Track 2.04
Health Plan Populations Track

Disease Surveillance after Hurricane Katrina:
Use of Predictive Modeling by a Medicare Advantage Health Plan

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Presentation Goals

- Describe how a variety of different predictive modeling tools and how they were used by a Medicare-Advantage health plan.

- Highlight the challenges of using predictive modeling in a Medicare health plan.

- Display results from several different predictive models, pre- and post-Katrina.

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Katrina Background

- Hurricane Katrina swept across southeastern Louisiana and Mississippi on the morning of August 29, 2005.

- Katrina was a Category 5 hurricane while over the Gulf of Mexico, it made landfall east of New Orleans as a Category 3 storm.

- Although substantial havoc was wrought by the hurricane's winds, the worst damage in Louisiana was caused by storm surge, overtopped flood walls and levee breaches.

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Katrina Background (cont.)

- Most destructive and costliest natural disaster in the history of the United States.
  - Deadliest hurricane since the 1928 Okeechobee Hurricane.
  - As of May 2006, the confirmed death toll (total of direct and indirect deaths) stood at 1,836, mainly from Louisiana (1,577) and Mississippi (238).
    - However, 705 people remain categorized as missing in Louisiana.
  - Katrina's storm surge caused 53 different levee breaches in greater New Orleans submerging eighty percent of the city.
  - A June 2007 expert report stated that two-thirds of the flooding were due to levee breaches.
  - The total damage from Katrina is estimated at $81.2 billion, nearly double the cost of the previously most expensive storm, Hurricane Andrew.
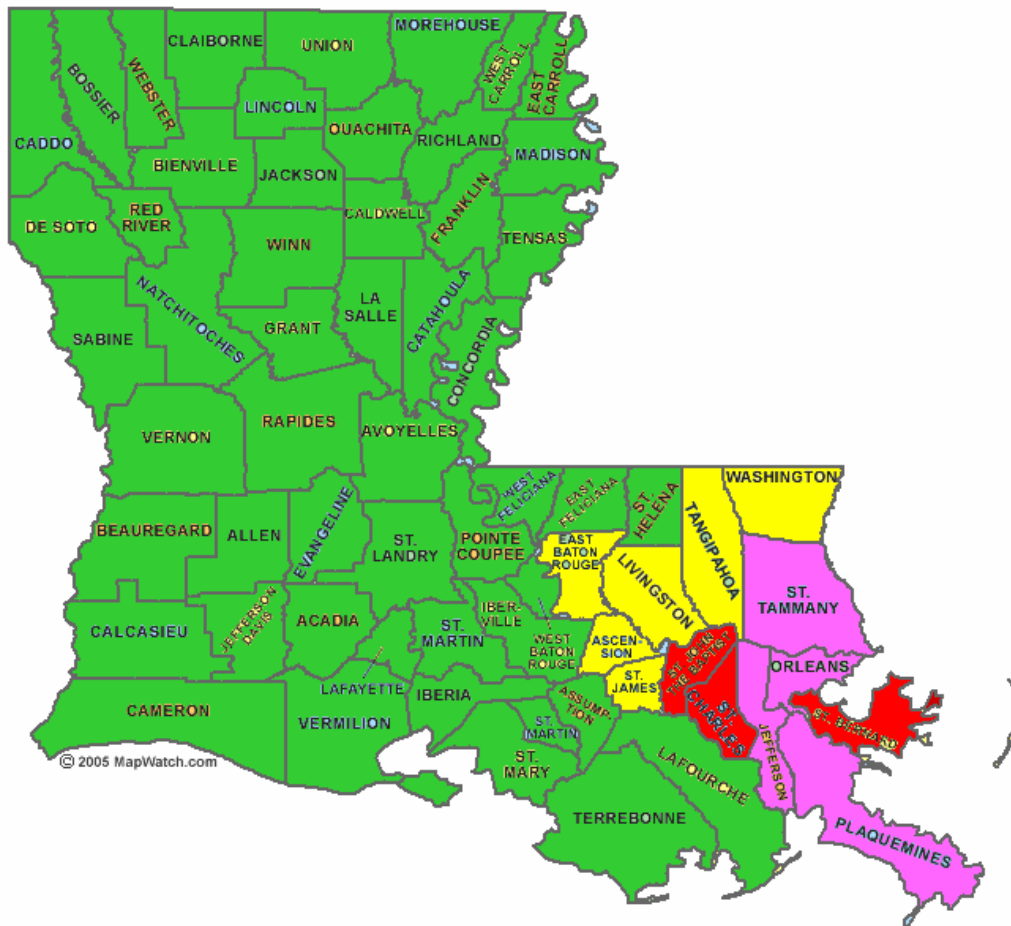
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About People's Health

- People's Health (PHN) is a 100% provider-owned HMO focusing exclusively on Medicare beneficiaries.

- Founded in 1997 as a joint venture between five local hospitals and local physicians.

- Has enjoyed rapid growth in both membership and revenue.

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People's Health Service Area

- Original service area was southeastern Louisiana: Orleans, Jefferson, Plaquemines and a portion of St. Tammany parishes.

- In July 2005, PHN expanded its service area to include, "the River Parishes," St. John the Baptist, St. Charles and St. Bernard. Residents of these parishes traditionally have poor access to health care providers.

- As a result of Katrina, PHN expanded its service area west toward Baton Rouge and north toward Mississippi on January 1, 2007.

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"The Map"

This Research is a Collaborative Effort

- PHN is working the Johns Hopkins University School of Public Health and Health Data Services to understand the impacts of Katrina on Medicare beneficiaries.

- PHN has provided a research grant to the Johns Hopkins Health Services Research and Development Center to study the impacts of Hurricane Katrina on older persons.

- HDS provides an array of risk adjustment and morbidity measurement services to PHN and has created the longitudinal claims and prescription drug database.

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PHN's Response to Hurricane Katrina

- Plan remained operational throughout disaster: moved administrative operations to Baton Rouge.

- Immediately notified every member and provider that all copayments and deductibles were waived for all out-of-network services.

- Working in conjunction with medical societies in several states, every provider and pharmacy was informed (either by letter or phone) that they could serve PHN members and be assured full reimbursement at prevailing Medicare rates.

- Access to prescription drugs was uninterrupted.

- Copayment/deductible waiver remained in effect through December 31, 2006.

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PHN Study Population

- 35,000 Medicare members who originally resided in the New Orleans metro area.

- Stable Population

- Complete, Longitudinal Claims History
  - All medical claims
  - Complete pharmacy data (prior to Medicare Part D)
  - Clinical laboratory data
  - Can track provider ID for continuity of care studies

PHN Study Population (cont.)

- Spatial Information
  - Self-reported address changes
  - Address changes reported to SSA
  - Geocoding of pharmacy addresses where prescriptions have been filled.

- Data collection is ongoing- we have 4-5 years of data on many members.

- We believe we have developed a unique database that allows us to study the longitudinal impacts of Hurricane Katrina in a variety of different ways.

PHN's Interests After Katrina

- Ensure all members received optimal health care services, regardless of where they were living.

- Support their employees
  - Over 95% returned to work

- Maintain adequate revenue stream to ensure that all medical care services could be delivered to all members.

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Impact of Medicare Risk Adjustment on PHN

- Since 2004, Medicare-Advantage plans have been paid based on the illness burden of their members.
  - Illness burden is measured by the submission of diagnosis codes to CMS.
- By 2006, 75 percent of the payment from CMS was calculated using diagnosis-based risk adjustment (the HCC model). In 2007 and beyond, 100 percent of payments are risk adjusted.
- **Because PHN is a Medicare-only plan, they are especially sensitive to changes in their "risk score."**

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Medicare Risk Adjustment and PHN

- PHN's risk score decreased in 2006, due to the submission of fewer diagnosis codes.
- The health plan began a comprehensive program singularly focused on collecting every possible diagnosis code.
- Program included:
  – Medical record reviews
  – Provider education
  – Suspect identification using predictive modeling

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Use of Predictive Modeling on Behalf of PHN

- Several different models in use:
  - HCC model
    - Very limited, but essential to plan operations
  - Johns Hopkins ACG Predictive Model (ACG-PM)
  - Johns Hopkins pharmacy-based morbidity groups (Rx-MGs).
  - A series of ad hoc predictive models
    - Incorporating clinical laboratory results

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Challenges of Introducing Predictive Modeling to a Medicare Health Plan

- Medicare-Advantage plans already operate under a "predictive model."
  - The HCC model generates prospective risk scores for every member on a semi-annual basis.
  - PHN has been "ahead of the curve" in learning how the HCC model impacts their operations.
  - Nonetheless it is difficult to introduce other predictive models because of the inherent complexity of the HCC model and the Medicare risk adjustment system.

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Discussing Predictive Modeling in a Medicare-Advantage Plan

- It is essential to understand the strengths and limitations of the Medicare HCC Model.
  - It does an adequate job of paying Medicare health plans according to their illness burden.
  - But it is primarily a chronic disease model, focusing on a handful of diseases common to Medicare beneficiaries (both over-65 and under-65 disabled).
  - It is inadequate as a predictive model, other than for payment.

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Use of the Johns Hopkins ACGs

- The Johns Hopkins ACG-PM model was used for two purposes:
  - Retrospectively to stratify the study population
    - JHU conducted a telephone survey of a stratified random sample of PHN members to learn about their responses to Hurricane Katrina.
    - I studied disease progression in a population of diabetics using the ACG-PM to control for illness burden beyond diabetes.

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Use of ACG-PM as an Illness Burden "Stratifier"

Costs of Disease Progression for Members with Diabetes

Pre-Katrina vs. Post-Katrina

	Members	PMPM Allowed Charges, Pre-Katrina	PMPM Allowed Charges, Post-Katrina	Percent Change
All Diabetics	**8,306**	**$617.98**	**$857.31**	**38.7%**
Non-Users	174	$58.51	$343.01	486.2%
Healthy	1,553	$133.41	$357.04	167.6%
Less Healthy	1,762	$249.20	$491.61	97.3%
Sick	2,244	$537.05	$817.65	52.2%
Very Sick	2,573	$1,271.41	$1,479.05	16.3%

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Limitations of Diagnosis-based Risk Adjustment

- Even in a best-case scenario, there is typically a 3-month lag between the end of the data collection period and when an analyst can reliably use the diagnoses for predictive modeling.

- In the aftermath of Hurricane Katrina, PHN experienced a substantial decline in the number and "complexity" of diagnosis codes submitted.

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Limitations of Diagnosis-based Risk Adjustment (cont.)

- PHN experienced how sensitive the HCC model was to reductions in diagnosis codes.
  - Many paper claims came in from out-of-area providers.
  - Many members only sought care for episodic conditions and their chronic diseases were not often recorded
- Because it uses the entire array of ICD-9-CM codes, the ACG-PM model is more stable when the flow of diagnosis codes varies.

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Getting Beyond the "Risk Score"

- I believe that "raw" risk scores (the output from a predictive model) are more difficult to understand than one would assume.

  - Providers have trouble grasping the concept that higher scores are not necessarily "better" than lower scores.

- The most useful component of a predictive model is the building blocks that drive the predictive model.

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Johns Hopkins Expanded Diagnosis Clusters

- The Johns Hopkins Expanded Diagnosis Clusters (EDCs) complement the unique person-oriented approach that underpins the ACG System.

- **EDCs are a tool for easily identifying people with specific diseases or symptoms**.

- Each ICD-9 code maps to a single EDC. ICD codes within an EDC share similar clinical characteristics and are expected to evoke similar types of diagnostic and therapeutic responses.

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Johns Hopkins Expanded Diagnosis Clusters

- The EDC methodology assigns ICD-9 codes found in claims or encounter data to one of 264 EDCs, which are further organized into 27 categories called Major Expanded Diagnosis Clusters (MEDCs).

- As broad groupings of diagnosis codes, **EDCs help to remove differences in coding behavior between practitioners**.

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Examples of some EDCs

- ALL01: Allergic reactions
- ALL03: Allergic rhinitis
- ALL04: Asthma, w/o status asthmaticus
- ALL05: Asthma, with status asthmaticus
- ALL06: Disorders of the immune system
- CAR01: Cardiovascular signs and symptoms
- CAR03: Ischemic heart disease
- CAR04: Congenital heart disease
- CAR05: Congestive heart failure
- CAR06: Cardiac valve disorders
- CAR07: Cardiomyopathy
- CAR08: Heart murmur
- CAR09: Cardiac arrhythmia
- CAR12: Acute myocardial infarction
- CAR13: Cardiac arrest, shock
- CAR14: Hypertension, w/o major complications
- CAR15: Hypertension, with major complications

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Pre- vs. Post-Katrina Disease Prevalence using EDCs in a Continuously Enrolled Population

EDC	Pre-Katrina	SEP05-AUG06	SEP06-AUG07	Percent Change
CAR12-Myocardial Infarction	8.3	10.9	8.5	31.6%
CAR05-CHF	63.7	74.5	65.1	16.9%
END06-Diabetes w/complication	99.8	115.6	128.7	15.8%
END07-Diabetes w/o complications	51.7	61.4	55.8	18.7%
PSY09-Depression	9.3	10.5	8.7	13.6%
PSY07-Schizophrenia	4.5	4.3	3.0	(5.25)
RES04-COPD	88.1	81.0	83.3	(8.1%)

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Johns Hopkins Rx Morbidity Groups

- Version 8.0 of the ACG Toolkit contains the Rx-MGs and Rx-PM functionality.

- Over 100,000 National Drug Codes are reduced to 60 morbidity groups.

- Some of the morbidity groups are disease-specific, others are not.

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Examples of the Rx-Morbidity Groups

- **Allergy/Immunology / Asthma**
- Allergy/Immunology / Chronic Inflammatory
- Cardiovascular / Vascular Disorders
- Ears, Nose, Throat / Acute Minor
- Endocrine / Bone Disorders
- **Endocrine / Diabetes With Insulin**
- **Endocrine / Diabetes Without Insulin**
- Endocrine / Thyroid Disorders
- Female Reproductive / Contraception
- Female Reproductive / Infertility
- Gastrointestinal/Hepatic / Acute Minor
- Gastrointestinal/Hepatic / Chronic Liver Disease
- Gastrointestinal/Hepatic / Inflammatory Bowel Disease
- Gastrointestinal/Hepatic / Peptic Disease
- Genito-Urinary / Acute Minor
- Infections / Acute MajorGenito-Urinary / Chronic Renal Failure

- Infections / Acute Minor
- **Infections / HIV/AIDS**
- Infections / TB
- Neurologic / Migraine Headache
- **Neurologic / Seizure Disorder**
- **Psychosocial / ADHD**
- **Psychosocial / Addiction**
- **Psychosocial / Anxiety**
- **Psychosocial / Depression**
- **Psychosocial / Acute Minor**
- **Psychosocial / Unstable**
- Skin / Acne
- Skin / Acute and Recurrent
- Skin / Chronic Medical

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Advantages of Rx-Based Predictive Models

- ## More timely data availability

  – Pharmacy claims are available virtually in "real-time," usually within one week of the transaction.

  – The database is complete from the start– there is no lag as there is with diagnosis-based risk adjustment.

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Pre- vs. Post-Katrina Disease Prevalence using Rx-MGs in a Continuously Enrolled Population

Rx-MG	Pre-Katrina	SEP05-AUG06	SEP06-AUG07	Percent Change
Depression	77.5	138.8	137.8	79.1%
Asthma	44.9	78.8	87.0	75.7%
Rheumatic Diseases	5.3	10.0	11.4	91.0%
CHF	34.2	65.0	79.1	90.0%
Hypertension	261.4	531.2	588.6	103%
Diabetes	98.5	195.5	226.9	91.2%
Hyperlipidemia	149.3	345.2	401.1	131%

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A Predictive Model to Identify Chronic Renal Failure

- Using clinical laboratory result data, we developed a prediction model that identifies patients with chronic renal failure.
  - Results from serum creatinine and albumin levels are used to compute glomerular filtration rate (GFR).
  - Patients with GFR < 60 for greater than 3 months have chronic renal failure, divided into five stages.

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A Predictive Model to Identify Chronic Renal Failure (cont.)

- We incorporated other variables into the model:
  - Presence of diabetes, hypertension and CHF
  - Member's age, race and gender
- When we compared the results of the model to the prevalence of chronic renal failure (as reported using ICD-9 codes), we found that only 50% of the members with GFR < 60 had chronic renal failure diagnosis codes.
- A medical record review is ongoing to validate this model and the underlying approach.

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Conclusions

- The predictive models are an essential component of any analysis of service utilization, provider efficiency, etc.

- In a Medicare health plan, the prospective component of a predictive model are difficult to implement.

- Pharmacy-based risk adjustment is a substantial enhancement to diagnosis-based risk adjustment, but it too has its limitations.

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Conclusions (cont.)

- Pharmacy-based risk adjustment is a substantial enhancement to diagnosis-based risk adjustment, but it too has its limitations.
  - The key benefit is timeliness of the data stream.
  - But Rx-based risk adjustment often generates morbidity prevalence rates that are so different from their diagnosis-based "cousins"
    - The differences make me nervous!
    - Rx-based results should be reconciled and/or combined with diagnosis-based results.

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