ReThink Health System Dynamics Model

Reference Sources & Studies for Local Calibrations

Each local configuration of the ReThink Health model draws from a variety of data sources to create a broad and balanced profile of the health and health care system in a particular region. The core data elements currently address:

**Population composition**, divided by 10 subgroups according to age, insurance status, and income, and projections for aging and overall growth through 2040;

**Population health status**, including the prevalence of physical and mental illness (by population subgroup);

**Health risks**, including fractions of the population with high risk behaviors, environmental hazards, and high crime (by population subgroup);

**Provider resources**, including office-based primary care providers (private and safety net) and specialists, and acute care hospital beds;

**Health care utilization**, including PCP visits and available slots for the indigent, ER visits urgent and non-urgent, inpatient stays and readmissions and discharge destinations, and people in nursing facilities or using home health care;

**Health care costs**, including nearly every category in the “personal healthcare expenditures” portion of the National Health Expenditures tracking system.

Wherever possible we use local data contrasted against national averages. If local data are unavailable or inadequate, we then develop small area estimates based on regional, state, or national sources. Some of the main databases that inform this model include:

**Local, State, Regional Sources**

- Local/regional/state surveys (e.g., Colorado Child Health Survey, Colorado Household Survey)
- Local/regional/state research reports (e.g., reports from the Colorado Health Institute)
- Administrative data (e.g., hospital billing)
- Ad hoc information gathering (e.g., high crime areas)

**Ex extractions/Adjustments from National Databases**

- U.S. Census 2010 (American Community Survey)
- CDC’s Behavioral Risk Surveillance System (BRFSS)
- National Ambulatory Medical Care Survey (NAMCS)
- National Hospital Ambulatory Medical Care Survey (NHAMCS)
- National Survey of Children’s Health (NSCH)
- National Nursing Home Survey (NNHS)
- National Home Health Care Survey (NHHCS)
- National Health Expenditure Accounts
- National Health Interview Survey (NHIS)
- National Health and Nutrition Examination Survey (NHANES)
- Medical Expenditure Panel Survey (MEPS)
- National Vital Statistics Reports from the CDC
- Kaiser Family Foundation State Health Facts
- National Hospital Discharge Survey (NHDS)
- Agency for Healthcare Research and Quality-Health Care Utilization Project (AHRQ-HCUP)
- Health Resources and Services Administration – Area Resource Files (ARF)
- Dartmouth Atlas of Health Care

Prior Integrative Studies

Many parameters are consistent with previously published analytic tools such as:

- CDC HealthBound policy model, selected by AcademyHealth as Public Health Systems Research Article of the Year for 2012.

References: Milstein, Homer, Hirsch 2010; Milstein, Homer, Briss, et.al. 2011; Homer, Hirsch, Milstein 2007

- CDC-NIH Prevention Impacts Simulation Model (PRISM), selected by the System Dynamics Society as Best Application of System Dynamics Modeling for 2011.


Selecting a Geographic Focus

<table>
<thead>
<tr>
<th>Measure</th>
<th>Source</th>
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<tbody>
<tr>
<td>Population by age group Census 2010</td>
<td>U.S. Population by age group Census 2010</td>
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### Illness & Risk

<table>
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<tr>
<th>Measure</th>
<th>Source</th>
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<tbody>
<tr>
<td>Chronic mild and severe physical illness prevalence by pop segment</td>
<td>Chronic mild and severe physical illness prevalence by pop segment</td>
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<tr>
<td>Chronic mental illness prevalence by pop segment; controlled and uncontrolled</td>
<td>Chronic mental illness prevalence by pop segment; controlled and uncontrolled</td>
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</table>
| Risky behavior prevalence by pop segment                                | Youth: NSCH 2007. Overweight or obese or no activity or smoker in the house  
Adults: National data from NHANES 2010.  
Binge Drinking: (5+ drinks in a night) > 24 times in last year or Smoking: Current Smoker or Obesity: BMI>=30 or No Physical Activity: No usual vigorous or moderate recreational activities, and no regular use of biking or walking as transportation. Additional data from NHANES 2010 on drug abuse |
| Fraction of people living in high crime areas                           | 2007 National Survey of Children's Health on safety and vandalism     |
| Fraction of people living in areas with higher risk of toxic exposures (e.g., air pollution) | 2007 National Survey of Children's Health: Does neighborhood have litter or garbage? OR Does neighborhood have dilapidated housing? |

### Providers

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<th>Measure</th>
<th>Source</th>
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<tbody>
<tr>
<td>Primary care physicians and physician- equivalents (private, safety net)</td>
<td>CDC’s NCHS 05-06, AHRQ 2009, NAMCS 2010, Kaiser Family Foundation 2010, HRSA Area Resources File 2010</td>
</tr>
<tr>
<td>Specialist physicians</td>
<td>CDC’s NCHS 05-06, AHRQ 2009, NAMCS 2010, HRSA Area Resources File 2010</td>
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Acute care hospital beds US Census Bureau, 2009

## Utilization

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<th>Measure</th>
<th>Source</th>
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<tbody>
<tr>
<td>Physician Office Visits, Visits to safety net PCPs, and visit capacity per safety net PCP</td>
<td>NAMCS 2010, Kaiser Family Foundation 2010</td>
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<tr>
<td>ER visits</td>
<td>MEPS 2009; NHAMCS 2009</td>
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<tr>
<td>Non-urgent fraction of ER visits</td>
<td>NHAMCS 2009</td>
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<tr>
<td>Inpatient stays Outpatient visit volumes</td>
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<tr>
<td>Fraction of hospital discharges to SNF/rehab facility or home care agency</td>
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<tr>
<td>Nursing home population</td>
<td>ARF 2001, NNHS 2004</td>
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## Costs

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<th>Measure</th>
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<tbody>
<tr>
<td>Average charge per ER visit</td>
<td>MEPS 2009</td>
</tr>
<tr>
<td>Average charge per inpatient stay</td>
<td>MEPS 2009</td>
</tr>
<tr>
<td>Non-urgent fraction of ER visits</td>
<td>MEPS 2009</td>
</tr>
</tbody>
</table>

## Selected Studies of the Health and Health Care System


Bodenheimer T, Chen E, Bennett HD. Confronting the growing burden of chronic disease: can the U.S.


Colwill JM, Cultice JM, Kruse RL. Will generalist physician supply meet demands of an increasing and aging population? Health Affairs 2008; 27(3):w232-w241.


Homer J, Hirsch G, Milstein B. Chronic illness in a complex health economy: the perils and promises of


Lambrew JM, Podesta JD, Shaw TL. Change in challenging times: a plan for extending and improving health coverage. Health Affairs, 2005 Web Exclusive: W5-119-W5-132.


National Safety Council (NSC). What are the odds of dying? (Odds of death due to injury, 2003).  


Selected Studies of Specific Risk Factors and Disease Conditions


Fichtenberg CM, Glantz SA. Effect of smoke-free workplaces on smoking behaviour: systematic review. *BMJ* 2002;325:188.


Frasure-Smith N, Lespérance F. Depression and other psychological risks following myocardial infarction. *Arch Gen Psychiatry* 2003; 60:627–636.


Pratt LA, Dey AN, Cohen AJ. Characteristics of adults with serious psychological distress as measured by the K6 scale: United States, 2001–04. *Advance Data from Vital and Health Statistics* #382; DHHS, CDC, National Center for Health Statistics; March 30, 2007.


