Dose of Services Measure Definition

May 2024

Prepared for:
Administration for Community Living

MITRE | Center for Transforming Health

Operator of the CMS Alliance to Modernize Healthcare (The Health FFRDC)

A Federally Funded Research and Development Center

This and other CODI resources are available at https://mitre.github.io/codi/.

Notice

The views, opinions and/or findings contained in this report are those of The MITRE Corporation and should not be construed as an official government position, policy, or decision, unless designated by other documentation.

Authors

The MITRE Corporation, McLean, VA

Acknowledgments

This measure was collaboratively developed by MITRE and the Chesapeake Regional Information System for our Patients (CRISP). We would like to thank the CRISP team for their time and contributions to the development of this dose measure.

Table of Contents

List of Tables

1 Introduction

1.1 Purpose

This document describes a method for measuring the amount of services that an individual receives or consumes (i.e., dose of services). The term "services" in this document means an activity where assets are provided (e.g., meals, groceries, rides, or vouchers) to an individual to address an identified need; services may also be referred to as programs or interventions by different organizations. This document is intended for health information exchanges (HIEs) receiving and using data from community settings or community-based organizations (CBOs) who are interested in measuring the amount of services delivered. Food services (e.g., delivery of meals) were the use case that informed development of this measure but it was designed to be used across different types of services. This measure is intended to function as a standalone measure that can also be used in combination with other measures to contextualize the results (e.g., impact of differing levels of service on outcomes of interest).

MITRE partnered with the Chesapeake Regional Information System for our Patients (CRISP), the HIE in Maryland to co-design this definition. This work is part of an Administration for Community Living (ACL) sponsored project, the Community and Clinical Data Initiative (CODI) Maryland pilot.[1]

1.2 Background Research

MITRE conducted an environmental scan of nutritional service literature and reviewed 19 relevant studies to identify examples of how the amount of programs and services can be defined. Key findings included that the metrics for dose of food services often include the number of individuals receiving services, total number of meals received, frequency of food service, type of food (fresh or frozen), type of service (home-delivered versus congregate meals), and duration of services. In research studies, the shortest duration of food service was 28 days, and the most common duration of food service was six months, which could be a recommendation for a meaningful dose. The Older Americans Act Title III-C Nutrition Services Program evaluation offers the most relevant dose insights as it reflects real-world service delivery (not protocol driven) and voluntary participation in congregate and home-delivered meals. Appendix A summarizes findings from relevant literature.

In addition to the environmental scan, MITRE also conducted a needs assessment and engaged two CBOs (MAC[2] and Meals on Wheels of Central Maryland[3] [MOWCM]) that provide home-delivered meals and congregate meals. Learnings from that assessment with relevance for this measure are summarized in Appendix B.

[1] This and other resources available at https://mitre.github.io/codi/

[2] MAC Incorporated website: https://macinc.org/

[3] Meals on Wheels of Central Maryland website: https://mealsonwheelsmd.org/

1.3 Assumptions

This measure definition makes the following assumptions.

- This measure assumes that services delivered to one person are intended for and used by only that person and not other individuals in the same household.
- This measure assumes that services delivered are used as intended (e.g., meal is consumed).

2 Measure Overview

There are two intended aims of the dose measure.

1. Quantify the amount of a service an individual or group of individuals received over a designated period of time. Important dose concepts are volume, frequency, unit, and duration.
2. Support measuring change in clinical or quality of life outcomes following receipt of service. The dose measure definition will allow for the selection of specific service amounts or exclusion of patients who received a low or high amount of services (e.g., individuals who received one meal in one year).

2.1 Source Data

The minimum data necessary to compute dose of services are described in Appendix C in the context of the CODI Data Model.[4] Attributes needed to compute the dose measure can be found in the ASSET_DELIVERY table.

2.2 Data Quality

The quality of the data used to calculate dose should be assessed regularly to improve the accuracy and reliability of the results. Users are encouraged to assess data quality based on completeness, accuracy and stability, among others. Users should set their own measurement benchmarks and targets for these metrics as appropriate for their data sources. Data standards for programs and services should be used whenever possible; the leading standards for social needs and services come from The Gravity Project.[5]

2.3 Selecting a Service Time Period

A period of time is required to calculate dose (referred to as the service time period). The purpose of the service time period is to define a period of time during which dose is measured. The service time period comprises a start and end date established by the organization implementing the dose measure. The service time period may be as short as one month or as long as multiple years. For example, a user may calculate dose of food services for the year 2023.

[4] Available at https://mitre.github.io/codi/

[5] Available at https://thegravityproject.net/

For a given individual and service, up to five dates may be available:

- Date of service enrollment (ASSET_ENROLLMENT.ENROLLMENT_DATE)[6]
- Planned service start date (ASSET_ENROLLMENT.DELIVERY_START_DATE)
- Planned service end date (ASSET_ENROLLMENT.DELIVERY_END_DATE)
- Service delivery start date (ASSET_DELIVERY.DELIVERY_START_DATE)
- Service delivery end date (ASSET_DELIVERY.DELIVERY_END_DATE)

However, dates from records of service delivery (dates from ASSET_DELIVERY) are strongly preferred over dates from intended service delivery entered as part of a program or service enrollment (dates from ASSET_ENROLLMENT).

Once defined, a user applies the service time period as a date range to individual records of program or service delivery (i.e., are ASSET_DELIVERY.DELIVERY_START_DATE and ASSET_DELIVERY.DELIVERY_END_DATE within the service time period). The comparison of these dates to the service time period allows for the identification of individuals who received services during the service time period. Those individuals will be included in the dose calculation.

Key Considerations about Service Time Period

- Using dates from the ASSET_ENROLLMENT table is not preferable for the following reasons:
    - Recognizing that an individual's receipt of services is predicated by an enrollment, service time period applies only to delivered services and not to planned dates because dose is calculated on services that were delivered rather than services that were planned to be delivered.
    - Service time period is distinct from the total amount of time individuals are enrolled to receive services. Individuals may have been receiving services before the service time period start date and may continue to receive services beyond the service time period date end date.
- Service time period does not infer service frequency (e.g., receiving meals once per week versus daily) and does not consider periods during the service time period that services are suspended. Thus, service time period does not assume uninterrupted services.
- Service time period must be considered in context of data latency and availability. For example, if social service delivery data are refreshed every month, service time periods set to include yesterday may produce inaccurate results.

2.4 Metric Descriptions

The dose measure includes three metrics for dose of services (ASSET_TYPE or ASSET_SUBTYPE): volume, reach, and average volume.

1. **VOLUME**: Count of total services delivered during the service time period.
    - Count of total services is computed as a sum of quantity of services (ASSET_QUANTITY) with delivery dates

[6] References are listed as (TABLE.ATTRIBUTE from CODI Data Model)

(ASSET_DELIVERY.DELIVERY_START_DATE and ASSET_DELIVERY.DELIVERY_END_DATE) during the service time period.

- Counts may be computed for all individuals in the selected time period and also stratified by demographic attributes.
- Counts are not designed to sum across different service units (ASSET_UNIT). For example, counts of meals are not intended to be combined with bags of groceries or cash equivalent benefits.

2. **REACH**: Count of total individuals receiving services during the service time period.
    - Count of total individuals is computed as the count of distinct individuals (PATID) receiving services (ASSET_QUANTITY>0) with delivery dates (ASSET_DELIVERY.DELIVERY_START_DATE and ASSET_DELIVERY.DELIVERY_END_DATE) during the service time period.
3. **AVERAGE VOLUME**: Average number of services delivered during the service time period per individual.
    - Average number of services is computed as the total services (Sum of ASSET_QUANTITY) divided by the number of distinct individuals (count of PATIDs) with delivery dates (ASSET_DELIVERY.DELIVERY_START_DATE and ASSET_DELIVERY.DELIVERY_END_DATE) during the service time period.

2.5 Inclusion and Exclusion Criteria

The population evaluated for dose is individuals who received a service of interest during the service time period. By default, no individuals are excluded from the dose algorithm. The intent is to measure dose based on all service delivery data and use subsequent analytic activities to customize an evaluation cohort, like limiting the analysis to individuals within a specific age range, as desired by the end user.

Of note, users may want to select only individuals who had sustained service delivery throughout the time period, excluding individuals with a very small dose of services. Additionally, users may want to exclude individuals whose service stopped during the time period (e.g., due to death, moved out of service area, stopped services).

2.6 Limitations

- The dose measure was developed based on the knowledge and experience shared by two community-based organizations in Maryland providing congregate and home-delivered meal services to older adults; although this dose measure was not specifically designed for nutrition services, it has not been validated for other service types.
- The dose measure definition is not intended to be used at the individual-level; therefore, dose results are aggregate measures.
- Since the measure assumes that services documented for a single person are only used by that individual, if services delivered are actually intended for multiple people in a household, the dose measure calculation may produce inaccurate estimates (e.g., average meals per person).

Appendix A Background Research Findings

This appendix summarizes findings from relevant nutritional service literature that informed measure development.

Table A-1. Background Research on Nutrition Intervention

ID	Title	Findings
1	Improved Time in Range During 28 Days of Meal Delivery for People With Type 2 Diabetes	Single-arm research study assessing the impact of home-delivered meals on continuous glucose monitoring, glycemic control, and quality of life. Participants received 28 days of home-delivered, pre-portioned meals (three meals per day). Outcomes measured were time within range, assessed using sensors, which record glucose readings.
2	Mom's Meals®, Inland Empire Health Pilot Program Reduces Hospital Visits for Patients With Congestive Heart Failure	Evaluation of impact on hospitalizations among 93 individuals with congestive heart failure and a minimum of two hospital stays within the previous year. Participants received three tiers of food services: Mom's Meals provided three lower-sodium fully prepared meals per day, and then two lower-sodium fully prepared meals per day, and then one lower-sodium fully prepared meals per day with fresh produce and pantry boxes, delivered to their home. Outcomes were assessed via claims analysis.
3	Effects of two models of nutritional intervention on homebound older adults at nutritional risk	A six-month prospective research study where newly applied Meals on Wheels (MOW) homebound older adult participants received either the Traditional MOW program of five hot meals per week, or the restorative, comprehensive New MOW program of three meals and two snacks per day, seven days a week. Outcomes were weight change and BMI change and were assessed at baseline, three months, and six months by in-person visit by a nurse.
4	Deliver-EE: Evaluating Effects of Meal Delivery	Double-arm, pragmatic, randomized-controlled trial to compare outcomes between two meal delivery interventions among food insecure older adults in seven states through MOW program. Participants received a lunch time meal delivered to their home five days per week with a wellness check and socialization and ten frozen meals mailed to the participant every two weeks for six months. The primary study outcome will be the ratio of days spent in institutional settings (i.e., hospital, nursing home) in the six months after participants begin receiving meals. The secondary outcomes include the ratio of days spent in institutional settings in the three months after participants begin receiving meals, food insecurity, subjective isolation/loneliness, and health-related quality of life. The team will also examine differences in dietary intake between the two groups as an exploratory outcome.

ID	Title	Findings
5	A Pilot Food Bank Intervention Featuring Diabetes-Appropriate Food Improved Glycemic Control Among Clients In Three States	A six-month food bank pilot where 687 participants with diabetes in three states received diabetes-appropriate food, blood sugar monitoring, primary care referral, and self-management support for six weeks. Study assessed glycemic control and found hemoglobin A1c decreased from 8.11 percent to 7.96 percent and fruit and vegetable intake increased from 2.8 to 3.1 servings per day.
6	Home-Delivered Meals and Disease Management: A Powerful Combination To Control Diabetes	Mom's Meals partnership program evaluation among Medicaid members with type 2 diabetes. The members participated in disease management counseling for four weeks followed by a delivery program of two meals daily for eight weeks. Members engaged with a registered nurse once per week for the full 12 weeks. After 12 weeks, outcomes assessed included net cost of care and average A1C.
7	HOMEFOOD randomized trial—beneficial effects of 6-month nutrition therapy on body weight and physical function in older adults at risk for malnutrition after hospital discharge	A randomized controlled trial where 106 participants (>65 years) were randomized into the intervention group ($n = 53$) and into the control group ($n = 53$). The intervention group received individual nutrition therapy (five in person visits and three phone calls) and freely delivered energy- and protein- rich foods (one hot meal/day and two in-between-meals/day) delivered once a week for six months. Dietary intake, anthropometrics, and short physical performance battery were assessed at baseline and at endpoint.
8	Evaluation of the Effect of the Older Americans Act Title III-C Nutrition Services Program on Participants' Food Security, Socialization, and Diet Quality	Evaluation of Title III-C Nutrition Services Program, funded by the Older Americans Act. The Nutritional Services Program funds the provision of congregate and home-delivered meals. Congregate meal participants attended congregate meal sites frequently, with 43 percent receiving five or more meals per week and 82 percent receiving three or more meals per week. Most congregate meal participants (79 percent) attended a single site for meals. Home-delivered meal participants also received meals frequently. Seventy-one percent received five or more meals per week, and 85 percent received three or more meals per week. The majority of participants have received meals and program services for more than a year. Eighty-four percent of congregate meal participants and 70 percent of home-delivered meal participants first enrolled in the meal program one or more years before the evaluation.

Appendix B Key Findings from Needs Assessment

This appendix includes key learnings from a needs assessment that were relevant for the development of this measure. The needs assessment was conducted in Fall 2023 and included input from Chesapeake Regional Information System for our Patients (CRISP), MAC Inc., and Meals on Wheels of Central Maryland (MOWCM).

General Findings

- The standard unit for food services is meals. Some meals include beverages.
- Food services are generally 1) home-delivered meals, 2) congregate meals, 3) food banks or pantries, and 4) provision of shelf stable meals (e.g., bags of groceries).
    - No foodbank or pantry was engaged in the CODI Maryland pilot and provision of shelf stable meals (e.g., bags of food provided at the time of hospital discharge) may or may not be tracked at the individual level.
- Home-delivered meal types include fresh meals (both hot and cold meals), frozen meals, and shelf stable meals.
- Meals may also be medically or clinically tailored such as low salt. Not all CBOs offer medically tailored meals.
- Meal delivery may be customized by individual preferences or allergies such as no pork, no fish, no gluten, or texture modified.
- For congregate meals, CBOs record attendance at congregate meals.
- For home-delivered meals, CBOs record delivery of meals.
- CBOs use custom information system to track enrollment in and delivery of food services that will provide data for a dose calculation.
- Most individuals are receiving home-delivered meals daily during the week. Very few clients receive less than four home-delivered meals every week.
- Home-delivered meals are not left unattended; thus some intended deliveries are not completed when the client or caregiver is not home or available to answer the door.
- When meals cannot be delivered repeatedly, services may be suspended (placed on hold) until communication and receipt of meals can be re-established.
- Food service enrollment can be short-term (e.g., 90 days) or long-term (as long as need documented).

MAC Specific Findings

- MAC offers congregate meals and operates a home-delivered meals program where meals are delivered four days per week (Monday through Thursday) in multiple counties on the eastern shore of Maryland. The maximum home-delivered meals an individual can receive is seven per week.
- MAC clients are most often enrolled in home-delivered meals with no intended end date.
- MAC has tracked home-delivered meals in a system called Apricot since early 2022.
- Apricot is used for multiple programs in addition to food services. For food services, Apricot is used for documenting nutritional risk from targeted assessments, enrolling individuals in home-delivered and congregate meals, recording attendance at congregate meals, and recording delivery of home-delivered meals.
- MAC does not currently measure or report on dose of food services in any uniform way.

MOWCM Specific Findings

- MOWCM operates a home-delivered meals program where meals are delivered five days per week (Monday through Friday). The maximum home-delivered meals an individual can receive is 14 per week.
- MOWCM tracks home-delivered meals in a system called ServTracker that is used by MOW organizations nationwide. ServTracker has been used by MOWCM for over 10 years and has recently undergone a major system upgrade.
- ServTracker is used for enrolling individuals in home-delivered meals, storing assessment results related to nutritional risk, directing the kitchen preparation for the appropriate number of meals, and tracking home-delivered meals.
- MOWCM has done some work to report on dose of food services by counting total meals delivered.
- MOWCM clients are most often enrolled in 90 days of food services.
- MOWCM reports on home-delivered meals as total meals and total individuals reached.

Appendix C CODI Data Model Attributes Required to Compute Dose

This appendix defines the data attributes needed to compute the dose measure organized by the CODI Data Model tables; attributes are identified in ALL CAPS as they are defined in the CODI Data Model Data Dictionary.[7] If you are not using the CODI Data Model, you will need to map the fields from your source system to the attributes defined below.

The ASSET_DELIVERY table contains information about the delivery of assets associated with an asset enrollment; assets are resources transferred to an individual, like home-delivered meals. The attributes below represent a subset of the ASSET_DELIVERY table. Other attributes and tables may be used to define a specific cohort of interest to evaluate dose.

Table C-1. ASSET_DELIVERY Table Data Elements for Dose Calculations

Attribute Name	Format	Definition	Example Inputs	Measure Calculation Use
ASSET_DELIVERY_ID	Char	A primary key that uniquely identifies a row in the table.	PL342MC	Primary Key
PATID	Char	Arbitrary person-level identifier. Used to link across tables.	MRAG8308	Determine receipt of services during service time period; calculate reach and average volume
ASSET_ENROLLMENT_ID	Char	A link back to the asset enrollment that this asset delivery belongs to. An asset delivery should be linked to either a program or asset enrollment.	174	Foreign Key
PROGRAM_ID	Char	A link back to the program table. An asset delivery should be linked to either a program or asset enrollment.	CTC	Foreign Key
ASSET_TYPE	Char	Defines type of asset delivered (e.g., food, transportation).	HD	Selection of service of interest

[7] Available at https://mitre.github.io/codi/

Attribute Name	Format	Definition	Example Inputs	Measure Calculation Use
ASSET_SUBTYPE	Char	Define subtype of asset delivered. For food insecurity, recommended values include fresh meals, frozen meals, and shelf stable.	fresh	Selection of service of interest
ASSET_QUANTITY	Num	The total amount of asset delivered (e.g., total meals) on a specific date.	4	Dose calculation
ASSET_UNIT	Char	A unit to describe the asset delivered (e.g., meal).	M	Dose calculation
DELIVERY_START_ DATE	Date	The first date the asset(s) was delivered.	1/2/24	Service time period
DELIVERY_END_ DATE	Date	The end date the asset(s) was delivered. For a single day, the entry may populate the same date for start and end.	1/2/24	Service time period