Medicaid and Social Determinants of Health: Adjusting Payment and Measuring Health Outcomes

Prepared by Ellen Breslin and Anissa Lambertino of Health Management Associates in partnership with Dennis Heaphy of the Disability Policy Consortium and Tony Dreyfus.

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IN THIS BRIEF

✓ **Social determinants of health have an important influence** on the health, health care outcomes and spending associated with Medicaid beneficiaries.

✓ **Massachusetts and Minnesota** provide compelling examples of the ways in which Medicaid programs can account for SDOH in their payment and quality improvement policies.

✓ **Massachusetts recently developed an enhanced risk adjustment model** that aims to account for the impact of SDOH on the State's Medicaid spending.

✓ **Minnesota has developed an approach to identify Medicaid populations** with the greatest health disparities by examining a number of social risk factors.

Introduction

State policy makers are increasingly focused on the social determinants of health (SDOH), because of the important influence that they have on health, health care outcomes and Medicaid spending. There is an extensive body of evidence[1] that shows that SDOH play a powerful role in shaping health and health outcomes.

Social determinants include a broad array of social and environmental risk factors such as poverty, housing stability, early childhood education, access to primary care, access to healthy food, incarceration and discrimination. Figure 1 offers some examples of SDOH within five different domains as described in Healthy People 2020.[2]

Figure 1: Social Determinants of Health – Five Domains				
Economic Stability	Education	Health and Health Care	Neighborhood and Built Environment	Social and Community Context
• Poverty • Employment • Food Security • Housing Stability	• High school graduation • Language and literacy • Early childhood education	• Access to health care • Access to primary care • Health literacy	• Access to healthy food • Quality of housing • Crime and violence • Environmental conditions	• Social cohesion • Civic participation • Incarceration • Discrimination

This brief address two key questions for state policy makers:

1. Why should Medicaid programs account for SDOH in setting payments and in measuring quality?

2. What methods can Medicaid programs use to examine SDOH and account for them in their payment and/or quality improvement policies?

In responding to these questions, the brief includes case studies from Medicaid agency efforts in both Massachusetts and Minnesota. From Massachusetts, this brief offers state agencies practical guidance on methods that can be used to factor SDOH into Medicaid managed care payment models. From Minnesota, the brief offers guidance to states on methods to examine health disparities in Medicaid populations and the role of SDOH. This brief concludes with five potential action steps for state agencies interested in addressing SDOH to ultimately improve care, outcomes, and efficiencies for Medicaid managed care and other programs serving vulnerable populations.

Why should Medicaid programs account for SDOH in setting payments and in measuring quality?

State Medicaid programs should seek to account for SDOH in setting payments for Medicaid plans and Accountable Care Organizations (ACOs), as in the case of Massachusetts, and in measuring quality for the Medicaid population, as in the case of Minnesota. Accounting for SDOH in payment and quality improvement policies would provide plans and ACOs more accurate payments and states with a better understanding of quality across providers and populations. With an improved understanding regarding how SDOH factors influence cost and quality of care for Medicaid populations, states and managed care entities can take actions to develop new strategies to better address disparities in outcomes for these populations in a more cost-effective manner.

"Social determinants of health are conditions in the environments in which people are born, live, learn, work, play, worship, and age that affect a wide range of health, functioning, and quality-of-life outcomes and risks."

Healthy People 2020,
Centers for Disease Control and Prevention

Research Demonstrating Impact of Food Supports on Health Outcomes

A 2010 study of food insecurity[3] found a high correlation between food insecurity and chronic diseases among low-income populations; specifically, among nonelderly adults living below 200 percent of the Federal Poverty Level, researchers identified a link between food insecurity, and hypertension and diabetes. A pilot food bank intervention provided free diabetes-appropriate food to individuals in low-income families. Researchers enrolled nearly 700 diabetic food pantry clients across three states in a six-month intervention that tested the effect of diabetes-appropriate food, glycemic monitoring and self-management support on health outcomes. The study found improvements across a variety of indicators including glycemic control, fruit and vegetable intake, and medication adherence.

Key reasons to account for SDOH in payment

Accounting for SDOH in Medicaid payment models creates a better alignment between the risk of the population and the payment amount – that is, payment that better reflects the health and well-being of the population and their likely health care and social service needs.[4] A more accurate payment system provides Medicaid health plans and ACOs with the right incentives and helps set them on the right course to meeting the needs of covered populations. Payment accuracy in Medicaid managed care also leads to more effective use of taxpayer dollars.

States typically do not account for social determinants of health in their payment models.[5] More often, states set capitation rates and total cost of care targets for Medicaid plans and ACOs using only diagnosis-based risk adjustment to capture the relative risk of a plan's or an ACO's Medicaid population. These relative risk scores do not account, however, for social determinants such as income, education, or housing status. Without a corresponding adjustment in their payment models, states may financially penalize Managed Care Organizations (MCOs) and ACOs for caring for people with significant social challenges, or for creating innovative programs to meet the needs of these individuals. By taking steps to adjust payments for SDOH, states can effectively encourage providers to innovate and develop better services – including services that go beyond health services – for people who often experience poor outcomes.

Key reasons to account for SDOH in quality measurement

States have at least two compelling reasons to use SDOH data in support of their quality measurement activities. First, states that adjust for SDOH when making quality comparisons across plans or ACOs have the potential to support more accurate and meaningful comparisons among plans or ACOs.[6] Second, by analyzing SDOH data, states can achieve a deeper and more refined understanding of variations in quality across their Medicaid populations and subpopulations which may help to spark new programs to address these gaps in quality.

Adjusting performance measurement by SDOH is not without its controversy, however, because such adjustment could in some cases create inappropriate incentives by artificially boosting the performance scores of providers treating vulnerable individuals.[7] On the one hand, downward adjustments in performance targets would recognize the role that social risk factors play in shaping health outcomes. Such a downward adjustment would serve to protect plans and ACOs from being penalized for failing to hit targets. On the other hand, a state that adjusts quality performance expectations for these factors may end up with a multi-tiered system that inadvertently perpetuates health disparities and that undermines the potential to improve outcomes and reduce Medicaid costs. By adjusting quality expectations in this way, some argue that a state is sending the message to plans and providers that it is acceptable to provide poorer care, e.g. fewer immunizations or cervical cancer screenings, etc., to beneficiaries with more adverse determinants of health. The National Quality Forum has examined this topic in detail and made recommendations for how and when quality performance measures might be adjusted for social risk factors.[8] In-depth analysis of whether and how social risk factors should be accounted for in the Medicare program is also underway and may provide some useful guidance for Medicaid programs.[9]

Improving Health Outcomes for People with Disability

Considering a person's disability solely as a diagnostic risk factor for health spending ignores the negative effects of SDOH on health outcomes. People with disabilities have a history of facing discrimination, poverty, low-educational attainment, inaccessible neighborhoods and built environments, and lack of access to preventative health care. Interventions addressing SDOH should include strategies to address SDOH in people with disabilities and improve health outcomes.[10] Research provides strong evidence that people with disabilities face significant barriers in accessing health care. For example, women with disabilities are diagnosed with breast cancer at later stages of the disease than women without disabilities, because of poorer access to breast cancer screenings.[11] The relationship between disability, SDOH and health outcomes is an area that would benefit from policy makers' attention and more rigorous analyses. Such analyses could help to refine interventions to mitigate the impact of SDOH on persons with disabilities and improve health outcomes for this population.

What methods can Medicaid programs use to examine social determinants of health—and to account for these determinants in their payment and quality improvement policies?

Accounting for social determinants of health in Medicaid payment models and in quality measurement programs is new and evolving. Each state may approach this work differently, but with the same common goal of developing methods that improve their ability to measure and address the needs of the populations they serve. Various factors such as differences in the available data and access to that data, state variations in Medicaid program design, and state-specific resource and budgetary constraints may influence the methods that states choose to address the SDOH.

The next section of this brief describes efforts to use SDOH data to improve Medicaid managed care in Massachusetts and Minnesota, including:

⟩ a new payment model that the Massachusetts Medicaid program has developed to adjust payments for social risk factors such as poverty, education, employment, family status, and housing,[12] and

⟩ an approach designed by Minnesota to examine Medicaid populations with poor health outcomes by identifying key SDOH factors that are predictive of poor health outcomes or health disparities and Medicaid spending.[13]

Massachusetts: A Newly-Developed Method to Enhance Medicaid Risk Adjustment

In 2016, Massachusetts announced the development of its "Social Determinant of Health" model, an enhanced risk adjustment model that the State hopes will account for the impact of SDOH on Medicaid spending.[14] This work breaks new ground in risk adjustment, moving beyond mostly medical claims-based data to a richer methodology that also uses factors such as homelessness and neighborhood stress to adjust

payments to MCOs. This new payment method is one of many elements included in Massachusetts' recent 1115 waiver renewal from the Centers for Medicare and Medicaid Services (CMS) under the state's ACO program which is supported by a new Delivery System Reform Incentive Payment (DSRIP) program.[15]

Why did Massachusetts undertake this SDOH risk-adjustment project?

Massachusetts recognized that its method of risk adjustment using a standard diagnosis-based grouper could be improved by incorporating additional factors, including data on SDOH.[16] The SDOH risk-adjustment project provides the State with an opportunity to orient Medicaid managed care plans and newly-established ACOs to focus more deliberately on improving population health.

How did the State conduct its work?

State policy makers worked with researchers at the University of Massachusetts Medical School to build on Massachusetts' existing risk adjustment model by evaluating the statistical associations between various factors – including social determinants and other risk factors – and Medicaid spending. The State supplemented claims data with plan encounter data and data from sister state agencies and the U.S. Census Bureau to compile the variables.[17] The State complemented expanded age, gender, and diagnostic variables with new variables to account for unstable housing, neighborhood stress, eligibility for Medicaid because of disability, and for status as served by a state agency for people with significant mental health or developmental disabilities.

Massachusetts now includes new and refined variables in its Medicaid managed care risk-adjustment model as illustrated in Table 1. Variables that fall within the realm of SDOH include "unstable housing" and "neighborhood stress score" based upon residence in a census block group. The neighborhood stress score represents a composite measure of financial or economic stress using census data within census block groups. The addition of these variables reflects Massachusetts Medicaid's policy goals to recognize the financial implications of these types of SDOH variables on health care expenses for populations served by Medicaid managed care entities.

Table 1: Variables Included in Massachusetts Medicaid Payment Model[18]	
Diagnostic Risk Scores	DxCG v 4.2
Age	0-1, 2-5, 6-12, 13-17, 18-24, 25-34, 35-44, 45-54, 55-59, 60+, male and female
Additional Diagnostic Variables	Mental illness, substance use disorders
State Agency Affiliation	Department of Mental Health, Department of Developmental Services
Disability	Entitled to Medicaid due to disability
Unstable Housing	Three or more addresses in single year or ICD-code for homeless on claim[19]
Neighborhood Stress Score	Composite measure from seven census data variables: • % families with incomes < 100% FPL • % < 200% FPL • % adults unemployed • % households receiving public assistance • % households with no cars • % single parent households • % adults 25+ with no high school degree

What are the key findings of this effort?

Through this effort, Massachusetts improved the power of its risk-adjustment model's fit.[20] In describing the predictive power of the Medicaid risk-adjustment model, researchers Arlene Ash and Eric Mick found that "when used to predict next year's costs from this year's data, the model's explanatory power is estimated to be 38 percent, which is at the high end of best-performing prospective models in Medicaid populations."

The State's new model of risk adjustment demonstrates that adding social determinants and related variables strengthens the predictive power of risk adjustment, and improves the accuracy of the payments and financial targets set for plans and ACOs respectively. It must be noted, however, that because many Medicaid beneficiaries suffer from poor SDOH, the addition of the State's risk adjustment variables for Serious Mental Illness (SMI), Substance Use Disorder (SUD) and state agency involvement probably contributed a larger proportion of the improvement in predictive power than the addition of SDOH-related factors.

In 2016, Massachusetts began using this enhanced payment model to set Medicaid capitation rates for its MCOs; in 2017, it will use the model to establish total cost of care targets for its ACO program. The new payment model captures the financial impact of SDOH on MCO and ACO risk. The model works by adjusting per member per month (PMPM) amounts for each program and participating MCO and ACO to account for associated financial risk of SDOH, which improves the accuracy of payments to MCOs and ACOs.[21]

Minnesota: An Emerging Approach to Identifying Populations with the Greatest Health Disparities

Medicaid populations are particularly vulnerable to health disparities due to low income, food insecurity, poor housing and other socio-economic risk factors. Health care disparities are essentially SDOHs "in action," meaning disparities in health outcomes are often evidence of underlying social and economic risk factors.

In 2015, the Minnesota legislature directed the Medicaid program to "develop a methodology to pay a higher payment rate for health care providers and services that takes into consideration the higher cost, complexity, and resources needed to serve patients and populations who experience the greatest health disparities [in order] to achieve the same health and quality outcomes that are achieved for other patients and populations."[22]

How will Minnesota conduct its work?

Minnesota has divided this project into two parts to reflect research, development and implementation of the legislative directive.[23] In this first part of the work, the State conducted interviews with a small sample of community members (37) who had experienced poverty, homelessness and immigration. In addition, the Oregon Health and Sciences University conducted a limited review of the literature.[24] This work addressed the State's first question: Which demographic and social risk factors[25] best identify the populations with poor health outcomes? The report to the Minnesota legislature identified six risk factors that were strongly related to health including: low educational attainment, poverty, homelessness, mental illness, substance use disorder, and diminished parental functioning. Minnesota is currently conducting an analysis of quantitative data to identify those "risk factors which are most predictive of health care utilization, payments, and performance measures." In subsequent work, the State will address the question: What are the interventions and payment methodologies which best target these populations to meet their needs and reduce health disparities?

How will the State identify populations with the greatest disparities?

To begin this work, Minnesota developed a conceptual framework for identifying those populations that experience health disparities; for each risk factor that the State reviewed, it considered the following questions:

> Is there evidence that people with this risk factor have worse health?

> How might this risk factor impact health?

> How might the State identify enrollees with this risk factor?

Minnesota's approach to considering risk factors offers one framework for states to consider. Other frameworks are available. For example, the Wisconsin Population Institute offers one such framework, the National Academies of Sciences, Engineering and Medicine another. [27,28] These frameworks provide varying approaches to measuring health disparities: using mortality and morbidity rates, health care access and utilization, health care performance, or health care spending across populations.

What data will the State use?

Minnesota Medicaid has built a large data set for running cross-tabulations and regressions.[29] The data set includes data from the following sources: Medicaid enrollment and claims data, child protection services, cash assistance and other non-Medicaid sources. The data set includes information on mortality rates and the prevalence of morbidities across a range of chronic diseases and conditions, measures of health care access and use, Medicaid spending, and many social risk factors. The appendix provides more information about the common methods that can be used to analyze data.

> *Health disparities are "a particular type of health difference that is closely linked with social, economic, and/or environmental disadvantage. Health disparities adversely affect groups of people who have systematically experienced greater obstacles to health based on their racial or ethnic group; religion; socioeconomic status; gender; age; mental health; cognitive, sensory, or physical disability; sexual orientation or gender identity; geographic location; or other characteristics historically linked to discrimination or exclusion.[26]*
>
> *— Healthy People 2020, Centers for Disease Control and Prevention*

Minnesota's research plan includes an examination of several social risk factors. For adults, the State is planning to assess the importance of factors – income, family homelessness status, education, race, immigration status and primary language spoken – to health outcomes. For children, the potential social risk factors include child protection involvement, presence of four or more children in the household, and various parental factors such as substance use disorder, mental illness, disability, and likelihood of having been incarcerated.[30] Like Massachusetts, Minnesota will also examine an array of other factors, including: demographic variables such as age, gender, race, enrollment variables such as length of enrollment; and, medical variables such as diagnostic groups, disability status, mental illness, substance use disorder, and developmental disability status.[31] To examine health outcomes of interest, Minnesota plans to use several sources of information including Healthcare Effectiveness Data and Information Set (HEDIS) and Agency for Healthcare Research and Quality (AHRQ) health care performance measures.[32] Such quality measures might include access to oral health, measures of appropriate utilization such as potentially preventable emergency department visits and hospital admissions, and measures of quality such as comprehensive diabetes care.[33,34]

What are the next steps for Minnesota?

Minnesota's early analytic work is complete. A forthcoming report will reflect the State's response to the Legislature's directive to identify the populations with the worst health outcomes, or greatest disparities. The State also plans to make available summaries of the work undertaken for this project on its website for other states and researchers who are interested in learning more about Minnesota's efforts. The State's next steps will include researching and developing interventions to improve health outcomes for the subpopulation groups identified as those with the worst health outcomes. These groups could include those who are homeless or those living in deep poverty (50 percent or below the Federal Poverty Level), for instance.

Potential Action Steps for States

In the long run, more rigorous collection, analysis, and use of data on the SDOH can help to make more effective use of Medicaid managed care dollars, better align Medicaid payments with the risk of covered populations, and ultimately improve care and outcomes for vulnerable populations.

State policy makers contemplating using SDOH data in Medicaid managed care programs should consider the following strategies and action steps.

1. **Identify and Work with Partners.** State Medicaid agencies should identify and work with partners to develop SDOH reporting and data analytics capacity. Medicaid agencies should reach out to other state agencies such as public health and housing that may have prior experience in assessing SDOH. In addition, Medicaid agencies can partner with sister state agencies to obtain data related to SDOH factors to augment the Medicaid managed care data set. Other state agencies also may have pre-existing relationships with stakeholders across the state that can contribute to state efforts to analyze SDOH data. Working with sister agencies, Medicaid agencies can convene potential partners, such as state universities, managed care partners, and ACOs, to galvanize and motivate resources related to SDOH data and analytics. These partners may be able to offer resources for assessing sources of SDOH data, and analyzing the data itself.

2. **Use Literature and Qualitative Data to Identify Leading SDOH and Their Impact.** States do not need to venture out on their own to identify potential SDOH that are related to poor health outcomes. States can conduct a limited literature review or learn from those conducted by other states like Minnesota who are further along to achieve a better understanding of the factors that could be included in these efforts. Gathering qualitative data via interviews with stakeholders, as Minnesota did, can also be powerful for states seeking to understand how these social, economic, and physical conditions that Medicaid population groups face affect their health. Conducting interviews or focus groups offers a means of asking beneficiaries what services can be delivered by health and social service providers to help mitigate these conditions.

3. **Assess Existing Sources of SDOH Data.** States have access to a wealth of data that can be used to analyze SDOH with the same rigor used to analyze health status, utilization and costs. States collect claims and enrollment data which contain some information on income and additional demographic data as well as indicators of housing instability. Sister state agencies can provide access to additional data on members relative to who uses state services for certain disabilities or significant mental illness and substance use disorder treatment. Other state and federal agency data can provide additional information that can be used to identify geographic areas where SDOH may be predictive of poor health outcomes. Variables from these data sets can be used for geocoding at the neighborhood level and include: food deserts, transportation availability, income and poverty status, educational attainment, family status, unemployment, crime rates, housing availability, incidence of ambulatory care sensitive conditions and potentially preventable emergency department visits.

4. **Analyze Risk Factors Predictive of Costs and Health Outcomes.** Once a database is created, state policy makers can analyze the data to determine which risk factors are predictive of poor health outcomes and health care expenditures in their regions. States can compare people who are living in the poorest neighborhoods to those who live elsewhere, for instance. For such groups, states might examine outcomes such as mortality rates, the prevalence of morbidities or disease burden, measures of access, utilization and quality, and measures of spending. These simple comparisons can help states in many ways: to highlight unmet needs, to target certain groups for service intervention or care coordination, to increase Medicaid health plan and ACO accountability, to establish a more accurate baseline to measure improvement, and to develop targeted contractual requirements around performance that may have an ameliorating effect on the social determinants of health.

5. **Establish Goals and Get Started Using SDOH.** Methods to adjust managed care payments to account for SDOH and to examine the relationships between these factors and health outcomes and costs can be analytically intensive.[35] The important task for states getting started is to identify short and longer term goals for using SDOH to improve care. States can do much to use SDOH data to improve Medicaid managed care risk-adjustment approaches, adjust quality measurements and to understand health disparities. These efforts do not need to be on the same scale as those undertaken by Massachusetts and Minnesota; smaller projects can fit with states' current initiatives and priorities. For example, states can:

   › **Advance Medicaid health plan and provider understanding of SDOH and use of SDOH data**. States can and should share information to enhance MCO and provider understanding of SDOH. They should also concentrate on enhancing and collecting potential types of such data. For example, in addition to sharing results of state SDOH analyses, states and stakeholders could discuss screening members for SDOH as well as sharing and recording SDOH data in electronic health records.

   › **Use SDOH Data to Examine Disparities and Develop Interventions**. A Medicaid program might monitor key health outcomes to track health disparities across Medicaid populations and to craft more targeted responses. Key measures might include mortality, morbidity, health care use and health care quality. Such measures could help states to identify the populations that experience health disparities and to strategize on interventions to reduce them.

   › **Use SDOH Data to Refine Managed Care Payment Approaches to Better Reflect Risk**. When developing capitation rates or budget targets for contracted MCOs or ACOs, respectively, a state could examine how Medicaid expenditures vary based on SDOH data and use this analysis to create mechanisms to more accurately account for SDOH across Medicaid managed care populations served by different managed care entities.

> ❯ **Account for SDOH When Making Quality Comparisons Across Contractors.** When comparing quality performance across MCOs or ACOs, a state could examine how quality performance varies based on SDOH data, with careful attention to the risks of doing so as noted earlier in this brief.

States can and should consider a range of actions and strategies related to accounting for SDOH in Medicaid managed care programs to better understand and act on SDOH data related to quality improvement, cost effectiveness, or both types of outcome measures. By understanding variations and links between SDOH, quality performance, and cost, state Medicaid agencies can develop more efficient and effective strategies to successfully improve outcomes and reduce disparities.

Appendix: Common Methods of Analysis[36]

Three of the most common methods of analysis that can be used to examine the importance of the SDOH to Medicaid programs are univariate, bivariate and multiple regression analysis. These three methods vary in terms of the level of difficulty of the method and types of answers that can be provided. This table provides an overview of the methods and examples of the questions that can be answered by each method. Depending upon the method used, the results can be displayed in any number of formats including tables, cross-tabulations, and graphs.

The Use of Methods of Analysis for Examining Social Determinants of Health		
Analytic Level	Statistical Name of the Method	Example Questions
Basic	Univariate analysis can be used to analyze one variable at a time and to describe the population.	How many and what percent of persons have income less than 50 percent of the Federal Poverty Level? How many and what percent of persons have not graduated high school?
More Advanced	Bivariate analysis can be used to examine the relationship or associations between two variables; and, to help prioritize the selection of variables for the regression model and to design the regression analysis.	What is the mortality rate for people who are homeless compared with the mortality rate for people who are not homeless? What is Medicaid spending for people who are homeless compared with the spending for people who are not homeless? What is the relationship between homelessness and Medicaid spending?
Complex	Regression can be used to examine many variables and to assess the relative importance of each "independent variable" to the dependent variable of health outcomes or Medicaid spending. The selection of multiple regression or logistic regression will be based on the variables included. States will want to propose a set of regressions that are inclusive of age, gender, diagnostic risk score, and social risk factors and regress these factors against the outcomes of interest such as mortality, morbidity, health care access and quality measures, and Medicaid spending.	How is morbidity associated with very low income, with limited education, and with homelessness? How do these associatios compare with each other? How are risk factor, such as age, gender, risk score and social risk factors, predictive of the outcomes such as mortality, morbidity, and Medicaid spending?

Endnotes

1. Research and articles related to the role of SDOH in health outcomes include, for example;

   - J. Michael McGinnis et al. "The Case for More Active Policy Attention to Health Promotion," Health Affairs, March 2002. Click here to access.

   - Bridget C. Booske et al. "County Health Rankings Working Paper: Different Perspectives for Assigning Weights to Determinants of Health," University of Wisconsin, Population Health Institute, February 2010. Click here to access.

   - Sandro Galea, et al. "Estimated Deaths Attributable to Social Factors in the United States," American Journal of Public Health, August 2011. Click here to access.

   - National Quality Forum, Technical Report. Risk Adjustment for Socioeconomic Status or Other Sociodemographic Factors, August 2014. Click here to access

   - Yale Global Health Leadership Institute, "Leveraging Social Determinants of Health: What Works?" The Blue Cross Blue Shield of Massachusetts Foundation. June 29, 2015. Click here to access.

   - Massachusetts Medicaid Policy Institute (MMPI), "Estimating Cost Reductions Associated with the Community Support Programs for People Experiencing Homelessness," The Blue Cross Blue Shield of Massachusetts Foundation. March 2017. Click here to access.

2. Centers for Disease Control and Prevention, Healthy People 2020 Midcourse Review, Chapter 39, page 39-2. Click here to access.

3. Hilary K. Seligman, et al. "Food Insecurity is Associated with Chronic Disease Among Low Income NHANES Participants," Journal of Nutrition, February 2010. Click here to access.

4. Society of Actuaries' Health Section. Syed Muzayan Mehmud, "Nontraditional Variables in Healthcare Risk Adjustment," July 2013, p.15-16. Click here to access.

5. Society of Actuaries. "Risk Adjustment in State Medicaid Programs," January 2008. Click here to access.

6. National Quality Forum, Risk Adjustment for Socioeconomic Status or Other Sociodemographic Factors: Technical Report, August 2014. Click here to access.

7. Christine Cassel, "Should Provider Performance Measures Be Risk-Adjusted For Sociodemographic Factors?" Health Affairs Blog, March 2014. Click here to access.

8. National Quality Forum, Risk Adjustment for Socioeconomic Status or Other Sociodemographic Factors: Technical Report, August 2014. Click here to access.

9. National Academies of Sciences, Engineering, and Medicine, "Accounting for Social Risk Factors in Medicare Payment: Identifying Social Risk Factors," January 2016. Click here to access.

10. Disability and Health | Healthy People 2020. Click here to access.

11. Canadian Breast Cancer Network, "Women with Disabilities & Breast Cancer Screening, An Environmental Scan," 2013. Click here to access.

12. Executive Office of Health and Human Services. MassHealth Risk Adjustment Model: Social Determinants of Health. October 2016. Click here to access.

13. Accounting for Social Risk Factors in Minnesota Health Care Program Payments. Phase I Initial Findings. Minnesota Department of Human Services, Legislative Report, April 2016. Click here to access.

14. Executive Office of Health and Human Services. MassHealth Risk Adjustment Model: Social Determinants of Health, October 2016. Click here to access.

15. Executive Office of Health and Human Services. Section 1115 Demonstration Project Amendment and Extension Request, July 2016. Click here to access.

16. Winkelman et al. A Comparative Analysis of Claims-Based Tools for Health Risk Assessment. Society of Actuaries, April 2007. Click here to access.

17. Center for Health Care Strategies, Inc., "Measuring Social Determinants of Health among Low-Income Populations: Early Insights from State Initiatives, "Webinar Presentation and Issue Brief, December 2016. Click here and here to access.

18. Executive Office of Health and Human Services. MassHealth Risk Adjustment Model: Social Determinants of Health, October 2016. Click here to access.

19. The V-codes, part of the ICD system, are for describing circumstances that may influence care but are probably not used often enough to yield an accurate count of persons who are homeless.

20. Arlene S Ash, PhD, Eric Mick, PhD, "Risk Adjustment Project for MassHealth Payment and Care Delivery Reform: Describing the 2017 Payment Model," UMASS Medical School, Center for Health Policy and Research, October 2016. Click here to access.

21. Ibid.

22. The Office of the Revisor of Statutes. 2015 Minnesota Session Laws. Chapter 71, Article 11, Section 63. Health Disparities Payment Enhancement. Laws of Minnesota 2015, chapter 71, article 11, section 63. Click here to access.

23. Minnesota Department of Human Services, Legislative Report, Accounting for Social Risk Factors in Minnesota Health Care Program Payments. Phase I Initial Findings, April 2016. Click here to access.

24. Ibid.

25. Social risk factors are conceptually the same as the social determinants of health. These can be defined as the range of personal, social, economic and environmental factors that influence the health of individuals and populations (Minnesota Department of Health, 2013).

26. U.S. Department of Health and Human Services. The Secretary's Advisory Committee on National Health Promotion and Disease Prevention Objectives for 2020. Phase I report: Recommendations for the framework and format of Healthy People 2020. Section IV: Advisory Committee findings and recommendations. Click here to access and learn more.

27. David A. Kindig, "Improving Population Health: Ideas and Action," University of Wisconsin Population Health Institute, April 2014. Click here to access.

28. National Academies of Sciences, Engineering, and Medicine, "Accounting for Social Risk Factors in Medicare Payment: Identifying Social Risk Factors," January 2016. Click here to access.

29. Under contract with the Department of Human Services, Health Management Associates in partnership with JEN Associates, Inc. developed the data set and analyzed the data.

30. As states begin addressing SDOH, they may consider disability status including mental health, as distinct social determinants that lead to disparities in mortality, morbidity, health care access and quality. Research provides strong evidence that people with disabilities face significant barriers in accessing health care.

31. Minnesota Department of Human Services Health Care Administration, Request for Proposal for a Qualified Contractor to recommend and implement a methodology which adjusts payments according to recipient social risk factors, January 25, 2016.

32. Ibid.

33. Several sources offer additional information on social determinants of health in oral health. Click here and here to learn more.

34. Harry J. Heiman and Samantha Artiga, "Beyond Health Care: The Role of Social Determinants in Promoting Health and Health Equity," Kaiser Family Foundation, November 4, 2015. Click here to access.

35. See Appendix for a review of the three most common methods that can be used to examine these relationships.

36. Jeffrey A. Witmer, Myra L. Samuels, and Andrew Schaffner, *Statistics for the Life Sciences*, 5th Edition. Pearson Education, 2015.

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