This paper was submitted to the National Science Foundation as part of its SBE 2020 planning activity (www.nsf.gov/sbe/sbe_2020/). Its inclusion does not constitute approval of the content by NSF or the US Government. The opinions and views expressed herein are those of the author(s) and do not necessarily reflect those of the NSF or the US Government.

NSF/SBE 2020 White Paper
An Integrated Systems Approach to Building Healthy Communities

Submitted by

Wojtek Chodzko-Zajko, Edward McAuley, William P. Stewart, Kenneth L. Watkin, and Tanya M. Gallagher

Center on Health, Aging, and Disability
http://chad.illinois.edu/
College of Applied Health Science
University of Illinois, Urbana-Champaign

This work is licensed under the Creative Commons Attribution-NonCommercial-ShareAlike 3.0 Unported License. To view a copy of this license, visit http://creativecommons.org/licenses/by-nc-sa/3.0/ or send a letter to Creative Commons, 171 Second Street, Suite 300, San Francisco, California, 94105, USA.

Abstract: New community health models that complement and extend traditional primary care strategies must be developed and move us from an illness-oriented model of disease treatment to a wellness-oriented model of health promotion. Teams of researchers and scholars will need to partner across a broad array of disciplines and with a wide variety of community agencies to develop a new, cohesive, and multi-dimensional systems approach to prevention and management of chronic disease and disability. At Illinois we have developed an Integrated Systems Model of Healthy Communities that recognizes that effective health policies, programs, and interventions cannot be targeted at only one level of determinants or risk factors. It is questionable whether traditional disease-based approaches to health care research will be of much value in advancing our understanding of the complex interactions among the multiple levels articulated in the Integrated Systems Model. Rather, realizing our vision will require an investment in the infrastructure and resources needed to build and empower multidisciplinary teams of experts in the social and behavioral sciences, technology and computer science,

This paper was submitted to the National Science Foundation as part of its SBE 2020 planning activity (www.nsf.gov/sbe/sbe_2020/). Its inclusion does not constitute approval of the content by NSF or the US Government. The opinions and views expressed herein are those of the author(s) and do not necessarily reflect those of the NSF or the US Government.

informatics, social work, education, nutrition, health economics, health policy, and health disparities.

The Challenge: *The problem, simply stated, is that health care in the United States is not* meeting the nation's health needs and cannot be sustained financially**.** The United States spends much more on health care than any other country, and these costs continue to escalate placing excessive burdens on employers, insurance companies, state and federal governments, health care providers, and individuals and their families. While reform of the medical care and public health delivery systems is part of the solution, this alone cannot solve the problem. **To solve it, we need a much more comprehensive, intensive, and integrated systems approach to managing the determinants of health.** At the root of the problem is a long-standing underinvestment in prevention and management of chronic diseases and disabilities. Chronic diseases alone are responsible for at least 75% of the nation's $2 trillion medical care costs and 92% of Medicare costs, yet they are some of the most preventable conditions. The Diabetes Prevention Project showed that 56% of diabetes is preventable by a simple exercise program and modest weight loss. The American Diabetes Association estimated the cost of diabetes in 2007 (for the US) was $174 billion, $116 billion in medical costs and $58 billion in lost productivity. There is a great economic burden of chronic disease and further deteriorating health on productivity in the work place, and on the competitiveness of the US in global markets. Perhaps most importantly, chronic diseases and disabilities have a devastating and unacceptable impact on the quality of life of too many Americans.

The focus on acute conditions and biological determinants of disease, rather than on healthy lifestyles, prevention and health management of chronic diseases and disability, has resulted in fragmented healthcare delivery commonly known as "silos." Conditions that can be effectively

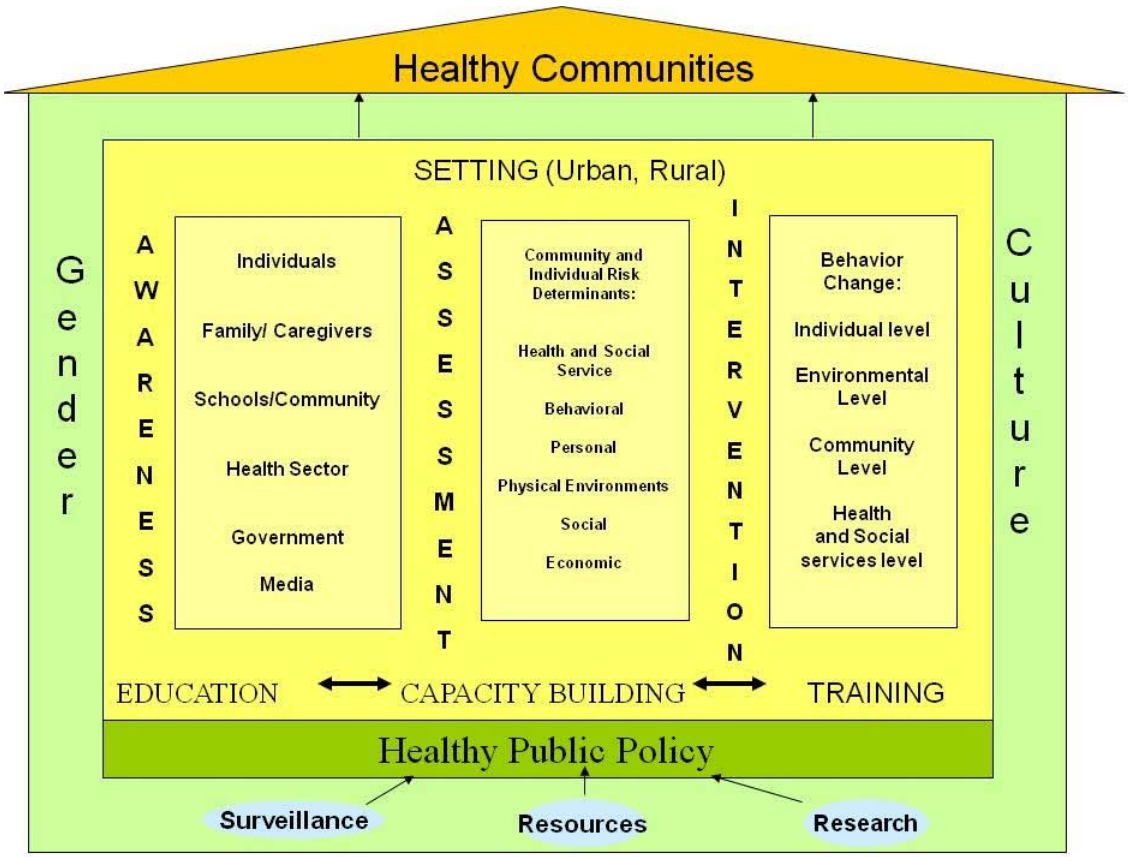
This paper was submitted to the National Science Foundation as part of its SBE 2020 planning activity (www.nsf.gov/sbe/sbe_2020/). Its inclusion does not constitute approval of the content by NSF or the US Government. The opinions and views expressed herein are those of the author(s) and do not necessarily reflect those of the NSF or the US Government.

prevented or more effectively managed through lifestyle changes, education, and greater environmental supports are often left unaddressed until they have escalated to serious levels and require medical treatment. To a great extent, the solution to our health crisis lies in creating systems that draw from resources and expertise beyond the traditional health care sector. The Centers for Disease Control and Prevention (CDC) has defined the public health system not just as public health departments, but as "the collection of public, private, and voluntary entities as well as individuals and informal associations that contribute to the public's health." Until we do a much better job of engaging other sectors in the management of the determinants of health, we will not make substantial progress addressing chronic conditions and disabilities. As an example, consider the epidemic of obesity in our children and youth. There is strong scientific evidence that limiting caloric intake and engaging in regular physical activity can prevent obesity. However, school menus are designed by the private sector; physical education classes are implemented by the education sector; playgrounds and sports opportunities are provided by the parks and recreation sector; after-school physical activity programs are offered at community centers, buildings and homes are designed by architects, and communities are designed by urban planners. In order to optimally address the growing health needs in our population, we will have to move beyond an ad hoc, fragmented approach to translation, to a much better funded, more comprehensive, systematic and sophisticated approach that builds upon the expertise of partnerships. Public health and related sciences can provide us with cost-effective, evidence-based approaches for managing health. These solutions, however, will require a greater investment in integrated, translational research. We need to translate what we already know into programs and initiatives that make a difference in our communities, while taking advantage of new technologies and further research to facilitate the translation process.

This paper was submitted to the National Science Foundation as part of its SBE 2020 planning activity (www.nsf.gov/sbe/sbe_2020/). Its inclusion does not constitute approval of the content by NSF or the US Government. The opinions and views expressed herein are those of the author(s) and do not necessarily reflect those of the NSF or the US Government.

The Solution: New community health models that complement and extend traditional primary care strategies must be developed and move us from an illness-oriented model to a wellness-oriented model. These new approaches to the promotion of health and well-being will need to extend care into communities as well as support health promotion, healthy lifestyles, the effective management of chronic conditions and disabilities, and empowered home-based self-care. Teams of researchers and scholars will need to partner across a broad array of disciplines and with a wide variety of community agencies to develop a new, cohesive, and multi-dimensional systems approach to prevention and promoting the health management of chronic disease and disability. At Illinois we have developed an Integrated Systems Model of Healthy Communities that recognizes that effective health policies, programs, and interventions cannot be targeted at only one level of determinants or risk factors, such as the molecular bases of disease. To be effective, health promotion, disease prevention, and health management strategies need to acknowledge the multidimensional nature of health determinants, such as recognizing the importance of individual-level risk factors and responsibilities, the development of environments that support and sustain healthy lifestyle choices, a focus on those who are disproportionately at risk for various conditions, and the formulation of policies and programs that are culturally appropriate, evidence-based, cost-effective, and sustainable.

This paper was submitted to the National Science Foundation as part of its SBE 2020 planning activity (www.nsf.gov/sbe/sbe_2020/). Its inclusion does not constitute approval of the content by NSF or the US Government. The opinions and views expressed herein are those of the author(s) and do not necessarily reflect those of the NSF or the US Government.



Integrated Systems Model of Healthy Communities

The Integrated Systems Model of Healthy Communities is built around three pillars, representing three strategies, that are highly interrelated and mutually dependent: (1) Building awareness of the importance of healthy lifestyles; (2) Improving the assessment of individual, environmental, and societal factors that increase the likelihood of chronic diseases and disabilities and risks for deteriorating health, (3) Facilitating the design, implementation, and evaluation of culturally-appropriate, evidence-based interventions that will significantly reduce the burden of chronic disease and disability throughout our communities. Effective implementation of these strategies will require an on-going commitment to capacity building, education, and training. Furthermore, the Illinois Integrated Systems Model of Healthy Communities cannot succeed unless it is

This paper was submitted to the National Science Foundation as part of its SBE 2020 planning activity (www.nsf.gov/sbe/sbe_2020/). Its inclusion does not constitute approval of the content by NSF or the US Government. The opinions and views expressed herein are those of the author(s) and do not necessarily reflect those of the NSF or the US Government.

supported by public policies that embrace a multi-dimensional approach to the prevention, treatment, and management of chronic conditions, diseases and disabilities.

New models of healthy communities will require change at the individual, family, school, community, and institutional levels, as well as extensive community participation. Our vision of healthy communities requires the mobilization and commitment of many sectors of society including health and social services, education, labor and industry, finance, housing, transportation, and both rural and urban development. It is questionable whether traditional disease-based approaches to health care research will be of much value in advancing our understanding of the complex interactions among the multiple levels articulated in the Health Systems Model. Rather realizing our vision will require an investment in the infrastructure and resources needed to build and empower multidisciplinary teams of experts in the social and behavioral sciences, technology and computer science, informatics, social work, education, nutrition, health economics, health policy, and health disparities. These teams will, in turn, need to build partnerships and work in collaboration with national, state, and local community agencies to jointly test the policies, programs, and innovations developed. Although the investment needed will be considerable, the return will be much greater. The implementation of comprehensive, community-based, health promotion strategies that simultaneously build awareness, improve assessment, and design programs that work has the potential to stop the runaway increase in health care costs that have plagued our nation for the past twenty years.

This paper was submitted to the National Science Foundation as part of its SBE 2020 planning activity (www.nsf.gov/sbe/sbe_2020/). Its inclusion does not constitute approval of the content by NSF or the US Government. The opinions and views expressed herein are those of the author(s) and do not necessarily reflect those of the NSF or the US Government.

Next Steps: What is needed is national investment in research centers that can bring together scholars from a wide range of disciplines including the behavioral and social sciences, informatics, life sciences, physical sciences, engineering, computing, neuroscience, communications, education, and environmental sciences. At Illinois, interdisciplinary and multidisciplinary collaborative teams have a history of working successfully together. Interdisciplinary centers, institutes, and collaborative teams working on health include the Center on Health, Aging and Disability, the Disability Research Institute, the Division of Disability Resources and Educational Services, the Health and Wellness Initiative, the Interdisciplinary Division of Nutritional Sciences, the Children and Family Research Center, the Beckman Institute, the National Center for Supercomputing Applications, the Information Trust Institute, the Illinois Rural Health Net, the Coordinated Science Laboratory, the Illinois Informatics Initiative, the Center for Healthy Minds, the Family Resiliency Center, the Children's Environmental Health Center, the University of Illinois Extension Service and the Institute of Government and Public Affairs. These interdisciplinary teams have a history of conducting translational health research studies that have been able to simultaneously address the multiple determinants of health. Examples of ongoing health research efforts at Illinois that have embraced a multi-dimensional approach to the prevention, and management of chronic conditions, diseases, and disabilities include:

Active living and cognitive vitality: For the past 15-years, researchers at Illinois have conducted ground breaking investigations of the impact of lifestyle factors on cognitive health in a variety of populations including older adults, as well as, children and youth. Multidisciplinary teams of experts from neuroscience, kinesiology, nutrition, immunology, and medicine have

This paper was submitted to the National Science Foundation as part of its SBE 2020 planning activity (www.nsf.gov/sbe/sbe_2020/). Its inclusion does not constitute approval of the content by NSF or the US Government. The opinions and views expressed herein are those of the author(s) and do not necessarily reflect those of the NSF or the US Government.

developed and implemented cost-effective interventions that have been shown to have a profound impact on physical and cognitive functioning. Their evidence-based research has established that changing physical activity patterns and improving cardio respiratory fitness leads to improved physical and cognitive function, more efficient use of brain structures, and even the regeneration of neurons. Given the $148 billion annual costs of dementia, the importance of translating such research findings to the broader community cannot be over-emphasized.

Social Interaction, Communication and Health: Interdisciplinary teams are studying the relationships among communication processes and personal, social, cultural and institutional factors and health including the health impacts of social networks, and social support systems. The extraordinarily powerful computing, engineering, and technology resources available at Illinois, in combination with close links to established comprehensive, state-wide dissemination networks, such as the Illinois Extension Service, has made Illinois an ideal environment for conducting state of the art health communication research.

Health Disparities and Disability: Interdisciplinary teams are studying access and delivery of health care to racial minority and other under-represented groups, low income families, older adults, rural and small community populations, and individuals with disabilities. The university has long been an international leader in research and service for persons with disabilities and the Illinois Division of Disability Resources and Educational Services has provided unprecedented opportunities to address issues related to the health of persons with physical and/or psychological disabilities.

This paper was submitted to the National Science Foundation as part of its SBE 2020 planning activity (www.nsf.gov/sbe/sbe_2020/). Its inclusion does not constitute approval of the content by NSF or the US Government. The opinions and views expressed herein are those of the author(s) and do not necessarily reflect those of the NSF or the US Government.

Three Requested Citations:

Ralph J. DiClemente, Richard A. Crosby, Michelle Kegler. (2009). Emerging Theories in Health Promotion Practice and Research, San Francisco, Jossey-Bass.

Sallis, J.F., and Owen, N. (2002). Ecological models of health behavior. pp. 462-484. In K. Glanz, B.K. Rimer, and F.M. Lewis (Eds.), Health Behavior and Health Education: Theory, Research, and Practice, third edition. San Francisco: Jossey-Bass.

Stokols, D. (1996). Translating social ecological theory into guidelines for community health promotion. American Journal of Health Promotion, 10, 282-298.