Diabetes Study Contd.
Comorbidities, Mental Health, and Pre-Diabetes

State of Arkansas – Employee Benefits Division

✶ Segal

Comorbidities

Segal

Comorbidities
Active and Non-Medicare Retiree

Diabetic Comorbidities

Hypertension — Diabetics 81%, SHAPE BoB 69%, Overall Plan Prevalence 28%

Obesity — Diabetics 75%, SHAPE BoB 37%, Overall Plan Prevalence 18%

Hyperlipidemia — Diabetics 75%, SHAPE BoB 74%, Overall Plan Prevalence 22%

Mental Health — Diabetics 46%, SHAPE BoB 35%, Overall Plan Prevalence 38%

IVD — Diabetics 18%, SHAPE BoB 5%, Overall Plan Prevalence 5%

CAD — Diabetics 14%, SHAPE BoB 10%, Overall Plan Prevalence 4%

SUD — Diabetics 6%, SHAPE BoB 8%, Overall Plan Prevalence 4%

CHF — Diabetics 3%, SHAPE BoB 2%, Overall Plan Prevalence 1%

COPD — Diabetics 2%, SHAPE BoB 2%, Overall Plan Prevalence 1%

Legend:
- Diabetics
- SHAPE BoB
- Overall Plan Prevalence

Diabetic Comorbidity Distribution (by ADI[3])

Comorbidities	1-3	4-7	8-10
No Comorbidities	3.5%	3.3%	2.5%
1 Comorbidities	12.6%	10.8%	9.4%
2 Comorbidities	29.2%	26.9%	28.9%
3 Comorbidities	27.7%	28.8%	26.3%
4+ Comorbidities	27.0%	30.2%	32.9%

Legend:
- 4+ Comorbidities
- 3 Comorbidities
- 2 Comorbidities
- 1 Comorbidities
- No Comorbidities

Observations

- The top left chart reflects the prevalence of comorbid conditions of diabetics[1], compared to the SHAPE[2] BoB and overall Plan prevalence.

- At 81%, hypertension was the top diabetes comorbid condition, followed by hyperlipidemia at 75%. Obesity was the third highest comorbid condition at 74%. Note: SHAPE BoB comorbid prevalence of obesity is significantly lower due to lack of proper coding of BMI diagnosis.

- The top right chart illustrates the distribution of comorbidity by ADI. 27% of diabetics had 4 or more comorbidities in the 1-3 ADI band, compared to about 33% in the 8-10 ADI Band.
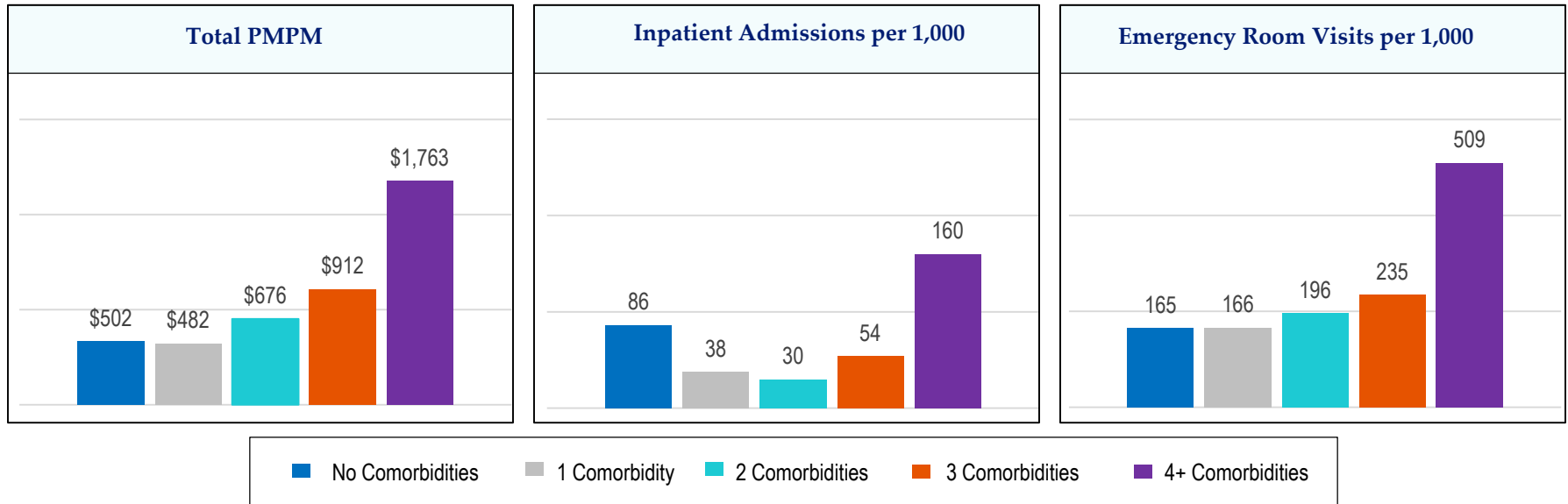
Segal

Cost and Utilization by Comorbidities[1]
Active and Non-Medicare Retiree

Total PMPM	Inpatient Admissions per 1,000	Emergency Room Visits per 1,000

Total PMPM
- $502
- $482
- $676
- $912
- $1,763

Inpatient Admissions per 1,000
- 86
- 38
- 30
- 54
- 160

Emergency Room Visits per 1,000
- 165
- 166
- 196
- 235
- 509

Legend: ■ No Comorbidities ■ 1 Comorbidity ■ 2 Comorbidities ■ 3 Comorbidities ■ 4+ Comorbidities

Observations

- The above charts breakdown total PMPM, inpatient admissions, and emergency room ("ER") visits by the number of comorbidities.

- Diabetics with 4 or more comorbidities have the highest PMPM, mainly driven by higher inpatient and ER utilization.

- The middle chart shows that diabetics with no comorbidity have the second highest rate of inpatient admissions, however they seem to be of lower severity since the overall PMPM for that cohort is still the lowest of all other cohorts.

- The next page looks at specific comorbidities of diabetics and compares cost, utilization, and compliance rates.

Comorbidities – Age Groups
Active and Non-Medicare Retiree

Total PMPM

Inpatient Admissions per 1,000

Emergency Room Visits per 1,000

Legend: ■ No Comorbidities ■ 1 Comorbidity ■ 2 Comorbidities ■ 3 Comorbidities ■ 4+ Comorbidities
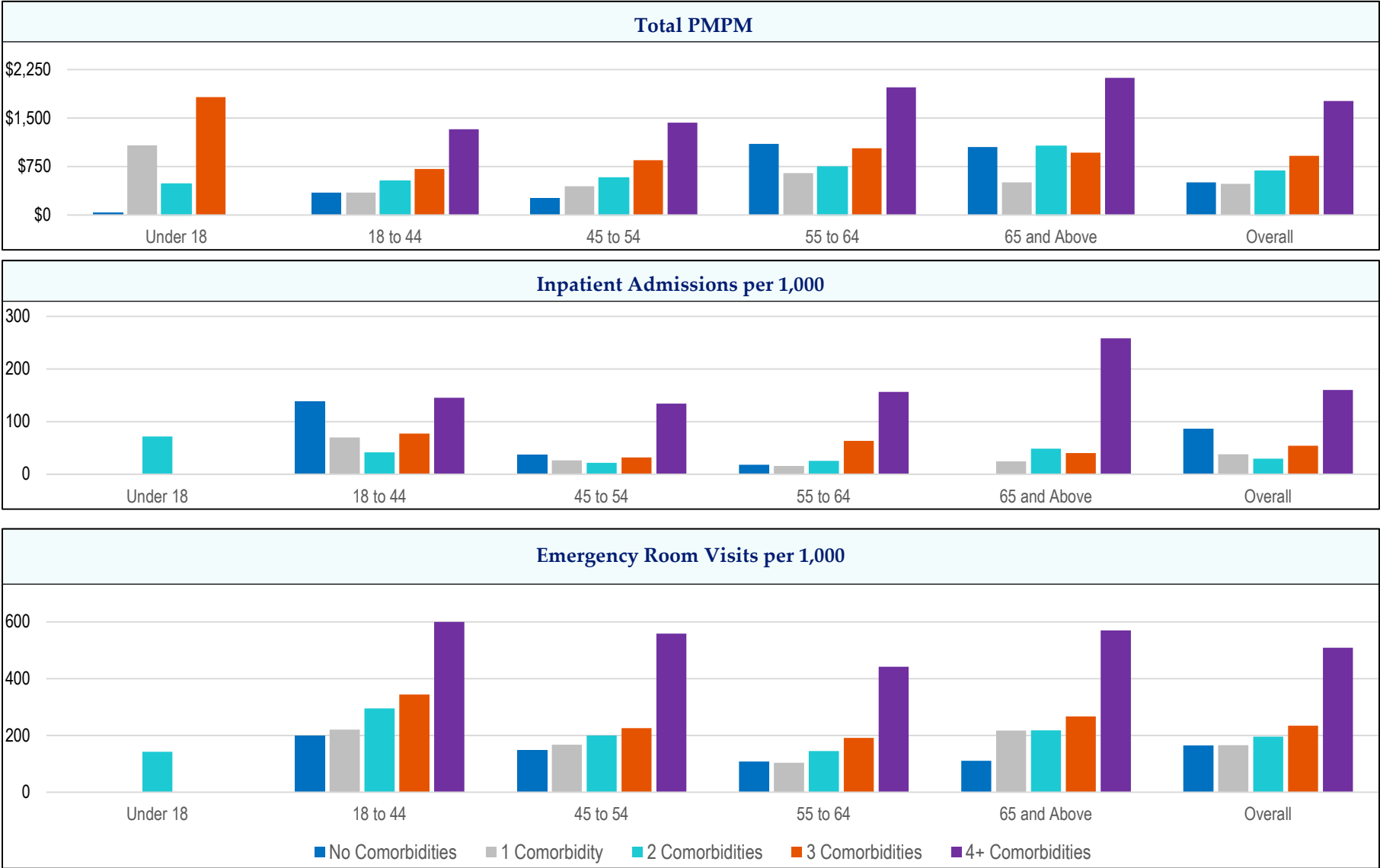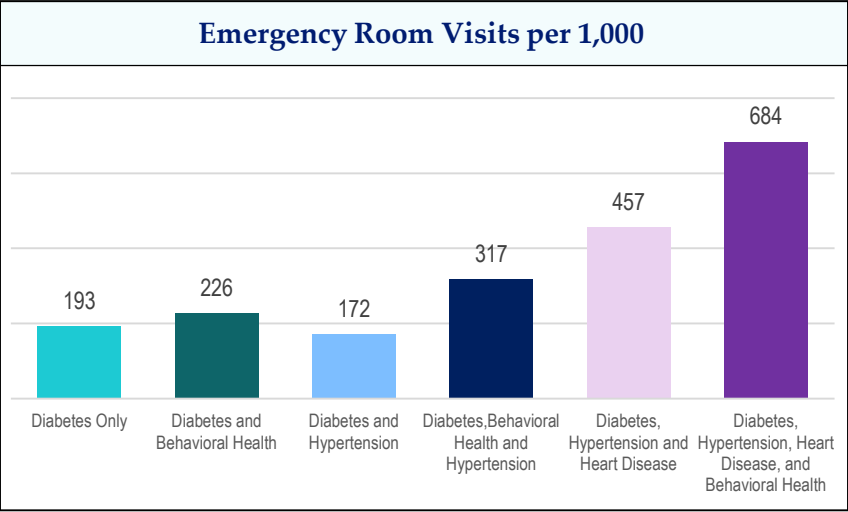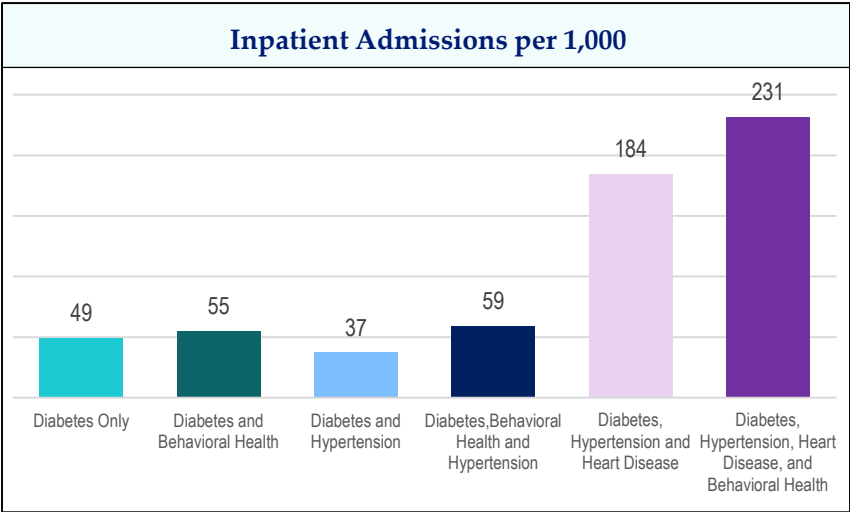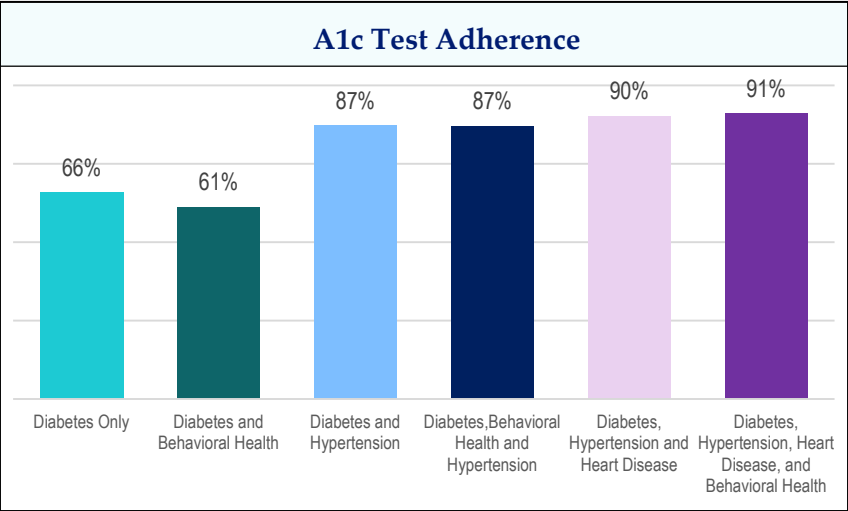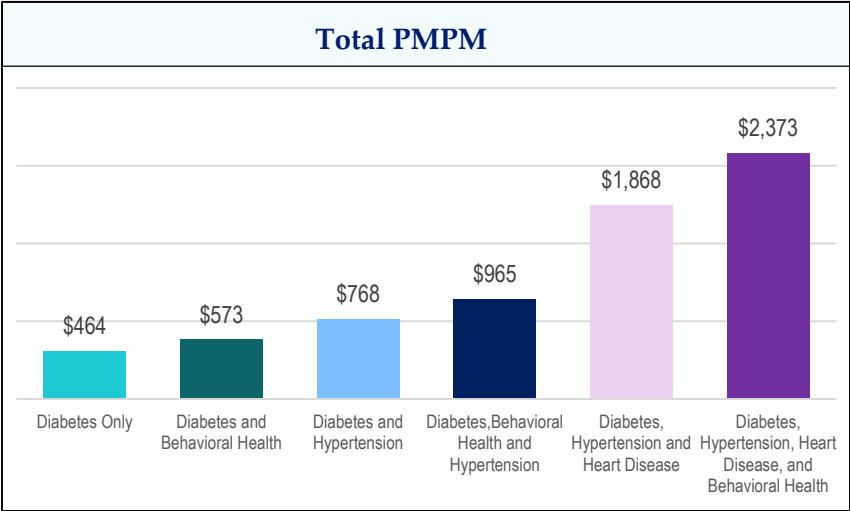
Note: Type I diabetics are excluded from this analysis. Reflects CY 2022 claims experience.

Hypertension, Behavioral Health, and Heart Disease Comorbidities
Active and Non-Medicare Retiree

Total PMPM

- Diabetes Only: $464
- Diabetes and Behavioral Health: $573
- Diabetes and Hypertension: $768
- Diabetes, Behavioral Health and Hypertension: $965
- Diabetes, Hypertension and Heart Disease: $1,868
- Diabetes, Hypertension, Heart Disease, and Behavioral Health: $2,373

A1c Test Adherence

- Diabetes Only: 66%
- Diabetes and Behavioral Health: 61%
- Diabetes and Hypertension: 87%
- Diabetes, Behavioral Health and Hypertension: 87%
- Diabetes, Hypertension and Heart Disease: 90%
- Diabetes, Hypertension, Heart Disease, and Behavioral Health: 91%

Inpatient Admissions per 1,000

- Diabetes Only: 49
- Diabetes and Behavioral Health: 55
- Diabetes and Hypertension: 37
- Diabetes, Behavioral Health and Hypertension: 59
- Diabetes, Hypertension and Heart Disease: 184
- Diabetes, Hypertension, Heart Disease, and Behavioral Health: 231

Emergency Room Visits per 1,000

- Diabetes Only: 193
- Diabetes and Behavioral Health: 226
- Diabetes and Hypertension: 172
- Diabetes, Behavioral Health and Hypertension: 317
- Diabetes, Hypertension and Heart Disease: 457
- Diabetes, Hypertension, Heart Disease, and Behavioral Health: 684

Note: Type I diabetics are excluded from this analysis. Reflects CY 2022 claims experience.

✦ Segal

Mental Health

Mental Health
Active and Non-Medicare Retiree

CY 2022			Medical		Pharmacy		Total	
Diabetic[1] Cohort	% of All Diabetics	% of All Non-Diabetics	PMPM Cost	Relative Cost[2]	PMPM Cost	Relative Cost[2]	PMPM Cost	Relative Cost[2]
No mental health condition	53.2%	61.5%	$544	0.9	$381	0.9	$925	0.9
Any mental health condition	46.8%	38.5%	$710	1.1	$466	1.1	$1,176	1.1
Sleep	24.3%	8.6%	$878	1.4	$577	1.4	$1,454	1.4
Anxiety	12.4%	14.1%	$741	1.2	$396	0.9	$1,137	1.1
Depression	10.4%	8.7%	$730	1.2	$477	1.1	$1,207	1.2
Psychotic disorders	0.3%	0.2%	$2,265	3.6	$661	1.6	$2,926	2.8
Any substance use disorder[3]	0.6%	0.5%	$893	1.4	$632	1.5	$1,525	1.5
Alcohol use disorder	0.3%	0.3%	$623	1.0	$355	0.8	$978	0.9
Opioid use disorder	0.3%	0.2%	$1,133	1.8	$879	2.1	$2,012	1.9

Observations

- In CY 2022, 53.2% of diabetics had no mental health condition, while 46.8% had at last one mental health condition. This compared to 61.5% and 38.5% for the non-diabetic members, respectively.

- Sleep disorder is the most prevalent mental health condition for diabetics, followed by anxiety. Diabetics with sleep disorders are 1.4 times costlier, on a PMPM basis, than the average PMPM of all diabetics.

[1] Type I diabetics are excluded from this analysis. Reflects CY 2022 claims experience
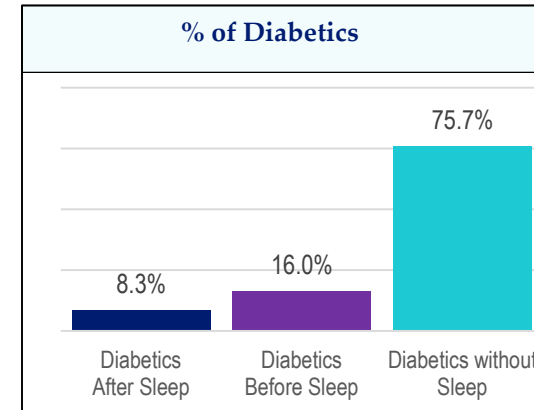[2] Relative cost compares the PMPM of specified cohort to the PMPM of all diabetics in CY 2022
[3] Excludes members with tobacco use disorders

Mental Health – Sleep Disorders
Active and Non-Medicare Retiree

CY 2022 Categories	Diabetics[1] with Sleep Disorders			Diabetics[1] Without Sleep Disorders
	Diabetics After Sleep	Diabetics Before Sleep	Total	
Membership				
Members	766	1,466	2,232	6,945
% of Total	8.3%	16.0%	24.3%	75.7%
Average Age	51	53	53	51
% Female	55.5%	53.3%	54.1%	63.4%
Claim Experience				
Medical PMPM	$648	$998	$878	$539
Rx PMPM	$384	$677	$577	$371
Total PMPM	$1,032	$1,675	$1,454	$910
Relative Cost[2]	0.99	1.60	1.39	0.87
% Hight-Cost Claimants[3]	16.72	18.88	18.14	13.13

% of Diabetics

- Diabetics After Sleep: 8.3%
- Diabetics Before Sleep: 16.0%
- Diabetics without Sleep: 75.7%

PMPM

- Diabetics After Sleep: $1,032
- Diabetics Before Sleep: $1,675
- Diabetics without Sleep: $910
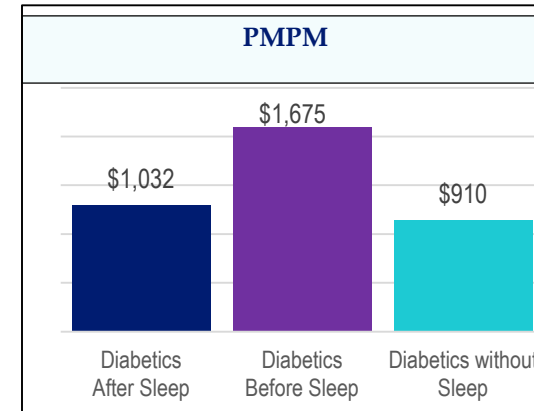
Observations

- Sleep disorders are not a top comorbidity for non-diabetics, yet it is the most prevalent mental health condition for diabetics.

- Diabetics with sleep disorders are 1.4 times costlier; the order in which a participant is diagnosed significantly influences experience and cost.

[1] Type I diabetics are excluded from this analysis. Reflects CY 2022 claims experience
[2] Relative cost compares the PMPM of specified cohort to the PMPM of all diabetics in CY 2022
[3] High-cost Claimants (HCC) reflects the ratio of members who exceeded $100k in medical claims during the reporting period
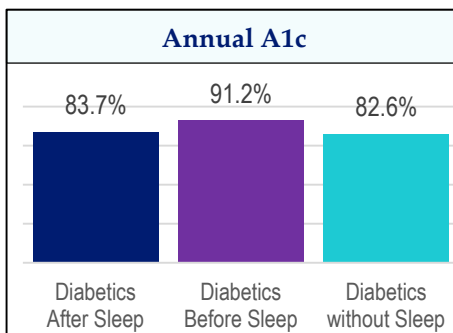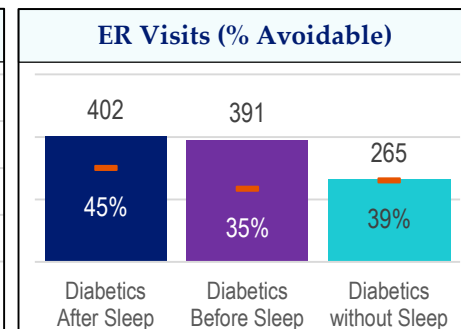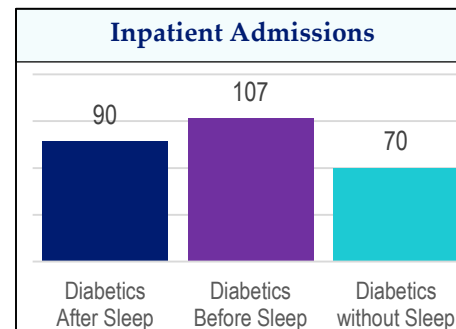[4] Percentage of ER visits deemed non-emergent and/or PC treatable. Based the NYU Center for Health and Public Service Research algorithm developed to help classify ER utilization
[5] Diabetic patients were deemed adherent when diabetes medication possession ratio (MPR = total days supply / 365) was 80% or higher

Mental Health – Sleep Disorder Experience
Active and Non-Medicare Retiree

CY 2022 Categories	Diabetics[1] with Sleep Disorders			Diabetics[1] Without Sleep Disorders
	Diabetics After Sleep	Diabetics Before Sleep	Total	
Key Utilization Metrics (per 1,000)				
Inpatient Admissions	90	107	101	70
Emergency Room Visits	402	391	395	265
% Avoidable[4] ER Visits	45%	35%	38%	39%
Adherence Rates				
Annual HB A1c Test	83.7%	91.2%	88.6%	82.6%
Diabetes Rx Adherence[5]	43.7%	68.4%	59.9%	54.6%

Inpatient Admissions

Diabetics After Sleep	Diabetics Before Sleep	Diabetics without Sleep
90	107	70

ER Visits (% Avoidable)

Diabetics After Sleep	Diabetics Before Sleep	Diabetics without Sleep
402 / 45%	391 / 35%	265 / 39%

Annual A1c

Diabetics After Sleep	Diabetics Before Sleep	Diabetics without Sleep
83.7%	91.2%	82.6%

Rx Adherence

Diabetics After Sleep	Diabetics Before Sleep	Diabetics without Sleep
43.7%	68.4%	54.6%

Observations

Underlying Sleep Disorders in Participants who Developed Diabetes

- While the cost is more controlled with this cohort, it remains higher than that of diabetics without sleep disorders.
- Recommended interventions for this cohort include providing support and education about medication adherence and appropriate usage of emergency care.

Diabetics who Developed Sleep Disorders

- This cohort tends to use resources more appropriately and is more adherent to recommended treatment, yet it has the significantly higher cost.
- Recommended interventions for this cohort include treating root causes of sleep disorders and providing proactive support to prevent costly inpatient stays and necessary emergency visits.

[1] Type I diabetics are excluded from this analysis. Reflects CY 2022 claims experience
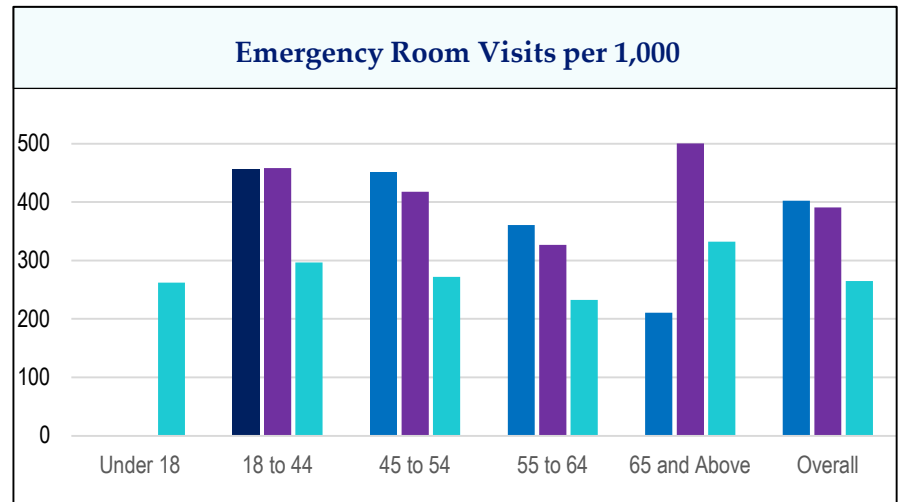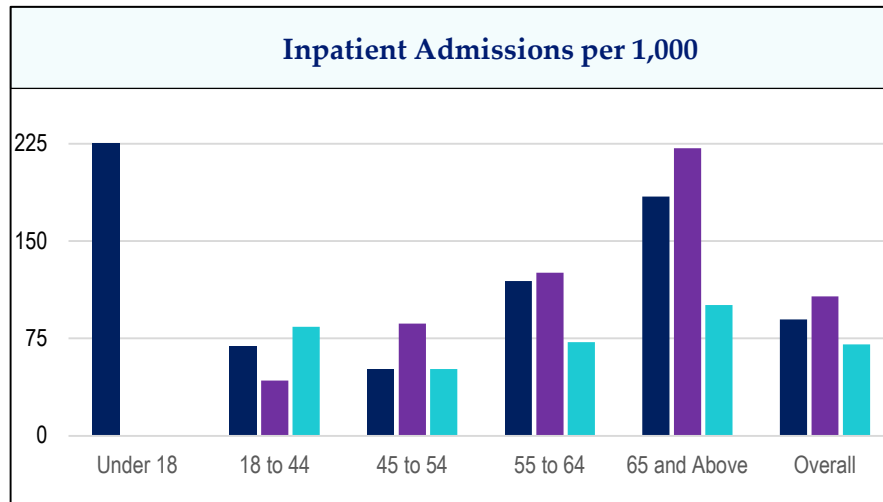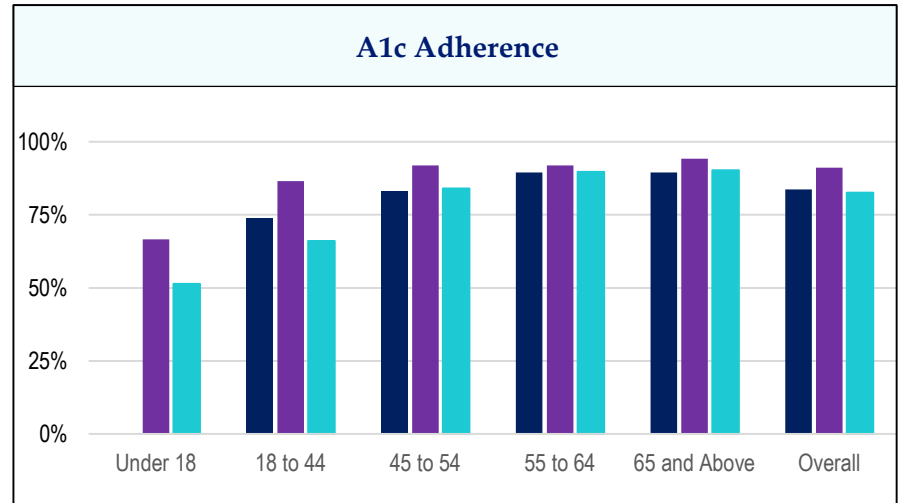[2] Relative cost compares the PMPM of specified cohort to the PMPM of all diabetics in CY 2022
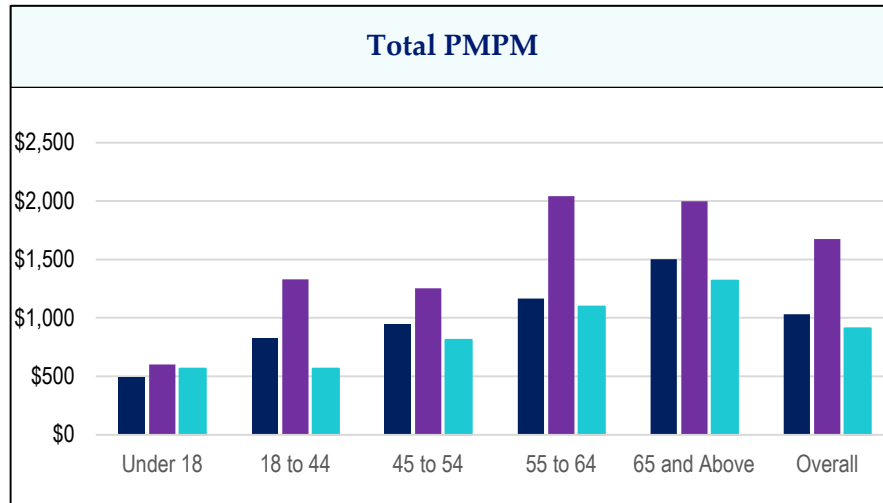[3] High-cost Claimants (HCC) reflects the ratio of members who exceeded $100k in medical claims during the reporting period
[4] Percentage of ER visits deemed non-emergent and/or PC treatable. Based the NYU Center for Health and Public Service Research algorithm developed to help classify ER utilization
[5] Diabetic patients were deemed adherent when diabetes medication possession ratio (MPR = total days supply / 365) was 80% or higher

Segal

Mental Health – Sleep Disorder Experience by Age
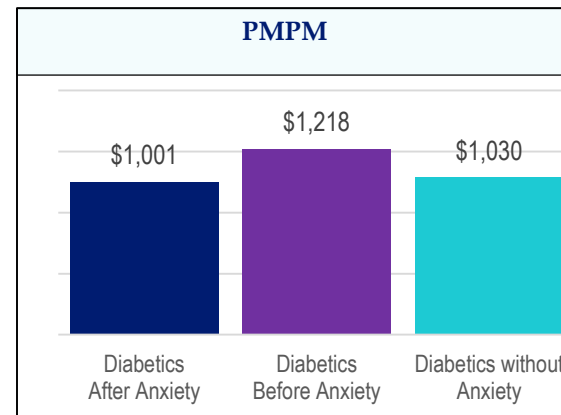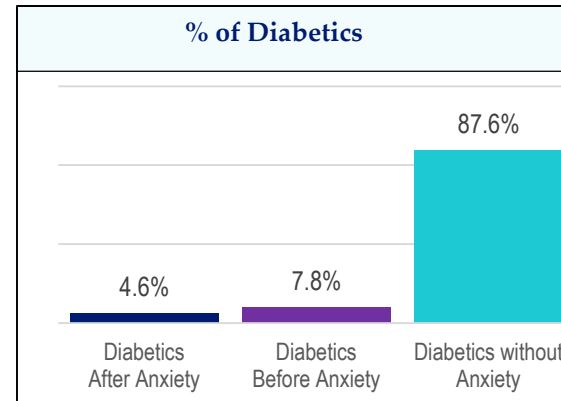## Active and Non-Medicare Retiree

Legend: Diabetics After Sleep ■ | Diabetics Before Sleep ■ | Diabetics Without Sleep Disorders ■

Mental Health - Anxiety
Active and Non-Medicare Retiree

CY 2022 Categories	Diabetics[1] with Anxiety			Diabetics[1] Without Anxiety
	Diabetics After Anxiety	Diabetics Before Anxiety	Total	
Membership				
Members	424	718	1,142	8,035
% of Total	4.6%	7.8%	12.4%	87.6%
Average Age	44	48	46	52
% Female	81.1%	77.0%	78.5%	58.7%
Claim Experience				
Medical PMPM	$743	$739	$741	$605
Rx PMPM	$258	$479	$396	$425
Total PMPM	$1,001	$1,218	$1,137	$1,030
Relative Cost[2]	0.96	1.17	1.09	0.99
% Hight-Cost Claimants[3]	0.9%	1.3%	1.1%	0.7%

% of Diabetics

Diabetics After Anxiety	Diabetics Before Anxiety	Diabetics without Anxiety
4.6%	7.8%	87.6%

PMPM

Diabetics After Anxiety	Diabetics Before Anxiety	Diabetics without Anxiety
$1,001	$1,218	$1,030

Observations

- The cohort of diabetics with comorbid anxiety is smaller than that of those with comorbid sleep disorders.
- While overall PMPM appears relatively stable between the anxiety cohorts, the overall PMPM masks poor prescription adherence for the cohort with underlying anxiety.

[1] Type I diabetics are excluded from this analysis. Reflects CY 2022 claims experience
[2] Relative cost compares the PMPM of specified cohort to the PMPM of all diabetics in CY 2022
[3] High-cost Claimants (HCC) reflects the ratio of members who exceeded $100k in medical claims during the reporting period
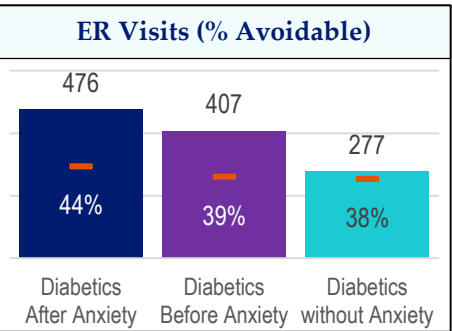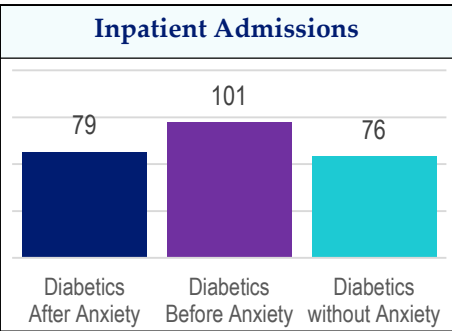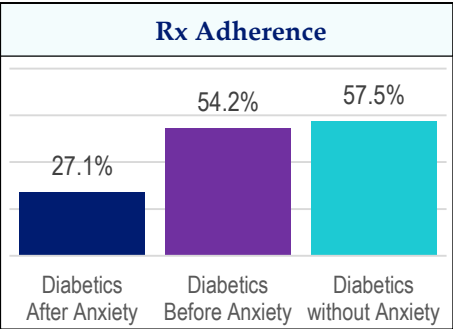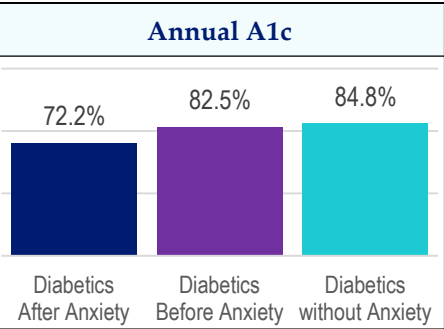[4] Percentage of ER visits deemed non-emergent and/or PC treatable. Based the NYU Center for Health and Public Service Research algorithm developed to help classify ER utilization
[5] Diabetic patients were deemed adherent when diabetes medication possession ratio (MPR = total days supply / 365) was 80% or higher

Segal

Mental Health – Anxiety Experience
Active and Non-Medicare Retiree

CY 2022 Categories	Diabetics[1] with Anxiety			Diabetics[1] Without Anxiety
	Diabetics After Anxiety	Diabetics Before Anxiety	Total	
Key Utilization Metrics (per 1,000)				
Inpatient Admissions	79	101	93	76
Emergency Room Visits	476	407	433	277
% Avoidable[4] ER Visits	44%	39%	41%	38%
Adherence Rates				
Annual HB A1c Test	72.2%	82.5%	78.6%	84.8%
Diabetes Rx Adherence[5]	27.1%	54.2%	44.1%	57.5%

Inpatient Admissions

Diabetics After Anxiety	Diabetics Before Anxiety	Diabetics without Anxiety
79	101	76

ER Visits (% Avoidable)

Diabetics After Anxiety	Diabetics Before Anxiety	Diabetics without Anxiety
476	407	277
44%	39%	38%

Annual A1c

Diabetics After Anxiety	Diabetics Before Anxiety	Diabetics without Anxiety
72.2%	82.5%	84.8%

Rx Adherence

Diabetics After Anxiety	Diabetics Before Anxiety	Diabetics without Anxiety
27.1%	54.2%	57.5%

Observations

Underlying Anxiety in Participants who Developed Diabetes

- This cohort experiences a significant impairment in medication adherence and needs intensive support to identify root causes and practical interventions.

- Recommended interventions for this cohort also include providing support and education about appropriate usage of emergency care.
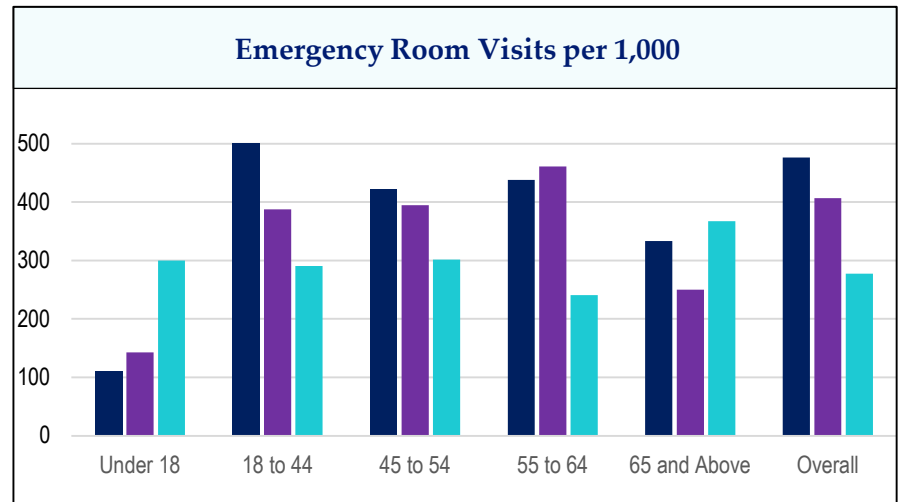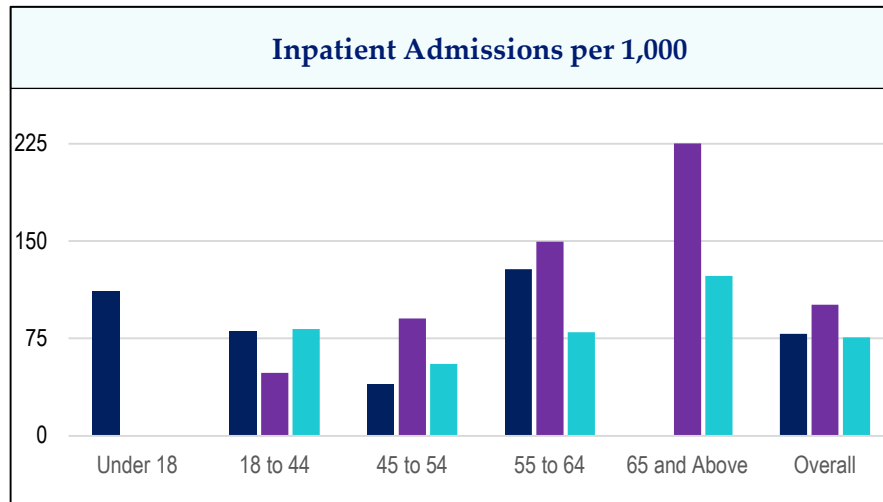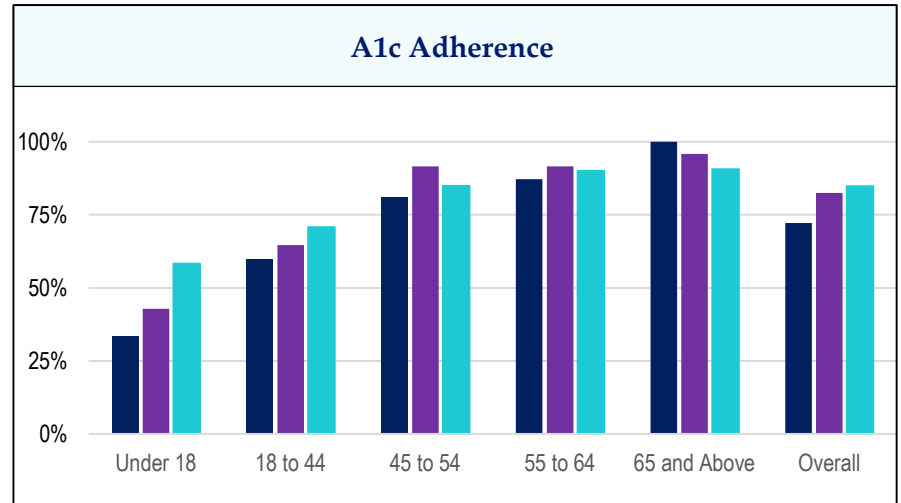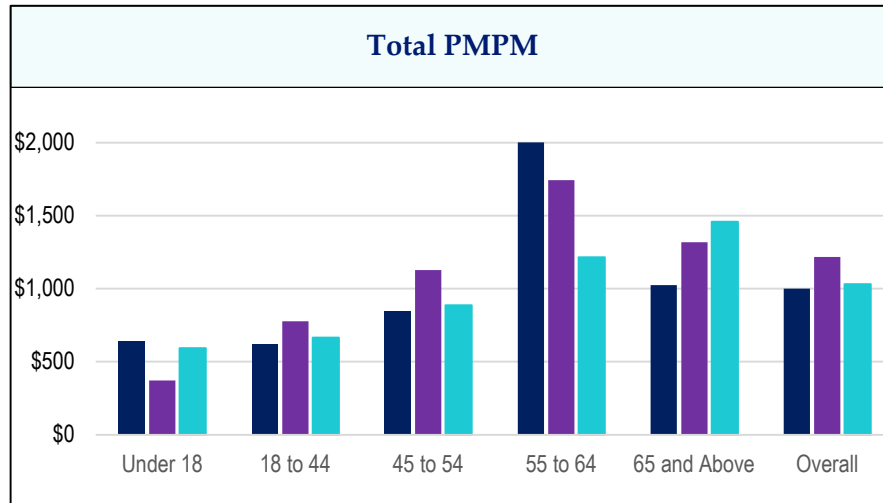
Diabetics who Developed Anxiety

- This cohort would benefit from greater support and healthcare navigation to proactive treatment before acute treatment becomes unavoidable.

- Recommended interventions include proactive outreach to frequently assess health and emotional status.

[1] Type I diabetics are excluded from this analysis. Reflects CY 2022 claims experience
[2] Relative cost compares the PMPM of specified cohort to the PMPM of all diabetics in CY 2022
[3] High-cost Claimants (HCC) reflects the ratio of members who exceeded $100k in medical claims during the reporting period
[4] Percentage of ER visits deemed non-emergent and/or PC treatable. Based the NYU Center for Health and Public Service Research algorithm developed to help classify ER utilization
[5] Diabetic patients were deemed adherent when diabetes medication possession ratio (MPR = total days supply / 365) was 80% or higher

Mental Health – Anxiety Experience by Age
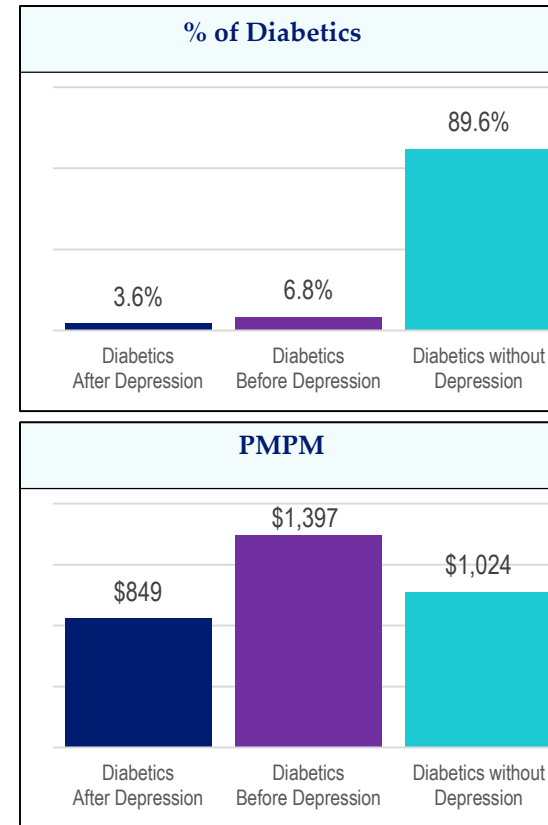## Active and Non-Medicare Retiree

Note: Type I diabetics are excluded from this analysis. Reflects CY 2022 claims experience.

Mental Health - Depression
Active and Non-Medicare Retiree

CY 2022 Categories	Diabetics[1] with Depression			Diabetics[1] Without Depression
	Diabetics After Depression	Diabetics Before Depression	Total	
Membership				
Members	332	622	954	8,223
% of Total	3.6%	6.8%	10.4%	89.6%
Average Age	43	50	47	52
% Female	82.5%	76.5%	78.6%	59.1%
Claim Experience				
Medical PMPM	$641	$777	$730	$609
Rx PMPM	$208	$620	$477	$415
Total PMPM	$849	$1,397	$1,207	$1,024
Relative Cost[2]	0.81	1.34	1.16	0.98
% Hight-Cost Claimants[3]	0.6%	0.6%	0.6%	0.8%

% of Diabetics

- Diabetics After Depression: 3.6%
- Diabetics Before Depression: 6.8%
- Diabetics without Depression: 89.6%

PMPM

- Diabetics After Depression: $849
- Diabetics Before Depression: $1,397
- Diabetics without Depression: $1,024

Observations

- The cohort of diabetics with comorbid depression is slightly smaller than the comorbid anxiety cohort.
- The overall PMPM masks poor medication adherence for the cohort with underlying depression, just as it did for the cohort with underlying anxiety.

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[1] Type I diabetics are excluded from this analysis. Reflects CY 2022 claims experience
[2] Relative cost compares the PMPM of specified cohort to the PMPM of all diabetics in CY 2022
[3] High-cost Claimants (HCC) reflects the ratio of members who exceeded $100k in medical claims during the reporting period
[4] Percentage of ER visits deemed non-emergent and/or PC treatable. Based the NYU Center for Health and Public Service Research algorithm developed to help classify ER utilization
[5] Diabetic patients were deemed adherent when diabetes medication possession ratio (MPR = total days supply / 365) was 80% or higher

Segal

Mental Health – Depression Experience
Active and Non-Medicare Retiree

CY 2022 Categories	Diabetics[1] with Depression			Diabetics[1] Without Depression
	Diabetics After Depression	Diabetics Before Depression	Total	
Key Utilization Metrics (per 1,000)				
Inpatient Admissions	70	120	103	75
Emergency Room Visits	462	457	459	278
% Avoidable[4] ER Visits	50%	34%	39%	39%
Adherence Rates				
Annual HB A1c Test	78.6%	85.4%	83.0%	84.2%
Diabetes Rx Adherence[5]	31.0%	59.0%	49.3%	56.6%

Inpatient Admissions

ER Visits (% Avoidable)

Annual A1c
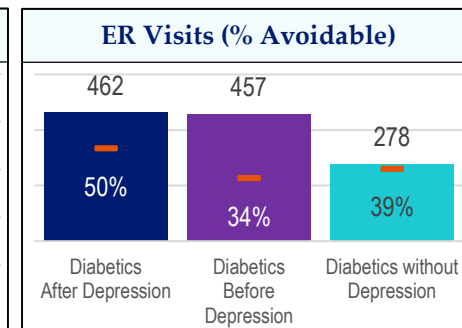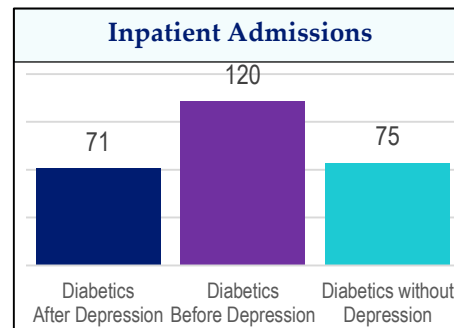
Rx Adherence

Observations

Underlying Depression in Participants who Developed Diabetes

- This cohort experiences a significant impairment in medication adherence and needs intensive support to identify root causes and practical interventions.

- Half of emergency visits may be avoidable for this cohort. Recommended interventions include providing support and education about appropriate usage of emergency care.

Diabetics who Developed Depression

- This cohort experiences the highest costs, driven largely by significantly higher inpatient admissions and high acuity of illness. This cohort would benefit from greater support and healthcare navigation to proactive treatment before acute treatment becomes unavoidable.

- Recommended interventions include proactive outreach to frequently assess health and emotional status.

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Mental Health – Depression Experience by Age
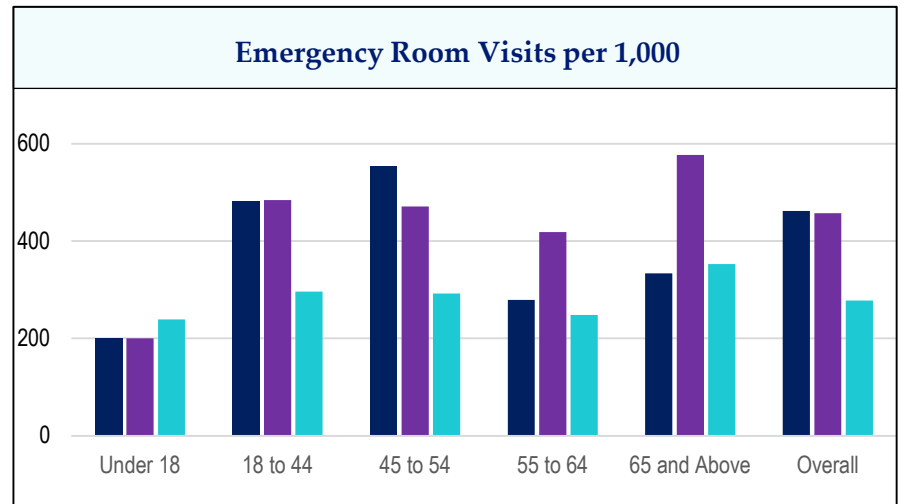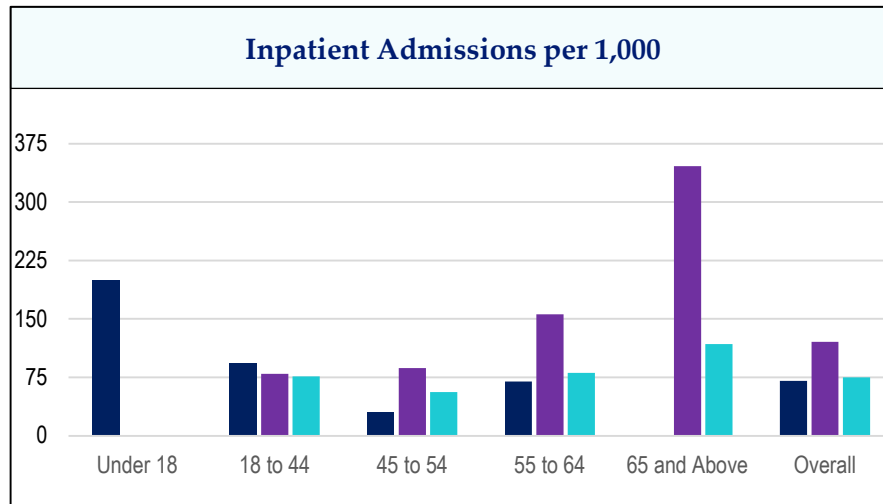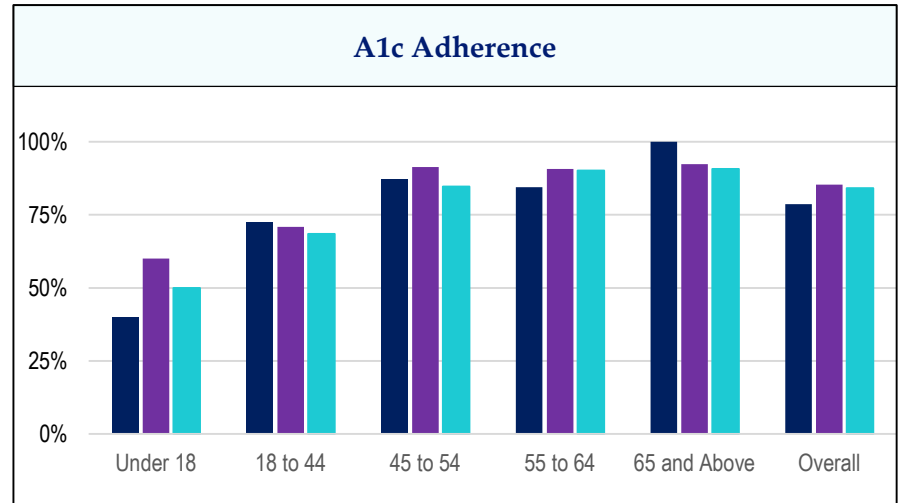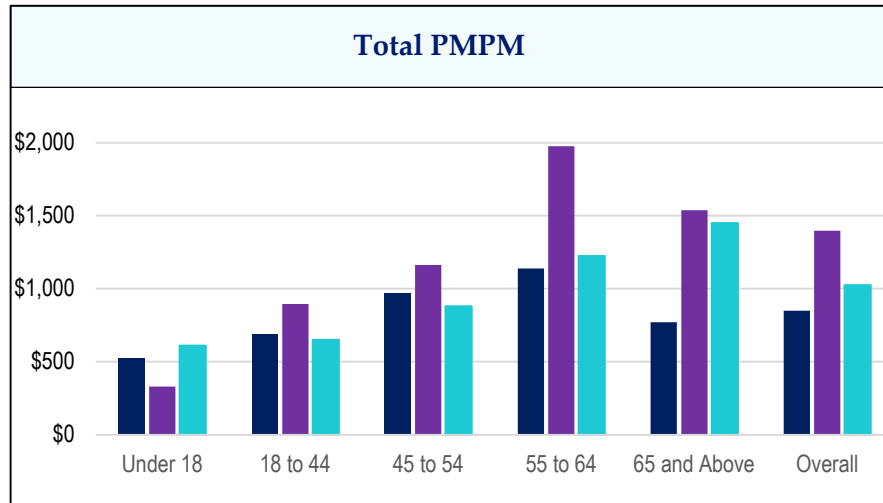
Active and Non-Medicare Retiree

Note: Type I diabetics are excluded from this analysis. Reflects CY 2022 claims experience.

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Mental Health and Pre-Diabetes
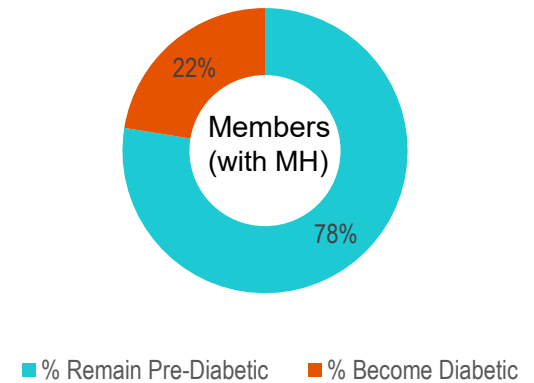## Active and Non-Medicare Retiree

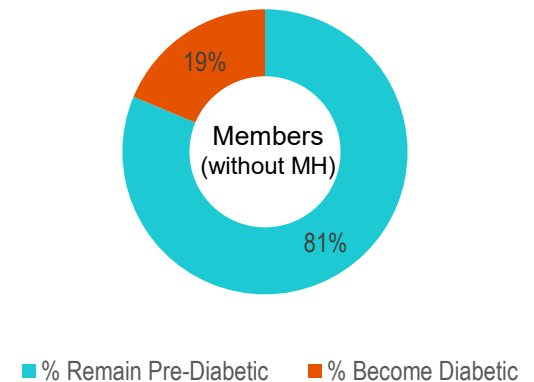| CY 2022	Neither Pre-Diabetics, Nor Diabetics	Pre-Diabetics	Diabetics[1]
Members	112,109	3,753	9,177
% of Members	90%	3%	7%
Medical Allowed PMPM	$283	$494	$622
Rx Allowed PMPM	$94	$176	$421
Total PMPM	**$378**	**$670**	**$1,043**
Relative Cost[2]	0.8	1.5	2.3
Inpatient Admissions Per 1,000	53	59	78
ER Visits Per 1,000	207	316	297

Observations

- 3% of Plan participants were identified as pre-diabetics. The top right chart shows that 22% of pre-diabetics with mental health ("MH") as a comorbidity become diabetics. On the other hand, 19% of pre-diabetics become diabetics with the absence of MH comorbidity.

- Pre-diabetics, on a PMPM basis, are 1.5 times costlier when compared to the PMPM of all Plan participants; diabetics are 2.3 times costlier.

Historical Pre-Diabetes Progression

Members (with MH)

22% / 78%

■ % Remain Pre-Diabetic ■ % Become Diabetic

Historical Pre-Diabetes Progression

Members (without MH)

19% / 81%

■ % Remain Pre-Diabetic ■ % Become Diabetic

Next Steps and Recommendations

1. As we saw in the series of these presentations, prevalence and costs of diabetes are high in the Plan and need to be addressed.

2. Comorbidities of diabetes present a higher burden of illness.

3. Mental health as a comorbidity of diabetes remains very high as well.

4. There are many vendors / point solutions out there that can help the Plan address these issues. Segal recommends the Plan implement a diabetic program that includes:
   - Mental health and other comorbidity monitoring and treatment integrated within the diabetic treatment module
   - Claims integration to facilitate identification of high-risk individuals for proactive outreach
   - Control over GLP-1 drug costs
   - Performance guarantees that address proactive outreach process measures in addition to outcomes measures for mental health and other comorbidities

5. Compare vendor fees; consider whether the vendor offers credits or allowances to offset its cost. Negotiate competitive vendor contracts that include performance guarantees.

6. Compliance considerations: MHPAEA, HSA/HDHPs, wellness rules, ERISA, etc.

7. Manage rollout and member engagement communications, which are important because the learning curve can be steep as participants adjust to the new user experience.

8. Measure the actuarial-driven ROI periodically.

Appendix

Are of Deprivation Index

About the Area Deprivation Index (ADI)

The Area Deprivation Index (ADI) is based on a measure created by the Health Resources & Services Administration (HRSA) over three decades ago, and has since been refined, adapted, and validated to the Census Block Group neighborhood level by Amy Kind, MD, PhD and her research team at the University of Wisconsin-Madison. It allows for rankings of neighborhoods by socioeconomic disadvantage in a region of interest (e.g. at the state or national level). It includes factors for the theoretical domains of income, education, employment, and housing quality. It can be used to inform health delivery and policy, especially for the most disadvantaged neighborhood groups.

https://www.neighborhoodatlas.medicine.wisc.edu/

What do the ADI values mean?

The ADIs on this website are provided in national percentile rankings at the block group level from 1 to 100. The percentiles are constructed by ranking the ADI from low to high for the nation and grouping the block groups/neighborhoods into bins corresponding to each 1% range of the ADI. Group 1 is the lowest ADI and group 100 is the highest ADI. A block group with a ranking of 1 indicates the lowest level of "disadvantage" within the nation and an ADI with a ranking of 100 indicates the highest level of "disadvantage".

Similarly, ADIs are also available in deciles from 1 to 10 for each individual state. The state deciles are constructed by ranking the ADI from low to high for each state alone without consideration of national ADIs. Again, group 1 is the lowest ADI (least disadvantaged) and 10 is the highest ADI (most disadvantaged).

Are of Deprivation Index

Map of Area Deprivation Index

https://www.neighborhoodatlas.medicine.wisc.edu/mapping