



Published in final edited form as:

Am J Prev Med. 2011 October ; 41(4 0 3): S164–S169. doi:10.1016/j.amepre.2011.06.022.

Refocusing Knowledge Generation, Application, and Education: Raising Our Gaze to Promote Health Across Boundaries

Kurt C. Stange, MD, PhD

Those educating healthcare professionals face the undeniable challenge that the current U.S. healthcare system is untenable.¹ U.S. health care epitomizes low value—spending more than any other country while ranked 37th in the world—between Costa Rica and Slovenia, in its ability to equitably engender health.² The September 14–15, 2010 conference on *Patients and Populations: Public Health in Medical Education*, sponsored by the Association of American Medical Colleges (AAMC) and the CDC, provided inspiring examples from those who are trying to show the healthcare professionals of the future a better way.

Yet, with U.S. healthcare spending American business into noncompetitiveness,³ mortgaging not only our children's but our grandchildren's futures, the task is more than to bring a public health understanding into the mainstream of research and medical education.^{4–6} The urgent need is to inspire and enable the younger generation to spring over the current dysfunctional medico-industrial complex, to bubble up diverse new streams that together create a torrential delta of change, so that quality health care becomes about both health and caring, accessible to all, while still leaving resources to strengthen the social and environmental determinants of health.⁵

This daunting task—providing high-value health care for all while spending less and doing more to improve the actual health of the population—requires a different way of understanding health care and health than the current biomedical model. It requires a more inclusive way of framing the generation of new knowledge and of applying that knowledge in education and practice. This reframing involves raising the gaze and spanning boundaries.

Raising the Gaze

A reductionist biomedical enterprise has made impressive strides in understanding disease mechanisms and in curing or ameliorating certain diseases.^{7–9} But as the predominant health problems increasingly relate to chronic more than acute illness¹⁰; as multimorbidity becomes the norm in an aging population^{11–14}; as health behavior, the education and employment of the population, and other social and environmental determinants become the

© 2014 American Journal of Preventive Medicine. Published by Elsevier Inc. All rights reserved.

Address correspondence to: Kurt C. Stange, MD, PhD, Department of Family Medicine, Case Western Reserve University, 10900 Euclid Ave., Cleveland OH 44106. kcs@case.edu.

Publisher's Disclaimer: This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

No financial disclosures were reported by the author of this paper.

predominant drivers of health¹⁵; a fragmented approach to understanding and advancing health becomes less and less effective, and the need for a complementary more inclusive approach has become more apparent.^{7, 16, 17}

A different lens with which to see the problem becomes vital.^{18, 19} This lens not only focuses on smaller and smaller parts, but also elevates the gaze upward—from molecule to person, from person to system, system to community, community to environment.²⁰ Shown in the Figure as four circles, a gaze that takes in the broad factors affecting health includes: individuals and families, primary health care, healthcare systems, public health and communities. This elevated view recognizes that people live in a social context and their health is more than the sum of their diseases.^{21, 22} It recognizes that healthcare systems based on primary care have better population health, higher-quality health care at lower cost, and less inequality than systems based on more fractured approaches.^{23–25} It takes a systems perspective to health care, public health, and community.

As Risa Lavizzo-Mourey and David Williams note in an article in another recent supplement to the *American Journal of Preventive Medicine*:

There is more to health than health care. Where we live, work, learn, and play can affect our health more than what happens in the physician's office. Yet, ask our national leaders, "What determines health?" and you'll hear about access to health care. As vital as health care and healthcare reform are, they are just part of the answer.²⁶

Moving beyond health care to a broader view of health as a state that enables people to do valued life activities can totally reframe our health promotion efforts. Health can be understood as:

- a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity²¹
- a resource for everyday life, not the objective of living; it is a positive concept, emphasizing social and personal resources, as well as physical capacities²⁷
- conditions that enable a person to work to achieve his or her biological and chosen potential²⁸
- membership in community²⁹
- the biological, social, and psychological ability that affords an equal opportunity for each individual to function in the relationships appropriate to his or her cultural context at any point in the life cycle³⁰
- the ability to develop meaningful relationships and pursue a transcendent purpose in a finite life³¹

Any of these inclusive, grounded, meaningful definitions of health helps to refocus energy toward solutions to the U.S. health and healthcare crisis, rather than toward more of the same. The enabling importance of focusing on health is indicated in the Figure by its centrality.

Boundary Spanning

Boundary spanning is reaching across borders to “build relationships, interconnections, and interdependencies”³² in order to manage complex problems. Boundary-spanning individuals develop partnerships and collaboration by “building sustainable relationships, managing through influence and negotiation, and seeking to understand motives, roles, and responsibilities.”³² Boundary-spanning organizations³³ create “strategic alliances, joint working arrangements, networks, partnerships, and many other forms of collaboration across organizational boundaries.”³² Boundary spanning can be a source of innovation and of solving the problems created by working narrowly.^{34–37}

Transdisciplinary,^{38–48} multilevel^{49–51} research, education, and practice, and boundary-spanning efforts to promote health⁵² have great potential to build on the strengths of more narrowly focused approaches, while transcending their weaknesses.⁵³ Many of these boundaries relate to crossing ideologies, disciplines, cultures, markets, peoples, and entrenched worldviews. As shown in the Figure and outlined below, boundaries that are important to span to advance health relate to (1) personalized health care; (2) healing environments; (3) responsible, evolvable organizations; and (4) healthy environments.

1. Personalized health care—a relationship between a clinician and care team with the individual and family that includes;^{24, 54}
 - accessibility as the first contact with the healthcare system;
 - a comprehensive whole-person approach;
 - coordination of care across settings, and integration of care of acute and chronic illnesses, mental health and prevention; and
 - a sustained partnership over time.
2. Healing environments—restorative settings and conditions, including:
 - trustworthy, invested interpersonal and interorganizational relationships;
 - situations that enable a balance of action and reflection;
 - physical space that provides access to nature, light, privacy or positive sensory experience; and
 - meaningful work or activity.
3. Responsible organizations that move beyond sustaining past successes to continued development based on making sense of a rapidly changing environment—moving from sustainability to evolvability. Such organizations that enable health by:
 - following sound environmental procedures;
 - operating with integrity;
 - being accountable to employees, customers, vendors and the communities in which they operate;

- recognizing the impact of their actions on the physical; emotional and social well-being of individuals and communities; and
 - developing to meet emerging needs and conditions.
4. Healthy environments—physical and social surroundings that foster health, including:
- clean air, water and sanitation;
 - affordable, accessible, nutritious food, especially fruits and vegetables;
 - safe, affordable, comfortable and pest-free housing;
 - safe, spacious areas for walking;
 - crime-free neighborhoods and violence-free homes;
 - economic opportunities; and
 - affordable and available education.

Generating and Learning the Relevant Knowledge

Fortunately, different ways of knowing¹⁹ and of generating knowledge^{55, 56} are emerging. These emergent approaches have great potential to complement the dominant reductionist models of knowledge generation and use^{57–60} to enable boundary spanning that advances health. The new models include participatory^{50, 61–65} and practice-based network research,^{62, 66–76} multimethod approaches that integrate quantitative and qualitative methods,^{77–83} and theories that recognize the complex adaptive nature of the systems that relate to health and health care.^{13, 80, 84–95} Glimmers of support for these more inclusive approaches to research are seen in the NIH Clinical and Translational Science Awards, CDC Prevention Research Centers, and the CDC–AAMC Cooperative Agreement that led to this journal supplement. Even the comparative effectiveness research movement^{96–99} has potential to step in a more systemic direction as it struggles to move from a focus on drugs and devices⁹⁶ to comparing different systems affecting health care and health.¹⁰⁰

I invite readers who are interested in the emerging effects of boundary spanning and health to share your own stories or knowledge from other sources at the website of the Promoting Health Across Boundaries initiative (www.PHAB.org).

Daniel Federman, in his address at the 2007 American Association of Medical Colleges Annual Meeting commented:

I believe we should enlist some medical students as agents of change, committed to designing a system of care that is equitable, cost-effective, prevention-oriented, universal, and thus moral. I suggest...an activist focus, and consistent mentoring.^{5, 101}

The 2010 conference on *Patients and Populations: Public Health in Medical Education* advanced this vision beyond medical students to include multiple disciplines, generations, organizations, and communities that care about health. The hard work of the boundary

spanner is needed in research, education, systems development, and practice. Combined with an inclusive view of health and an elevated gaze, there is great cause for hope.³¹

Acknowledgments

Mary Ruhe and Heide Aungst helped to develop many of the ideas contained in this manuscript. Dr. Stange's time is supported in part by a Clinical Research Professorship from the American Cancer Society and by the Case Western Reserve University/Cleveland Clinic Clinical and Translational Science Collaborative, Grant Number UL1 RR024989 from the National Center for Research Resources (NCRR), a component of the National Institutes of Health and NIH roadmap for Medical Research. Its contents are solely the responsibility of the author and do not necessarily represent the official view of NCRR, the NIH or the ACS.

Publication of this article was supported by the CDC–AAMC (Association of American Medical Colleges) Cooperative Agreement number 5U36CD319276.

References

1. Institute of Medicine: Committee on Quality of Health Care in America. *Crossing the Quality Chasm: A New Health System for the 21st Century*. Washington, DC: National Academy Press; 2001.
2. World Health Organization. [Accessed March 23, 2011] Press Release WHO/44: World Health Organization assesses the world's health systems. 2000. www.who.int/inf-pr-2000/en/pr2000-44.html.
3. Congress of the United States, Congressional Budget Office. [Accessed July 14, 2010] The Long-Term Outlook for Health Care Spending. Pub. No. 3085, November [pdf]. 2007. www.cbo.gov/ftpdocs/87xx/doc8758/11-13-LT-Health.pdf.
4. Maeshiro R, Johnson I, Koo D, et al. Medical education for a healthier population: reflections on the Flexner Report from a public health perspective. *Acad Med*. 2010 Feb; 85(2):211–219. [PubMed: 20107345]
5. Maeshiro R. Responding to the challenge: population health education for physicians. *Acad Med*. 2008 Apr; 83(4):319–320. [PubMed: 18367886]
6. Maeshiro R. Public health practice and academic medicine: promising partnerships regional medicine public health education centers--two cycles. *J Public Health Manag Pract*. 2006 Sep-Oct; 12(5):493–495. [PubMed: 16912617]
7. Pauli HG, White KL, McWhinney IR. Medical education, research, and scientific thinking in the 21st century (part three of three). *Education for health (Abingdon, England)*. 2000; 13(2):173–186.
8. Lesko LJ. Personalized medicine: elusive dream or imminent reality? *Clin. Pharmacol. Ther*. 2007 Jun; 81(6):807–816. [PubMed: 17505496]
9. Shaw SE, Greenhalgh T. Best research--for what? Best health--for whom? A critical exploration of primary care research using discourse analysis. *Soc. Sci. Med*. 2008 Jun; 66(12):2506–2519. [PubMed: 18378371]
10. Mokdad AH, Marks JS, Stroup DF, Gerberding JL. Actual causes of death in the United States, 2000. *JAMA*. 2004 Mar 10; 291(10):1238–1245. [PubMed: 15010446]
11. Fortin M, Bravo G, Hudon C, Vanasse A, Lapointe L. Prevalence of multimorbidity among adults seen in family practice. *Ann. Fam. Med*. 2005 May-Jun; 3(3):223–228. [PubMed: 15928225]
12. Fortin M, Soubhi H, Hudon C, Bayliss EA, van den Akker M. Multimorbidity's many challenges. Time to focus on the needs of this vulnerable and growing population. *BMJ*. 2007 May 19; 334(7602):1016–1017. [PubMed: 17510108]
13. Valderas JM, Starfield B, Sibbald B, Salisbury C, Roland M. Defining comorbidity: implications for understanding health and health services. *Ann. Fam. Med*. 2009 Jul-Aug; 7(4):357–363. [PubMed: 19597174]
14. Tinetti ME, Bogardus ST Jr, Agostini JV. Potential pitfalls of disease-specific guidelines for patients with multiple conditions. *N. Engl. J. Med*. 2004 Dec 30; 351(27):2870–2874. [PubMed: 15625341]

15. World Health Organization. [Accessed August 13, 2010] Commission on Social Determinants of Health - Final Report. 2008. www.who.int/social_determinants/final_report/en/index.html.
16. Bulger RJ. Reductionist biology and population medicine - strange bedfellows or a marriage made in heaven? *JAMA*. 1990; 264(4):508–509. [PubMed: 2366285]
17. Sturmberg JP. Systems and complexity thinking in general practice: part 1 - clinical application. *Aust. Fam. Physician*. 2007 Mar; 36(3):170–173. [PubMed: 17339983]
18. Stange KC, et al. Integrative approaches to promoting health and personalized, high-value health care: a science of connectedness and the practice of generalism. *Ann. Fam. Med.* 2009–2010 www.annfammed.org/cgi/collection/editorial_series.
19. Stange KC. Ways of knowing, learning, and developing. *Ann. Fam. Med.* 2010 Jan-Feb;8(1):4–10. [PubMed: 20065272]
20. Stange KC. The problem of fragmentation and the need for integrative solutions. *Ann. Fam. Med.* 2009; 7(2):100–103. [PubMed: 19273863]
21. World Health Organization. Definition of Health. 1948. www.who.int/about/definition/en/print.html.
22. World Health Organization. [Accessed June 30, 2010] Declaration of Alma-Ata: International conference on primary health care, Alma-Ata, USSR, 6–12 September 1978. 1978. www.who.int/hpr/NPH/docs/declaration_almaata.pdf.
23. Starfield B, Shi LY, Macinko J. Contribution of primary care to health systems and health. *Milbank Q.* 2005; 83(3):457–502. [PubMed: 16202000]
24. Donaldson, MS.; Yordy, KD.; Lohr, KN.; Vanselow, NA., editors. *Primary Care: America's Health in a New Era*. Washington, DC: National Academy Press; 1996.
25. Friedberg MW, Hussey PS, Schneider EC. Primary care: a critical review of the evidence on quality and costs of health care. *Health Affair.* 2010 May; 29(5):766–772.
26. Lavizzo-Mourey R, Williams DR. Strong medicine for a healthier America: introduction. *Am J Prev Med.* 2011 Jan; 40 Suppl 1(1):S1–S3. [PubMed: 21146775]
27. First International Conference on Health Promotion. Ottawa Charter for Health Promotion. WHO/HPR/HEP/95.1; 1986 Nov 21. www.who.int/hpr/NPH/docs/ottawa_charter_hp.pdf.
28. Seedhouse, D. *Health: The Foundations for Achievement*. 2nd ed.. New York: Wiley; 2001.
29. Berry, W. Health is membership. In: Wirzba, N., editor. *The Art of the Commonplace: The Agrarian Essays of Wendell Berry*. Berkeley: Counterpoint : Distributed by Publishers Group West; 2002. p. 144-158.
30. Fine, M.; Peters, JW. *The Nature of Health: How America Lost, and Can Regain, A Basic Human Value*. Abingdon, Oxfordshire: Radcliffe Publishing Limited; 2007.
31. Stange KC. Power to advocate for health. *Ann. Fam. Med.* 2010; 8(2):100–107. [PubMed: 20212296]
32. Williams PT. The competent boundary spanner. *Public Admin.* 2002; 80(1):103–124.
33. Levina N, Vaast E. The emergence of boundary spanning competence in practice: implications for information systems' implementation and use. *MIS Quarterly.* 2005 Jun; 29(2):335–363.
34. Aldrich H, Herker D. Boundary Spanning Roles and Organization Structure. *Acad. Manage. Rev.* 1977; 2(2)
35. Miller PM. Examining the work of boundary spanning leaders in community contexts. *International Journal of Leadership in Education: Theory and Practice.* 2008; 11(4):353–377.
36. Weerts DJ, Sandmann LR. Community engagement and boundary-spanning roles at research universities. *The Journal of Higher Education.* 2010; 81(6):702–726.
37. Hsu S-H, Wang Y-C, Tzeng SF. The Source of Innovation: Boundary Spanner. *Total Quality Management and Business Excellence.* 2007; 18(10):1133–1145.
38. Warnecke RB, Oh A, Breen N, et al. Approaching health disparities from a population perspective: the National Institutes of Health Centers for Population Health and Health Disparities. *Am. J. Public Health.* 2008; 98(9):1608–1615. [PubMed: 18633099]
39. Syme SL. The science of team science: assessing the value of transdisciplinary research. *Am. J. Prev. Med.* 2008 Aug; 35(2 Suppl):S94–S95. [PubMed: 18619409]

40. Stokols D, Misra S, Moser RP, Hall KL, Taylor BK. The ecology of team science: understanding contextual influences on transdisciplinary collaboration. *Am J. Prev. Med.* 2008 Aug; 35(2 Suppl):S96–S115. [PubMed: 18619410]
41. Nash JM. Transdisciplinary training: key components and prerequisites for success. *Am J. Prev. Med.* 2008 Aug; 35(2 Suppl):S133–S140. [PubMed: 18619393]
42. Mabry PL, Olster DH, Morgan GD, Abrams DB. Interdisciplinarity and systems science to improve population health: a view from the NIH Office of Behavioral and Social Sciences Research. *Am J. Prev. Med.* 2008 Aug; 35(2 Suppl):S211–S224. [PubMed: 18619402]
43. Klein JT. Evaluation of interdisciplinary and transdisciplinary research: a literature review. *Am J. Prev. Med.* 2008 Aug; 35(2 Suppl):S116–S123. [PubMed: 18619391]
44. Kessel F, Rosenfield PL. Toward transdisciplinary research: historical and contemporary perspectives. *Am J. Prev. Med.* 2008 Aug; 35(2 Suppl):S225–S234. [PubMed: 18619403]
45. Harper GW, Neubauer LC, Bangi AK, Francisco VT. Transdisciplinary research and evaluation for community health initiatives. *Health Promot Pract.* 2008; 9(4):328–337. [PubMed: 18936267]
46. Emmons KM, Viswanath K, Colditz GA. The role of transdisciplinary collaboration in translating and disseminating health research: lessons learned and exemplars of success. *Am J. Prev. Med.* 2008 Aug; 35(2 Suppl):S204–S210. [PubMed: 18619401]
47. Croyle RT. The National Cancer Institute's transdisciplinary centers initiatives and the need for building a science of team science. *Am J. Prev. Med.* 2008 Aug; 35(2 Suppl):S90–S93. [PubMed: 18619408]
48. Stokols D. Toward a science of transdisciplinary action research. *Am J. Community Psychol.* 2006; 38(1–2):63–77. [PubMed: 16791514]
49. Petermann L, Petz G. The E2D2 Model: a dynamic approach to cancer prevention interventions. *Health Promot Pract.* 2010
50. Schensul JJ. Community, culture and sustainability in multilevel dynamic systems intervention science. *Am J. Community Psychol.* 2009; 43(3–4):241–256. [PubMed: 19387824]
51. Taplin SH, Rodgers AB. Toward improving the quality of cancer care: addressing the interfaces of primary and oncology-related subspecialty care. *J. Natl. Cancer Inst. Monogr.* 2010; 2010(40):3–10. [PubMed: 20386048]
52. Richter AW, West MA, Dick RV, Dawson JF. Boundary spanners' identification, intergroup contact, and effective intergroup relations. *Acad. Manage. J.* 2006; 49(6):1252–1269.
53. Burt RS. Structural holes and good ideas. *The American Journal of Sociology.* 2004; 110(2):349–399.
54. Stange KC, Nutting PA, Miller WL, et al. Defining and measuring the patient-centered medical home. *J. Gen. Intern. Med.* 2010; 25(6):601–612. [PubMed: 20467909]
55. Stange KC. A science of connectedness. *Ann. Fam. Med.* 2009; 7(5):387–395. [PubMed: 19752466]
56. Stange KC, Miller WL, McWhinney I. Developing the knowledge base of family practice. *Fam. Med.* 2001; 33(4):286–297. [PubMed: 11322522]
57. Polanyi, M. *Personal Knowledge: Towards a Post-Critical Philosophy.* Chicago, IL: University of Chicago Press; 1962.
58. McWhinney IR. Medical knowledge and the rise of technology. *The Journal of medicine and philosophy.* 1978 Dec; 3(4):293–304. [PubMed: 10240602]
59. Best A, Hiatt RA, Norman CD. Knowledge integration: conceptualizing communications in cancer control systems. *Patient Educ. Couns.* 2008; 71(3):319–327. [PubMed: 18403175]
60. Wenger, E.; McDermott, RA.; Snyder, W. *Cultivating Communities of Practice: A Guide to Managing Knowledge.* Boston, Mass: Harvard Business School Press; 2002.
61. Minkler, M.; Wallerstein, N. *Community-Based Participatory Research for Health: from process to outcomes.* San Francisco, CA: Jossey-Bass; 2008.
62. Green LW. Making research relevant: if it is an evidence-based practice, where's the practice-based evidence? *Fam. Pract.* 2008 Sep 15.
63. Cargo M, Mercer SL. The value and challenges of participatory research: strengthening its practice. *Annu. Rev. Public Health.* 2008; 29:325–350. [PubMed: 18173388]

64. Israel, BA.; Eng, E.; Schulz, AJ.; Parker, EA., editors. *Methods in Community-Based Participatory Research for Health*. San Francisco, CA: Jossey-Bass; 2005.
65. Macaulay AC, Commanda LE, Freeman WL, et al. Participatory research maximises community and lay involvement. North American Primary Care Research Group. *BMJ*. 1999; 319(7212):774–778. [PubMed: 10488012]
66. Agency for Healthcare Research and Quality. [Accessed June 3, 2011] AHRQ Support for Primary Care Practice- Based Research Networks (PBRNs). 2001 Jun. revised February 2011. www.ahrq.gov/research/pbrn/pbrnfact.htm.
67. Fagnan LJ, Handley MA, Rollins N, Mold J. Voices from left of the dial: reflections of practice-based researchers. *J. Am Board Fam. Med.* 2010; 23(4):442–451. [PubMed: 20616286]
68. Fagan LJ, Davis M, Deyo RA, Werner JJ, Stange KC. Linking practice-based research networks and Clinical and Transitional Science Awards: new opportunities for community engagement by academic health centers. *Acad. Med.* 2010; 85(3):476–483. [PubMed: 20182121]
69. Westfall JM, Fagnan LJ, Handley M, et al. Practice-based research is community engagement. *J. Am Board Fam. Med.* 2009 Jul-Aug;22(4):423–427. [PubMed: 19587257]
70. Baker EA, Brennan Ramirez LK, Claus JM, Land G. Translating and disseminating research-and practice-based criteria to support evidence-based intervention planning. *J. Public Health Manag. Pract.* 2008; 14(2):124–130. [PubMed: 18287917]
71. Westfall JM, Mold J, Fagnan L. Practice-based research--"Blue Highways" on the NIH roadmap. *JAMA*. 2007 Jan 24; 297(4):403–406. [PubMed: 17244837]
72. Westfall JM, VanVorts RF, Main DS, Herbert C. Community-based participatory research in practice-based research networks. *Ann. Fam. Med.* 2006; 4(1):8–14. [PubMed: 16449391]
73. Macaulay AC, Nutting PA. Moving the frontiers forward: incorporating community-based participatory research into practice-based research networks. *Ann. Fam. Med.* 2006 Jan-Feb;4(1):4–7. [PubMed: 16449390]
74. Mold JW, Peterson KA. Primary care practice-based research networks: working at the interface between research and quality improvement. *Ann. Fam. Med.* 2005 May 1; 3(Suppl 1):S12–S20. 2005. [PubMed: 15928213]
75. Nutting PA, Beasley JW, Werner JJ. Practice-based research networks answer primary care questions. *JAMA*. 1999; 281(8):686–688. [PubMed: 10052423]
76. Thomas P, Griffiths F, Kai J, O'Dwyer A. Networks for research in primary health care. *BMJ*. 2001; 322(7286):588–590. [PubMed: 11238155]
77. Stange KC, Crabtree BF, Miller WL. Publishing multimethod research. *Ann. Fam. Med.* 2006 Jul-Aug;4(4):292–294. [PubMed: 16868231]
78. Stange KC, Miller WL, Crabtree BF, O'Connor PJ, Zyzanski SJ. Multimethod research: approaches for integrating qualitative and quantitative methods. *J. Gen. Intern. Med.* 1994; 9(5):278–282. [PubMed: 8046531]
79. Crabtree, BF.; Miller, WL.; Addison, RB.; Gilchrist, VJ.; Kuzel, A. Part III: the search for multimethod research. In: Crabtree, BF.; Miller, WL.; Addison, RB.; Gilchrist, VJ.; Kuzel, A., editors. *Exploring Collaborative Research in Primary Care*. Thousand Oaks, CA: SAGE Publications; 1994. p. 177-179.
80. Pawson R, Greenhalgh T, Harvey G, Walshe K. Realist review--a new method of systematic review designed for complex policy interventions. *J. Health Serv. Res. Policy.* 2005; 10(Suppl 1):21–34. [PubMed: 16053581]
81. Creswell JW, Fetters MD, Ivankova NV. Designing a mixed methods study in primary care. *Ann. Fam. Med.* 2004; 2(1):7–12. [PubMed: 15053277]
82. Borkan JM. Mixed methods studies: a foundation for primary care research. *Ann. Fam. Med.* 2004; 2(1):4–6. [PubMed: 15053276]
83. Creswell, JW. *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*. 2nd ed.. Thousand Oaks, CA: Sage Publications; 2003.
84. Sturmberg JP, Martin CM. Complexity and health--yesterday's traditions, tomorrow's future. *J. Eval. Clin. Pract.* 2009 Jun; 15(3):543–548. [PubMed: 19522908]
85. Peek CJ. Integrating care for persons, not only diseases. *Journal of clinical psychology in medical settings*. 2009 Mar; 16(1):13–20. [PubMed: 19259794]

86. Miles A. Complexity in medicine and healthcare: people and systems, theory and practice. *J. Eval. Clin. Pract.* 2009 Jun; 15(3):409–410. [PubMed: 19522904]
87. Heath I, Rubinstein A, Stange KC, van Driel ML. Quality in primary health care: a multidimensional approach to complexity. *BMJ.* 2009 Apr 2.338(apr02_1) 2009 b1242.
88. Leischow SJ, Best A, Trochim WM, et al. Systems thinking to improve the public's health. *Am J. Prev. Med.* 2008 Aug; 35(2 Suppl):S196–S203. [PubMed: 18619400]
89. Berkes, F.; Colding, J.; Folke, C. *Navigating Social-Ecological Systems: Building Resilience for Complexity and Change.* Cambridge: Cambridge University Press; 2008.
90. Wilson T, Holt T, Greenhalgh T. Complexity science: complexity and clinical care. *BMJ.* 2001; 323(7314):685–688. [PubMed: 11566836]
91. Plsek PE, Wilson T. Complexity, leadership, and management in healthcare organisations. *BMJ.* 2001; 323(7315):746–749. [PubMed: 11576986]
92. Plsek PE, Greenhalgh T. Complexity science: the challenge of complexity in health care. *BMJ.* 2001; 323(7313):625–628. [PubMed: 11557716]
93. Miller WL, McDaniel RR Jr, Crabtree BF, Stange KC. Practice jazz: understanding variation in family practices using complexity science. *J. Fam. Pract.* 2001; 50(10):872–878. [PubMed: 11674890]
94. Albrecht G, Freeman S, Higginbotham N. Complexity and human health: the case for a transdisciplinary paradigm. *Cult Med Psychiatry.* 1998; 22(1):55–92. [PubMed: 9657059]
95. Campbell M, Fitzpatrick R, Haines A, et al. Framework for design and evaluation of complex interventions to improve health. *BMJ.* 2000 Sep 16; 321(7262):694–696. [PubMed: 10987780]
96. Volpp KG, Das A. Comparative effectiveness--thinking beyond medication A versus medication. *B. N. Engl. J. Med.* 2009 Jul 23; 361(4):331–333.
97. Iglehart JK. Prioritizing comparative-effectiveness research--IOM recommendations. *N. Engl. J. Med.* 2009 Jul 23; 361(4):325–328. [PubMed: 19567828]
98. Hoffman A, Pearson SD. 'Marginal medicine': targeting comparative effectiveness research to reduce waste. *Health Aff. (Millwood).* 2009 Jul-Aug;28(4):w710–w718. [PubMed: 19556249]
99. Conway PH, Clancy C. Comparative-effectiveness research--implications of the Federal Coordinating Council's report. *N. Engl. J. Med.* 2009 Jul 23; 361(4):328–330. [PubMed: 19567829]
100. Glasgow, RE.; Steiner, JS. Comparative effectiveness research that translates. In: Brownson, RC.; Colditz, GA.; Proctor, E., editors. *Dissemination and Implementation Research.* Oxford: Oxford University Press; 2011.
101. Federman, DD. Healing and heeling; Address at the 2007 AAMC Annual Meeting; 2007. www.aamc.org/meetings/annual/2007/highlights/cohen_federman.pdf.

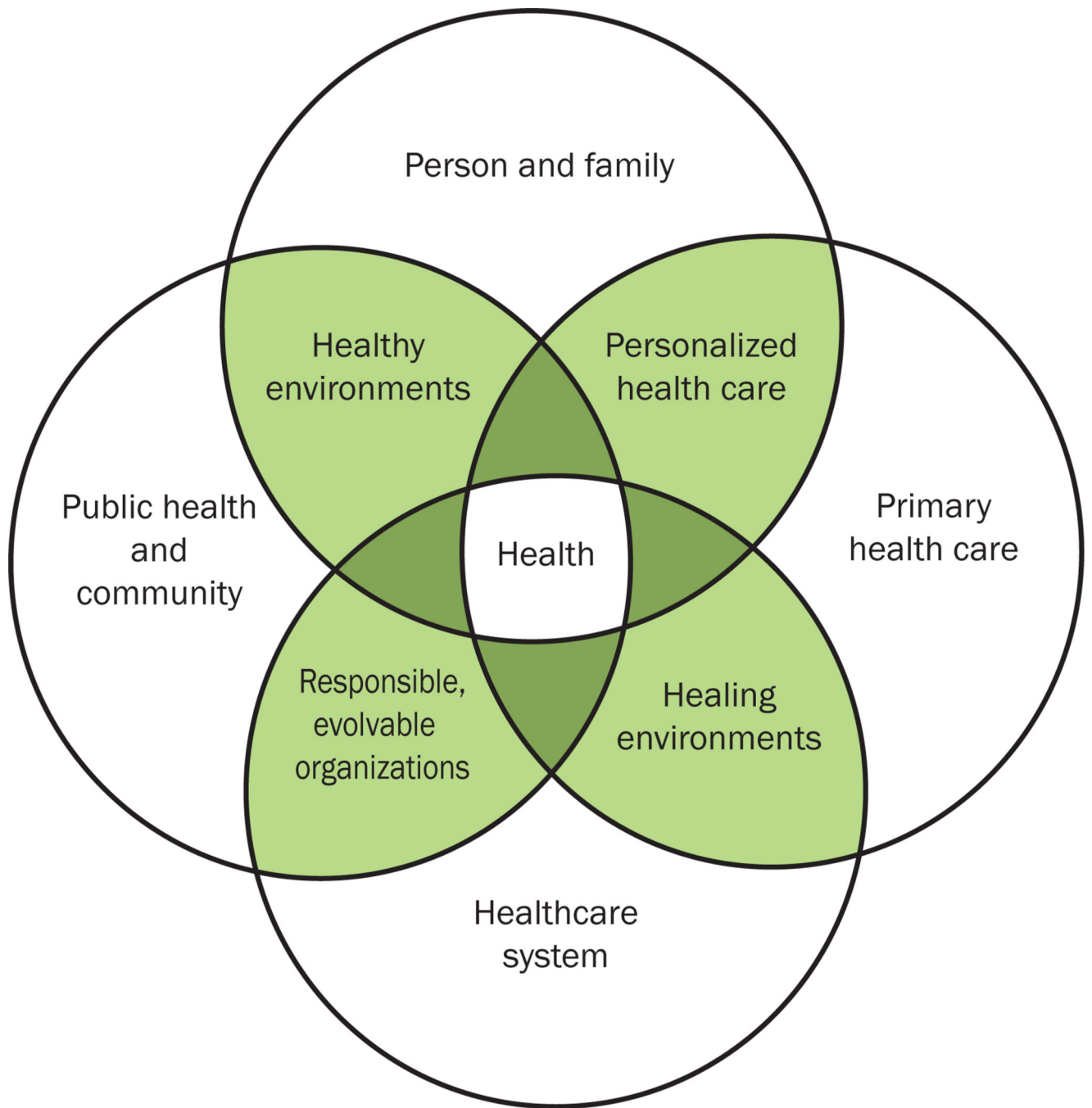


Figure 1.
Promoting health across boundaries