

Medication Nonadherence Social Determinants of Health Score: Development and Use

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BACKGROUND

- Social determinants of health (SDOH), defined as the conditions in people's environments that affect health, functioning, and quality-of-life outcomes and risks, have been shown to have a greater influence on health than either genetic factors or access to health care services.¹
- Centers for Medicare & Medicaid Services (CMS) published the CMS Framework for Health Equity 2022-2032 and, notably, Priority 3 of the framework is to "Build Capacity of Health Care Organizations and the Workforce to Reduce Health and Health Care Disparities." In the Priority 3 description, it states, "health care professionals across settings must be equipped with resources and knowledge of what works to reduce disparities. Each organization and team must establish their shared vision of health equity in order to shift from addressing health issues in silos to an embedded approach that drives improvements and closes gaps in access, quality, and outcomes among specific populations."²
- In April 2023, Medicare announced two major changes to the Medicare Stars Rating program to expand ways in which Star Ratings create incentives to address health disparities and improve health equity: 1) replace the current reward factor with the Health Equity Index (HEI); and 2) implement a risk adjustment for social and demographic factors into the Star Ratings program's three medication adherence measures.³ These two changes are a major shift from prior Medicare policy and will meaningfully impact Part D plan sponsor's Star Ratings and their associated quality bonus payments.
- To achieve the maximum HEI rewards, contracts must perform well above average on a wide range of measures among members with low-income status, disability and low SDOH scores.⁴ Failure to perform well within this group will result in no HEI reward, and, without this reward, plans may not be likely to exceed a 4-Star Rating, on a 1 to 5 scale. Medication adherence is a major component of Medicare's Star Ratings, measured across three drug categories: diabetes medications, renin angiotensin system (RAS) for hypertension and cholesterol lowering (statins). It is essential to incorporate SDOH member level factors into managed care pharmacy Medicare Star Ratings programs.
- Prime Therapeutics has an existing program that clients can choose to reward pharmacies for improving members' CMS Star measure performance. There is an opportunity to enhance the existing program to include SDOH related incentives.

OBJECTIVE

To support medication management and improve adherence by developing a Medicare member specific SDOH-related medication nonadherence risk score prioritization model

METHODS

- Data to create the medication nonadherence SDOH risk score came from pharmacy claims for medication adherence measure-eligible members enrolled in 65 Medicare Advantage and Part D (MAPD and PDP) contracts during 2022. The three Medicare Star Ratings program medication adherence measures were used for this analysis.
- Each member's calendar year 2022 medication Star drug category adherence was measured using the CMS Star measure technical specifications. The specifications define adherence with the proportion of days covered (PDC) method as greater than or equal to 80% (i.e., 0.8).⁵
- SDOH factors considered for the analysis were identified through literature review and assessment of stakeholder priorities and are shown in **Table 1**. The final set of factors were selected based on statistical model output data accuracy, feasibility, licensing and availability, as well as collinearity with other factors and the relationship to medication nonadherence within each of the three Star drug categories.
- Factor weights were derived from a linear probability model with Star drug category medication adherence, dichotomized as PDC <0.8 vs. ≥0.8, as the dependent variable and SDOH factors as key independent variables. SDOH factor model coefficients were multiplied by 100 to create factor-specific weights, and these weights were summed at the member level to create a single score representing the member's percentage point likelihood of SDOH-related medication nonadherence.
- We desired a scoring system that was specific to a member and consistent from CMS Star medication adherence measure to measure, i.e., the same member wouldn't have vastly different scores for different measures. Testing showed that the relationship between SDOH factors and the three Medicare adherence measures was relatively consistent, with no meaningful differences in point estimates for correlation (beta coefficients) across measures.
- A fixed effect for the member's state of residence was also included.

TABLE 1

Factors Considered in the Medication Nonadherence Social Determinants of Health Risk Score Model

| Factor | Description | Encoding (levels and reference) | Final model inclusion | Source |
|----------------------------------|--|---|-----------------------|--|
| Z-codes | Presence of any Z-code indicating a SDOH factor in the last 12 months: Z55, Z56, Z57, Z59, Z60, Z62, Z63, Z64, Z65, Z71, Z72, Z73, Z74, Z75, Z77, Z91. | 0, 1 0 – no SDOH-related Z-code 1 – presence of a SDOH-related Z-code | Yes | Medical and Pharmacy claims (Not available for PDP only) |
| Social Vulnerability Index (SVI) | Social vulnerability refers to the potential negative effects on communities caused by external stresses on human health. Such stresses include natural or human-caused disasters or disease outbreaks. The CDC/ATSDR Social Vulnerability Index (CDC/ATSDR SVI) uses 16 U.S. census variables to help local officials identify communities that may need support before, during or after disasters. | 0 - <.50, .50 - <.70, .70 - <.85, .85 - 1 0 is lowest relative social vulnerability; 1 is highest relative social vulnerability | Yes | Census tract linked |
| Area Deprivation Index (ADI) | The ADI allows for rankings of neighborhoods by socioeconomic disadvantage in a region of interest (e.g., at the state or national level). It includes factors for the theoretical domains of income, education, employment and housing quality. It can be used to inform health delivery and policy, especially for the most disadvantaged neighborhood groups. | 0 – 1 0 is least relative disadvantage; 1 is highest relative disadvantage | No | Census tract linked |
| Race | CMS provided race code categories | 0 – Unknown 1 – White 2 – Black 3 – Other 4 – Asian 5 – Hispanic 6 – Native American | No | Eligibility file |
| Language | Indicator of non-English as primary language | 0, 1 0 – No indication of non-English language 1 – non-English language documented | No | Eligibility file |
| Low-income subsidy | Presence of any low-income subsidy | 0, 1 0 – No low-income subsidy 1 – Low-income subsidy | Yes | Eligibility file |
| Dual eligibility | Dual enrollment in Medicare and Medicaid | 0, 1 0 – Not dual eligible 1 – Dual eligible | Yes | Eligibility file |
| Age | Age as of 12/31/2022 | <60, 60-64, 65-69, >70 | Yes | Eligibility file |
| Gender | Gender | Female, Male | Yes | Eligibility file |
| Rural-urban status | 2010 census ZIP code designation assigned by Quest platform | Rural, Suburban, Urban, N/A | Yes | 5-digit ZIP linked |
| Disability | CMS Original Reason for Entitlement Code (OREC) | 0, 1 0 – No disability 1 – Disability | Yes | Eligibility file |

PDP = prescription drug plan; N/A = not available

REFERENCES

1. *Social determinants of health*. Centers for Disease Control and Prevention. December 12, 2022. Accessed 2023. <https://www.cdc.gov/about/sdoh/addressing-sdoh.html>
2. *CMS Framework for Health Equity 2022-2032*. Centers for Medicare & Medicaid Services. April 2022. Accessed 2023. <https://www.cms.gov/files/document/cms-framework-health-equity-2022.pdf>
3. *88 FR 50043 - Medicare Program; Contract Year 2024 Policy and Technical Changes to the Medicare Advantage Program, Medicare Prescription Drug Benefit Program, Medicare Cost Plan Program, and Programs of All-Inclusive Care for the Elderly*. Centers for Medicare & Medicaid Services. August 1, 2023. Accessed 2024. <https://www.govinfo.gov/app/details/FR-2023-08-01/2023-16307>

TABLE 2

Overall Frequencies for Social Determinants of Health Factors Included in the Final Risk Score Model

| SDOH factor | Levels | Total (N=1,012,314) |
|--|--|---|
| Presence of SDOH-related Z-code | Yes | 78,844 (7.8%) |
| SVI category for census tract (state adjusted) | 0 to < .50 .50 to <.70 .70 to <.85 .85-1 Not available | 552,058 (54.5%) 178,751 (17.7%) 113,555 (11.2%) 87,368 (8.6%) 80,582 (8.0%) |
| Low income subsidy | Yes | 93,190 (9.2%) |
| Disability status | Yes | 117,825 (11.6%) |
| Medicaid enrollment status | Yes | 72,948 (7.2%) |
| Age category, years | <60 60-64 65-69 70+ | 27,230 (2.7%) 27,149 (2.7%) 229,164 (22.6%) 728,771 (72.0%) |
| Gender | F M | 541,397 (53.5%) 470,917 (46.5%) |
| Rural-urban status | Not available Rural Suburban Urban | 23 (0.00%) 260,632 (25.7%) 115,471 (11.4%) 636,188 (62.8%) |

SDOH=social determinants of health; SVI=social vulnerability index

TABLE 3

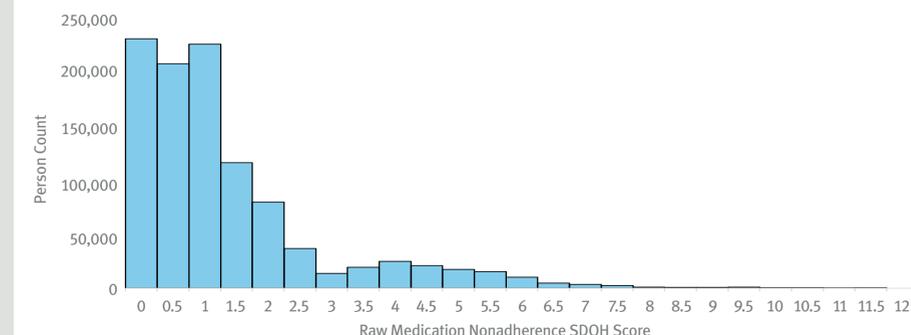
Factor Weights for the Medication Nonadherence Social Determinants of Health Risk Score Model

| SDOH factor | Level | SDOH factor weight (95% confidence interval) |
|--|---|--|
| Age category, reference ≥70 years | <60 60–64 65–69 | 4.06 (3.63 to 4.49) 1.76 (1.37 to 2.16) 0.42 (0.29 to 0.55) |
| Disability status, reference 0 | 1 | 0.79 (0.58 to 1.00) |
| Gender code, reference Male | Female | 0.68 (0.57 to 0.78) |
| Low-income subsidy, reference 0 | 1 | 0.52 (0.13 to 0.91) |
| Medicaid enrollment, reference 0 | 1 | 0 (-0.40 to 0.46) |
| SVI category, reference 0 to <.50 | .50 to <.70 .70 to <.85 .85 to 1 Not available | 0.44 (0.29 to 0.58) 1.01 (0.83 to 1.19) 1.56 (1.36 to 1.76) 1.11 (0.90 to 1.33) |
| Rural-urban status, reference Urban | Suburban Rural | 0.11 (-0.28 to 0.07) 0.36 (0.22 to 0.51) |
| Presence of SDOH-related Z-code, reference 0 | 1 | 3.62 (3.40 to 3.84) |

SDOH=social determinants of health; SVI=social vulnerability index; 0=no, 1=yes

FIGURE

Overall Distribution of Raw Medication Nonadherence Social Determinants of Health Risk Scores



SDOH=social determinants of health. Distribution of member scores, based on the sum of their SDOH factor weights, see **Table 3** for factor weights.

RESULTS

- The final model considered 1,012,314 Medicare enrollees, and SDOH factors consisted of SDOH-related Z-codes, social vulnerability index, low-income subsidy status, disability status, Medicaid enrollment status, age, gender and rural-urban status. **Table 2** provides the population frequencies for SDOH factors included in the final medication nonadherence risk score model.
- As shown in the **Figure**, the distribution of SDOH scores appeared skewed and multimodal, with large clusters of members close to 0, close to 1.25, and around 4.25. The mean score was 1.6 with a median of 1.1 and a max of 11.⁶
- As shown in **Table 3**, the most influential factors were SDOH-related Z-codes and age <60 years with factor weights of 3.62 and 4.06, respectively.
- The medication nonadherence SDOH score model performance C-statistic was 0.575 in improving medication adherence prediction over the base model without SDOH factors.
- To create a member level medication nonadherence SDOH score, which can be used by clients as a part of their SDOH-related targeting efforts, each client's attributed membership was ranked by score, and the resulting rank was used to create a scale from 0 to 100 where 0 is the lowest SDOH score, 100 is the highest score, and each score in between represents the percentile rank for that given score. As a result, each client's medication nonadherence SDOH score represents different absolute raw SDOH score values.

LIMITATIONS

- Future improvements could include expanding the number of SDOH factors considered and variable transformations to maintain the continuous nature of some of variables (e.g., age and SVI) while acknowledging the nonlinear nature of the relationships between these variables and SDOH burden.
- The model should be updated frequently to reflect the dynamic nature of an individual's SDOH factors.
- The influence of multicollinearity between Medicaid enrollment, disability status, low-income status and age requires further investigation. This could be addressed through interaction terms. Multicollinearity among many of the variables is acknowledged (e.g., dual status and low-income subsidy, dual status and age < 65 years, etc.). The decision was made to not use interaction terms, as it would make interpretation of model weights by clients more challenging.
- This SDOH score is effective in distinguishing between those with high SDOH burden and those with moderate to low SDOH burden. Reliability of cut points below 70 is uncertain, as the underlying distribution becomes less dispersed and cut points are more prone to random variation. Due to large numbers of members clustering around certain low scores, the 20th and 30th percentiles are collapsed together for some clients and very close for others.

CONCLUSIONS

- This managed care pharmacy SDOH health risk score successfully used historical data to identify future medication nonadherence and can support MAPD and PDP plan sponsors' efforts in response to Medicare's SDOH-related initiatives. These findings demonstrate the feasibility of combining many different types of SDOH-related data scoring, at the member level, and pharmacists and pharmacies will find it valuable in prioritizing care management services.
- Further efforts will look to improve the model performance for predicting medication nonadherence based on SDOH factors, develop standardized disparity reporting based on SDOH factors, and implement the program incentivizing care outreach to members with conditions often not considered by traditional health care services.

