

PRISM: An SD Model Supporting Chronic Disease Policymaking



SD Modelers
Jack Homer
Kris Wile
Gary Hirsch

Health Economists
Justin Trogon
Amanda Honeycutt

CDC & NIH Coordinators
Bobby Milstein
Diane Orenstein
Lawton Cooper

**Scores of
Collaborators**



International SD Conference
Washington, DC
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Partners in Development and Application

- Centers for Disease Control and Prevention (CDC)
- National Institutes of Health (NIH)
- Austin/Travis County, Texas, Health and Human Services Dep't
- Mississippi Department of Health
- El Paso County, Colorado, Department of Health and Environ
- New Zealand Ministry of Health
- Communities Putting Prevention to Work (N=50 sites)
- RTI International
- Sustainability Institute
- Georgia Health Policy Center
- Forio Business Simulations

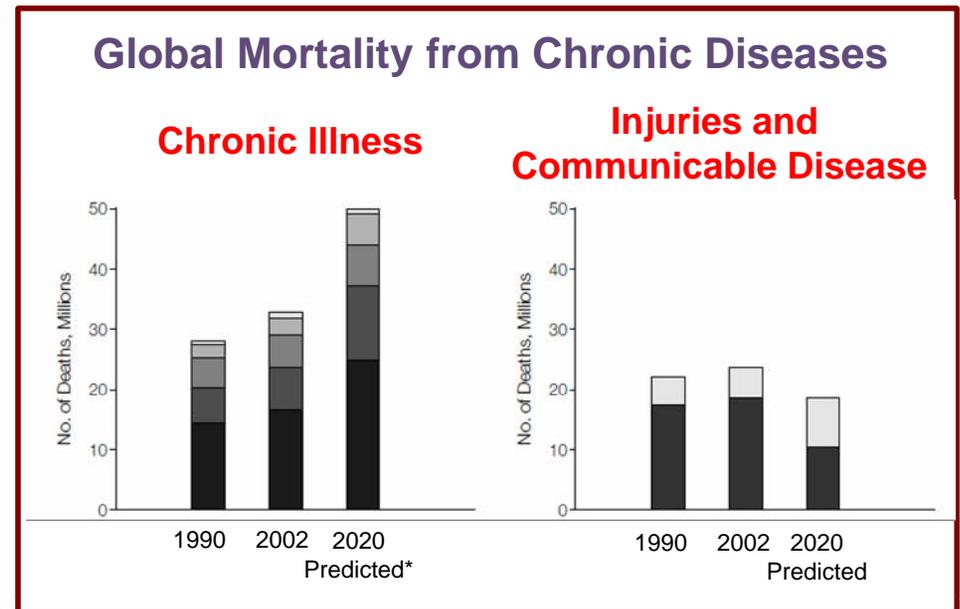
National sponsors
Subject matter experts
Core teammates

Local experts
Action planners
Policy innovators

Methodologists
Communicators
Core teammates

Problem Context

- **Chronic diseases are growing worldwide**
 - **Over 70% of deaths in the US**
 - **More than \$1T / year in medical and productivity costs**
- **Much is known about prevention and treatment, but it is often unclear how best to allocate limited resources**
- **This opens a promising niche for dynamic policy modeling—to pull together credible info about disease progression, demographic trends, changes in risk factors, and the likely effects of interventions on health and economic outcomes over time**

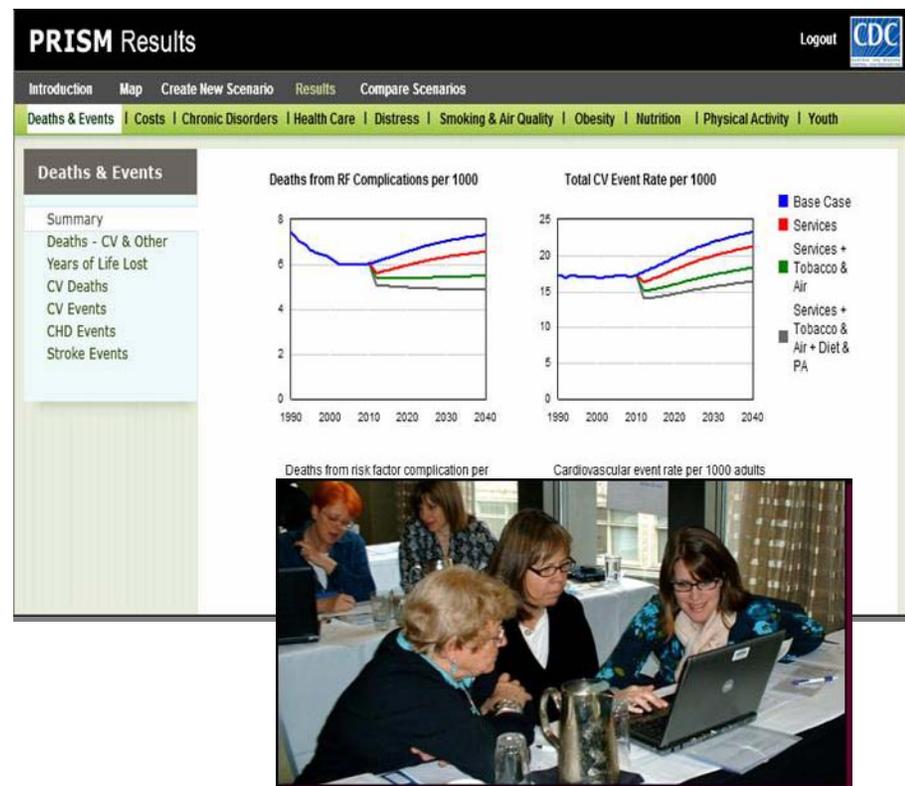


Yach, et.al. JAMA 2004;291(21):2616-22.

PRISM

Prevention Impacts Simulation Model

- Simulates chronic disease dynamics from 1990-2040 focusing on 34 different interventions and their impacts on cardiovascular disease and other chronic disease-related consequences
- Though relatively large (~5,500 elements) the compartmental structure runs scenarios rapidly, allowing for interactive inquiry with non-modelers and extensive testing



Progressive Evolution of Applications

- **2007:** US national model developed with partners at CDC and in Austin
- **2009:** Adapted to high burden areas of Texas, Mississippi, and Colorado for multi-stakeholder planning
- **2009:** Adapted in New Zealand to see if needs differ by ethnic group
- **2010:** Used by CDC, HHS, and AHA to craft national initiatives (Million Hearts; Sodium; Simple 7)
- **2011:** PRISM Online supports prospective evaluation for **50 sites** addressing obesity & smoking
- **\$3.5M** over 4 years
- **7 papers;** 20 invited presentations
- **Two prior awards (ASysT & CDC)**



**Remains a
Work in Progress**

In the Words of Our Champions

“The **policy trade-offs**, and the importance of **longer time horizon** for evaluation, are far clearer than in our pre-PRISM judgments...I am very pleased with PRISM’s **practical utility** for our community work in Texas and Mississippi.”



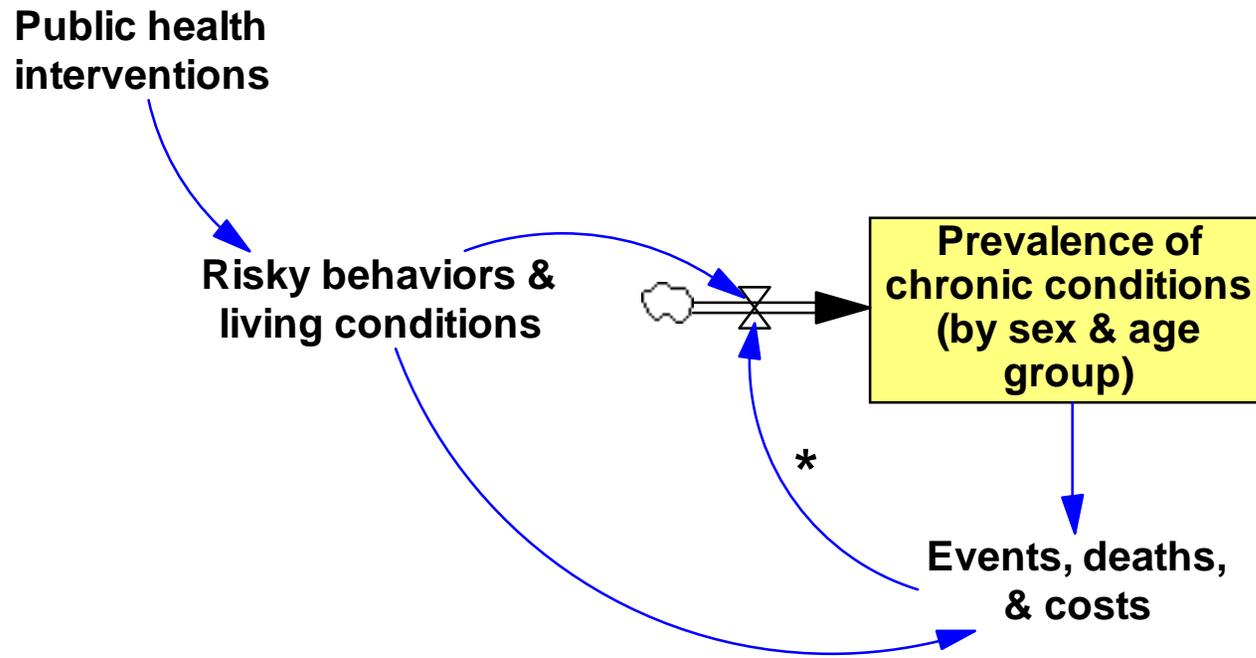
- Dr. Darwin Labarthe, Director,
CDC Division for Heart Disease and Stroke Prevention



“PRISM has really helped us to **reframe and energize our collective thinking** about the challenges [and] the opportunities for transformative change...We need **integrative analyses** and **effective communication tools** like PRISM, to make the case for greater emphasis on health protection and health equity. I applaud the PRISM team for **bringing together stakeholders**, and for following through with **interactive learning labs** [to] disseminate the results to key colleagues in agencies across the country.”

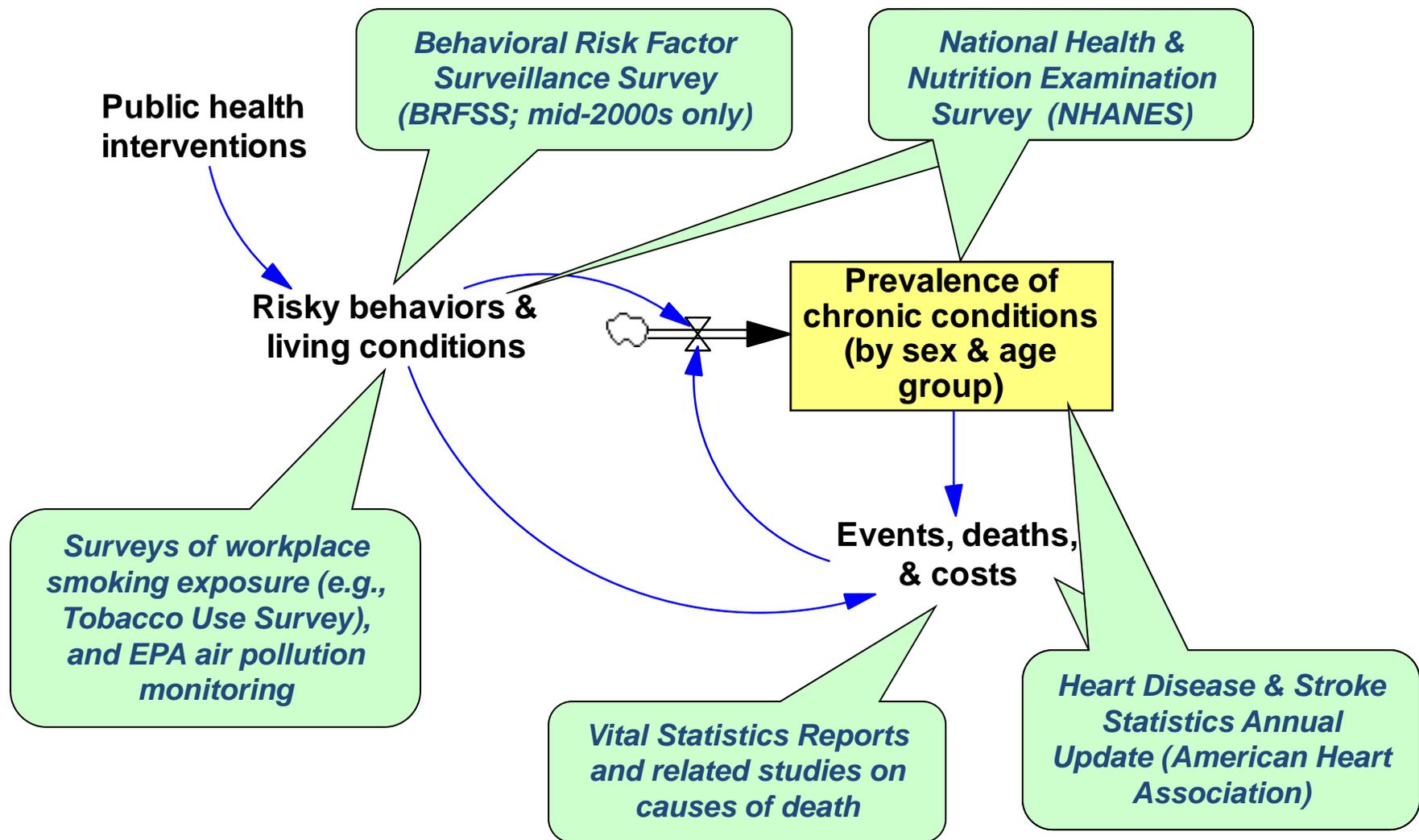
- Dr. Philip Huang, Medical Director,
Austin/Travis County Health and Human Services

Conceptual Framework

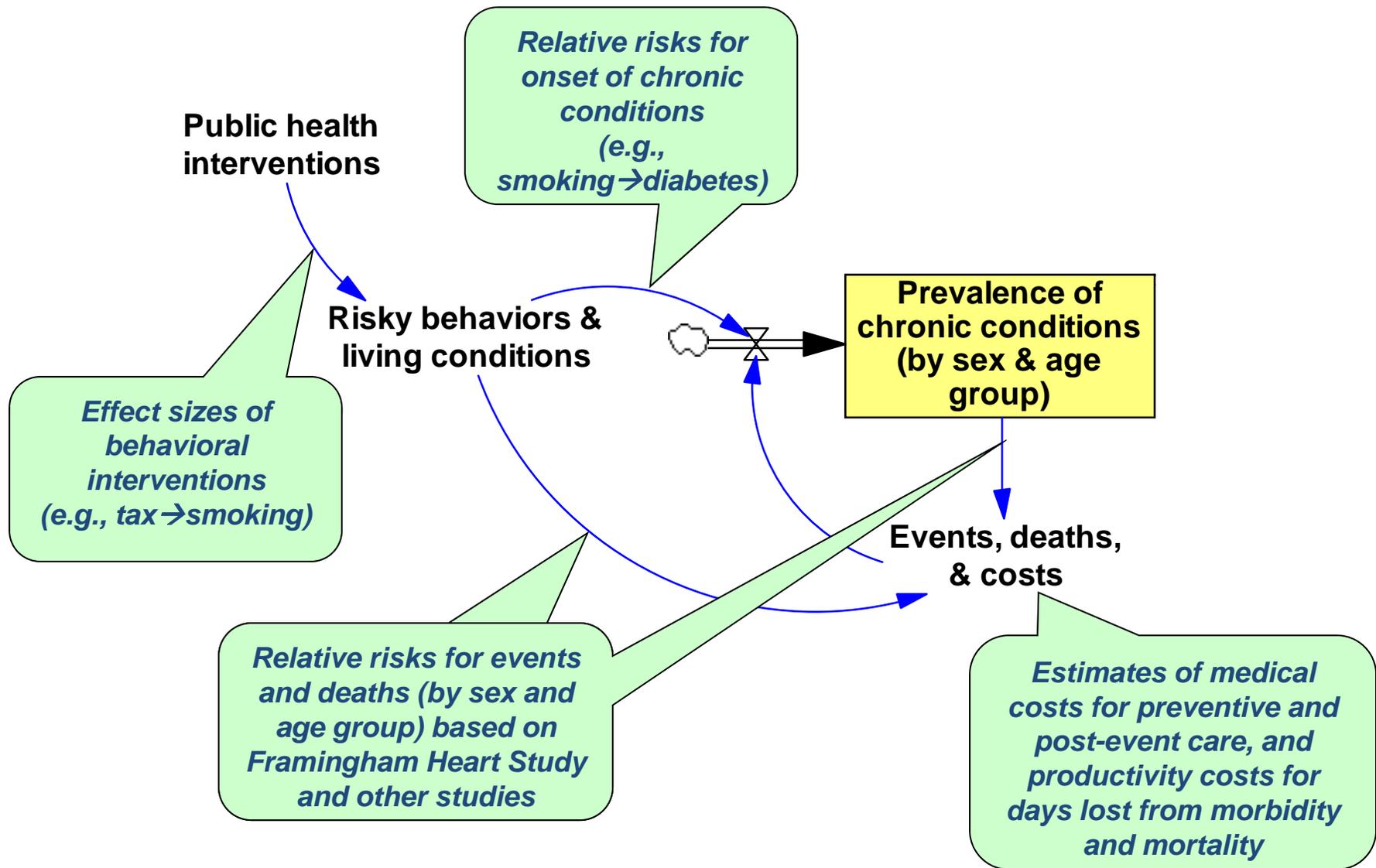


- * (1) *First cardiovascular event (if survived) moves individual into “post-CVD” status.*
- (2) *Death reduces population and any associated chronic condition prevalence; a reduction in death rate among individuals with chronic conditions (e.g. via improved control) thus tends to increase the prevalence of such conditions.*

Using Survey Data to Establish the Past (1990-present)



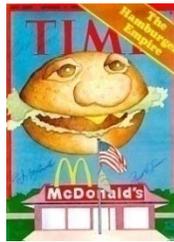
Research Literature Provides Parameter Estimates (with confidence intervals for sensitivity testing)



Many Related Factors to Consider— Each a Complex Issue in Itself



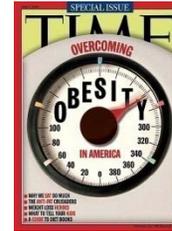
Tobacco



Junk Food



Physical Activity



Obesity



Heart Disease and Stroke



Air Pollution



Healthy Food



Weight Loss



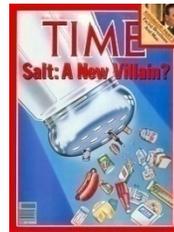
Diabetes



Cancer



Stress



Sodium



Mental Health Services



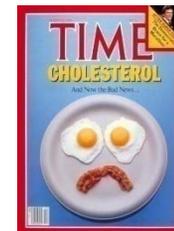
Blood Pressure



Health Care Costs



Trans fat



Cholesterol

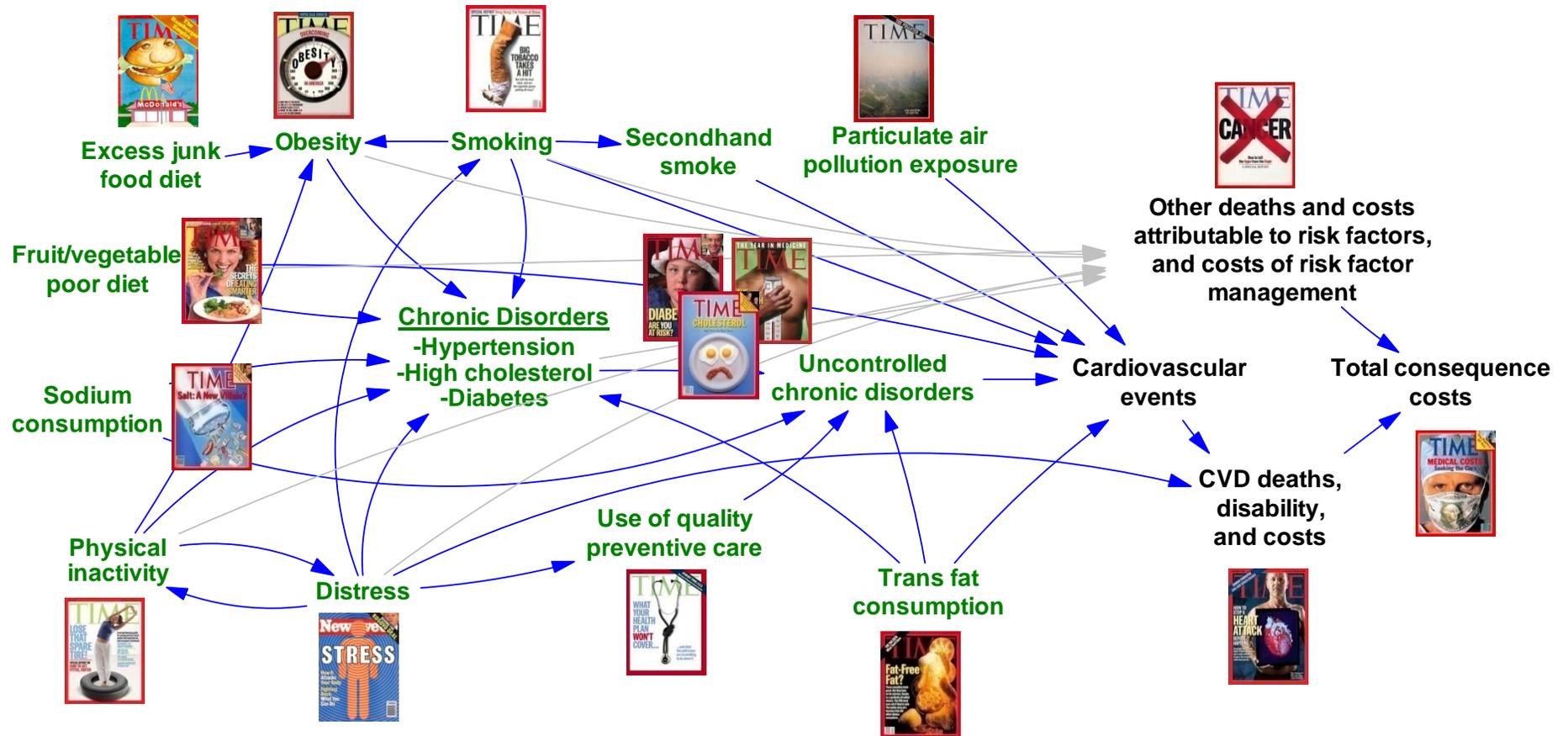


Preventive Care

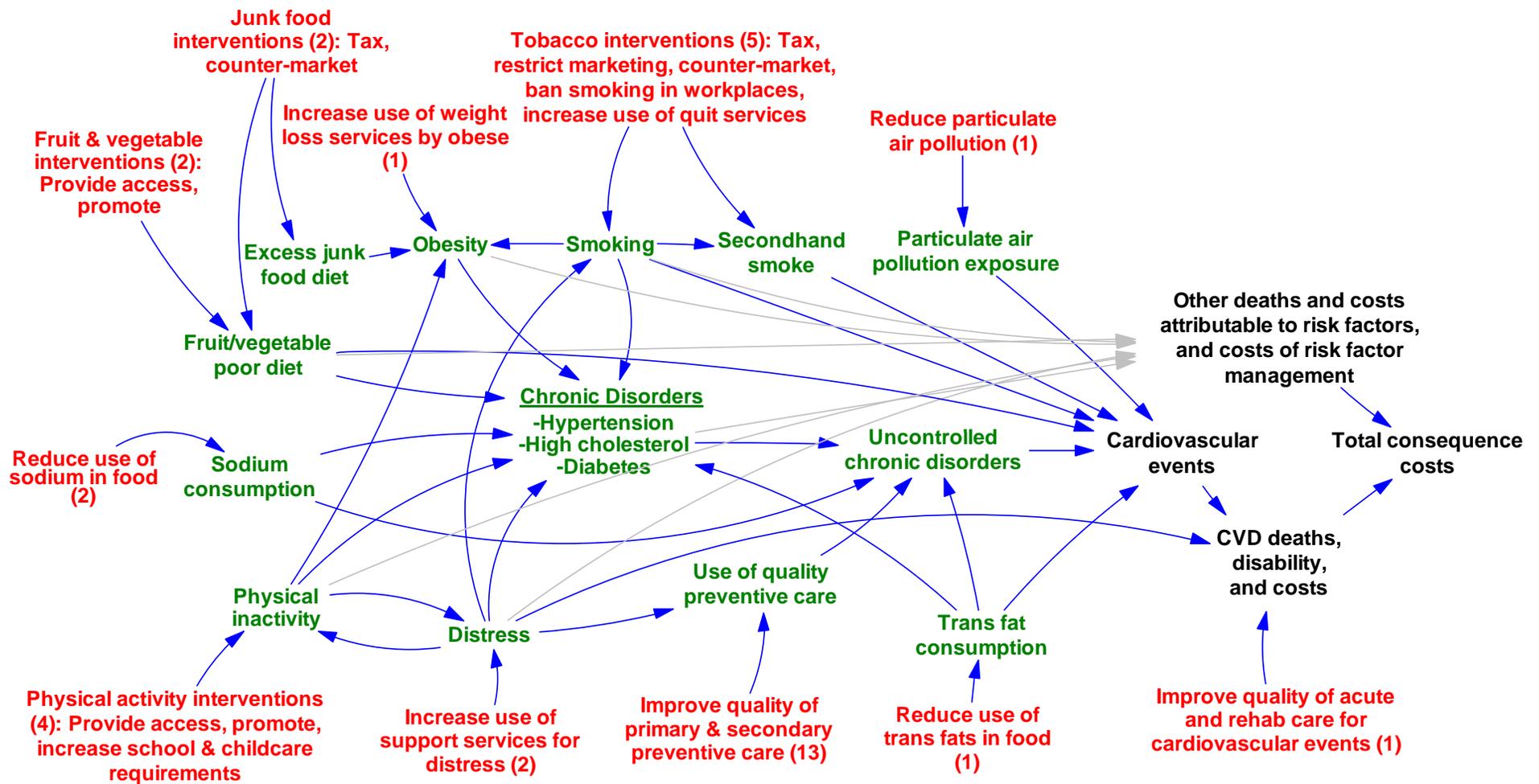


Emergency & Rehab Care

PRISM Relates the Factors Causally— and Has Evolved as We Keep Learning More



Over 30 Realistic Interventions Can Be Tested Along the Continuum of Prevention & Care

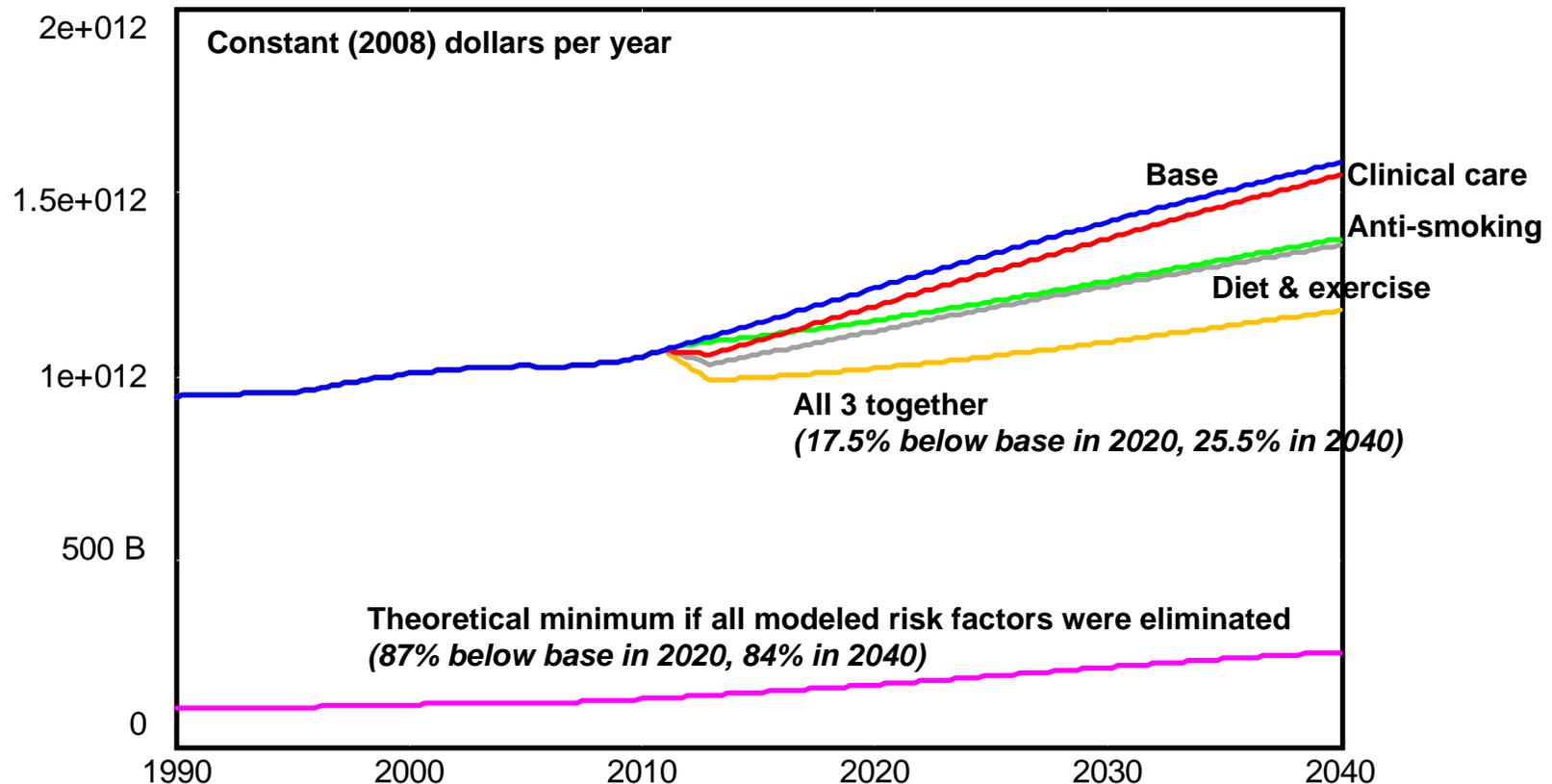


Example Tests

- Base Run:
 - Assume no changes after 2010 in exogenous behaviors and environment
 - Any simulated changes in outputs after 2010 are due to population aging and turnover, and delayed effects of the past growth in obesity
- Clinical Care cluster:
 - Improved primary and secondary preventive care
 - Improved acute and rehabilitation care
- Anti-Smoking cluster:
 - Increased taxes, restrictions, and counter-marketing
 - Increased use of smoking cessation services
 - Full ban on smoking in workplaces and other public places
- Diet & Exercise cluster:
 - Policies to reduce consumption of sodium, trans fats, and junk food
 - Policies to increase consumption of fruits & vegetables
 - Policies to promote exercise by adults and children

Total Consequence Costs

Combined Risk-Factor-Related Medical & Productivity Costs



- Clinical care quickly reduces events & deaths, but perpetuates costly disease rather than preventing it.
- Smoking reduction takes time (and recent ex-smokers still have elevated risk), but it has major impacts on CVD, chronic respiratory disease, and cancer.
- Reductions in sodium & trans fat consumption have strong and immediate effects, helping to mitigate chronic conditions. The fruit/veg and junk food policies appear less effective.

Final Thoughts

- **PRISM confirms that a rebalancing of priorities toward more prevention would save lives and money**
- **But some of the most powerful preventive policies require statutory action and may be difficult to enact**
 - **These include reduced sodium and trans fats in foods, more extensive smoking bans, and reduced particulate air pollution**
- **Our clients tell us that PRISM helps make the case for special new efforts, even if they're challenging**
 - **E.g., the health departments in Austin and Mississippi are now looking for ways to reduce particulate air pollution, which they had not formerly prioritized**
- **We will continue to move forward on two fronts: enriching the model, and making it more available to local and national health leaders**