MILLIMAN WHITE PAPER

Prevalence and Treatment Costs for Alzheimer's Disease and Other Dementias, Stroke-Like Diagnoses, and Parkinson's Disease

A review of Medicare experience

Commissioned by Ceresti Health

Matthew Smith, FSA, MAAA
Ryan Jubber, ASA, MAAA
Nancy Gu

Milliman

Alzheimer's Disease and other Dementias (ADOD) affect 11.2% of the 2018 over-65 Medicare Fee-for-Service (FFS) population.[1] This paper provides information on prevalence and treatment costs for individuals with ADOD, Stroke or Stroke-Like Diagnoses (SLD), or Parkinson's Disease (PD).

Having a better understanding of prevalence and treatment costs for ADOD, SLD, and PD would enable plans and providers to more accurately project care needs for these populations. It can also help identify the potential for savings that exists by impacting the utilization and cost patterns for individuals diagnosed with these conditions. This can be particularly useful given that these populations often require additional support to manage their overall health, including family caregiver support.

Our analysis primarily focused on the Medicare Advantage (MA) market, using Milliman's *Consolidated Health Cost Guidelines Sources Database* (CHSD) to evaluate prevalence rates and total allowed costs for individuals identified with these conditions as reflected in historical claims data. We also used data from the Centers for Medicare and Medicaid Services (CMS) 5% Sample to compare results to our aggregate analysis of the MA population and to evaluate the Dual Eligible population.

Prevalence and Total Allowed Cost

For individuals with ADOD, SLD, or PD, we observed prevalence rate and total allowed per member per month (PMPM) costs to Medicare Advantage plans in 2018 as shown in Figure 1. We identified members with these conditions using two distinct methods that a payer might use when examining its claims data: (i) diagnoses made at any point in 2018, or (iii) diagnoses made at any point in 2016-2018. Figure 1 illustrates the findings for both methods. Appendices 3 and 4 show additional data for these population sets, including cost detail by category of service. Please note that in both cases, we summarized 2018 experience; only the identification period varies between the two sets.

FIGURE 1: PREVALENCE AND COST, 2018 MEDICARE ADVANTAGE POPULATION

	MEMBERS IDENTIFIED FROM 2018 CLAIMS		MEMBERS IDENTIFIED FROM 2016-2018 CLAIMS	
CONDITION	PREVALENCE	TOTAL ALLOWED PMPM	PREVALENCE	TOTAL ALLOWED PMPM
Alzheimer's or Dementia (ADOD)	7.3%	$3,025	8.5%	$2,812
Stroke or Stroke-Like Diagnoses (SLD)	5.8%	$3,263	7.8%	$2,767
Parkinson's Disease (PD)	1.6%	$2,568	1.8%	$2,470
Any[2]	12.5%	$2,847	15.0%	$2,576
None	87.5%	$996	85.0%	$988
All Members	100%	$1,223	100%	$1,223

[1] CMS (October 2020). Alzheimer's Disease Disparities in Medicare Fee-For-Service Beneficiaries. Data Snapshot. Retrieved July 11, 2021, from https://www.cms.gov/About-CMS/Agency-Information/OMH/Downloads/OMHDataSnapshot_Alzheimers_Final_508.pdf.

[2] "Any" condition refers to any of ADOD, SLD, and/or PD. Some members may have more than one of the specified conditions. "None" refers to members who do not have any of the three conditions.

In Figure 1, “Total Allowed PMPM” represents the total cost of medical and prescription drug care, including both member cost sharing and costs paid by health plans. Some members were identified with more than one of these conditions; thus, the prevalence rate for “Any” condition was lower than the sum of the rates for the individual conditions.

In our study population, the costs to an MA plan for members who have one or more of these conditions were 2.5 to 3 times higher than members without these conditions. Note that these are total costs, not normalized for risk adjustment. The risk-normalized costs of these members would be lower; for instance, other research found that the risk-normalized costs for the ADOD population were only 11% above costs for the overall Medicare FFS population. [3]

Appendix 2 displays comparisons of prevalence and cost values provided in our study to other sources. Other comparisons are discussed where appropriate.

Longitudinal Analysis

Figure 2 shows the annual identification of ADOD, SLD, and PD between 2016 and 2018. This figure tracks all members identified with the specified condition in 2016, excluding members who terminated coverage before 2018. Additional detail underlying these exhibits, including for members newly diagnosed in 2017, is presented in Appendix 5.

Figure 2 highlights that not all members identified with a condition in 2016 have another identifying claim in subsequent years. In the case of ADOD we found that 27% of individuals with 2016 diagnoses did not have an ADOD diagnosis in 2017. This potential “under-diagnosis gap” can have a direct impact on plan revenues through risk score-adjusted premiums.[4]

FIGURE 2: ANNUAL IDENTIFICATION OF ADOD, SL, AND PD IN MEMBERS[5]

CONDITION	2016 STATUS	2017 STATUS	2018 STATUS
ADOD	Full cohort of members identified with condition ("Yes")	Yes - 73%	Yes - 62%
			No - 11%
		No - 27%	Yes - 9%
			No - 18%
CONDITION	**2016 STATUS**	**2017 STATUS**	**2018 STATUS**
SLD	Full cohort of members identified with condition ("Yes")	Yes - 47%	Yes - 29%
			No - 17%
		No - 53%	Yes - 10%
			No - 43%
CONDITION	**2016 STATUS**	**2017 STATUS**	**2018 STATUS**
PD	Full cohort of members identified with condition ("Yes")	Yes - 84%	Yes - 76%
			No - 8%
		No - 16%	Yes - 4%
			No - 12%

[3] Pyenson, B., Sawhney, T.G., Steffens, C. et al. (July 2019). The Real-World Medicare Costs of Alzheimer Disease: Considerations for Policy and Care. *Journal of Managed Care & Specialty Pharmacy*. Retrieved July 11, 2021, from https://www.jmcp.org/doi/pdf/10.18553/jmcp.2019.25.7.800.

[4] In MA, members are assigned risk scores based on demographic and condition data. Risk scores are higher for members who have an underlying diagnosis representing conditions expected to have higher claim costs. Plan revenues are adjusted by total member risk scores.

[5] Members identified with a condition in a given year are flagged as "Yes." The 2016 cohort represents all members identified with that condition in 2016; the 2017 and 2018 cohorts split between those reidentified with the condition (“Yes”) and those no longer identified (“No").

Possible reasons for these "dropped" diagnosis codes include the following:

MISDIAGNOSIS

Some members without diagnoses codes in 2017 and 2018 may have been incorrectly diagnosed with a condition in 2016. Such members may be particularly likely to be present in the "Yes-No-No" cohort.

As noted in Appendix 1, our approach to exclusions may result in a more inclusive data set than some other studies. This may also create some false positives.

RECOVERY

Some members with dropped codes may have recovered from their conditions. As with false positives, recovered members may be more likely to be present in the "Yes-No-No" cohort.

The SLD population, for example, has a much larger percentage of "Yes-No-No" members than ADOD and PD. As noted by the CDC, some people recover fully from strokes in weeks or months. [6] This may be the source of the higher rate of dropped diagnosis codes for SLD.

LACK OF DIAGNOSES

Some members with dropped codes may not have been re-diagnosed with the condition in 2017, 2018, or both.

This lack of diagnoses could represent members who did not receive care for the condition, or who received care but did not have a diagnosis code recorded. Identifying which of the above explanations most applies to our data was beyond the scope of our study but may be a productive avenue for future analysis.

We also note that the potential under-diagnosis gaps highlighted in Figure 2 could be more relevant to plans going forward due to the addition of Hierarchical Condition Categories (HCCs) 51 and 52 (Dementia with and without complications) to CMS's Part C risk adjuster as of 2020. For Medicare Advantage members, these HCCs have risk factors (or coefficients) ranging from 0.346 (NonDual) to 0.453 (FBDual), among the aged population. [7] These weighting factors translate to an additional $4,000 to $5,500 in annual health plan benchmark revenue for every member diagnosed with dementia.

For plans with material portions of their population experiencing Dementia, filling in these under-diagnosis gaps could substantially impact revenue.

Age Group

Figures 3 and 4 below show prevalence and average cost by age group. Additional detail is provided in Appendix 6.

FIGURE 3: DISEASE PREVALENCE BY AGE GROUP

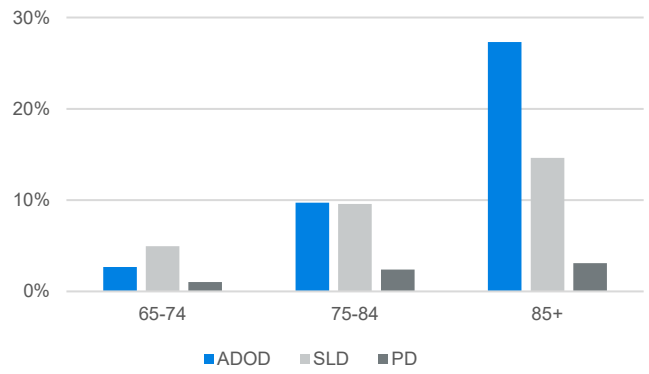
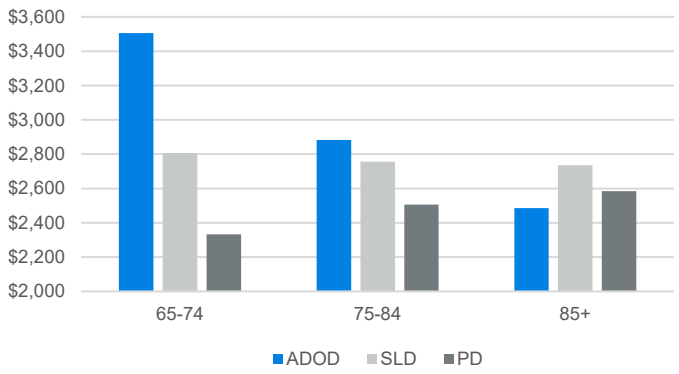


FIGURE 4: AVERAGE 2018 COST OF PEOPLE WITH DISEASE BY AGE GROUP



[6] CDC. Recovering From Stroke. Retrieved July 11, 2021, from https://www.cdc.gov/stroke/recovery.htm.

[7] CMS (April 1, 2019). Announcement of Calendar Year (CY) 2020 Medicare Advantage Capitation Rates and Medicare Advantage and Part D Payment Policies and Final Call Letter, data table on p. 76. Retrieved July 11, 2021, from https://www.cms.gov/Medicare/Health-Plans/MedicareAdvtgSpecRateStats/Downloads/Announcement2020.pdf.

The prevalence of the neurological conditions in our study increased materially with age. For instance, 27% of those aged 85 and over had a diagnosis of ADOD as determined from 2016-2018 claims data.

Meanwhile, costs as a function of age varied by condition. Note that costs for the 65-74-year-old ADOD population are substantially higher than for the other age groups. A recent study on dementia costs in Australia showed a similar result, where total costs peaked in the 75-79 age group for males and in the 70-74 age group for females. [8]

Dual Eligible Population

Because the CHSD data set does not track members by Dual status, we instead used the CMS 5% Sample data to evaluate this population. Figure 5 illustrates the prevalence rates for Full-Benefit Dually Eligible (FBDE), Partial, and Non-Duals among the FFS population determined from the CMS 5% sample using only 2018 data. [9] Additional detail is provided in Appendix 7.

FIGURE 5: 5% SAMPLE: PREVALANCE RATES BY CONDITION AND DUAL STATUS

	ADOD	NON-ADOD	ALL FFS	% ADOD	SLD	NON-SLD	ALL FFS	% SLD	PD	NON-PD	ALL FFS	% PD
All	178,459	1,680,124	1,858,583	9.6%	114,392	1,744,191	1,858,583	6.2%	32,882	1,825,701	1,858,583	1.8%
FBDE	56,727	122,243	178,970	31.7%	23,978	154,992	178,970	13.4%	7,804	171,166	178,970	4.4%
Partial	5,798	52,399	58,197	10.0%	4,612	53,585	58,197	7.9%	857	57,340	58,197	1.5%
Non-Dual	115,934	1,247,071	1,363,005	8.5%	85,802	1,277,203	1,363,005	6.3%	24,221	1,338,784	1,363,005	1.8%
% FBDE	31.8%	7.3%	9.6%		21.0%	8.9%	9.6%		23.7%	9.4%	9.6%	
% Dual	35.0%	10.4%	12.8%		25.0%	12.0%	12.8%		26.3%	12.5%	12.8%	

In the 5% Sample data, ADOD, SLD and PD each had a higher prevalence among Dual Eligible members than among the larger Medicare FFS population. One cause of the higher prevalence may be members depleting their resources or income over time due to high out-of-pocket costs, thus becoming eligible for Medicaid.[10] Poverty may also be a risk factor for these conditions.

Figure 5 highlights a particularly high prevalence of ADOD (31.7%) in FBDE members, as compared the prevalence among Partial Duals (10.0%) and Non-Duals (8.5%). Similar relationships applied to SLD and PD.

We also note that for PD, the prevalence rate among Partial Duals (1.5%) was lower than the prevalence rate among non-duals (1.8%); the reverse relationship held for ADOD and SLD.

Although these results were determined using FFS data rather than MA data, this finding may also be relevant for Dual Eligible SNP (D-SNP) plans given their focus on the FBDE population. Most people living with ADOD are not-dual eligible; however, for plans with large Dual Eligible membership (particularly D-SNPs), the high prevalence of ADOD in their FBDE population may be a material driver of costs.

The above results can be compared to the rates in the 2019 paper in the Journal of Managed Care and Specialty Pharmacy entitled “The Real-World Medicare Costs of Alzheimer Disease: Considerations for Policy and Care”, which found that 15% of patients with dementia were Dual Eligible 8 years before death, a rate that rose to 30% in the year of death (9% and 15% for non-dementia population). [11] While our results showed a higher rate of dual status overall among the ADOD population, we also observed a pattern of substantial correlation between Dual Eligibility and ADOD diagnoses.

We can also compare ADOD prevalence rates for Dual Eligible status members from the CMS Chronic Conditions Warehouse (CCW) data, which shows 9.4% prevalence for non-dual eligible members 65 and older (we calculated 8.5%), and 29.3% prevalence for Dual Eligible members 65 and older (we calculated 26.4%).

[8] Brown, L., Hansnata, E., & La, H.A. Economic Cost of Dementia in Australia 2016-2056: Report Prepared for Alzheimer’s Australia. University of Canberra. Retrieved July 11, 2021, from https://researchprofiles.canberra.edu.au/en/publications/economic-cost-of-dementia-in-australia-2016-2056-report-prepared-.

[9] CMS defines the FBDE population as qualifying for the full package of Medicaid benefits; see March 2020 Fact Sheet, “People Dually Eligible for Medicare and Medicaid.”

[10] Garfield, R., Musumeci, M., Reaves, E., & Damico, A. (October 19, 2015). Medicaid's Role for People With Dementia. Kaiser Family Foundation. Retrieved July 11, 2021, from https://www.kff.org/medicaid/issue-brief/medicaids-role-for-people-with-dementia/.

[11] Pyenson, B., Sawhney, T.G., Steffens, C. et al. (July 2019), op cit.

Costs by Condition Code Frequency

For each of the three conditions studied (ADOD, SLD, and PD), we found that overall costs increased significantly as the number of claims containing a diagnosis code for the condition increased.

Figure 6 shows the number of MA members and their costs stratified by the number of claims with the specified diagnoses in 2018, for all members identified as having the condition at any point in 2016-2018. We provide additional data in Appendix 8.

FIGURE 6: COSTS BY CONDITION CODE FREQUENCY

	ADOD		SLD		PD	
	ADOD MEMBER COUNT	TOTAL ALLOWED PMPM	SLD MEMBER COUNT	TOTAL ALLOWED PMPM	PD MEMBER COUNT	TOTAL ALLOWED PMPM
All Members with 2016-2018 Condition Claims	205,914	$2,812	190,879	$2,767	43,085	$2,470
No Condition Claims in 2018	28,184	$1,429	50,745	$1,416	4,293	$1,520
1-5 Condition Claims	107,408	$2,778	96,697	$2,724	18,865	$2,059
6-30 Condition Claims	64,418	$3,166	39,472	$4,018	17,354	$2,643
31+ Condition Claims	5,904	$6,078	3,965	$9,311	2,573	$5,699

In Figure 6, members identified as having a condition in the 2016-2018 period, but without condition-specific claims in 2018, had higher claim costs than the overall Medicare Advantage population ($1,223 PMPM, from Figure 1). This suggests that members who are identified as having one of these conditions could have above-average claims in future years, even if they are subject to the "under-diagnosis gap" discussed earlier in the paper.

Summary of Results

In this paper, we have analyzed data on the ADOD, SLD, and PD populations, focusing on prevalence and costs. Our findings included the following:

- **Overall prevalence and allowed cost of these conditions in the 2018 MA population**. We found that costs for members with one or more of these conditions were substantially higher than for members without these conditions.
- **The annual rate of re-identification of these conditions in members who had previously been diagnosed**. We found evidence of a potential under diagnosis gap as not all members with a condition in 2016 have another identifying claim in subsequent years.
- **Prevalence and allowed costs of these conditions by age group**. Our analysis showed that the prevalence of these conditions increases materially with age. Meanwhile, costs as a function of age varied by condition. Most notably, the costs for the 65-74-year-old ADOD population are substantially higher than for the other age groups.
- **Dual Eligible population prevalence rates in FFS data**. We saw that ADOD, SLD and PD each had a higher prevalence among Dual Eligible members than among the larger Medicare FFS population. The prevalence of these conditions in FBDE members was particularly high compared to the prevalence among Partial Duals and Non-Duals.
- **Costs by frequency of condition codes**. We found that overall costs increased substantially as the number of claims containing a diagnosis code for the condition increased. Also, members identified as having a condition in the 2016-2018 period, but without condition-specific claims in 2018, had higher claim costs than the overall Medicare Advantage population. This suggests that members who are identified as having one of these conditions could have above-average claims in future years, even if they are subject to the "under-diagnosis gap" discussed earlier in the paper.

Caveats

The results presented here were based on historical data in Milliman's *Consolidated Health Cost Guidelines Sources Database* (CHSD) in 2016-2018 and the CMS 5% sample in 2018. The CHSD data may not be fully representative of the overall MA market. The results presented here were on a nationwide basis and represented a population consistent with the underlying datasets; results for other populations, payors, or providers may vary due to demographics, local practice patterns, negotiated reimbursement levels, or other factors. Differences between our condition definitions and those used in other analyses or studies could also result in differences in prevalence, cost, or both.

This report was commissioned by Ceresti Health, a provider of digital caregiver support for individuals with cognitive impairments and their caregivers. The findings reflect the research of the authors. Milliman does not endorse any product or organization.

CONTACT

Matthew Smith
matthew.smith@milliman.com

Ryan Jubber
ryan.jubber@milliman.com

Nancy Gu
nancy.gu@milliman.com

Appendix 1: Methodology and Data Sources

DATA SOURCES

We rely on two primary claims databases for this analysis:

1. 2016-2018 Milliman Consolidated Health Cost Guidelines ™ Database (CHSD). This is a multi-year, multi-line of business, longitudinal claims and enrollment data structure used in product production, internal research, and client engagements. This database has over 120 million unique members across all lines, and over 2 million unique members in Medicare Advantage.
2. 2018 CMS 5% Sample Files. These files include claims and membership for a 5% sample of the Medicare population including Inpatient Facility, Outpatient Facility, Home Health Agency, Hospice, SNF, DME, and Part B claims.

National results discussed in this paper reflect the distribution of individuals within these two databases and have not been adjusted to reflect a standard geographic distribution of the United States.

IDENTIFICATION CODES

Using the CHSD data for the Aged MA Population (65+) in each of the years 2016-2018, and the 5% sample data for 2018, we identify patients with diagnosis codes suggestive of Alzheimer's or Dementia; Stroke or Stroke-Like symptoms; or Parkinson's Disease. Identification was performed concurrently; a member with an ADOD claim in 2018 was flagged as having ADOD in 2018, for instance.

We then use these identifying flags to summarize prevalence and cost rates across the identified population. The diagnosis codes used are listed in Figure 7 below. Codes at a greater level of detail are also included in the analysis; for instance, F01.50 and F01.51 are included for the ADOD category.

FIGURE 7: IDENTIFIERS BY CONDITION

ICD-10 Codes for Alzheimer's Disease / Dementia (ADOD)	F01, F02, F03, F04, F05, F06.1, F06.8, G13.8, G30, G31, G31.2, G94, R41.81, R54
ICD-10 Codes for Stroke or Stroke-Like (SLD)	G45.0, G45.1, G45.2, G45.8, G45.9, G46, G97.3, I60, I61, I63, I66, I67.84, I67.89, I97.810, I97.811, I97.820, I97.821
ICD-10 Codes for Parkinson's Disease (PD)	G20, G21.11, G21.19, G21.8, G23.1, G23.2, G31.83, G31.85, G90.3

We can compare our list of codes with the list from CMS's Chronic Conditions Data Warehouse (CCW) for both ADOD and SL. For ADOD we observed no differences. For SLD, we observed that the CCW list of 153 claim ICD-10 codes excluded two codes (I63.033 and I63.133) which our analysis included.

For PD, the codes listed above are based on information provided by the Lewin Group in their 2019 "Economic Burden and Future Impact of Parkinson's Disease Final Report" paper[12]. We note that other studies have used different definitions of Parkinson's or Parkinsonism: for instance, the Lewin Group paper, the 2020 paper "Mediterranean Dietary Pattern at Middle Age and Risk of Parkinson's Disease: A Swedish Cohort Study"[13], and the 2019 paper "Linking Individual Patient Data to Estimate Incidence and Prevalence of Parkinson's Disease by Comparing Reports of Neurological Services and Pharmacy Prescription Refills at a Nationwide Level"[14] each used a different code definition Opining on the relative merits or demerits of the differing PD code sets is outside the scope of this analysis.

EXCLUSIONS

We counted all medical claims with flagged diagnoses, as opposed to applying an additional metric of requiring members to have one IP or two OP claims (as CMS CCW uses for Stroke, but not ADOD). This results in a consistent methodology applied across all conditions.

[12] Lewin Group (July 5, 2019). Economic Burden and Future Impact of Parkinson's Disease: Final Report, p. 11. Retrieved July 11, 2021, from https://www.michaeljfox.org/sites/default/files/media/document/2019%20Parkinson%27s%20Economic%20Burden%20Study%20-%20FINAL.pdf.

[13] Yin, W. et al. (October 20, 2020). Mediterranean Dietary Pattern at Middle Age and Risk of Parkinson's Disease: A Swedish Cohort Study. *Movement Disorders*. Retrieved July 11, 2021, from https://movementdisorders.onlinelibrary.wiley.com/doi/full/10.1002/mds.28314.

[14] Szatmari Jr., S. et al. (June 18, 2019). Linking Individual Patient Data to Estimate Incidence and Prevalence of Parkinson's Disease by Comparing Reports of Neurological Services and Pharmacy Prescription Refills at a Nationwide Level. *Frontiers in Neurology*. Retrieved July 11, 2021, from https://www.frontiersin.org/articles/10.3389/fneur.2019.00640/full.

We also did not exclude claims given certain primary diagnoses. This is relevant for our Stroke or Stroke-Like Diagnoses cohort. CMS CCW's definition of stroke excludes claims with primary diagnosis of Z581, S01, S02, or S06 (primarily relating to Traumatic Brain Injury). Our identification methodology instead targeted members with stroke or stroke-like conditions, based on the potential need for reliance on family caregivers. There may therefore be differences in values between this group and patients diagnosed strictly with stroke.

Our approach to exclusions may result in a more inclusive data set as compared to some other studies. It may also create some false positive results, as noted in the "Longitudinal Analysis" section.

MEMBERSHIP DEFINITION

We restricted the CHSD data to only use individuals who had both Medical and Rx coverage for at least part of 2018, to be consistent with what most MA plans' membership will look like. We did not remove members for ESRD or Hospice status. We also did not remove members who died, of these conditions or other causes.

AGE DEFINITION

For our age group analysis, we tracked members by age group (65-74; 75-84; and 85+) based on their age as of 2018.

CMS 5% SAMPLE MEMBER DEFINITION

For our CMS 5% sample analysis, we studied 2018 data for members who had both Part A and B coverage, tracking available member-level status information, such as dual-eligibility flags.

Appendix 2 - Comparison to Other Studies

TABLE 2A - ADOD COMPARISONS

VARIABLE	MILLIMAN VALUE	OTHER STUDY VALUE	OTHER STUDY DETAIL
ADOD Prevalence Rate	7.3% - MA ADOD prevalence using 2018 data	6.5% - MA ADOD prevalence using 2016 claims	Diagnosed prevalence of Alzheimer's disease and related dementias in Medicare Advantage plans Eric Jutkowitz,Julie P.W. Bynum,Susan L. Mitchell, et all Published 05 July 2020
ADOD Prevalence Rate	9.6% - 5% Sample prevalence using 2018 data	11.2% - FFS prevalence rate, 2016-2018 data	Alzheimer's Disease Disparities in Medicare Fee-For-Service Beneficiaries CMS Data Snapshot October 2020 (we assume the CMS study used 2016-2018 claims data due to CCW definition)
ADOD Prevalence Rate, 65+	9.6% - 5% Sample prevalence using 2018 data	11.9% FFS prevalence rate, 2016-2018 data	CMS Chronic Conditions Warehouse
ADOD PMPM Medical Cost	$2,500 - Total MA Medical Allowed PMPM in 2018, identified using 2016-2018 data	$2,241 FFS PMPM - 2018 claims, identified using 2016-2018 data	CMS Chronic Conditions Warehouse
ADOD PMPM Medical Cost	$2,716 - Total MA Medical Allowed PMPM in 2018, using 2018 data	$2,241 FFS PMPM - 2018 claims, identified using 2016-2018 data	CMS Chronic Conditions Warehouse

TABLE 2B - SLD COMPARISONS

VARIABLE	MILLIMAN VALUE	OTHER STUDY VALUE	OTHER STUDY DETAIL
SLD Prevalence Rate	5.8% - MA SLD prevalence using 2018 data	3.9% - FFS stroke prevalence rate, members 65 and older	CMS Chronic Conditions Warehouse
SLD Prevalence Rate	6.2% - FFS SLD prevalence using 2018 data	3.9% - FFS stroke prevalence rate, members 65 and older	CMS Chronic Conditions Warehouse
SLD PMPM Medical Cost	$2,943 - Total MA Medical Allowed PMPM in 2018, using 2018 data	$2,886 - FFS stroke PMPM, using 2018 data	CMS Chronic Conditions Warehouse
SLD PMPM Medical Cost	$3,001 - Total FFS Medical Allowed PMPM in 2018, using 2018 data	$2,886 - FFS stroke PMPM, using 2018 data	CMS Chronic Conditions Warehouse

TABLE 2C - PD COMPARISONS

VARIABLE	MILLIMAN VALUE	OTHER STUDY VALUE	OTHER STUDY DETAIL
PD Prevalence Rate	1.8% - MA PD prevalence in 2018, identified using 2016- 2018 data	1.69% - 2017 PD Prevalence, Medicare Population, 65+	Current and projected future economic burden of Parkinson's disease in the U.S. Wenya Yang, Jamie L. Hamilton, Catherine Kopil, et all Published 09 July 2020
PD Prevalence Rate	1.8% - MA PD prevalence in 2018, identified using 2016-2018 data	1.33% - 2017 PD Prevalence, US Population, 65-74	Economic Burden and Future Impact of Parkinson's Disease LewinGroup Final Report July 5, 2019
PD Prevalence Rate	1.8% - MA PD prevalence in 2018, identified using 2016-2018 data	2.18% - 2017 PD Prevalence, US Population, 75+	Economic Burden and Future Impact of Parkinson's Disease LewinGroup Final Report July 5, 2019

Appendix 3 - Detailed Exhibits - CHSD MA Population, 2018

CONDITION FLAGS USING 2018 CLAIMS

TABLE 3A - HIGH LEVEL REVIEW

	MEMBERSHIP INFORMATION		PREVALENCE RATE	TOTAL COST PMPM		
CONDITION	MEMBER COUNT	MEMBER MONTHS	% OF MEMBERS	MEDICAL	RX	COMBINED
ADOD	177,730	1,851,322	7.3%	$2,716	$308	$3,025
SLD	140,134	1,524,343	5.8%	$2,943	$320	$3,263
PD	38,792	420,505	1.6%	$2,189	$379	$2,568
Any Condition	304,537	3,252,867	12.5%	$2,535	$312	$2,847
No Condition	2,131,540	23,261,550	87.5%	$797	$199	$996
All MA Population*	2,436,077	26,514,417	100%	$1,010	$213	$1,223

*All MA Population Includes Members with Cognitive Disorders

TABLE 3B - DETAILS BY TYPES OF SERVICE

	IP HOSPITALIZATION				READMISSION	
CONDITION	ADMITS PER 1,000	% OF ALL ADMITS	DAYS PER 1,000	% OF ALL DAYS	READMISSION RATES	% OF ALL READMISSIONS
ADOD	796	25%	5,910	31%	10%	35%
SLD	853	22%	6,205	27%	9%	28%
PD	552	4%	3,950	5%	8%	5%
Any Condition	718	40%	5,163	47%	9%	50%
No Condition	151	60%	811	53%	7%	50%
All MA Population*	220	100%	1,345	100%	8%	100%

	IP COST		SNF COST		OP COST	
CONDITION	AVERAGE COST (PER ADMIT)	ALLOWED PMPM	AVERAGE COST (PER ADMIT)	ALLOWED PMPM	AVERAGE COST (PER VISIT)	ALLOWED PMPM
ADOD	$17,916	$1,188	$8,769	$259	$327	$356
SLD	$18,805	$1,336	$8,570	$191	$417	$467
PD	$17,341	$798	$8,981	$187	$351	$369
Any Condition	$18,253	$1,092	$8,669	$192	$374	$392
No Condition	$17,686	$222	$7,672	$16	$446	$221
All MA Population*	$17,913	$329	$8,263	$38	$430	$242

	ED VISIT		ED COST	
CONDITION	ED PER 1000	% OF ALL ED	AVERAGE COST (PER VISIT)	ALLOWED PMPM
ADOD	933	19%	$805	$63
SLD	908	15%	$942	$71
PD	793	4%	$801	$53
Any Condition	846	30%	$852	$60
No Condition	273	70%	$660	$15
All MA Population*	343	100%	$718	$21

TABLE 3B - DETAILS BY TYPES OF SERVICE (CONTINUED)

	PROF COST		OTHER MEDICAL COST		RX COST	
CONDITION	AVERAGE COST (PER PROCEDURE OR VISIT)	ALLOWED PMPM	AVERAGE COST (PER PROCEDURE)	ALLOWED PMPM	AVERAGE COST (PER SCRIPT)	ALLOWED PMPM
ADOD	$92	$514	$178	$337	$68	$308
SLD	$98	$608	$164	$271	$84	$320
PD	$95	$499	$175	$283	$89	$379
Any Condition	$95	$524	$171	$276	$77	$312
No Condition	$94	$266	$118	$56	$93	$199
All MA Population*	$94	$298	$135	$83	$90	$213

Appendix 4 - Detailed Exhibits - CHSD MA Population, 2016-2018

CONDITION FLAGS USING 2016-2018 CLAIMS

TABLE 4A - HIGH LEVEL REVIEW

	MEMBERSHIP INFORMATION		PREVALENCE RATE	TOTAL COST PMPM		
CONDITION	MEMBER COUNT	MEMBER MONTHS	% OF MEMBERS	MEDICAL	RX	COMBINED
ADOD	205,914	2,135,966	8.5%	$2,500	$312	**$2,812**
SLD	190,879	2,083,965	7.8%	$2,450	$317	**$2,767**
PD	43,085	463,666	1.8%	$2,094	$377	**$2,470**
Any Condition	366,328	3,921,157	15.0%	$2,265	$310	**$2,576**
No Condition	2,069,749	22,593,260	85.0%	$792	$196	**$988**
All MA Population*	2,436,077	26,514,417	100%	$1,010	$213	**$1,223**

*All MA Population Includes Members with Cognitive Disorders

TABLE 4B - DETAILS BY TYPES OF SERVICE

	IP HOSPITALIZATION				READMISSION	
CONDITION	ADMITS PER 1,000	% OF ALL ADMITS	DAYS PER 1,000	% OF ALL DAYS	READMISSION RATES	% OF ALL READMISSIONS
ADOD	734	27%	5,415	32%	10%	37%
SLD	710	25%	5,078	30%	9%	31%
PD	533	4%	3,804	5%	8%	5%
Any Condition	639	43%	4,544	50%	9%	53%
No Condition	148	57%	789	50%	7%	47%
All MA Population*	220	100%	1,345	100%	8%	100%

	IP COST		SNF COST		OP COST	
CONDITION	AVERAGE COST (PER ADMIT)	ALLOWED PMPM	AVERAGE COST (PER ADMIT)	ALLOWED PMPM	AVERAGE COST (PER VISIT)	ALLOWED PMPM
ADOD	$17,580	$1,075	$8,686	$232	$323	$340
SLD	$18,022	$1,066	$8,334	$155	$393	$410
PD	$17,031	$757	$8,856	$176	$345	$357
Any Condition	$17,865	$951	$8,570	$165	$368	$366
No Condition	$17,948	$221	$7,755	$16	$451	$220
All MA Population*	$17,913	$329	$8,263	$38	$430	$242

TABLE 4B - DETAILS BY TYPES OF SERVICE (CONTINUED)

	ED VISIT		ED COST	
CONDITION	ED PER 1000	% OF ALL ED	AVERAGE COST (PER VISIT)	ALLOWED PMPM
ADOD	877	21%	$790	$58
SLD	810	19%	$885	$60
PD	772	4%	$793	$51
Any Condition	779	34%	$827	$54
No Condition	268	66%	$663	$15
All MA Population*	343	100%	$718	$21

	PROF COST		OTHER MEDICAL COST		RX COST	
CONDITION	AVERAGE COST (PER PROCEDURE OR VISIT)	ALLOWED PMPM	AVERAGE COST (PER PROCEDURE)	ALLOWED PMPM	AVERAGE COST (PER SCRIPT)	ALLOWED PMPM
ADOD	$91	$485	$176	$311	$71	$312
SLD	$95	$530	$160	$229	$85	$317
PD	$94	$482	$173	$270	$88	$377
Any Condition	$94	$484	$168	$245	$80	$310
No Condition	$94	$266	$118	$55	$93	$196
All MA Population*	$94	$298	$135	$83	$90	$213

Appendix 5 - Longitudinal Analysis, CHSD MA Population, 2018

TABLE 5A - ADOD

2016 STATUS	2017 STATUS	2018 STATUS	MEMBER COUNT	% OF "YES IN 2016" TOTAL
With Claim (Yes)	Yes	Yes	23,245	62%
With Claim (Yes)	Yes	No	4,293	11%
With Claim (Yes)	No	Yes	3,211	9%
With Claim (Yes)	No	No	6,766	18%

2016 STATUS	2017 STATUS	2018 STATUS	MEMBER COUNT	% OF "YES IN 2017" TOTAL
Without Claim (No)	Yes	Yes	33,009	66%
Without Claim (No)	Yes	No	17,125	34%

TABLE 5B - SLD

2016 STATUS	2017 STATUS	2018 STATUS	MEMBER COUNT	% OF "YES IN 2016" TOTAL
With Claim (Yes)	Yes	Yes	10,461	29%
With Claim (Yes)	Yes	No	6,238	17%
With Claim (Yes)	No	Yes	3,742	10%
With Claim (Yes)	No	No	15,235	43%

2016 STATUS	2017 STATUS	2018 STATUS	MEMBER COUNT	% OF "YES IN 2017" TOTAL
Without Claim (No)	Yes	Yes	21,627	42%
Without Claim (No)	Yes	No	29,272	58%

TABLE 5C - PD

2016 STATUS	2017 STATUS	2018 STATUS	MEMBER COUNT	% OF "YES IN 2016" TOTAL
With Claim (Yes)	Yes	Yes	6,980	76%
With Claim (Yes)	Yes	No	722	8%
With Claim (Yes)	No	Yes	366	4%
With Claim (Yes)	No	No	1,138	12%

2016 STATUS	2017 STATUS	2018 STATUS	MEMBER COUNT	% OF "YES IN 2017" TOTAL
Without Claim (No)	Yes	Yes	7,791	76%
Without Claim (No)	Yes	No	2,433	24%

Appendix 6 - Exhibit by Age Group, CHSD MA Population, 2018

TABLE 6A - ENTIRE 2018 POPULATION; CONDITION FLAGS USING 2016-2018 CLAIMS

	MEMBERSHIP INFORMATION		TOTAL COST		
CONDITION	MEMBER COUNT	PENETRATION	MEDICAL PMPM	RX PMPM	TOTAL ALLOWED PMPM
ADOD	205,914	8.5%	$2,500	$312	$2,812
SLD	190,879	7.8%	$2,450	$317	$2,767
PD	43,085	1.8%	$2,094	$377	$2,470
Any Condition	366,328	15.0%	$2,265	$310	$2,576
No Condition	2,069,749	85.0%	$792	$196	$988
All MA Population	2,436,077	100%	$1,010	$213	$1,223

TABLE 6B - 65-74 YEARS OLD

	MEMBERSHIP INFORMATION		TOTAL COST		
CONDITION	MEMBER COUNT	PENETRATION	MEDICAL PMPM	RX PMPM	TOTAL ALLOWED PMPM
ADOD	34,433	2.7%	$3,071	$434	$3,505
SLD	63,923	5.0%	$2,436	$369	$2,806
PD	13,265	1.0%	$1,889	$444	$2,333
Any Condition	97,956	7.6%	$2,365	$382	$2,747
No Condition	1,191,536	92.4%	$689	$195	$883
All MA Population	1,289,492	100%	$818	$209	$1,027

TABLE 6C - 75-84 YEARS OLD

	MEMBERSHIP INFORMATION		TOTAL COST		
CONDITION	MEMBER COUNT	PENETRATION	MEDICAL PMPM	RX PMPM	TOTAL ALLOWED PMPM
ADOD	78,142	9.7%	$2,545	$337	$2,882
SLD	76,995	9.6%	$2,442	$313	$2,755
PD	19,237	2.4%	$2,132	$374	$2,506
Any Condition	144,039	17.9%	$2,268	$317	$2,585
No Condition	660,646	82.1%	$892	$203	$1,095
All MA Population	804,685	100%	$1,132	$223	$1,354

TABLE 6D - 85+ YEARS OLD

	MEMBERSHIP INFORMATION		TOTAL COST		
CONDITION	MEMBER COUNT	PENETRATION	MEDICAL PMPM	RX PMPM	TOTAL ALLOWED PMPM
ADOD	93,339	27.3%	$2,243	$242	$2,486
SLD	49,961	14.6%	$2,481	$254	$2,736
PD	10,583	3.1%	$2,292	$292	$2,584
Any Condition	124,333	36.4%	$2,181	$242	$2,423
No Condition	217,567	63.6%	$1,029	$180	$1,209
All MA Population	341,900	100%	$1,430	$202	$1,632

Appendix 7 - Exhibit by Dual Status, 5% Sample Data, 2018

TABLE 7A - ALL FFS MEMBERS

	MEMBERSHIP INFORMATION		PREVALENCE RATE	TOTAL MEDICAL COST
CONDITION	MEMBER COUNT	MEMBER MONTHS	% OF MEMBERS	ALLOWED PMPM
ADOD	178,459	1,483,699	9.6%	$3,023
SLD	114,392	1,082,821	6.2%	$3,001
PD	32,882	304,282	1.8%	$2,557
Any Condition	266,965	2,404,836	14.4%	$2,705
No Condition	1,333,207	14,286,586	71.7%	$771
All FFS*	1,858,583	19,964,802	100%	$1,049

*Excluding ESRD

TABLE 7B FULL-BENEFIT DUAL ELIGIBLE MEMBERS

	MEMBERSHIP INFORMATION		PREVALENCE RATE	TOTAL MEDICAL COST
CONDITION	MEMBER COUNT	MEMBER MONTHS	% OF MEMBERS	ALLOWED PMPM
ADOD	56,727	420,551	31.7%	$3,158
SLD	23,978	185,147	13.4%	$3,904
PD	7,804	60,262	4.4%	$3,216
Any Condition	69,032	528,884	38.6%	$3,091
No Condition	109,938	985,938	61.4%	$1,090
All Full-Benefit Dual Eligible	178,970	1,514,822	100%	$1,788

TABLE 7C - PARTIAL DUAL MEMBERS

	MEMBERSHIP INFORMATION		PREVALENCE RATE	TOTAL MEDICAL COST
CONDITION	MEMBER COUNT	MEMBER MONTHS	% OF MEMBERS	ALLOWED PMPM
ADOD	5,798	40,988	10.0%	$3,467
SLD	4,612	37,091	7.9%	$3,267
PD	857	6,512	1.5%	$2,711
Any Condition	9,389	72,070	16.1%	$3,024
No Condition	48,808	438,052	83.9%	$886
All Dual Partial	58,197	510,122	100%	$1,188

TABLE 7D - NON-DUAL MEMBERS

	MEMBERSHIP INFORMATION		PREVALENCE RATE	TOTAL MEDICAL COST
CONDITION	MEMBER COUNT	MEMBER MONTHS	% OF MEMBERS	ALLOWED PMPM
ADOD	115,934	1,022,160	8.5%	$2,950
SLD	85,802	860,583	6.3%	$2,796
PD	24,221	237,508	1.8%	$2,386
Any Condition	188,544	1,803,882	13.8%	$2,579
No Condition	1,174,461	12,862,596	86.2%	$742
All Non Dual	1,363,005	14,666,478	100%	$968

Appendix 8 - Exhibit by Code Frequency, CHSD MA Population, 2018

TABLE 8A - ADOD

	MEMBER COUNT	MEDICAL PMPM	RX PMPM	TOTAL ALLOWED PMPM
Entire 2018 Population	205,914	$2,500	$312	**$2,812**
No Claims in 2018	28,184	$1,095	$334	**$1,429**
1-5 Claims in 2018	107,408	$2,479	$299	**$2,778**
6-30 Claims in 2018	64,418	$2,849	$317	**$3,166**
31+ Claims in 2018	**5,904**	**$5,692**	**$386**	**$6,078**

TABLE 8B - SLD

	MEMBER COUNT	MEDICAL PMPM	RX PMPM	TOTAL ALLOWED PMPM
Entire 2018 Population	190,879	$2,450	$317	**$2,767**
No Claims in 2018	50,745	$1,106	$310	**$1,416**
1-5 Claims in 2018	96,697	$2,407	$316	**$2,724**
6-30 Claims in 2018	39,472	$3,693	$325	**$4,018**
31+ Claims in 2018	**3,965**	**$8,958**	**$353**	**$9,311**

TABLE 8C - PD

	MEMBER COUNT	MEDICAL PMPM	RX PMPM	TOTAL ALLOWED PMPM
Entire 2018 Population	43,085	$2,094	$377	**$2,470**
No Claims in 2018	4,293	$1,164	$356	**$1,520**
1-5 Claims in 2018	18,865	$1,736	$323	**$2,059**
6-30 Claims in 2018	17,354	$2,233	$410	**$2,643**
31+ Claims in 2018	**2,573**	**$5,132**	**$567**	**$5,699**