



# Using Predictive Risk Solutions to Structure Population Care Programs

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# Berkshire Health Systems

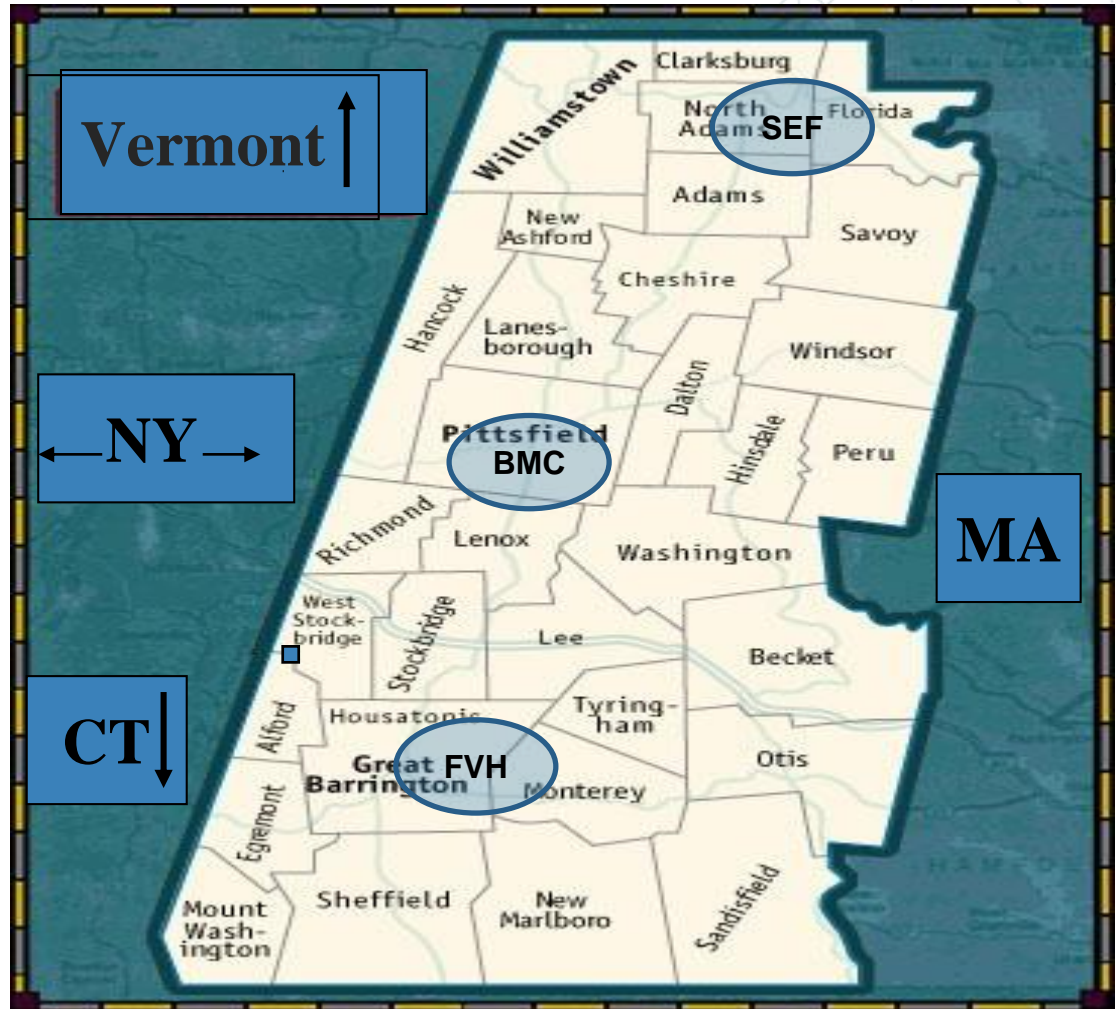


- ⊙ Berkshire Medical Center
- ⊙ Berkshire Visiting Nurses Association
- ⊙ Hillcrest Campus
- ⊙ North County Campus
- ⊙ Provider Practices



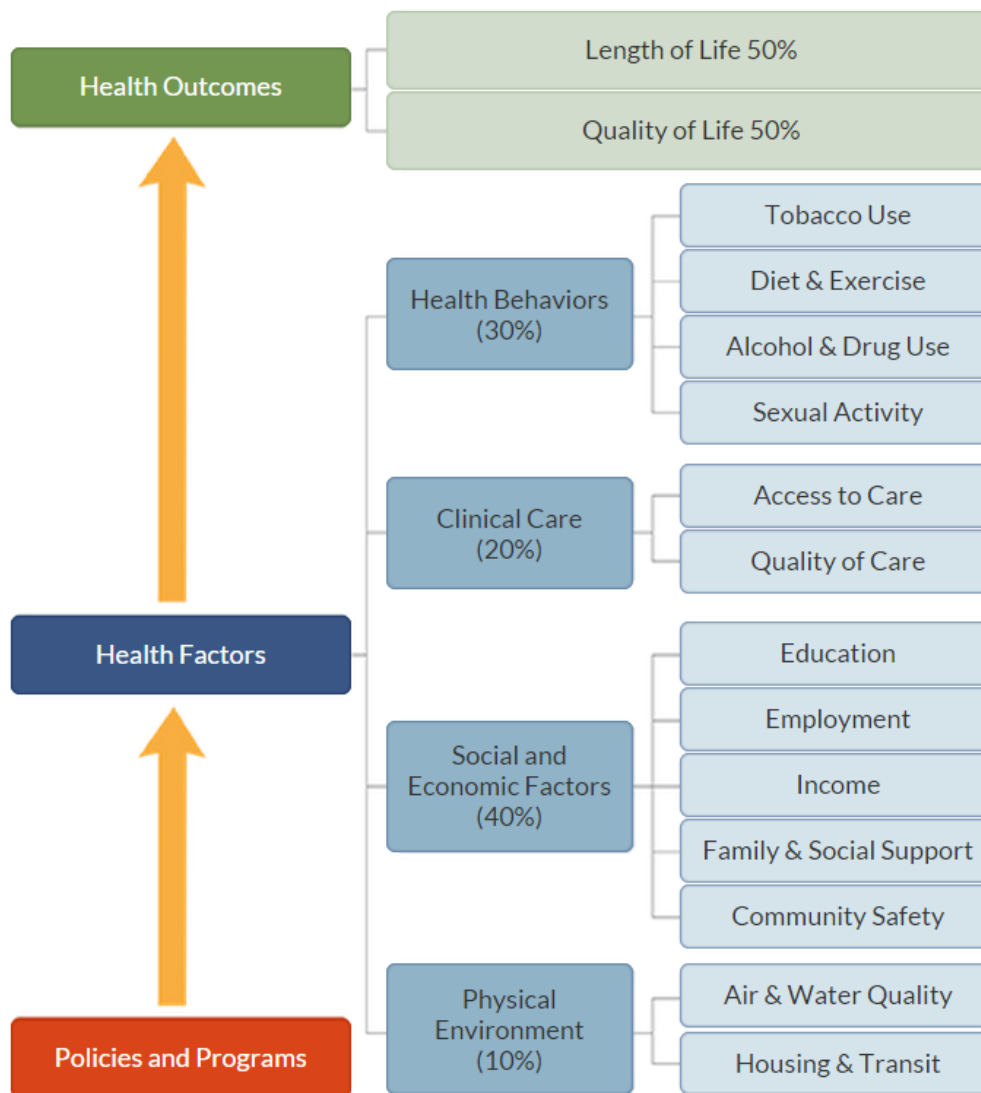
# Berkshire County, Massachusetts

- 32 Cities/Towns
- 946 Square Miles
- Population: 126,313
- % 65 and Over: 23%, MA: 16%
- % under 18: 17%, MA: 20%
- 92% White, MA 81%
- Income 26% lower than state
- Cultural/Tourist Area



# County Health Rankings

## Model of Population Health



County Health Rankings model © 2014 UWPHH

### Berkshire Rank (of 14)

*Lower is better*

2017	2018
13	14
10	11
8	8
5	5
11	11
4	8

# HBI Solutions

Uses data science to help customers achieve demonstrable improvements in clinical outcomes and cost efficiencies



Spotlight



Risk Analytic Software



Strong, Expert Team



Consulting Guidance



# HBI Solutions: Spotlight Analytic Solution

Berkshire is using two modules from HBI's Spotlight Analytics Platform:

## Acute Risk Management

## Population Risk Management

Solutions



Acute Risk Management

- Inpatient 30 day readmission risk
- Inpatient sepsis risk
- Inpatient mortality risk
- Inpatient predicted LOS
- Emergency 30 day revisit risk



Population Risk Management

- Cost risk
- Utilization risk (IP, ED)
- Disease risk
- Mortality risk

Insights

Platform

### All Data



- EHR
- Social Determinants
- Claims

### Risk Insight Engines



- Machine learning / AI as a service
- Predictive risk engines

# How we use the Spotlight Risk Models



## Acute Risk - Inpatient Workflow

- The HBI 30 Day Readmission Risk Scores are run daily M-F by the Case Management Dept.
- This gives the CM's the opportunity to evaluate re-admission risk for their discharging patients and focus on additional strategies for post hospital care.
- Used to prioritize discharge appointments in patients whom the team believes require a f/u appointment within a few days of discharge d/t their heightened risk for re-admission.



## Population Risk - Outpatient Workflow

- 1 – ACO contracts....
- 2 – POD organization and workflow....
- 3 – Other management entities

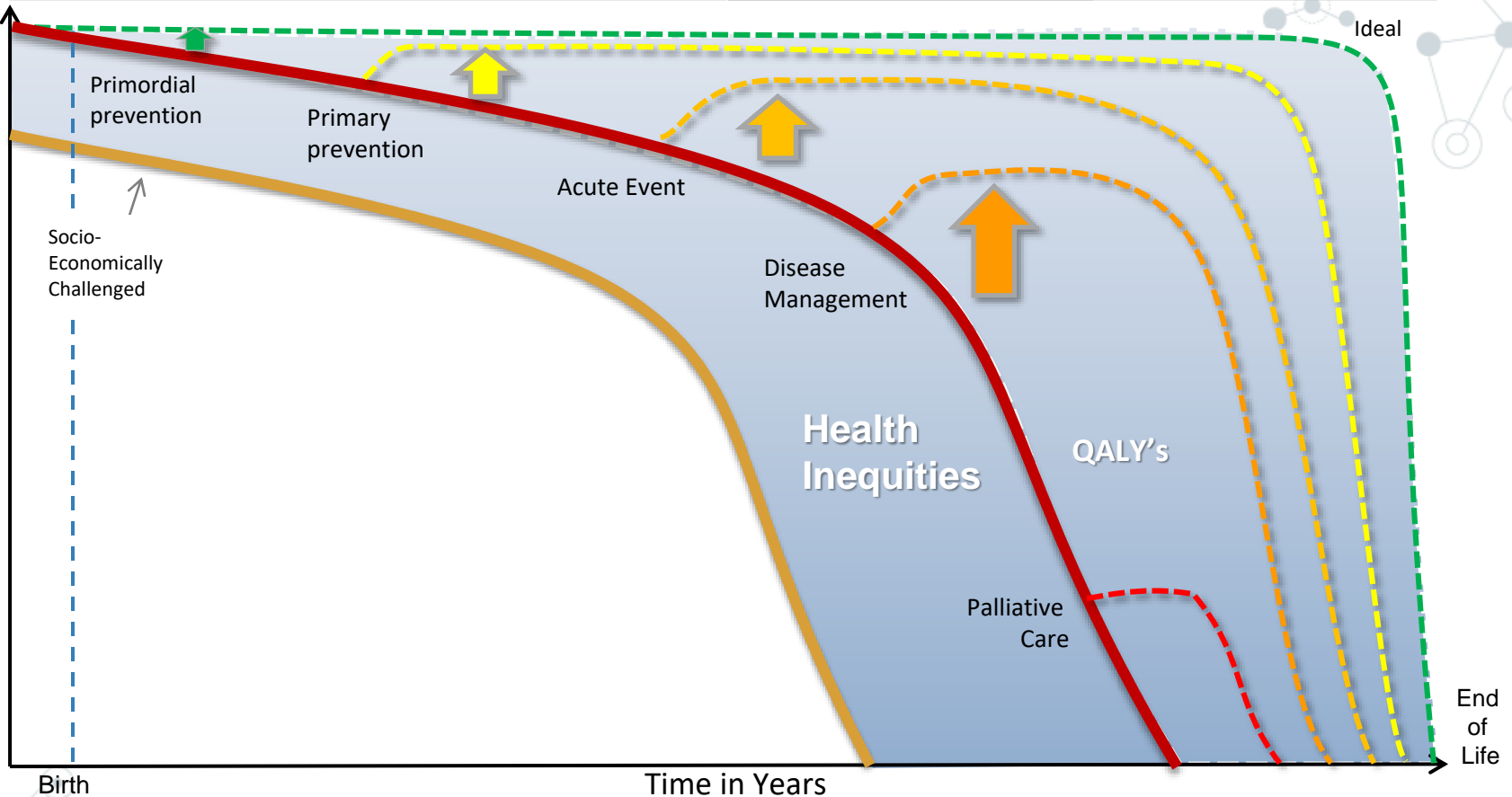
# A Healthier Community is Why

**Predictive Analytics**

**Berkshire programs**

Primordial	Primary Prevention	Acute Care, Disease Management	End of Life
Identify High Risk Groups Early e.g. Socio-economically Challenged	Identify Pts for Primary Prevention e.g. Diabetes, Smoking, HTN	Identify Pts with Established High-Risk Conditions e.g. HF, CAD, CVA	Identify Pts at High-Risk for Short-Term Mortality
E.g. Wellness at Work, Canyon Ranch Institute/ Berkshire Health Systems, PCMH	E.g. Prevention Wellness Trust Fund, PCMH	E.g. CHART (PCMN), PCMH	E.g. Compression of Morbidity, Palliative Care, Hospice

Quality of Life



**Infra-structure**

**Health Outcomes & Factors**  
(County Health Rankings)

Robust Primary Care System/Community Integration/Community-Based Care Teams/Virtual Health
Comprehensive I.T. Integration
Predictive Analytics/Machine Learning Derived from Clinical EHR Data, Social Determinants, ACE
Social & Economic Factors
Health Behaviors
Clinical Care
Physical Environment

Adapted from Charles Pain, Clinical Excellence Commission, New South Wales, Australia and Stein, SIBR Rounds by R. Glasener, M. Pettus, and G. Ellrodt of BHS



## Two similar patients on the active inpatient list

55	M	3/20/1963	2 East Medical	aspiration PNA?/ alcohol withdrawal	Inpatient	2/21/2019 3:28 PM	Physician/Self Referral	8	2.5	0.1	0.2	34
56	M	9/26/1962	3 South Medical	Community Acquired Pneumonia	Inpatient	2/19/2019 3:15 PM	Physician/Self Referral	10	3.2	0.1	2	34

Similar level of  
care:  
**Medical Unit**

Same age  
group and  
gender:  
**55/56 yr. Male**

Similar length  
of stay:  
**2 – 3 days**

Same  
readmission  
risk:  
**34 (high)**

## Patient #1 Risk Profile

**30 Day Readmission Risk 34 (high)**  
**Medicaid Patient**

( Male | 55 | 3/20/1963 )  
Address: [REDACTED]  
Patient Location: 2 East Medical  
Attending Physician: [REDACTED]  
Working Diagnosis: aspiration PNA?/ alcohol withdrawal  
Payor: **Medicaid**

### Active Inpatient Risk Profile

Admission Date:	2/21/2019 3:28 PM
Current LOS:	8
Predicted LOS:	2.5
Risk Score - IP Mortality:	0.1
Risk Score - IP Sepsis:	0.2
Risk Score - IP 30 Day Readmission:	34

Last IP Discharge:	7/29/2018	Readmission Risk:	32
Last ED Discharge:	1/13/2019	Return Risk:	34

## Patient #2 Risk Profile

**30 Day Readmission Risk 34 (high)**  
**Commercial Patient**

( Male | 56 | 9/26/1962 )  
Address: Pittsfield, MA, US, 01202  
Patient Location: 3 South Medical  
Attending Physician: [REDACTED]  
Working Diagnosis: Community Acquired Pneumonia  
Payor: **Commercial**

### Active Inpatient Risk Profile

Admission Date:	2/19/2019 3:15 PM
Current LOS:	10
Predicted LOS:	3.2
Risk Score - IP Mortality:	0.1
Risk Score - IP Sepsis:	2
Risk Score - IP 30 Day Readmission:	34

Last IP Discharge:		Readmission Risk:	
Last ED Discharge:	5/16/2018	Return Risk:	18

## Patient #1 Risk Profile

30 Day Readmission Risk **34 (high)**

**Medicaid Patient**

### Top Risk Features

1. High historical utilization
2. Mental health and substance abuse issues
3. Community social determinants

Top Risk Features	Odds Ratio
10+ total inpatient days in last 12 months	12.1
Estimated cost greater than \$24700 in last 12 month	11.1
3+ emergency visit(s) in last 12 months	2.5
Screening and history of mental health and substance abuse codes	2.3
Alcohol related disorders	2.2
Substance related disorders	2.2
Anxiety disorders	1.7
Mood disorders	1.7
Patient's Zip Code has a (Low) % of residents with US Citizenship	1.5
Patient's Zip Code has a (Very High) % of residents with Medicaid Health Insurance	1.5

## Patient #2 Risk Profile

30 Day Readmission Risk **34 (high)**

**Commercial Patient**

### Top Risk Features

1. Multiple chronic diseases  
(**Very low** historical utilization)  
(**No** social determinant issues)

Top Risk Features	Odds Ratio
Esophageal disorders	2.0
Chronic kidney disease	1.7
Cataract	1.5
Other eye disorders	1.5
Diabetes	1.3
Hypertension	1.2
Peripheral and atherosclerosis	1.2
Other nutritional or metabolic disorders	1.1

# Future Opportunity: Better ICD-10 Coding for Common Socioeconomic Issues

- ◎ The available code groups cover a wide range of common social, economic, environmental, and interpersonal issues, including:
- ◎ Z55 – Problems related to education and literacy
- ◎ Z56 – Problems related to employment and unemployment
- ◎ Z57 – Occupational exposure to risk factors
- ◎ Z59 – Problems related to housing and economic circumstances
- ◎ Z58 – Problems related to physical environment (excluding occupational exposure)
- ◎ Z59 – Problems related to housing and economic circumstances
- ◎ Z60 – Problems related to social environment
- ◎ Z62 – Problems related to upbringing
- ◎ Z63 – Other problems related to primary support group, including family circumstances
- ◎ Z64 – Problems related to certain psychosocial circumstances
- ◎ Z65 – Problems related to other psychosocial circumstances

ICD-10 adds more detail on the social determinants of health

November 16th, 2016 / By Paul LaBrec

In the ICD-10 classification scheme, Z Codes are found in Chapter 21, "[Factors influencing health status and contact with health services \(Z00-Z99\)](#)." Among these new "Z" codes is the following series related to potential hazards due to family and social circumstances impacting health status:

Z55-Z65 – Persons with potential health hazards related to socioeconomic and psychosocial circumstances<sup>1</sup>

Z55 – Problems related to education and literacy

Z56 – Problems related to employment and unemployment

Z57 – Occupational exposure to risk factors

Z59 – Problems related to housing and economic circumstances

Z60 – Problems related to social environment

Z62 – Problems related to upbringing

Z63 – Other problems related to primary support group, including family circumstances

Z64 – Problems related to certain psychosocial circumstances

Z65 – Problems related to other psychosocial circumstances

Each of these codes has sub-codes providing a more specific description of the problem. Some of these codes describe issues traditionally recognized as related to socioeconomic status:

Z59 – Problems related to housing and economic circumstances

Z59.0 – Homelessness

Z59.1 – Inadequate housing

Z59.4 – Lack of adequate food and safe drinking water

Z59.5 – Extreme poverty

Z59.6 – Low income

Z59.7 – Insufficient social insurance and welfare support

While others are not traditional measures of social factors:

Z60.2 – Problems related to living alone

Z60.3 – Acculturation difficulty

Z60.5 – Target of (perceived) adverse discrimination and persecution

Z63.1 – Problems in relationship with in-laws

Z62.1 – Parental overprotection

The inclusion of Z Codes in administrative claims data now allows direct analysis of aspects of the patient's social environment alongside demographic and clinical factors, and both can be related to utilization and financial outcomes.

In the [November 2016 issue](#) of *Health Affairs*, Gottlieb and colleagues suggest four ways in which data on social determinants of health collected through Z codes may be used to inform population health initiatives.

- **Improving panel management** – supplementing traditional clinical data for patient management

- **Expanding the definition of quality improvement** – to include activities such as food access intervention

- **Staffing for team-based care** – to include staff such as social workers to help patients secure adequate housing or other social services

- **Adjusting provider panel sizes** – to account for additional time necessary to address the special needs of patients with certain social situations impacting their health

In discussing the potential benefits for increased collection and use of social determinants data, the authors cite the success of "e codes"—patient injury data collected by hospitals—in identifying population needs for interventions such as drowning prevention, firearm safety and bicycle injury prevention, as an example of the public health benefits that can be gained through such data collection, aggregation and analysis. The authors from *Health Affairs* conclude that:

"Identifying a clear process for collecting and aggregating data on social determinants of health is an important next step towards transforming health care, refining value-based payment, and ultimately influencing both health- and non-health-sector strategies to improve population health."

Our Clinical and Economic Research team at 3M has created a composite index of social determinants of health defined at a Census Tract level using state-specific analysis of U.S. Census data. We can link these standardized scores based on geography to the geocoded addresses of patients. With the advent of ICD-10 we will be investigating socioeconomic factors as revealed in Z codes on claims with socioeconomic status as defined in Census data.

# Conclusions:

- ◎ Berkshire County like many rural communities presents a unique opportunity to manage a population
- ◎ The challenge is to integrate EHRs, community resources, clinical factors and social determinants of health
- ◎ Predictive risk tools present a unique opportunity to prioritize and focus scarce resources for such communities
- ◎ County Health Rankings can help track progress in a cost effective way