

THE USE OF QUINTILE ANALYSIS AS A MEASURE OF DISEASE SEVERITY: A COMPARISON WITHIN AND ACROSS DISEASES

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INTRODUCTION:

- Analyses of administrative claims data are often criticized for lacking adjustments for severity.
- We explored whether disease-specific cost (DSC) quintiles may be indicative of disease severity in an examination of several diseases.
- Vilfredo Pareto was an economist who is credited with establishing what is now widely known as the Pareto Principle or 80/20 rule. In general, the Pareto Principle predicts that costs or resources will be maldistributed within a population.
- In this case, we wanted to test what percent of the population incurred the top 20% of disease-specific costs.

METHODOLOGY:

- The employees included in this research project came from the Human Capital Management Services Research Reference Database (HCMS RRD).
- Data for these employees come from multiple large employers that are widely dispersed throughout the United States and represent the retail, service, manufacturing, and financial industries.
- The results presented are taken from several different studies of different diseases.
- Persons were considered to have a disease if they had a health insurance claim for a disease with an ICD-9-CM code presented in Table 1.
- The annual period of analysis for each disease state is described in Table 2.
- Annual Disease-Specific Costs (DSC) were calculated as the sum of the:
 - Disease-Specific Medical Costs (DSMC) for services associated with the disease-specific ICD-9-CM codes, and the
 - Disease-Specific Prescription Cost (DSRxC) for outpatient medicines.
- Employees in each disease state were rank ordered into 5 cost quintiles based on DSC (20% of DSC in each) ranging from lowest to highest cost quintile.
- Across diseases, pairwise differences in the quintile distributions were assessed using Chi-squared tests.

RESULTS:

- The Disease-Specific Costs (DSCs) by Quintile Group are presented in Figure 1.
- The Disease-Specific Medical Costs (DSMC) and Disease-Specific Prescription Costs (DSRxC) by Quintile Group are shown in Table 3.
- The percentages of employees within each disease state assigned to each quintile are shown in Table 4.
- All pairwise comparisons of distributions in Table 4 were significant (for FD and GERD $P=0.0468$, and for the remaining comparisons $P\leq 0.01$).

TABLE 1: ICD-9-CM CODES FOR STUDY COHORTS

DISEASE	ICD-9-CM CODES
Back Disorders	720.xx, 721.2x-721.9x, 722.1x-722.3x, 722.5x, 722.6x, 722.7, 722.70, 722.72, 722.73, 722.8, 722.80, 722.82, 722.83, 722.9x, 724.xx
Bipolar Disorder	Manic Disorders: 296.0x, 296.1x Bipolar Affective Disorders: 296.4x, 296.5x, 296.6x, 296.7x Manic-depressive psychosis, other, and unspecified: 296.8x
Cancer	140.xx – 239.xx
Functional Dyspepsia	536.8x
Gastroesophageal Reflux Disease (GERD)	Hypersecretory condition: 251.5 Esophagitis: 530.10, 530.1, 530.11, 530.12, 530.19 Esophageal reflux: 530.81, Heartburn: 787.1; Dysphagia – Complete: 787.2
Headache	346.xx, 349.0x, 784.0x, 307.81
Neuropathic Disorders	Face: 350.1x, 350.2x, 351.0x, 351.8x, 351.9x; Spinal Cord: 336.9x, 952.00, 952.06, 952.08, 952.09, 952.10, 952.11, 952.16, 952.2x, 952.9x; Nerve Lesions: 354.1x, 354.2x, 354.3x, 355.0x, 355.2x, 355.6x; Mononeuritis: 354.5x, 354.8x, 354.9x, 355.8x, 355.9x; Neuropathy: 337.1x, 356.8x, 356.9x, 357.0x, 357.5x, 357.81, 357.82, 357.9x Pain Complex Regional Syndrome: 337.20, 337.21, 337.22, 337.29; Miscellaneous: 353.0x, 353.1x, 353.3x, 353.6x, 353.8x, 729.2x, 951.4x, 953.4x, 955.5x, 955.6x, 955.7x, 344.61, 336.0x, 336.8x, 340.xx, 341.9x, 342.11, 342.12, 342.81, 342.91, 342.92, 343.8x, 343.9x, 344.00, 344.01, 344.03, 344.04, 344.1x, 344.60, 344.89, 344.9x, 355.1x, 355.71, 358.00, 728.86, 726.31, 726.32, 710.1x, 726.31, 726.32
Osteoarthritis	715.xx

CONCLUSIONS:

- Disease-Specific Costs are extremely maldistributed.
- In all diseases explored, 3.5% of subjects or fewer consume the highest 20% of costs.
- These cost-comparison results may suggest that cost quintiles are indicative of severity in all disease states.
- Further investigation is warranted over an extended period of time using clinical severity data to confirm this relationship.

TABLE 2: ANNUAL PERIOD DEFINITIONS FOR STUDY COHORTS

DISEASE	12 MONTH PERIOD
<ul style="list-style-type: none"> Back Disorders Cancer Headache Neuropathic Disorders Osteoarthritis 	Calendar Year 2004 (1/1/2004 – 12/31/2004) If subjects were ineligible in 2004, then the protocol explored eligibility for Calendar Year 2002 (1/1/2002 – 12/31/2002)
<ul style="list-style-type: none"> Bipolar Disorder GERD 	12 months following their first medical claim with the disorder
<ul style="list-style-type: none"> Functional Dyspepsia 	3 months before to 9 months following their first medical claim with the disorder

TABLE 3: MEAN PER-PATIENT DISEASE-SPECIFIC MEDICAL AND PRESCRIPTION COSTS BY QUINTILE

N	DISEASE	VARIABLE	QUINTILE				
			LOWEST	2ND	3RD	4TH	HIGHEST
27,311	Back Disorders	DSMC	\$233	\$2,243	\$6,162	\$14,279	\$39,807
	Back Disorders	DSRxC	\$17	\$163	\$356	\$753	\$570
761	Bipolar Disorder	DSMC	\$266	\$1,174	\$2,968	\$8,357	\$21,427
	Bipolar Disorder	DSRxC	\$300	\$1,423	\$2,183	\$2,203	\$2,354
30,745	Cancer	DSMC	\$444	\$6,068	\$20,536	\$48,289	\$108,678
	Cancer	DSRxC	\$11	\$71	\$207	\$160	\$167
1,669	Functional Dyspepsia	DSMC	\$67	\$199	\$229	\$449	\$1,171
	Functional Dyspepsia	DSRxC	\$61	\$400	\$764	\$931	\$1,278
11,653	GERD	DSMC	\$105	\$290	\$512	\$1,175	\$4,886
	GERD	DSRxC	\$129	\$768	\$987	\$1,169	\$1,108
15,305	Headache	DSMC	\$104	\$792	\$1,511	\$2,648	\$6,846
	Headache	DSRxC	\$10	\$65	\$109	\$257	\$1,134
7,522	Neuropathic Disorder	DSMC	\$169	\$1,556	\$4,130	\$12,700	\$80,463
	Neuropathic Disorder	DSRxC	\$18	\$181	\$403	\$2,440	\$741
7,596	Osteoarthritis	DSMC	\$211	\$5,366	\$18,390	\$27,428	\$44,677
	Osteoarthritis	DSRxC	\$33	\$548	\$523	\$128	\$59

DSMC =Disease-Specific Medical Costs
DSRxC=Disease-specific Rx Costs

FIGURE 1: MEAN PER PATIENT DISEASE-SPECIFIC COSTS BY QUINTILE AND DISEASE

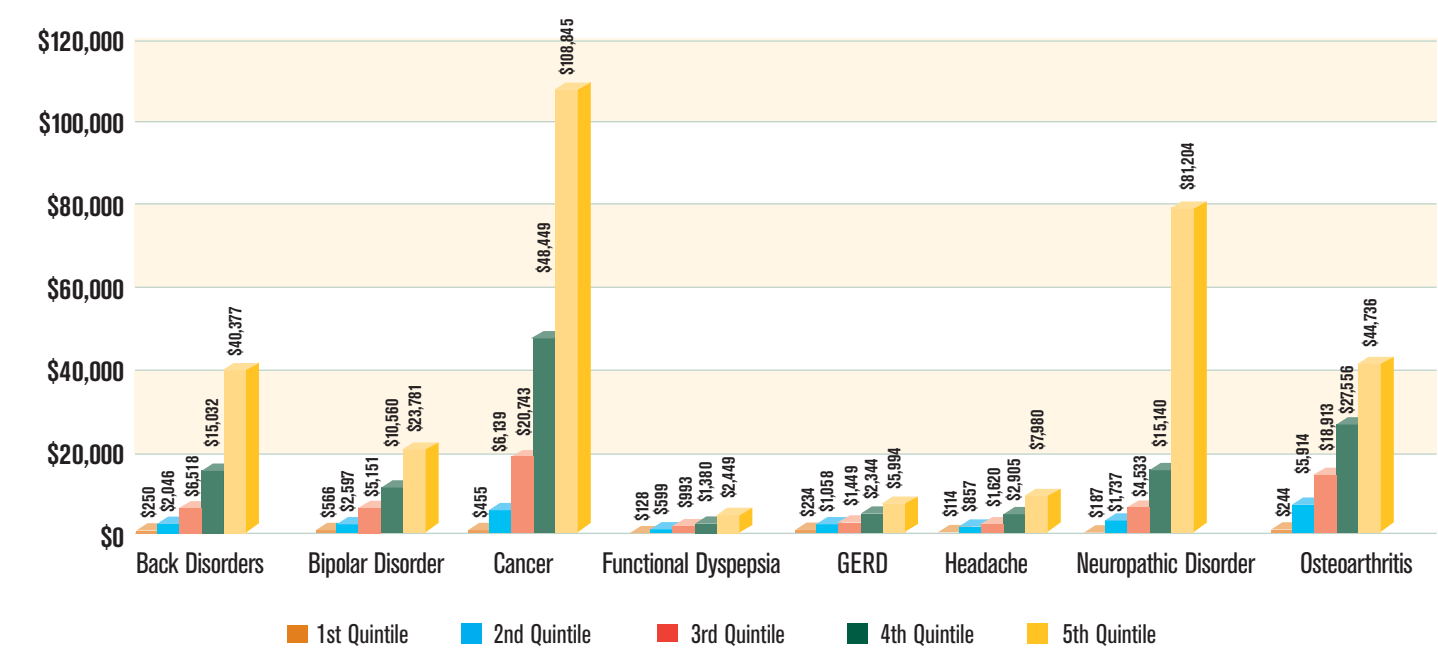


TABLE 4: PERCENTAGE OF COHORTS ASSIGNED TO QUINTILES BY DISEASE

DISEASE	N	QUINTILE				
		1ST QUINTILE LOWEST	2ND QUINTILE 2ND	3RD QUINTILE 3RD	4TH QUINTILE 4TH	5TH QUINTILE HIGHEST
Back Disorders	27,311	85.86%	8.90%	3.28%	1.42%	0.53%
Bipolar Disorder	761	71.22%	15.37%	7.88%	3.81%	1.71%
Cancer	30,745	90.13%	6.67%	1.97%	0.85%	0.38%
Functional Dyspepsia	1,669	67.29%	14.32%	8.63%	6.23%	3.54%
GERD	11,653	66.00%	14.57%	10.28%	6.57%	2.57%
Headache	15,305	79.43%	10.66%	5.63%	3.14%	1.14%
Neuropathic Disorders	7,522	85.89%	9.29%	3.55%	1.06%	0.20%
Osteoarthritis	7,596	93.60%	3.84%	1.21%	0.83%	0.51%

P-values (Chi-squared) for pairwise distribution comparisons:

- Functional Dyspepsia vs. GERD: $P=0.0468$
- Bipolar vs. FD: $P=0.0095$
- Bipolar vs. GERD: $P=0.0013$
- Back Pain vs. Neuropathic Pain: $P=0.0002$
- The other 24 pairwise comparisons: $P<0.0001$

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