DEVELOPING A CALIFORNIA HEALTH FORECAST

Need for health forecasting…
- Policy makers want to know the likely effects of possible laws, regulations, programs and other actions on health of the population over time
- Large disparities in health outcomes—limited knowledge on how policy decisions affect these
- Health providers and health agencies need info on health trends and changes in disease burdens
- No other authoritative source of information on key health trends
- California rapidly changing unique socio-demographic population mix

...and improved modeling capability…
- Advances in data collection, such as the California Health Interview Survey and Los Angeles Health Survey
- Increased computing capability -- allows for cost effective micro-simulation models
- More epidemiological studies to support modeling
- Future health is more easily predicted than outcomes in many other sectors (economics, agriculture, weather etc.)

...provide the right environment for a California Health Forecast
A framework that helps users to anticipate the future impact of current decisions and actions on health outcomes
HEALTH FORECASTING – A TOOL FOR HEALTH IMPACT ASSESSMENT IN A DYNAMIC ENVIRONMENT

Socio-economic and demographic information on population

Research-based linkages between health determinants and health outcomes

Projected future values of model parameters

Inquiries:
• What will happen if nothing changes?
• How do interventions stack up?
• What is the magnitude of major discrepancies in health outcomes across ethnic and geographic segments?

Output:
• Future population w/ demographic and socio-economic characteristics and expected health outcomes
• Projections of impact of intervention(s) on health outcomes in a target population

Effects of interventions on key health determinants
ENABLING DECISION MAKERS TO MAKE MORE INFORMED DECISIONS

The model will allow decision makers in health related fields to answer questions at various levels of detail.

How will mortality rates in the state of California (or any county) change over time?

What is the incidence or prevalence of disease X in different counties in California, and how is this expected to change in the next 10 years?

How much of the differences in disease incidence rates and other key health outcomes across ethnic and geographic segments can be attributed to known factors?

10 years from now, what will be the effect of a public health intervention Y on the health outcomes for different ethnic and racial groups in Ventura County and Los Angeles County?
CURRENT PROJECT

People:

Project Team

Principal Investigator: Jonathan Fielding
Co-Principal Investigators: Gerald Kominski, David Hayes-Bautista
Project Manager: Jeroen van Meijgaard
Research Associate: Sandra Hoffman

The project is based at UCLA and is a collaboration with the Los Angeles DHS and the California DHS

Timeline:

The project has been funded by The California Endowment since 2002 – current funding through the middle of 2007 supports implementation and developing interface

Research literature and collect data / Develop prototype model / Refine model and trend analysis / Synthesize findings / Secure continuation
BUILDING THE PROTOTYPE MODEL

Descriptive Population Framework
Population model including socio-economic and demographic information of the population of interest – includes variables such as gender, age, race/ethnicity, education, income, etc

Risk Factor/Disease Modules
Smaller models that describe linkages between individual risk factors, environment effect, socio-economic and demographic characteristics and health outcomes

Forecasting Module
Future trends of assumptions and underlying data of risk factor/disease modules and the population framework

The model is built around a microsimulation setting, allowing for inclusion of joint distributions as well as analysis of complex interactions, and distributional information on outcomes
PROTOTYPE: THE BASELINE CASE

The Descriptive Population Framework

What will happen to patterns of mortality (and likely disease burden) over time based on substantial changes in demography due to:

- Changes in age distribution of different ethnic/racial groups based on current populations
- Immigration*
- Marriage rates*
- Birth rates*

* California Department of Finance estimates (CADOF)

Risk Factor – Physical Activity and Obesity

Physical Activity and Obesity are risk factors for many chronic diseases. They are associated with each other and each impact morbidity, mortality and related medical outcomes in different ways

Ameliorable through:

- Individual interventions (medical care system, spas, gyms, home)
- Environmental interventions (worksite, school, community)
- Nutrition interventions

Health Outcomes – Coronary Heart Disease

What is the disease burden of a specific disease on different population groups, and how does this develop over time.

Coronary Heart Disease is the leading cause of death in the United States, while mortality has been reduced significantly during the last 30 years. Still both incidence and mortality can be reduced further through changing people’s behavior.
ADDITIONAL RISK FACTORS AND OUTCOMES: OBESITY AND EXTENSIONS FOR DIABETES AND SMOKING

Covariates - Gender, Race/Ethnicity, Age and Calendar Time

Risk Factors
- Physical Activity (METhrs/wk)
- Overweight Status (BMI)
- Additional factors impacting Overweight Status

Health Outcomes
- Coronary Heart Disease Incidence and Mortality
- Diabetes Incidence
- Other Cause Mortality

Legend:
- Existing relationship in the prototype model
- Need to be developed for extension
PHYSICAL ACTIVITY AND OBESITY ARE NOT INDEPENDENT

Any intervention targeting physical activity or obesity should take into account the association between these two behaviors. The population health forecasting model explicitly enables users to explore the joint distribution and the joint impact on health outcomes.

People with healthy BMI have higher levels of Physical Activity:

People with low levels of Physical Activity (<8 METhrs/wk) are more likely to be overweight:

Source: CA-BRFS 1984-2000
MODELLING THE IMPACT OF OBESITY ON MEDICAL EXPENDITURES

Overweight and Obesity in California

Observations

- BMI levels have increased steadily since the early 1980s
- Increases are seen among all groups but are most pronounced among younger people and Latinos
- Individual BMI levels are highly correlated over time
- BMI and Physical Activity are negatively correlated

Model Implementation

- Individual BMI levels are determined by gender, ethnicity, age, previous BMI and Physical Activity
- BMI impacts mortality though a relative risk function derived from the literature. RR of BMI on mortality decreases as age increases and are gender specific
- BMI trends in the model with three scenarios
  1. Decline to 1984 levels by 2025
  2. Stable at 2005 levels
  3. Continued increase through 2025

Medical Expenditures associated with Obesity and Physical Activity

- Direct Personal Medical Expenditures associated with Obesity and Physical Activity are estimated using NHIS data linked with data from the Medical Expenditure Panel Survey 1998-2002
- Medical expenditures are significantly higher for Obese people (BMI>30) among the under 65 population, and significantly higher for Overweight and Obese people (BMI>25) among the over 65 population.
- Medical expenditures are significantly lower for people over 65 with recommended levels of Physical Activity (>16 METhrs/wk)
- The simulation model allows researchers to analyze expenditures as BMI and PA levels change for each individual from year to year, thus enabling analysis of lifetime medical expenditures
INCREASED BMI SIGNIFICANTLY REDUCES LIFE EXPECTANCY

Average Remaining Life conditional on Age and BMI in 2005 - Male
(Numbers show difference compared with normal weight - BMI=18.5-25)

Average Remaining Life conditional on Age and BMI in 2005 - Female
(Numbers show difference compared with normal weight - BMI=18.5-25)
INDIVIDUALS WITH HIGHER BMI HAVE UP TO 25% HIGHER LIFETIME MEDICAL EXPENDITURES

Average Remaining Lifetime Medical Expenditures conditional on Age and BMI in 2005 - Male
(Numbers show difference compared with normal weight - BMI=18.5-25)

Average Remaining Lifetime Medical Expenditures conditional on Age and BMI in 2005 - Female
(Numbers show difference compared with normal weight - BMI=18.5-25)
FURTHER INCREASES IN BMI LEVELS COULD COST CALIFORNIANS AN ADDITIONAL $12 BILLION IN DIRECT PERSONAL MEDICAL EXPENDITURES ANNUALLY BY 2025

Total direct personal medical expenditures*, age 18+ (2003 $000,000)

Direct personal medical expenditures for the non-institutionalized population make up about 50-55% of total medical expenditures as defined by the National Health Accounts.

* personal direct expenditures for the non-institutionalized population as defined by MEPS
IMPLEMENTATION OF THE CURRENT PROTOTYPE WITH STAKEHOLDERS IN TWO STAGES

Stage 1 (15 months) – Make prototype model operational and test at sites

- Continue discussions with potential users to assure that product meets needs
- Incorporate relevant Community Guide interventions
- Include county specific information for some of the most populous counties
- Develop user friendly interface that will enable community groups, local health departments and the state health department to analyze the impact of policies and programs on small local populations

Stage 2 (15 months) – Implement with stakeholders and refine capabilities

- Train stakeholders in use of the model
- Refine model interface based on stakeholders’ feedback
- Work with local health departments to increase utility of the Model in presenting Boards of Supervisors, City Councils and state legislative bodies
- Further refine the model by adding additional interventions from the meta-analytic literature
- Incorporate diabetes and smoking into the model
- Expand medical expenditure information by including expenditures associated with specific diseases and behaviors that are modeled
MAKING THE MODEL WORK FOR PUBLIC HEALTH

Objectives – Long Term

- Fully developed and functioning micro simulation model to project health of Californians
- Simple user-friendly version of the model that can be accessed through health forecasting website
- On-line user guide that documents sources of information, technical specifications, and underlying assumptions of the forecasting model

The model will give you

- …the most comprehensive projections on disparities in health outcomes over time if nothing new is done, assisting in planning and prioritizations
- …the effect of specific interventions on health outcomes by race, ethnicity, income, age and gender, providing a tool to compare alternative investment choices
- …the ability to determine adverse health effects of reduced access to health care
- …a way to quickly incorporate new information as the research literature evolves, e.g. projecting health benefits of improved cultural competency in health care
- …a standardized approach that leaves primary assumptions in place when comparing the impact of various interventions thus enabling quick analysis of the effects of proposed interventions on the local community