

# MERCER

Government Human Services Consulting

August 14, 2007

## **Population Health - Using Health Information Technology to Promote a Healthier Medicaid Population**

**MMIS: The Golden State of New Age Technology**

**Steve Johnson**



Marsh & McLennan Companies

# Topics

- Predictive modeling overview.
- Methodologies for identifying high cost individuals.
- Predictive modeling results for Medicaid populations.

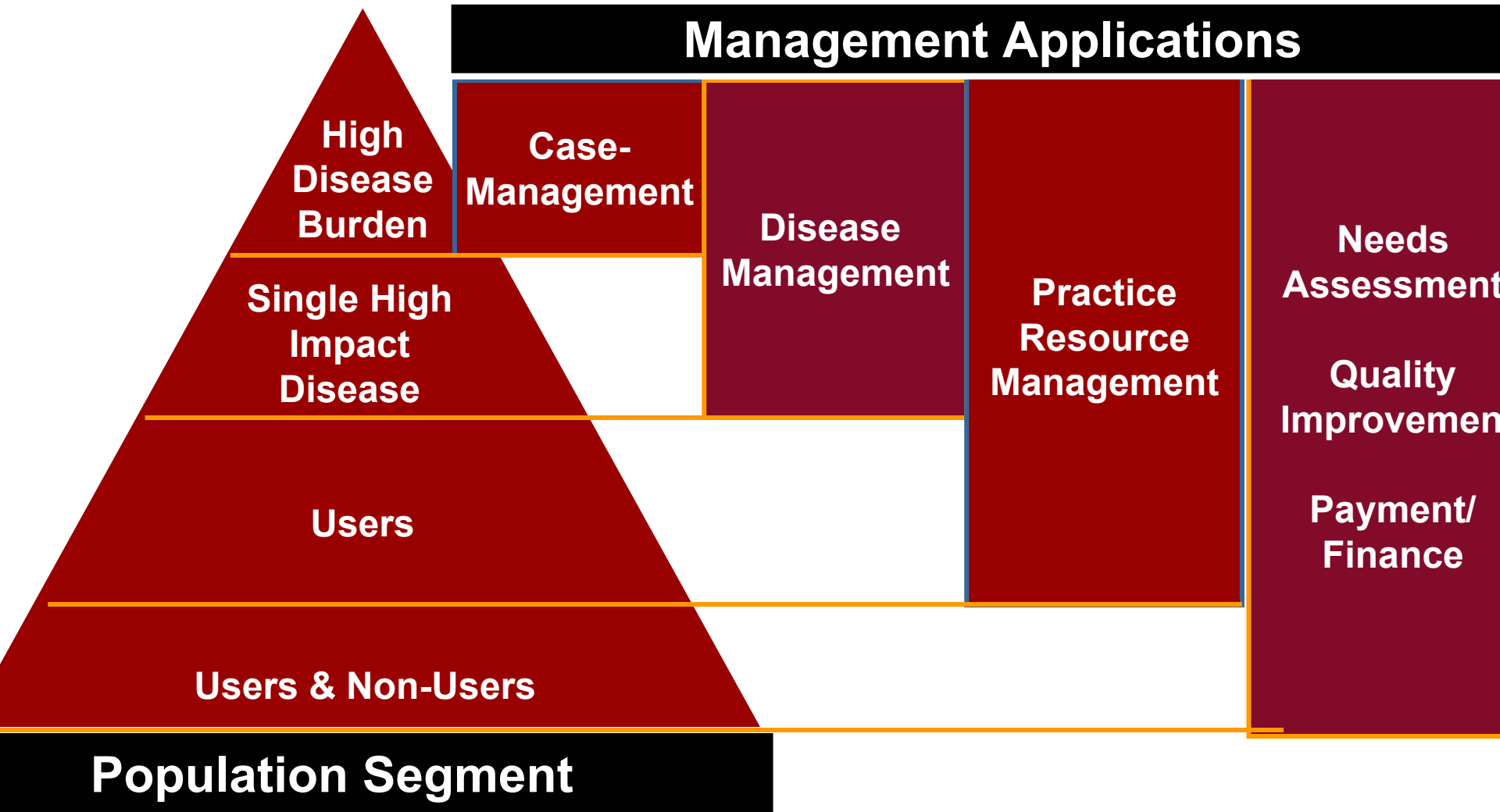
# The \$64,000 Question

- Does predictive modeling work?
  - Definitely yes; predictive modeling techniques have proven to be very successful in identifying members that will be expensive in future time periods.
- Is predictive modeling perfect?
  - No, most models will generate some false positives, and identify people that will not be among the most expensive in the next time period.
- Are predictive modeling results improving?
  - Yes, the models are getting better, and health plans are developing more effective strategies to mine the data.

# Predictive Modeling Objectives

- Identify members that are projected to be high cost in the future for additional interventions, in an effort to reduce their future expenditures.
  - Members must have ongoing health care needs.
- Stratify members by their projected health care needs to be able to determine the appropriate intervention.
- Identify members that are currently inexpensive and are at the early stages of a disease onset, that would have not been identified by more traditional risk adjustment techniques.

# The Risk Measurement Pyramid



# Considerations in Choosing a Model

- The statistical performance of the most widely used risk adjustment models is comparable.
- All offer significant improvements over age-gender models.
- Some of the main factors to consider in choosing a model are:
  - Approach to measuring a members health status.
    - Categorical vs. Additive.
  - Measures of a member's health status that are created by the model.
  - Does the model generate a predictive modeling score.
  - Acceptance amongst your constituents.

# Considerations in Choosing a Model

- What are the data elements required by the model, and can then be supported by your data systems.
  - Encounter data may suffer from incomplete reporting.
- Does the model utilize pharmacy data in evaluating a member's health status?
- Does the model utilize procedure codes to evaluate a member's health status?

# Predictive Modeling Techniques

- The Adjusted Clinical Groups (ACGs) and Diagnostic Cost Groups (DCGs) risk adjustment system have both developed predictive modeling components that are included in their risk adjustment models.
- Both of these models are recognized as being among the leaders of the risk adjustment systems that are currently available.
- Mercer has recently completed several projects that utilized the ACG system to evaluate the efficiency of managed care organizations (MCOs).
- The strategies we employed, and our findings for Medicaid clients are presented in the following slides.

# Financial Performance

- The ACG system calculates a risk score for each member, and also assigns each member to one of 110 mutually exclusive risk groups.
- The ACG risk scores computed for the population are based upon a set of national normative weights developed using commercial data.
- The distribution of members across the risk groups can also be used to evaluate the health status of the members enrolled in each plan and identify members for care management programs.
- This comparison can be simplified by looking at the distribution of members across the 6 Resource Utilization Bands (RUBs) defined for the ACG system.
- RUBs group ACGs with similar expected costs into the same RUB category.

# ACG Risk Scores

## Medicaid Population

Risk Score	Fiscal Year 04	Fiscal Year 05	Percent Change
ACG Concurrent	2.01	3.07	52.7%

# RUB Group Distribution

<b>RUB Group</b>	<b>FY 04 Members</b>	<b>FY 04 % Members</b>	<b>FY 05 Members</b>	<b>FY 05 % Members</b>
Non User	3,332	19.6%	1,389	11.0%
Administrative	1,718	10.1%	1,047	8.3%
Low	4,479	26.3%	3,119	24.8%
Medium	5,435	31.9%	4,585	36.4%
High	1,557	9.1%	1,800	14.3%
Very High	507	3.0%	658	5.2%
<b>Total</b>	<b>17,028</b>		<b>12,598</b>	

# RUB Group Expenditures

<b>RUB Group</b>	<b>FY 04 Total \$ PMPM</b>	<b>FY 05 Total \$ PMPM</b>	<b>Percent Change</b>
Non User	\$ 37.36	\$ 19.93	-46.7%
Administrative	\$ 38.54	\$ 43.70	13.4%
Low	\$ 116.48	\$ 125.66	7.9%
Medium	\$ 286.40	\$ 291.37	1.7%
High	\$ 812.48	\$ 842.48	3.7%
Very High	\$ 2,660.79	\$ 2,458.83	-7.6%
<b>Total</b>	<b>\$ 282.38</b>	<b>\$ 399.54</b>	<b>41.5%</b>



# **Prevalence of Chronic Conditions**

# Prevalence of Chronic Conditions

- The ACG grouper also identifies members with chronic conditions that are amenable to disease management interventions.
- These chronic condition markers can be used to evaluate the prevalence of chronic conditions within a population.
- The chronic conditions that are identified by the ACG grouper are:
  - Arthritis, Asthma, Back Pain, COPD, CHF, Diabetes, Depression, Hyperlipidemia, Hypertension, Ischemic Heart Disease, and Renal Failure.
- Members with multiple chronic conditions would have a marker for each condition.

# Prevalence of Chronic Conditions

- To avoid counting a member in multiple disease categories, a chronic condition hierarchy was used to assign each member to 1 chronic disease category.
- The hierarchy that was used to assign members is as follows:
  - Renal Failure, CHF, COPD, Ischemic Heart Disease, Depression, Asthma, Diabetes, Hyperlipidemia, Hypertension, Arthritis, and Low Back Pain.
- The number of members identified with each chronic condition, after applying this hierarchy is provided on the next table.

# Prevalence of Chronic Conditions

## Hierarchical Assignments

Chronic Condition	Fiscal Year 04		Fiscal Year 05	
	# of Members	Percent of Members	# of Members	Percent of Members
Arthritis	122	0.7	128	1.0
Asthma	1,060	6.3	1,052	8.4
Back Pain	629	3.7	618	4.9
CHF	77	0.5	96	0.8
COPD	182	1.1	242	1.9
Depression	494	2.9	578	4.6
Diabetes	324	1.9	290	2.3
Hylipidemia	292	1.7	346	2.7
Hypertension	357	2.1	355	2.8
Ischemic Heart Disease	116	0.7	176	1.4
No Chronic Conditions	13,339	78.3	8,669	68.8
Renal Failure	36	0.2	48	0.4
All Members	17,028		12,598	

# Chronic Conditions Expenditures

- Utilization rates will vary among members within each chronic condition category depending upon their health status.
- The cost and complexity of caring for a patient with any of these chronic conditions will be affected by the number of comorbidities that each member has, which will impact their health status.
- These factors can be accounted for by examining the RUB group assignment for members with chronic conditions.
- The following slides profile the health care utilization of the members in each chronic condition category based upon their RUB group assignment.

# Health Care Utilization

## Asthma

RUB Group	Total Members	Total \$ PMPM	Inpatient \$ PMPM	Physician \$ PMPM	Rx \$ PMPM	ER \$ PMPM	Inp Days 1,000 PY	Phy Serv 1,000 PY	Phar CI 1,000 PY	ER Vis 1,000 PY
<b>Fiscal Year 2003–2004</b>										
Low	162	\$125	\$18	\$15	\$33	\$3	98	2,967	8,439	241
Medium	640	\$262	\$52	\$50	\$64	\$16	253	8,763	15,870	985
High	209	\$870	\$393	\$144	\$103	\$36	2,196	17,671	25,464	1,910
Very High	49	\$3,892	\$1,286	\$369	\$333	\$36	9,074	30,949	42,629	1,623
<b>Total</b>	1,060	\$527	\$171	\$77	\$79	\$19	1,017	10,609	17,799	1,078
<b>Fiscal Year 2004–2005</b>										
Low	115	\$106	\$8	\$18	\$34	\$2	27	3,270	7,881	161
Medium	643	\$263	\$33	\$50	\$71	\$15	205	8,816	16,350	829
High	237	\$947	\$251	\$136	\$133	\$33	1,278	17,817	27,475	1,644
Very High	57	\$3,583	\$1,743	\$318	\$293	\$50	8,589	30,244	53,973	2,220
<b>Total</b>	1,052	\$580	\$173	\$80	\$93	\$19	883	11,402	19,975	1,015

# Health Care Utilization

## Depression

RUB Group	Total Members	Total \$ PMPM	Inpatient \$ PMPM	Physician \$ PMPM	Rx \$ PMPM	ER \$ PMPM	Inp Days 1,000 PY	Phy Serv 1,000 PY	Phar CI 1,000 PY	ER Vis 1,000 PY
<b>Fiscal Year 2003–2004</b>										
Low	24	\$385	-	\$11	\$95	\$1	-	2151	16,642	57
Medium	229	\$577	\$39	\$42	\$147	\$13	507	5,850	24,409	720
High	154	\$1,087	\$423	\$144	\$176	\$44	3,502	15,042	32,093	2,176
Very High	87	\$1,775	\$758	\$239	\$320	\$63	6,177	23,660	54,150	3,075
<b>Total</b>	494	\$958	\$296	\$110	\$187	\$32	2,516	11,995	32,128	1,602
<b>Fiscal Year 2004–2005</b>										
Low	22	\$590	-	\$10	\$87	\$1	-	1,909	15,218	55
Medium	217	\$581	\$57	\$61	\$189	\$16	632	8,807	30,179	741
High	226	\$996	\$237	\$148	\$224	\$36	1,690	16,777	40,123	1,606
Very High	113	\$1,773	\$588	\$277	\$342	\$78	4,282	30,479	58,085	3,577
<b>Total</b>	578	\$987	\$324	\$137	\$230	\$36	1,767	16,117	39,254	1,634

# Health Care Utilization

## Diabetes

RUB Group	Total Members	Total \$ PMPM	Inpatient \$ PMPM	Physician \$ PMPM	Rx \$ PMPM	ER \$ PMPM	Inp Days 1,000 PY	Phy Serv 1,000 PY	Phar CI 1,000 PY	ER Vis 1,000 PY
<b>Fiscal Year 2003–2004</b>										
Low	36	\$389	-	\$19	\$146	-	-	3,034	29,434	-
Medium	182	\$384	\$35	\$63	\$188	\$10	258	7,700	40,508	500
High	70	\$869	\$326	\$170	\$167	\$21	2,254	16,545	40,169	995
Very High	36	\$2,217	\$1,066	\$328	\$395	\$44	11,368	28,288	52,620	1,895
<b>Total</b>	324	\$744	\$238	\$119	\$207	\$16	2,187	12,080	40,960	754
<b>Fiscal Year 2004–2005</b>										
Low	21	\$264	-	\$28	\$171	-	-	4,109	33,457	-
Medium	155	\$372	\$26	\$65	\$166	\$9	145	7,550	35,985	428
High	77	\$792	\$218	\$160	\$208	\$36	1,268	16,613	42,551	1,631
Very High	37	\$1,526	\$532	\$259	\$375	\$26	4,587	25,732	61,458	1,033
<b>Total</b>	290	\$630	\$142	\$114	\$205	\$18	1,016	12,190	40,916	815



# **Disease Management and Predictive Modeling**

# Disease Management and Predictive Modeling

- The chronic condition markers can be used to identify members that are candidates for disease management programs.
- The number of members with chronic conditions can be used to determine if there is sufficient membership to institute a disease management program.
- The challenge is to identify a subset of members within each chronic condition that would benefit from a disease management program.
- Members whose condition is stable and have few comorbidities may have moderate health care needs.
- Complex members with multiple comorbidities will have significant health care needs and would benefit from the focus on the care offered by a disease management program.

# Disease Management and Predictive Modeling

- The ACG system offers multiple measures that can be used to identify the subset of members that would benefit the most from a disease management program.
- The ACG system calculates a predictive modeling (PM) score for each member.
- The PM score represents the probability that they will be in the top 5% most expensive members the following year.
- A PM score of .95 indicates that there is a 95% chance that a member will be among the top 5% most expensive members the next year.
- These scores can be used to identify a subset of members within each chronic condition that have significant health care needs.

# Disease Management and Predictive Modeling

- The PM scores range from 0 to 1.
- Members with a PM score of .9 or higher will be very expensive the next year, but this score will identify a small number of members.
- Selecting a lower PM score will identify more members, but some of these members will have lower costs in the following year.
- The following chart identified members as high risk if they had a PM score of .6 or higher.
- The chart looks at a cohort of members that were enrolled in both FY04 and FY05.
- Their FY04 PM score is related to their FY05 expenditures.

# FY 04 PM Score

## FY 05 Utilization

Disease Category	Low PM Score in FY 04						High PM Score in FY 04					
	Total Members	Total \$ PMPM	Inpatient \$ PMPM	ER \$ PMPM	Inpatient Days 1,000 PY	ER Visits 1,000 PY	Total Members	Total \$ PMPM	Inpatient \$ PMPM	ER \$ PMPM	Inpatient Days 1,000 PY	ER Visits 1,000 PY
Arthritis	75	\$584	\$82	\$16	715	566	2	\$1497	-	\$15	-	1,000
Asthma	674	\$375	\$80	\$16	411	882	21	\$5,066	\$1,055	\$76	9,731	2,622
Back Pain	366	\$441	\$110	\$26	625	1,204	12	\$1,890	\$593	\$57	2,656	2,754
CHF	30	\$1,695	\$774	\$13	5,155	536	14	\$2,788	\$1,555	\$63	17,455	1,488
COPD	107	\$642	\$189	\$27	2,063	1,182	20	\$1,908	\$590	\$36	4,608	1,468
Depression	272	\$809	\$199	\$33	1,169	1,491	31	\$1,577	\$565	\$57	5,692	2,465
Diabetes	192	\$622	\$103	\$23	793	1,019	8	\$2,054	\$483	\$40	6,308	1,385
Hyper-lipidemia	185	\$408	\$86	\$13	780	620	4	\$3,393	\$1,595	\$100	12,766	4,851
Hypertension	214	\$484	\$153	\$13	889	674	7	\$1,946	\$1,087	\$77	5,440	3,360
Ischemic HD	66	\$902	\$265	\$18	1,934	751	12	\$956	\$26	\$38	105	1,579
Renal Failure	4	\$136	-	-	-	-	10	\$2,665	\$568	\$50	3,310	1,241
No Chronic	7,010	\$255	\$76	\$10	429	559	24	\$1,939	\$674	\$20	3,966	979
<b>Total</b>	9,195	\$318	\$88	\$13	523	654	165	\$2,368	\$728	\$51	6,123	2,011

# Disease Management and Predictive Modeling

- The PM score identified a small subset of members within each chronic condition that had dramatically higher expenses in FY05.
- Asthmatics with a high PM score cost \$5,066 PMPM in FY05, members with a low PM score cost \$376.
- The separation between the PM groups is smaller for the CHF chronic condition group.
- All members with a high PM score cost \$2,368 in FY05, members with a low PM score cost \$318.
- The PM score offers one method for identifying an expensive subset of members within each chronic condition.
- Another alternative is to look at a member's RUB group assignment.
- The following chart relates a member's FY04 RUB group assignment to their FY05 expenditures.

# FY 04 RUB Assignment

## FY 05 Utilization

Disease Category	Non User RUB	Administrative RUB	Low RUB	Medium RUB	High RUB	Very High RUB
Arthritis	-	-	\$270	\$485	\$789	\$1,064
Asthma	-	-	\$178	\$329	\$575	\$3,279
Back Pain	-	\$31	\$232	\$406	\$620	\$1,641
CHF	-	-	-	\$1,192	\$1,756	\$2,994
COPD	-	-	\$30	\$488	\$897	\$1,285
Depression	-	-	\$742	\$663	\$841	\$1,759
Diabetes	-	-	\$663	\$581	\$746	\$1,137
Hyperlipidemia	-	-	\$169	\$422	\$409	\$1,293
Hypertension	-	-	\$176	\$395	\$554	\$2,092
Ischemia HD	-	-	-	\$946	\$412	\$1,299
Renal Failure	-	-	\$1,300	-	\$2,265	-
No Chronic	\$199	\$94	\$174	\$402	\$397	\$1,093

# Disease Management and Predictive Modeling

- Another measure created by the ACG system that can be used to identify a subset of high cost members is to look at the number of comorbidities that a member has.
- Members with multiple chronic conditions will be more complex to treat and generally have more significant health care needs.
- The chart on the following slide relates the number of chronic condition markers a member had in FY04 to their expenses in FY05.
- Members with 4 or more chronic conditions in FY04 were significantly more expensive than members with 0 or 1 chronic conditions.

# FY 04 Number of Chronic Conditions

## FY 05 Utilization

# of Chronic Conditions	# of Members	Total \$ PMPM	Inpatient \$ PMPM	ER \$ PMPM	Inpatient Days 1,000 PY	ER Visits 1,000 PY
0	7,034	\$260	\$77	\$11	439	560
1	1,456	\$505	\$123	\$18	819	904
2	472	\$734	\$209	\$28	1,459	1,250
3	231	\$866	\$215	\$31	1588	1,331
4	98	\$1,041	\$275	\$37	2,114	1,466
5	43	\$1,387	\$348	\$33	3,645	1,038
6	19	\$1,546	\$474	\$37	3,587	1,304
7	4	\$2,166	\$735	\$43	10,957	1,304
8	1	\$1,717	-	\$69	-	2,000
9	1	\$639	-	-	-	-
10 +	1	\$3,324	\$1,223	-	11,000	-

# Disease Management and Predictive Modeling

- Another measure created by the ACG system is the number of hospital dominant conditions that a member has.
- A hospital dominant condition is a diagnosis that has a high probability of requiring the member to be hospitalized in the following year.
- The higher the number of hospital dominant conditions a member has, the greater their health care needs will be in the following year.
- The following chart relates a members FY04 number of hospital dominant conditions to their FY05 expenditures.
- Members with 1 or more hospital dominant conditions were significantly more expensive the following year.

# FY 04 Hospital Dominant Conditions

## FY 05 Utilization

# of Chronic Conditions	# of Members	Total \$ PMPM	Inpatient \$ PMPM	ER \$ PMPM	Inpatient Days 1,000 PY	ER Visits 1,000 PY
0	8,960	\$315	\$86	\$12	518	632
1	309	\$1,004	\$237	\$35	1,395	1,673
2	58	\$1,790	\$709	\$66	5,577	2,446
3	25	\$2,874	\$1,406	\$44	15,629	1,984
4	5	\$1,810	\$1,120	\$78	5,091	1,455
5	2	\$3,493	\$1,005	\$121	5,400	2,400
6 +	1	\$6,690	\$4,102	\$31	57,000	1,000

# Disease Management and Predictive Modeling

- The combination of PM score, RUB group, number of chronic conditions, and number of hospital dominant conditions can be used to identify a subset of members that will be high cost in the following year.
- The following chart uses the Mercer Risk Index to identify high cost members based upon their FY04 ACG information.
- The Mercer Risk Index is then related to their FY05 health care utilization.

# FY 05 Health Care Utilization

## FY 04 Mercer Risk Index

Disease Category	Low PM Score in FY 04						High PM Score in FY 04					
	Total Members	Total \$ PMPM	Inpatient \$ PMPM	ER \$ PMPM	Inpatient Days 1,000 PY	ER Visits 1,000 PY	Total Members	Total \$ PMPM	Inpatient \$ PMPM	ER \$ PMPM	Inpatient Days 1,000 PY	ER Visits 1,000 PY
Arthritis	68	\$561	\$59	\$16	446	529	9	\$960	\$223	\$17	2,423	923
Asthma	643	\$341	\$73	\$16	382	873	52	\$2,788	\$581	\$48	4,698	1,735
Back Pain	353	\$397	\$109	\$26	635	1,184	25	\$1,732	\$351	\$43	1,431	2,215
CHF	17	\$1,372	\$627	\$6	4,000	317	27	\$2,563	\$1,322	\$46	12,807	1,238
COPD	80	\$519	\$139	\$16	1,675	716	47	\$1,422	\$455	\$49	3,860	2,070
Depression	248	\$721	\$143	\$30	931	1,406	55	\$1,624	\$647	\$56	4,755	2,408
Diabetes	178	\$624	\$112	\$24	859	1,021	22	\$1,080	\$161	\$26	2,103	1,128
Hyper-lipidemia	171	\$390	\$89	\$12	852	552	18	\$1,246	\$411	\$42	2,913	2,155
Hypertension	200	\$401	\$90	\$13	526	647	21	\$1,795	\$1,087	\$37	5,943	1,886
Ischemic HD	44	\$640	\$186	\$15	843	618	34	\$1,265	\$285	\$30	2,724	1,215
Renal Failure	2	\$224	-	-	-	-	12	\$2,322	\$494	\$43	2,880	1,080
No Chronic	6,955	\$252	\$75	\$10	843	618	79	\$1,023	\$333	\$24	2,090	1,287
<b>Total</b>	8,959	\$297	\$81	\$12	477	633	401	\$1,621	\$508	\$39	3,869	1,699

# Disease Management and Predictive Modeling

- Within each chronic condition category the Mercer Risk Index identifies a cohort of significantly more expensive members.
- High risk asthmatics had a total cost of \$2,788 in FY05, low risk asthmatics cost \$341.
- The relative cost of members in the high risk category was 5.5 times the cost of members in the low risk category.
- This relationship varied from a high relative cost of 10.4 in the Renal Failure category to a low of 1.71 in the Arthritis category.
- Mercer can vary the parameters of the Mercer Risk Index to identify more members, which will result in less separation between the high and low risk group, or identify a smaller subset that will have greater separation.

# Questions

- If you have any questions contact:
  - Steve Johnson
  - (602) 522-8566
  - [steve.johnson@mercer.com](mailto:steve.johnson@mercer.com)