for both areas. In Round 3, panelists were asked to prioritize the research questions by dragging and dropping them into order of importance for their country. The two areas and question lists were randomly presented.

Additional results

Supplemental Table 1. Numbers of Enrolled Participants Residing and Working in Low- and Middle-Income Countries			
Global region*	**Number of MIC / number MIC in region (%)**	**Number LIC / number LIC in region (%)**	**Number of enrolled participants**
Europe	8/22 (36)	0/0 (0)	14
Africa	11/20 (55)	4/27 (15)	69
South Asia	4/6 (67)	1/1 (100)	19
Asia Pacific	6/23 (26)	0/1 (0)	11
North American Caribbean	3/6 (50)	1/1 (100)	5
South America	9/19 (47)	0 (0)	19
Eastern Mediterranean	3/13 (23)	0/1 (0)	4
Total	44/109 (40%)	6/31 (19%)	141
Between 48% and 60% of enrolled panelists participated in each round.			

Supplemental Table 2. Research Questions for PHC Organization and Financing Rated for Importance						
	Organization / models of care	**Sum**	**Mean**	**Financing**	**Sum**	**Mean**
1.	How can family physicians be supported to provide comprehensive community-based care instead of resources being directed into vertical programmes?	290	3.58	What are the barriers to implementing best practice in PHC?	285	3.52
2.	What are the drivers for PHC teams to deliver high quality services (intrinsic and extrinsic factors such as pay, status, career pathway/promotion etc)?	286	3.53	When resources are limited, where/how is it most cost-effective to use the available funds for the greatest health outcomes in PHC?	280	3.46
3.	How can education and training support the PHC workforce to deliver the range of services that address priority health needs of the community?	284	3.51	What are the best practices in PHC and how can they be scaled up?	279	3.44

4.	How does PHC impact the health indicators of the countries? What are these indicators? How are they measured? How do they compare between countries?	284	3.51	What are the resources essential to deliver quality PHC services?	274	3.38
5.	What are the factors that facilitate recruitment and retention of a PHC workforce in underserved community settings?	280	3.46	What is the ideal proportion of the total health care budget that guarantees the development of quality PHC?	272	3.36
6.	What are the best strategies to implement and monitor best practice in PHC?	280	3.46	What is the most appropriate payment system to increase access and availability of quality PHC?	270	3.33
7.	Are the services and scope of practice of PHC aligned with people's health needs, taking into account variations in population needs, resources and geography, and what is the evidence on which the range of services/scope of care provided should be decided?	279	3.44	How much of the PHC budget should be allocated for preventable diseases (e.g. NCDs, vaccination, cancer screening)?	270	3.33

8.	What strategies can be undertaken to ensure quality in the delivery of PHC service to patients (e.g. training/research/quality control)?	279	3.44	Does everyone have access to quality PHC that he/she needs?	267	3.30
9.	What are the factors or incentives that can improve distribution of PHC workforce or equity of accessing PHC services?	277	3.42	What effective funding models exist for delivering universal PHC coverage in LMICs?	266	3.28
10.	How can different stakeholders (e.g. policymakers, health system managers, health workforce organizations, academic institutions and communities) support and assist the PHC workforce and successful team functioning?	277	3.42	What mechanisms have been found to be effective in persuading governments to invest in PHC?	263	3.25
11.	How can PHC services be integrated with other community-based health and social services?	276	3.41	How do you maintain accountability for safety and/or quality in PHC while scaling up?	261	3.22

12.	What are the factors to be considered and negotiated for successful referral from primary to secondary care and back?	275	3.40	Do accreditation systems (e.g. of vocational training, of practices) improve quality of patient care?	260	3.21
13.	What PHC models of care provision in resourced limited environments provide the highest impact?	274	3.38	How can the public and private sectors work more collaboratively to improve and integrate PHC coverage and prevent segmentation of the services?	258	3.19
14.	How should care be horizontally integrated and coordinated among the multidisciplinary PHC team?	273	3.37	What percentage of public health care spending is dedicated to PHC in different LMIC countries?	258	3.19
15.	What factors should determine the composition of the PHC team and what professionals should the team include as a minimum?	270	3.33	What advances have been made in the last ten years to improve PHC and quality in the public and private sectors?	257	3.17

16.	What are the essential features to ensure adequate coordination and collaboration among PHC team members to address the priority health concerns of the population they serve?	270	3.33	Does the government have policies/legal provisions to insure quality and safety of PHC?	257	3.17
17.	What procedures and protocols are required to ensure seamless transitions and transfers occur when required to and from primary and secondary care? What role can IT play in this?	269	3.32	Does the allocation of resources follow a defined pattern that considers social determinants in health in PHC?	256	3.16
18.	What is the best leadership model for PHC? Who should lead the PHC delivery team where there is no physician?	268	3.31	What incentives and rewards are required to ensure that the PHC private sector contributes to successful comprehensive primary health care?	255	3.15

19.	How can different stakeholders (e.g. health system managers, health workforce members, academic institutions and communities) advise policymakers on how to ensure that PHC services address population health needs?	268	3.31	How do you communicate clearly the risks and benefits of PHC vs other high-cost subspecialty care?	252	3.11
20.	What can be done to prioritize limited resources and what alternatives including telemedicine can assist in providing PHC to under-resourced areas?	264	3.26	Are quality measurements currently used to allocate resources in PHC?	247	3.05
21.	What tools and processes are best for assessing the match between PHC team structure and function and patient/community needs?	263	3.25	How do PHC facilities clearly communicate their funding needs through a transparent, accountable system?	246	3.04

22.	What is the effective panel (patient population) size for provision of effective, comprehensive PHC? How does this differ depending on worker type, PHC team composition, and location (e.g. urban vs rural)?	259	3.20	What are the appropriate outcomes to assess the effectiveness of different governance models for both the PHC public and private sectors?	244	3.01
23.	How does a PHC team establish practice priorities, what essential services need to be provided and decide what is out of scope?	255	3.15	Why, and when, should PHC services be contracted out by ministries of health and will this lead to improvements in quality of care and better management of scarce resources?	241	2.98
24.	Are there differences in the ability to access PHC based on the region of the country, and between rural and urban?	254	3.14	What are the similarities in PHC between the public and private networks in different HIC and LMIC countries?	236	2.91

25.	What are the most useful ways of delineating PHC services and hospital services in a generalist district health system model?	253	3.12	What is the role of NGOs in the PHC system?	235	2.90
26.	What do patients consider should be the basic / essential scope of practice for PHC team?	252	3.11	How do the PHC public and private sectors learn from each other to improve quality?	233	2.88
27.	What role is there for specialists to see patients in community settings and for PHC workers including family physicians to work in secondary and tertiary settings?	252	3.11	What is the role of the private sector in PHC services?	232	2.86
28.	Why is there a significant number of the populace not able or willing to access services in PHC?	251	3.10	How does the quality and safety of the implementation of PHC affect having differences in the budget in the private and public sectors?	232	2.86

29.	What role is there for community members guide the development and delivery of public and private community-based PHC services and to contribute to government policy which supports these services?	247	3.05	Is the PHC system well-funded through taxation (leading to subsidized payments) or via co-payments determined by insurance services?	230	2.84
30.	What are the most effective and efficient means of tracking of where PHC workers practice after completing training in LMICs?	243	3.00	How does regulation of the PHC private sector compare with public sector regulation by regulatory bodies?	225	2.78
31.	How do government policies impact migration (import or export) of PHC physicians in LMICs?	242	2.99	Are taxes on products with harmful effects, such as alcohol and tobacco, used to try to increase health system funding?	216	2.67
32.	How can traditional healers be accommodated within a PHC system?	238	2.94			
33.	What are the legal barriers & enablers that most inhibit and facilitate access to PHC services?	234	2.89			

34.	Is there a role for high school graduates to work in PHC teams as community workers if physicians and other trained clinicians are not available, particularly in rural areas, and what would a standardised skill set for these health workers be?	233	2.88			
35.	How do different PHC terminologies in LMIC and HIC countries influence comparative international research outcomes?	231	2.85			
36.	Do centres of excellence in key urban areas focus predominantly on secondary and tertiary services in your country? Are workers sent to rural and PHC settings as a form of disciplinary action?	223	2.75			
* Maximum possible score = 336 (if all panellists rated the question very important)						

References

1. World Bank Group. List of economies Washington DC, USA2017 [Available from: https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups accessed 18 Mar 2018.
2. Sinha IP, Smyth RL, Williamson PR. Using the Delphi technique to determine which outcomes to measure in clinical trials: recommendations for the future based on a systematic review of existing studies. *PLoS Med* 2011;8(1):e1000393. doi: https://dx.doi.org/10.1371/journal.pmed.1000393