Superutilizers and Texas Medicaid

Talk Outline

1. Revenue analysis of utilization based Superutilizers
2. Limitation of utilization based Superutilizers
3. Temporal consistency of expenditure based Superutilization
4. Disease burden and Superutilization
5. Future work

Texas Medicaid Data: Study Population

1. Multiple programs
   - STAR
   - STAR+PLUS
   - FFS
   - STARHEALTH
2. Total number of adult patients (18-60)
   - 1,772,924
3. Years 2011-2014
4. Overall expenditures per year
   - $4+ Billion
5. Dual eligibles excluded
6. Using encounter and enrollment data

Medicaid, CY2014: Number of Patients (ER Visits = X and IP Stays =Y)

	IP Stays							
ER Visits	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**…**
0	598,893	148,778	8,255	1,485	518	192	78	…
1	120,550	44,488	4,829	1,251	479	228	109	…
2	49,180	20,214	3,120	997	399	203	104	…
3	22,892	10,075	1,909	681	332	177	84	…
4	12,049	5,586	1,226	488	251	134	69	…
5	6,694	3,212	864	364	182	108	66	…
6	3,994	1,997	527	275	143	79	58	…
7	2,490	1,175	401	203	100	66	40	…
8	1,630	794	276	148	74	44	32	…
9	1,055	553	211	120	66	47	27	…
10	784	389	147	84	54	38	20	…
…	…	…	…	…	…	…	…	…

Total number of patients: 1.10 Million

Medicaid, CY2014: Expenditure Percentage (ER Visits = X and IP Stays =Y)

	IP Stays							
ER Visits	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**…**
0	14.12	21.56	4.14	1.44	0.71	0.27	0.15	…
1	6.58	8.39	2.57	1.17	0.60	0.38	0.18	…
2	3.62	4.41	1.75	0.92	0.56	0.31	0.16	…
3	2.09	2.36	1.07	0.62	0.41	0.23	0.13	…
4	1.28	1.48	0.70	0.41	0.30	0.19	0.12	…
5	0.82	0.87	0.49	0.34	0.22	0.13	0.11	…
6	0.55	0.57	0.31	0.23	0.14	0.12	0.08	…
7	0.38	0.36	0.22	0.17	0.12	0.08	0.06	…
8	0.27	0.26	0.18	0.11	0.08	0.05	0.05	…
9	0.19	0.19	0.14	0.10	0.07	0.06	0.04	…
10	0.15	0.15	0.10	0.07	0.06	0.05	0.02	…
…	…	…	…	…	…	…	…	…

Overall Expenditure: $4.31 Billion

ER visits = 4 and IP stays =2

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Medicaid CY2014: Cumulative Expenditures Percentage (ER Visits >= X and IP Stays >=Y)

	IP Stays							
ER Visits	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**…**
0	100.00	69.25	27.98	15.80	9.75	6.11	3.90	…
1	57.42	40.79	21.08	13.04	8.43	5.50	3.57	…
2	37.31	27.26	15.94	10.47	7.03	4.71	3.16	…
3	25.40	18.97	12.05	8.34	5.82	4.05	2.82	…
4	18.30	13.96	9.39	6.75	4.86	3.50	2.49	…
5	13.63	10.57	7.49	5.55	4.07	3.02	2.20	…
6	10.51	8.27	6.06	4.61	3.47	2.64	1.94	…
7	8.35	6.66	5.03	3.89	2.99	2.29	1.72	…
8	6.83	5.53	4.26	3.33	2.60	2.03	1.54	…
9	5.76	4.72	3.71	2.97	2.35	1.85	1.41	…
10	4.86	4.02	3.20	2.59	2.07	1.64	1.26	…
…	…	…	…	…	…	…	…	…

Overall expenditure: $4.31 Billion

ER visits >= 4 and IP stays >=2

Restrictive definitions of Super Utilizers imply that the population and expenditure that can be targeted is small.

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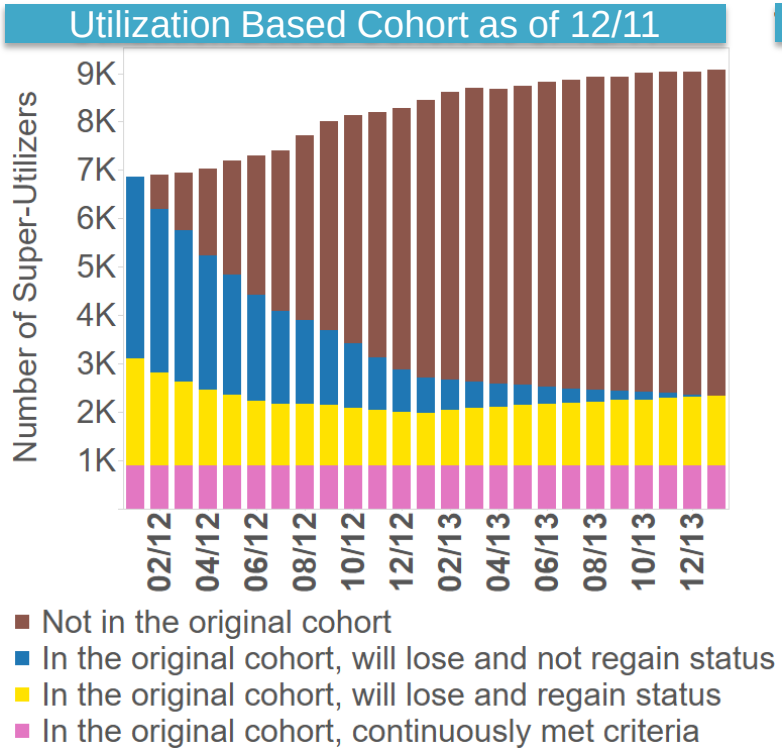
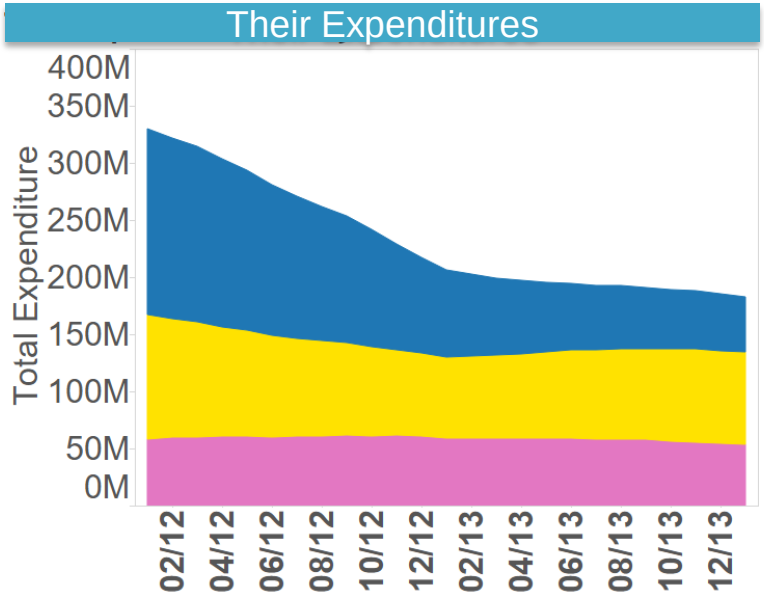
Utilization versus Expenditures





Superutilizers = at least 3 IP visits, or SMI with at least 2 IP visits in a rolling twelve-month look-back period

Texas Medicaid Data, 30+ enrolled months from CY2011 to CY2013, N=203,356

Utilization based definition of Superutilizers has limitations.

Expenditures provide a more accurate picture.

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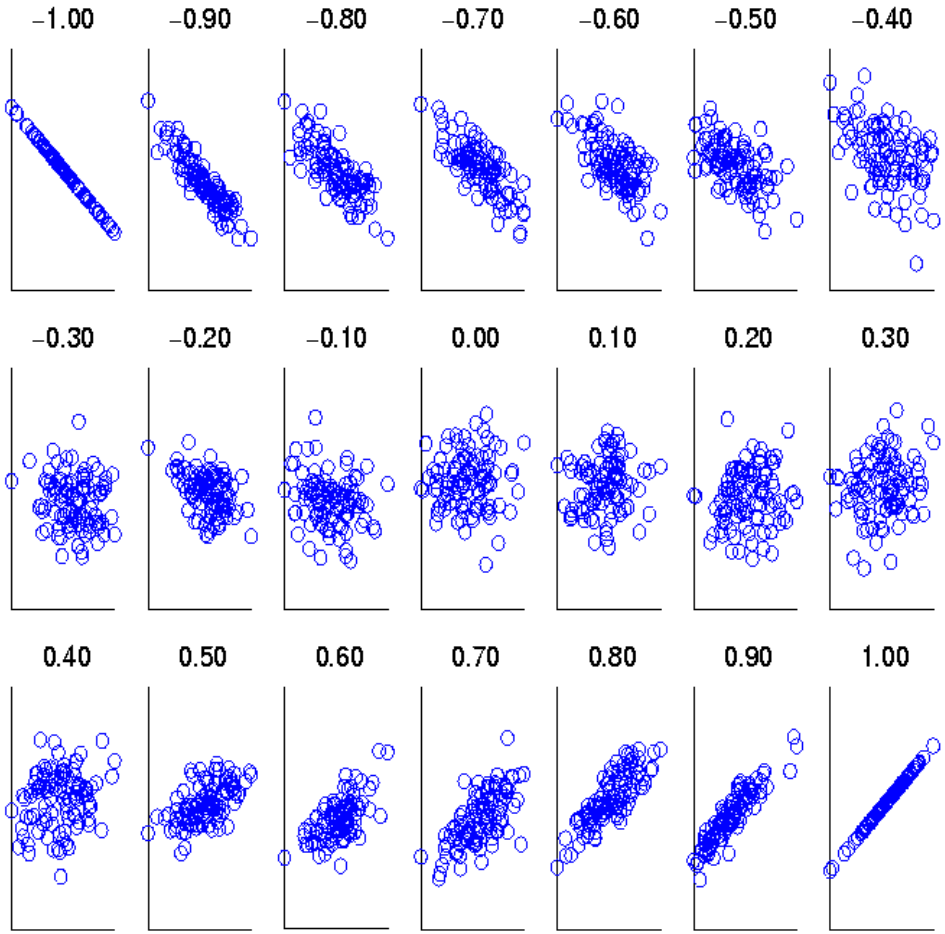
Temporal Consistency based on Expenditures

1. Is there a temporal correlation of patients' medical expenditure between consecutive time intervals (month, quarter, six-months, one year) for the Medicaid population?
2. Is the correlation higher for SuperUtilizers (top 10% of expenditures)?
3. Does the temporal correlation change based on the length of time interval (time window size)?
4. Are there chronic disease cohorts that show a stronger temporal correlation than the general population?

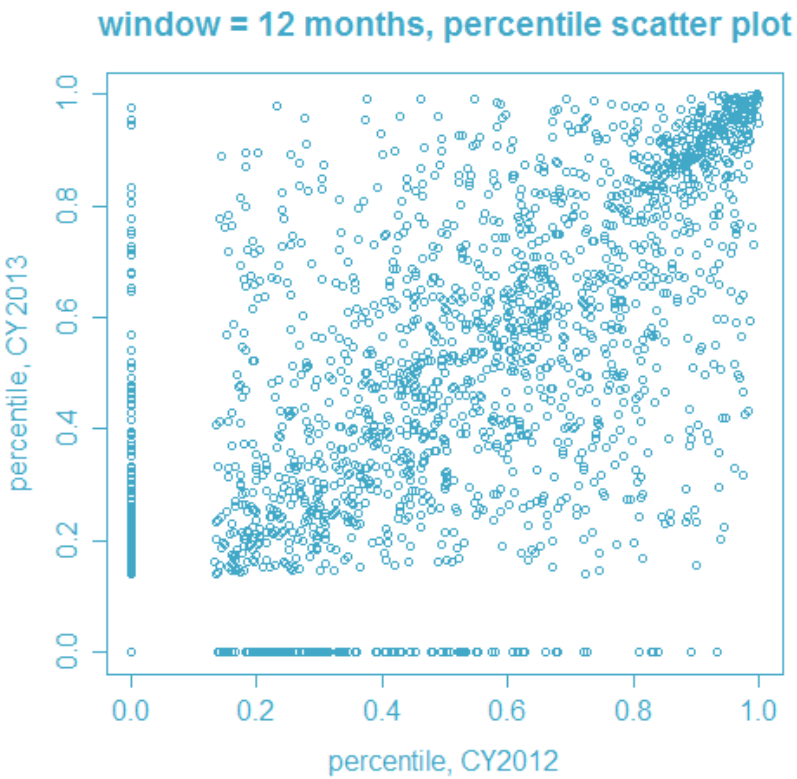
Using Rank Based Correlation

Approach

1. Rank order all the patients in period 1 and period 2
2. Compute the correlation between the rank percentiles in the two periods
3. Patients considered should be continuously enrolled for both periods



Rank Based Correlation of Expenditures



Aggregation Window	3 months later	6 months later	9 months later
3 months	0.651	0.584	0.516
	6 months later	**12 months later**	**18 months later**
6 months	0.653	0.566	0.515
	12 months later	**24 months later**	
12 months	0.676	0.594	-

Expenditure correlation is larger with larger window size.

Superutilization is more consistent than the rest of the population.

Texas Medicaid Data, 10+ enrolled months in CY2012 and 10+ enrolled months CY2013, N=277,461

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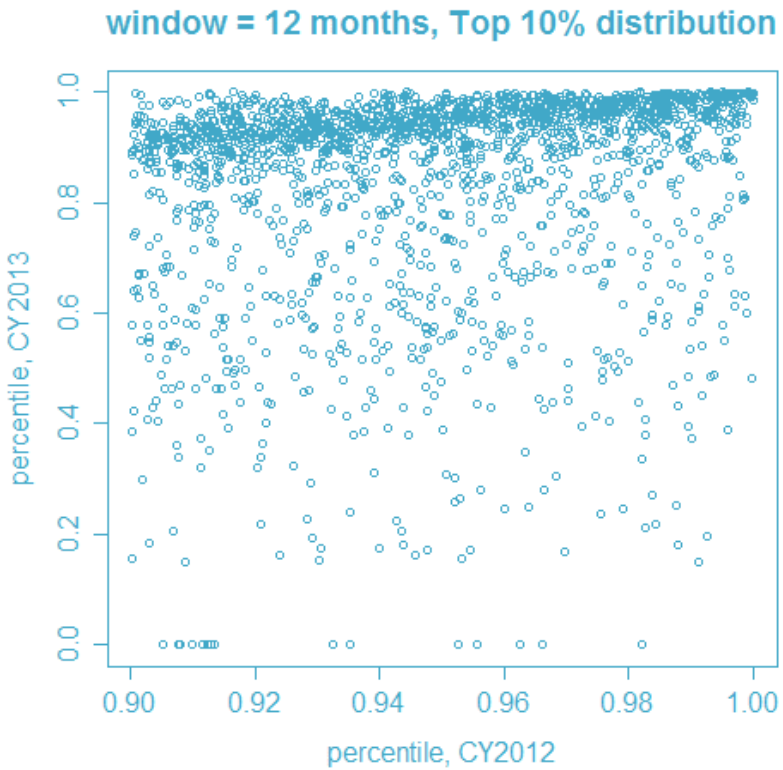
SuperUtilizers (Top 10% Patients Based on Expenditures)



Texas Medicaid Data, 10+ enrolled months in CY2012 and 10+ enrolled months CY2013, N=277,461

Average Percentile ± Standard Deviation	3 months later	6 months later	9 months later
3 months	80.84± 24.42	78.12± 27.09	76.58± 28.09
	6 months later	**12 months later**	**18 months later**
6 months	83.13± 21.11	80.60± 23.37	79.33± 24.12
	12 months later	**24 months later**	
12 months	85.39± 18.01	82.91± 20.19	-

Expenditures for top 10% patients remain stable from one period to another (whether the period is a quarter, six months or 1 year)

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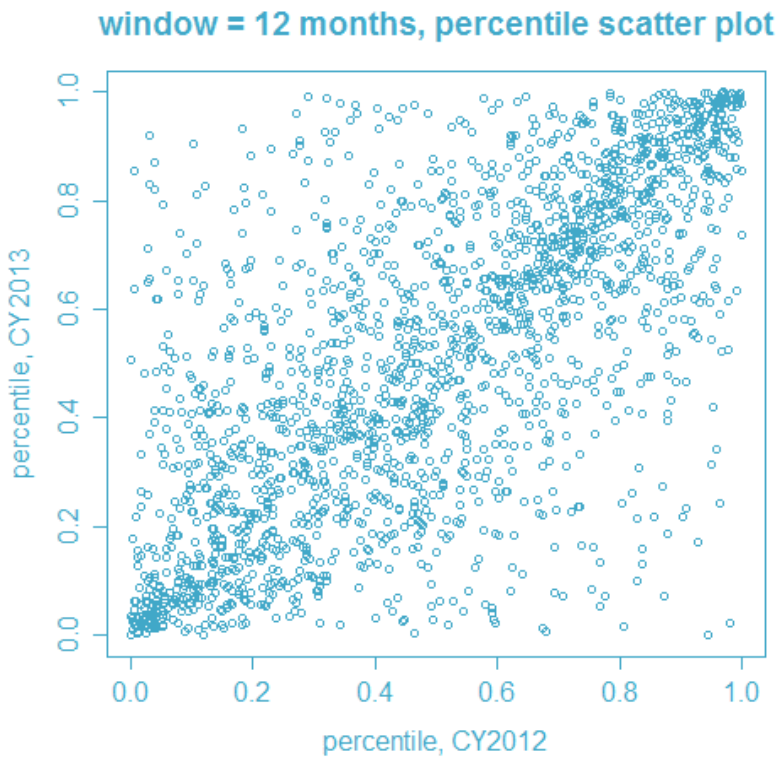
Rank Based Correlation of Expenditures for the Diabetes Cohort



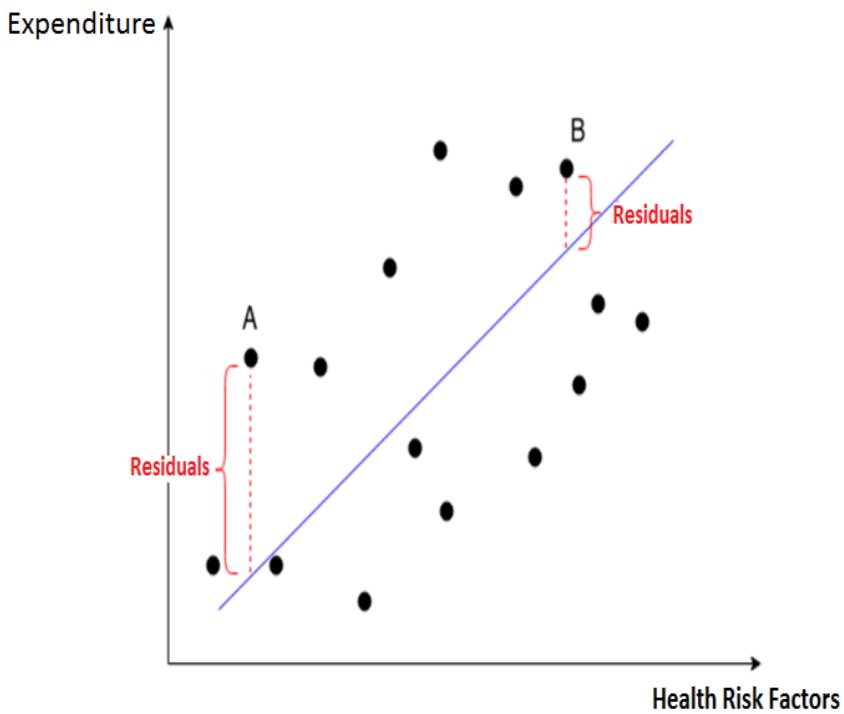
Aggregation Window	3 months later	6 months later	9 months later
3 months	0.649	0.592	0.559
	6 months later	**12 months later**	**18 months later**
6 months	0.662	0.594	0.541
	12 months later	**24 months later**	
12 months	0.675	0.581	-

Similar behavior was found for Asthma, COPD an Hypertension cohorts.

The temporal correlation of specific disease cohorts is not significantly different from the general population.

Diabetes cohort are patients who continuously have diabetes diagnosis (CCS Category 49 or 50) in 2011, 2012 and 2013. The Clinical Classification Software (CCS) is a grouping software of ICD9-CM codes developed by AHRQ. N = 52,412

Incorporating Disease Burden and Other Attributes



	Patient A	Patient B
Disease Burden	Diabetes Schizophrenia	Diabetes Hypertension COPD
Actual Per Member Month Expenditure	$4000	$5000
Predicted Per Member Month Expenditure	$1000	$5000
Residuals	$3000	$0

Residuals – Unexplained expenditures based on disease burden and other attributes

Residuals correspond to genetic, environmental or other factors that were not observed.

Large cohorts (with similar risk factors) with high average residuals may reflect potentially impactable focus areas.

Model Formulation

Model	Ordinary Linear Regression
Dependent Variable	**Per Member Month Expenditure**
Baseline Model Predictors	**Disease Categories:** ICD9 codes grouped into Clinical Classification Software Categories (CCS) from AHRQ
	Basic Demographics: Age, Gender, Race, and Disabled Status
	Geographical Pricing Difference: CMS Wage Index
Additional Predictors	**Geographical Information**: Residence County, Service Area
	Health Programs and Plans

Linear regression based model to adjust all of the above factors. (Current model does not account for contractual factors)

Residuals = Real Value – Predicted Value
(Positive residuals means overspending while negative means underspending)

Residuals Based Comparison of MCOs and Service Areas in STAR+PLUS

Average Residuals, Service Area vs. MCO, STARPLUS, CY2012

Service Area

MCO	Bexar	Dallas	El Paso	Harris	Hidalgo	Jefferson	Lubbock	Nueces	Tarrant	Travis
MCO1					80.2				-127.2	
MCO2	33.7	-130.4			154.8		-238.6	52.0		
MCO3	-43.7	-77.9	-67.5	128.8	76.7	4.3				
MCO4	-87.9		-138.7	33.0		-50.1	-207.6		-107.2	-10.6
MCO5				130.6		-223.0		122.9		129.2

Average Residuals, Service Area vs. MCO, STARPLUS, CY2013

Service Area

MCO	Bexar	Dallas	El Paso	Harris	Hidalgo	Jefferson	Lubbock	Nueces	Tarrant	Travis
MCO1					111.2				-93.6	
MCO2	6.7	-85.7			196.5		-195.7	-6.2		
MCO3	15.7	-16.0	13.7	325.8	86.5	28.1				
MCO4	-133.4		-106.9	-18.7		-111.3	-146.6		-80.8	-6.8
MCO5				45.2		-81.1		16.7		25.4

Average Residuals, Service Area vs. MCO, STARPLUS, CY2014

Service Area

MCO	Bexar	Dallas	El Paso	Harris	Hidalgo	Jefferson	Lubbock	Nueces	Tarrant	Travis	Central	Northeast	West
MCO1					232.9				-41.3			-49.6	
MCO2	-5.0	-67.3			250.4		-140.0	86.7			-119.0		-98.6
MCO3	-33.4	55.3	142.4	227.6	191.2	140.0							
MCO4	-100.1		-52.3	-24.5		-52.3	-181.6		-56.4	64.2			-420.3
MCO5				61.0		-7.0		-6.5		-19.9	-94.8	-41.7	

Average Residuals

-300 300.0

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Residuals Based Comparison of MCOS and Service Areas for STAR

Average Residuals, Service Area vs. MCO, STAR, CY2013

Service Area

MCO	Bexar	Dallas	El Paso	Harris	Hidalgo	Jefferson	Lubbock	Nueces	Tarrant	Travis	Central	Northeast	West
MCO1	-26.3								-59.7				
MCO2			-18.1										
MCO3							-52.4						13.7
MCO4											-81.0		
MCO5										98.1			
MCO6										23.7			
MCO7	-39.4	-23.6		-25.4		-47.7	-55.5		-42.2		6.3	-2.0	-16.8
MCO8										-0.3			
MCO9								-34.0					
MCO10				75.7		75.4							
MCO11									-62.0				
MCO12					-28.3			-26.2					
MCO13	-13.2												
MCO14		10.4											
MCO15		-2.9	60.8	30.8	11.8	60.2							
MCO16				-4.5	-17.4	-18.0							
MCO17	11.2		1.7		-18.0		-61.5	21.6		37.4	-21.0	2.9	16.0
MCO18				65.6		22.6							

Average Residuals, Service Area vs. MCO, STAR, CY2014

Service Area

MCO	Bexar	Dallas	El Paso	Harris	Hidalgo	Jefferson	Lubbock	Nueces	Tarrant	Travis	Central	Northeast	West
MCO1	-54.5								-59.7				
MCO2			-28.6										
MCO3							-42.7						26.3
MCO4											-65.5		
MCO5										115.5			
MCO6										-3.3			
MCO7	-39.0	-6.4		-27.6		14.6	-40.4		-40.1		-7.5	-2.8	14.2
MCO8										-5.5			
MCO9								-28.0					
MCO10				43.9		43.5							
MCO11									-55.6				
MCO12					-21.8			-8.2					
MCO13	-20.0												
MCO14		8.3											
MCO15		1.3	83.1	42.8	0.7	134.0							
MCO16				4.1	-19.8	9.3							
MCO17	2.4		-4.4		-9.6		-33.7	0.4		37.4	-27.6	7.4	11.4
MCO18				75.3		44.4							

Average Residuals

-300 300.0

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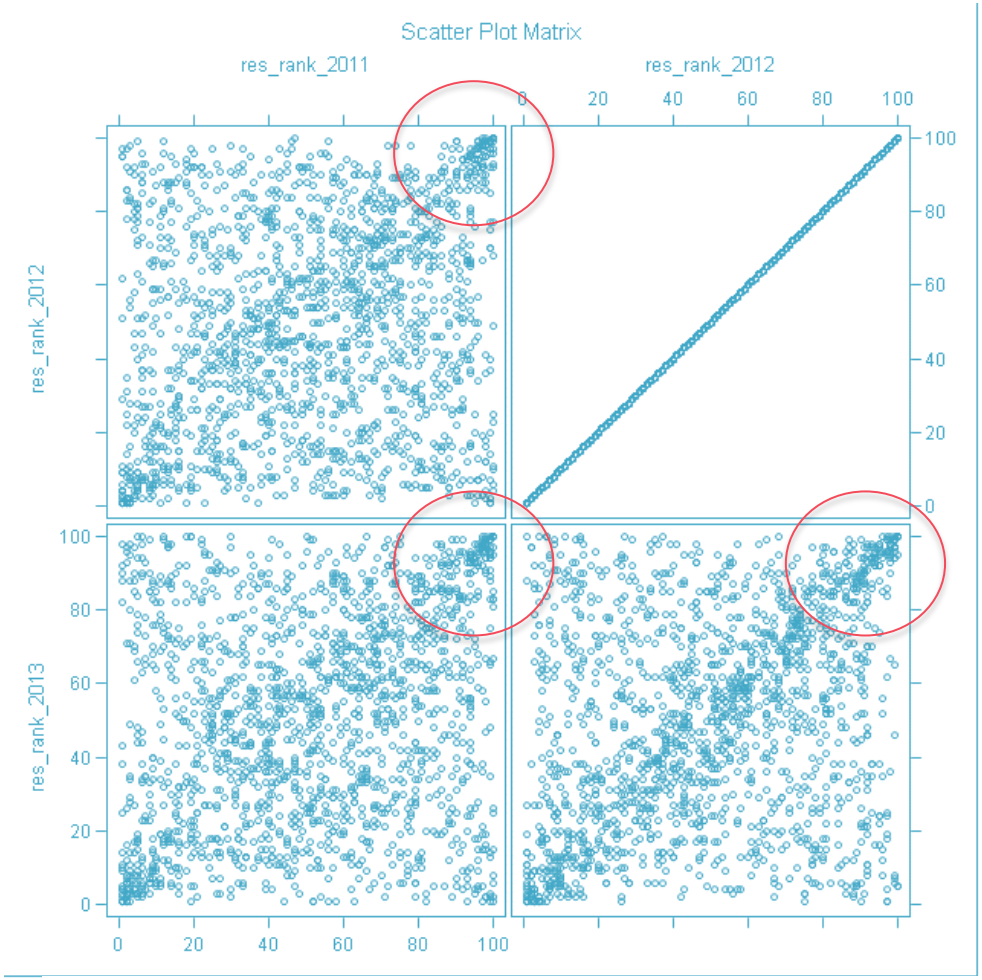
Annual Correlation between Residuals (2011-2013)

Patient Level Residuals Rank



There is a high correlation of residuals from year to year.

Patients with high residuals have more consistency.

Texas Medicaid Data, 30+ enrolled months from CY2011 to CY2013, N=203,356

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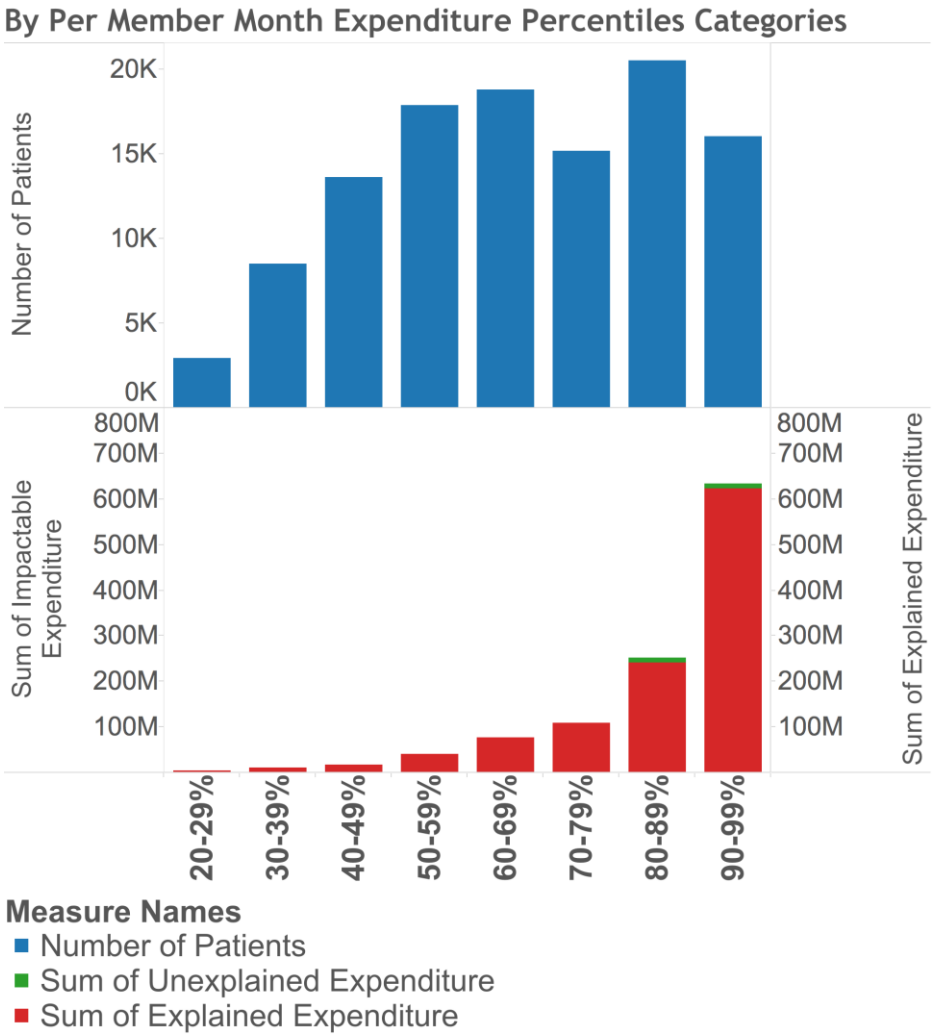
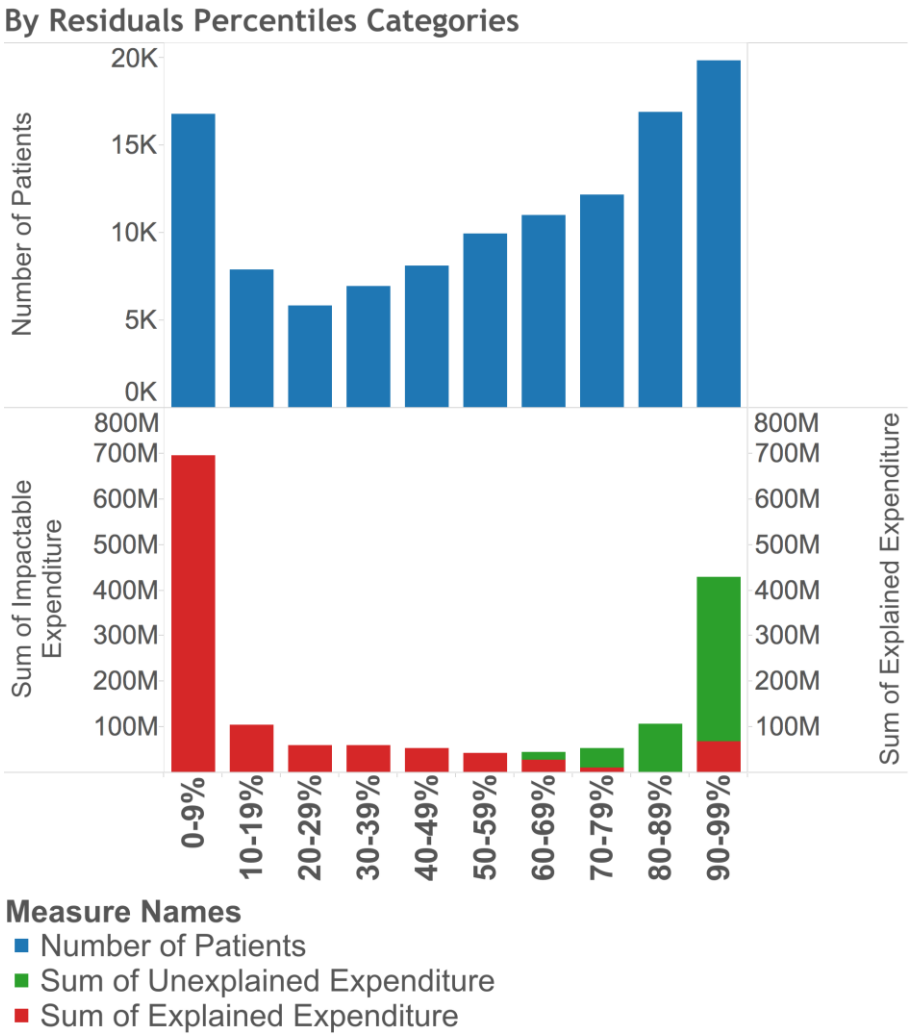
SMI Cohort CY2014: Expenditure versus Residuals





SMI patients are identified by ICD9-CM code of 295x, 296x, 297x and 298x in the study year. N = 115,408.

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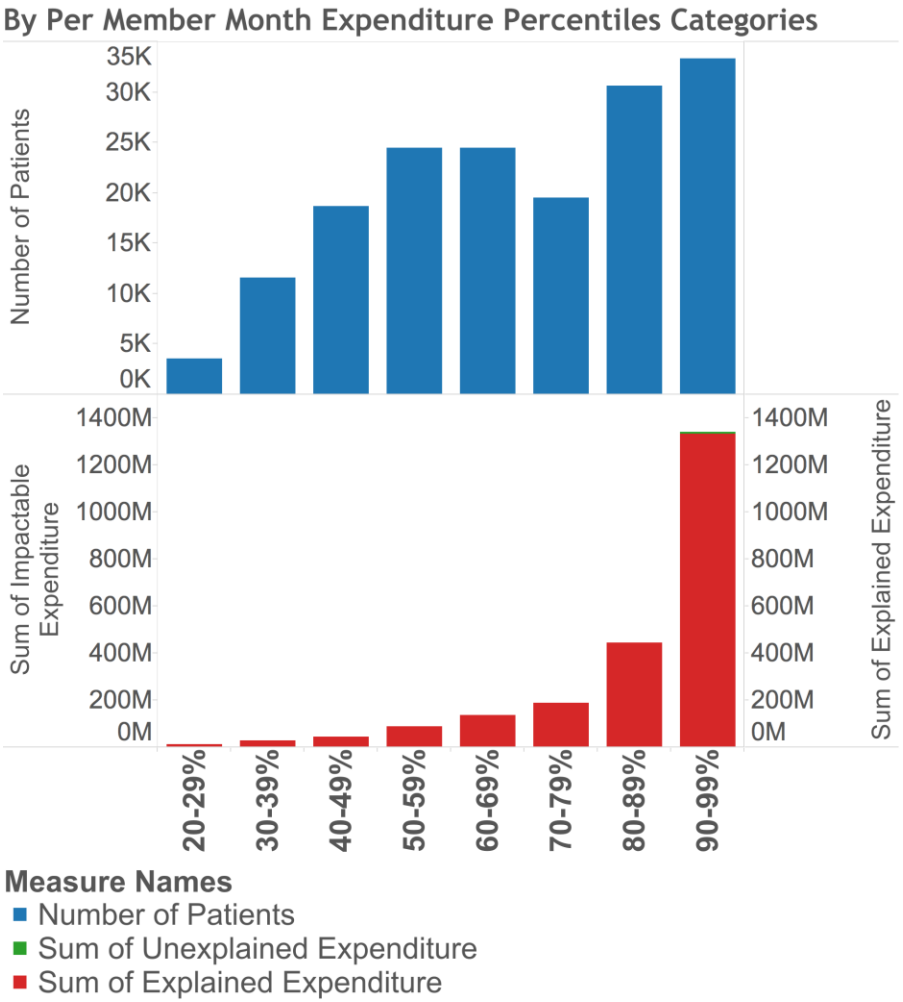
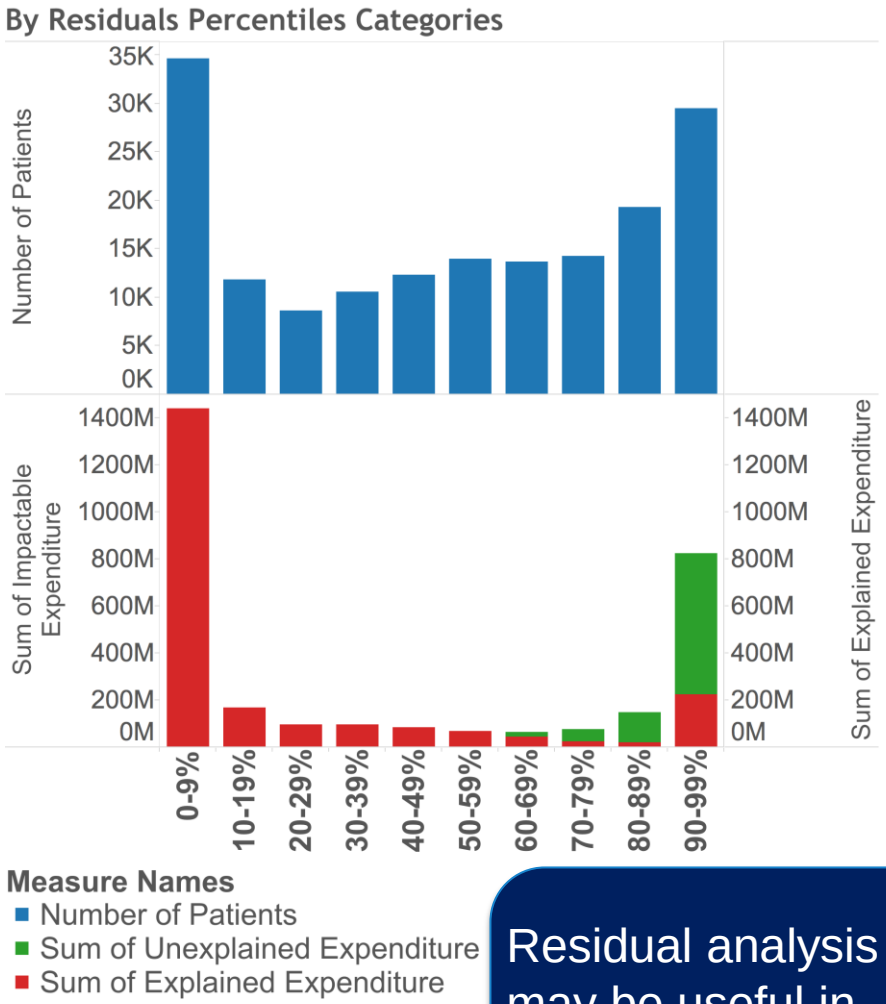
Hypertension Cohort CY2014: Expenditure versus Residuals





Hypertension patients are identified by CCS category of 98 and 99 in the study year. The Clinical Classification Software CCS) is a grouping software of ICD9-CM codes developed by AHRQ. N = 168,777.

Residual analysis may be useful in deriving potentially impactable cohorts

Conclusions

1. Choosing high thresholds of ER visits and IP stays for defining Superutilizers may significantly reduce the dollars that can be targeted.
2. Utilization based measures may not accurately reflect the actual expenditures.
3. Expenditures are temporally consistent over quarters and years (Prediction models can be built that use historical information to predict future expenditures).
4. Residuals may be helpful in deriving potentially impactable cohorts.