



This document describes how we constructed the variables included in the Wave 1 Nursing Home measures file. The file contains one observation for each nursing home—identified by unique Centers for Medicare & Medicaid Services (CMS) certification number (CCN)—sampled for the Wave 1 Nursing Home Survey. The file contains variables describing characteristics of the facility based on the Minimum Data Set (MDS), Nursing Home Compare, and LTCFocus. It also contains variables based on the MDS that describe the demographic and health-related characteristics of all residents and the subset of residents with dementia. In addition, the file contains claims-based and managed care encounter-based information on hospitalizations, outpatient emergency department (ED) visits or observation stays, and Part D drug use among residents with dementia enrolled in Medicare.

Each measure falls into one of five broad categories of variables, specifically:

1. **Facility characteristics.** These variables describe characteristics of the nursing homes—for example, for-profit status, number of certified beds, and whether the facility is in a rural region. Many of the variables in this section are sourced from publicly available data sources, including CMS’s Nursing Home Compare and Brown University’s LTCFocus. As described in Table 1, some characteristics were also constructed from the 2022 MDS, the most recent data available when we began this work.
2. **Resident demographics and Medicare enrollment characteristics.** These variables describe the nursing homes’ residents at a single point in time in 2022, specifically on April 7, 2022. This is the first Thursday in April. This approach is based on methods developed by LTCFocus. As described by LTCFocus, “Research has shown that the nursing home population fluctuates both by season during the year and by day of the week. The nursing home population is highest during the winter months and lowest during the summer months. In addition, we have found that nursing home admissions and discharges fluctuate during each week, with the greatest number of admissions occurring on Mondays and the greatest number of discharges occurring on Fridays. We sought to avoid these issues by calculating all MDS prevalence measures based on the nursing home population on the first Thursday in April each year.”<sup>1</sup> The measures in this category cover four overlapping groups of residents. Specifically, we constructed measures using the 2022 MDS to describe the demographic characteristics of (1) the full population of residents; and (2) the subset of residents with dementia. In addition, among Medicare-enrolled residents, we used the calendar year 2022 Medicare Master Beneficiary Survey File (MBSF) to construct measures of Medicare enrollment characteristics (for example, the number of residents dually enrolled in Medicare and Medicaid) among (3) all residents enrolled in Medicare; and (4) residents with dementia enrolled in Medicare.
3. **Clinical characteristics of residents.** These measures describe the clinical characteristics of each nursing home’s population of residents with dementia on the first Thursday in April 2022. Most of these measures are based on the MDS assessment data—for example, variables that count the

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<sup>1</sup> LTCFocus. FAQs, available at: <https://ltcfocus.org/about>. Last accessed June 11, 2025.

number of residents with various conditions and variables that describe cognitive status, incontinence status, pain, and mean mortality risk score. Among residents with dementia enrolled in Medicare, we also used Medicare fee-for-service (FFS) and Medicare Advantage (MA) encounter data (excluding chart review records) to calculate hierarchical condition category (HCC) scores. For the HCC scores, we used 2021 FFS and MA encounter data to ensure that we had adequate claims history, particularly for any residents who died shortly after the first Thursday in April 2022.

4. **Variables related to Medicare Parts A and B service use.** These measures describe the number of acute hospitalizations and outpatient ED visits or observation stays from the nursing home among Medicare-enrolled residents with dementia at any time during 2022. (Unlike the measures described above, these are not limited to the population in each nursing home on the first Thursday in April). For these measures, we used Medicare FFS claims and MA encounter data to identify events—acute hospitalizations or outpatient ED visits or observation stays—that occurred on the discharge date of a nursing home stay or otherwise overlapped with a nursing home stay. For both acute hospitalizations and outpatient ED visits and observation stays, we also measured the number that were potentially avoidable.<sup>2</sup>
5. **Part D drug-related variables.** These measures describe Part D prescription drug fills and days' supply among Medicare-enrolled, Part D-covered residents with dementia in each nursing home at any time during 2022. For these residents, we measured the total number of Part D-paid claims and total days' supply for each of eight classes of medications, where the claims overlapped with a nursing home stay, except for the discharge date (we excluded claims on the discharge date because the fill might have occurred post-discharge in the community). We searched for Part D fills during any nursing home stay, even though Part A should cover the costs of medications during a Medicare-covered stay for post-acute care. Recent analyses suggest that Part D nonetheless pays for many prescription drug fills during Medicare post-acute care stays.<sup>3</sup>

In the following table, we provide detailed information on how we constructed each measure. For the July 1, 2025, Wave 1 release, we used MDS and Medicare enrollment, FFS, and MA Research Identifiable Files from the Virtual Research Data Center (VRDC) to construct these measures. Because we constructed these measures on the VRDC and not on the Linkage platform, we had to suppress all measures with fewer than

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<sup>2</sup> For more information about potentially avoidable hospitalizations and ED visits from the nursing home settings, see: Ouslander, J.G., G. Lamb, M. Perloe, J.H. Givens, L. Kluge, T. Rutland, A. Atherly, and D. Saliba. "Potentially Avoidable Hospitalizations of Nursing Home Residents: Frequency, Causes, and Costs." *Journal of the American Geriatrics Society*, vol. 58, no. 4, 2010, pp. 627–635. Also see: Walsh, E.G., J.M. Wiener, S. Haber, A. Bragg, M. Freiman, and J.G. Ouslander. "Potentially Avoidable Hospitalizations of Dually Eligible Medicare and Medicaid Beneficiaries from Nursing Facility and Home- and Community-Based Services Waiver Programs." *Journal of the American Geriatrics Society*, vol. 60, no. 5, 2012, pp. 821–829. Also, for a publication with a list of ICD-10 diagnosis codes for potentially avoidable hospitalizations, see: Hamasaki, Y., N. Sakata, X. Jin, T. Sugiyama, K. Morita, K. Uda, S. Matsuda, and N. Tamiya. "Facility Staffing Associated with Potentially Avoidable Hospitalizations in Nursing Home Residents in Japan: A Retrospective Cohort Study." *BMC Geriatrics*, vol. 23, 2023, article 566.

<sup>3</sup> See: U.S. Department of Health and Human Services Office of Inspector General. "Medicare Part D Paid Millions for Drugs for Which Payment Was Available Under the Medicare Part A Skilled Nursing Facility Benefit." Report number: A-09-21-03008. Posted on October 22, 2024. Available at: [Medicare Part D Paid Millions for Drugs for Which Payment Was Available Under the Medicare Part A Skilled Nursing Facility Benefit | Office of Inspector General | Government Oversight | U.S. Department of Health and Human Services](https://oig.hhs.gov/reports/all/2024/medicare-part-d-paid-millions-for-drugs-for-which-payment-was-available-under-the-medicare-part-a-skilled-nursing-facility-benefit/)<https://oig.hhs.gov/reports/all/2024/medicare-part-d-paid-millions-for-drugs-for-which-payment-was-available-under-the-medicare-part-a-skilled-nursing-facility-benefit/>. Last accessed June 11, 2025.

11 units (or where a user could otherwise back out a cell less than 11) to comply with the CMS suppression rules. In future releases of this file, we will construct the measures on Linkage and will be able to provide non-suppressed data (though end users will need to comply with CMS suppression rules for their analyses).

We used the following values to indicate that we suppressed values:

- .S = suppressed values for cell counts less than 11
- .A = also suppressed because otherwise an end user could back out a suppressed value (this is only relevant to categorical variables)

**Table 1.** Nursing home characteristics, as defined from MDS, Nursing Home Compare, LTCFocus, Medicare claims and enrollment data, and other administrative data sources

Variable name	Variable definition	Source data (year)
<b>Facility characteristics</b>		
PROVIDER_ENCRYPTED	The encrypted CCN for each nursing home created by Acumen	Acumen (2025)
FOR_PROFIT	<b>The profit status of the nursing home:</b> = 1 if nursing home is for-profit = 0 otherwise	Nursing Home Compare (2024)
TOT_BEDS	<b>Number of federally certified beds.</b>	Nursing Home Compare (2024)
NRESID_ALL	<b>Number of residents present on the first Thursday in April.</b> This is the number of residents who had at least one MDS assessment or entry tracking record on or before April 7, 2022 and no discharge assessment before April 7, 2022. This variable measures the total number of residents in the nursing home, including residents with and without dementia.	MDS (2021 and 2022)
NRESID_MCARE	<b>Number of residents present on the first Thursday in April who were enrolled in Medicare.</b> This is the total number of residents in the nursing home on the first Thursday in April 2022, as described above in NRESID_ALL, who were also enrolled in Medicare Part A or Part B in April 2022 based on MBSF data (MDCR_ENTLMNT_BUYIN_IND_04 was not equal to 0 [not Medicare enrolled for the month] or not equal to missing [not found in the 2022 MBSF]).	MDS (2021 and 2022); MBSF (2022)
N_D_RESID	<b>Number of residents present on the first Thursday in April who had dementia.</b> Among residents present on the first Thursday in April, this is the number with dementia based on the most recent MDS assessment on or before April 7, 2022 (where I4200_ALZHMR_CD = 1 or I4800_DMNT_CD = 1) or, for Medicare-enrolled residents, based on whether they met the Bynum-Standard criteria <sup>a</sup> for dementia based on FFS claims or MA encounter data (excluding chart review records) between April 8, 2021 and April 7, 2022. See Appendix Table 1 for a full list of dementia diagnosis codes.	MDS (2021 and 2022); Medicare FFS and MA inpatient, skilled nursing facility (SNF), outpatient, home health, hospice, and carrier files (2021 and 2022)
N_D_RESID_MCARE	<b>Number of residents present on the first Thursday in April who had dementia and were enrolled in Medicare.</b> This is the total number of residents with dementia in the nursing home on April 7, 2022 who were also enrolled in Medicare in April 2022, as described above in NRESID_MCARE.	MDS (2021 and 2022); MBSF (2022); Medicare FFS and MA inpatient, SNF, outpatient, home health, hospice, and carrier files (2021 and 2022)
N_D_MCARE_RESYRS	<b>Number of resident years among residents with dementia enrolled in Medicare in the facility.</b> This is calculated as the total number of resident days in the facility in 2022 among residents with dementia enrolled in Medicare, divided by 365. Residents with dementia had evidence of dementia on an assessment record (where I4200_ALZHMR_CD = 1 or	MDS (2021 and 2022); MBSF (2022); Medicare FFS and MA inpatient, SNF, outpatient, home

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Variable name	Variable definition	Source data (year)
	I4800_DMNT_CD = 1) or, for Medicare-enrolled residents, based on whether they met the Bynum-Standard criteria <sup>a</sup> for dementia based on FFS claims or MA encounter data in 2022. Residents enrolled in Medicare had evidence in the MSBF of Part A or Part B coverage anytime in 2022 (MDCR_ENTLMNT_BUYIN_IND_01 - MDCR_ENTLMNT_BUYIN_IND_12 were not equal to 0 [not Medicare enrolled] or not equal to missing [not found in the 2022 MBSF]) in all months. This variable is the denominator for the following four measures: (1) number of acute inpatient days from the nursing home per resident year (TOT_D_ACUTE_IP_DAYS); (2) number of acute inpatient days from the nursing home that were potentially avoidable per resident year (TOT_D_PAH_IP_DAYS); (3) number of outpatient ED visits (including observation stays) from the nursing home per resident year (TOT_D_ED_VISITS); and (4) number of outpatient ED visits (including observation stays) from the nursing home that were potentially avoidable per resident year (TOT_D_PAH_ED_VISITS_D), which are described below. This variable can help analysts distinguish zeros in the four measures listed above between facilities with no events (true zeros) (where N_D_MCARE_RESYRS > 0) versus facilities with no dementia residents during the year (where N_D_MCARE_RESYRS = 0).	health, hospice, and carrier files (2022)
N_D_MCARE_PTD_RESYRS	<b>Number of resident years in the facility among Medicare-covered residents with dementia who were enrolled in Part D.</b> This is calculated as the total number of resident days in the facility in 2022 among residents with dementia enrolled in Medicare Part D based on the MBSF (PTD_PLAN_CVRG_MONS ≥ 1), divided by 365. This variable can be used as the denominator for the Medicare Part D-related measures to calculate the number of claims (or fills) for specific drugs per Medicare Part D-covered resident with dementia in the year.	MDS (2021 and 2022); MBSF (2022); Medicare FFS and MA inpatient, SNF, outpatient, home health, hospice, and carrier files (2022)
N_D_ADMSN_FROM_HOSP	<b>The number of facility admissions from acute care hospitals among residents with dementia.</b> This is the number of nursing home stays for residents with dementia ages 55 and older (based on C_RSDNT_AGE_NUM) who were admitted from an acute care hospital (A1800_ENTRD_FROM_TXT= 03, indicating “entered from hospital”), and did not have a nursing home discharge in the 100 days before the admission. This measure can be used as the denominator to calculate the readmission rate for each facility (using NUM_D_REHOSP, described below, for the numerator). This measure includes residents with dementia present in the facility at any time in 2022.	MDS (2021 and 2022)
ALZUNIT	<b>Indicator variable for whether the nursing home has a dementia care unit:</b> = 1 if the facility has an Alzheimer’s disease special care unit = 0 if the facility does not have an Alzheimer’s disease special care unit = missing if it is unknown whether the facility has an Alzheimer’s disease special care unit (this applies to facilities in Alaska and the District of Columbia, which are not included in LTCFocus)	LTCFocus (2021)
HOSP_BASED	<b>Indicator variable for whether the nursing home was in a hospital:</b>	Nursing Home Compare (2024)

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Variable name	Variable definition	Source data (year)
	<p>= 1 if Nursing Home Compare indicated that the nursing home was in a hospital (Provider_Resides_in_Hospital = Y)</p> <p>= 0 Nursing Home Compare indicated that the nursing home was not located in a hospital (Provider_Resides_in_Hospital = N)</p>	
MULTIFAC	<p><b>Indicator variable for whether the nursing home was part of a chain:</b></p> <p>= 1 if Nursing Home Compare indicated that the nursing home was part of a group of nursing homes that shared at least one individual or organizational owner, officer, or entity with operational or managerial control (Affiliated_Entity_ID was not blank)</p> <p>= 0 if Nursing Home Compare indicated that the nursing home was <u>not</u> part of a group of nursing homes that shared at least one individual or organizational owner, officer, or entity with operational or managerial control (Affiliated_Entity_ID was blank)</p>	Nursing Home Compare (2024)
ADM_PER_BED	<b>Number of admissions per bed.</b> This is calculated as the number of admissions to each nursing home in 2022 based on the MDS divided by the number of federally certified beds from Nursing Home Compare.	MDS (2022); Nursing Home Compare (2022)
OCCPCT	<b>Occupancy rate on the first Thursday in April 2022.</b> This is calculated as the number of residents on the first Thursday in April 2022 from the MDS divided by the number of federally certified beds from Nursing Home Compare.	MDS (2021 and 2022) and Nursing Home Compare (2022)
PAYMCAID	<b>Percentage of facility residents whose primary support is Medicaid.</b> This variable will contain missing values for facilities in Alaska and District of Columbia.	LTCFocus (2021)
RUCA	<p><b>Primary rural-urban commuting area (RUCA) code of the nursing home's address:</b></p> <p>1 = Metropolitan area core: primary flow within an urbanized area (UA)</p> <p>2 = Metropolitan area high commuting: primary flow 30% or more to a UA</p> <p>3 = Metropolitan area low commuting: primary flow 10% to 30% to a UA</p> <p>4 = Micropolitan area core: primary flow within an urban cluster (UC) of 10,000 to 49,999 (large UC)</p> <p>5 = Micropolitan high commuting: primary flow 30% or more to a large UC</p> <p>6 = Micropolitan low commuting: primary flow 10% to 30% to a large UC</p> <p>7 = Small town core: primary flow within an urban cluster of 2,500 to 9,999 (small UC)</p> <p>8 = Small town high commuting: primary flow 30% or more to a small UC</p> <p>9 = Small town low commuting: primary flow 10% to 30% to a small UC</p> <p>10 = Rural areas: primary flow to a tract outside a UA or UC</p> <p>99 = Not coded: Census tract has zero population and no rural-urban identifier information</p>	Nursing Home Compare (2024) for address data; <a href="#">U.S. Department of Agriculture</a> (USDA) data for RUCA codes (2010)

Variable name	Variable definition	Source data (year)
RURAL	<b>Indicator variable for whether the nursing home is in a rural region:</b> = 1 if the nursing home's address is assigned to a RUCA equal to 7–10 = 0 otherwise	Nursing Home Compare (2024) for address data; <a href="#">U.S. Department of Agriculture (USDA)</a> data for RUCA codes (2010)
<b>Resident demographics and Medicare enrollment characteristics</b>		
<b><i>Among residents WITH DEMENTIA in the nursing home on the first Thursday in April (April 7, 2022)</i></b>		
AVG_AGE_D	<b>Mean age of residents with dementia.</b> This is the mean age of residents with dementia in the facility on the first Thursday in April, as described above in N_D_RESID, based on the C_RSDNT_AGE_NUM variable from the assessment record on or just before the first Thursday in April.	MDS (2021 and 2022) for age and dementia diagnosis; Medicare FFS and MA inpatient, SNF, outpatient, home health, hospice, and carrier files for dementia diagnoses (2021 and 2022)
NUM_D_AGE_CAT_LT65	<b>Number of residents with dementia who were younger than 65.</b> This is the number of residents with dementia in the facility on the first Thursday in April, as described above in N_D_RESID, in this age category based on the C_RSDNT_AGE_NUM variable from the assessment record on or just before the first Thursday in April.	MDS (2021 and 2022) for age and dementia diagnosis; Medicare FFS and MA inpatient, SNF, outpatient, home health, hospice, and carrier files for dementia diagnoses (2021 and 2022)
NUM_D_AGE_CAT_65_69	<b>Number of residents with dementia who were between ages 65 and 69.</b> This is the number of residents with dementia in the facility on the first Thursday in April, as described above in N_D_RESID, in this age category based on the C_RSDNT_AGE_NUM variable from the assessment record on or just before the first Thursday in April.	MDS (2021 and 2022) for age and dementia diagnosis; Medicare FFS and MA inpatient, SNF, outpatient, home health, hospice, and carrier files for dementia diagnoses (2021 and 2022)
NUM_D_AGE_CAT_70_74	<b>Number of residents with dementia who were between ages 70 and 74.</b> This is the number of residents with dementia in the facility on the first Thursday in April, as described above in N_D_RESID, in this age category based on the C_RSDNT_AGE_NUM variable from the assessment record on or just before the first Thursday in April.	MDS (2021 and 2022) for age and dementia diagnosis; Medicare FFS and MA inpatient, SNF, outpatient, home health, hospice, and carrier files for dementia diagnoses (2021 and 2022)
NUM_D_AGE_CAT_75_79	<b>Number of residents with dementia who were between ages 75 and 79.</b> This is the number of residents with dementia in the facility on the first Thursday in April, as described above in N_D_RESID, in this age category based on the C_RSDNT_AGE_NUM variable from the assessment record on or just before the first Thursday in April.	MDS (2021 and 2022) for age and dementia diagnosis; Medicare FFS and MA inpatient, SNF, outpatient, home health, hospice, and carrier

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Variable name	Variable definition	Source data (year)
		files for dementia diagnoses (2021 and 2022)
NUM_D_AGE_CAT_80_84	<b>Number of residents with dementia who were between ages 80 and 84.</b> This is the number of residents with dementia in the facility on the first Thursday in April, as described above in N_D_RESID, in this age category based on the C_RSDNT_AGE_NUM variable from the assessment record on or just before the first Thursday in April.	MDS (2021 and 2022) for age and dementia diagnosis; Medicare FFS and MA inpatient, SNF, outpatient, home health, hospice, and carrier files for dementia diagnoses (2021 and 2022)
NUM_D_AGE_CAT_85P	<b>Number of residents with dementia who were ages 85 and older.</b> This is the number of residents with dementia in the facility on the first Thursday in April, as described above in N_D_RESID, in this age category based on the C_RSDNT_AGE_NUM variable from the assessment record on or just before the first Thursday in April.	MDS (2021 and 2022) for age and dementia diagnosis; Medicare FFS and MA inpatient, SNF, outpatient, home health, hospice, and carrier files for dementia diagnoses (2021 and 2022)
NUM_D_FEMALE	<b>Number of residents with dementia in the nursing home who were female.</b> This is the number of residents with dementia in the facility on the first Thursday in April, as described above in N_D_RESID, who were female (A0800_GNDR_CD = 2) based on the assessment record on or just before the first Thursday in April.	MDS (2021 and 2022); Medicare FFS and MA inpatient, SNF, outpatient, home health, hospice, and carrier files (2021 and 2022)
NUM_D_BLACK	<b>Number of residents with dementia in the nursing home who were Black.</b> This is the number of residents with dementia in the facility on the first Thursday in April, as described above in N_D_RESID, who were Black (A1000C_AFRCN_AMRCN_CD = 1) based on the assessment record on or just before the first Thursday in April. Note that a resident might be counted in more than one race or ethnicity category.	MDS (2021 and 2022); Medicare FFS and MA inpatient, SNF, outpatient, home health, hospice, and carrier files (2021 and 2022)
NUM_D_HISPANIC	<b>Number of residents with dementia in the nursing home who were Hispanic.</b> This is the number of residents with dementia in the facility on the first Thursday in April, as described above in N_D_RESID, who were Hispanic (A1000D_HSPNC_CD = 1) based on the assessment record on or just before the first Thursday in April. Note that a resident might be counted in more than one race or ethnicity category.	MDS (2021 and 2022); Medicare FFS and MA inpatient, SNF, outpatient, home health, hospice, and carrier files (2021 and 2022)
NUM_D_WHITE	<b>Number of residents with dementia in the nursing home who were White.</b> This is the number of residents with dementia in the facility on the first Thursday in April, as described above in N_D_RESID, who were White (A1000F_WHT_CD = 1) based on the assessment record on or just before the first Thursday in April. Note that a resident might be counted in more than one race or ethnicity category.	MDS (2021 and 2022); Medicare FFS and MA inpatient, SNF, outpatient, home health, hospice, and carrier files (2021 and 2022)
NUM_D_DUAL	<b>Number of Medicare residents with dementia in the nursing home who were dually eligible for Medicare or Medicaid (full or partial).</b> This is the number of residents with	MDS (2021 and 2022); Medicare FFS and MA inpatient, SNF,



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Variable name	Variable definition	Source data (year)
	dementia in the facility on the first Thursday in April who were enrolled in Medicare, as described above in N_D_RESID_MCARE, and who were dually eligible for Medicare and Medicaid in the month (DUAL_STUS_CD_04 = 01, 02, 03, 04, 05, 06, or 08).	outpatient, home health, hospice, and carrier files (2021 and 2022); MBSF (2022)
NUM_D_LIS	<b>Number of Medicare residents with dementia in the nursing home who were eligible for a Part D low-income drug subsidy.</b> This is the number of residents with dementia in the facility on the first Thursday in April who were enrolled in Medicare, as described above in N_D_RESID_MCARE, and who were eligible for a low-income drug subsidy in the month (CST_SHR_GRP_CD_04 = 01–08).	MDS (2021 and 2022); Medicare FFS and MA inpatient, SNF, outpatient, home health, hospice, and carrier files (2021 and 2022); MBSF (2022)
NUM_D_DUALORLIS	<b>Number of Medicare residents with dementia in the nursing home who were dually eligible for Medicare and Medicaid or who were eligible for a Part D low-income drug subsidy in April 2022.</b> This is the number of residents with dementia in the facility on the first Thursday in April who were enrolled in Medicare, as described above in N_D_RESID_MCARE, and who were either dually eligible for Medicare and Medicaid or eligible for a low-income drug subsidy in the month (DUAL_STUS_CD_04 = 01, 02, 03, 04, 05, 06, or 08 <u>or</u> CST_SHR_GRP_CD_04 = 01–08).	MDS (2021 and 2022); Medicare FFS and MA inpatient, SNF, outpatient, home health, hospice, and carrier files (2021 and 2022); MBSF (2022)
NUM_D_MA_ENRLD	<b>Number of Medicare residents with dementia in the nursing home who were enrolled in MA in April 2022.</b> This is the number of residents with dementia in the facility on the first Thursday in April who were enrolled in Medicare, as described above in N_D_RESID_MCARE, and who were enrolled in a MA plan in the month (HMO_IND_04 = 1, 2, A, B, C).	MDS (2021 and 2022); Medicare FFS and MA inpatient, SNF, outpatient, home health, hospice, and carrier files (2021 and 2022); MBSF (2022)
NUM_D_PARTD	<b>Number of Medicare residents with dementia in the nursing home who were enrolled in Part D in April 2022.</b> This is the number of residents with dementia in the facility on the first Thursday in April who were enrolled in Medicare, as described above in N_D_RESID_MCARE, and who had Part D coverage in the month. (The first value of PTD_CNTRCT_ID_04 = {H, R, S, E} or the first value of PTD_CNTRCT_ID_04 = X and is followed by four alphanumeric characters).	MDS (2021 and 2022); Medicare FFS and MA inpatient, SNF, outpatient, home health, hospice, and carrier files (2021 and 2022); MBSF (2022)
<b>Among ALL RESIDENTS (with and without dementia) in the nursing home on the first Thursday in April (April 7, 2022)</b>		
AVG_AGE_ALL	<b>Mean age of all residents in the nursing home.</b> This is the mean age of all residents in the facility on the first Thursday in April, as described above in NRESID_ALL, based on the C_RSDNT_AGE_NUM variable from the assessment record on or just before the first Thursday in April.	MDS (2021 and 2022)
NUM_ALL_AGE_CAT_LT65	<b>Number of residents who were younger than 65.</b> This is the number of residents in the facility on the first Thursday in April, as described above in NRESID_ALL, in this age category based on the C_RSDNT_AGE_NUM variable from the assessment record on or just before the first Thursday in April.	MDS (2021 and 2022)

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Variable name	Variable definition	Source data (year)
NUM_ALL_AGE_CAT_65_69	<b>Number of residents who were between ages 65 and 69.</b> This is the number of residents in the facility on the first Thursday in April, as described above in NRESID_ALL, in this age category based on the C_RSDNT_AGE_NUM variable from the assessment record on or just before the first Thursday in April.	MDS (2021 and 2022)
NUM_ALL_AGE_CAT_70_74	<b>Number of residents who were between ages 70 and 74.</b> This is the number of residents in the facility on the first Thursday in April, as described above in NRESID_ALL, in this age category based on the C_RSDNT_AGE_NUM variable from the assessment record on or just before the first Thursday in April.	MDS (2021 and 2022)
NUM_ALL_AGE_CAT_75_79	<b>Number of residents who were between ages 75 and 79.</b> This is the number of residents in the facility on the first Thursday in April, as described above in NRESID_ALL, in this age category based on the C_RSDNT_AGE_NUM variable from the assessment record on or just before the first Thursday in April.	MDS (2021 and 2022)
NUM_ALL_AGE_CAT_80_84	<b>Number of residents who were between ages 80 and 84.</b> This is the number of residents in the facility on the first Thursday in April, as described above in NRESID_ALL, in this age category based on the C_RSDNT_AGE_NUM variable from the assessment record on or just before the first Thursday in April.	MDS (2021 and 2022)
NUM_ALL_AGE_CAT_85P	<b>Number of residents who were ages 85 and older.</b> This is the number of residents in the facility on the first Thursday in April, as described above in NRESID_ALL, in this age category based on the C_RSDNT_AGE_NUM variable from the assessment record on or just before the first Thursday in April.	MDS (2021 and 2022)
NUM_ALL_FEMALE	<b>Number of residents in the nursing home who were female.</b> This is the number of residents in the facility on the first Thursday in April, as described above in NRESID_ALL, who were female (A0800_GNDR_CD = 2) based on the assessment record on or just before the first Thursday in April.	MDS (2021 and 2022)
NUM_ALL_BLACK	<b>Number of residents in the nursing home who were Black.</b> This is the number of residents in the facility on the first Thursday in April, as described above in NRESID_ALL, who were Black (A1000C_AFRCN_AMRCN_CD = 1) based on the assessment record on or just before the first Thursday in April. Note that a resident might be counted in more than one race or ethnicity category.	MDS (2021 and 2022)
NUM_ALL_HISPANIC	<b>Number of residents in the nursing home who were Hispanic.</b> This is the number of residents in the facility on the first Thursday in April, as described above in NRESID_ALL, who were Hispanic (A1000D_HSPNC_CD = 1) based on the assessment record on or just before the first Thursday in April. Note that a resident might be counted in more than one race or ethnicity category.	MDS (2021 and 2022)

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Variable name	Variable definition	Source data (year)
NUM_ALL_WHITE	<b>Number of residents in the nursing home who were White.</b> This is the number of residents in the facility on the first Thursday in April, as described above in NRESID_ALL, who were White (A1000F_WHT_CD = 1) based on the assessment record on or just before the first Thursday in April. Note that a resident might be counted in more than one race or ethnicity category.	MDS (2021 and 2022)
NUM_ALL_DUAL	<b>Number of Medicare residents in the nursing home who were dually eligible for Medicare or Medicaid (full or partial) in April 2022.</b> This is the number of residents in the facility on the first Thursday in April who were enrolled in Medicare, as described above in NRESID_MCARE, and who were dually eligible for Medicare and Medicaid in the month (DUAL_STUS_CD_04 = 01, 02, 03, 04, 05, 06, or 08).	MDS (2021 and 2022); MBSF (2022)
NUM_ALL_LIS	<b>Number of Medicare residents in the nursing home who were eligible for a Part D low-income drug subsidy in April 2022.</b> This is the number of residents in the facility on the first Thursday in April who were enrolled in Medicare, as described above in NRESID_MCARE, and who were eligible for a low-income drug subsidy in the month (CST_SHR_GRP_CD_04 = 01–08)	MDS (2021 and 2022); MBSF (2022)
NUM_ALL_DUALORLIS	<b>Number of Medicare residents in the nursing home who were dually eligible for Medicare and Medicaid or who were eligible for a Part D low-income drug subsidy in April 2022.</b> This is the number of residents in the facility on the first Thursday in April who were enrolled in Medicare, as described above in NRESID_MCARE, and who were either dually eligible for Medicare and Medicaid or eligible for a low-income drug subsidy in the month (DUAL_STUS_CD_04 = 01, 02, 03, 04, 05, 06, or 08 or CST_SHR_GRP_CD_04 = 01–08).	MDS (2021 and 2022); MBSF (2022)
NUM_ALL_MA_ENRLD	<b>Number of Medicare residents in the nursing home who were enrolled in MA in April 2022.</b> This is the number of residents in the facility on the first Thursday in April who were enrolled in Medicare, as described above in NRESID_MCARE, and who were enrolled in a MA plan in the month (HMO_IND_04 = 1, 2, A, B, C).	MDS (2021 and 2022); MBSF (2022)
NUM_ALL_PARTD	<b>Number of Medicare residents in the nursing home who were enrolled in Part D in April 2022.</b> This is the number of residents with dementia in the facility on the first Thursday in April who were enrolled in Medicare, as described above in NRESID_MCARE, and who had Part D coverage in the month. (The first value of PTD_CNTRCT_ID_04 = {H, R, S, E} or the first value of PTD_CNTRCT_ID_04 = X and is followed by four alphanumeric characters).	MDS (2021 and 2022); MBSF (2022)
<b>Clinical characteristics of residents with dementia in the facility on the first Thursday in April (April 7, 2022)</b>		
NUM_D_HIGH_CFS	<b>Number of residents with dementia with a cognitive function score (CFS) of 4 (severe cognitive impairment).</b> This is the number of residents with dementia who did not complete the Brief Interview for Mental Status (BIMS) and had a cognitive performance score (CPS) score equal to 5 or 6—meaning that they were either in a coma or they had severe functional	MDS (2021 and 2022)

Variable name	Variable definition	Source data (year)
	impairment and were dependent on assistance for eating—based on the assessment record on or just before the first Thursday in April. We calculated the CFS using the algorithm developed by Thomas et al. (2017), <sup>b</sup> which uses the BIMS, if completed, otherwise the CPS (Morris et al. 1994). <sup>c</sup>	
NUM_D_MID_CFS	<b>Number of residents with dementia with a CFS of 2 or 3 (moderate or mild cognitive impairment).</b> This the number of residents with dementia who had a CFS score indicating they were moderately impaired—that is, they scored between 0 and 7 on the BIMS or had a CPS score equal to 3 or 4—or mildly impaired—that is, they scored between 8 and 12 on the BIMS or had a CPS score between 0 and 2—based on the assessment record on or just before the first Thursday in April. We calculated the CFS using the algorithm developed by Thomas et al. (2017), <sup>b</sup> which uses the BIMS, if completed, otherwise the CPS (Morris et al. 1994). <sup>c</sup>	MDS (2021 and 2022)
NUM_D_BEDFAST	<b>Number of residents with dementia who were bedfast.</b> This is the number of residents with dementia who were dependent on staff for assistance transferring between surfaces or where no transfer occurred in the past seven days (G0110B1_TRNSFR_SELF_CD = 4 or 8) based on the assessment record on or just before the first Thursday in April.	MDS (2021 and 2022)
NUM_D_CATH	<b>Number of residents with dementia who had a catheter.</b> This is the number of residents with dementia with an indwelling catheter in the past seven days (H0100A_INDWLG_CTHTR_CD = 1) based on the assessment record on or just before the first Thursday in April.	MDS (2021 and 2022)
NUM_D_FALL	<b>Number of residents with dementia who had fallen since admission or prior assessment.</b> This is the number of residents with dementia with a fall since admission or since the prior assessment (J1800_FALL_LAST_ASMT_CD = 1) based on the assessment record on or just before the first Thursday in April.	MDS (2021 and 2022)
NUM_D_INCNT_BLDR	<b>Number of residents with dementia who were bladder incontinent.</b> This is the number of residents with dementia who were “occasionally,” “frequently,” or “always” bladder incontinent in the past seven days (H0300_URNRY_CNTNC_CD = 1, 2, or 3) based on the assessment record on or just before the first Thursday in April.	MDS (2021 and 2022)
NUM_D_INCNT_BWL	<b>Number of residents with dementia who were bowel incontinent.</b> This is the number of residents with dementia who were “occasionally,” “frequently,” or “always” bowel incontinent in the past seven days (H0400_BWL_CNTNC_CD = 1, 2, or 3) based on the assessment record on or just before the first Thursday in April.	MDS (2021 and 2022)
NUM_D_LOWCARE	<b>Number of residents with dementia who were low care.</b> This is the number of residents with dementia who did not require physical assistance in any of the four late-loss activities of daily living—bed mobility, transferring, using the toilet, and eating (G0110A2_BED_MBLTY_SPRT_CD = 0 and G0110B2_TRNSFR_SPRT_CD = 0 and	MDS (2021 and 2022)

## Nursing Home Data Dictionary for LINKAGE

Variable name	Variable definition	Source data (year)
	G0110H2_EATG_SPRT_CD = 0 and G0110I2_TOILTG_SPRT_CD = 0) based on the assessment record on or just before the first Thursday in April.	
NUM_D_PAIN_TOT	<b>Number of residents with dementia who had pain (either self- or staff-reported).</b> This is the number of residents with dementia who self-reported pain (J0300_PAIN_CD = 1) or for whom staff reported they had pain in the past seven days (J0800A_NVRBL_SND_CD = 1 or J0800B_VCL_CMPLNT_CD = 1 or J0800C_FACE_EXPRSN_CD = 1 or J0800D_PRTCTV_MVMT_CD = 1) based on the assessment record on or just before the first Thursday in April.	MDS (2021 and 2022)
HCC_D_MEAN	<b>Mean hierarchical condition category (HCC) score among residents with dementia enrolled in Medicare.</b> This is the mean HCC score among residents with dementia enrolled in Medicare who were in the facility on April 7, 2022. We calculated HCC scores using CMS's publicly available 2024 HCC software (version 28), available at: <a href="https://www.cms.gov/medicare/payment/medicare-advantage-rates-statistics/risk-adjustment">https://www.cms.gov/medicare/payment/medicare-advantage-rates-statistics/risk-adjustment</a> (last accessed June 5, 2025). We ran the software on calendar year 2021 FFS and MA claims (12-month lookback). The HCC algorithm calculates scores for beneficiaries in institutional settings (institutional score), beneficiaries with less than 12 months of Part B coverage in the measurement year (new enrollee score), and for beneficiaries otherwise in the community (community score). (There is a separate HCC algorithm for beneficiaries with end stage renal disease [ESRD], but we did not use the ESRD model, as it requires information on kidney transplants that were unavailable to us). We assigned all residents the institutional HCC score because they were all in a nursing home on the first Thursday of April 2022. Following CMS's approach, we normalized the HCC scores and applied a managed care coding intensity factor to account for differences in diagnosis code submission patterns between FFS and MA (the coding factor adjusts HCC scores of residents enrolled in MA plans downwards).	MDS (2021 and 2022); Medicare FFS and MA inpatient, outpatient, and carrier files (2021); MBSF (2021 and 2022); publicly available <a href="#">HCC software</a> (2024)
MORT_RISK_SCR_D_MEAN	<b>Mean mortality risk score.</b> This is the mean mortality risk score (MRS), calculated based on the algorithm developed by Thomas et al. (2019) <sup>d</sup> among residents with dementia in the facility on the first Thursday in April. The MRS is a continuous score ranging from 1 to 20, with higher scores indicating greater mortality risk. We calculated the MRS using the assessment record on or just before the first Thursday in April.	MDS (2021 and 2022)
NUM_D_CANCER	<b>Number of residents with dementia with a diagnosis of cancer.</b> This is the number of residents with dementia with I0100_CNCR_CD = 1 on the assessment record on or just before the first Thursday in April.	MDS (2021 and 2022)
NUM_D_ANEMIA	<b>Number of residents with dementia with a diagnosis of anemia.</b> This is the number of residents with dementia with I0200_ANEMIA_CD = 1 on the assessment record on or just before the first Thursday in April.	MDS (2021 and 2022)

## Nursing Home Data Dictionary for LINKAGE

Variable name	Variable definition	Source data (year)
NUM_D_CAD	<b>Number of residents with dementia with a diagnosis of coronary artery disease.</b> This is the number of residents with dementia with I0400_CAD_CD = 1 on the assessment record on or just before the first Thursday in April.	MDS (2021 and 2022)
NUM_D_HRT_FAILR	<b>Number of residents with dementia with a diagnosis of heart failure.</b> This is the number of residents with dementia with I0600_HRT_FAILR_CD = 1 on the assessment record on or just before the first Thursday in April.	MDS (2021 and 2022)
NUM_D_HYPERT	<b>Number of residents with dementia with a diagnosis of hypertension.</b> This is the number of residents with dementia with I0700_HYPRTNSN_CD = 1 on the assessment record on or just before the first Thursday in April.	MDS (2021 and 2022)
NUM_D_HYPOTNSN	<b>Number of residents with dementia with a diagnosis of hypotension.</b> This is the number of residents with dementia with I0800_HYPOTNSN_CD = 1 on the assessment record on or just before the first Thursday in April.	MDS (2021 and 2022)
NUM_D_PVD	<b>Number of residents with dementia with a diagnosis of peripheral vascular disease.</b> This is the number of residents with dementia with I0900_PVD_CD = 1 on the assessment record on or just before the first Thursday in April.	MDS (2021 and 2022)
NUM_D_ULCRTV_CLTS	<b>Number of residents with dementia with a diagnosis of ulcerative colitis.</b> This is the number of residents with dementia with I1300_ULCRTV_CLTS_CD = 1 on the assessment record on or just before the first Thursday in April.	MDS (2021 and 2022)
NUM_D_ESRD	<b>Number of residents with dementia with a diagnosis of end stage renal disease.</b> This is the number of residents with dementia with I1500_ESRD_CD = 1 on the assessment record on or just before the first Thursday in April.	MDS (2021 and 2022)
NUM_D_NRGNC_BLADR	<b>Number of residents with dementia with a diagnosis of neurogenic bladder.</b> This is the number of residents with dementia with I1550_NRGNC_BLADR_CD = 1 on the assessment record on or just before the first Thursday in April.	MDS (2021 and 2022)
NUM_D_OBSTRCT_URPTHY	<b>Number of residents with dementia with a diagnosis of obstructive uropathy.</b> This is the number of residents with dementia with I1650_OBSTRCT_URPTHY_CD = 1 on the assessment record on or just before the first Thursday in April.	MDS (2021 and 2022)
NUM_D_MDRO	<b>Number of residents with dementia with a diagnosis of multi-drug resistant organism.</b> This is the number of residents with dementia with I1700_MDRO_CD = 1 on the assessment record on or just before the first Thursday in April.	MDS (2021 and 2022)
NUM_D_PNEU	<b>Number of residents with dementia with a diagnosis of pneumonia.</b> This is the number of residents with dementia with I2000_PNEUMO_CD = 1 on the assessment record on or just before the first Thursday in April.	MDS (2021 and 2022)

## Nursing Home Data Dictionary for LINKAGE

Variable name	Variable definition	Source data (year)
NUM_D_SPTCMIA	<b>Number of residents with dementia with a diagnosis of septicemia.</b> This is the number of residents with dementia with I2100_SPTCMIA_CD = 1 on the assessment record on or just before the first Thursday in April.	MDS (2021 and 2022)
NUM_D_TB	<b>Number of residents with dementia with a diagnosis of tuberculosis.</b> This is the number of residents with dementia with I2200_TB_CD = 1 on the assessment record on or just before the first Thursday in April.	MDS (2021 and 2022)
NUM_D_UTI	<b>Number of residents with dementia with a diagnosis of urinary tract infection.</b> This is the number of residents with dementia with I2300_UTI_CD = 1 on the assessment record on or just before the first Thursday in April.	MDS (2021 and 2022)
NUM_D_VRL_HPT	<b>Number of residents with dementia with a diagnosis of viral hepatitis.</b> This is the number of residents with dementia with I2400_VRL_HPT_CD = 1 on the assessment record on or just before the first Thursday in April.	MDS (2021 and 2022)
NUM_D_WND_INFCTN	<b>Number of residents with dementia with a diagnosis of wound infection.</b> This is the number of residents with dementia with I2500_WND_INFCTN_CD = 1 on the assessment record on or just before the first Thursday in April.	MDS (2021 and 2022)
NUM_D_DM	<b>Number of residents with dementia with a diagnosis of diabetes.</b> This is the number of residents with dementia with I2900_DM_CD = 1 on the assessment record on or just before the first Thursday in April.	MDS (2021 and 2022)
NUM_D_HYPONATREMIA	<b>Number of residents with dementia with a diagnosis of hyponatremia.</b> This is the number of residents with dementia with I3100_HYPONATREMIA_CD = 1 on the assessment record on or just before the first Thursday in April.	MDS (2021 and 2022)
NUM_D_HYPERKALEMIA	<b>Number of residents with dementia with a diagnosis of hyperkalemia.</b> This is the number of residents with dementia with I3200_HYPERKALEMIA_CD = 1 on the assessment record on or just before the first Thursday in April.	MDS (2021 and 2022)
NUM_D_HYPERLPD	<b>Number of residents with dementia with a diagnosis of hyperlipidemia.</b> This is the number of residents with dementia with I3300_HYPERLIPIDMIA_CD = 1 on the assessment record on or just before the first Thursday in April.	MDS (2021 and 2022)
NUM_D_HIP_FRCTR	<b>Number of residents with dementia with a diagnosis of hip fracture.</b> This is the number of residents with dementia with I3900_HIP_FRCTR_CD = 1 on the assessment record on or just before the first Thursday in April.	MDS (2021 and 2022)
NUM_D_OTHR_FRCTR	<b>Number of residents with dementia with a diagnosis of other fractures.</b> This is the number of residents with dementia with I4000_OTHR_FRCTR_CD = 1 on the assessment record on or just before the first Thursday in April.	MDS (2021 and 2022)



## Nursing Home Data Dictionary for LINKAGE

Variable name	Variable definition	Source data (year)
NUM_D_ALZHMR	<b>Number of residents with dementia with a diagnosis of Alzheimer's disease.</b> This is the number of residents with dementia with I4200_ALZHMR_CD = 1 on the assessment record on or just before the first Thursday in April.	MDS (2021 and 2022)
NUM_D_APHASIA	<b>Number of residents with dementia with a diagnosis of aphasia.</b> This is the number of residents with dementia with I4300_APHASIA_CD = 1 on the assessment record on or just before the first Thursday in April.	MDS (2021 and 2022)
NUM_D_CRBRL_PLSY	<b>Number of residents with dementia with a diagnosis of cerebral palsy.</b> This is the number of residents with dementia with I4400_CRBRL_PLSY_CD = 1 on the assessment record on or just before the first Thursday in April.	MDS (2021 and 2022)
NUM_D_STRK	<b>Number of residents with dementia with a diagnosis of stroke.</b> This is the number of residents with dementia with I4500_STRK_CD = 1 on the assessment record on or just before the first Thursday in April.	MDS (2021 and 2022)
NUM_D_DMNT	<b>Number of residents with dementia with a diagnosis of non-Alzheimer's dementia.</b> This is the number of residents with dementia with I4800_DMNT_CD = 1 on the assessment record on or just before the first Thursday in April.	MDS (2021 and 2022)
NUM_D_HEMIPLG	<b>Number of residents with dementia with a diagnosis of hemiplegia.</b> This is the number of residents with dementia with I4900_HEMIPLG_CD = 1 on the assessment record on or just before the first Thursday in April.	MDS (2021 and 2022)
NUM_D_PARAPLG	<b>Number of residents with dementia with a diagnosis of paraplegia.</b> This is the number of residents with dementia with I5000_PARAPLG_CD = 1 on the assessment record on or just before the first Thursday in April.	MDS (2021 and 2022)
NUM_D_QUADPLG	<b>Number of residents with dementia with a diagnosis of quadriplegia.</b> This is the number of residents with dementia with I5100_QUADPLG_CD = 1 on the assessment record on or just before the first Thursday in April.	MDS (2021 and 2022)
NUM_D_MS	<b>Number of residents with dementia with a diagnosis of multiple sclerosis.</b> This is the number of residents with dementia with I5200_MS_CD = 1 on the assessment record on or just before the first Thursday in April.	MDS (2021 and 2022)
NUM_D_HNTGTN	<b>Number of residents with dementia with a diagnosis of Huntington's disease.</b> This is the number of residents with dementia with I5250_HNTGTN_CD = 1 on the assessment record on or just before the first Thursday in April.	MDS (2021 and 2022)
NUM_D_PRKNSN	<b>Number of residents with dementia with a diagnosis of Parkinson's disease.</b> This is the number of residents with dementia with I5300_PRKNSN_CD = 1 on the assessment record on or just before the first Thursday in April.	MDS (2021 and 2022)



## Nursing Home Data Dictionary for LINKAGE

Variable name	Variable definition	Source data (year)
NUM_D_TOURT	<b>Number of residents with dementia with a diagnosis of Tourette's syndrome.</b> This is the number of residents with dementia with I5350_TOURT_CD = 1 on the assessment record on or just before the first Thursday in April.	MDS (2021 and 2022)
NUM_D_SZRE	<b>Number of residents with dementia with a diagnosis of seizure disorder or epilepsy.</b> This is the number of residents with dementia with I5400_SZRE_CD = 1 on the assessment record on or just before the first Thursday in April.	MDS (2021 and 2022)
NUM_D_TBI	<b>Number of residents with dementia with a diagnosis of traumatic brain injury.</b> This is the number of residents with dementia with I5500_BRN_INJURY_CD = 1 on the assessment record on or just before the first Thursday in April.	MDS (2021 and 2022)
NUM_D_MALNTRTN	<b>Number of residents with dementia with a diagnosis of malnutrition.</b> This is the number of residents with dementia with I5600_MALNTRTN_CD = 1 on the assessment record on or just before the first Thursday in April.	MDS (2021 and 2022)
NUM_D_ANXTY	<b>Number of residents with dementia with a diagnosis of anxiety disorder.</b> This is the number of residents with dementia with I5700_ANXTY_DSORDR_CD = 1 on the assessment record on or just before the first Thursday in April.	MDS (2021 and 2022)
NUM_D_DPRSN	<b>Number of residents with dementia with a diagnosis of depression (other than bipolar).</b> This is the number of residents with dementia with I5800_DPRSN_CD = 1 on the assessment record on or just before the first Thursday in April.	MDS (2021 and 2022)
NUM_D_MNC_DPRSN	<b>Number of residents with dementia with a diagnosis of manic depression (bipolar disorder).</b> This is the number of residents with dementia with I5900_MNC_DPRSN_CD = 1 on the assessment record on or just before the first Thursday in April.	MDS (2021 and 2022)
NUM_D_PSYCHTC	<b>Number of residents with dementia with a diagnosis of psychotic disorder.</b> This is the number of residents with dementia with I5950_PSYCHTC_CD = 1 on the assessment record on or just before the first Thursday in April.	MDS (2021 and 2022)
NUM_D_SCHZ	<b>Number of residents with dementia with a diagnosis of schizophrenia (schizoaffective and schizophreniform disorders).</b> This is the number of residents with dementia with I6000_SCHZOPRNIA_CD = 1 on the assessment record on or just before the first Thursday in April.	MDS (2021 and 2022)
NUM_D_PTSD	<b>Number of residents with dementia with a diagnosis of post-traumatic stress disorder.</b> This is the number of residents with dementia with I6100_PTSD_CD = 1 on the assessment record on or just before the first Thursday in April.	MDS (2021 and 2022)
NUM_D_ASTHMA	<b>Number of residents with dementia with a diagnosis of asthma.</b> This is the number of residents with dementia with I6200_ASTHMA_CD = 1 on the assessment record on or just before the first Thursday in April.	MDS (2021 and 2022)

## Nursing Home Data Dictionary for LINKAGE

Variable name	Variable definition	Source data (year)
NUM_D_RSPRTRY_FAILR	<b>Number of residents with dementia with a diagnosis of respiratory failure.</b> This is the number of residents with dementia with I6300_RSPRTRY_FAILR_CD = 1 on the assessment record on or just before the first Thursday in April.	MDS (2021 and 2022)
<b>Service use among residents with dementia</b>		
<b>MDS-based service use among residents with dementia</b>		
NUM_D_REHOSP	<b>The number of facility admissions from acute care hospitals that resulted in a readmission to a hospital.</b> This is calculated as the number of admissions to the facility from an acute hospital among residents with dementia ages 55 and older who were admitted from an acute care hospital and did not have a nursing home discharge in the 100 days before admission, as described above in N_D_ADMSN_FROM_HOSP, that ended in a discharge to an acute care hospital (A2100_DSCHRG_STUS_CD = 03, indicating “discharge to acute hospital”) within 30 days of admission. This measure can be used as the numerator to calculate the readmission rate for each facility (using N_D_ADMSN_FROM_HOSP, described above, for the denominator). This measure includes residents with dementia present in the facility at any time in 2022.	MDS (2021 and 2022)
<b>Parts A- and B-based service use among residents with dementia enrolled in Medicare</b>		
TOT_D_ACUTE_IP_DAYS	<b>Number of acute inpatient days from the nursing home per resident year.</b> This is calculated as the number of days in an acute inpatient setting among Medicare-enrolled residents with dementia divided by the number of resident years in the facility among dementia residents (N_D_MCARE_RESYRS). Specifically, we identified inpatient stays at acute care facilities in Medicare FFS claims and MA encounter records that occurred on the discharge date of a nursing home stay (that is, the nursing home stay led to an acute inpatient stay) or overlapped with a nursing home stay and then summed the total number of acute inpatient days across all residents with dementia before dividing by number of resident years among dementia residents. The definition of acute inpatient stays excludes FFS claims and MA encounter records for inpatient psychiatric stays, inpatient rehabilitation stays, and long-term hospital stays. This measure includes any day(s) in an ED or observation unit for acute inpatient admissions that began in the ED. Multiple claims representing transfers between hospitals for the same resident were combined into a single stay, as were multiple claims at the same hospital with overlapping dates for the same resident, so these count as one admission and overlapping inpatient days are only counted once. This measure includes residents with dementia present in the facility at any time in 2022.	MDS (2021 and 2022); Medicare FFS and MA inpatient claims (2022)
TOT_D_ED_VISITS	<b>Number of outpatient ED visits (including observation stays) from the nursing home per resident year.</b> This is calculated as the number of outpatient ED visits and observation stays among Medicare-enrolled residents with dementia divided by the number of resident years in	MDS (2021 and 2022); Medicare FFS and MA outpatient claims (2022)

Variable name	Variable definition	Source data (year)
	the facility among dementia residents (N_D_MCARE_RESYRS). Specifically, we flagged outpatient FFS claims and MA encounter records as outpatient ED visits if any revenue center line contained 045X (where “X” is a wildcard that can take any value) or 0981 (emergency room care). If there were any claims flagged as ED visits, but all revenue center lines for the claim were for imaging and tests—that is, if every revenue center line on the claim had a procedure code in the 70000–79999 or 80000–89999 range, we excluded the claim from the count of outpatient ED visits (our assumption was that the visit was for pre-admission testing). We flagged outpatient claims as observation visits if any revenue center code contained 0762 (treatment or observation room), or 0760 (treatment or observation room—general classification) and if the number of service units was more than eight hours and the claim line had a corresponding HCPCS code of G0378 (hospital observation services per hour). A single outpatient claim might be flagged as both an ED visit and an observation stay. In this case, we only counted it as one visit. We counted only one ED visit or observation stay per beneficiary per day (with the assumption that multiple claims on the same day were part of the same episode). We then identified ED visits and observation stays that overlapped with a nursing home stay. This measure excludes ED visits or observation stays on inpatient claims—that is, where an ED visit led to an inpatient admission at the same hospital. This measure includes residents with dementia present in the facility at any time in 2022.	
TOT_D_PAH_IP_DAYS	<b>Number of acute inpatient days from the nursing home that were potentially avoidable per resident year.</b> This is calculated as the number of days in an acute inpatient setting for stays that were potentially avoidable among Medicare-enrolled residents with dementia divided by the number of resident years in the facility among dementia residents (N_D_MCARE_RESYRS). Specifically, we identified inpatient stays at acute care facilities in Medicare FFS claims and MA encounter records that occurred on the discharge date of a nursing home stay (that is, the nursing home stay led to an acute inpatient stay) or overlapped with a nursing home stay and that were potentially avoidable. Potentially avoidable inpatient stays had a principal diagnosis code for a condition considered potentially preventable or manageable in nursing homes (Ouslander et al. 2010; Walsh et al. 2012; Hamasaki et al. 2023). <sup>e</sup> See above for additional details on how we processed inpatient claims and Appendix Table 2 for a list of potentially avoidable conditions and corresponding diagnosis codes.	MDS (2021 and 2022); Medicare FFS and MA inpatient claims (2022)
TOT_D_PAH_ED_VISITS	<b>Number of outpatient ED visits (including observation stays) from the nursing home that were potentially avoidable per resident year.</b> This is calculated as the number of outpatient ED visits and observation stays that were potentially avoidable among Medicare-enrolled residents with dementia divided by the number of resident years in the facility among dementia residents (N_D_MCARE_RESYRS). Specifically, we identified outpatient ED visits and observation stays in Medicare FFS claims and MA encounter records that overlapped with a nursing home stay and that were potentially avoidable. Potentially avoidable ED visits and	MDS (2021 and 2022); Medicare FFS and MA outpatient claims (2022)

Variable name	Variable definition	Source data (year)
	observation stays had a principal diagnosis code for a condition considered potentially preventable or manageable in nursing homes (Ouslander et al. 2010; Walsh et al. 2012; Hamasaki et al. 2023). <sup>e</sup> See above for additional details on how we processed outpatient ED and observation stay claims and Appendix Table 2 for a list of potentially avoidable conditions and corresponding diagnosis codes.	
<b>Part D-based drug use among residents with dementia enrolled in Part D</b>		
TOTCLMS_D_OPIOIDS	<p><b>Among residents with dementia in the facility, the total number of claims for opioids.</b> This is the total number of drug claims (also called fills or events) for opioids for Medicare-enrolled, Part D-covered beneficiaries with dementia during all nursing home stays in 2022, excluding the first and last day of each nursing home stay (in case the fill was made in the community or other setting). To identify claims for opioids, we first compiled a list of generic opioid drug names from CMS's 2023 Medicare Part D Specific Drug Lists Report, available at: <a href="https://data.cms.gov/provider-summary-by-type-of-service/medicare-part-d-prescribers/medicare-part-d-prescribers-by-provider">https://data.cms.gov/provider-summary-by-type-of-service/medicare-part-d-prescribers/medicare-part-d-prescribers-by-provider</a> (last accessed June 6, 2025). We then searched the 2022 Part D drug characteristics file for all 11-digit National Drug Codes (NDCs) associated with those drug names, searching in both brand and generic name fields. From this initial list of NDC codes, we created a list of unique nine-digit NDCs by dropping the last two digits from each NDC code (the last two digits describe the drug packaging). We then flagged all 2022 Part D Event (PDE) claims for residents with dementia that matched the list of NDC codes for opioids on the first nine digits and where the fill date overlapped with a nursing home stay. See Appendix Table 3 for a list of generic drug names for opioids.</p> <p><i>To calculate the number of opioid claims per resident year, please use <math>N\_D\_MCARE\_PTD\_RESYRS</math> as the denominator</i></p>	MDS (2021 and 2022); PDE claims (2022); Part D drug characteristics file (2022); Medicare Part D Specific Drug Lists Report (2023)
TOTDAYS_D_OPIOIDS	<p><b>Among residents with dementia in the facility, total number of days' supply for opioids.</b> This is the total number of days' supply across all Part D claims for opioids for Medicare-enrolled, Part D-covered beneficiaries with dementia during all nursing home stays in 2022. See above for details on how we identified Part D claims for opioids and Appendix Table 3 for a list of generic drug names for opioids.</p>	MDS (2021 and 2022); PDE claims (2022); Part D drug characteristics file (2022); Medicare Part D Specific Drug Lists Report (2023)
TOTCLMS_D_ANTIBIOTICS	<p><b>Among residents with dementia in the facility, total number of claims for antibiotics.</b> This is the total number of drug fills for antibiotics for Medicare-enrolled, Part D-covered beneficiaries with dementia during all nursing home stays in 2022, excluding the first and last day of each nursing home stay (in case the fill was made in the community or other setting). To identify claims for antibiotics, we first compiled a list of generic antibiotic drug names from CMS's 2023 Medicare Part D Specific Drug Lists Report, available at: <a href="https://data.cms.gov/provider-summary-by-type-of-service/medicare-part-d-prescribers/medicare-part-d-prescribers-by-provider">https://data.cms.gov/provider-summary-by-type-of-service/medicare-part-d-prescribers/medicare-part-d-prescribers-by-provider</a></p>	MDS (2021 and 2022); PDE claims (2022); Part D drug characteristics file (2022); Medicare Part D Specific Drug Lists Report (2023)

Variable name	Variable definition	Source data (year)
	<p><a href="#">prescribers/medicare-part-d-prescribers-by-provider</a> (last accessed June 6, 2025). We then searched the 2022 drug characteristics file for all 11-digit NDCs associated with those drug names, searching in both brand and generic name fields. From this initial list of NDC codes, we created a list of unique nine-digit NDCs by dropping the last two digits from each NDC code (the last two digits describe the drug packaging). We then flagged all 2022 PDE claims for residents with dementia that matched the list of NDC codes for antibiotics on the first nine digits and where the fill date overlapped with a nursing home stay. See Appendix Table 3 for a list of generic drug names for antibiotics.</p> <p><i>To calculate the number of antibiotic claims per resident year, please use <a href="#">N_D_MCARE_PTD_RESYRS</a> as the denominator</i></p>	
TOTDAYS_D_ANTIBIOTICS	<p><b>Among residents with dementia in the facility, total number of days' supply for antibiotics.</b> This is the total number of days' supply across all Part D claims for antibiotics for Medicare-enrolled, Part D-covered beneficiaries with dementia during all nursing home stays in 2022. See above for details on how we identified Part D claims for antibiotics and Appendix Table 3 for a list of generic drug names for antibiotics.</p>	MDS (2021 and 2022); PDE claims (2022); Part D drug characteristics file (2022); Medicare Part D Specific Drug Lists Report (2023)
TOTCLMS_D_ANTIPSYCH	<p><b>Among residents with dementia in the facility, total number of claims for antipsychotics.</b> This is the total number of drug fills for antipsychotics for Medicare-enrolled, Part D-covered beneficiaries with dementia during all nursing home stays in 2022, excluding the first and last day of each nursing home stay (in case the fill was made in the community or other setting). To identify claims for antipsychotics, we first compiled a list of generic antipsychotic drug names from CMS's 2023 Medicare Part D Specific Drug Lists Report, available at: <a href="https://data.cms.gov/provider-summary-by-type-of-service/medicare-part-d-prescribers/medicare-part-d-prescribers-by-provider">https://data.cms.gov/provider-summary-by-type-of-service/medicare-part-d-prescribers/medicare-part-d-prescribers-by-provider</a> (last accessed June 6, 2025). We then searched the 2022 drug characteristics file for all 11-digit NDCs associated with those drug names, searching in both brand and generic name fields. From this initial list of NDC codes, we created a list of unique nine-digit NDCs by dropping the last two digits from each NDC code (the last two digits describe the drug packaging). We then flagged all 2022 PDE claims for residents with dementia that matched the list of NDC codes for antipsychotics on the first nine digits and where the fill date overlapped with a nursing home stay. See Appendix Table 3 for a list of generic drug names for antipsychotics.</p> <p><i>To calculate the number of antipsychotic claims per resident year, please use <a href="#">N_D_MCARE_PTD_RESYRS</a> as the denominator</i></p>	MDS (2021 and 2022); PDE claims (2022); Part D drug characteristics file (2022); Medicare Part D Specific Drug Lists Report (2023)
TOTDAYS_D_ANTIPSYCH	<p><b>Among residents with dementia in the facility, total number of days' supply for antipsychotics.</b> This is the total number of days' supply across all Part D claims for</p>	MDS (2021 and 2022); PDE claims (2022); Part D drug characteristics

Variable name	Variable definition	Source data (year)
	antipsychotics for Medicare-enrolled, Part D-covered beneficiaries with dementia during all nursing home stays in 2022. See above for details on how we identified Part D claims for antipsychotics and Appendix Table 3 for a list of generic drug names for antipsychotics.	file (2022); Medicare Part D Specific Drug Lists Report (2023)
TOTCLMS_D_ANTIDEPR	<p><b>Among residents with dementia in the facility, total number of claims for antidepressants.</b> This is the total number of drug fills for antidepressants for Medicare-enrolled, Part D-covered beneficiaries with dementia during all nursing home stays in 2022, excluding the first and last day of each nursing home stay (in case the fill was made in the community or other setting). To identify claims for antidepressants, we first compiled a list of generic antidepressant drug names from the American Hospital Formulary System (AHFS) Pharmacologic-Therapeutic Classification. The full 2019 AHFS list is publicly available at: <a href="https://www.oregon.gov/obnm/Documents/Formulary%20Information/AHFSClassificationwithDrugs2019.pdf">https://www.oregon.gov/obnm/Documents/Formulary%20Information/AHFSClassificationwithDrugs2019.pdf</a> (last accessed June 6, 2025). We then searched the 2022 drug characteristics file for all 11-digit NDCs associated with those drug names, searching in both brand and generic name fields. From this initial list of NDC codes, we created a list of unique nine-digit NDCs by dropping the last two digits from each NDC code (the last two digits describe the drug packaging). We then flagged all 2022 PDE claims for residents with dementia that matched the list of NDC codes for antidepressants on the first nine digits and where the fill date overlapped with a nursing home stay. See Appendix Table 3 for a list of generic drug names for antidepressants.</p> <p><i>To calculate the number of antidepressant claims per resident year, please use <u>N D MCARE PTD RESYRS</u> as the denominator</i></p>	MDS (2021 and 2022); PDE claims (2022); Part D drug characteristics file (2022); AHFS Pharmacologic-Therapeutic Classification (2019)
TOTDAYS_D_ANTIDEPR	<b>Among residents with dementia in the facility, total number of days' supply for antidepressants.</b> This is the total number of days' supply across all Part D claims for antidepressants for Medicare-enrolled, Part D-covered beneficiaries with dementia during all nursing home stays in 2022. See above for details on how we identified Part D claims for antidepressants and Appendix Table 3 for a list of generic drug names for antidepressants	MDS (2021 and 2022); PDE claims (2022); Part D drug characteristics file (2022); AHFS Pharmacologic-Therapeutic Classification (2019)
TOTCLMS_D_BENZOS	<b>Among residents with dementia in the facility, total number of claims for benzodiazepines or Z-drugs.</b> This is the total number of drug fills for benzodiazepines or Z-drugs for Medicare-enrolled, Part D-covered beneficiaries with dementia during all nursing home stays in 2022, excluding the first and last day of each nursing home stay (in case the fill was made in the community or other setting). To identify claims for benzodiazepines or Z-drugs, we first compiled a list of generic benzodiazepine or Z-drug names from the AHFS Pharmacologic-Therapeutic Classification. The full 2019 AHFS list is publicly available at: <a href="https://www.oregon.gov/obnm/Documents/Formulary%20Information/AHFSClassificationwithDrugs2019.pdf">https://www.oregon.gov/obnm/Documents/Formulary%20Information/AHFSClassificationwithDrugs2019.pdf</a> (last accessed June 6, 2025). We then searched the 2022 drug characteristics file	MDS (2021 and 2022); PDE claims (2022); Part D drug characteristics file (2022); AHFS Pharmacologic-Therapeutic Classification (2019)

Variable name	Variable definition	Source data (year)
	<p>for all 11-digit NDCs associated with those drug names, searching in both brand and generic name fields. From this initial list of NDC codes, we created a list of unique nine-digit NDCs by dropping the last two digits from each NDC code (the last two digits describe the drug packaging). We then flagged all 2022 PDE claims for residents with dementia that matched the list of NDC codes for benzodiazepines or Z-drugs on the first nine digits and where the fill date overlapped with a nursing home stay. See Appendix Table 3 for a list of generic drug names for benzodiazepines or Z-drugs.</p> <p><i>To calculate the number of benzodiazepine or Z-drug claims per resident year, please use <u>N_D_MCare_PTD_RESYRS</u> as the denominator</i></p>	
TOTDAYS_D_BENZOS	<p><b>Among residents with dementia in the facility, total number of days' supply for benzodiazepines or Z-drugs.</b> This is the total number of days' supply across all Part D claims for benzodiazepines or Z-drugs for Medicare-enrolled, Part D-covered beneficiaries with dementia during all nursing home stays in 2022. See above for details on how we identified Part D claims for benzodiazepines or Z-drugs and Appendix Table 3 for a list of generic drug names for benzodiazepines or Z-drugs.</p>	MDS (2021 and 2022); PDE claims (2022); Part D drug characteristics file (2022); AHFS Pharmacologic-Therapeutic Classification (2019)
TOTCLMS_D_ANTISEIZURE	<p><b>Among residents with dementia in the facility, total number of claims for antiseizure medications.</b> This is the total number of drug fills for antiseizure medications for Medicare-enrolled, Part D-covered beneficiaries with dementia during all nursing home stays in 2022, excluding the first and last day of each nursing home stay (in case the fill was made in the community or other setting). To identify claims for antiseizure medications, we first compiled a list of generic antiseizure drug names from the AHFS Pharmacologic-Therapeutic Classification. The full 2019 AHFS list is publicly available at: <a href="https://www.oregon.gov/obnm/Documents/Formulary%20Information/AHFSCClassificationwithDrugs2019.pdf">https://www.oregon.gov/obnm/Documents/Formulary%20Information/AHFSCClassificationwithDrugs2019.pdf</a> (last accessed June 6, 2025). We then searched the 2022 drug characteristics file for all 11-digit NDCs associated with those drug names, searching in both brand and generic name fields. From this initial list of NDC codes, we created a list of unique nine-digit NDCs by dropping the last two digits from each NDC code (the last two digits describe the drug packaging). We then flagged all 2022 PDE claims for residents with dementia that matched the list of NDC codes for antiseizure medications on the first nine digits and where the fill date overlapped with a nursing home stay. See Appendix Table 3 for a list of generic drug names for antiseizure medications.</p> <p><i>To calculate the number of antiseizure medication claims per resident year, please use <u>N_D_MCare_PTD_RESYRS</u> as the denominator</i></p>	MDS (2021 and 2022); PDE claims (2022); Part D drug characteristics file (2022); AHFS Pharmacologic-Therapeutic Classification (2019)



Variable name	Variable definition	Source data (year)
TOTDAYS_D_ANTISEIZURE	<b>Among residents with dementia in the facility, total number of days' supply for antiseizure medications.</b> This is the total number of days' supply across all Part D claims for antiseizure medications for Medicare-enrolled, Part D-covered beneficiaries with dementia during all nursing home stays in 2022. See above for details on how we identified Part D claims for antiseizure medications and Appendix Table 3 for a list of generic drug names for antiseizure medications.	MDS (2021 and 2022); PDE claims (2022); Part D drug characteristics file (2022); AHFS Pharmacologic-Therapeutic Classification (2019)
TOTCLMS_D_CHLN_INHBTR_MEM	<b>Among residents with dementia in the facility, total number of claims for cholinesterase inhibitors or memantine.</b> This is the total number of drug fills for cholinesterase inhibitors or memantine for Medicare-enrolled, Part D-covered beneficiaries with dementia during all nursing home stays in 2022, excluding the first and last day of each nursing home stay (in case the fill was made in the community or another setting). To identify claims for cholinesterase inhibitors or memantine, we first compiled a list of generic drug names for cholinesterase inhibitors or memantine. We then searched the 2022 drug characteristics file for all 11-digit NDCs associated with those drug names, searching in both brand and generic name fields. From this initial list of NDC codes, we created a list of unique nine-digit NDCs by dropping the last two digits from each NDC code (the last two digits describe the drug packaging). We then flagged all 2022 PDE claims for residents with dementia that matched the list of NDC codes for cholinesterase inhibitors or memantine on the first nine digits and where the fill date overlapped with a nursing home stay. See Appendix Table 3 for a list of generic drug names for cholinesterase inhibitors or memantine.  <i>To calculate the number of cholinesterase or memantine claims per resident year, please use <a href="#">N_D_MCARE_PTD_RESYRS</a> as the denominator</i>	MDS (2021 and 2022); PDE claims (2022); Part D drug characteristics file (2022)
TOTDAYS_D_CHLN_INHBTR_MEM	<b>Among residents with dementia in the facility, total number of days' supply for cholinesterase inhibitors or memantine.</b> This is the total number of days' supply across all Part D claims for cholinesterase inhibitors or memantine for Medicare-enrolled, Part D-covered beneficiaries with dementia during all nursing home stays in 2022. See above for details on how we identified Part D claims for cholinesterase inhibitors or memantine and Appendix Table 3 for a list of generic drug names for cholinesterase inhibitors or memantine.	MDS (2021 and 2022); PDE claims (2022); Part D drug characteristics file (2022)
TOTCLMS_D_STRONGLY_ANTICHLNR GC	<b>Among residents with dementia in the facility, total number of claims for strongly anticholinergic medications.</b> This is the total number of drug fills for strongly anticholinergic medications for Medicare-enrolled, Part D-covered beneficiaries with dementia during all nursing home stays in 2022, excluding the first and last day of each nursing home stay (in case the fill was made in the community or other setting). To identify claims for strongly anticholinergic medications, we first compiled a list of generic drug names for medications with strongly anticholinergic properties from the 2023 American Geriatrics Society (AGS) Beers	MDS (2021 and 2022); PDE claims (2022); Part D drug characteristics file (2022); AGS Beers Criteria (2023)



Variable name	Variable definition	Source data (year)
	<p>Criteria.<sup>f</sup> We then searched the 2022 drug characteristics file for all 11-digit NDCs associated with those drug names, searching in both brand and generic name fields. From this initial list of NDC codes, we created a list of unique nine-digit NDCs by dropping the last two digits from each NDC code (the last two digits describe the drug packaging). We then flagged all 2022 PDE claims for residents with dementia that matched the list of NDC codes for strongly anticholinergic medications on the first nine digits and where the fill date overlapped with a nursing home stay. See Appendix Table 3 for a list of generic drug names for strongly anticholinergic medications.</p> <p><i>To calculate the number of strongly anticholinergic medication claims per resident year, please use <b>N_D_MCARE_PTD_RESYRS</b> as the denominator</i></p>	
TOTDAYS_D_ STRONGLY_ANTICHLNRGC	<b>Among residents with dementia in the facility, total number of days' supply for strongly anticholinergic medications.</b> This is the total number of days' supply across all Part D claims for strongly anticholinergic medications for Medicare-enrolled, Part D-covered beneficiaries with dementia during all nursing home stays in 2022. See above for details on how we identified Part D claims for strongly anticholinergic medications and Appendix Table 3 for a list of generic drug names for strongly anticholinergic medications.	MDS (2021 and 2022); PDE claims (2022); Part D drug characteristics file (2022); AGS Beers Criteria (2023)

Note: For the set of clinical characteristics of residents with dementia on the first Thursday in April 2022, we excluded conditions that were optional for states to report on quarterly assessments due to higher rates of missing data in these variables. The exclusions apply to the following conditions: atrial fibrillation or other dysrhythmia (I0300\_DYSRHYTHMIA\_CD); deep vein thrombosis, pulmonary embolus (PE), or pulmonary thrombo-embolism (PTE) (I0500\_DVT\_CD); cirrhosis (I1100\_CRRHS\_CD); gastroesophageal reflux disease or ulcer (I1200\_GERD\_CD); benign prostatic hyperplasia (I1400\_BPH\_CD); thyroid disorder (I3400\_THYRD\_CD); arthritis (I3700\_ARTHTS\_CD); osteoporosis (I3800\_OSTPRS\_CD); and cataracts, glaucoma, or macular degeneration (I6500\_CTRCT\_CD).

<sup>a</sup> For more information on the Bynum-Standard algorithm, see Grodstein, F., C.-H. Chang, A.W. Capuano, M.C. Power, D.X. Marquez, L.L. Barnes, D.A. Bennett, et al. "Identification of Dementia in Recent Medicare Claims Data, Compared With Rigorous Clinical Assessments." *The Journals of Gerontology, Series A*, vol. 77, no. 6, 2021, pp. 1272–1278. <https://doi.org/10.1093/gerona/glab377>. See Appendix Table 1 for a full list of dementia diagnosis codes.

<sup>b</sup> Thomas, K.S., D. Dosa, A. Wysocki, and V. Mor. "The Minimum Data Set 3.0 Cognitive Function Scale." *Medical Care*, vol. 55, no. 9, 2017, e68–e72. Available at: <https://journals.lww.com/lww-medicalcare/pages/articleviewer.aspx?year=2017&issue=09000&article=00011&type=Fulltext>.

<sup>c</sup> Morris, J.N., B.E. Fries, D.R. Mehr, C. Hawes, C. Phillips, V. Mor, and L.A. Lipsitz. "MDS Cognitive Performance Scale." *Journal of Gerontology*, vol. 49, no. 4, 2017, M174–M182. <https://doi.org/10.1093/geronj/49.4.m174>.

<sup>d</sup> Thomas, K.S., J.A. Ogarek, J. M. Teno, P.L. Gozalo, and V. Mor. "Development and Validation of the Nursing Home Minimum Data Set 3.0 Mortality Risk Score (MRS3)." *The Journals of Gerontology, Series A*, vol. 74, no. 2, 2019, pp. 219–225. Available at: <https://pubmed.ncbi.nlm.nih.gov/29514187/>.

<sup>e</sup> Ouslander, J.G., G. Lamb, M. Perloe, J.H. Givens, L. Kluge, T. Rutland, A. Atherly, and D. Saliba. "Potentially Avoidable Hospitalizations of Nursing Home Residents: Frequency, Causes, and Costs." *Journal of the American Geriatrics Society*, vol. 58, no. 4, 2010, pp. 627–635. Also see: Walsh, E.G., J.M. Wiener, S.

Haber, A. Bragg, M. Freiman, and J.G. Ouslander. "Potentially Avoidable Hospitalizations of Dually Eligible Medicare and Medicaid Beneficiaries from Nursing Facility and Home- and Community-Based Services Waiver Programs." *Journal of the American Geriatrics Society*, vol. 60, no. 5, 2012, pp. 821–829. Also, for a publication with a list of ICD-10 diagnosis codes for potentially avoidable hospitalizations, see: Hamasaki, Y., N. Sakata, X. Jin, T. Sugiyama, K. Morita, K. Uda, S. Matsuda, and N. Tamiya. "Facility Staffing Associated with Potentially Avoidable Hospitalizations in Nursing Home Residents in Japan: A Retrospective Cohort Study." *BMC Geriatrics*, vol. 23, 2023, article 566.

<sup>f</sup> 2023 AGS Beers Criteria® Update Expert Panel. "The American Geriatrics Society 2023 updated AGS Beers Criteria® for potentially inappropriate medication use in older adults." *Journal of American Geriatrics Society*, vol. 71, no. 7, 2023, pp. 2052–2081. <https://doi.org/10.1111/jgs.18372>.

AGS = American Geriatrics Society; AHFS = American Hospital Formulary System; BIMS = Brief Interview for Mental Status; CFS = cognitive function score; CCN = CMS certification number; CMS = Centers for Medicare & Medicaid Services; CPS = cognitive performance score; ED = emergency department; ESRD = end-stage renal disease; FFS = fee-for-service; HCC = hierarchical condition category; MA = Medicare Advantage; MBSF = Master Beneficiary Summary File; MDS = minimum data set; MRS = mortality risk score; NDC = National Drug Code; PDE = Part D Event; RUCA = rural-urban commuting area; SNF = skilled nursing facility; UA = urban area; UC = urban cluster; USDA = U.S. Department of Agriculture.

**Appendix Table 1.** ICD-10 diagnosis codes to identify patients with dementia

Dementia diagnosis codes	Description
<b><i>Bynum-standard algorithm<sup>a,b</sup></i></b>	
F01.50–F01.51	Vascular dementia
F02.80–F02.81	Dementia
F03.90–F03.91	Unspecified dementia
F04	Amnesic disorder
G30.0, G30.1, G30.8, G30.9	Alzheimer's disease
G31.01	Pick's disease
G31.09	Frontotemporal dementia
G31.83	Dementia with Lewy bodies
G31.1	Senile degeneration
G31.2	Degeneration of nervous system
R41.81	Age-related cognitive decline
<b><i>New dementia-related ICD-10 codes effective as of October 1, 2022</i></b>	
F01	Vascular dementia (non-billable code)
F015	Vascular dementia, unspecified severity (non-billable code)
F01.511	Vascular dementia, unspecified severity, with agitation
F01.518	Vascular dementia, unspecified severity, with other behavioral disturbance
F01.52	Vascular dementia, unspecified severity, with psychotic disturbance
F01.53	Vascular dementia, unspecified severity, with mood disturbance
F01.54	Vascular dementia, unspecified severity, with anxiety
F01.A	Vascular dementia, mild
F01.A0	Vascular dementia, mild, without behavioral disturbance, psychotic disturbance, mood disturbance, and anxiety
F01.A1	Vascular dementia, mild, with behavioral disturbance
F01.A11	Vascular dementia, mild, with agitation
F01.A18	Vascular dementia, mild, with other behavioral disturbance
F01.A2	Vascular dementia, mild, with psychotic disturbance
F01.A3	Vascular dementia, mild, with mood disturbance
F01.A4	Vascular dementia, mild, with anxiety
F01.B	Vascular dementia, moderate
F01.B0	Vascular dementia, moderate, without behavioral disturbance, psychotic disturbance, mood disturbance, and anxiety
F01.B1	Vascular dementia, moderate, with behavioral disturbance
F01.B11	Vascular dementia, moderate, with agitation
F01.B18	Vascular dementia, moderate, with other behavioral disturbance
F01.B2	Vascular dementia, moderate, with psychotic disturbance
F01.B3	Vascular dementia, moderate, with mood disturbance
F01.B4	Vascular dementia, moderate, with anxiety
F01.C	Vascular dementia, severe
F01.C0	Vascular dementia, severe, without behavioral disturbance, psychotic disturbance, mood disturbance, and anxiety
F01.C1	Vascular dementia, severe, with behavioral disturbance
F01.C11	Vascular dementia, severe, with agitation
F01.C18	Vascular dementia, severe, with other behavioral disturbance
F01.C2	Vascular dementia, severe, with psychotic disturbance
F01.C3	Vascular dementia, severe, with mood disturbance
F01.C4	Vascular dementia, severe, with anxiety
F02	Dementia in diseases classified elsewhere (non-billable code)
F028	Dementia in diseases classified elsewhere, unspecified severity
F02.811	Dementia in other diseases classified elsewhere, unspecified severity, with agitation
F02.818	Dementia in other diseases classified elsewhere, unspecified severity, with other behavioral disturbance

F02.82	Dementia in other diseases classified elsewhere, unspecified severity, with psychotic disturbance
F02.83	Dementia in other diseases classified elsewhere, unspecified severity, with mood disturbance
F02.84	Dementia in other diseases classified elsewhere, unspecified severity, with anxiety
F02.A	Dementia in other diseases classified elsewhere, mild
F02.A0	Dementia in other diseases classified elsewhere, mild, without behavioral disturbance, psychotic disturbance, mood disturbance, anxiety
F02.A1	Dementia in other diseases classified elsewhere, mild, with behavioral disturbance
F02.A11	Dementia in other diseases classified elsewhere, mild, with agitation
F02.A18	Dementia in other diseases classified elsewhere, mild, with other behavioral disturbance
F02.A2	Dementia in other diseases classified elsewhere, mild, with psychotic disturbance
F02.A3	Dementia in other diseases classified elsewhere, mild, with mood disturbance
F02.A4	Dementia in other diseases classified elsewhere, mild, with anxiety
F02.B	Dementia in other diseases classified elsewhere, moderate
F02B0	Dementia in other diseases classified elsewhere without behavioral disturbance, mood disturbance, and anxiety
F02.B1	Dementia in other diseases classified elsewhere, moderate, with behavioral disturbance
F02.B11	Dementia in other diseases classified elsewhere, moderate, with agitation
F02.B18	Dementia in other diseases classified elsewhere, moderate, with other behavioral disturbance
F02.B2	Dementia in other diseases classified elsewhere, moderate, with psychotic disturbance
F02.B3	Dementia in other diseases classified elsewhere, moderate, with mood disturbance
F02.B4	Dementia in other diseases classified elsewhere, moderate, with anxiety
F02.C	Dementia in other diseases classified elsewhere, severe
F02.C0	Vascular in other diseases classified elsewhere, without behavioral disturbance, psychotic disturbance, mood disturbance, and anxiety
F02.C1	Dementia in other diseases classified elsewhere, severe, with behavioral disturbance
F02.C11	Dementia in other diseases classified elsewhere, severe, with agitation
F02.C18	Dementia in other diseases classified elsewhere, severe, with other behavioral disturbance
F02.C2	Dementia in other diseases classified elsewhere, severe, with psychotic disturbance
F02.C3	Dementia in other diseases classified elsewhere, severe, with mood disturbance
F02.C4	Dementia in other diseases classified elsewhere, severe, with anxiety
F03	Unspecified dementia (non-billable code)
F039	Unspecified dementia (also non-billable)
F03.911	Unspecified dementia, unspecified severity, with agitation
F03.918	Unspecified dementia, unspecified severity, with other behavioral disturbance
F03.92	Unspecified dementia, unspecified severity, with psychotic disturbance
F0393	Unspecified dementia, unspecified severity, with mood disturbance
F03.94	Unspecified dementia, unspecified severity, with anxiety
F03.A	Unspecified dementia, mild
F03.A0	Unspecified dementia, mild, without behavioral disturbance, psychotic disturbance, mood disturbance, anxiety
F03.A1	Unspecified dementia, mild, with behavioral disturbance
F03.A11	Unspecified dementia, mild, with agitation
F03.A18	Unspecified dementia, mild, with other behavioral disturbance

F03.A2	Unspecified dementia, mild, with psychotic disturbance
F03.A3	Unspecified dementia, mild, with mood disturbance
F03.A4	Unspecified dementia, mild, with anxiety
F03.B	Unspecified dementia, moderate
F03.B0	Unspecified dementia, moderate, without behavioral disturbance, psychotic disturbance, mood disturbance, anxiety
F03.B1	Unspecified dementia, moderate, with behavioral disturbance
F03.B11	Unspecified dementia, moderate, with agitation
F03.B18	Unspecified dementia, moderate, with other behavioral disturbance
F03.B2	Unspecified dementia, moderate, with psychotic disturbance
F03.B3	Unspecified dementia, moderate, with mood disturbance
F03.B4	Unspecified dementia, moderate, with anxiety
F03.C	Unspecified dementia, severe
F03.C0	Unspecified dementia, severe, without behavioral disturbance, psychotic disturbance, mood disturbance, anxiety
F03.C1	Unspecified dementia, severe, with behavioral disturbance
F03.C11	Unspecified dementia, severe, with agitation
F03.C18	Unspecified dementia, severe, with other behavioral disturbance
F03.C2	Unspecified dementia, severe, with psychotic disturbance
F03.C3	Unspecified dementia, severe, with mood disturbance
F03.C4	Unspecified dementia, severe, with anxiety
G30	Alzheimer's disease (non-billable code)
G310	Frontotemporal dementia (non-billable code)

<sup>a</sup> Online supplementary materials from Grodstein, F., C.-H. Chang, A.W. Capuano, M.C. Power, D.X. Marquez, L.L. Barnes, D.A. Bennett, et al. "Identification of Dementia in Recent Medicare Claims Data, Compared with Rigorous Clinical Assessments." *The Journals of Gerontology, Series A*, vol. 77, no. 6, 2021, pp. 1272–1278. <https://doi.org/10.1093/gerona/glab377>.

<sup>b</sup> Per Grodstein et al. (2021): "These ICD codes are searched in the following claims files:

- 1) Any inpatient or skilled nursing facility claim
  - 2) Home Health Agency: Any claim
  - 3) Hospice: Any claim
  - 4) Hospital Outpatient File (HOF) for outpatient medical services: Only claims from Rural Health Clinics, Federally Qualified Health Centers, and Critical Access Hospitals-Payment Option II
  - 5) Carrier (Provider) File for services from physicians and other health care providers: Any claim, with the condition that there are two or more qualifying Carrier or HOF claims at least 7 days apart."
- ICD-10 = International Classification of Diseases, 10th Revision.

**Appendix Table 2. List of conditions and associated ICD-10 diagnosis codes that are potentially avoidable from the nursing home**

Condition	ICD-10 codes
Anemia	D500, D501, D508, D509, D510, D511, D513, D518, D520, D521, D528, D529, D530–D532, D538, D539, D630, D638, D649
Congestive heart failure	I098, I110, I130, I132, I500, I501, I509, J81
Hypertension and hypotension	I10, I119, I129, I131, I951, I952, I958, I959
Poor glycemic control	E10, E11, E131, E15, E162, R730
Dehydration, volume depletion, acute renal failure, hyponatremia	E86, E876, N17, N170–N172, N178, N179, N258, N259, E871
Constipation, fecal impaction, obstipation	K564, K590
Diarrhea, gastroenteritis, Clostridium Difficile	A020, A030–A033, A038, A039, A040–A046, A048, A049, A050–A054, A058, A059, A060, A070–A073, A078, A079, A080–A083, A090, A099, K522, K523, K528, K529, A047
Skin ulcers, cellulitis	L890–L893, L899, L97, L984, L030–L033, L038, L039, L049, L080, L088, L089, L88, L980, E832
Lower respiratory pneumonia and bronchitis	J120–J122, J128, J129, J13, J14, J150–J159, J160, J168, J180, J189, J690, A481
Urinary tract infection	N10, N12, N159, N160–N165, N168, N300–N302, N308, N309, N340, N351, N37, N390, N410–N413, N418, N419, N51
Falls and trauma	S020, S021, S022, S023, S024, S026, S029, S120, S121, S122, S124, S125, S126, S128, S129, S220, S222, S223, S224, S225, S229, S320, S321, S322, S323, S324, S325, S326, S328, S329, S420, S421, S429, S422, S423, S424, S520, S521, S523, S524, S525, S536, S527, S529, S620, S621, S623, S625, S626, S629, S723, S724, S729, S820, S821, S822, S823, S824, S825, S829, S920, S921, S922, S923, S924, S925, S928, S929, S720, S721, S722, S030, S131, S331, S332, S333, S430, S431, S432, S530, S531, S630, S631, S730, S830, S831, S832, S930, S931, S933, S060, S061, S063, S064, S065, S066, S069, S049, S070, S079, S090, S098, S099, S119, S141, S142, S149, S179, S259, S269, S280, S298, S369, S379, S380, S381, S398, S449, S479, S489, S498, S570, S578, S598, S670, S672, S673, S698, S749, S77, S770, S771, S772, S798, S87, S870, S878, S898, S970, S971, S978, S014, S019, S211, S212, S310, S410, S411, S510, S710, S614, S615, S910, S911, S913, S009, T200, T201, T202, T203, T210, T211, T212, T213, T220, T221, T222, T223, T230, T231, T232, T233, T240, T241, T242, T243, T250, T251, T252, T253, T260, T261, T262, T264, T265, T266, T271, T280, T281, T282, T283, T284, T300, T310, T311, T312, T313, T314, T315, T316, T317, T318, T319, T07, T149, T159, T509, T659, T670, T671, T672, T673, T674, T675, T676, T677, T678, T679, T68, T698, T699, T711, T730, T731, T751, T754, T758, T788, T799, T889
Altered mental status, acute confusion, delirium psychosis, severe agitation, organic brain syndrome	F010–F013, F018, F019, F03, F050, D051, F058, F059, F199, F01, F060–F064, F068, F220, F228, F229, F230–F233, F238, F239, F24, F28, F29, F323, F333, F448, F530, F531, F538, F539
Chronic-obstructive pulmonary disease, asthma	J200, J209, J218, J40, J410, J411, J418, J42, J439, J441, J449, J47, J440, J441, J449, J459
Weight loss, nutritional deficiencies, seizures	R633, R634, R636, E40, E41, E43, E440, E441, E45, E46, E550, E643

Sources: Hamasaki, Y., N. Sakata, X. Jin, T. Sugiyama, K. Morita, K. Uda, S. Matsuda, and N. Tamiya. "Facility Staffing Associated with Potentially Avoidable Hospitalizations in Nursing Home Residents in Japan: A Retrospective Cohort Study." *BMC Geriatrics*, vol. 23, 2023, article 566. <https://doi.org/10.1186/s12877-023-04278-2>. Hamasaki et al. followed the definition of potentially avoidable hospitalizations developed by Walsh et al. (2012) and crosswalked the ICD-9 codes to corresponding ICD-10 codes.

Walsh, E.G., J.M. Wiener, S. Haber, A. Bragg, M. Freiman, and J.G. Ouslander. "Potentially Avoidable Hospitalizations of Dually Eligible Medicare and Medicaid Beneficiaries from Nursing Facility and Home- and Community-Based Services Waiver Programs." *Journal of the American Geriatrics Society*, vol. 60, no. 5, 2012, pp. 821–829.  
<https://doi.org/10.1111/j.1532-5415.2012.03920.x>.

ICD-10 = International Classification of Diseases, 10th Revision.

Appendix Table 3. List of generic drug names for each drug class

Drug class	Generic drug names
Opioids <sup>a</sup>	Buprenorphine, Butorphanol, Codeine, Dihydrocodeine, Fentanyl, Hydrocodone, Hydromorphone, Levorphanol, Meperidine, Methadone, Morphine, Opium, Oxycodone, Oxymorphone, Pentazocine, Tapentadol, Tramadol
Antibiotics <sup>a</sup>	Amoxicillin, Ampicillin, Azithromycin, Aztreonam, Cefaclor, Cefadroxil, Cefazolin, Cefdinir, Cefditoren, Cefepime, Cefiderocol, Cefixime, Cefotaxime, Cefotetan, Cefoxitin, Cefpodoxime, Cefprozil, Ceftaroline, Ceftazidime, Ceftibuten, Ceftolozane, Ceftriaxone, Cefuroxime, Cephalexin, Ciprofloxacin, Clarithromycin, Clindamycin, Dalbavancin, Daptomycin, Delafloxacin, Demeclocycline, Dicloxacillin, Doripenem, Doxycycline, Eravacycline, Ertapenem, Erythromycin, Fidaxomicin, Fosfomycin, Gemifloxacin, Gentamicin, Imipenem, Lefamulin, Levofloxacin, Lincomycin, Linezolid, Meropenem, Metronidazole, Minocycline, Moxifloxacin, Nafcillin, Neomycin, Nitrofurantoin, Norfloxacin, Ofloxacin, Omadacycline, Oritavancin, Oxacillin, Penicillin, Piperacillin, Plazomicin, Quinupristin, Rifamycin, Rifaximin, Sarecycline, Secnidazole, Streptomycin, Sulfadiazine, Sulfamethoxazole, Tedizolid, Telavancin, Telithromycin, Tetracycline, Ticarcillin, Tigecycline, Tinidazole, Tobramycin, Trimethoprim, Vancomycin, Amikacin
Antipsychotics <sup>a</sup>	Chlorpromazine, Fluphenazine, Haloperidol, Perphenazine, Aripiprazole, Brexpiprazole, Cariprazine, Clozapine, Lurasidone, Olanzapine, Paliperidone, Pimavanserin, Quetiapine, Risperidone, Ziprasidone, Asenapine, Iloperidone, Lumateperone, Loxapine, Molindone, Pimozide, Thioridazine, Thiothixene, Trifluoperazine
Antidepressants <sup>b</sup>	Isocarboxazid, Phenelzine, Tranylcypromine, Selegiline, Rasagiline, Desvenlafaxine, Duloxetine, Levomilnacipran, Venlafaxine, Milnacipran, Citalopram, Escitalopram, Fluoxetine, Fluvoxamine, Paroxetine, Sertraline, Vilazodone, Nefazodone, Trazodone, Vortioxetine, Amitriptyline, Amoxapine, Clomipramine, Desipramine, Doxepin, Imipramine, Maprotiline, Nortriptyline, Protriptyline, Trimipramine, Bupropion, Mirtazapine
Benzodiazepines/Z-drugs <sup>b</sup>	Alprazolam, Chlordiazepoxide, Clobazam, Clonazepam, Clorazepate, Diazepam, Estazolam, Flurazepam, Lorazepam, Midazolam, Oxazepam, Quazepam, Temazepam, Triazolam, Eszopiclone, Zaleplon, Zolpidem
Antiseizure medications <sup>b</sup>	Ethoin, Fosphenytoin, Phenytoin, Ethadione, Paramethadione, Trimethadione, Ethosuximide, Mesuximide, Methsuximide, Brivaracetam, Carbamazepine, Eslicarbazepine, Felbamate, Gabapentin, Lacosamide, Lamotrigine, Levetiracetam, Oxcarbazepine, Perampanel, Pregabalin, Rufinamide, Stiripentol, Sultiame, Tiagabine, Topiramate, Valproate, Divalproex, Valproic acid, Vigabatrin, Zonisamide, Acetazolamide, Phenobarbital, Primidone
Cholinesterase inhibitors or memantine	Galantamine, Rivastigmine, Donepezil, Memantine
Strongly anticholinergic medications <sup>c</sup>	Amitriptyline, Amoxapine, Clomipramine, Desipramine, Doxepin, Imipramine, Nortriptyline, Paroxetine, Prochlorperazine, Promethazine, Brompheniramine, Chlorpheniramine, Cyproheptadine, Dimenhydrinate, Diphenhydramine, Doxylamine, Hydroxyzine, Meclizine, Triprolidine, Darifenacin, Fesoterodine, Flavoxate, Oxybutynin, Solifenacin, Tolterodine, Trospium, Benztropine, Trihexyphenidyl, Chlorpromazine, Clozapine, Olanzapine, Perphenazine, Atropine, Clidinium-chlordiazepoxide, Dicyclomine, Homatropine, Hyoscyamine, Scopolamine, Cyclobenzaprine, Orphenadrine

Sources: CMS Medicare Part D Prescribers by Provider and Drug data set. Available at: <https://data.cms.gov/provider-summary-by-type-of-service/medicare-part-d-prescribers/medicare-part-d-prescribers-by-provider-and-drug>.

AHFS Pharmacologic-Therapeutic Classification. The full 2019 AHFS list is publicly available at:

<https://www.oregon.gov/obnm/Documents/Formulary%20Information/AHFSClassificationwithDrugs2019.pdf>.

2023 AGS Beers Criteria® Update Expert Panel. "The American Geriatrics Society 2023 updated AGS Beers Criteria® for Potentially Inappropriate Medication Use in Older Adults." *Journal of American Geriatrics Society*, vol. 71, no. 7, 2023, pp. 2052–2081. <https://doi.org/10.1111/jgs.18372>.

Note: The majority of generic drug names only belong to one drug class, except for certain antipsychotics and antidepressants which are also strongly anticholinergic.

<sup>a</sup> Lists of generic drug names for opioids, antibiotics, and antipsychotics are identified based on the CMS Medicare Part D Prescribers by Provider and Drug data set.

<sup>b</sup> Lists of generic drug names for antidepressants, benzodiazepines/Z-drugs, and antiseizure medications are identified based on the AHFS Pharmacologic-Therapeutic Classification. Generic drug names for antidepressants are identified by AHFS drug class code 28:16.04 (Antidepressants). Generic drug names for benzodiazepines/Z-drugs



are identified by AHFS drug class code 28:24.08 (Benzodiazepines) and selected drugs under drug class code 28:24.92 (Anxiolytics, Sedatives, and Hypnotics; Miscellaneous) for Z-drugs. Generic drug names for antiseizure medications are identified by AHFS drug class code 28:12.12 (Anticonvulsants: Hydantoins), 28:12.16 (Anticonvulsants: Oxazolidinediones), 28:12.20 (Anticonvulsants: Succinimides), 28:12.92 (Anticonvulsants: Miscellaneous), and 28:12.04 (Anticonvulsants: Barbiturates). Note that benzodiazepines commonly used to treat seizures listed under AHFS drug class code 28:12.08 are excluded from the list of antiseizure medications.

° The list of generic drug names for strongly anticholinergic medications is based on the AGS 2023 updated AGS Beers Criteria®. Per the Beers Criteria®, doxepin is only considered strongly anticholinergic when the daily dosage is above 6mg/day. We also applied this dosage criteria to identify claims/fills for doxepin as a strongly anticholinergic medication in Part D claims.

AGS = American Geriatrics Society; AHFS = American Hospital Formulary System; CMS = Centers for Medicare & Medicaid Services.