

# ReThink Health System Dynamics Model

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## 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)

### *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.

References: Homer, Milstein, et.al. 2008, 2010; Hirsch, Homer, et.al. 2010)

### *Selecting a Geographic Focus*

#### Population

Measure		Source	
Population by age group Census 2010	U.S.	Population by age group Census 2010	U.S.
Population projection by age group Census Projections 2008	U.S.	Population projection by age group Census Projections 2008	U.S.

Disadvantaged fractions by age group American Communities Survey 2009– Public Use Micro-area	American Communities Survey 2009– Public Use Micro-area	Disadvantaged fractions by age group American Communities Survey 2009– Public Use Micro-area	American Communities Survey 2009– Public Use Micro-area
Insured fractions by age/income American Communities Survey 2009– Public Use Micro-area	American Communities Survey 2009– Public Use Micro-area	Insured fractions by age/income American Communities Survey 2009– Public Use Micro-area	American Communities Survey 2009– Public Use Micro-area
Births, Deaths, Net Migration CDC National Vital Statistics Reports	CDC National Vital Statistics Reports	Births, Deaths, Net Migration CDC National Vital Statistics Reports	CDC National Vital Statistics Reports
Population by age group Census 2010	U.S. Census 2010	Population by age group Census 2010	U.S. Census 2010
Population projection by age group Census Projections 2008	U.S. Census Projections 2008	Population projection by age group Census Projections 2008	U.S. Census Projections 2008

## Illness & Risk

Measure	Source
Chronic mild and severe physical illness prevalence by pop segment	Chronic mild and severe physical illness prevalence by pop segment
Chronic mental illness prevalence by pop segment; controlled and uncontrolled	Chronic mental illness prevalence by pop segment; controlled and uncontrolled
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

Measure	Source
Primary care physicians and physician- equivalents (private, safety net)	CDC's NCHS 05-06, AHRQ 2009, NAMCS 2010, Kaiser Family Foundation 2010, HRSA Area Resources File 2010
Specialist physicians	CDC's NCHS 05-06, AHRQ 2009, NAMCS 2010, HRSA Area Resources File 2010



Acute care hospital beds	US Census Bureau, 2009
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## Utilization

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

## Costs

Measure	Source
Average charge per ER visit	MEPS 2009
Average charge per inpatient stay	MEPS 2009
Non-urgent fraction of ER visits	MEPS 2009

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