



January 13-14, 2011, Geneva, Switzerland  
IAGG/WHO/SFGG Workshop n°2  
“Health promotion program on prevention of late onset dementia”

---

## **Implementation Research and Innovation in Public Health: Perspectives on Dementia**

Deborah R. Gustafson, MS, PhD

Corresponding author:

Deborah R. Gustafson, M.S., Ph.D.

Associate Professor/docent

Swedish Research Council Senior Researcher in Psychiatric Epidemiology

Mailing addresses:

University of Gothenburg  
Institute for Neuroscience and Physiology  
NeuroPsychiatric Epidemiology Unit  
Wallinsgatan 6  
431 41 Gothenburg  
Sweden

SUNY-Downstate Medical Center  
Department of Neurology  
450 Clarkson Avenue, Box 1213  
Brooklyn, New York 11203  
USA

e-mail: [deborah.gustafson@neuro.gu.se](mailto:deborah.gustafson@neuro.gu.se)

telephone: +46 (0)31 343 8646

mobile: +46 (0)768 808 865

fax: +46 (0)31 776 04 03

[deborah.gustafson@downstate.edu](mailto:deborah.gustafson@downstate.edu)

+1 718 270 1581

+1 347 585 2133

+1 718 270 3840

Word Count: 1704 total, including Figure 1 (168 words)

Dementia prevention strategies should echo those summarized by the Institute of Medicine in relation to obesity in 2005: 'For such complex challenges in implementation where evidence from randomized controlled trials may not exist or even be possible to collect, other sorts of evidence from quasi-experimental trials, to mixed-methods research, to expert panels may need to be used for making decisions with the best available evidence, not the best possible evidence.'

Implementation science, the scientific study of methods to promote the systematic uptake of research findings and other evidence-based practices into routine practice, and to improve the quality and effectiveness of health services, is Public Health.<sup>1</sup> Implementation science creates generalizable knowledge that is applied across contexts to answer central questions, and relies on multidisciplinary teams. Implementation science initiatives related to dementia are ongoing in France (the University-Hospital Aging Institute (IHU)); the U.S. (linkages between academic medicine, research and health care<sup>1</sup>); Sweden (lifestyle departments in primary health care clinics);(Läkartidningen, 2011); and other areas around the world.<sup>2</sup>

Top ten implementation innovations in dementia prevention, will be discussed.

**Figure 1. Innovations in Dementia Prevention**

**Innovation #1:** Primary prevention of dementia includes reduction of overweight and obesity to at least age 70 years and promotion of physical activity **always** to improve metabolic and vascular health.

**Innovation #2:** Dementia intervention must be bottom-up and top-down.

**Innovation #3.** Dementia prevention begins in utero.

**Innovation #4.** Dementia prevention acknowledges lifetime critical periods of exposure.

**Innovation #5.** Risk phenotyping is based on consistent screening over time.

**Innovation #6.** Understanding absolute levels and trajectories of metabolic and cardiovascular risk factors over time is required to enhance successful aging.

**Innovation #7.** Prevention of dementia in susceptible populations is prioritized.

**Innovation #8.** Trials designed to test vascular and metabolic risk modulation in elderly should be adequately powered for cognitive outcome measures and should include older participants at higher risk for cognitive impairments.

**Innovation #9.** Studies should focus on cognitive and biological marker-based dementia phenotypes as outcomes.

**Innovation #10.** A common health language that is used in multidisciplinary settings and across populations brings sustainable change.

**Innovation #1: Primary prevention of dementia includes reduction of overweight and obesity to at least age 70 years and promotion of physical activity always to improve metabolic and vascular health.**

Global epidemiology strongly suggests that vascular risk is important for cognitive health. Overweight and obesity, affecting over 50% of the world's population, are cornerstones of vascular risk. The World Health Organization reports that half of the Top 10 causes of death worldwide, accounting for 40.3% of all deaths, are related to obesity. These include: ischemic heart disease, cerebrovascular disease, chronic obstructive pulmonary disease, Type 2 diabetes, and hypertensive heart disease. Obesity and its sequelae are associated with cognitive impairments and dementia.<sup>2</sup> In addition to body mass index (BMI), waist circumference (combined with triglyceride levels), should be measured. Physical activity confers metabolic health irrespective of any measure of overweight or obesity.

**Innovation #2: Dementia intervention must be bottom-up and top-down.**

Globalization, the diaspora of people groups, and increasing genetic heterogeneity, lead to increasingly complex populations and environments. Systems level reformation allowing individual choice of healthy options, expedites societal health behavior change. Appropriate and nurturing systems facilitate community readiness, conscienteness and motivation for change. As not all risk factor-dementia associations are replicated, population-specific recommendations are timely. Combined collective support and individual responsibility for personal health brings the population to a lower level of common risk. 'The use of collective action to support personal responsibility is central to public health'.<sup>3</sup>

How are overweight and obesity reduced and a physically active lifestyle that promotes healthy cognitive and physical aging encouraged at the systems level? The Robert Wood Johnson Foundation supports creation of Healthy Communities. In Sweden there are 'levande stadsdelar' or 'living neighborhoods'. Well-circumscribed communities that include food shops, pharmacies, primary care clinics, recreation centers across age groups, churches, schools and playgrounds, all within walking distance of where people live, promote physical, mental and social health and minimize stress. Often there is a purposeful mixing of ages - seniors living alongside younger families and multigenerational families. The built environment has the power to encourage or discourage physical activity.

Tobacco use prevention and control are examples of successful system-wide public health interventions resulting in behaviour change and reduced mortality. Taxing cigarettes and limiting smoking to defined areas reduced cigarette smoking and lung cancer incidence. Related to obesity, there is a US initiative to tax beverages with added sugar or caloric sweeteners. The suggested tax is one penny per ounce, with revenue used for obesity prevention programs or healthy food subsidies. This tax is estimated to reduce consumption of sugar-sweetened beverages 23% and generate US\$150 billion over 10 years.

While vascular risk may be the umbrella for dementia intervention over the life course, cross-national and cross-cultural comparisons show that understanding sociocultural and biological characteristics of communities when implementing interventions is essential.

Sociocultural differences that guide health and competing risks for healthy behaviors, such as suicide, drug abuse and depression must be understood. In U.S. Native American communities, for example, elders are respected, and the today's youth are prioritized to ensure survival of communities and traditions. Biological risk related to neurodegeneration in dementia across populations is the focus of the Global Alzheimer's Disease Neuroimaging Initiative 2 (ADNI 2). Allelelic distribution differences in the APOE gene exemplify biological differences in genetic susceptibility for late onset dementia.

### **Innovation #3. Dementia prevention begins in utero.<sup>4</sup>**

Preferences for certain nutrients, metabolic regulation of energy expenditure, establishment of regulatory axes, stress responses, even brain size, are early developmental, in utero processes. The nutritional and physical activity health of pregnant women is key for health of offspring and forecasts future health of the central nervous system, lowering risk for dementia.

### **Innovation #4. Dementia prevention acknowledges lifetime critical periods of exposure.**

Risk periods are chronologically and biologically age-related.<sup>4</sup> In relationship to dementia, critical periods overlap temporally in relation to neuropathology, vascular changes, and/or clinical manifestation of cognitive impairments and dementia. Vascular lesions are observed in utero. First amyloid plaques are observed in Down's Syndrome in the 3<sup>rd</sup> decade of life. Understanding dementia susceptibility by age, preclinical phenotype, and position on the age by cognitive or metabolic trajectory is important for prevention. In children, periods of 'catch-up' growth, as well as puberty, set the stage for healthy aging. In women, age of menses onset, reproductive status, and menopausal age denote significant biological aging events. These events may interact with interventions beneficial for cognition. The Women's Health Initiative Memory Study I (WHIMS I) and now WHIMS II illustrate importance of timing of hormone replacement therapy in relation to cognition. Lifetime dementia risk should not be based solely on survivorship models. Population risk models for dementia based on continuous observation over time are not informative (Gothenburg Birth Cohort Studies, unpublished data) due to competing risks for mortality. All best available evidence should be used for defining dementia prevention strategies and for prioritizing optimal aging.

### **Innovation #5. Risk phenotyping is based on consistent screening over time.**

The prevalence of undiagnosed hypertension, hyperlipidemia, obesity, and type 2 diabetes is high, especially among certain segments of the population. Guidelines for the frequency of blood pressure, blood lipid, and blood glucose monitoring hardly vary from age 18 years. Many hospitals and clinics have Electronic Medical Records, some of which include Health Risk Assessments (HRAs), however screening and evaluation tools must be used to be effective. Barriers to use are time in the clinic and perceived importance among practitioners.

**Innovation #6. Understanding absolute levels and trajectories of metabolic and cardiovascular risk factors over time is required to enhance successful aging.**

Guidelines for absolute levels of cardiovascular risk indicators hardly vary from age 18 years, and need modification for persons over the age of 70 years. Among these survivors, higher levels of body mass index, blood cholesterol, and blood pressure, may not be as risky. However, this must be re-evaluated due to observed birth cohort differences in levels of cardiovascular risk indicators.

**Innovation #7. Prevention of dementia in susceptible populations is prioritized.**

Susceptible populations include those with cardiovascular diseases such as hypertension, hyperlipidemias, type 2 diabetes mellitus (T2DM), and overt cardiovascular disease, as well metabolic syndromes or subclinical constellations of metabolic and vascular symptoms. Of high global importance is the HIV/AIDS epidemic affecting 33.3 million people. In the developing world and certain large cities in the Western world, there is imminent a sobering cluster of cardiovascular, cognitive, and infectious disease (ID) due to the globalization and co-occurrence of overnutrition and ID treatments related to metabolic syndrome development. Not only has highly active antiretroviral therapy (HAART) for HIV/AIDS reduced mortality to that of the uninfected population, but it is also effective in reducing community viral load (17th Conference on Retroviruses and Opportunistic Infections, February 2010). Priority intervention recommendations (World Health Organization and others, 2010), advocate earlier use of HAART in HIV (CD4+ count < 500 cells/mcl), and in children. The metabolic consequences of HAART therapy are disastrous for dementia risk, and include lipodystrophy, type 2 diabetes, and cardiovascular disease. Up to one third of children with HIV experience lipodystrophy in response to HAART. The consequences of HAART on metabolic cardiovascular complications among increasing numbers of HIV/AIDS survivors, and therefore dementia risk, is staggering.

**Innovation #8. Trials designed to test vascular and metabolic risk modulation in elderly should be adequately powered for cognitive outcome measures and include older participants at higher risk for cognitive impairments.**

**Innovation #9. Studies should focus on cognitive and biological marker-based dementia phenotypes as outcomes.**<sup>5</sup>

While memory-based deficits and neurodegenerative and amyloid phenotyping approaches in dementia are ongoing (ADNI) and form the basis for some clinical trials (Lipididiet), other dementia phenotypes, for example vascular pathologies and white matter changes, also warrant attention.

## **Innovation #10. A common health language that is used in multidisciplinary settings and across populations brings sustainable change.**

Scientists, researchers, and medical professionals, must communicate a vision for building healthy systems and health messages to key opinion leaders, with dissemination to local gate keepers, physicians, other health professionals, educators, communities and clinics. Communities desiring action have a basic awareness of need and ask for assistance in ways they deem most appropriate based on knowledge. It is through a common health language, that system change becomes **sustainable change**.

### **Acknowledgements.**

Dr. Gustafson receives research funding related to this summary from the EU FP7 project LipiDiDiet, Grant Agreement N° 211696; the Swedish Research Council; the National Institutes of Health/National Institute on Aging, National Institute of Allergy and Infectious Diseases and the Native American Research Centers for Health; the State University of New York Research Foundation; and the Hans-Gabriel och Alice Trolle-Wachtmeisters Foundation for Medical Research.

### **References:**

1. Madon T, Hofman KJ, Kupfer L, Glass RI. Public health. Implementation science. *Science*. Dec 14 2007;318(5857):1728-1729.
2. Khachaturian ZS, Snyder PJ, Doody R, et al. A roadmap for the prevention of dementia II: Leon Thal Symposium 2008. *Alzheimers Dement*. Mar 2009;5(2):85-92.
3. Brownell KD, Kersh R, Ludwig DS, et al. Personal responsibility and obesity: a constructive approach to a controversial issue. *Health Aff (Millwood)*. Mar-Apr;29(3):379-387.
4. Gustafson D. A life course of adiposity and dementia. *Eur J Pharmacol*. May 6 2008;585(1):163-175.
5. Aisen PS, Andrieu S, Sampaio C, et al. Report of the task force on designing clinical trials in early (predementia) AD. *Neurology*. Dec 23.