List Case 1

Healthcare Data and Analytics Case Study:

Analytics of Patients and Consumers Survey

数据背景

Patients and consumers surveys are becoming an important source of information about the performance and responsiveness of healthcare systems. The more elaborate variations of patient surveys are known as healthcare utilization survey. WHO World Health Survey is an example. Depending on country's features of the health system the country specific surveys may vary but for the most part their major chapters are pretty similar. These surveys are important sources of information for the governments and policy makers to learn about the means and ways of financing health care by households but also their utilization habits for different healthcare services. They provide a nice picture about the insurance coverage of individuals and also their usual source of care. By default, some demographic information is always included in these surveys.

In this case study we run analytics on a US provided survey with roughly 13k sample size. As discussed in class Medicare is the largest federal insurance program in the US. With over 65 million beneficiaries the program's financial turnover was over $750 Billion. Medicare spending accounts for 21 percent of total National Health Expenditure NHE. Obviously such a large program has many monitoring and evaluation mechanisms in place. In the demand side of the market in particular Medicare program monitors patients through multiple channels and one of the most important methods of monitoring and evaluation of its patients is the Medicare Current Beneficiary Survey MCBS. The MCBS is a continuous, multipurpose survey of a nationally representative sample of the Medicare population, conducted by the Office of Enterprise Data and Analytics (OEDA) of the Centers for Medicare & Medicaid Services (CMS) through a contract with NORC at the University of Chicago. According to the Survey's official website it has been collecting data on Medicare beneficiaries for over 25 years and has conducted over 1 million interviews. The provides useful information on the expenditures and sources of payment for verity of services as utilized by the beneficiaries, including measures of out of pocket payments such as co-payments, deductibles, and non-covered services. Among other topics it collects data on all types of health insurance coverage and relate coverage to sources of payment also outcomes over time, such as changes in health status. There is also a chapter on the impacts of Medicare program changes on satisfaction with care and usual source of care.

The MCBS Survey File has a version that is fully de-identified and could be safely used for research by the public. The public use file (PUF) provides a publically available MCBS file for researchers interested in the health, health care use, access to and satisfaction with care for Medicare beneficiaries, while insuring the privacy of the responders. The MCBS PUF is prepared from data collected from community dwelling Medicare beneficiaries and contains standard demographic variables, such as age categories, race/ethnicity and gender, as well as information about health conditions, access to and satisfaction with care, type of insurance coverage, and information on utilization, such as the number of fee-for-service claims per beneficiary for certain health care event types. The MCBS PUF is available free for download, along with its accompanying documentation here on the MCBS PUF page. Usually the PUF file is

released a few months after the original MCBS Survey File is available.

You can access the 2016 PUF file at the link below

https://www.cms.gov/Research-Statistics-Data-and-Systems/Downloadable-Public-Use-Files/MCBS-Public-Use-File

When in the page scroll down to see the table of the files by year and type. Please use 2016 Medicare Current Beneficiary Survey File PUF. The data files along with all the documentation and the codebooks are available in the table in the row pertaining to year 2016.

Sample explanation:

The Survey Year 2016, which is the subject of this case study contains 12,852 Medicare beneficiary responders. Make sure the number of records in your file matches this number.

Steve

Q1) Racial disparity in ability to pay for care 支付医疗费用能力的种族差异

In theory the responders in the MCBS are all insured by the Medicare. Most of them are eligible by age meaning they are seniors who have reached the retirement age 65 which is the eligibility criterion for Medicare. However as we discussed earlier in class a small group have become eligible due to certain disabilities or other conditions. In any event while these people are all insured by Medicare program there are still elements of direct and indirect costs associated with utilization of healthcare services. We want to investigate if there is any racial disparity in terms of affordability of the out of pocket healthcare costs. To do that we filter the data for those who are eligible for Medicare only because of age >65. Use the variable ADM_H_MEDSTA and choose only value = 1 which is age based eligibility and filter out other values. After flirting your data we can investigate the racial disparity in ability to pay for the services. The variable Dem_Race gives you the race/ethnicity of the Medicare beneficiary. We are focusing for now on the two racial groups Non-Hispanic White and Non-Hispanic Black which are values 1 and 2 according to the MCBS codebook. We now need a direct or proxy variable indicating the financial ability of the subjects. The closest variable would be "ACC_HCDELAY": Last year ever delay in care due to cost. The value 1 = Yes means the person has delayed care for money reasons. Do you see any racial disparity with regard to financial difficulties? Is it statistically significant? (calculate the proportion of those who have reported financial difficulties and using a Fisher's Exact test see if the racial difference is statistically significant)

raceX financial ability

处理 ①筛data ②2x2 table

报告 ①做表 ②proportion (总,分) ③test结果

Ziyu

Q3) Gender differentials in healthcare utilization 医疗利用的性别差异

Women on average utilize more health services. While during reproductive ages they do need more care we may think the gender differences should fade away older individuals once the child bearing related needs have passed. But again if they naturally have better health seeking behavior than men the trend of higher utilization should sustain as they age as well. Let us test this using our data. Filter your data with ADM_H_MEDSTA =1 to insure only individuals with age over 65 are included in your study so that your data is clean from younger individuals who are eligible by non-age reasons. Using the ADM_H_PHYEVT we create a proxy for healthcare utilization. In order to create a continuous variable we replace the values of "none" with 0, and all count ranges with their midpoint for example value "1-5" with 3, and 16-20 with 18and finally for the last category of 21+ replace 23. With your new continuous count variable calculate the weighted average of the number of doctor visits for male and female subjects

处理: ① range变为midpoint → 分类变量变为"次数"
② weighted average < male female

报告：比较 weighted average → 分析结论
t-test → 2个体的t检验

separately. (Weighted average would be your new count variable multiplied by the frequency of the row, summed over all rows, divided by total number of male subjects. Repeat the calculation for female) DEM_SEX

Do you agree that men are in fact lazier or ignorant in terms of health seeking behavior? the fact that this is not necessarily because women are assuming the burden of child bearing and caring when they are in reproductive ages because the pattern continues onto older ages as well?

Henry Q3) A test of relationship between education and health 教育与健康

In the health econ textbook by Folland et al 7th Edition in Chapter 7 it is suggested that education makes individuals healthier thru better life style and more informed life and health related decisions. Let us test this hypothesis here using the data in hand.

To measure obesity we use the variable HLT_BMI_CAT which repots BMI categories (kg/m^2). To consider a person obese we will consider the values 4 and 5 in the definition i.e. obese and extreme or high risk obesity. These (HLT_BMI_CAT = 4 and 5) are clinically speaking the BMI values over 40 if you refer to the code book. So this is our dependent variable so far. Our independent variable in this example according to Folland et al book is the level of education. It is reported by the variable DEM_EDU. Since the education until high school is so common we consider college education as a separate category. So if the education code value is 3 we mark the person as Highly Educated and lesser values are the less educated category. By creating two categories for education and already two categories for obesity we can repeat our Fisher's Exact test to investigate if in fact higher levels of education helps individuals to maintain their health and stay below the risky BMI levels. How does the obesity rate vary across the two education categories? Is Folland's book theory statistically valid?

education X obesity
处理：分类data
2x2表
报告：① 表 ② results 分析

Note: for this question you do not need to filter your data for age eligibility. Let all survey responders in for this investigation (no filter is applied based on ADM_H_MEDSTA)

Hanna Q4) Are obesity and anxiety/depression related? 肥胖与抑郁

Medical literature has established the relationship between obesity and multiple health conditions such as Type II diabetes, cardiovascular disease, cancer, and many more. Additionally the literature claims the increased risk of depression and anxiety disorder among obese individuals (see for example "Overweight, Obesity, and Depression A Systematic Review and Meta-analysis of Longitudinal Studies ARCH GEN PSYCHIATRY/VOL 67 (NO. 3), MAR 2010". At the same time a group of health and nutrition scientists believe that depression leads to all kinds of eating disorders that eventually increase the risk of obesity. So it is either the negative psychological impacts of the obesity, or vice versa the depression caused obesity. Scientifically speaking we are dealing with a reciprocal causation here. Reciprocal causation is the case when two factors have simultaneous causal effects on each other, in our case obesity might cause depression and on the other hand the depressed individual tend to develop unhealthy eating habits and become obese over time. Without getting into complexities involving statistical examination of reciprocal causation we want to test if the correlation is observed in real world using our own data.

2x2表

报告：① health和obese groups的depression rate分别为多少
② test result analysis

Once again, to consider a person obese use the values 4 and 5 for the variable HLT_BMI_CAT i.e. obese and extreme or high risk obesity. These (HLT_BMI_CAT = 4 and 5) are clinically speaking the BMI values over 40 if you refer to the code book. The other variable in this model is unset of depression, reported by the variable HLT_OCDEPRSS, with value 1 means Yes the person has been diagnosed with depression. Calculate the depression rate in the two healthy and obese groups and perform a Fisher test to see if the difference in the depression rate is in fact statistically different between the two groups.

Note: for this question you do not need to filter your data for age eligibility. Let all survey responders in for this investigation (no filter is applied based on ADM_H_MEDSTA)

Jimmy Q5) Time to make an educated guess and test it! 不同性别、肥胖与抑郁

If you look into the literature investigating the two sides of the obesity-depression causal relationship you might come up with a guess in terms of the role of gender in the severity of the relationship. What is your a-priori expectation with regards to the role of gender in the reciprocal relationship between obesity and depression? To test your a-priori you need to repeat the test you did in the previous section twice separately for male and female subjects and see which gender has a higher rate differential. Before the data reveals anything it is important for you to discuss your prediction of the results. This makes your evidence based findings even more exciting!

报告：①假设 ②两次fisher ③分析

Note: for this question you do not need to filter your data for age eligibility. Let all survey responders in for this investigation (no filter is applied based on ADM_H_MEDSTA)

Jemma Q6) Loneliness and health 孤独与健康

I think most of us agree living alone is not a pleasant experience. One of the major health concern a human being might have is the risk of loneliness. Apart from socio-psychological burden, the health risks of loneliness are serious as well. A British study has shown that loneliness, as defined by living alone and poor social connections have a health burden as high as smoking 15 cigarettes a day. (Julianne Holt-Lunstad et al. 2010) heart disease and depression are also mentioned in other studies as the risks of poor or no social relationship. Julianne Holt-Lunstad, the researcher of social relationship has also measured the increased risk of mortality due to loneliness to be as high as 29% (Julianne Holt-Lunstad, 2015). The seriousness of the problem is better acknowledged and being addressed in the Europe than in the US. There are multiple campaigns sponsored by the government and private entities across Europe dealing with the loneliness problem. Rest of the world has its own cultural norms to respect and take care of elderly family members but the concern is that those highly valued cultural norms are changing for bad. We want to look into our own data to investigate some of the health issues associated with loneliness among elderly Americans.

lone x health

处理：分类data 2x2表

Let us test how the seniors who live alone without a family or any effective social relationships perceive their own health. Note that perception is just a felling but still a strong reflection of one's overall health and happiness. First, Filter your data with ADM_H_MEDSTA =1 to insure only individuals with age over 65 are included in your study. The question HLT_GENHELTH reports the responders perception of the general health compared to others at the same age. Use the values of 4 and 5 for the variable to identify those who perceive their health to be

报告：① 表 ② results分析

worse than others with the same age. Values 1 thru 3 are individuals who feel happy and healthy compared to others. Recode values 4 and 5 to PoorFairHealth and values 1 to 3 as GoodHealth. To determine the loneliness use the variable DEM_MARSTA and recode the value 1 to WithFamily and values 2 and 3 and 4 as LivingAlone. With two categories for perceived health and happiness and two categories for living arrangement form a 2x2 x-tab and interpret the results and its statistical significance. Do you see any correlation between living with family/partner and health status?

Q6) Loneliness and risk of depression 孤独与抑郁

First, Filter your data with ADM_H_MEDSTA =1 to insure only individuals with age over 65 are included in your study. Repeat the above analysis this time with the depression (variable HLT_OCDEPRSS, with value 1 means Yes the person has been diagnosed with depression). Do you see any correlation between loneliness and risk of depression?

处理：分类data 2x2表

报告：① 表 ② results 分析

ADM_H_MEDSTA	MEDSTAF	Medicare status code as of 12/31
	10,629	1 1:Aged
	2,210	2 2:Disabled
	13	3 3:Unknown

Notes: Results include all respondents; source administrative data

DEM_RACE	RACE	BQ11A, DI1A	Race/ethnicity group
		9,566	1 1:Non-Hispanic white
		1,277	2 2:Non-Hispanic black
		1,227	3 3:Hispanic
		782	4 4:Other

Notes: Named IV_RACE in 2013-15

ACC_HCDELAY	YESFMT	HFAC31	Last year ever delay in care due to cost
		10	D .D:Don't know
		4	R .R:Refused
		7	. Inapplicable/Missing
		1,135	1 1:Yes
		11,696	2 2:No

Notes: Results include all respondents

有经济困难

ADM_H_PHYEVT	PHYVIST		Total office visits in current yr (FFS)
	5,597	0	0:No office visit
	2,797	1	1:1 to 5 office visits
	2,115	2	2:6 to 10 office visits
	1,184	3	3:11 to 15 office visits
	611	4	4:16 to 20 office visits
	548	5	5:21 or more office visits

Notes: Results include all respondents; source administrative data
Named ADM_H_PMTVST in 2013

DEM_SEX	SEX	ENS5,IN11	Gender	
		5,802	1	1:Male
		7,050	2	2:Female

Notes: Named IV_SEX in 2013-15
Results include all respondents

HLT_BMI_CAT	BMIFMT	HFE1	BMI categories (kg/m^2)	
		393	.	Inapplicable/Missing
		266	1	1:Underweight, <18.5
		3,950	2	2:Healthy, 18.5-<25
		4,428	3	3:Overweight, 25-<30
		3,207	4	4:Obese, 30-<40
		608	5	5:Extreme or high risk obesity, >=40

Notes: Results include all respondents

DEM_EDU	EDU	DI13A	Highest grade completed	
		31	D	.D:Don't know
		1	N	.N:Not ascertained
		24	R	.R:Refused
		2,466	1	1:Less than high school
		4,597	2	2:High school or vocational, technical, business, etc
		5,733	3	3:More than high school

Notes: Named D_EDU in 2013-15
1st asked in new panels in facilities after 96 & all community after 98

HLT_OCDEPRSS	YESFMT	HFJ30AA	Depression (ever)	
		15	D	.D:Don't know
		4	R	.R:Refused
		7	.	Inapplicable/Missing
		3,531	1	1:Yes
		9,295	2	2:No

Notes: Results include all respondents

HLT_GENHELTH	GENHFMT	HFA1	General health compared others same age
		56	D .D:Don't know
		4	R .R:Refused
		7	. Inapplicable/Missing
		2,090	1 1:Excellent
		3,631	2 2:Very good
		3,946	3 3:Good
		2,263	4 4:Fair
		855	5 5:Poor

bad health

DEM_MARSTA	MARSTA	IN13	Marital status
		4	D .D:Don't know
		8	R .R:Refused
		6,102	1 1:Married
		3,313	2 2:Widowed
		1,976	3 3:Divorced/separated
		1,449	4 4:Never Married

not alone

Notes: Named D_MARSTA in 2013-15
After 1994, marital status was asked annually in the fall round.

Medicare → feder → age. disable

Medicaid → state → 存款

Commercial → 私

List Case 2

Investigative Work:

The Case of Hospital Monopoly Practices in the US

Due in 3 weeks

inpatient →
outpatient →
emergency →

Correspondences and Materials:

Data file: Inpatient VT 2016 (inpatient hospital claim data); on LATTE
Guidance and X-walk files: Excel file named CaseStudy_O-D_HospMonopoly.xlsx; on LATTE
CNBC Report: Why U.S. Hospitals Are Closing? https://www.youtube.com/watch?v=18kxPz4Z_g8

Case:

We are investigating the case of monopoly in hospital market in the US after a prolong consolidation trend that has been going on for years. We are in particular interested in some monopolistic behavior of the big and richer players in the market. It appears that the big fish is eating the small fish and then trying to exercise its monopoly power over insurance companies, consumers, and other payers. The documentary produced by the CNBC explains the concerning trend and the goal of this case study is to do some investigative/detective work to examine the claims of the report.

CNBC: Why U.S. Hospitals Are Closing (18 minutes long)

https://www.youtube.com/watch?v=18kxPz4Z_g8

The report suggests that the larger hospitals with more capital and better access to technology and staff survive but also thrive and gradually tend to become monopolies. Once they have become the sole or one of the few dominant players in any major geographic area they can raise their revenue by focusing on well paid patients, mainly commercial insurance patients with deep pocket and generous payments. By attracting better paid patients they can then easily jack up their prices even more so if the state and local governments are either sidelined in terms of regulations or respect and live with the immense political power of such powerful monopolies. When the states eventually wake up they may try to resist against some consolidation and M&A efforts. A few too little too late efforts by some state governments to block such monopolistic moves are reported here:

New Hampshire AG blocks Partners acquisition over antitrust concerns
https://www.bizjournals.com/boston/news/2019/09/20/new-hampshire-ag-blocks-partners-acquisition-over.html

and here:

Partners' deal to acquire three hospitals rejected

https://www.bostonglobe.com/business/2015/01/29/partners/s9TxpYCBakjPN6pDbBFHGL/story.html

The CBNC report claims that this is the highly complex and technology intensive areas of care that gives the bigger hospitals the real edge. So we want to test whether in more complex procedures among the

Major Diagnostic Categories MDCs the larger hospitals attract more of the well paid Commercial insurance patients and fewer government paid Medicare beneficiaries. To do that we calculate their market share and compare it with all other hospitals combined. While we can do this for the entire state of Vermont for which we do have free access to the all payer data, we want to also explore the geographical referral patterns of the state for its hospital care. Remember that patients for the most part do enjoy the freedom of choice and movement between hospitals to seek the care as they wish and once that decision is made then the commercial insurance ought to pay the negotiated price of the chosen hospital even if it is much higher than the other hospitals in the same market area.

In order to investigate the referral network of hospital care in the state we use what is known as Health Service Areas (HSAs). The HSAs were originally defined by the National Center for Health Statistics, part of the Centers for Disease Control and Prevention, to be a single county or cluster of contiguous counties which are relatively self-contained with respect to hospital care.

As shown in the excel file of this case study there are 13 HSAs in the state of VT. For sake of this analysis we collapse the original 13 HSAs to 5 major Referral Regions RR1 to RR5. Mapping of the 13 HSAs into 5 RRs are found in the Excel file. Patients live in any of the 13 HSAs identified by the variable name hsa in the 2016 Inpatient file. Hospitals too are located in any of the HSAs hence in our collapsed version of the RRs. The tab Hosp_Destination in the Excel file maps each and every hospital using hnum2 variable in the 2016 Inpatient file into an RR. For example Copley Hospital (hnum2 = 4) belongs to our RR2 (Bare) referral region. So any patient living in one of the HSA regions in our HSA-Origin tab of the Excel file is free to go for his/her hospital care to any of the hospitals listed in our Hosp_Destination.

Origin-Destination Matrix for Modeling Referral Patterns

We model the referral patterns using Origin-Destination matrixes. The movement of patient from an Origin RR to a Destination RR can be modeled using an Origin-Destination O-D matrix with Origins are listed as row headings and the Destinations as the column heading. Any diagonal element of the O-D matrix shows the number or percentage of the care that was rendered locally with no unnecessary need for traveling out of the region. Policy makers ideally want to insure the O-D matrix remains heavily concentrated in the diagonal elements with very few leakages to other areas. Such localized care insures better access for the patients but also more importantly higher degree of localized and well-coordinated care with minimal hand offs to random providers.

Jemma
Ziyu
Steve

O-D matrixes could be created for entire portfolio of hospital procedures as well as sub-specialty care for example using MDCs or DRGs and even different flavors of DRGs like With MCC vs plain simple DRG.

An example of O-D Matrix is shown in O-D Example tab in the Excel file. It is created for the MDC 1 = Nervous System with no other filter for payers etc. The data used is VT 2016 Inpatient. The hospital admission counts as well as the percentage of share of each hospital are both presented in the Excel tab. The percentage based O-D matrix might be more appropriate for this case study where you compare the market share of the "magnet" hospital University of Vermont Health Center located in RR1—Burlington against the rest of the hospitals while you move from lower end MDCs to high end high tech pricey MDCs and across well paid commercial and government paid Medicare patients.

MDCs and Payers:

高薪患者的高端医疗

We want to examine any contrast in the marketing of high-end care as targeted to well-paid patients, as claimed by the CNBC report. The report mentions for example cardiac care as a clear example of high-end money making care being heavily advertised by the dominant or monopoly players in the market. So we pick MDC 5. On the other hand the MSK procedures are commonly done in pretty much every mid to large size hospital with no need for crazy technology and highly super-specialized staff. The MDC code for Musculoskeletal is 8.

To separate the payers use the PPAY variable where Medicare is code 1 and commercials are 6 and 7.

Henry
Jimmy
Hanna

MDC==5
MDC==8

Directions for Submission

For sake of this case study and its technical report use your own creativity to test the hypothesis in the CNBC report that claims big hospitals compete in two dimensions simultaneously: higher end care over routine and standard care which could be cheaply done elsewhere, AND higher and well paid patients from private commercial insurers over government covered Medicare patients. To demonstrate this two-dimensional competition for more money you would need to create 4 O-D matrixes for two MDCs and two payers. The quality and approach to interpretation make significant portion of your evaluation so you want to be as elaborate and precise there.

Optional bonus activity: Once you have demonstrated the contrast between the market shares above you can go further and do some data mining to see if you can find any major DRG where the monopolistic practices are even more pronounced. To do that try to mine the data for a pair of high- and low-end DRG perhaps from different MDCs. In doing so make sure you choose a good volume example otherwise your observation may not be that solid statistically speaking. Look for good volume examples in both high- and low-end DRGs again to contrast between the behavior of the market vis-à-vis payer types: commercial patients vs Medicare patients.

DRG 再做一遍 → 更差异的例子.

费用. pday. 人数. descriptive analysis

↓

找哪个DRG (data evidence)

Investigative work: Hospital Monopoly I the US

Larger hospitals with more capital and better access to technology and staff survive but also make good money by focusing on well paid patients, mainly commercial insurance patients with deep pocket and generous payments.

We want to test in more complex care MDCs if in fact they attract more of the Commercial and fewer Medicare.

To do that we compare their market share of total market size with other hospitals.

CNBC: Why U.S. Hospitals Are Closing

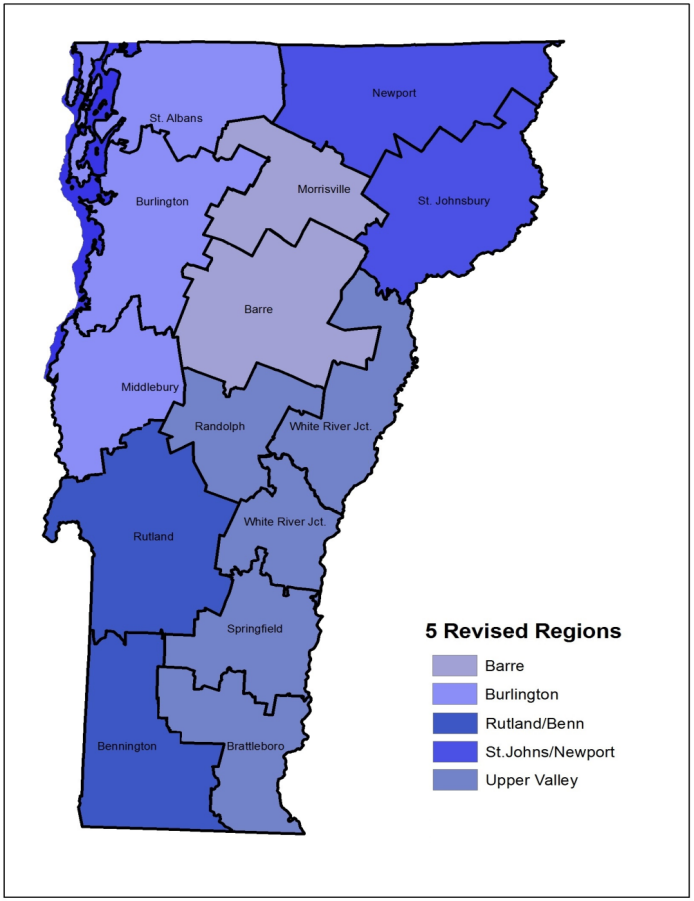
https://www.youtube.com/watch?v=18kxPz4Z_g8

Health Service Areas (HSAs) were originally defined by the National Center for Health Statistics, part of the Centers for Disease Control and Prevention, to be a single county or cluster of contiguous counties which are relatively self-contained with respect to hospital care.

MDC	Definition
0	Ungroupable
1	Nervous System
2	Eye
3	Ear, Nose, Mouth, And Throat
4	Respiratory System
5	Circulatory System
6	Digestive System
7	Hepatobiliary System and Pancreas
8	Musculoskeletal System and Connective Tissue
9	Skin, Subcutaneous Tissue, and Breast
10	Endocrine, Nutritional, and Metabolic System
11	Kidney and Urinary Tract
12	Male Reproductive System
13	Female Reproductive System
14	Pregnancy, Childbirth, and Puerperium
15	Newborn and Other Neonates (Perinatal Period)
16	Blood and Blood Forming Organs and Immunological Disorders
17	Myeloproliferative Diseases and Disorders (Poorly Differentiated Neoplasms)
18	Infectious and Parasitic Diseases and Disorders
19	Mental Diseases and Disorders
20	Alcohol/Drug Use or Induced Mental Disorders
21	Injuries, Poison, and Toxic Effect of Drugs
22	Burns
23	Factors Influencing Health Status
24	Multiple Significant Trauma
25	Human Immunodeficiency Virus (HIV) Infection

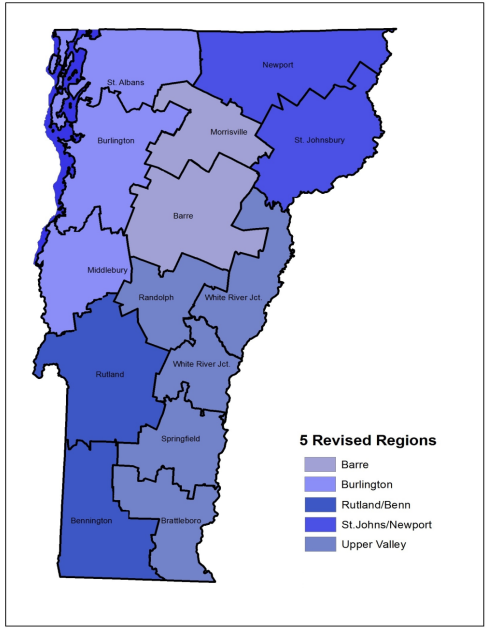
RR Name
RR2--Barre
RR1--Burlington
RR2--Barre
RR4--Randolph
RR3--Newport/St. Jns
RR3--Newport/St. Jns
RR1--Burlington
RR1--Burlington
RR5--Rutland
RR5--Rutland
RR4--Randolph
RR4--Randolph
RR4--Randolph
Z_OutState

5 RR Colored with 13 HSAs Outlined



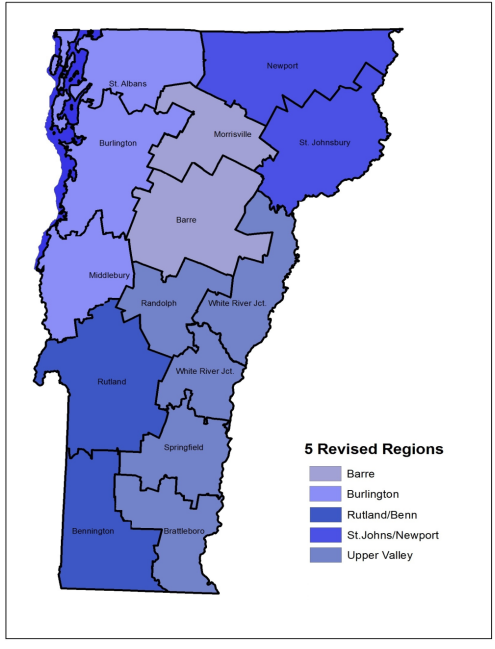
HSA Health Service Area	HSA Name	RR Collapsed Referral Region	Name	RR Name
1	Barre	RR2	Barre	RR2--Barre
2	Burlington	RR1	Burlington	RR1--Burlington
3	Morrisville	RR2	Barre	RR2--Barre
4	Randolph	RR4	Randolph	RR4--Randolph
5	Newport	RR3	Newport/St. Jns	RR3--Newport/St. Jns
6	St. Johnsbury	RR3	Newport/St. Jns	RR3--Newport/St. Jns
7	St. Albans	RR1	Burlington	RR1--Burlington
8	Middlebury	RR1	Burlington	RR1--Burlington
9	Rutland	RR5	Rutland	RR5--Rutland
10	Bennington	RR5	Rutland	RR5--Rutland
11	Springfield	RR4	Randolph	RR4--Randolph
12	White River Jct.	RR4	Randolph	RR4--Randolph
13	Brattleboro	RR4	Randolph	RR4--Randolph
98	Out of state	Z_OutState	Z_OutState	Z_OutState
99	Missing			

5 RR Colored with 13 HSAs Outlined



hnum2	HospitalName	RR	RRName
1	Northwestern Medical Center	RR1	RR1--Burlington
2	North Country Hospital And Health Center	RR3	RR3--Newport/St. Jns
3	Northeastern Vermont Regional Hospital	RR3	RR3--Newport/St. Jns
4	Copley Hospital	RR2	RR2--Barre
5	University of Vermont Medical Center (as of 2014)	RR1	RR1--Burlington
6	Central Vermont Hospital	RR2	RR2--Barre
8	Rutland Regional Medical Center	RR5	RR5--Rutland
9	Porter Medical Center	RR1	RR1--Burlington
10	Gifford Memorial Hospital	RR4	RR4--Randolph
11	Mount Ascutney Hospital And Health Center	RR4	RR4--Randolph
12	Springfield Hospital	RR4	RR4--Randolph
14	Grace Cottage Hospital	RR4	RR4--Randolph
15	Brattleboro Memorial Hospital	RR4	RR4--Randolph
16	Southwestern Vermont Medical Center	RR5	RR5--Rutland
17	Fanny Allen Hospital (Prior To 1995)		
19	Veterans Administration (Prior To 7/1/2006)		

5 RR Colored with 13 HSAs Outlined



MDC 1 : Nervous System

O-D Matrix with Counts

RRName	RR1--Burlington	RR2--Barre	RR3--Newport/St_ Jns	RR4--Randolph	RR5--Rutland	Total Admissions
RR1--Burlington	1,202	5	1	1	10	1,219
RR2--Barre	244	237	2	11		494
RR3--Newport/St. J	40	5	116	1		162
RR4-- Randolph	13	4	1	196	12	226
RR5-- Rutland	100			4	389	493
Destination Hosp SubTotal:	1,599	251	120	213	411	2,594

O-D Matrix with Percentages

RRName	RR1--Burlington	RR2--Barre	RR3--Newport/St_ Jns	RR4--Randolph	RR5--Rutland
RR1--Burlington	99%	0%	0%	0%	1%
RR2--Barre	49%	48%	0%	2%	0%
RR3--Newport/St. J	25%	3%	72%	1%	0%
RR4--Randolph	6%	2%	0%	87%	5%
RR5--Rutland	20%	0%	0%	1%	79%
Hospital Market Share %	62%	10%	5%	8%	16%

一. 5个RR O-D Matrix → 4个 matrix

↓ ↓ RR-level

Furthermore, hospital-level → giant player

↓

13x13 O-D Matrix → 4个

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data report

分析：logic