Development of Quality Indicators for the Home and Community-Based Services Population: Technical Report

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AHRQ Quality Indicators

Development of Quality Indicators for Home and Community-Based Services Population: Technical Report

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EXECUTIVE SUMMARY

Purpose
These quality indicators (QIs) are intended to reflect the health and well-being of beneficiaries receiving home and community-based services (HCBS) through state Medicaid programs. The indicators focus on the well being of HCBS beneficiaries as reflected by potentially preventable hospitalizations. These include hospitalizations for specific conditions associated with chronic disease exacerbation and progression as well as poor access to care and support services. .

Measure Development Process
We initially evaluated a set of 30 candidate indicators, including 8 proposed composites. These were based on existing quality indicators developed by the Agency for Healthcare Research and Quality (AHRQ) for the general population and new indicators spanning intentional injuries caused by others, unintentional injuries potentially due to neglect, and potentially preventable behavioral health events.

To assess the applicability of the candidate measures to the HCBS population, and to evaluate their validity and reliability for use as indicators of well-being, we performed the following steps:

1. Reviewed published evidence related to the candidate QI events in HCBS populations.
2. Discussed applicability of the QI events with experts in various HCBS sub-populations, specifically individuals with intellectual or development disabilities, with physical disabilities, with traumatic brain or spinal cord injuries, with mental illness or substance abuse, with HIV or AIDS, elderly individuals, and individuals needing long-term support and services.
3. Conducted empirical analyses to assess reliability and validity of the indicators in the HCBS population, and compared rates among HCBS persons to rates in the general population. These analyses used data from the Medicaid Analytic eXtract (MAX) dataset, Medicare claims data Medicare Provider Analysis and Review file (MedPAR), State Inpatient Databases (SID), Nationwide Inpatient Sample (NIS). All data were from 2005.
4. After determining which indicators to include in the final measure set, we performed further analyses to guide refinement of indicator definitions and interpretation of the indicators. These analyses also included the HCBS population and comparisons with the general population, using the same datasets noted above.

Our empirical analyses include examination of QI rates for the entire population of HCBS persons included in the quality indicator denominator definition (HCBS QI denominator population): all individuals enrolled in an HCBS 1915(c) waiver or receiving HCBS 1915(c) services or receiving HCBS state plan services at some point during calendar year 2005. A limited number of subgroup analyses focused on the HCBS population that was eligible for both Medicare and Medicaid, which we refer to as the HCBS dual eligible population, on the HCBS population that is eligible only for Medicaid (HCBS Medicaid-only population), and on all Medicaid beneficiaries (full Medicaid population).

Final Indicator Set
The table below lists the indicators included in the final measure set and their rate in the HCBS population.

National Rates of HCBS QIs

Indicator	Rate per 100,000
Short-term Complications of Diabetes	288

Asthma or Chronic Obstructive Pulmonary Disorder (COPD)	3,865
Congestive Heart Failure (CHF)	5,131
Composite: Potentially Preventable Infection	*8,031*
Bacterial Pneumonia	4,929
Urinary Tract Infection (UTI)	3,102
Infection due to Device or Implant	756
Dehydration	1,903
Composite: Ambulatory Care Sensitive Condition (ACSC) Chronic conditions	*11,903*
Composite: ACSC Acute conditions	*7,336*
Composite ACSC Overall	*19,238*
Pressure Ulcer	3,485
Injurious Falls	298

Annualized quarterly rate per 100,000 population. Numerator definitions are version 1.8c. Denominator definition is quarterly implementation of version 4.2
Source: 2005 MAX and MedPAR data
Table includes 1,625,750 persons from HCBS QI denominator population.

Key Findings

- As expected, QI rates were generally higher in the HCBS population than in the estimated dual eligible and general populations. Similarly, in most cases, rates were highest in the HCBS dual eligible population and lowest in the full Medicaid population. These patterns fit with our expectations that for most indicators the HCBS QI denominator population would experience higher rates of the QI events than the Medicaid population overall, and likewise that the HCBS dual eligible subpopulation would experience higher rates than the Medicaid-only subpopulation. This congruence between expected and observed patterns of differences among populations supports validity of the indicators.
- Patterns of differences in QI rates across age groups within the HCBS population also fit with expectations, further supporting validity of the QIs. In general, rates increased in older age groups, with the exception of Short-term Complications of Diabetes, where rates are expected to be lower in older individuals, and the Asthma/Chronic Obstructive Pulmonary Disorder (COPD) indicator, which increases then peaks at the 65-74 age group, as is often observed in the general population.
- We observed that QI rates were substantially lower among individuals qualifying for HCBS in all 4 quarters of the year, compared to those with only partial-year eligibility for the QI denominator. This suggests that clinical populations in the denominator for a short period of time may be different than those in the denominator for all four quarters. The final QIs account for mid-year changes in eligibility by calculating the indicators based on quarters, then annualizing the rates. Because analyses only included one year of data, we are unable to ascertain how many individuals with part-year eligibility went on to have long-term eligibility in later years.
- Based on SID data from California and New York, which include a present on admission flag for diagnoses codes, we found that a majority of pressure ulcers captured by the Pressure Ulcer indicator are likely to have developed prior to admission, although some ulcers that develop in-hospital are also captured. These analyses support inclusion of both principal and secondary diagnoses of pressure ulcer in this indicator, as does feedback from our expert panelists suggesting that pressure ulcers are an important indicator of the health and well-being of the HCBS population whether they develop in the community or during hospitalization.

- As expected, in preliminary regression analyses of factors associated with hospitalization for QI events, the presence of comorbid chronic disease was consistently a strong predictor of hospitalization for all QIs, especially the chronic disease QIs. In contrast, age, dual eligible status and income were not associated with hospitalization for QI events. For the other patient characteristics examined, large effects were observed for a few QIs, but were generally weaker for the remainder. These regression analyses offer a preliminary view of how key individual characteristics might influence rates of the HCBS QIs and are generally in line with the expected direction and magnitude. If the observed risk factors differed substantially from those anticipated from literature-based and clinical assessments, this might raise validity concerns, but we did not observe such differences.

Considerations for QI Interpretation

- The HCBS QIs report the rate of hospitalization for QI events and conditions. However, in some cases it may be desirable to examine a person-level rate, only accounting for one hospitalization per person per indicator per year. This reduces the impact of frequent users who are admitted multiple times for the same QI. Frequent users have a substantial impact on the rates of the chronic condition and Pressure Ulcer QIs. Calculating the QIs based on person-level rates provides a view of the health and well-being of the population, while event-based rates, as the QI measure set is currently defined, provide information on utilization and disease severity.
- All the QIs have some potential to capture readmissions that may be considered complications of previous admissions. Several of the acute event QIs (Urinary Tract Infection, Injurious Falls, Infection from Device or Implant), seem particularly likely to capture such events. Pressure Ulcer likely captures repeated admissions in high risk patients and may also capture the same unhealed ulcer repeatedly. Readmissions associated with complications of previous admissions still reflect the health and well-being of the HCBS population, but understanding these readmission provides further information regarding the nature of the events captured by the QIs.
- As defined in the final version of the specifications (version 1.8c), the HCBS QIs do not account for transfers from one hospital to another because MAX and MedPAR data lack a variable that explicitly captures transfers. Our analyses show that the HCBS QIs may overestimate the rate of events by 2 to 5% for most of the QIs, since this is the range of numerator cases flagged as a transfer in the general population. However, the rate of transfers, and therefore the degree of overestimation in QI rates, is likely higher for the Infection due to Device or Implant and Pressure Ulcer indicators. We found that using same-day readmissions for the same condition may be a useful method of identifying transfers. Our results suggest that same-day readmissions may be a more sensitive method of identifying transfers than the admission source variable used by other AHRQ QI sets, because same-day readmissions will capture transfers admitted via the emergency department, which may be missed by some admission source variables. In addition, for the events captured by the HCBS QIs, it is very unlikely that two admissions on the same day would represent unique events. Adjusting for transfers by counting same-day readmissions for the same condition in the same individual as only one numerator event to avoid overestimating QI rates (using version 1.8d of the QI specifications) may facilitate interpretation of the QIs.
- As currently defined, the HCBS QIs do not include case mix adjustment models and is intended for use at a national level and for evaluations within states, but not for cross-state comparisons. Any comparisons of QI rates across states would require such adjustment, to account for differences in the composition of the HCBS QI denominator

population across states (such as distribution of clinical subgroups and comorbidity burden), as well as differences in Medicaid policy, service availability, and other population-level factors. Inasmuch as these factors systematically vary by program or state, then case mix adjustment will be essential for appropriate interpretation of the indicators.

Conclusion

The HCBS QI set consists of a variety of hospitalization events, including exacerbations of chronic conditions (diabetes, asthma, COPD, and congestive heart failure), acute illnesses (bacterial pneumonia, urinary tract infection, dehydration, infection due to device or implant), pressure ulcers and injurious falls. These events likely reflect chronic disease progression and development and progression of acute events, which in turn reflect the well-being of the HCBS population. Many of these indicators are based on ambulatory care sensitive conditions (ACSC). In the general population it is theorized that these conditions can typically be well managed on an outpatient basis, avoiding the need for hospitalization. Similar mechanisms may impact hospitalization rates in the HCBS population. In addition, events captured by these indicators—in particular pressure ulcers and falls—should be avoidable with adequate support or preventive care, both within the hospital and within the community. Although not every hospitalization for these events and conditions is preventable, the rate of hospitalization for the QIs among beneficiaries of Medicaid HCBS programs reflects the health and well-being of that population. These indicators are not intended for use as measures of the quality of care or support services received under HCBS and should not be used in this way. Rather, they are intended as metrics of the health and well-being of HCBS beneficiaries. Furthermore, these indicators reflect just one aspect of health and well-being, focused on clinical aspects of care and health. If available, indicators that focus on additional aspects of well-being, such as support services, level of functioning, independence, satisfaction with support, and adverse consequences of unmet needs, may provide additional information to create a more rich view of overall health and well-being in the HCBS population.

ORIENTATION TO THE REPORT

This report details development of the Agency for Healthcare Research and Quality Quality Indicators for the Home and Community-Based Services Population.

This report includes 6 main sections:

1. The introduction provides background on the HCBS QI development project, HCBS programs and populations, and data used in developing the indicators.
2. The methods section provides an overview of the QI development process, including discussions with HCBS population experts, a review of the literature, and empirical analyses.
3. The results section is divided into two main parts. The first provides a summary of lessons learned from the discussions with experts and literature review (full details are included in the appendix) and a brief summary of knowledge learned through the empirical analyses. The second section provides details of empirical analyses performed to support QI development.
4. The section on follow-up analyses provides a summary of all analyses performed after the initial indicator development phase. These analyses were aimed at informing the interpretation and use of the indicators.
5. The concluding thoughts section provides a discussion of interpretation of the indicators, issues related to risk adjustment, and definitional refinements.
6. Technical specifications for the set of HCBS QIs included in the version 1.8c measure set.

Additional material is included in a number of appendixes at the end of the report.

A separate report related to use of this measure set is also available from: Konetzka RT, Potter DEB, and Karon S. Assessing the Health and Welfare of the HCBS Population: Findings Report. Agency for Healthcare Research and Quality, Rockville, MD, AHRQ Publication No. 11(12)-0017-EF, June, 2012.

TABLE OF CONTENTS

1. INTRODUCTION 1
1.1 Congressional Mandate 1
1.2 Project Goals 1
1.3 Background 1
1.3.1 HCBS Programs 1
1.3.2 HCBS Populations 1
1.3.3 Candidate Indicators 2
1.3.4 Data Sources 2
2. METHODS 5
2.1 Candidate Quality Indicators 5
2.2 Development of Indicator Definitions 7
2.2.1 Candidates Based on Existing AHRQ Quality Indicators 7
2.2.2 New Indicators 7
2.2.3 Iterative Refinement 8
2.3 Review of Literature 8
2.3.1 Overview of Search Strategies 8
2.3.2 Included Populations 9
2.3.3 Research Questions 9
2.4 Discussions with HCBS Population Experts 9
2.5 Empirical Analyses 10
2.5.1 SID Analyses 10
2.5.2 Application of the Indicators Using MAX Data 11
2.5.3 QI Validity Assessment 13
3. RESULTS 14
3.1 Overview of Key Findings from Literature Searches and Expert Calls 14
3.1.1 Literature Review 14
3.1.1.1 PQI-based Indicators 14
3.1.1.2 Intentional Injuries Caused by Others 14
3.1.1.3 Unintentional Injuries Potentially Due to Neglect 15
3.1.1.4 Mental Illness and Potentially Preventable Behavioral Health Events 16
3.1.1.5 Consequences of Unmet Needs for Assistance with Activities of Daily Living 16
3.1.2 Expert Calls 17
3.2 Empirical Analyses to Support QI Development 19

3.2.1. SID Analyses 27
3.2.2 E-code Analyses 30
3.2.3 Florida SID Quality Control Review 32
3.3 Empirical Analyses to Support QI Development Using MAX Data 34
3.3.1 HCBS QI Denominator 34
3.3.2 Indicator Rates for HCBS QI Denominator Population 34
3.3.3 Indicators Included in HCBS Measure Set 41
3.3.4 Indicators Not Included in the HCBS Measure Set 42
3.3.5 Follow-up Analyses for Included Indicators 44
3.3.5.1 Age-stratified QI Rates 44
3.3.5.2 Quarterly QI Rates 46
3.3.5.3 Clinical Subpopulations 47
3.3.5.4 Definition Refinements 48
3.3.6 Final QI Rates for HCBS QI Denominator Population 52
4. FOLLOW-UP ANALYSES TO GUIDE INTERPRETATION OF INDICATORS 53
4.1. Numerator Composition and Present on Admission Status 53
4.2. Impact of Transfers on QIs 57
4.2.1 Impact of Same-day Readmissions on QIs 58
4.2.2 Same-day Readmissions as a Proxy for Transfers 59
4.3. Impact of Repeat Admissions on QIs 61
4.4. Impact Of Short-Term Readmissions on QIs 63
4.5 Comparison of HCBS QI Rates Across Populations 64
4.6. Individual-Level Factors Impacting HCBS QIs 66
4.6.1 Methods 66
4.6.2 Characteristics of the HCBS QI Denominator Population 67
4.6.3 Regression Results 68
5. CONCLUDING THOUGHTS 74
6. QI SPECIFICATIONS – Version 1.8c 77
6.1. Background 77
6.2. Code Specifications 77
6.3. Additional Notes 78
6.4. Numerator Specifications – Version 1.8c 79
6.5. Denominator Specifications – Version 4.2 110
7. REFERENCES 115

LIST OF TABLES AND FIGURES

Table 1. List of Candidate Quality Indicators for HCBS 6
Table 2. Summary of Empirical Analyses, Results, and Implications 19
Table 3. Comparison of Mean (SD) State Rates for the General, Medicaid and Dual Eligible Populations using SID 2005 Data 27
Table 4. State-to-State Variation in Percent of Numerator Events Based Solely on E-codes 30
Table 5. State-to-State Variation in QI Rates 30
Table 6. Comparison of National Rates for HCBS QI Denominator Population and General Population, 2005 34
Table 7. Range of State-level Indicator Rates for HCBS QI Denominator Population, 2005 36
Table 8. National Indicator Rates for HCBS Dual Eligible Population Compared to HCBS QI Denominator Population and SID Dual Eligible Population, 2005 37
Table 9. National QI Rates for HCBS QI Denominator Population, by Age Groups, 2005 44
Table 10. Percent of National HCBS QI Denominator in Each Age Group 45
Table 11. National Rates for Full HCBS QI Denominator Population, by Number of Quarters Individual Qualifies for Version 3 QI Denominator 46
Table 12. Annualized Quarterly Rates of QIs for HCBS QI Denominator Population, 2005 52
Table 13. Percent of Asthma/COPD Numerator Based on Each Inclusion Criterion, California and New York SID Medicaid and Medicare Populations, 2005 53
Table 14. Percent of UTI Numerator Based on Each Inclusion Criterion, California and New York SID Medicaid and Medicare Populations, 2005 54
Table 15. Percent of Dehydration Numerator Based on Each Inclusion Criterion, California and New York SID Medicaid and Medicare Populations, 2005 55
Table 16. Percent of Pressure Ulcer Numerator Based on Principal and Secondary Diagnoses, California and New York SID Medicaid and Medicare Populations, 2005 55
Table 17. Percent Bacterial Pneumonia Numerator Based on Aspiration Pneumonia, by Clinical Sub-group, HCBS QI Denominator Population, 2005. 56
Table 18. Percent of Potential Numerator Cases Excluded due to Transfers, by Primary Payer Source 57
Table 19. Comparison of Transfers and Same-day Readmissions as a Percent of Numerators 59
Table 20. Comparison of Annualized Quarterly Rates of QIs With and Without Same-day Readmissions Included, HCBS QI Denominator Population, 2005 61
Table 21. Percent of QI Numerator Persons with Repeat Admissions, HCBS QI Denominator Population, 2005 61
Table 22. Comparison of HCBS QI Rates Based on Admissions vs. Persons Admitted 62
Table 23. National QI Rates for 4 Populations 65
Table 24. Characteristics of HCBS QI Denominator Population 67
Table 25. Summary of Regression Results 68
Figure 1. Distribution of Time from Any Previous Admission to Index QI Admission – Qtr 4 63
Figure 2. Overview of Version 4.2 Denominator Definition 110

LIST OF APPENDICES

APPENDIX 1A: DETAILS OF LITERATURE REVIEW 1A-1
APPENDIX 1B: DETAILS OF EXPERT PANEL REVIEW 1B-1
APPENDIX 2: SID TABLES 2-1
Table 2-1: Range of State-level Indicator Rates for General Adult Population 2-1
Table 2-2: Range of State-level Indicator Rates for Adult Medicaid* Population 2-2
Table 2-3: Range of State-level Indicator Rates for Dual-Eligible Population 2-3
Table 2-4: Comparison of SID and HCUPnet PQI Rates, 2005 2-4

APPENDIX 3: NUMERATOR AND DENOMINATOR DEFINITIONS USED IN REPORT 3-1
Table 3-1. Overview of Numerator and Denominator Versions 3-1
Figure 3-1. Overview of Version 3 Denominator Definition 3-3
APPENDIX 4: SPECIFICATIONS OF QIs NOT INCLUDED IN FINAL MEASURE SET 4-1
APPENDIX 5: DETAILS OF CLINICAL SUB-GROUP DEFINITIONS 5-1

1. INTRODUCTION

1.1 Congressional Mandate

Under Section 6086(b) of the Deficit Reduction Act, the Agency for Healthcare Research and Quality (AHRQ) has been tasked with the responsibility to develop quality indicators (QI) to assess the overall system of providing home and community-based services (HCBS) under the Medicaid program, in particular the "health and welfare" of HCBS recipients.

1.2 Project Goals

This project aims to develop quality indicators that reflect the health and welfare and quality of care of beneficiaries receiving home and community-based services through state Medicaid programs. The indicators will focus on clinical quality, access to care and the general welfare of HCBS beneficiaries. They will be applicable across diverse HCBS populations and across states.

The indicators are intended for use by federal agencies and state Medicaid agencies as tools for monitoring the welfare of recipients and for planning purposes. They are not intended to be used in establishing accountability of individual providers or waiver programs. Because important differences exist in how states implement HCBS programs, this project focuses primarily on developing indicators to be applied at the national level (that is, aggregating across states). Developing risk adjustment models to facilitate valid comparisons across states is not included in this initial development effort.

1.3 Background

1.3.1 HCBS Programs

HCBS programs allow states to provide long-term supports and services to Medicaid beneficiaries in a home or community setting rather than an institutional setting. For the purposes of this project, HCBS is defined broadly to include the array of long-term care services that could be provided by Medicaid as HCBS. This includes 1915 (c) waiver services and state plan services such as home health care, personal care services, and case management. Such services may be provided by a variety of state administering agencies, not just Medicaid.

1.3.2 HCBS Populations

States implement HCBS programs differently, leading to heterogeneity in the composition of each state's HCBS population. However, across all states and programs, HCBS programs are designed to provide care in a community-based setting to beneficiaries otherwise requiring an institutional level of care. To receive Medicaid HCBS services individuals must have met financially eligibility requirements as well as functional eligibility requirements. For 1915(c) waiver services, an enrollment slot also must be available.

According to a recent Kaiser Family Foundation analysis, in 2005, nearly 2.8 million individuals received HCBS benefits. Of these, 1 million were enrolled in HCBS waivers, over 900,000 received care through the home health benefit, and nearly 800,000 received the personal care services benefit (Ng, 2008). In that year, there were 272 HCBS 1915(c) waivers with persons enrolled and every state operated multiple such waivers (except Arizona, which provides HCBS through a section 1115 waiver). Nearly half of all 1915(c) waiver participants (49%) received services through waivers targeted towards the aged or disabled, while 41% received care through waivers targeted towards individuals with intellectual or developmental disabilities.

In developing these indicators, we focused on several key populations that are frequently included in HCBS programs, specifically: people with intellectual and developmental disabilities (ID/DD); people with physical disabilities, including individuals with spinal cord injury (SCI) or traumatic brain injury (TBI); people with mental illness; and elderly individuals. Because a limited number of states target some HCBS programs towards people with HIV or AIDS, we also considered this population. Individuals admitted to the hospital from a long-term care setting (e.g., nursing home) will be excluded from the indicators because HCBS focuses on provision of services outside of the institutional setting.

Our empirical analyses include examination of QI rates for the entire population of HCBS persons included in the quality indicator denominator definition: all individuals enrolled in an HCBS 1915(c) waiver or receiving HCBS 1915(c) services or receiving HCBS state plan services at some point during calendar year 2005 (see Section 2.5.2 for details). Throughout this report, we refer to this as the full HCBS QI denominator population. A limited number of subgroup analyses focused on the HCBS population that was eligible for both Medicare and Medicaid, which we refer to as the HCBS dual eligible population, and on the HCBS population that is eligible only for Medicaid (HCBS Medicaid-only population).

1.3.3 Candidate Indicators

The initial assessment of potential measures was completed during an earlier phase of this project and based on that report and an assessment of available data sources a list of candidate indicators was compiled prior to the start of the current development work (Galantowicz, 2008). That report is available online at http://www.ahrq.gov/research/ltc/hcbsreport/.

The set of candidate indicators focused on assessing HCBS recipients' health and welfare using existing, administrative data sources on hospitalizations to monitor potentially avoidable hospitalizations, encounters for abuse and neglect, critical incidents and serious reportable events.

The potential HCBS measures fall into two categories. The first set of measures (referred to as Measure Set 1) addresses prevention of potentially avoidable hospitalizations. These candidate measures are based on the AHRQ Prevention Quality Indicators (PQI), an existing set of validated indicators used to assess access to high-quality outpatient care in the general adult population (Agency for Healthcare Research and Quality, 2010). These indicators focus on ambulatory care sensitive conditions—conditions that should rarely result in hospitalization when patients have access to high-quality outpatient care (Billings, 1996; Weissman, 1992). In the HCBS population, these conditions may also reflect support services that promote self-care, nutrition, transportation or other contributing factors.

The second set of measures (referred to as Measure Set 2) focuses on three key areas: intentional injuries caused by others (such as abuse, rape and assault); unintentional injuries potentially due to neglect (such as pressure ulcers, medication errors and accidents related to burns, fire arms, falls, etc); and intentional self-inflicted injuries and other behavioral health events (such as suicide, self-harm, substance abuse and hospitalizations associated with certain serious and persistent mental illness diagnoses). Conceptually, these are "surveillance" measures that are potentially associated with receipt of adequate services and support. These candidate measures are not based on existing indicators, but are informed by prior work on critical incident systems and NQF never events.

1.3.4 Data Sources

Both sets of candidate indicators may be implemented using administrative data that include hospital discharge summary data. Specifically, this project focuses on developing the indicators for use with the Medicaid Analytic eXtract (MAX) dataset (Centers for Medicare and Medicaid Services, 2010a). MAX dataset contains data on eligibility, service utilization and payments for all individuals enrolled in HCBS in a particular calendar year, including individuals who did not actually use Medicaid services in that year. The MAX files are constructed using data from the Medicaid Statistical Information System (MSIS) data submitted by the states to the Centers for Medicare and Medicaid Services (CMS). The files are organized into one Person Summary File and four encounter files for each of the 50 states and the District of Columbia. The data includes encrypted patient identifiers to allow linkage between the files. Data were for calendar year 2005.

The Person Summary File (PS) includes data on eligibility, demographics, enrollment in managed care and HCBS waivers, and a summary of utilization and Medicaid payments by type of service. It contains information on HCBS waiver type and identifier for enrollment in up to three waivers per month for all 12 months and information on expenditures for 21 categories of community-based long term care. The four encounter files include service dates, International Classification of Disease, Ninth Revision, Clinical Modification (ICD-9-CM) diagnosis codes, procedure codes, national drug codes, and payments associated with Inpatient Care (IP), Long Term Care (LT), Other Services (including community-based long-term care and outpatient care) (OT), and Prescription Drugs (RX). The four files also contain information on encounter data (utilization of managed care services) and premium payments for managed care, in addition to detailed information on Fee for Service claims.

The MAX data do not contain complete information on services paid by Medicare. Therefore, for individuals who are enrolled in both Medicaid and Medicare during at least one month, whom we refer to as dual eligible, we used Medicare claims data (Medicare Provider Analysis and Review file [MedPAR]) to provide supplemental information necessary to calculate the quality indicators for this group. Data from the Medicare Denominator File were used to identify the dual eligible population and HCBS participants enrolled in Medicare Advantage plans (Centers for Medicare and Medicaid Services, 2010b).

We used several additional data sets in the process of developing the indicators:

- The State Inpatient Databases (SID), 2005 (Agency for Healthcare Research and Quality, 2011c). This dataset is maintained by the Healthcare Cost and Utilization Project (HCUP). It contains state-specific de-identified data on hospital inpatient stays. It includes information on diagnoses, procedures, admission and discharge status, primary payer, and for some states secondary payer, and demographic information (age, sex, for some states race). Unless otherwise noted, our analyses using SID 2005 data included 37 states: Arizona, Arkansas, California, Colorado, Connecticut, Florida, Georgia, Hawaii, Illinois, Indiana, Iowa, Kansas, Kentucky, Maryland, Massachusetts, Michigan, Minnesota, Missouri, Nebraska, Nevada, New Hampshire, New Jersey, New York, North Carolina, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, South Dakota, Tennessee, Texas, Utah, Vermont, Washington, West Virginia, Wisconsin.
- The Nationwide Inpatient Sample (NIS), 2005 (Agency for Healthcare Research and Quality, 2011b). This de-identified dataset is maintained by HCUP. It is the largest all-payer inpatient database in the U.S., containing data from approximately 8 million hospital stays each year. Results are generalizable to the general U.S. population. It includes information on diagnoses, procedures, admission and discharge status, primary payer, and demographic information (age, sex, race, and median income based on zip code). The 2005 NIS contains data from 37 states.

- HCUPnet is a free, online system that queries the HCUP datasets, such as the SID or the NIS (Agency for Healthcare Research and Quality, 2011a). It provides data on rates of the AHRQ quality indicators, such as the Prevention Quality Indicators and Patient Safety Indicators (PSIs), based on the NIS.

2. METHODS

2.1 Candidate Quality Indicators

The list of candidate HCBS QIs was divided into two sets (Table 1). Measure Set 1 included modified versions of 7 of the AHRQ Prevention Quality Indicators. Specifically, these were hospitalizations for:

- Short-Term Complications of Diabetes (based on PQI 1)
- Asthma or Chronic Obstructive Pulmonary Disease (COPD) (based on PQIs 5 and 15)
- Congestive Heart Failure (CHF) (based on PQI 8)
- Bacterial Pneumonia (based on PQI 11)
- Urinary Tract Infection (UTI) (based on PQI 12)
- Dehydration (based on PQI 10)
- Perforated Appendix (based on PQI 2).

Measure Set 1 also included PQI Ambulatory Care Sensitive Conditions composite indicators (overall, acute conditions, chronic conditions) as well as one new indicator focused on infections associated with implants or devices.

Candidate Measure Set 2 included a modified version of the AHRQ Patient Safety Indicator for Pressure Ulcer (PSI 3) and new indicators covering intentional injuries caused by others, unintentional injuries potentially due to neglect, and potentially preventable behavioral health events. Specifically, these were hospitalizations for:

- Physical and sexual abuse, including criminal neglect
- Intentional trauma and physical violence
- Medication errors, such as wrong drug, wrong dose, wrong patient, wrong time, wrong rate, wrong preparation or wrong route of administration. (Adverse drug events resulting from correct use of medications are not included in this indicator).
- Pressure ulcer (based on PSI 3)
- Accidents due to fire, burns, smoke inhalation or electronic shock
- Accidental poisoning (excluding medication errors, self-inflicted or assault by poisoning)
- Fire arms accidents
- Accidental drowning
- Excessive heat and cold exposure
- Injurious falls
- Suicide and self-harm
- Serious and persistent mental illness, including schizophrenia, major depressive disorder, Bipolar disorder, manic disorders, delusional disorders, and pervasive developmental disorders.
- Substance abuse, including alcohol, illicit and prescription drugs
- Dual diagnosis of serious and persistent mental illness and substance abuse

Several of these Measure Set 2 indicators were also grouped into composite indicators for Intentional Injuries Caused by Others, Potentially Preventable Infections, Unintentional Injuries Potentially due to Neglect, Accidents Potentially due to Neglect, and Serious and Persistent Mental Illness and Suicide. See Table 1 for specification of the composite components.

Table 1: List of Candidate Quality Indicators for HCBS

Indicators	Level of Development
Measure Set 1	
Short-term Complications of Diabetes	Existing PQI
Asthma and Chronic Obstructive Pulmonary Disorder (COPD)	Existing PQIs
Congestive Heart Failure (CHF)	Existing PQI
Composite: Potentially preventable infection	
Bacterial Pneumonia	Existing PQI
Urinary Tract Infection (UTI)	Existing PQI
Infection due to Device or Implant	New
Dehydration	Existing PQI
Perforated Appendix	Existing PQI
Composite: ACSC Chronic Conditions	Existing PQI composite
Composite: ACSC Acute Conditions	Existing PQI composite
Composite ACSC Overall	Existing PQI composite
Measure Set 2	
Composite: Intentional injuries caused by others	New
Physical/sexual abuse	New
Intentional trauma/physical violence	New
Composite: Unintentional Injuries Potentially due to Neglect	New
Medication errors	New
Pressure Ulcer	Existing PSI
Composite: Accidents Due to Potential Neglect	New
Fire, burns, smoke inhalation, electronic shock	New
Accidental Poisoning	New
Fire arm accidents	New
Accidental drowning	New
Excessive heat/cold exposure	New
Injurious Falls	New
Composite: Serious and Persistent Mental Illness and Attempted Suicide	New
Attempted suicide/self-inflicted harm	New
Serious and persistent mental illness	New

Substance abuse	New
Dual diagnosis of mental illness and substance abuse	New

ACSC – Ambulatory Care Sensitive Conditions; HCBS – Home and Community-Based Services; PQI – Prevention Quality Indicators; PSI – Patient Safety Indicators.

2.2 Development of Indicator Definitions

Upon receipt of the list of candidate quality indicators, we developed draft definitions. This process was different for the new indicators and those indicators based on existing AHRQ quality indicators.

2.2.1 Candidates Based on Existing AHRQ Quality Indicators

For these indicators (see Table 1), we began with the definition of the most recent version of the AHRQ QI upon which it was based. For the PQI-based indicators, that was version 4.1 of the PQIs, released in December 2009. For the Pressure Ulcer indicator, that was version 3.2 of the AHRQ Patient Safety Indicator (PSI) for decubitus ulcer (PSI 3). (Detailed technical specifications available at http://www.qualityindicators.ahrq.gov/).

Recently, the AHRQ PQIs were reviewed by clinical experts to assess several new applications of the indicators in the general population. Although recommendations from that review have not yet been implemented into the PQI definitions, we modified the definition of some candidate HCBS indicators based on those recommendations when we believed that doing so would strengthen application of the indicator in the HCBS population. For example, the panel recommended including aspiration pneumonia in PQI 11 (Bacterial Pneumonia), because they believed that in some populations, such as elderly individuals, aspiration is indicated as the cause of pneumonia even if testing to confirm the true cause is not conducted. Because the HCBS population includes elderly individuals, as well as individuals with intellectual and developmental disorders, who may be at high risk for aspiration pneumonia, we believed that the panelists' recommendation to include aspiration pneumonia was important to investigate in the HCBS population. Accordingly, we added aspiration pneumonia to the draft definition of the HCBS Bacterial Pneumonia indicator. A report detailing the PQI review panel process and results is available upon request (contact Sheryl Davies at smdavies@stanford.edu).

We also made some changes to the draft definitions to better tailor the indicator to the HCBS population. For example, version 4.1 PQI 12 (Urinary Tract Infection) excludes people with compromised immune systems, including individuals with HIV or AIDS. Because some HCBS waivers target individuals with HIV/AIDS, we removed this exclusion from the list of immunocompromised state in the draft definition of the HCBS UTI indicator.

2.2.2 New Indicators

For those indicators not based on existing AHRQ QIs, we developed draft definitions from a variety of sources. One key source was a matrix of E-codes developed by the Centers for Disease Control and Prevention (CDC) National Center for Injury Prevention and Control for identifying morbidity and mortality associated with injuries in the U.S. (Centers for Disease Control and Prevention, 1997). The matrix distinguishes the mechanism of injury, such as burns, poisoning, drowning, exposure to elements, and falls, from the intent of the injury (assault, self-inflicted, unintentional and undetermined).

Additional key sources for several indicators were HCUP Statistical Briefs (Elixhauser, 2007; Kassad, 2007; Merrill, 2008; Milenkovic, 2007; Russo, A., 2008; Russo, C.A., 2006) and a Fact Book (Owens, 2007). These included a detailed list of ICD-9-CM codes used to identify

hospitalization events for a number of conditions relevant to candidate HCBS indicators, including alcohol and drug abuse, burns, drug events, violence, and excessive heat and cold exposure.

When possible, we identified other sources useful in drafting measure definitions through literature and internet searches. When no or only limited sources were identified to inform development of a particular indicator definition, we also searched a database of ICD-9-CM diagnosis codes to look for relevant diagnoses. Indicator definitions were initially developed based on ICD-9-CM codes current as of the time this search was performed (March 2009). The definitions were later updated with any codes that were valid between 2004 and 2009, even if they later became invalid.

2.2.3 Iterative Refinement

The initial specifications for both Measure Set 1 and Measure Set 2 were refined through discussion among members of the project team and groups of clinical experts in key HCBS populations (see Section 2.4). These draft specifications were implemented into SAS code and evaluated through empirical analyses (see section 2.5). Indicators included in the final measure set were further refined based on additional empirical analyses and discussion among project team members.

2.3 Review of Literature

We reviewed the published literature to provide context for development of the HCBS QIs. We did not intend for the review to provide a comprehensive survey of the evidence of the proposed indicator events within all potential HCBS populations, but rather to provide an overview of the information most important to the development and interpretation of the candidate indicators in key groups of HCBS beneficiaries. We also reviewed use of similar indicators by the Organization for Economic Co-operation and Development (OECD) (OECD, 2009).

2.3.1 Overview of Search Strategies

We used a number of online databases, including PubMed, PsychInfo, and ISI Web of Science, to search the published literature to identify key sources of information relevant to the proposed set of HCBS QIs. We stratified our search to address two specific lines of evidence:

- First, we searched PubMed and PsychInfo for articles that directly addressed the validity of using hospital admission for the proposed conditions as proxies for HCBS population well-being. This included those research questions identified with (*) below.
- Second, we sought to identify additional information about these conditions in the HCBS populations that could provide insight into applying these indicators to these populations. For these questions, we narrowed our search to include only review articles.

For all searches we included only English language articles published within the last 10 years and excluded articles that focused exclusively on children. In addition to searches of online databases, we sought input from experts on additional relevant sources, in particular government reports or other material not typically published in peer-reviewed journals.

We sought information on health conditions and events included in the set of candidate HCBS QIs. This included ambulatory care sensitive conditions covered by the AHRQ PQIs (diabetes, congestive heart failure, COPD, asthma, bacterial pneumonia, dehydration, urinary tract infection and perforated appendix); intentional injuries inflicted by others (abuse, neglect, physical violence); medication errors; pressure ulcers; accidental injuries potentially due to neglect (burns, poisoning, fire arms accidents, drowning, excessive heat or cold exposure, and

falls); and mental illness and behavioral health events (serious and persistent mental illness, substance abuse, suicide and self harm). In addition, based upon expert feedback, we reviewed key literature pertaining to unmet needs of disabled populations.

2.3.2 Included Populations

States implement HCBS programs differently, leading to much heterogeneity in the composition of each state's HCBS population. We sought information specific to populations frequently included in HCBS programs, including people with intellectual and developmental disabilities, people with physical disabilities, people with mental illness, and elderly individuals. When we believed it to be pertinent, we also included limited information on candidate QI health events in the general population.

2.3.3 Research Questions

In seeking pertinent information, we were guided by a set of research questions:

- What is the prevalence of the health event or condition in key HCBS populations?
- What are important clinical considerations for this health event/condition in key HCBS populations?
- Is there evidence of poor clinical or self-care related to the health event/condition in key HCBS populations?
- What is the frequency of exacerbation of the health event/condition in key HCBS populations and how is this linked to clinical and self-care? (Not applicable to all indicators)
- What is the evidence for prevention of the health event or hospitalization related to the health event/condition? (Not applicable to all indicators)
- What factors impact hospitalization for the health event/condition in key HCBS populations?
- What is known about documentation of and coding related to the health event/condition, including sensitivity and specificity?

Further details of our search strategies, including a list of key words used to identify literature pertinent to key HCBS populations and QI health events and conditions, can be found in the full report on the literature review, located in Appendix 1A.

2.4 Discussions with HCBS Population Experts

To provide context for development of the HCBS QIs, we consulted with experts in several key HCBS populations: individuals with intellectual or developmental disabilities, individuals with physical disabilities, individuals with mental illness, individuals with HIV or AIDS, individuals with traumatic brain injury or spinal cord injury, and elderly individuals. We also consulted with experts in long-term care, because the HCBS QIs are intended to exclude individuals admitted from the long-term care institutional setting.

We conducted a series of seven conference calls with each of these expert groups. The groups included academic researchers, clinicians, case managers, state Medicaid program administrators, and representatives of advocacy organizations. A majority of experts were already participating in a stakeholder panel receiving period project updates; additional experts were identified through personal contacts and by contacting National organizations were initially contacted via email. In all, we consulted with 22 experts.

Prior to the calls, we sent participants a brief description of the project, a list of proposed indicators, and a draft of the literature review(s) relevant to their areas of expertise. During the

calls, we briefly oriented participants to our the HCBS QI development project, then invited them to share any information that they believed would be helpful for us to consider while developing or interpreting the indicator set. In particular, we asked them to tell us about any special considerations for the HCBS populations regarding:

- The propensity to develop one of the proposed indicator events or conditions
- The propensity to develop disease complications or experience severe injuries from an event
- Propensity to present to medical care
- Prevention, diagnosis and management of the proposed indicator events or conditions
- Propensity to be hospitalized for one of the proposed indicator events or conditions

We also asked call participants what is known (through published evidence or clinical experience) about the following key issues for HCBS populations:

- Self care as it relates to prevention or management of the proposed indicator events or conditions
- Self care as it relates to risk factors for the proposed indicator events or conditions
- Quality of medical care for the proposed indicator events or conditions

Finally, we asked the experts to tell us about any literature, reports or other information sources that they believed would be important for us to review as we validate the proposed indicators for the HCBS population.

2.5 Empirical Analyses

2.5.1 SID Analyses

For the purposes of testing the SAS code that calculates the QIs, and for comparison with MAX results, we calculated the candidate indicators using 2005 State Inpatient Databases (SID) data from 37 states (for the QI numerators) and denominator data from the U.S. Census (for the general population) and Kaiser Family Foundation for the two Medicaid populations:

1) General adult population: Numerator – All individuals within the SID, age 18 and older. Denominator – U.S. Census Bureau 2006-08 American Community Survey estimates for state populations, adults age 18 and older.
2) Medicaid population: Numerator – All individuals where either primary or secondary payer is Medicaid, age 18 and older (includes dual eligible individuals). Only the 26 states within the 2005 SID with secondary payer were included in these analyses[i]. Denominator – Estimate of Total Adult Medicaid Population from Kaiser State Health Facts Website . The adult Medicaid population was estimated from Medicaid enrollment for 3 groups: adults, elderly, and disabled. The disabled group includes an unknown number of individuals <18 years old who qualify for Medicaid based on a disability. A 1997 report on dual eligible populations suggests that 4 to 5% of Medicaid enrollees are disabled children (Farley, 1997). Decreasing the number of disabled enrollees by 5% for each state results in a 1 to 2.5% decrease in the size of state denominators. Therefore, the rates reported here may be underestimates by approximately 1 to 2.5%.
3) Dual eligible population: Numerator – All individuals with both Medicaid and Medicare indicated between the two payer variables, age 18 and older. Only the 26 states[i] within the

[i] Those states are: Arkansas, Connecticut, Georgia, Illinois, Indiana, Kansas, Kentucky, Maryland, Massachusetts, Michigan, Minnesota, Missouri, Nebraska, Nevada, New Jersey, New York, North Carolina, Oregon, South Carolina, Tennessee, Texas, Utah, Vermont, Washington, West Virginia, Wisconsin.

2005 SID with secondary payer were included in these analyses. Denominator –Total Dual Eligible Population (Full + Partial) Fiscal Year 2005 (includes those <18 yrs) from Kaiser State Health Facts Website . Note that children (<18 years) are included in the Kaiser dual eligible population used for the denominators, but are excluded from the numerators, making these rates underestimates. The degree of underestimation is unknown, but an older report on children with chronic conditions who are enrolled in Medicaid suggested that between 2-4% are also enrolled in Medicare (Burwell, 1997).

In addition to examining estimated QI rates, we also used 2005 SID data to examine the impact on QI rates of variation between states in use of E-codes. For those candidate indicators that included any E-code in the numerator definition (Abuse, Physical Violence, Medication Errors, Burns, Firearms Accidents, Accidental Poisoning, Accidental Drowning, Exposure due to Weather Conditions, and Injurious Falls) we compared QI rates for states known to use E-codes on a high percentage (>90%) of injury discharges and those known to use E-codes on a low percentage (<75%) of injury discharges. For those 6 candidate indicators that use but do not require an E-code in the numerator definition, we also examined the percent of numerator cases included in the numerator based solely on an E-code and compared this percentage across the two groups of states. The state groupings were based on previous AHRQ analysis of SID data. States known to use E-codes on >90% of injury discharges are: Arkansas, California, Colorado, Connecticut, Florida, Georgia, Hawaii, Massachusetts, Maryland, Missouri, North Carolina, Nebraska, New Hampshire, New Jersey, New York, Rhode Island, South Carolina, Tennessee, Utah, Vermont, Washington, and Wisconsin. States known to use E-codes on <75% of injury discharges are: Illinois, Indiana, Ohio, Oklahoma, South Dakota, and West Virginia. Nine states used E-codes on between 75 and 89% of injury discharges (Arizona, Iowa, Kansas, Kentucky, Michigan, Minnesota, Nevada, Oregon, and Texas) and were included with the high-user group in a sensitivity analysis. We also conducted a sensitivity analysis using 85% as the cut-off for dividing low-use states from other states when making comparisons. Under this alternative definition, the low-E states included: Arizona, Iowa, Kentucky, Michigan, Nevada, Texas in addition to the <75% group.

In addition, we used 2005 SID data from California and New York to investigate the impact of using primary and secondary diagnoses in some indicators. SID data from these states contain information on whether secondary diagnoses are present on admission (POA), which allowed us to better understand how secondary diagnoses flagged by the QIs should be interpreted.

Finally, we examined rates for certain QIs in the SID general and dual eligible populations compared to rates generated by HCUPnet based on the 2005 NIS for the general population and older adult population (age 65+). QI included in this analysis are: Short-term Complications of Diabetes, CHF, Bacterial Pneumonia, UTI, Dehydration, Perforated Appendix, the ACSC composites (chronic, acute and overall) and Pressure Ulcer. Large discrepancies in rates from these two sources would suggest potential problems in how the candidate HCBS QIs are calculated. Some discrepancies were expected due to differences in how we implemented certain QIs; we looked for evidence that observed discrepancies fit with the expected pattern of differences.

2.5.2 Application of the Indicators Using MAX Data

We calculated rates of the candidate QIs for the HCBS QI denominator population using 2005 MAX data. To calculate rates for individuals receiving both Medicaid and Medicare benefits (which we refer to as dual eligible individuals), we combined MAX data with the 2005 Medicare

denominator and MedPAR file. The MAX and Medicare files were linked using a CMS crosswalk file.

We examined the QI rates for the entire HCBS QI denominator population. This is comprised of all individuals, age 18 and older, (1) enrolled in a 1915(c) waiver or (2) receiving 1 of 6 different community-based long-term care services provided through the state plan[ii] or (3) receiving 1 out of 11 different community-based long-term care services provided through 1915(c) waivers[iii]. Excluded from this population were (1) individuals who were enrolled in a Medicaid or Medicare managed care plan (including all persons from Arizona), and (2) individuals not eligible for Medicaid for at least one month of the year. This definition of the HCBS QI denominator population was based on an approach developed by Mathematica Policy Research (MPR) in 2009 for use in CMS's Money Follows the Persons demonstration evaluation.

Additionally, when calculating the indicators for the HCBS QI denominator population, we excluded individuals from the denominator who received care in an institutional setting because these indicators are designed to focus on individuals who reside in a community setting. We identified the institutional care population as persons who had no HCBS claim (no fee-for-service payments for services listed under criteria 2 or 3 of the HCBS denominator population definition) but who did have a claim for institutional care services. We defined an institutional care services claim as a stay of at least one day in any of 4 institutional care settings or a MAX type of service code indicating a stay in one of those 4 settings[iv]. We used the MAX Long-term Care File to identify such claims.

For an overview of the HCBS QI denominator population, see Figure 2. For detailed specification of the QI denominator, see the denominator specifications in Section 6.5.

We performed a limited number of analyses using the HCBS dual eligible population: Individuals, age 18 and older, within the HCBS QI denominator population with a matching record in Medicare enrollment files (MedPAR).

For the purposes of QI development, we examined ever-in-year rates. These are calculated as the number of admissions for a QI event from among all individuals who qualify for the denominator at any point during the year. We also developed quarterly denominator definition to account for individuals with partial-year eligibility. This allowed calculation of quarterly QI rates which were annualized for reporting.

In calculating the numerators, we counted each qualifying hospital admission as a separate event, even if it represented a readmission for a particular individual. Thus, if the same individual was admitted for a qualifying event twice during the year, then he or she contributed one case to the denominator and two cases to the numerator. In this way, the indicators represent the rate of events, not the proportion of the population experiencing such events.

[ii] The 6 services are: personal care, at home private duty nursing, adult day, home health for at least 90 days, residential care, and at home hospice.

[iii] This set includes services for personal care, private duty nursing, adult day, home health, residential care, and hospice, rehabilitation, targeted case management, transportation, durable medical equipment, and a residual category that includes all other types of waiver services.

[iv] The 4 Medicaid institutional care settings are: Intermediate Care Facility for the Mentally Retarded (ICF-MR); Nursing Facility, Inpatient Psychiatric Facility for Individuals under age 21; and Mental Hospital for the Aged.

Due to serious problems with MAX data related to HCBS from Maine, Washington and Wisconsin, we omitted those states from all QI analyses using MAX data

2.5.3 QI Validity Assessment

We examined QI rates nationally and across 46 states and the District of Columbia. We examined numerators and denominators to evaluate reliability of the indicators (sufficient number of cases to provide stable rates). We compared QI rates for the HCBS QI denominator population to rates calculated for the general, Medicaid and dual eligible populations using SID data for 37 states and to rates of related AHRQ QIs available via HCUPnet for the general population nationally. We looked for any patterns of rates that did not fit our expectations and further investigated any such unusual patterns.

3. RESULTS

3.1 Overview of Key Findings from Literature Searches and Expert Calls

3.1.1 Literature Review

Key findings from the literature review are highlighted below. A complete summary of the literature review can be found in the full report on the literature review, located in Appendix 1A.

- We identified a limited amount of information on candidate HCBS QI events and conditions among individuals with intellectual and developmental disabilities. Very little information was available relevant to the QIs among individuals with physical disabilities. In contrast, much information was available about elderly individuals.
- Due to differences between study samples and HCBS subpopulations, few prevalence estimates identified in the literature can be directly compared with rates of the candidate QIs in the HCBS QI denominator population. However, information on the relative risk for QI events or conditions among different populations may inform interpretation of the QI rates.
- Through our review of the literature, we identified a number of potential biases in the candidate QIs, which may be investigated empirically. These include possible higher risk of death from injuries before hospitalization among elderly individuals, differential use of E-codes in the ID/DD population, and difficulty identifying individuals with mental illness using administrative data.
- The literature addressing adverse consequences of unmet needs for assistance with activities of daily living (ADL) provides support for the use of hospitalization as an indicator of adequacy of support services for many of the events and conditions included in the candidate QI set.

3.1.1.1 PQI-based Indicators

- We did not identify any evidence regarding the rate of hospitalization for PQI conditions in individuals with intellectual and developmental disabilities or among those with mental illness.
- Use of certain antipsychotic medications may increase the risk of diabetes and cardiovascular disease, putting some individuals with mental illness or intellectual or developmental disabilities at greater risk for these conditions.
- The presence of depression may increase the risk for admissions related to COPD, asthma and CHF, but results were mixed across several studies. Higher rates of hypertension, COPD, and asthma have been documented in individuals with bipolar disorder.
- Greater health care utilization related to diabetes, including hospitalization and emergency department visits, is associated with lower socioeconomic status, even after adjusting for age, race, sex and area of residence (urban vs. rural). It is unclear the extent to which these effects reflect poor access to quality care in this population, or factors beyond the control of the health care system.

3.1.1.2 Intentional Injuries Caused by Others

- Most review articles focused on abuse in older adults. We found only a very limited number of review articles for people with mental illness or intellectual or developmental disabilities.
- Estimates of the prevalence of abuse among HCBS populations ranged widely. Among the elderly, estimates of abuse prevalence ranged from 3-30%. Among individuals with intellectual or developmental disabilities, estimates ranged from 12-81%, but these figures

were generally based on small samples and self-reports of lifetime experience of abuse. We found no estimates of the prevalence of hospitalization for abuse.

- HCBS populations, including elderly individuals, people with intellectual and developmental disabilities, and people with physical disabilities are at higher risk for all kinds of abuse. One study estimated that increased risk to be between 2 and 5 times that of the general population. However, abuse may go unreported or undetected in a greater proportion of cases among HCBS populations. Overall, most cases of abuse are not reported or identified as such, and are unlikely to be coded
- In some cases higher rates of reported abuse may reflect better detection of underlying abuse and neglect. However, it is unclear how this might impact the overall rate of hospitalization in a state.
- One major source of variation in the identification of abuse is differing interpretations of the terms "abuse" and "neglect," which may vary geographically. Providers may interpret and document potential abuse and neglect cases differently, leading to variation in coding.

3.1.1.3 Unintentional Injuries Potentially Due to Neglect

Medication Errors

- The majority of published literature focused on adverse drug events (ADE), adverse reactions to correctly administered medications. Very little information was available from the literature regarding medication errors.
- Limited evidence data on medication errors in long term care settings suggests that medication errors occur frequently, but rarely require medical attention as a result.
- A number of reviews examined strategies to prevent medication errors or adverse drug events in inpatient, home health, and community settings. Few studies examined hospitalization as an outcome and of those that did only a small proportion reported reduced hospitalization as a result of the intervention.

Pressure Ulcer

- Pressure ulcers are a particular concern in elderly individuals and individuals with limited mobility, key populations receiving HCBS. Several studies suggested that low socioeconomic status plays a role in development of pressure ulcers through lack of comprehensive health care, financial, and social support.
- Malnutrition is a major risk factor for pressure ulcers. In addition, obesity is a risk factor for higher stage pressure ulcers. The risk of pressure ulcers also increases with the use of physical restraints and inadequate repositioning for individuals with limited mobility.
- Effective strategies to prevent development and progression of pressure ulcers include: risk assessment, nutritional assessments and if necessary supplementation, frequent re-positioning, pressure reduction, proper skin care, and patient education about the risks and prevention of pressure ulcers.
- Review articles almost exclusively focus on pressure ulcers developed in hospitals or care facilities (post-admission). No information was available about patients admitted directly as a result of pressure ulcers (only as a hospital complication).
- Pressure ulcers may currently be classified using a variety of methods and instruments, many of which have low inter-rater reliability. There is currently insufficient evidence to recommend a specific pressure ulcer classification system for use in daily practice.

Accidents due to Potential Neglect

- We identified a large body of literature addressing falls in the elderly population. Literature on other injuries included within the candidate indicator (burns, poisoning, firearms accidents, drowning, and exposure to heat and cold) was more sparse. This literature typically focused on the general population, although we identified a limited number of

reviews specifically addressing injuries among individuals with intellectual or developmental disabilities.

- Prevalence of falls among elderly adults living in the community range from 33-50% per year. Many of these falls result in injury, however it is unknown exactly how many falls result in hospitalization. Reported estimates of the rate of physical injury due to falls in elderly individuals ranged from 3 to 30%.
- Effective strategies to reduce the risk of falls in elderly individuals include: use of assistive devices, exercise programs, gait examination, home modification, education and risk assessment. Effective strategies for preventing other types of injuries in the ID/DD population include education (for parents, schools and clinicians, as well as for individuals with disabilities), improved home content design (smoke detectors, swimming pool fences, safety glass, child-resistant containers for household poisons and pharmaceuticals, etc), improved fitness and coordination and behavior modification.
- Injury patterns in people with intellectual disabilities are similar to that of young children in the general population. Seventy-five percent of injuries to people with intellectual disabilities occur in the home. Falls are by far the most common reason for hospitalization for injury in the ID/DD population, followed by poisoning, burns and drowning. Drowning and asphyxia are the leading cause of death in this population.
- Some serious injuries will not result in hospitalization because the individual dies before being admitted. The risk of death from injuries is highest among older adults.
- One study suggested that injury E-codes may be used less frequently in individuals with intellectual and developmental disabilities than in the general public.

3.1.1.4 Mental Illness and Potentially Preventable Behavioral Health Events

- Few review articles provided information on prevalence of mental illness or behavioral health events in HCBS populations, other than in older adults.
- Individuals with intellectual or developmental disabilities were reported to use and abuse alcohol at rates similar to the general population. However, reported use of illicit drugs is less frequent
- There is a greater chance that a suicide attempt by elderly individuals is likely to be fatal than in other populations, suggesting that hospital admission data may underestimate the rate of suicide attempts to a greater degree in older adults than in other populations. Women with intellectual or developmental disabilities may exhibit suicidal behavior at levels similar to the general population of women, however, rates may be lower in men with ID/DD
- Very little evidence exists about effectiveness of community-based mental health treatment for individuals with intellectual disabilities.
- Among the elderly population, substance abuse often stems from misuse of medications, including over- and under-use, or non-adherence to regimen, whereas in younger populations substance abuse is most often associated with use of illicit drugs.
- A number of studies suggested that detection of mental illness is more difficult in older adults. Symptoms of mental illness may be interpreted by clinicians or the older adult themselves as signs of other ailments or part of the aging process.
- Identifying individuals with mental illness from administrative data alone is tricky. Algorithms remain problematic even when incorporating outpatient and pharmacy data.

3.1.1.5 Consequences of Unmet Needs for Assistance with Activities of Daily Living

- Some evidence exists linking unmet needs for assistance with activities of daily living and higher health care utilization, including hospitalizations. This evidence focuses primarily on elderly individuals.
- One study of HCBS waiver enrollees demonstrated lower rates of hospitalization for waiver participants who received services such as home-delivered meals, attendant care and

homemaking services. The risk of hospitalization also decreased with receipt of a greater number of services.
- Many studies have examined adverse consequences associated with unmet needs for assistance with ADLs, although few have examined hospitalization as a consequence. Unmet needs were associated with reports of falls, missed medical appointments, missed meals, unintentional weight loss, dehydration and pressure ulcers, among other adverse consequences.

3.1.2 Expert Calls

Key lessons learned from discussions with HCBS population experts included:

- The Injurious Falls and Pressure Ulcer indicators were the most strongly supported of the proposed indicators. Expert call participants also accepted the idea that high quality in-home support services should reduce rates of hospitalization for the PQI-based indicators, pointing to some evidence from the literature that unmet needs for support are linked with adverse consequences and higher health care utilization. They noted that evidence linking the other proposed Measure Set 2 indicators is weaker.
- Call participants noted that rates of the PQI-based indicators are likely to be strongly affected by underlying health issues. Some indicator events may be less preventable in particular HCBS subpopulations who are at greater risk for the event or in whom prevention strategies are complicated. However, participating experts offered very little feedback on questions of risk adjustment and there was little agreement among those that did about whether and how to adjust for risk factors and health status.
- Call participants suggested several ways that the indicators might be impacted by local, state or national policies, including reimbursement rates for specific health services (e.g., mental health) and diagnoses (e.g., HIV), local gun control laws (firearms, suicide), and licensing regulations for residential facilities serving HCBS populations (firearms), in addition to state-to-state differences in populations receiving HCBS services.

Participants in our expert call discussions also raised a number of issues that may impact the validity of some proposed HCBS QIs:

- A number of participants expressed concern that certain indicator events would be very rare, making indicator rates difficult to interpret. They specifically raised concerns about the accidents and abuse indicators (especially firearms accidents) and perforated appendix.
- Some serious indicator events, in particular the accidents and suicide, will not always result in a hospitalization because some individuals may die before reaching the hospital. Participants worried about this potential bias in particular for fires, burns and accidental drowning.
- Infections or other events in patients with AIDS are more severe clinically and in some cases will have a lower threshold for admission. But current coding makes it difficult to distinguish these more severe AIDS patients from those with HIV who are functioning well.
- Hospital admission is not a uniform indicator of severity. Threshold for admission will vary by indicator event/condition and HCBS population, but also by a number of access issues, such as local practice patterns and availability of acute and non-acute health services (i.e., number of beds in psychiatric facilities, availability of specialists, urgent care clinics). Many of these factors will be difficult to adjust for when making comparisons across regions.
- Using hospital admissions as the sole outcome for the proposed indicators focuses measurement on clinical aspects of care and health, even though these comprise only a part of overall well-being of HCBS beneficiaries.

A detailed summary of lessons learned through the expert discussions can be found in the complete summary of discussions with clinical expert panelists, located in Appendix 1B. Lessons learned through the expert panel discussions were used in guiding and interpreting results of empirical analyses.

3.2 Empirical Analyses to Support QI Development

Table 2 provides a summary of all empirical analyses performed during the QI development process. Details of each analysis follow in the remainder of section 3 and in section 4.

Table 2. Summary of Empirical Analyses, Results, and Implications

Analyses	Summary of Results	Indicator-Specific Highlights	Implications
Validity and Reliability			
Indicator rates in HCBS QI denominator population compared to SID general population and estimated SID dual eligible population	▪ The HCBS rates for the PQI-based indicators were about 3.5 times the estimated SID dual eligible rates and more than 10 times the SID general population rates. ▪ Many of the Measure Set 2 indicators were very rare.	▪ Like most of the PQI-based indicators, the rate of Infection due to Device or Implant was about 3.5 times higher in the HCBS QI denominator population compared to the SID dual eligible population. ▪ The rate of Pressure Ulcer in the HCBS QI denominator population was nearly 5 times that of the estimated SID dual eligible population and more than 25 times that of the SID general population. ▪ The rate of Injurious Falls in the HCBS QI denominator population as only slightly higher than that observed in the SID general population (by about 10%). The HCBS rate was just half that of the SID dual eligible population.	▪ In general we observed the expected pattern that indicator rates were higher in the HCBS QI denominator population compared to the estimated SID dual eligible population, and much higher than the SID general population. ▪ An important exception was the pattern observed for the Injurious Falls indicator, which warrants further exploration of the indicator definition (see below).
Final rates Full Medicaid, HCBS QI denominator, HCBS Medicaid-only, and HCBS Dual eligible populations	▪ For most indicators, rates were highest in the HCBS dual eligible population and lowest in the full Medicaid population, as expected. For all but one indicator (Injurious Falls), rates in the full Medicaid population were lower than in any of the HCBS QI denominator populations, as expected.		▪ The observed patterns fit with our expectations. We do not have reason to suspect major validity or reliability problems with the indicators based on the observed patterns across these 4 populations.
State-level variation of rates	▪ Variability between states is in line with that seen for the PQIs in the general population. The	▪ Variation between states for the Pressure Ulcer indicator was substantial. The high degree of	▪ Most of the PQI-based indicators appear to be valid and reliable for use in the HCBS population,

	standard deviation was about one third of the mean for all but 2 PQI-based QIs. Many of the Measure Set 2 indicators were too rare for use as rate-based indicators. There was wide variability across states for the serious mental illness and substance abuse indicators.	variation between states may be due in part to variation in the coding of stage I and II pressure ulcers, particularly as it is impacted by the number of diagnosis fields. ▪ There is no evidence that variation across states for the Injurious Falls indicator is due to variation in the use of E-codes. ▪ The serious and persistent mental illness and substance abuse indicators demonstrated very wide variability across states, supporting the concern that bias due to variation in location of care is a problem.	but most of the Measure Set 2 indicators were not so.
Stratified rates calculations by age and quarters of eligibility; breakdown of HCBS subpopulations among hospitalized HCBS persons	▪ For most of the PQI-based indicators, the rates increased with age both when examining national rates and when comparing age strata within a state. The same pattern was observed for all states. ▪ We observed that QI rates were significantly lower among individuals qualifying for all 4 quarters, compared to those with only partial-year eligibility for the QI denominator. ▪ In the HCBS denominator, we noted large state-to-state variation in the percent of admissions for patients with autism, chromosomal abnormalities and HIV/AIDS, compared to other subpopulations.		▪ The observed pattern of rates by age strata fit with our expectations, which supports validity of the indicators. ▪ The lower rates in individuals qualifying for 4 quarters compared to those with less eligibility suggests that clinical populations in the denominator for a short period of time may be different than those in the denominator for all four quarters. ▪ The wide state-to-state variation in proportions of clinical subpopulations within the HCBS denominator is consistent with known differences in waiver and inclusion criteria for HCBS programs by state and likely will be reflected in the QI rates.
Examination of impact of cases qualifying only due to E-codes given variation in E-code usage.	For the proposed QIs that used E-codes, the percent of numerators based on E-codes and QI rates for	▪ In the final measure set, only Injurious Falls uses E-codes. The difference in mean QI rate between	▪ For states with low use of E-codes, rates of QIs that rely on E-codes are likely to be

(SID 2005 data).	the general population tended to be lower in states known to be lower users of E-codes (<85% of injury diagnoses).	low and high E-code states was 28%.	underestimates.
Number of diagnosis fields available	▪ In both MAX and MedPAR data the average number of diagnosis fields used by most states was about 6. ▪ The average number of fields used by states varied more widely for MAX data. Alaska, Arkansas, California, and Rhode Island were especially low (2 fields on average).	▪ There was no correlation between the average number of diagnosis fields used and state rates for either the Injurious Falls or Pressure Ulcer indicators when using both MAX and MedPAR data. But the average Pressure Ulcer QI rate was significantly lower among the 4 states with the fewest number of diagnosis fields used, compared to states with more than 6 fields used on average.	▪ For the HCBS dual eligible population we do not expect to see systematic variation in QI rates across states due to differences in the number of diagnosis fields available. ▪ In those states that typically report very few diagnosis fields, the Pressure Ulcer QI rate for HCBS Medicaid-only persons is likely to be an underestimate, and the same may be true for Injurious Falls. The effect on other QIs is likely to be mixed, depending on how secondary diagnoses are used in the indicator definition.
Indicator-Specific Definitional Questions			
Effect of definition modifications for PQI-based indicators	▪ The definition modifications expanded the indicator numerators. The percent change in the numerator was greater for the Medicare population, compared to Medicaid.	▪ The effect of combining the asthma and COPD PQIs had differing effects for the SID Medicaid and SID dual eligible populations, with a greater share of the Medicaid numerator due to asthma in adults age 40+. ▪ 24% of SID Medicaid and 39% of SID Medicare numerator cases were included based on the alternative principal diagnoses with UTI in the secondary position. The vast majority had principal diagnosis of sepsis; <1% of the numerator qualified with catheter infection. ▪ Approximately half of the Dehydration numerator qualified with one of the alternative principal	▪ These modifications improve the sensitivity of the indicators, and in the case of Asthma/COPD, minimize the impact of diagnostic ambiguity.

		diagnoses (SID Medicaid 52%, Medicare 40%).	
Percent of cases qualifying with alternative diagnoses in the principal position, that had the target diagnoses in the secondary position POA.	▪ The QI target diagnosis in the secondary position was POA in the vast majority of admissions for UTI and dehydration when combined with the alternative diagnoses in the principal position.	▪ >95% of secondary diagnoses of UTI with the alternative principal diagnoses were POA. ▪ The secondary diagnosis of dehydration was POA in nearly all numerator cases (>94%) included based on an alterative principal diagnosis.	▪ The alternative diagnoses in the principal position are capturing true-positives. Even in the absence of POA data, combining these alternative diagnoses with a secondary diagnosis of UTI or dehydration is unlikely to capture a large number of false-positives.
Presence of HIV/AIDS in principal diagnosis position with QI event in secondary position POA		▪ Admissions with a principal diagnosis of HIV/AIDS and a secondary diagnosis of bacterial pneumonia accounted for 11% of the Bacterial Pneumonia numerator in the Medicaid population and <1% in the Medicare population. Nearly all of those cases had pneumonia coded as POA (93% Medicaid, 94% Medicare).	▪ Including admissions with a principal diagnosis of HIV/AIDS and a secondary diagnosis of the indicator target condition strengthens the indicators by capturing true positive cases that would otherwise by missed, and is unlikely to capture a large number of false positives.
Infection due to device/implant: Numerator breakdown	▪ In the HCBS QI denominator population, this indicator was driven by similar codes as was seen in the general population.	▪ 55% of numerator cases were infections of vascular devices or implants, including arterial line infections such as those used in dialysis. Next most common were indwelling urinary catheter with 13% (this diagnosis later removed from this indicator), then internal joint prosthesis (10%).	▪ There was initially overlap between this and the UTI indicator. Definition modifications to both indicators minimized this overlap (see below).
UTI: Overlap with Infection due to Device or Implant indicator	▪ In the HCBS QI denominator population, 75% of admissions with a principal diagnosis of indwelling urinary catheter infection had a secondary diagnosis of UTI. Only 0.8% of urinary catheter infections (principal or secondary diagnosis) had a principal diagnosis of UTI.	▪ We removed infections due to indwelling urinary catheters from the Infections due to Device or Implants indicator and instead included in the UTI indicator anyone with this principal diagnosis and a secondary diagnosis of UTI.	▪ The revised definitions should minimize overlap between these indicators, and strengthen the UTI indicator by capturing additional cases of interest.
Injurious Falls: Series of analyses to characterized captured cases	▪ One third of the HCBS numerator was based on femur injuries,		▪ The original Injurious Falls definition was capturing some

and potential false negatives	including hip fracture. 93% of these were coded as the principal diagnosis. Contusions were the second most common type of injury included in the numerator (15%), most often coded as a secondary diagnosis (66%). ▪ The most common principal diagnoses for these contusion numerator cases included syncope and collapse, convulsions, stroke, pneumonia, dehydration, UTI, CHF and COPD.		minor injuries associated with falls resulting from syncope, stroke or seizures, which might be less preventable. It was also capturing some falls incidental to hospitalization for other serious conditions, such as CHF and pneumonia, which are captured by other indicators. ▪ The final indicator definition excludes admissions with any diagnosis of syncope, seizure, stroke, or with a principal diagnosis of pneumonia, CHF, COPD, UTI or dehydration.
Pressure ulcer: Use of principal vs. secondary code	▪ In the HCBS QI denominator population, principal diagnoses of pressure ulcer account for 12.2% of all pressure ulcer diagnoses in the QI denominator and 15% of the Pressure Ulcer numerator cases. ▪ In the Medicaid population most secondary diagnoses of pressure ulcer were POA (92.0% in California, 83.7% in New York).		▪ The indicator includes some pressure ulcers that develop during hospitalization, but these analyses have assured us that including both principal and secondary diagnoses of pressure ulcer is appropriate for the HCBS QIs.
Aspiration pneumonia	▪ In the full HCBS QI denominator population, 17.3% of the Bacterial Pneumonia numerator cases were included based on a principal diagnosis of aspiration pneumonia.	▪ The proportion of the numerator based on aspiration pneumonia was highest in subgroups at greatest risk for aspiration, such as those with brain injuries (26.6%) and ID/DD clinical subgroups (range 20.9% to 48.0%). The proportion among the mental illness subgroups was similar to the overall HCBS QI denominator population (range 13.2% to 24.3%). The proportion was very low in the HIV/AIDS subgroup (1.5%).	▪ The observed pattern of aspiration pneumonia across clinical subgroups fits with expectations, supporting the validity of this definition modification.
Variation in position infection due	▪ Some cases of infections due to		▪ Coding guidelines specifically

to device/implant is coded relative to PSI infection codes	device/implant (996.x) might be missed because the infection code is listed as the principal diagnosis and the 996.x code is in a secondary position. Adding such cases to the numerator definition would increase the numerator by 17.4%		state that some 996.x codes should be coded in the principal position with infection codes in the secondary position, but guidance is not specified for all 996 codes. Variation in adherence to this guidance could impact rates of this indicator by 15-20%
Alternative definitions of Medication errors	▪ E-codes impacted numerator exclusions to a much greater degree than they impacted inclusions. ▪ In an analysis of the SID dual eligible population for 5 states, very few cases were included in the numerator based on a Medical Error (E870) code.		▪ Variation in E-code usage will generally lead to fewer numerator exclusions in states where E-codes are used less frequently. Variation in use of medical error codes is unlikely to impact the indicator much since they are used so rarely. ▪ This indicator was ultimately not included in the HCBS QI set, due to concerns about coding of medication error events.
Follow-up Analyses to Guide Interpretation and Use			
Examination of best way to identify transfers	▪ Transfers make a substantial contribution to the numerator of several indicators, in particular Pressure Ulcer and Infection due to Device or Implant. Same-day readmissions is likely a more sensitive way to identify transfers than the admission source variable (in the SID) or either the patient status (MAX) or discharge destination (MedPAR) variables.		▪ Without adjusting for transfers, the QIs are likely to overestimate the rate of events for several indicators. We recommend using same-day readmissions as the best way to identify transfers and avoid double counting them in the HCBS QI denominator population.
Repeat QI events for same individual (frequent users)	▪ The QIs with the highest percent of frequent users were the Chronic Conditions and Overall Composites, Pressure Ulcer, CHF and Asthma/COPD. These QIs had the largest rate reductions when calculating the numerator		▪ Frequent users have a substantial impact on the rates of the chronic condition and Pressure Ulcer QIs. Using patient-level rates masks this impact and provides a view of the health and well-being of the

	based on persons rather than discharges. ▪ Injurious Falls had the fewest frequent users.		population. Event-based rates provide additional information on resource use and disease severity.
QI events that are readmissions	▪ Time from previous admission to QI event ranged from a median of 24 days (Pressure Ulcer) to 62 days (Asthma/COPD). Most QIs had median QI readmission times between 40 and 60 days. ▪ For all but one QI, 25% of numerator cases had a previous all-cause admission within 2 weeks or less of the index QI event.	▪ The 25th percentile of QI readmission time was lowest for Pressure Ulcer (0 days).	▪ All the QIs have some potential to capture readmissions that may be considered complications of previous admissions, rather than events associated with care and support services received in the community setting. Several of the acute event QIs (UTI, Injurious Falls, Infection from Device/Implant), seem particularly likely to capture such events. Pressure Ulcer likely captures repeated admissions in high risk patients and may also capture the same unhealed ulcer repeatedly.
Review of HCBS QI denominator population characteristics	▪ Individuals were older (mean age 60.5 years), predominantly female (63.4%), and White (56.9%). The most common clinical subgroup was mental illness (18.0%), followed by intellectual and developmental disability (16.7%). Approximately 33% of individuals qualified for HCBS for fewer than 4 quarters in 2005.		▪ The HCBS QI denominator population is diverse in demographic, socioeconomic and clinical characteristics. The impact of these characteristics on QI rates was explored through preliminary regression analyses (see below).
Regression analyses	▪ Comorbid chronic disease was consistently associated with greater risk of hospitalization for all QI events, with the largest magnitude of association for the chronic disease QIs. In contrast, age, dual eligible status and income were not associated with	▪ Range of odds ratios for comorbid chronic disease: 1.26 (UTI) to 6.09 (Short-term Complications of Diabetes). ▪ Urban residence was associated with a lower chance of hospitalization for 8 of 13 QIs (range of ORs 0.64 to 0.88).	▪ These regression analyses offer a preliminary view of how key individual characteristics might influence rates of the HCBS QIs and are generally in line with the expected direction and magnitude. It is reassuring that the observed patterns of risk

	any QIs in a clinically meaningful way. For the other patient characteristics examined, large effects were observed for a few QIs, but were weaker for the remainder. ▪ The ID/DD subgroup had an increased chance of hospitalization for the acute condition QIs, but a lower chance for the chronic condition QIs. ▪ Individuals with mental illness and those with brain or spinal cord injuries had an increased chance of hospitalization for most QIs. ▪ Individuals who were not eligible for HCBS in all 4 quarters generally had an increased risk of hospitalization for all conditions.	▪ Hispanic ethnicity and Asian, American Indian or Hawaiian/Pacific Islander race were frequently associated with a decreased chance of hospitalization, compared to White race. Results were mixed for African American race. ▪ Results were also mixed for gender, where for half of the QIs, no clinically meaningful effect sizes were observed.	factors did not differ substantially from those anticipated from literature-based and clinical assessments. ▪ The characteristics demonstrating strong associations with hospitalization for particular QI events in these analyses may be considered a starting place for further analyses, such as development of risk models.

CHF – Congestive Heart Failure; COPD – Chronic Obstructive Pulmonary Disease; ID/DD – Intellectual or developmental disabilities; HCBS – Home and community-based services; MAX – Medicaid Analytic eXtract File; MedPAR – Medicare Provider Analysis and Review file; PSI – Patient Safety Indicator; POA – Present on Admission; PQI – Prevention Quality Indicator; QI – Quality Indicator; SID – Healthcare Cost and Utilization Project State Inpatient Database; UTI – Urinary Tract Infection

3.2.1. SID Analyses

We used SID data in a preliminary assessment of QI rates. We calculated rates in the general population and in estimated Medicaid and dual eligible populations (Table 3), assessed use of E-codes (Table 4) and examined variability across states in the general population (Table 5). All analyses used version 1.7 of the numerator specifications.

For additional tables of SID results, see Appendix 2.

Table 3. Comparison of Mean (SD) State Rates for the General, Medicaid and Dual Eligible Populations using SID 2005 Data

Indicators	General Population[1]	Medicaid Population[2]	Dual Eligibles[3]
Measure Set 1			
Short-term Complications of Diabetes	51.116 (13.191)	159.169 (46.501)	115.115 (36.584)
Asthma or COPD	324.283 (121.154)	758.053 (253.740)	1,130.187 (371.772)
CHF	419.163 (127.252)	752.842 (280.569)	1,413.263 (512.212)
Composite: Potentially Preventable Infections	720.820 (178.806)	1,413.032 (376.508)	2,611.694 (746.749)
Bacterial Pneumonia	487.748 (126.072)	907.445 (233.743)	1,682.912 (485.905)
Urinary Tract Infection	233.072 (61.563)	505.587 (160.926)	928.782 (311.315)
Infection due to Device or Implant	69.391 (16.039)	168.839 (58.371)	276.140 (107.035)
Dehydration	192.429 (54.232)	343.152 (109.634)	608.339 (201.729)
Perforated Appendix**	308.244 (35.014)	299.546 (47.694)	457.487 (53.045)
ACSC Composite: Chronic Conditions	1,011.309 (311.411)	2,176.011 (668.543)	3,377.320 (1073.155)
ACSC Composite: Acute Conditions	702.284 (182.844)	1,290.233 (358.675)	2,302.410 (695.777)
ACSC Composite: Overall	1,713.510 (475.139)	3,466.006 (988.293)	5,679.134 (1714.888)
Measure Set 2			
*Composite: Intentional Injuries by Others***	31.409 (12.929)	81.516 (55.473)	29.583 (14.046)
Physical/sexual Abuse**	1.655 (0.671)	5.358 (2.820)	4.678 (3.129)
Intentional Trauma or Physical Violence**	30.164 (12.805)	77.654 (54.623)	25.805 (13.033)
*Composite: Potential Neglect***	566.372 (102.136)	995.668 (260.781)	1,714.879 (540.276)
Medication Errors**	48.869 (11.660)	149.685 (40.034)	148.514 (57.781)
Pressure Ulcer	137.653 (53.172)	376.633 (162.476)	740.331 (325.927)
*Composite: Accidents***	386.161 (72.799)	482.059 (135.251)	848.494 (297.607)
Fire, Burns**	15.410 (4.609)	34.765 (12.823)	34.174 (14.058)
Poisoning**	7.921 (1.924)	13.037 (4.554)	14.866 (5.747)
Fire Arm Accidents**	2.507 (1.449)	5.490 (4.741)	1.315 (1.034)
Accidental Drowning**	0.338 (0.367)	0.585 (0.511)	0.384 (0.627)
Excessive Heat/cold Exposure**	9.619 (3.074)	21.641 (8.258)	27.692 (11.941)
Injurious Falls	351.563 (71.502)	408.731 (123.200)	772.522 (279.890)
*Composite: Potentially Preventable Behavioral Health Events***	481.201 (155.679)	1,763.952 (790.905)	1,738.516 (804.594)
Attempted Suicide or Self-inflicted Harm**	73.534 (15.410)	220.658 (78.381)	139.561 (73.198)

Serious and Persistent Mental Illness**	420.327 (151.324)	1,589.713 (771.743)	1,628.972 (775.451)
Substance Abuse**	188.043 (115.002)	545.005 (513.819)	298.298 (174.633)
Dual Diagnosis of Mental Illness and Substance Abuse**	180.078 (69.827)	735.022 (414.924)	572.851 (301.276)

Annual rate per 100,000 population, except for Perforated Appendix, which is per 1,000 admissions with appendicitis. Numerator specifications version 1.7.

[1] Numerator – 2005 SID, all payers (37 states included). Denominator – U.S. Census Bureau 2006-08 American Community Survey estimates for state populations, adults age 18 and older.

[2] Data Sources: Numerator calculated from 2005 SID, primary or secondary payer is Medicaid (includes dual eligible persons), 26 states included. Denominator based on estimate of total adult Medicaid population from Kaiser State Health Facts Website (http://www.statehealthfacts.org/).[v] Denominator for Perforated Appendix is number of discharges for appendicitis among Medicaid population in 2005 SID.

[3] Data Sources: Numerator calculated from 2005 SID, both Medicaid and Medicare are payers (26 states included). Denominator estimated from total dual eligible population (Full + Partial) Fiscal Year 2005 (includes those <18 yrs) from Kaiser State Health Facts Website: http://www.statehealthfacts.org/.[vi] Denominator for Perforated Appendix is number of discharges for appendicitis among dual eligible population in 2005 SID.

**Candidate measure not included in final measure set.

ACSC – Ambulatory Care Sensitive Condition; CHF – Congestive Heart Failure; COPD – Chronic Obstructive Pulmonary Disease; SD – Standard Deviation; SID – Healthcare Cost and Utilization Project State Inpatient Database;

- In general, the PQI-based indicator rates (Short-term Complications of Diabetes, Asthma/COPD, CHF, Bacterial Pneumonia, UTI, Dehydration, Perforated Appendix) are in-line with HCUPnet results for 2005 (Table 2-4). Both the rates calculated using the SID and the rates from HCUPnet that use the 2005 NIS reflect rates in the general population and large discrepancies in rates from these two sources would suggest potential problems in how the candidate HCBS QIs are calculated.
- As expected, rates are higher in the HCBS indicators for the UTI and Dehydration indicators, which we modified to include additional ways of entering the numerator (Table 2-4). Surprisingly, the rate of Short-term Complications of Diabetes in the dual eligible population is more than 3 times the rate for persons age 65 and older from HCUPnet. This is likely due in part to higher rates of diabetes, comorbidities and other factors that increase admission rates in the Medicaid population, because the general population Short-term Complications of Diabetes rates from the SID analyses and HCUPnet are very similar.
- The standard deviation (SD) is quite large for the HCBS Pressure Ulcer indicator in all 3 populations (between 39 and 44% of the mean), likely due to variation in the coding of state I and II pressure ulcers (Table 3). As expected, the SID general population rate is much

[v] The adult Medicaid population is estimated from figures available through the Kaiser State Health Facts website on Medicaid enrollment for 3 groups: adults, elderly, and disabled. The disabled group includes an unknown number of individuals <18 years old who qualify for Medicaid based on a disability. A 1995 report on Medicaid enrollment suggests that 4 to 5% of Medicaid enrollees are disabled children. Decreasing the number of disabled enrollees by 5% for each state results in a 1 to 2.5% decrease in the size of state denominators. Therefore, the rates reported here may be underestimates by approximately 1 to 2.5%.

[vi] Note that children (<18 years) are included in the Kaiser dual eligible population used for the denominators, but are excluded from the numerators, making these rates underestimates. We don't know by how much, but an older report on children with chronic conditions who are enrolled in Medicaid suggested that between 2-4% are also enrolled in Medicare.

higher than the rate reported by HCUPnet for the general population because the HCBS Pressure Ulcer indicator includes all diagnoses, while the HCUPNet Pressure Ulcer indicator includes only principal diagnosis (Table 2-4).

- The Intentional Injuries Caused by Others composite rate is driven largely by the Intentional Trauma or Physical Violence indicator. Rates of abuse are very low in all 3 populations (Table 3); two states had zero numerator cases for Physical/sexual Abuse in the dual eligible population (see comment below for further discussion). It may be more appropriate to use the Intentional Trauma or Physical Violence indicator alone rather than as a composite with Physical/sexual Abuse.
- Several events included among the Measure Set 2 indicators appear by themselves to be too rare to use as indicator rates, at least in the general population (Table 3). Specifically these are Physical/sexual Abuse, Fire Arm Accidents, and Accidental Drowning. HCBS populations are vulnerable to abuse and some literature suggests that they experience abuse at higher rates than the general population, although it is unknown what portion of abuse cases are detected and result in hospitalization among the HCBS population. Given that rates remain low at about 2-5 per 100,000 annually, abuse is likely under coded. States with small populations are particularly vulnerable to variation in reporting for these rare indicators. If these indicators are of high interest given the nature of the injuries, they could be reported as counts or case finding tools.
- Of the indicators that rely entirely on E-codes (Fire Arm Accidents, Injurious Falls) we see no differences in states with high use of E-codes and those with low use of E-codes (per HCUP SID analyses) (Table 4).
- The Accidents composite is driven largely by the Injurious Falls indicator. Similarly, the Potential Neglect composite is driven mostly by the Pressure Ulcer and Injurious Falls indicators. It may be more appropriate to use Fire Arm Accidents and Accidental Drowning as count-based “never events” indicators, rather than including these very rare events in composite rates (Table 3).
- In the general population, the distribution of the Serious and Persistent Mental Illness indicator is similar to the other indicators, in that the standard deviation is about one third (36%) of the mean rate (Table 3). The inter-quartile range (IQR) also is not too wide (median=446.9, IQR = 308.3-515.7). However, there is greater variation between states for this indicator in the Medicaid and dual eligible populations, where the standard deviation is 49% and 48% of the mean, respectively (Table 3). This is what we would expect if location of care for mental illness is driven by Medicaid and Medicare policies, which vary across states. The observed inter-state variation may be explained by a number of different factors, but raises validity concerns for this indicator, particularly in Medicaid and dual eligible populations.
- The Substance Abuse indicator has a very wide distribution in all 3 populations, but particularly in the Medicaid population, where the standard deviation is 94% of the mean rate (Table 3). The very wide standard deviation in all 3 populations is partially driven by outlier states: New York, Illinois and Massachusetts. However, even when excluding these states, the distributions of the Medicaid and dual eligible populations remain quite wide (data not shown). This high variability suggests that comparisons across states may not be valid. (Location of care for substance abuse likely varies across states. States where a higher proportion of substance abuse treatment is provided outside the acute care hospital setting will appear to have lower rates, even if the actual rate of substance abuse is similar or higher than in states where such care in provided in community hospitals).
- In general, there is greater variability for dual eligible individuals than for the general population. For a limited number of indicators variability was also somewhat higher in the Medicaid population compared to the general population, but to a lesser extent than for dual eligible population (Table 3).

- Rates of nearly all indicators are much higher in the dual eligible population compared to the general population, as expected due to older age in duals. Those without much difference are very rare in both populations (Fire Arm Accidents, Accidental Drowning), with the exception of Intentional Trauma or Physical Violence, which one might expect to be higher in younger populations (Table 3).

3.2.2 E-code Analyses

For this analysis, we compared the percent of numerator cases based solely on an E-code (% E-code) and QI rates for states known to use E-codes on a high percentage of injury discharges (high-E states) to those that use E-codes on a low percentage of injury discharges (low-E states) (Table 4). See the methods (Section 2.5.1) for further details and a list of states included in each category. Analyses use SID 2005 data.

Table 4. State-to-State Variation in Percent of Numerator Events Based Solely on E-codes

	Mean (SD)		p-value
	Low-E States	High-E States	
Physical/sexual Abuse**	0.0 (0.0)	0.5 (1.6)	0.17
Medication Errors**	7.0 (3.5)	10.9 (4.4)	0.04
Fire, Burns**	4.5 (1.1)	7.5 (3.8)	0.003
Accidental Poisoning**	14.5 (5.3)	25.3 (8.4)	0.002
Accidental Drowning**	20.6 (22.2)	25.3 (22.0)	0.66
Excessive heat/cold Exposure**	2.0 (1.5)	8.6 (5.0)	<0.0001

Source: SID 2005, all payers (37 states included).
**Candidate measure not included in final measure set.
SD – Standard Deviation; SID – Healthcare Cost and Utilization Project State Inpatient Database

Table 5. State-to-State Variation in QI Rates

	Mean (SD)		p-value
	Low-E States	High-E States	
Physical/sexual Abuse**	2.071 (0.725)	1.448 (0.637)	0.10
Medication Errors**	58.543 (14.707)	46.585 (10.727)	0.11
Fire, Burns**	12.857 (3.936)	16.667 (4.974)	0.08
Accidental Poisoning**	6.979 (1.278)	8.120 (1.882)	0.11
Accidental Drowning**	0.192 (0.093)	0.413 (0.442)	0.04
Excessive Heat/cold Exposure**	8.927 (1.830)	9.548 (3.306)	0.55
Intentional Trauma or Physical Violence**†	23.469 (5.765)	32.248 (14.324)	0.03
Fire Arm Accidents**†	2.200 (0.406)	2.703 (1.789)	0.24
Injurious Falls†	275.574 (36.466)	383.103 (65.980)	<0.0001
Suicide or Self-inflicted Harm**†	70.905 (12.153)	74.848 (16.731)	0.53

Source: SID 2005, all payers (37 states included).
**Candidate measure not included in final measure set.
†This indicator requires use of E-codes for numerator inclusion.
SD – Standard Deviation; SID – Healthcare Cost and Utilization Project State Inpatient Database

There are differences in the relative contribution of E-codes to the numerators of several of the accidents indicators for states with high and low use of E-codes (Table 4). These differences remained when defining low-use states as either <75% of injury discharges accompanied by an E-code (n=6 states) or <85% (n=12 states), with the exception of the Accidental Drowning indicator. The differences in E-code contribution to numerators are generally accompanied by a trend towards lower QI rates in the low-E states. Two indicators that rely entirely on E-codes for

the numerator inclusion criteria (Intentional Trauma or Physical Violence and Injurious Falls) do have significantly lower QI rates in the states with the lowest use of E-codes. The potential impact on QI rates varied between a 14% and 65% difference in the QI rate between the two groups of states.

These analyses suggest that for states with low use of E-codes (in general <85% of injury diagnoses), QI rates are likely underestimates. The degree of underestimation is important (14-65%). Comparisons with other states should be interpreted with caution. Although these analyses were based on E-code usage in the general population, we do not believe that use of E-codes would differ for the HCBS population.

Medication Errors

Because the Medication Errors indicator relies heavily on E-codes, and E-codes for medical errors which might be used differently from other E-codes, we conducted additional analyses for this indicator. Overall, the distribution of the percent of the numerator based on E-code was fairly narrow (range 3.3-20.1%, mean [standard deviation (SD)] 9.9 [4.3]). There was a modest and borderline significant difference in the percent of numerator events based on an E-code between low-E states and high-E states (mean 7.0% vs. 10.9%, p=0.04). Based on a previous AHRQ analysis, there are only two states with high use of medical errors codes (New York [NY] and Vermont [VT]). Although we cannot detect trends with only two data points, but it is worthy of noting that the percent of numerator cases based on an E-code was quite different in these two states (7.7% in NY, 19.8% in VT). In a detailed analysis for 6 states (Illinois, New Jersey, New York, Vermont and West Virginia), we observed that the medical errors E-codes made a very small contribution to the numerator relative to other E-codes, even in New York and Vermont.

In our detailed 6-state analysis, we calculated the Medication Errors indicator 3 ways: (1) using the version 1.7 specifications (numerator=18,161); (2) eliminating the medical errors E-codes (numerator=18,133); and (3) eliminating all E-codes from both numerator inclusion and exclusion criteria (numerator=30,402). Overall, E-codes impacted exclusions to a much greater degree than they impacted inclusions. In these 6 states combined, there were many cases (13,764) that were excluded based on an E-code. There were relatively few cases (1495) that were included based on an E-code and not also subsequently excluded based on an E-code. Thus, the net effect of ignoring E-codes was to increase the numerator substantially (range 57.1 to 141.4% increase in numerator cases; mean=85.1%).

For the Medication Errors indicator, there was a trend towards higher QI rates in states with low E-code usage (mean [SD] QI rate of 58.543 [14.707] for low-E states vs. 46.585 [10.727] for high-E states, p=0.11). This is what we would expect if variation in use of E-codes was leading to fewer exclusions from the low-E states. Given the large impact of E-codes on this indicator, state-to-state comparisons are likely to be problematic.

Our finding that most of the E-codes to be included in the numerator were accompanied by an additional E-code on the exclusion list suggested that some E-codes may not be used appropriately. All of the E-codes used as inclusion criteria represent accidental poisoning with medicinal substances and the largest group of E-codes used as exclusion criteria are for adverse drug events, yet accidental poisoning E-codes should not be used in conjunction with ADEs. Before being considered for use as an indicator, further investigation is need to better understand whether E-codes for accidental poisoning are inappropriately coded in conjunction with adverse drug events.

Indicators Relying Entirely on E-codes

There are 4 indicators that use only E-codes in the numerator definition: Intentional Trauma or Physical Violence, Fire Arm Accidents, Injurious Falls, and Suicide and Self-inflicted Harm. For these indicators, we compared the QI rate between the low-E and high-E states (Table 5). Rates were significantly lower in the low-E states for the Intentional Trauma or Physical Violence ($p=0.03$) and Injurious Falls ($p<0.0001$) indicators. In both cases the low-E state rates were about 30% lower than in the high-E states. (Intentional Trauma or Physical Violence, mean [SD] low-E rate = 23.469 [5.765] vs. high-E rate = 32.248 [14.324]); Injurious Falls, low-E rate = 275.574 [36.466] vs. high-E rate = 383.103 [65.980]). For both these indicators, rates for the states with low E-code usage should be considered underestimates and interpreted with caution if comparing to other states.

There were no differences in QI rates between low- and high-E states for the Fire Arm Accidents or Suicide and Self-inflicted Harm indicators (Table 5). However, given the consistent pattern of variation of E-code usage across states, we still maintain some concerns about the validity of comparisons between states for these indicators.

3.2.3 Florida SID Quality Control Review

Using 2005 Florida SID data, we examined the number of cases meeting each of the key inclusion and exclusion criteria for the QIs. Below, we summarize conclusions from that review.

Short-term Complications of Diabetes

- No cases with gestational diabetes code in Florida. This exclusion is likely to have very minimal impact on the national QI rate.

Asthma or COPD

- An additional 34,573 cases were captured by adding COPD as a numerator inclusion criteria for 40+ patients. That's 63% of the total numerator for Florida, or a 170% increase in the size of the numerator over what it would otherwise be using just asthma diagnosis for all adults.

UTI

- In Florida in 2005, there were 13,718 cases included in numerator under the "principal diagnosis of sepsis with secondary diagnosis of UTI" criterion, accounting for 33.6% of the numerator cases. That's a 51% increase in the size of the numerator using the AHRQ PQI version 4.1 definition.

Dehydration

- Of the 28,099 total numerator cases:
  - Principal diagnosis hyperosmolarity + secondary diagnosis dehydration: n=68
  - Principal diagnosis gastroenteritis + secondary diagnosis dehydration: n=4,019
  - Principal diagnosis renal failure without Chronic Kidney Disease (CKD) + secondary diagnosis dehydration: n=9,410. This is high compared to the other reasons. A useful follow-up analysis would be to look for diagnosis codes for CKD in outpatient records among those individuals who qualify for the numerator based on this criterion.
- Altogether, that's an additional 13,497 cases, or 92% increase of the numerator, beyond those cases included based on the PQI version 4.1 definition. The additional inclusion criteria account for 48% of the total numerator cases.

Physical/sexual Abuse

- 82% of numerator cases are in females.

Medication Errors

- The numerator exclusions have a substantial impact. There are 8,532 cases excluded that would otherwise be included. The vast majority o these (97%) would be included based at least in part on codes 960-979 (poisoning by medicinal substance). In MAX, a useful follow-up analysis would be to look at reasons for exclusion by groups: (1) poisoning by narcotics, hallucinogens, cocaine (2) accidental poisoning by heroin, hallucinogens and cocaine; (3) adverse drug events (4) self-inflicted poisoning (5) assault by poisoning.
- 94.6% (n=7815) of cases are included based wholly or in part on codes 960-979. As expected, the medical errors codes, in particular, were very rarely used (only 5 cases total in FL). Prior analyses showed that in Florida, <20% of medical error diagnoses were accompanied by a medical error E-code.
- Undetermined poisoning E-code as the only numerator inclusion criterion was rare (3% of cases). It was used more often in conjunction with the 960-979 code range (n=1783 cases, or 22% of numerator cases).
- E-codes for accidental poisoning make relatively little unique contribution to the numerator (2%).

Accidental Drowning

- The numerator exclusion criteria exclude one third of the potential numerator cases (those meeting inclusion criteria). Overall this indicator is too rare to use as a rate.

Injurious Falls

- There are 5,569 cases that were omitted from the numerator because they had a secondary diagnosis of an E-code for falls, but no diagnosis from our list of injuries (800-957).
- Of all discharges in Florida with an injury that qualifies for this indicator (800-957), 44% have an E-code for a fall.

3.3 Empirical Analyses to Support QI Development Using MAX Data

3.3.1 HCBS QI Denominator

In order to calculate indicator rates in the HCBS QI denominator population, we developed a working definition of the QI denominator definition. This working definition, referred to as version 3, was used for all HCBS QI rate calculations reported in this section. Details of the version 3 denominator definition are included in Appendix 3.

3.3.2 Indicator Rates for HCBS QI Denominator Population

The tables that follow report rates of the candidate indicators in the HCBS QI denominator population. We compared these rates to a number of other estimated rates, such as general population, Medicaid population and dual eligible population rates (Table 6, Table 8). We report national rates and the range of state rates (Table 7). All analyses using MAX data exclude Arizona, Maine, Washington and Wisconsin due to serious problems with MAX data from these states.

Unless otherwise noted, all rates reported are annual, meaning the QI denominator includes all individuals who were eligible at any point during the year and the numerator includes all events that occurred during the year for persons included in the denominator.

Analyses use MAX and MedPAR data from 2005 for the HCBS QI denominator populations and SID 2005 data for comparison rates in the general, Medicaid and dual eligible populations, as well as NIS 2005 data (via HCUPnet) for additional comparison in the general population.

Table 6. Comparison of National Rates for HCBS QI Denominator Population and General Population, 2005

Indicators	HCBS Population[1]		SID Data		
	Numerator	Rate[2]	Gen Pop Rate[3]	Medicaid [4]	Dual Eligible[5]
Measure Set 1					
Short-term Complications of Diabetes	6,502	368.527	52.083	149.213	107.160
Asthma or COPD	71,560	4,055.951	316.615	753.758	1,142.202
CHF	96,517	5,470.490	433.397	787.086	1,530.266
Composite: Potentially Preventable Infection	*154,159*	*8,737.582*	*695.862*	*1,383.058*	*2,676.189*
Bacterial Pneumonia	94,936	5,380.880	454.027	861.611	1,661.910
Urinary Tract Infection	59,223	3,356.702	241.835	521.447	1,014.279
Infection due to Device or Implant	17,590	996.984	72.583	166.151	283.952
Dehydration	35,096	1,989.207	189.257	339.121	633.499
Perforated Appendix[6]**	672	486.96	297.034	282.002	451.740
Composite: ACSC	*227,072*	*12,870.220*	*1,034.381*	*2,239.828*	*3,580.220*

Chronic conditions					
Composite: ACSC Acute conditions	*140,324*	*7,953.428*	*668.008*	*1,254.633*	*2,345.327*
Composite ACSC Overall	*367,367*	*20,822.005*	*1,702.306*	*3,494.252*	*5,925.033*
Measure Set 2					
*Composite: Intentional Injuries Caused by Others***	*395*	*22.388*	*37.081*	*88.971*	*28.938*
Physical/sexual Abuse**	262	14.850	1.666	4.874	4.414
Intentional Trauma or Physical Violence**	136	7.708	35.871	85.565	25.395
*Composite: Unintentional Injuries Potentially due to Neglect***	*91,734*	*5,199.394*	*581.806*	*1,019.502*	*1,820.196*
Medication Errors**	9,314	527.908	48.736	144.117	131.347
Pressure Ulcer	72,123	4,087.862	158.474	419.185	874.975
*Composite: Accidents **	*10,837*	*614.231*	*381.552*	*468.277*	*836.458*
Fire, Burns**	2,222	125.941	15.345	32.800	32.283
Accidental Poisoning**	654	37.068	8.097	12.997	14.607
Fire Arm Accidents**	24	1.360	2.620	5.187	1.386
Accidental Drowning**	28	1.587	0.356	0.476	0.356
Excessive Heat/cold Exposure**	1,202	68.128	9.356	20.227	27.018
Injurious Falls	6,760	383.150	346.974	398.580	762.946
*Composite: Serious and Persistent Mental Illness and Attempted Suicide***	*87,249*	*4945.189*	*520.091*	*1,823.122*	*1790.427*
Attempted Suicide or Self-inflicted Harm**	680	38.542	68.421	193.033	118.165
Serious and Persistent Mental Illness**	86,729	4,915.715	464.048	1670.425	1,697.280
Substance Abuse**	14,621	828.704	217.962	916.732	355.108
Dual Diagnosis of Mental Illness and Substance Abuse**	21,289	1,206.640	194.833	801.819	592.191

Annual rate per 100,000 population, with the exception of Perforated Appendix, which is the rate per 1,000 admissions for appendicitis. Numerator definitions are version 1.8.

[1]HCBS QI denominator population data source is 2005 MAX data and 2005 MedPAR files.

[2]These results use the version 3 denominator definition (see Appendix 3). The denominator for national HCBS QI rates is 1,764,321. The denominator for Perforated Appendix is 1,380.

[3]Data source for numerator is 2005 SID data (37 states included). Data source for denominator is 2006-2008 American Community Survey estimates of adult population aggregated across all states included in SID.

[4]Data source for numerator is adults from 2005 SID (37 states) where primary expected payer is Medicaid. Data for denominator is estimate of all adults enrolled in Medicaid in Fiscal Year 2006, aggregated for all states included in SID. Source: Kaiser State Health Facts Website: http://www.statehealthfacts.org/.
[5]Data source for numerator is adults from 2005 SID where both Medicare and Medicaid are expected payers (for 26 states where secondary payer data is available). Data for denominator are estimates of total dual eligible persons, aggregated for all states included in numerator. Note that a small number of individuals <18 years of age are included in these estimates. Source: Kaiser State Health Facts Website: http://www.statehealthfacts.org/.
[6]The Perforated Appendix denominator is based on inpatient stays for appendicitis in 2005 SID.
**Candidate measure not included in final measure set.
ACSC – Ambulatory Care Sensitive Condition; CHF – Congestive Heart Failure; COPD – Chronic Obstructive Pulmonary Disease; Gen Pop – General Population; HCBS – Home and Community-based Services; MAX – Medicaid Analytic eXtract Data; MedPAR – Medicare Provider Analysis and Review file; QI – Quality Indicator; SID – Healthcare Cost and Utilization Project State Inpatient Database

Table 7. Range of State-level Indicator Rates for HCBS QI Denominator Population, 2005

Indicators	Mean (SD) Rate[1,2]	Minimum Rate	Maximum Rate[2]	# Hidden Cells[3]
Measure Set 1				
Short-term Complications of Diabetes	425.720 (210.410)	148.324	1,194.270	3
Asthma or COPD	4,179.039 (1570.655)	1,078.361	8,996.405	N/A
CHF	5,529.932 (2151.013)	1,545.651	11,661.388	N/A
Composite: Potentially Preventable Infection	*9,711.145 (2249.201)*	*5,498.604*	*14,650.188*	*N/A*
Bacterial Pneumonia	6,058.330 (1154.606)	3,505.468	9,130.704	N/A
Urinary Tract Infection	3,652.815 (1344.989)	1,642.613	7,081.101	N/A
Infection due to Device or Implant	1,083.374 (387.856)	392.428	2,221.511	N/A
Dehydration	2,152.118 (769.316)	916.607	4,232.495	N/A
Perforated Appendix[6]**	533.959 (90.823)	404.880	750.000	28
Composite: ACSC Chronic conditions	*13,031.112 (4553.838)*	*3,630.482*	*24,244.169*	*N/A*
Composite: ACSC Acute conditions	*8,861.141 (2020.093)*	*4,972.497*	*13,755.748*	*N/A*
Composite ACSC Overall	*21,890.051 (6284.913)*	*8,752.696*	*36,509.551*	*N/A*
Measure Set 2				
*Composite: Intentional Injuries Caused by Others***	*31.168 (14.974)*	*15.600*	*58.483*	*36*
Physical/sexual Abuse**	25.074 (15.890)	9.456	48.736	39
Intentional Trauma or Physical Violence**	10.862 (6.205)	5.481	17.649	44
Composite: Unintentional Injuries Potentially due to	*5,706.741 (2358.791)*	*2,774.179*	*13,331.414*	*N/A*

*Neglect***				
Medication Errors**	568.225 (172.007)	277.008	989.242	N/A
Pressure Ulcer	4,439.888 (2283.774)	1,810.075	11,805.356	N/A
*Composite: Accidents **	*773.938 (369.238)*	*373.451*	*1,849.464*	*3*
Fire, Burns**	171.384 (76.354)	62.409	415.412	11
Accidental Poisoning**	45.158 (10.969)	22.154	60.352	33
Fire Arm Accidents**	///	///	///	47
Accidental Drowning**	///	///	///	47
Excessive Heat/cold Exposure**	85.072 (34.426)	26.477	188.206	17
Injurious Falls	510.620 (349.138)	140.056	1,533.811	5
*Composite: Serious and Persistent Mental Illness and Attempted Suicide**	*4,183.134 (2059.413)*	*718.907*	*10,625.346*	*N/A*
Attempted Suicide or Self-inflicted Harm**	62.728 (45.775)	15.440	174.770	25
Serious and Persistent Mental Illness**	4,144.648 (2051.490)	718.907	10,538.877	N/A
Substance Abuse**	612.434 (419.626)	247.709	2,540.266	1
Dual Diagnosis of Mental Illness and Substance Abuse**	954.589 (690.838)	190.886	3,240.869	3

Annual rate per 100,000 population, with the exception of perforated appendix, which is the rate per 1,000 population. Numerator definitions are version 1.8. Denominator specifications are version 3.
[1] Data source is 2005 MAX data and 2005 MedPAR files. Only inpatient stays recorded in the MedPAR files are included in the numerator counts for the dual eligible population.
[2] Minimum rate assessed based only on states with numerators >10. States with small numerators (<11 cases) were not considered.
[3] State-level rates with a numerator <11 were masked and therefore omitted from the mean and SD calculations. A value of N/A indicates that no state rates were masked.
**Candidate measure not included in final measure set.
/// Small cell masked
ACSC – Ambulatory Care Sensitive Condition; CHF – Congestive Heart Failure; COPD – Chronic Obstructive Pulmonary Disease; HCBS – Home and Community-based Services; MAX – Medicaid Analytic eXtract Data; MedPAR – Medicare Provider Analysis and Review file; QI – Quality Indicator; SD – Standard Deviation; SID – Healthcare Cost and Utilization Project State Inpatient Database

Table 8. National Indicator Rates for HCBS Dual Eligible Population Compared to HCBS QI Denominator Population and SID Dual Eligible Population, 2005

Indicators	HCBS Dual Eligible Population[1]		MAX	SID
	Numerator	Rate[2]	Full HCBS[3]	Dual Eligible[4]
Measure Set 1				
Short-term Complications of Diabetes	3,253	257.425	368.527	107.160

Asthma or COPD	53,594	4,241.149	4,055.951	1,142.202
CHF	78,795	6,235.424	5,470.490	1,530.266
Composite: Potentially Preventable Infection	*127,650*	*10,101.554*	*8,737.582*	*2,676.189*
Bacterial Pneumonia	77,952	6,168.714	5,380.880	1,661.910
Urinary Tract Infection	49,698	3,932.840	3,356.702	1,014.279
Infection due to Device or Implant	12,026	951.675	996.984	283.952
Dehydration	28,661	2,268.082	1,989.207	633.499
Composite: ACSC Chronic conditions	*173,006*	*13,690.790*	*12,870.220*	*3,580.220*
Composite: ACSC Acute conditions	*115,591*	*9,147.267*	*7,953.428*	*2,345.327*
Composite ACSC Overall	*288,574*	*22,836.238*	*20,822.005*	*5,925.033*
Measure Set 2				
*Composite: Intentional Injuries Caused by Others***	*282*	*22.316*	*22.388*	*28.938*
Physical/sexual Abuse**	202	15.985	14.850	4.414
Intentional Trauma or Physical Violence**	83	6.568	7.708	25.395
*Composite: Unintentional Injuries Potentially due to Neglect***	*73,063*	*5,781.824*	*5,199.394*	*1,820.196*
Medication Errors**	5,612	444.104	527.908	131.347
Pressure Ulcer	58,902	4,661.196	4,087.862	874.975
*Composite: Accidents **	*8,970*	*709.839*	*614.231*	*836.458*
Fire, Burns**	1,399	110.710	125.941	32.283
Accidental Poisoning**	461	36.481	37.068	14.607
Fire Arm Accidents**	///	///	1.360	1.386
Accidental Drowning**	///	///	1.587	0.356
Excessive Heat/cold Exposure**	916	72.487	68.128	27.018
Injurious Falls	6,204	490.952	383.150	762.946
*Composite: Serious and Persistent Mental Illness and Attempted Suicide***	*54,622*	*4,322.500*	*4,945.189*	*1,790.427*
Attempted Suicide or Self-inflicted Harm**	435	34.424	38.542	118.165
Serious and Persistent Mental Illness**	54,282	4,295.594	4,915.715	1,697.280
Substance Abuse**	6,516	515.642	828.704	355.108
Dual Diagnosis of Mental Illness and Substance Abuse**	11,279	892.561	1,206.640	592.191

Annual rate per 100,000 population, with the exception of perforated appendix, which is the rate per 1,000 population. Numerator definitions are version 1.8.
[1]Data source is 2005 MAX data and 2005 MedPAR files. Only inpatient stays recorded in the MedPAR files are included in the numerator counts for the dual eligible population.
[2]These results use the version 3 denominator definition. The denominator for national HCBS Dual Eligible QI rates is 1,263,667.
[3]Data source is 2005 MAX data and 2005 MedPAR files. The denominator for national HCBS QI rates is 1,764,321. The denominator for Perforated Appendix is 1,380.
[4]Data source for numerator is adults from 2005 SID where both Medicare and Medicaid are expected payers (for 26 states where secondary payer data is available). Data for denominator are estimates of total dual eligible individuals, aggregated for all states included in numerator. Note that a small number of individuals <18 years of age are included in these estimates. Source: Kaiser State Health Facts Website: http://www.statehealthfacts.org/.
**Candidate measure not included in final measure set.
/// Numerator counts are too small in the Medicaid-only population, necessitating masking the counts and rates in the dual eligible population, to avoid revealing small cells when combined with full HCBS results.
ACSC – Ambulatory Care Sensitive Condition; CHF – Congestive Heart Failure; COPD – Chronic Obstructive Pulmonary Disease; HCBS – Home and Community-based Services; MAX – Medicaid Analytic eXtract Data; MedPAR – Medicare Provider Analysis and Review file; QI – Quality Indicator; SD – Standard Deviation; SID – Healthcare Cost and Utilization Project State Inpatient Database

Discussion:
Measure Set 1 –

- The HCBS rates for the PQI-based indicators were about 3.5 times the estimated SID dual eligible rates and more than 10 times the SID general population rates (Table 6). The 2005 HCUPnet rates were similar to the SID general population rates for Short-term Complications of Diabetes, CHF, and Bacterial Pneumonia (Table 2-4). HCUPnet rates for the general population are not comparable to the other PQI-based HCBS QIs due to definition changes.
- Variability between states is in line with that seen for the PQIs in the general population. The standard deviation was about one third of the mean for all but two PQI-based QIs (Table 7). Variability was greater for the Short-term Complications of Diabetes indicator (SD=49% of mean) and variability was lower for the Bacterial Pneumonia indicator (SD=19% of mean).
- The Short-term Complications of Diabetes distribution was skewed by two outliers (mean rates of 1,194.270 and 978.981, respectively). There were also 3 rates hidden due to small numerators (Table 7).
- In the Asthma/COPD distribution, there were outliers, with rates of 8626.636 and 8996.405, respectively (Table 7). The CHF, Bacterial Pneumonia, UTI and Dehydration distributions were all fairly evenly spread.

Infection due to Device or Implant:

- Like most of the PQI-based indicators, the rate of Infection due to Device or Implant was about 3.5 times higher in the HCBS QI denominator population compared to the SID dual eligible population (Table 6). We do expect higher rates in the HCBS QI denominator population, although we do not know how much higher the rate is expected to be. Searching HCUPnet using 2005 NIS data for the diagnosis codes included in the indicator definition yielded an estimated rate in the general adult population of 80.449 admissions for infections due to device or implant per 100,000 population, compared to 996.984 in the HCBS QI denominator population.
- For the Infection due to Device or Implant indicator, variation across states was in line with that of other PQIs, with the standard deviation representing about one third the mean and a median and IQR of 1,034.929 (790.800-1,331.435). Two states were distant outliers with

rates of 2,188.310 and 2,221.511, respectively. The rest of the distribution was fairly evenly spread (Table 7).

- In analyses by age group, the rate of Infection due to Device or Implant increased from the youngest age group (1,042.325) up to the 45-64 group (1,448.574) then decreased with each elderly category to reach just 366.297 among those age 85 and older (Table 9). In comparison, the SID rates ranged from 72.583 for the general population to 166.151 for the Medicaid population and 283.952 for the dual eligible population (Table 6). The same pattern of increasing then decreasing rates was seen in most states (Table 2-1, Table 2-2, Table 2-3).
- In the general population (HCUPnet NIS 2005), the most common of the codes included in this indicator were for infection due to vascular device, implant or graft (48% of all included codes), followed by infection due to internal joint prosthesis (14%) and infection due to urinary catheter (9%). This suggests overlap with the UTI indicator. In follow-up analyses using the NIS 2005, we saw that 79% of adults with a principal diagnosis of infection due to urinary catheter had a secondary diagnosis of UTI. The percent is similar among those age 65 and older. In contrast, <0.1% of adults with a principal diagnosis of UTI had a secondary diagnosis of infection due to urinary catheter. The percent was the same in the elderly.

Measure Set 2 –

- Many of the Measure Set 2 indicators were too rare for use as rate-based indicators. The Physical/sexual Abuse, Intentional Trauma or Physical Violence, Accidental Poisoning, Fire Arm Accidents, Accidental Drowning and Suicide and Self-inflicted Harm indicators have small numerators (<11 cases) for more than half the states examined, as does the Intentional Injuries composite (Table 7). The Fire, Burns and Excessive Heat/cold Exposure indicators also had small numerators for 11 and 17 states, respectively. These indicators might be considered in the future for use as never event indicators based on counts rather than rates, but they are not ready for use at this time.
- Because the rates of the other accidents indicators were so small, the Accidents composite rate was driven by the rate of Injurious Falls. Rather than using the composite, it is preferable to use the Injurious Falls indicator alone. Similarly, the rate of the Injuries due to Potential Neglect composite was driven largely by the rate of Pressure Ulcer, with smaller contributions from Injurious Falls and Medication Errors. It is preferable to use each of these indicators separately (Table 6).

Pressure Ulcer:

- The rate of Pressure Ulcer in the HCBS QI denominator population was nearly 5 times that of the estimated SID dual eligible population and more than 25 times that of the SID general population (Table 6).
- Variation between states was substantial (Table 7). The range of HCBS rates was 1,810.075 to 11,805.356, although the interquartile range (IQR) was more compact (2,719.216 to 5,519.510, median = 4,001.291). The standard deviation of state rates represented a higher proportion of the mean rate (51%) than was observed for the SID general population (38%) or SID dual eligible population (44%). Two states were distant outliers with rates of 11,805.356 and 10,947.860, respectively. The high degree of variation between states may be due in part to variation in the coding of stage I and II pressure ulcers, particularly as it is impacted by the number of diagnosis fields.
- Low reliability is unlikely to be a problem for this indicator if reported at the level of states. The smallest numerator across all states was 100 cases.

Medication Errors:

- The rate of admissions due to medication errors was about 4 times higher in the HCBS QI denominator population than in the estimated SID dual eligible population, and about 10 times higher than the SID general population (Table 6).

- The variation across states was moderate, with a median and IQR of 552.567 and 428.122 to 694.396 (Table 7). The standard deviation represented 30% of the mean, slightly higher than in the SID general population (24%). Washington, D.C. and Minnesota were borderline outliers, but overall, the distribution was evenly spread.
- There is no suggestion that variation in use of E-codes is responsible for variation in QI rates across states. Of the 6 states known to have low usage of E-codes, only one was more than 1 standard deviation from the mean rate across all states (data not shown).
- In an analysis of the SID dual eligible population for 5 states, very few cases were included in the numerator based on a medical error (E870) code, suggesting that variation between states in use of these codes would have a minimal effect on the overall rate (data not shown).

Injurious Falls:

- Somewhat surprisingly, the rate of Injurious Falls in the HCBS QI denominator population was only slightly higher than that observed in the SID general population (by about 10%). The HCBS rate was just half that of the SID dual eligible population (Table 6).
- Variation between states was quite wide (range 140.056 to 1533.811) (Table 7). The standard deviation represented 68% of the mean. In contrast, state-to-state variation was lower in the SID dual eligible population (SD 36% of mean) and even lower in the SID general population (SD 20% of mean). Although the median and IQR in the HCBS QI denominator population were more compact (417.430 [279.832-551.726]), the distribution overall was quite wide.
- There is no evidence that variation across states is due to variation in the use of E-codes. Only one of the 6 states with known low use of E-codes is more than 1 standard deviation away from the mean rate. That state, Oklahoma, has a higher rate, which is the opposite of what we would expect if low usage of E-codes were skewing QI rates (data not shown).

Mental Illness and Substance Abuse:

- A major concern about the validity of the Serious and Persistent Mental Illness indicator is that admissions to psychiatric facilities and treatment centers are not captured by the indicator as currently defined, and thus the national rate may be inaccurate due to missing data. In addition, admission to such facilities instead of to acute care hospitals likely varies systematically across states. The very wide distribution across states for this indicator suggests that bias due to variation in location of care is indeed a problem. The Serious and Persistent Mental Illness indicator ranged from a rate of 718.907 to 10,538.877 admissions per 100,000 population (Table 7). The distribution was evenly spread across this range. The standard deviation accounted for 50% of the mean rate across states. This indicator is unlikely to be valid even with further empirical investigation.
- Bias due to variation in location of care is also a concern for the Substance Abuse indicator. Although the standard deviation of this indicator accounted for 69% of its mean, this was skewed in large part due to two distant outliers with rates of 2,540.266 and 2,082.877. The remainder of the distribution was fairly compact, with a median and IQR of 519.597 and 378.761 to 688.496. However, without information on usual location of care for substance abuse treatment in each state, interpretation of this indicator will be confounded when making comparisons across states. Even within states, practice patterns and resource availability likely impact the QI rate across geographic areas, further confounding interpretation of this indicator.

3.3.3 Indicators Included in HCBS Measure Set

The final measure specifications (version 1.8c) of the HCBS QI measure set contains those indicators about which we have no major concerns at this time regarding their validity as indicators of the well-being of the HCBS population using MAX data. That determination is based on all analyses performed during QI development work (SID tables, E-code analyses,

rates in HCBS QI denominator population), use of similar indicators in the general public (for indicators based on AHRQ Quality Indicators), our review of the literature, feedback from our expert panel, and results of empirical analyses performed to date.

Included Indicators:
Short-term Complications of Diabetes
Asthma or Chronic Obstructive Pulmonary Disease
Congestive Heart Failure
Bacterial Pneumonia
Urinary Tract Infection
Infection due to Device or Implant
Dehydration
Pressure Ulcer
Injurious Falls

Included Composites:
Potentially Preventable Infection
ACSC Composite: Chronic Conditions
ACSC Composite: Acute Conditions
ACSC Composite: Overall

The Asthma and COPD indicators were combined based on feedback from a recent clinical expert review of the PQIs as well as evidence from detailed reviews by an international group of researchers and PQI performance in alternative administrative data sources. All evidence suggests that distinguishing asthma and COPD is often difficult, particularly in older adults. Two structured review panels independently concluded that administrative data could not be used reliably to distinguish these conditions. To address this issue, we limited the COPD indicator to individuals age 40 and older and combined the Asthma and COPD indicators individuals over age 39. Empirical analyses confirmed that diagnoses of COPD were rare in individuals under age 40.

In addition to the change in the Asthma and COPD indicators, we instituted changes to other indicators based on recent evidence, including the modification of the Dehydration and UTI indicators to include admissions where these diagnoses are included in the secondary field with a related diagnosis in the principal field. This is intended to increase the sensitivity of the indicators and reduce coding-related bias. Pressure ulcer was also extensively modified to reflect the new intention of the indicator – to capture all instances of pressure ulcers, not only those that occur in-hospital. Finally, Pressure Ulcer also includes the use of new stage-specific codes. Although we were unable to test these because they are unavailable in 2005 data, recent evidence related to the analogous PSI indicator suggests that this addition should increase sensitivity and specificity for advanced stage ulcers and minimize coding-related bias.

3.3.4 Indicators Not Included in the HCBS Measure Set

The final version of the measure specifications (version 1.8c) of the HCBS QI measure set contains only those indicators with no major validity concerns for their use as indicators of the well-being of the HCBS population using MAX data. Indicators that are not valid for use with MAX data or that require further investigation are excluded from the measure set. That determination is based on all analyses performed during QI development work (SID tables, E-code analyses, rates in HCBS QI denominator population), use of similar indicators in the general public (for indicators based on AHRQ Quality Indicators), our review of the literature, feedback from our expert panel, and results of empirical analyses performed to date.

For the purposes of better understanding results of empirical analyses, we include specifications of these excluded indicators in Appendix 4. These reflect the specifications used to calculate the QIs during empirical analyses (version 1.7).

Potentially Valid but Requiring Further Investigation:
Medication Errors – This indicator may eventually be developed into a valid measure, but a number of outstanding coding issues must first be resolved. Evidence from the literature suggests that medication errors and adverse drug events are not always coded, or are coded incorrectly. Variation between states in coding of such events may further impact the validity of the indicator. Results of an analysis of E-code usage in Florida suggested that some E-codes for accidental poisoning and adverse drug events may be used inappropriately, which would impact this indicator. These issues must be carefully examined in the HCBS QI denominator population before the validity of this indicator can be assessed.

Not Valid for Inclusion in the Indicator Set due to Concerns about Missing Data, Systematic Differences in Location of Care, Combined with High Variability Across States –
Serious and Persistent Mental Illness
Substance Abuse
Dual Diagnosis of Mental Illness and Substance Abuse
Composite: Serious and Persistent Mental Illness and Attempted Suicide

A major concern regarding these indicators is that data on psychiatric services received outside acute care hospital setting is incomplete for some HCBS recipients, specifically those enrolled in managed care plans. Thus, when making comparisons across states, rates may be biased by systematic differences in the location of care for mental illness and substance abuse, as was emphasized by experts during interviews. Patients in some areas may be admitted to mental health facilities not captured within the MAX or other administrative data sources, while in other areas patients may typically be treated in acute care hospitals that are included in administrative data. This variation in practice pattern is likely to be systematic, depending on the policies of the health care system in an area. We find evidence supporting this concern in the very wide distribution of state rates for Serious and Persistent Mental Illness and in the extreme outliers present in the distribution of state rates for the Substance Abuse indicators. The dual diagnosis QI and composite based on these indicators will likewise be biased by variation in location of care.

Not Valid for Inclusion in the Indicator Set due to Very Small Numerators –
Perforated Appendix
Physical/ sexual Abuse
Intentional Trauma and Physical Violence
Fire, Burns, Smoke Inhalation or Electronic Shock
Accidental Poisoning
Fire Arm Accidents
Accidental Drowning
Excessive Heat or Cold Exposure due to Weather Conditions
Attempted Suicide and Self-Inflicted Harm
Composite: Intentional Injuries Caused by Others
Composite: Unintentional Injuries Potentially Due to Neglect
Composite: Accidents due to Potential Neglect

The events captured in these measures are too rare for use as indicators. The Perforated Appendix, Physical/Sexual Abuse, Physical Violence, Accidental Poisoning, Fire Arms Accidents, Accidental Drowning and Suicide/Self-harm indicators have small numerators (<11 cases) for more than half the states examined. The Burns and Weather Exposure indicators also had small numerators for 11 and 17 states, respectively. In addition, analyses using SID data revealed a trend towards lower QI rates in states with low usage of E-codes, suggesting that variation in use of E-codes may systematically bias many of these QIs, which rely heavily on E-codes. Extremely wide variation in the rate of the Physical and Sexual Abuse indicator across states suggests that differences in abuse reporting and coding lead to biases in the rates of that QI. In addition to being extremely rare, our panel of experts brought up a number of concerns regarding the Perforated Appendix indicator, including a belief that it may not be preventable in many HCBS subpopulations, who are more likely to have atypical presentation or difficulties communicating symptoms.

Because the rates of the other accidents indicators were so small, the Accidental Injuries composite rate was driven by the rate of Injurious Falls. Rather than using the composite, it is preferable to use the Injurious Falls indicator alone. Similarly, the rate of the Injuries due to Potential Neglect composite was driven largely by the rate of Pressure Ulcer, with smaller contributions from Injurious Falls and Medication Errors. It is preferable to use each of these indicators separately.

3.3.5 Follow-up Analyses for Included Indicators

For those QIs included in the final HCBS measure set, we performed additional analyses to better understand their performance in the HCBS QI denominator population. These analyses used version 1.8 of the numerator definitions and relied on MAX and MedPAR data (2005) for HCBS rates and SID 2005 data from California and New York for analyses of present on admission status. HCUPnet was also used to calculate rates in the general population using the NIS 2005. Unless otherwise noted, all rates are annual.

3.3.5.1 Age-stratified QI Rates

To better understand the case-mix of the HCBS QI denominator population, we examined the rate of each QI in 5 age groups (Table 9) and the percent of the QI denominator that falls into each of these age groups (Table 10).

Table 9. National QI Rates for HCBS QI Denominator Population, by Age Groups, 2005

	Age Groups				
Indicators	**18-44**	**45-64**	**65-74**	**75-84**	**85+**
Short-term Complications of Diabetes	674.923	476.522	200.271	136.491	75.489
Asthma or COPD	961.210	5,210.067	6,440.857	4,739.860	2,892.882
CHF	980.535	4,761.576	7,130.337	8,093.901	9,969.551
Composite: Potentially Preventable Infection	*3,695.256*	*6,883.655*	*9,301.482*	*12,327.519*	*17,413.530*
Bacterial Pneumonia	2,089.660	4,522.163	5,900.638	7,404.277	10,434.642
Urinary Tract Infection	1,605.596	2,361.493	3,400.844	4,923.242	6,978.889
Infection due to Device or Implant	1,042.324	1,448.574	982.184	622.424	366.297

Dehydration	719.059	1,658.805	2,116.712	2,820.919	3,958.841
Composite: ACSC Chronic conditions	*4,227.036*	*14,275.895*	*17,468.094*	*16,013.679*	*15,378.887*
Composite: ACSC Acute conditions	*3,094.291*	*6,254.116*	*8,600.019*	*11,392.689*	*15,965.569*
Composite ACSC Overall	*7,321.327*	*20,528.283*	*26,065.716*	*27,404.874*	*31,340.403*
Pressure Ulcer	2,766.015	3,542.047	4,291.965	4,942.656	6,583.207
Injurious Falls	75.628	225.398	442.308	631.683	943.353

Annual rate per 100,000 population. Numerator definitions are version 1.8. Denominator definition is version 3.
Data sources: 2005 MAX data and 2005 MedPAR files. Only inpatient stays recorded in the MedPAR files are included in the numerator counts for the dual eligible population.
ACSC – Ambulatory Care Sensitive Condition; CHF – Congestive Heart Failure; COPD – Chronic Obstructive Pulmonary Disease; HCBS – Home and Community-based Services; MAX – Medicaid Analytic eXtract Data; MedPAR – Medicare Provider Analysis and Review file; QI – Quality Indicator; SD – Standard Deviation; SID – Healthcare Cost and Utilization Project State Inpatient Database.

Table 10. Percent of National HCBS QI Denominator in Each Age Group

Age Groups	HCBS QI Denominator	% Denominator
18-44	419,159	23.8%
45-64	520,857	29.5%
65-74	292,104	16.6%
75-84	334,820	19.0%
85+	197,381	11.2%

Denominator definition is version 3.
Data sources: 2005 MAX data and 2005 MedPAR files.
HCBS – Home and Community-based Services; QI – Quality Indicator.

- For most of the PQI-based indicators, the rates increased with age, as we would expect, both when examining national rates (Table 9) and when comparing age strata within a state (data not shown). The same pattern was observed for all states. There were 2 exceptions to this pattern.
- The Short-term Complications of Diabetes indicator decreased with age, from 674.923 for age 18-44 compared to 75.489 for age 85+ (Table 9). This pattern was expected because the Short-term Complications of Diabetes indicator largely reflects complications of Type I diabetes, which is more prevalent in younger populations. The same pattern seen in the general population, where HCUPnet shows that the Short-term Complications of Diabetes rate is higher in the 18-44 group (65.412) compared to the 45-65 (50.817) and 65+ (36.794) groups. However, the magnitude of the difference across age groups was much wider in the HCBS QI denominator population. Although there were many hidden cells for Short-term Complications of Diabetes, in general the pattern of decreasing rate with increasing age seemed to be consistent across all states (data not shown).
- The Asthma/COPD rate increased up to the 65-74 age group, then decreased again, as is sometimes typical of chronic disease in older populations (Table 9). The Chronic Conditions composite also demonstrated the pattern of peaking at 65-74, the declining again, but the differences between all groups except age 18-44 were pretty small.
- The rates of Injurious Falls increased with age, as we would expect. The rate of Injurious Falls increased from 75.628 among those age 18-44 to 943.353 among those age 85 and

older (Table 9). For comparison, the SID dual eligible rate was 762.946, similar to the rate of 631.683 among HCBS persons age 75-84 (Table 8). Many states had hidden cells for several age categories (typically the younger age groups), but the general pattern was consistent across all states that rate of falls increased with increasing age (data not shown).

- The rate of Pressure Ulcer increased from 2,766.015 among those aged 18-44 to 6,583.207 among those age 85 and older (Table 9). In comparison, the SID dual eligible rate was 874.975 (Table 8). However, the much higher rate in the HCBS QI denominator population is not surprising given that many individuals receive HCBS due to mobility limitations, which increases the risk for pressure ulcers. The pattern of increasing rate with age was evident in many states for Pressure Ulcer, although there were a number of states where instead the pattern was to increase then decrease in the oldest age categories. This may be a reflection of lack of stability in the rates when dividing the numerators into 5 age categories. The states with this pattern tended to have smaller cell counts (data not shown).
- Note that the distribution of age groups may vary across states. We did not test this for statistical significance, but observed that the percent of the QI denominator that fell in the 18-44 age group varied from 14.9% to 46.1% (data not shown) . Because the rates of most QIs included in the measure set varied by age, this suggests the need for risk adjustment by age.

3.3.5.2 Quarterly QI Rates

Although most of our QI development work focused on rates of QI events that occurred at any point during the year (annual rates), we also examined quarterly rates, which may better capture the dynamic nature of the HCBS population (Table 11).

To try to understand the case mix of the HCBS QI denominator population, we examined QI rates based on the number of quarters that an individual qualified for the HCBS QI version 3 denominator. We first divided the HCBS QI denominator population into groups based on the number of quarters each individual was eligible for the version 3 QI denominator. We then calculated annual QI rates for each group.

Table 11. National Rates for Full HCBS QI Denominator Population, by Number of Quarters Individual Qualifies for Version 3 QI Denominator

	Number of Quarters Individuals Qualify for the QI Denominator				
Indicators	**0[1]**	**1[2]**	**2**	**3**	**4**
Short-term Complications of Diabetes	753.324	719.627	641.004	612.990	202.218
Asthma or COPD	4,704.509	5,401.697	6,035.346	6,037.494	3,139.435
CHF	7,299.710	8,044.108	9,030.185	9,087.661	3,764.632
Composite: Potentially Preventable Infection	*15,616.407*	*14,379.639*	*13,573.889*	*12,557.988*	*5,991.141*
Bacterial Pneumonia	9,409.017	8,926.736	8,399.635	7,667.617	3,681.320
Urinary Tract Infection	6,207.390	5,452.904	5,174.254	4,890.370	2,309.822
Infection due to Device or Implant	1,359.750	1,548.703	1,730.987	1,532.168	670.897
Dehydration	3,156.428	3,148.612	3,277.101	3,168.452	1,327.381
Composite: ACSC Chronic conditions	*17,194.621*	*18,725.154*	*20,790.004*	*20,650.694*	*9,078.110*
Composite: ACSC Acute conditions	*13,232.137*	*12,386.496*	*12,301.234*	*11,634.498*	*5,614.037*

Composite ACSC Overall	*30,419.225*	*31,106.568*	*33,089.587*	*32,282.727*	*14,691.532*
Pressure Ulcer	7,002.147	7,507.417	7,638.683	7,072.493	2,258.147
Injurious Falls	474.594	552.326	515.144	639.482	269.361

Annual rate per 100,000 population. Numerator is version 1.8. Denominator is version 3.
Data sources: 2005 MAX data and 2005 MedPAR files.
[1]This group reflects differences in how exclusion criteria are applied when assessing eligibility for the version 3 QI denominator based on quarters vs. the full year.
[2]Individuals qualifying for only one quarter may qualify for additional quarters in 2004 or 2006, but we are limited to one year of data.
ACSC – Ambulatory Care Sensitive Condition; CHF – Congestive Heart Failure; COPD – Chronic Obstructive Pulmonary Disease; HCBS – Home and Community-based Services; MAX – Medicaid Analytic eXtract Data; MedPAR – Medicare Provider Analysis and Review file; QI – Quality Indicator; SD – Standard Deviation; SID – Healthcare Cost and Utilization Project State Inpatient Database;

- We observed that QI rates were substantially lower among individuals qualifying for all 4 quarters, compared to those with only partial-year eligibility for the QI denominator (Table 11). This suggests that clinical populations in the denominator for a short period of time may be different than those in the denominator for all four quarters. Follow-up analyses may focus on the age distribution for these individuals to test if differences exist by age.
- Rates for individuals qualifying for only 1 and to a lesser extent 2 quarters should be interpreted with caution, since we only have one year of data available. Follow-up analyses should examine the percent of patients qualifying for only quarter 1 or quarter 4 of 2005, as those are more likely to have qualifying quarters in 2004 or 2006, respectively.
- We were unable to identify mortality in patients, which may skew rates. Patients may have multiple admissions immediately prior to death, and then drop out of the denominator.
- Some admissions may reflect readmissions during a short-term acute-on-chronic exacerbation or following surgical admissions. Follow-up analyses may look at the percent of cases reflecting short-term readmissions, or the number of days since the last hospitalization by number of quarters an individual is present in the denominator.
- The differences in QI rates for individuals eligible for the full year compared to those with only part-year eligibility suggest that assessing the QI denominator based on quarters, then annualizing, may be more appropriate. See the final measure specifications in section 6 for how this was later implemented.

3.3.5.3 Clinical Subpopulations

We were unable to identify clinical subpopulations in the HCBS denominator because the MAX data did not contain a sufficient number of diagnosis fields in the Other Services file (where outpatient data and the use of HCBS services data are located). Furthermore, access to only one year of data limits the usefulness of outpatient diagnoses because they are likely to be reliable only when listed for several encounters and some individuals may have few encounters in a given year. However, we were able to examine the clinical subpopulation breakdown in individuals with at least one hospital admission. We noted large state-to-state variation in the percent of HCBS admissions for patients with autism, chromosomal abnormalities and HIV/AIDS (data not shown). This is consistent with known differences in waiver and inclusion criteria for HCBS programs by state and likely will be reflected in the QI rates.

We did not attempt more detailed subpopulation analyses as part of the QI development process due to the limitations in using definitions based solely on inpatient data and the limitations of using outpatient data, discussed above

3.3.5.4 Definition Refinements

We performed additional analyses (using version 1.8 of the numerator definitions) to investigate concerns that might impact the validity of some applications of the HCBS QIs. When warranted by the results of our investigation, we modified the definition of those QIs. The resulting specifications are the final version (1.8c)

Data sources for these analyses were the 2005 MAX and MedPAR data for HCBS rates, 2005 SID data, and HCUPnet (using NIS 2005).

Potential UTI-Urinary Catheter Overlap

As defined in the version 1.8 specifications, there was some conceptual overlap between the Urinary Tract Infection and Infections due to Device or Implant indicators. Specifically, the Infection due to Device or Implant indicator included infections due to indwelling urinary catheters. Examining the relative prevalence of principal diagnoses for Infection due to Device or Implant using HCUPnet revealed that in the general population in 2005, 9% of such infections were due to indwelling urinary catheters [996.64]. In the HCBS population this distinction is particularly important since the rate of indwelling catheters is high, especially suprapubic catheters in comparison to the general population. Coding guidelines require a physician to document that an infection is related to an indwelling catheter in order to be coded to ICD-9-CM diagnosis code 996.64. Therefore the UTI indicator may be capturing a large number of catheter related infections.

To better understand what drives the Infection due to Device or Implant indicator in the HCBS QI denominator population, we examined the frequency of each of the numerator diagnoses. We found that in the HCBS QI denominator population, this indicator is driven by similar codes as we saw in the general population: over half of numerator cases are vascular devices or implants (55%), these include arterial line infections including those used in dialysis, but do not include central venous catheters. The next most common numerator diagnosis was indwelling urinary catheter (13%), followed by internal joint prosthesis (10%).

To investigate potential overlap between the UTI and Infection due to Device or Implant indicators, we examined cross-frequencies of these codes using the 2005 NIS. We found that in the HCBS QI denominator population, 75% of admissions with a principal diagnosis of indwelling urinary catheter infection had a secondary diagnosis of UTI (1719/2285). Only 0.8% of urinary catheter infections (principal or secondary diagnosis, n=4189) had a principal diagnosis of UTI (n=37). Those results are similar to what we saw in the SID general population, where around 1-2% of urinary catheter infections had a principal diagnosis of UTI.

To minimize overlap between these two indicators, in the final specifications (version 1.8c) we amended the UTI indicator to include anyone with a principal diagnosis of infection due to indwelling urinary catheter [996.64] and a secondary diagnosis of UTI. We removed infections due to indwelling urinary catheters from the Infections due to Device or Implants indicator.

Pressure Ulcer

We investigated the impact of including both principal and secondary diagnoses in the numerator of this indicator. In the HCBS QI denominator population, principal diagnoses of pressure ulcer account for 12.2% of all pressure ulcer diagnoses in the QI denominator and 15% of the Pressure Ulcer numerator cases. (Some admissions have multiple diagnoses for pressure ulcer, accounting for the difference between the Pressure Ulcer numerator and the number of pressure ulcer diagnoses among the QI denominator).

We used SID data from California and New York (which have present on admission information available) to examine how often secondary diagnoses of pressure ulcer are present on admission. We found that in the Medicaid population (primary payer is Medicaid), the vast majority of secondary diagnoses of pressure ulcer were present on admission (92.0% in California, 83.7% in New York).

These analyses have assured us that including both principal and secondary diagnoses of pressure ulcer is appropriate for the HCBS Pressure Ulcer indicator. The indicator includes some pressure ulcers that develop during hospitalization, but our clinical expert panel suggested that these do reflect quality of care received prior to hospitalization because factors such as nutrition can influence the risk of developing pressure ulcers. We did not modify this indicator definition.

In addition, we examined the impact on this indicator of the number of diagnoses fields available within the MAX and MedPAR data. See the section below on number of diagnosis fields for details of that analysis.

Injurious Falls

Using 2005 SID data for the general population of Florida, over 5,000 admissions (representing nearly 10% of the actual numerator) with an E-code for a fall were omitted from the numerator because they were not accompanied by a diagnosis included on our list of potentially fall-related injuries (referred to as "omitted falls"). In the HCBS QI denominator population, we examined common principal diagnoses among omitted falls admissions to determine whether any additional injury diagnoses should be added to the numerator definition.

In the HCBS QI denominator population, we found 1,403 cases of omitted falls, out of a national numerator of 6,760, suggesting that we were missing 20% of potential numerator cases. However, closer examination of the omitted falls cases revealed that many of these were associated with minor injuries or with hospitalization for other common chronic and acute diseases, such as UTI, pneumonia, and CHF. The most common principal diagnosis associated with omitted falls cases was syncope and collapse. Nearly 2% of omitted falls cases had a principal diagnosis of unspecified head injury, which was among our list of numerator exclusions.

In the final specifications (version 1.8c), we modified the Injurious Falls indicator to remove all unspecified injuries from the exclusion list. This avoids excluding cases that have two coded injuries, one from the "included" list and one from the unspecified injury range would have been excluded, even though they had a significant injury.

To better understand the type of injuries captured by this indicator, we examined the frequency of principal and secondary diagnoses among numerator cases for various injury categories, such as head injuries, lower limb injuries and contusions. This analysis revealed that one third of the numerator is based on femur injuries, including hip fracture. Of these, the vast majority—93%—were coded as the principal diagnosis. The second most common type of injury included in the numerator was contusions, accounting for 15% of numerator cases. One third of contusion injuries were coded as the principal diagnosis. The five most common principal diagnoses of contusion among the Injurious Falls numerator were contusion of the hip (31.5%), face/scalp/neck (15.9%), chest wall (10.2%), knee (10.2%) and multiple contusions (7.8%). The five most common secondary diagnoses of contusion were similar.

To better understand whether we were capturing some minor contusions within the numerator, we examined the 10 most common principal diagnoses for numerator cases based only on a secondary diagnosis of a contusion and an E-code for falls (i.e., no principal diagnosis on the included injuries list). The most common of these diagnoses was syncope and collapse, representing 1.1% of the numerator. Other common principal diagnoses included convulsions (0.3% of numerator) and stroke (0.2%). Common chronic and acute conditions were also present (pneumonia, dehydration, UTI, CHF, COPD).

This analysis suggested that the Injurious Falls indicator is capturing some minor injuries associated with falls resulting from syncope, stroke or seizures. Falls might not be preventable in such cases, based on evidence from our literature review and feedback from our clinical expert panelists. The analysis also suggested that the indicator is capturing falls incidental to hospitalization for other serious conditions, such as CHF and pneumonia which are captured by other indicators. In the final specifications (version 1.8c), we amended the Injurious Falls indicator to exclude admissions with any diagnosis of syncope, seizure or stroke or with a principal diagnosis of pneumonia, CHF, COPD, UTI or dehydration.

Cross-State Comparisons—Number Of Diagnosis Fields

Nearly all the QIs rely on secondary diagnoses, either as numerator inclusion or exclusion criteria, frequently both. (Only Infection due to Device or Implant uses only principal diagnosis in the numerator definition). Comparisons of QI rates across states may be impacted by variation between states in the number of diagnosis fields available and the number typically used. We were particularly concerned about the impact this variation might have on the Pressure Ulcer and Injurious Falls indicators, which include principal and secondary diagnoses in the main numerator inclusion criteria.

Analyses using combined MAX and MedPAR data show that the maximum number of diagnosis fields available is 9 for all states and the average number of fields used across states is fairly consistent at about 6 fields. Thus, for the approximately two-thirds of the HCBS QI denominator population that are dual eligible, we do not expect to see systematic variation in QI rates across states due to differences in the number of diagnosis fields available.

However, we do see more variation in the number of available fields and the average number of fields used in the MAX data. In particular, Alaska, Arkansas, California, and Rhode Island stand out with only about two diagnosis fields used on average. We might expect QI rates to vary systematically for these states (higher or lower, depending on whether secondary fields are used for inclusion or exclusion). However, this is not born out by the data. We found no correlation between the average number of diagnosis fields used and state rates for either the Injurious Falls or Pressure Ulcer indicators. Scatterplots also did not reveal any relationship between number of diagnosis fields and indicator rates (data not shown).

Because the HCBS Medicaid-only population relies solely on MAX data for numerator calculations, variation in QI rates might be apparent in this population that is masked in the full HCBS QI denominator population by the larger dual eligible group. And indeed, the average Pressure Ulcer QI rate was significantly lower among the 4 states with the fewest number of diagnosis fields used, compared to states with more than 6 fields used on average (data not shown). We could not perform this analysis for the Injurious Falls indicator due to a very high number of state rates that were based on small numerators, and therefore masked. In those states that typically report very few diagnosis fields, the Pressure Ulcer QI rate for HCBS Medicaid-only persons is likely to be an underestimate, and the same may be true for Injurious

Falls. The effect on other QIs is likely to be mixed, depending on how secondary diagnoses are used in the indicator definition.

HIV/AIDS Subpopulation

Due to reimbursement policy, in many cases HIV/AIDS may be coded as the principal reason for admission even when the true reason for admission is something else. In the SID general population, we see that in California HIV/AIDS was coded as the principal diagnosis in 43% of cases with any diagnosis of HIV/AIDS. In New York the proportion of HIV/AIDS diagnoses coded in the principal position was slightly less (38%), but still substantial.

The QIs that rely primarily on the principal diagnosis for numerator inclusions (Short-term Complications of Diabetes, Asthma/COPD, CHF, Bacterial Pneumonia, UTI, Infection due to Device or Implant, Dehydration) might miss cases in the HIV/AIDS subpopulation because HIV/AIDS is frequently coded in the principal position. Using SID data from California and New York, we examined the numerators of these QIs when defined using a secondary diagnosis indicated as present on admission from among admission records with a principal diagnosis of HIV/AIDS.

Examining the numerator cases with a principal diagnosis of HIV/AIDS and secondary diagnosis POA of a QI numerator event, these potentially missed cases represent a small but non-trivial proportion of admissions with any HIV/AIDS diagnosis: 0.4% to 7.3% in California and 0.05% to 8.6% in New York. The highest proportion of potentially missed cases was for the Bacterial Pneumonia indicator, where 7.3% were potentially missed in California, and 8.6% were potentially missed in New York. The Dehydration indicator also stood out as potentially missing a larger proportion of cases (7.0% in California and 5.0% in New York) as did the Asthma/COPD indicator (5.1% in California and 7.5% in New York).

In the final specifications (version 1.8c), we modified the Bacterial Pneumonia and Dehydration indicators to include admissions with a principal diagnosis of HIV/AIDS when accompanied by a secondary diagnosis that was indicated as POA of pneumonia or dehydration, respectively. Because no states have POA information in the MAX dataset, when implementing these specifications we will include a principal diagnosis of HIV/AIDS if accompanied by a secondary diagnosis of pneumonia or dehydration. These two indicators were changed because they represent acute conditions that are common complications of HIV/AIDS. Therefore, changes in the ordering of codes is logical. However, for Asthma/COPD more investigation is required to better understand the overlap between HIV/AIDS and cases captured in that indicator, since it represents a clinically unrelated chronic disease.

ID/DD Subpopulation

A concern was raised that in some cases diagnoses for intellectual and developmental disabilities are inappropriately coded as the principal diagnosis during hospital admissions. This seems unlikely given that in many cases reimbursement would likely be lower if an ID/DD diagnosis were coded in the principal position rather than one of the HCBS QI conditions, but we examined coding of ID/DD using SID data from California and New York to better understand the impact of coding position on QI rates in this subpopulation.

An ID/DD diagnosis is coded in the principal position in only about 15% of discharges with any ID/DD diagnosis (principal or secondary) in California and about 18% in New York. Hospitalizations potentially missed because the QI condition was coded in a secondary position but indicated as POA represented a very small proportion of all inpatient stays with any ID/DD diagnosis—1% or less in both California and New York. Based on these results, we do not

believe that relying on the principal diagnoses for certain of the HCBS QIs poses a problem for the ID/DD subpopulation. We did not modify the QI specifications.

3.3.6 Final QI Rates for HCBS QI Denominator Population

Table 12 reports annualized quarterly rates of each indicator included in the final measure set using the final versions of the numerator and denominator definitions, as specified in Section 6.5 (version 1.8c of numerator and version 4.2 of denominator).

Table 12. Annualized Quarterly Rates of QIs for HCBS QI Denominator Population, 2005

Indicator	Rate
Short-term Complications of Diabetes	288
Asthma or COPD	3,865
CHF	5,131
Composite: Potentially Preventable Infection	*8,031*
Bacterial Pneumonia	4,929
Urinary Tract Infection	3,102
Infection due to Device or Implant	756
Dehydration	1,903
Composite: ACSC Chronic conditions	*11,903*
Composite: ACSC Acute conditions	*7,336*
Composite ACSC Overall	*19,238*
Pressure Ulcer	3,485
Injurious Falls	298

Annualized quarterly rate per 100,000 population. Numerator definitions are version 1.8c. Denominator definition is quarterly implementation of version 4.2.
Data Sources: 2005 MAX and MedPAR data
Table includes 1,625,750 persons from HCBS QI denominator population.
HCBS – Home and Community-based Services; QI – Quality Indicator; MAX – Medicaid Analytic eXtract Data; MedPAR – Medicare Provider Analysis and Review file.

4. FOLLOW-UP ANALYSES TO GUIDE INTERPRETATION OF INDICATORS

Following delivery of the final HCBS QI specifications (version 1.8c), we conducted additional analyses to inform interpretation of the indicators. These focused on several areas: understanding relative contributions of numerator inclusion criteria to particular QI rates (section 4.1); understanding the impact of transfers on QI rates (section 4.2); understanding the impact of repeat admissions on QI rates (section 4.3); understanding the impact of short-term readmissions on QI rates (section 4.4); comparing rates across Medicaid and HCBS QI denominator populations (section 4.5); understanding patient factors with important influence on QI events (section 4.6). Unless otherwise noted, all these analyses used version 1.8c of the numerator definitions and, when presented, rates use version 4.1 of denominator definition.

4.1. Numerator Composition and Present on Admission Status

In this analysis, we focused on understanding the impact of modifications made to PQI definitions in creating the HCBS QI set. Because many of those modifications included using secondary diagnoses, we used 2005 SID data from California and New York to examine the present on admission status of key numerator inclusion criteria for the Medicaid and Medicare populations. Medicaid and Medicare populations in the SID were identified using primary payer.

Asthma/COPD

Prior independent expert reviews of the HCBS and COPD indicators recommended considering asthma and COPD diagnoses together in individuals age 40 years and older. This recommendation is supported by studies showing poor diagnostic discrimination between these two diseases and potential for bias when measuring the diseases separately. We investigated the impact of the recommended definitional modification (Table 13). Using the modified definition, we found that in the Medicaid population, nearly half of numerator cases (48%) were included based on a principal diagnosis of asthma in older adults (age 40+). One third (33%) were included based on COPD in older adults and 18% were included based on asthma in younger adults (age 18-39). In contrast, a majority of numerator cases in the Medicare population were based on COPD in older adults, with nearly all the remainder (30%) based on asthma in older adults. As expected, less than 1% of the Medicare numerator was included based on asthma in younger adults. In both the Medicaid and Medicare populations, just over 1% of the numerator age 40+ had both a COPD and asthma diagnosis. Admissions among patients age 18-39 with both an asthma and COPD diagnosis were extremely rare, as would be expected given the infrequency of COPD in younger populations.

Table 13. Percent of Asthma/COPD Numerator Based on Each Inclusion Criterion, California and New York SID Medicaid and Medicare Populations, 2005

Numerator Inclusion Criteria	% Numerator	
	Medicaid[1]	Medicare[2]
Age 18-39 with principal diagnosis of asthma	18.3	0.9
Age 18-39 with principal diagnosis of COPD	0	0
Age 40+ with principal diagnosis of asthma	48.2	29.9
Age 40+ with principal diagnosis of COPD	33.4	68.8

Data Source: SID data from California and New York
[1] Primary payer is Medicaid. N=22,342
[2] Primary payer is Medicare. N=59,883
COPD – Chronic Obstructive Pulmonary Disease; SID – Healthcare Cost and Utilization Project State Inpatient Database.

Bacterial Pneumonia

Previous analyses have shown that 38 to 43% of HIV/AIDS diagnoses in the general adult population are coded in the principal position. Admissions with a principal diagnosis of HIV/AIDS and a secondary diagnosis of bacterial pneumonia accounted for 11% of the Bacterial Pneumonia numerator in the Medicaid population and <1% in the Medicare population. Nearly all of those cases had pneumonia coded as POA (93% Medicaid, 94% Medicare). This strongly supports including all secondary diagnoses of pneumonia when combined with a principal diagnosis of HIV in the Bacterial Pneumonia indicator, even in the absence of POA data.

Urinary Tract Infection

Prior expert reviews of the UTI PQI recommended that the definition also include a principal diagnosis of sepsis to avoid potential bias based on the ordering of diagnoses. Using this new proposed definition, we found that the Medicaid population had a majority (74%) of numerator cases included based on a principal diagnosis of UTI (Table 14). One quarter (24%) were included based on a principal diagnosis of sepsis with a secondary diagnosis of UTI. Of those, UTI was designated as present on admission in nearly all cases (96%). Admissions with a principal diagnosis of catheter infection and a secondary diagnosis of UTI made only a small contribution to the numerator (1%); UTI was designated as POA in nearly all those cases (96%). Results were similar for the Medicare population, although admissions with a principal diagnosis of sepsis made a larger contribution to the numerator (37%) at the expense of admissions with a principal diagnosis of UTI (61%). As was the case in the Medicaid population, nearly all numerator cases in the Medicare population with a secondary diagnosis of UTI were designated as POA.

Table 14. Percent of UTI Numerator Based on Each Inclusion Criterion, California and New York SID Medicaid and Medicare Populations, 2005

Numerator Inclusion Criteria	% Numerator	
	Medicaid[1]	Medicare[2]
Principal diagnosis UTI	74.4	60.9
Principal diagnosis catheter infection	1.4	2.2
Principal diagnosis of sepsis and secondary diagnosis of UTI	24.3	37.0

Data Source: SID data from California and New York
[1] Primary payer is Medicaid. N=12,637
[2] Primary payer is Medicare. N=64,459
SID – Healthcare Cost and Utilization Project State Inpatient Database.

Dehydration

Prior expert reviews of the Dehydration PQI recommended that the definition also include related principal diagnoses of acute renal failure and gastroenteritis to avoid potential bias based on the ordering of diagnoses. Further team review suggested the addition of hypernatremia. Using this new proposed definition we found that the Medicaid population had just under half (48%) of numerator cases included based on a principal diagnosis of dehydration (Table 15). Admissions with a principal diagnosis of renal failure, no chronic kidney disease, and a secondary diagnosis of dehydration constituted 19% of the numerator, while admissions with a principal diagnosis of HIV/AIDS and secondary diagnosis of dehydration constituted 18% of the numerator. Admissions with a principal diagnosis of gastroenteritis with a secondary diagnosis of dehydration made up 15% of the numerator, and admissions for a principal diagnosis of hypernatremia constituted <1% of the numerator.

The make-up of the Dehydration numerator was quite different in the Medicare population (Table 15). Admissions with a principal diagnosis of dehydration were again the largest

contributor to the numerator, and constituted a larger portion (60%) than in the Medicaid population. Similarly, admissions for renal failure constituted a larger share of the numerator (28%) in the Medicare population. The proportion of the numerator accounted for by admissions for gastroenteritis (10%) and hypernatremia (1%) were similar to the Medicaid population, but contributions from HIV were much smaller (2%).

In the Medicaid and Medicare populations, 5% and 7%, respectively, of all admissions for renal failure (without any other exclusion criteria) included a diagnosis for chronic kidney disease (principal or secondary), making the admission ineligible for inclusion in the numerator.

In both the Medicaid and Medicare populations, the secondary diagnosis of dehydration was designated as present on admission in nearly all numerator cases (>94%) included based on a secondary diagnosis of dehydration combined with a principal diagnosis of gastroenteritis, HIV/AIDS, or renal failure without chronic kidney disease. This strongly supports including all secondary diagnoses of dehydration when combined with these principal diagnoses, even in the absence of POA data.

Table 15. Percent of Dehydration Numerator Based on Each Inclusion Criterion, California and New York SID Medicaid and Medicare Populations, 2005

Numerator Inclusion Criteria	% Numerator	
	Medicaid[1]	Medicare[2]
Principal diagnosis of dehydration	48.4	60.3
Principal diagnosis of hypernatremia	0.3	0.9
Principal diagnosis of gastroenteritis with secondary diagnosis of dehydration	14.6	9.6
Principal diagnosis of renal failure (not chronic kidney disease) with secondary diagnosis of dehydration	18.8	28.2
Principal diagnosis of HIV/AIDS with secondary diagnosis of dehydration	17.9	1.0

Data Source: SID data from California and New York
[1] Primary payer is Medicaid. N=7,688
[2] Primary payer is Medicare. N=42,987
SID – Healthcare Cost and Utilization Project State Inpatient Database.

Pressure Ulcer

Unlike most other included indicators, the Pressure Ulcer indicator includes both principal and secondary diagnoses. In the Medicaid and Medicare populations, principal diagnoses of pressure ulcer accounted for only a small proportion of the numerator (9% and 5%, respectively) (Table 16). In the Medicaid population, 88% of the numerator cases with a secondary diagnosis of pressure ulcer were designated as pressure ulcer POA. This proportion was similar in the Medicare population (90%). These results fit with our interpretation that this QI incorporates pressure ulcers that develop in-hospital in addition to those that are present on admission.

Table 16. Percent of Pressure Ulcer Numerator Based on Principal and Secondary Diagnoses, California and New York SID Medicaid and Medicare Populations, 2005

Numerator Inclusion Criteria	% Numerator	
	Medicaid[1]	Medicare[2]
Principal diagnosis of pressure ulcer	8.7	5.2
Secondary diagnosis of pressure ulcer	91.3	94.8
Secondary diagnosis is POA	88.4	90.3
Secondary diagnosis is not POA	11.6	9.7

Data Source: SID data from California and New York

[1] Primary payer is Medicaid. N=10,328
[2] Primary payer is Medicare. N=67,492
POA – Present on Admission; SID – Healthcare Cost and Utilization Project State Inpatient Database.

Injurious Falls

Unlike most other proposed indicator the Injurious Falls indicator includes both principal and secondary diagnoses. In both the Medicaid and Medicare populations, a majority of numerator cases have a principal diagnosis of injury (77% and 81%, respectively). Of those numerator cases without a principal diagnosis of injury, a vast majority of the secondary injury diagnoses are present on admission (88% Medicaid, 90% Medicare).

Other Indicator-Specific Analyses

We further investigated numerator inclusion criteria for two indicators in the HCBS QI denominator population.

First, we examined the relative contribution that aspiration pneumonia diagnoses make to the Bacterial Pneumonia numerator for the full HCBS QI denominator population, and in each of the 15 clinical subgroups developed by our team (see Appendix 5 for details of the subgroup definitions). Clinical subgroups were defined based on diagnosis codes from inpatient stays.

In the full HCBS QI denominator population, 17.3% of the Bacterial Pneumonia numerator cases were included based on a principal diagnosis of aspiration pneumonia. The proportion of the numerator based on aspiration pneumonia is much higher in the TBI/SCI group (26.6%) and among many of the ID/DD clinical subgroups (range 20.9% to 48.0%, excluding the severe childhood brain injuries and fetal alcohol syndrome groups which have numerators <11 cases) (Table 17). As you might expect, the proportion among the mental illness subgroups is similar to the overall HCBS QI denominator population (range 13.2% to 24.3%, again excluding one group with a small numerator). The proportion of the Bacterial Pneumonia numerator included based on a principal diagnosis of aspiration pneumonia was very low in the HIV/AIDS subgroup (1.5%). This may be partially explained by the frequency of coding HIV/AIDS in the principal position (38-43% in the general population).

Table 17. Percent Bacterial Pneumonia Numerator Based on Aspiration Pneumonia, by Clinical Sub-group, HCBS QI Denominator Population, 2005.

Clinical Sub-group	% Numerator
Down's syndrome	32.5
Chromosomal abnormality	40.4
Severe brain injury in childhood	///
Cerebral palsy, epilepsy, or physical disability	48.0
Fetal alcohol syndrome	///
Other major cognitive disorder	39.4
Other minor cognitive disorder	20.9
Psychosis without affective disorder	16.8
Major affective disorders	13.2
Major anxiety disorders	13.2
Other major disorders or medical conditions	24.3
Minor affective disorders	///
Traumatic brain injury or spinal cord injury	26.6
HIV/AIDS	1.5

Data Sources: MAX and MedPAR data, 2005.
/// Results masked due to small cell size
MAX – Medicaid Analytic eXtract Data; MedPAR – Medicare Provider Analysis and Review file.

Although the code does not distinguish between pnuemonitis and pneumonia, in patients with high risk of aspiration, aspiration pneumonia may not be distinguishable from community acquired pneumonia. Nevertheless, these events reflect the health and well-being of this population. In a previous review of the PQIs by a group of clinical experts, panelists suggested that the Bacterial Pneumonia indicator may be strengthened by the inclusion of the ICD-9-CM diagnosis code for aspiration pneumonia because they believed an important portion of pneumonia cases may be coded as such. Although not tasked with assessing the PQIs in the elderly or disabled populations specifically, those panelists indicated that the Bacterial Pneumonia indicator may be particularly important when assessing the quality of long-term care, especially if aspiration pneumonia were added to the indicator definition. Panelists felt that preventing aspiration should be a current quality goal of long-term care facilities through appropriate utilization of feeding tubes and their positioning. These panel comments are directly applicable to the HCBS QIs, which are targeted towards a population of persons requiring long-term care supports and services, though not residing in long-term care facilities.

In our second indicator-specific analysis, we examined the frequency of admissions among the HCBS QI denominator population with an infection due to device/implant code in the secondary position and a principal diagnosis of a bacterial infection codes captured by the AHRQ Patient Safety Indicators. Although coding guidelines specifically state that some 996.x codes should be coded in the principal position with infection codes in the secondary position, this guidance is not specified for all 996 codes and there may be variation in the adherence to this guidance. In the HCBS QI denominator population, there are 2,105 cases with one of the PSI infection codes in the principal position and an infection due to device/implant code in the secondary position, compared to a total numerator of 12,095 cases (after same-day readmissions excluded). Adding such cases to the numerator definition would increase the numerator by 17.4%.

4.2. Impact of Transfers on QIs

The PQIs use the admission source variable to exclude transfers from another acute care hospital or from long-term care facilities, to avoid counting such events twice in the numerator, but no admission source variable is available in MAX data. To estimate the effect of transfers on the HCBS QIs, we used SID data to examine cases among the Medicare and Medicaid populations that were excluded from the QI numerators due solely to admission from another hospital or from long-term care (Table 18).

Table 18. Percent of Potential Numerator Cases Excluded due to Transfers, by Primary Payer Source

	Medicare		Medicaid	
	%	**Range**[1]	**%**	**Range**[1]
Short-term Complications of Diabetes	2.8	0.0 – 10.8	1.7	0.0 – 8.5
Asthma or COPD	3.3	0.4 – 10.8	1.7	0.0 – 8.4
CHF	4.3	1.1 – 11.9	3.2	0.4 – 18.2
Composite: Potentially Preventable Infections	5.7	1.0 – 17.1	3.7	0.6 – 13.8
Bacterial Pneumonia	5.7	0.8 – 16.2	3.5	0.6 – 10.6
Urinary Tract Infection	5.8	1.0 – 16.2	4.1	0.6 – 19.2
Infection due to Device/Implant	9.9	3.6 – 22.1	7.6	0.0 – 22.4
Dehydration	3.7	0.6 – 13.0	2.9	0.0 – 10.7
Composite: ACSC Chronic	4.1	0.9 – 11.6	2.6	0.4 – 9.0

conditions				
Composite: ACSC Acute conditions	4.6	0.7 – 14.3	2.9	0.5 – 12.1
Composite: ACSC Overall	4.3	0.9 – 12.6	2.7	0.5 – 9.9
Pressure Ulcer	17.2	4.5 – 29.0	17.0	2.3 – 32.3
Injurious Falls	6.3	1.4 – 19.9	5.0	0.0 – 11.3

Numerator definition is version 1.8c.
Data source: 2005 SID. Payer categories are based on primary payer.
Transfer exclusions are defined as admissions from another acute care hospital or from another health care facility, including long-term care. Potential numerator cases are those that meet inclusion criteria and do not meet any exclusion criteria other than the transfer exclusion.
[1]Range across all 37 SID states
ACSC – Ambulatory Care Sensitive Condition; CHF – Congestive Heart Failure; COPD – Chronic Obstructive Pulmonary Disease; SID – Healthcare Cost and Utilization Project State Inpatient Database.

For both the Medicare and Medicaid populations, the impact of transfers on the QI numerator is small but non-trivial for Injurious Falls and the PQI-based indicators (<6%). Transfers make up a greater percent of excluded cases for the Infection due to Device or Implant indicator (9.9% Medicare, 7.6% Medicaid) and especially for the Pressure Ulcer indicator (17% for both Medicare and Medicaid). The high number of transfers among the potential numerator cases for Pressure Ulcer is expected, since this indicator includes secondary diagnosis codes (e.g. comorbidities). More complex patients are more likely to have a pressure ulcer as well as to be transferred .

For most of the QIs, the percent of potential numerator cases with transfers was slightly greater for the Medicare population compared to the Medicaid population. However, there was no difference between the populations for Pressure Ulcer.

In the absence of transfer information within the MAX dataset, the HCBS QI numerators, as currently calculated, are likely overestimating the number of numerator events. To approximate this degree of overestimation, we examined same-day readmissions for the QI numerators in the HCBS QI denominator population using MAX and MedPAR data (see below).

4.2.1 Impact of Same-day Readmissions on QIs

MAX data do not include the admission source variable that is used in other AHRQ QI modules to avoid counting transfers as unique QI events. As an approximation of the impact of transfers on the HCBS QI rates, we examined the percent of the QI numerator events that are same-day readmissions. These are cases with a discharge and readmission on the same day for the same individual with the same QI condition.

Overall, the percent of numerator events attributable to same-day readmissions ranged between 1.4% (Short-term Complications of Diabetes) and 13.5% (Pressure Ulcer) (Table 19). Other QI numerators with the a high percent of same-day readmissions included Bacterial Pneumonia (8.0%), Potentially Preventable Infections Composite (8.0%), ACSC Overall Composite (7.6%), CHF (7.0%) and UTI (6.4%). Dehydration, (1.9%), Injurious Falls (3.5%) and Infection due to Device or Implant (3.6%) had the lowest percent of same-day readmissions, after Short-term Complications of Diabetes. The observed pattern of greater numbers of same-day readmissions for chronic conditions fits with expectations, because these patients are likely more ill. Patients with more severe illness or complications are more likely to be transferred. The same is true for the Pressure Ulcer indicator, where patients with more severe illness likely have lengthier hospital stays, increasing the chances for transfer and pressure ulcers. Though

not a chronic condition, admissions for bacterial pneumonia may be lengthy and complicated, especially in individuals with high chronic disease burden.

4.2.2 Same-day Readmissions as a Proxy for Transfers

To gauge whether same-day readmissions may be used as a proxy for transfers, we compared the percent of potential numerator cases excluded due to transfers in the SID Medicare and Medicaid population to the percent of numerator cases with a same-day readmission in the HCBS QI denominator population (Table 19). We also ranked the QIs by each of those percents and compared those rankings (lower rank = lower percent).

Table 19. Comparison of Transfers and Same-day Readmissions as a Percent of Numerators

	Medicare[1]		Medicaid[1]		HCBS[2]	
	% Transfers	Rank	% Transfers	Rank	% Same-day Readmission	Rank
Short-term Complications of Diabetes	2.8	**1**	1.7	**1**	1.4	**1**
Asthma or COPD	3.3	**2**	1.7	**1**	5.1	**5**
CHF	4.3	**5**	3.2	**7**	7.0	**9**
Composite: Potentially Preventable Infections	5.7	**8**	3.7	**9**	8.0	**11**
Bacterial Pneumonia	5.7	**8**	3.5	**8**	8.0	**11**
UTI	5.8	**10**	4.1	**10**	6.4	**7**
Infection due to Device/Implant	9.9	**12**	7.6	**12**	3.6	**4**
Dehydration	3.7	**3**	2.9	**5**	1.9	**2**
Composite: ACSC Chronic conditions	4.1	**4**	2.6	**3**	6.1	**6**
Composite: ACSC Acute conditions	4.6	**7**	2.9	**5**	6.6	**8**
Composite: ACSC Overall	4.3	**5**	2.7	**4**	7.6	**10**
Pressure Ulcer	17.2	**13**	17.0	**13**	13.5	**13**
Injurious Falls	6.3	**11**	5.0	**11**	3.5	**3**

Numerator definitions are version 1.8c.
Transfers are defined as admissions from another acute care hospital or from another health care facility, including long-term care, based on the SID admission source variable. Same-day readmissions are cases with a discharge and readmission on the same day for the same individual with the same QI condition.
[1]Data source: 2005 SID. Payer categories are based on primary payer.
[2]Data sources: 2005 MAX and MedPAR data.
ACSC – Ambulatory Care Sensitive Condition; CHF – Congestive Heart Failure; COPD – Chronic Obstructive Pulmonary Disease; MAX – Medicaid Analytic eXtract Data; MedPAR – Medicare Provider Analysis and Review file; SID – Healthcare Cost and Utilization Project State Inpatient Database; UTI – Urinary Tract Infection.

One explanation for indicators where the percent of potential numerator cases with transfers is substantially higher than the percent with same-day readmissions (Infection due to Device/Implant, Injurious Falls), is that the QI condition requires documentation linking a

condition to a specific cause. That cause may not be coded in the first hospitalization before patients are transferred. Thus, those transfers would be missed by the same-day readmission logic. However, the event would not be double-counted within the numerator unless it is coded by both the discharging and admitting hospital during a transfer, so these cases will not impact the QI rates.

An explanation for the observation that the chronic condition indicators (Asthma/COPD, CHF ACSC Overall Composite) have higher same-day readmissions than transfers is that same-day readmissions is more sensitive than the admission source variable in capturing transfer events. This might be the case if patients are transferred via the emergency department, which would be missed by the admission source variable. It is unlikely that same day admissions for these conditions would represent two separate events.

We also investigated the Patient Status variable within the MAX Inpatient File and the Discharge Destination variable within the MedPAR file to understand their potential usefulness in identifying transfers. Both variables include a value that indicates transfer to another short-term hospital. In the HCBS QI denominator population, these variables indicated transfer to another hospital for 9,472 inpatient stays (MAX) and 73,355 stays (MedPAR). In both datasets, <1% of inpatient stays were missing a value for these variables. For each QI numerator, we compared the number and percent of cases with a same-day readmission and a transfer to another hospital, as indicated by either patient status or discharge destination. (Same-day readmission is defined based on numerator criteria, so we could not perform this analysis for all QIs combined).

Across the HCBS QIs, between 11% and 21% of numerator events flagged as same-day readmissions were also flagged as transfers to another acute care hospital. (Injurious Falls same-day readmissions rate is too small to report reliably). Between 11% and 39% of transfers to another acute hospital were also flagged as same-day readmissions (again excluding two QIs with very small numbers).

We do not expect that all transfers will be flagged as same-day readmissions, because the diagnoses coded by one of the two hospitals during a transfer may not meet the QI numerator definition, and therefore would not be identified as a same-day readmission. Such cases will not impact QI rates, since the hospital stay is counted only once in the numerator. However, the low range of the percent same-day readmissions that are identified as transfers using patient status and discharge destination suggests that transfers are under-identified by these variables.

Overall, these analyses strongly suggest that transfers make a substantial contribution to the numerator of several indicators, in particular Pressure Ulcer and Infection due to Device or Implant. Comparing those results to the same-day readmissions analysis in the HCBS QI denominator population suggests that same-day readmissions may be a more sensitive way to identify transfers than the admission source variable (in the SID) or either the patient status (MAX) or discharge destination (MedPAR) variables. Therefore, we plan to use same-day readmissions as the preferred method of identifying transfers to avoid double-counting them in the QI numerator (version 1.8d of numerator specifications).

Overall, excluding same-day readmissions resulted in a 5.3% reduction in rates, on average, with a range of 1.0% to 12.0% among the QIs (Table 20). The Short-term Complications of Diabetes, Dehydration, and Injurious Falls indicators were least affected by the same-day readmissions exclusion, while the Pressure Ulcer indicator was most affected, with a 12% rate decrease. As a result, the rate of pressure ulcers may be overestimated by the HCBS QI.

Table 20. Comparison of Annualized Quarterly Rates of QIs With and Without Same-day Readmissions Included, HCBS QI Denominator Population, 2005

Indicator	Same-day Readmissions Included[1]	Same-day Readmissions Excluded[2]	% Difference
Short-term Complications of Diabetes	288	285	1.0
Asthma or COPD	3,865	3,689	4.6
CHF	5,131	4,814	6.2
Composite: Potentially Preventable Infection	*8,031*	*7,477*	*6.9*
Bacterial Pneumonia	4,929	4,587	6.9
Urinary Tract Infection	3,102	2,928	5.6
Infection due to Device or Implant	756	731	3.3
Dehydration	1,903	1,869	1.8
Composite: ACSC Chronic conditions	*11,903*	*11,262*	*5.4*
Composite: ACSC Acute conditions	*7,336*	*6,913*	*5.8*
Composite ACSC Overall	*19,238*	*17,971*	*6.6*
Pressure Ulcer	3,485	3,067	12.0
Injurious Falls	298	287	3.7

Annualized quarterly rate per 100,000 population.
Data Sources: 2005 MAX and MedPAR data
Table includes 1,625,750 persons from HCBS QI denominator population.
[1]Numerator definitions are version 1.8c. Denominator definition is version 4.2
[2]Numerator definitions are version 1.8d. Denominator definition is version 4.2
ACSC – Ambulatory Care Sensitive Condition; CHF – Congestive Heart Failure; COPD – Chronic Obstructive Pulmonary Disease; MAX – Medicaid Analytic eXtract Data; MedPAR – Medicare Provider Analysis and Review file; QI – Quality Indicator.

4.3. Impact of Repeat Admissions on QIs

In the HCBS QI denominator population, we examined the percent of QI numerator persons with 1, 2, or 3+ admissions within 2005 for the same QI. In this analysis, we only counted same-day readmissions (discharged and readmitted on same day for same QI) as one admission (version 1.8d of the numerator definitions).

As expected, the QIs with the highest percent of persons with repeat admissions for the same indicator (frequent users) were the chronic conditions and Pressure Ulcer (Table 21). The highest overall was the ACSC Chronic Conditions Composite (31.4% numerator persons with >1 admission for that QI), followed by the ACSC Overall Composite (30.8%), Pressure Ulcer (29.2%), CHF (28.9%) and Asthma/COPD (27.4%). The QI with the fewest frequent users was Injurious Falls (4.1%).

Table 21. Percent of QI Numerator Persons with Repeat Admissions, HCBS QI Denominator Population, 2005

Indicator	1 Admission	2 Admissions	3+ Admissions	Total with >1 Admission
Short-term Complications of Diabetes	80.4	11.2	8.3	19.6
Asthma or COPD	72.6	16.5	10.8	27.4
CHF	71.1	17.5	11.4	28.9
Composite: Potentially	*80.9*	*14.1*	*5.0*	*19.1*

Preventable Infection				
Bacterial Pneumonia	84.2	12.2	3.6	15.8
Urinary Tract Infection	84.5	11.5	4.0	15.5
Infection due to Device or Implant	80.7	14.4	4.9	19.4
Dehydration	91.4	7.3	1.2	8.6
Composite: ACSC Chronic conditions	*68.6*	*18.6*	*12.8*	*31.4*
Composite: ACSC Acute conditions	*83.4*	*12.8*	*3.8*	*16.6*
Composite ACSC Overall	*69.2*	*18.6*	*12.2*	*30.8*
Pressure Ulcer	70.8	17.8	11.4	29.2
Injurious Falls	95.9	3.9	0.3	4.1

Numerator definitions are version 1.8d.
Data Sources: MAX and MedPAR data, 2005.
ACSC – Ambulatory Care Sensitive Condition; CHF – Congestive Heart Failure; COPD – Chronic Obstructive Pulmonary Disease; HCBS – Home and Community-based Services; MAX – Medicaid Analytic eXtract Data; MedPAR – Medicare Provider Analysis and Review file; QI – Quality Indicator.

The QIs with the highest percent of frequent users in the 3 or more repeat admissions category were Short-term Complications of Diabetes (42.6%), ACSC Chronic Conditions Composite (40.9%) and the other chronic condition QIs (Asthma/COPD 39.8%, ACSC Overall Composite 39.6%, CHF 39.3%) and Pressure Ulcer (39.0%). Injurious Falls had the lowest percent of frequent users in the 3+ admissions category (6.3%).

We also calculated the QIs using the number of persons with at least one admission for the indicator as the numerator, rather than total number of admissions. This masks the impact of frequent users (Table 22), but highlights the well-being at the person level. The percent change in the QI rates using this alternative definition is very similar to the percent of frequent users for each QI; the largest changes were observed for the chronic conditions indicators and Pressure Ulcer.

Table 22. Comparison of HCBS QI Rates Based on Admissions vs. Persons Admitted

Indicator	Admissions[1]	Persons Admitted	% Difference
Short-term Complications of Diabetes	352	249	29.3
Asthma or COPD	4,349	2,913	33.0
CHF	5,724	3,803	33.6
Composite: Potentially Preventable Infection	*8,955*	*7,068*	*21.1*
Bacterial Pneumonia	5,497	4,540	17.4
Urinary Tract Infection	3,520	2,893	17.8
Infection due to Device or Implant	876	696	20.5
Dehydration	2,226	2,018	9.4
Composite: ACSC Chronic conditions	*13,440*	*8,540*	*36.5*
Composite: ACSC Acute conditions	*8,256*	*6,771*	*18.0*
Composite ACSC Overall	*21,402*	*13,850*	*35.3*
Pressure Ulcer	3,767	2,499	33.7
Injurious Falls	350	335	4.2

Annualized quarterly rate per 100,000 population. Numerator definitions are version 1.8d. Denominator definition is version 4.1
Data Sources: 2005 MAX and MedPAR data

[1]Excluding same-day readmissions for the same QI
ACSC – Ambulatory Care Sensitive Condition; CHF – Congestive Heart Failure; COPD – Chronic Obstructive Pulmonary Disease; HCBS – Home and Community-based Services; MAX – Medicaid Analytic eXtract Data; MedPAR – Medicare Provider Analysis and Review file; QI – Quality Indicator.

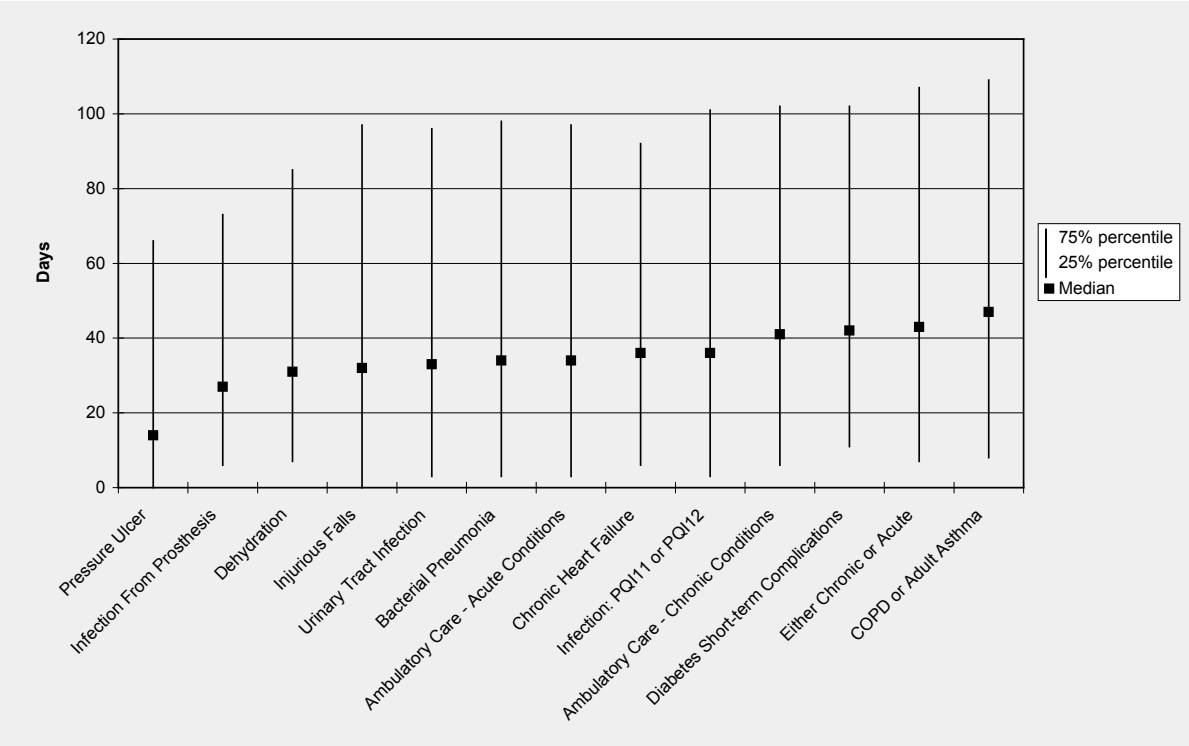
4.4. Impact of Short-Term Readmissions on QIs

In some cases, events captured by the QI numerators may represent short-term readmissions following a previous admission that was not included in the QIs. For example, an admission for infection due to device or implant within very close proximity to a surgical procedure may represent a complication of that surgery, but the surgical admission would not be captured by any of the HCBS QIs. Similarly, an admission for pressure ulcer soon after discharge from a previous hospital stay may indicate that the pressure ulcer developed as a result of that prior stay or from inadequate support during the period of at-home recovery.

To better understand how QI events might be related to previous admissions in the HCBS QI denominator population, we examined the distribution of times between any previous admission (all-cause) and QI events, for each QI. In this analysis, we counted same-day readmissions as only one numerator event (version 1.8d of numerator definitions). We did not include the first quarter (January through March) in this analysis because we lacked data from 2004, when previous admissions may have occurred.

Looking at results for Quarter 4 (Figure 1), the time from previous admission to QI event (QI readmission time) ranged from a median of 24 days (Pressure Ulcer, IQR 0 to 83 days) to 62 days (Asthma/COPD, IQR 5 to 142 days).

Figure 1. Distribution of Time from Any Previous Admission to Index QI Admission – Quarter 4



Numerator definitions are version 1.8c.

Data Sources: 2005 MAX and MedPAR data.
COPD – Chronic Obstructive Pulmonary Disease; MAX – Medicaid Analytic eXtract Data; MedPAR – Medicare Provider Analysis and Review file; QI – Quality Indicator.

The Infection due to Device or Implant QI also had a relatively short median QI readmission time (33 days, IQR 9 to 92 days) compared to the other QIs. All other QIs had median QI readmission times between 40 and 60 days with similar IQRs ranging from 3 to 145 days.

It is notable that in Quarter 4, for all but one QI, 25% of numerator cases had a previous admission within 2 weeks or less of the index QI event (the first QI event to occur during that quarter). The 25th percentile was lowest for Pressure Ulcer (0 days), and highest for Asthma/COPD (15 days), at just over 2 weeks. At least 25% of the 4th quarter index QI events occurred within one week following a previous admission for Injurious Falls (25th percentile = 3 days), UTI (6 days) and the ACSC Acute Conditions Composite (7 days). This suggests that all the QIs have some potential to capture readmissions that may be considered complications of previous admissions, rather than events associated with care and support services received in the community setting. Several of the acute event QIs (UTI, Injurious Falls, Infection due to Device or Implant), seem particularly likely to capture such events. Pressure Ulcer is a unique case, in that we are likely capturing repeated admissions in high risk patients. The incidence may be capturing the same unhealed ulcer repeatedly, given the short median between the QI event and previous hospitalizations in all quarters examined (quarters 2, 3 and 4). In this case, the index admission and the triggering admission will both be captured by the QI.

This analysis was limited by the lack of complete data on previous admissions. Because we had only one year of data (2005), there was less time for a previous admission to occur for QI events that occurred earlier in the year. We partially addressed this by omitting 1st quarter QI events from this analysis. However, we did observe a trend towards longer median QI readmission times in later quarters. For example, the median QI readmission time for Pressure Ulcer was 11 days in quarter 2, 20 days in quarter 3 and 24 days in quarter 4. This pattern was observed for all QIs. This suggests that some previous readmission events are missed for QI events occurring early in the year. Although median and IQR time to readmission was longer for all QIs when examining quarter 4 results only, the overall pattern was the same as observed for quarters 2 through 4 combined. For this reason, we focused our analysis on the 4th quarter results, which have the least potential for bias due to missed previous admissions. Also, previous admissions occurring within prior years (2004 or earlier) would occur at least 9 months before the fourth quarter index QI admission and thus are unlikely to be related to the QI event.

In this analysis, we did not treat same-day readmissions as a unique hospitalization event if both admissions were for the same QI event. Thus, a transfer from one hospital to another for the same QI condition would not be captured as a readmission event. However, we did count as readmissions re-hospitalizations that occurred on the same day with a different diagnosis. In the case of the Pressure Ulcer indicator, a QI readmission value of zero could indicate that an individual was transferred from one hospital to another (discharged and readmitted on the same day), but that the pressure ulcer was not documented until the second hospitalization.

4.5. Comparison of HCBS QI Rates Across Populations

Before concluding measure development work, we calculated final QI rates for 4 populations: the full HCBS QI denominator population, the HCBS dual eligible and HCBS Medicaid-only subpopulations, and the full Medicaid population (Table 23).

Table 23. National QI Rates for 4 Populations

Indicator	Full HCBS[1]	HCBS Dual Eligible[2]	HCBS Medicaid-only[3]	Full Medicaid[4]
Short-term Complications of Diabetes	285	227	453	188
Asthma or COPD	3,689	3,859	3,198	1,424
CHF	4,814	5,492	2,852	1,790
Composite: Potentially Preventable Infection	*7,477*	*8,377*	*4,873*	*3,181*
Bacterial Pneumonia	4,587	5,105	3,089	1,983
Urinary Tract Infection	2,928	3,322	1,786	1,238
Infection due to Device or Implant	731	707	803	284
Dehydration	1,869	2,109	1,174	723
Composite: ACSC Chronic conditions	*11,262*	*12,085*	*8,882*	*4,423*
Composite: ACSC Acute conditions	*6,913*	*7,815*	*4,301*	*2,846*
Composite ACSC Overall	*17,971*	*19,629*	*13,173*	*7,139*
Pressure Ulcer	3,067	3,372	2,185	1,136
Injurious Falls	287	364	65	105

Annualized quarterly rate per 100,000 population. Numerator is version 1.8d. Denominator for full HCBS QI denominator population is quarterly implementation of version 4.2

[1]Data sources: 2005 MAX data and 2005 MedPAR files. Only inpatient stays recorded in the MedPAR files are included in the numerator counts for the dual eligible population. Analyses include 1,625,750 persons.

[2]Data sources: 2005 MAX data and 2005 MedPAR files. Only inpatient stays recorded in the MedPAR files are included in the numerator counts for the dual eligible population. Analyses include 1,198,581 persons.

[3]Data source: 2005 MAX data. Analyses include 427,169 persons

[4]Data source: 2005 MAX data. Analyses include 21,939,783 persons.

ACSC – Ambulatory Care Sensitive Condition; CHF – Congestive Heart Failure; COPD – Chronic Obstructive Pulmonary Disease; HCBS – Home and Community-based Services; MAX – Medicaid Analytic eXtract Data; MedPAR – Medicare Provider Analysis and Review file; QI – Quality Indicator.

The rates in Table 23 reflect a change in methodology which eliminates same-day readmissions (version 1.8d numerator definition) and changes in how quarterly rates were calculated. The latter change, which included implementing the final version 4.2 quarterly implementation of the denominator definition, resulted in substantial decreases in QI rates. Information on the effect of the same-day readmissions exclusion is detailed in Table 20.

We examined rates for the different populations in Table 23 to assess whether the pattern observed across these populations fit with the general trends expected based on our review of literature and input from population experts. A major departure from the expected pattern would indicate a potential validity or reliability problem.

In most cases, rates were highest in the HCBS dual eligible population and lowest in the full Medicaid population, as expected. Hospitalization for two indicators did not fit this pattern. The rates of Short-Term Complications of Diabetes and Infection due to Device or Implant were highest in the HCBS Medicaid-only population, though still lowest in the full Medicaid group. The higher rate of Short-Term Complications of Diabetes in the HCBS Medicaid-only subpopulation compared to dual eligible population is expected, as rates of this indicator are typically higher in younger individuals in the general population. For all but one indicator, rates in the full Medicaid population were lower than in any of the HCBS QI denominator populations, as expected. The rate of Injurious Falls was higher in the full Medicaid population than in the HCBS Medicaid-only population, though still lower compared to the full HCBS, and especially HCBS dual eligible, populations.

These patterns fit with our expectations that for most indicators the HCBS QI denominator population would experience higher rates of the QI events than the Medicaid population overall, and likewise that the HCBS dual eligible subpopulation would experience higher rates than the Medicaid-only subpopulation.

4.6. Individual-Level Factors Impacting HCBS QIs

4.6.1 Methods

We conducted a preliminary investigation of individual characteristics associated with hospitalization for each of the HCBS QIs in the full HCBS QI denominator population by performing a series of logistic regression models. The information obtained from this investigation is intended to inform future directions for risk adjustment development and validity testing. For each QI, we modeled the patient-level probability of hospitalization for a numerator event (using version 1.8d of numerator definitions). Individual characteristics examined included demographic factors (age, gender, race/ethnicity, urban residence), socioeconomic status (based on quartiles of median zip code income), eligibility (number of quarters eligible, dual eligible status) and clinical characteristics (clinical subgroup, presence of chronic disease).

All data on individual characteristics were obtained from 2005 MAX data unless otherwise noted. We defined race and ethnicity based on a series of mutually exclusive binary variables for Hispanic ethnicity and White, African American, other and unknown race. We defined urban residence based on designation of the individual's zip code of residence (contained within MAX data) as a metropolitan statistical area (MSA). To define income quartiles, we assigned a median income to each patient based on their zip code of residence then divided the sample into quartiles based on the median zip code incomes observed among patients included in the HCBS denominator. Zip code-level data on MSA and median income were obtained from a separate intramural HCUP dataset that included demographic information from 2004 for individual zip codes. Use of this dataset for this analysis was approved by AHRQ.

We defined 4 clinical subgroups based on any diagnosis observed in inpatient or outpatient data. In order to create mutually exclusive categories, we assigned individuals to a subgroup in the following order: intellectual and developmental disabilities, mental illness, brain and spinal cord injuries, and HIV/AIDS. Not all individuals in the HCBS QI denominator population were assigned to one of these 4 categories. A list of ICD-9-CM diagnosis codes used in defining the subgroups may be found in Appendix 5.

We defined chronic disease as presence of one or more outpatient encounter with diagnosis (principal or secondary) of any of the ICD-9-CM diagnosis codes included in the AHRQ Comorbidity Software[vii] definitions for the following conditions: congestive heart failure, chronic pulmonary disease, diabetes with and without complications, hypertension, liver disease, peripheral vascular disease, pulmonary circulation, renal failure, and valvular disease. We did not consider Diagnosis Related Group (DRG) in our adaptation of the index definitions because our data did not include information on DRG. For all individuals in the HCBS QI denominator population, including dual eligible persons, we used only MAX data to identify comorbidities

[vii] HCUP Comorbidity Software, Version 3.6. Available at: http://www.hcup-us.ahrq.gov/toolssoftware/comorbidity/comorbidity.jsp. Further details are published in *Medical Care*, 1998;36:8-27.

because Medicare data on outpatient visits were not available. We excluded outpatient encounter records for laboratory tests and x-rays because such records may include rule-out diagnoses not actually present. We assessed the validity of using MAX outpatient data to identify comorbidities by comparing these outpatient-based comorbidity rates to rates based on inpatient data, for HCBS Medicaid-only persons with any inpatient admission.

Before performing regression analyses, we examined occurrence in the HCBS QI denominator population of each of the individual characteristics to be included in the regression models (Table 24). This examination aids interpretation of the regression results.

4.6.2 Characteristics of the HCBS QI Denominator Population

Individuals were older (mean age 60.5 years), predominantly female (63.4%), and White (56.9%). More than one third (35.0%) of all individuals had comorbid chronic disease. The most common clinical subgroup was mental illness (18.0%), followed by intellectual and developmental disability (16.7%). Only a small proportion of the HCBS QI denominator population were part of the brain or spinal cord injury or HIV/AIDS subgroups. Approximately one third of individuals qualified for HCBS for fewer than 4 quarters in 2005.

Table 24. Characteristics of HCBS QI Denominator Population

Characteristic	N (%)[1]
Mean (SD) age, in years	60.5 (20.3)
Male gender	595,073 (36.6)
Race	
White	925,020 (56.9)
African American	319,867 (19.7)
Hispanic	164,714 (10.1)
Other[2]	104,355 (6.4)
Unknown	111,794 (6.9)
Clinical subgroup	
Intellectual or developmental disability	271,986 (16.7)
Mental illness	292,256 (18.0)
Brain or spinal cord injury	49,345 (3.0)
HIV/AIDS	23,608 (1.5)
Urban residence	1,224,411 (75.3)
Median zip code income quartiles	
Median (IQR) of 1st quartile	27,253 (23,707-29,842)
Median (IQR) of 2nd quartile	34,719 (33,295-36,477)
Median (IQR) of 3rd quartile	42,428 (40,256-45,346)
Median (IQR) of 4th quartile	60,611 (53,998-71,549)
Chronic disease[3]	569,092 (35.0)
Dual eligible	1,198,581 (73.7)
Quarters of Eligibility	
1 quarter	159,711 (9.8)
2 quarters	168,762 (10.4)
3 quarters	160,884 (9.9)
4 quarters	1,136,393 (69.9)

Data sources: 2005 MAX data and 2005 MedPAR files.
1,625,750 persons met all inclusion criteria for the QI denominator and are included in this table
[1]Number and percent of patients, unless otherwise noted.
[2]Other race includes American Indian or Alaskan Native, Asian, or Hawaiian/Pacific Islander or those of multiple races.
[3]Defined based on outpatient encounters, excluding lab and x-ray records

HCBS – Home and Community-based Services; IQR – Interquartile range; MAX – Medicaid Analytic eXtract Data; MedPAR – Medicare Provider Analysis and Review file; QI – Quality Indicator; SD – Standard deviation.

Data on gender was missing for 53 individuals (<0.01%), who were excluded from regression analyses. Data were missing on income and urban residence for 2.6% of individuals. We imputed missing values based on age, gender and race/ethnicity using a hot-deck procedure. Information on race was missing for 111,831 individuals (6.9%), who were included in the regression in a missing race category.

Our assessment of comorbidities suggests that identifying comorbidities based on MAX outpatient data likely underestimates the true prevalence of comorbid disease, particularly in the dual eligible population for whom only one secondary diagnosis field is available in MedPAR data. Therefore, regression results should be considered preliminary due to validity concerns over comorbidity definition and data source. However, omitting comorbidity, known to be an important factor in hospitalization rates, would further weaken regression results.

4.6.3 Regression Results

Preliminary results showed that all factors examined were statistically significant predictors of hospitalization events, even when odds ratios were quite small. Thus, when interpreting regression results, we focused on effect sizes that were clinically meaningful, rather than statistical significance. We interpreted factors with odds ratios >1.10 or <0.90 as clinically meaningful. We eliminated two factors, dual eligibility status and income, that lacked a clinically meaningful effect size for every hospitalization event examined, then repeated analyses using these more parsimonious models. Although age also lacked a meaningful effect size for every indicator, we retained it in the models due to its known clinical importance.

Table 25 summarizes the direction and size of effects observed for a series of 13 logistic regression models, each predicting the probability of hospitalization for one of the HCBS QIs. Note that these models predicted patient-level hospitalization events, not rates of hospitalization.

Table 25. Summary of Regression Results

Characteristic	Greater Odds of Hospitalization[1]	Smaller Odds of Hospitalization[2]
Age		
Male gender	Short-term Complications of Diabetes (1.11) Bacterial Pneumonia (1.26) Pressure Ulcer (1.24)	Asthma/COPD (0.88) UTI (0.84) Injurious Falls (0.60)
Race		
White	Referent	Referent
African American	Short-term Complications of Diabetes (2.01) CHF (1.31) UTI (1.11) Infection due to device/implant (1.67) Dehydration (1.26) ACSC Chronic conditions composite (1.20)	Pneumonia/UTI composite (0.85) Bacterial Pneumonia (0.71) ACSC Acute conditions composite (0.87) Injurious Falls (0.48)

Characteristic	Greater Odds of Hospitalization[1]	Smaller Odds of Hospitalization[2]
	Pressure Ulcer (1.66)	
Hispanic	Infection due to device/implant (1.21)	Asthma/COPD (0.64) Potentially preventable infections composite (0.82) Bacterial Pneumonia (0.78) Dehydration (0.81) ACSC Acute conditions composite (0.82) Pressure Ulcer (0.86) Injurious Falls (0.65)
Other[3]		Short-term Complications of Diabetes (0.67) Asthma/COPD (0.38) CHF (0.45) Potentially preventable infections composite (0.53) Bacterial Pneumonia (0.56) UTI (0.49) Infection due to device/implant (0.73) Dehydration (0.53) ACSC Chronic conditions composite (0.48) ACSC Acute conditions composite (0.52) ACSC Overall composite (0.49) Pressure Ulcer (0.43) Injurious Falls (0.53)
Unknown		Asthma/COPD (0.77) CHF (0.88) Potentially preventable infections composite (0.79) Bacterial Pneumonia (0.77) UTI (0.83) Dehydration (0.87) ACSC Chronic conditions composite (0.89) ACSC Acute conditions composite (0.80) ACSC Overall composite (0.85) Injurious Falls (0.71)
Clinical subgroup		
Intellectual or developmental disability	Potentially preventable infections composite (1.68) Bacterial Pneumonia (1.91) UTI (1.33) Dehydration (1.20) ACSC Acute conditions composite (1.43)	Short-term Complications of Diabetes (0.64) Asthma/COPD (0.41) CHF (0.46) Infection due to device/implant (0.53) ACSC Chronic conditions composite (0.45) ACSC Overall composite (0.87)
Mental illness	Short-term Complications of Diabetes	Infection due to device/implant (0.85)

Characteristic	Greater Odds of Hospitalization[1]	Smaller Odds of Hospitalization[2]
	(1.34) Asthma/COPD (1.33) Potentially preventable infections composite (1.73) Bacterial Pneumonia (1.63) UTI (1.89) Dehydration (1.94) ACSC Chronic conditions composite (1.23) ACSC Acute conditions composite (1.83) ACSC Overall composite (1.49) Pressure Ulcer (1.41) Injurious Falls (1.85)	
Brain or spinal cord injury	CHF (1.14) Potentially preventable infections composite (2.58) Bacterial Pneumonia (1.78) UTI (3.85) Infection due to device/implant (2.00) Dehydration (1.61) ACSC Acute conditions composite (2.37) ACSC Overall composite (1.75) Pressure Ulcer (5.35) Injurious Falls (6.43)	
HIV/AIDS	Asthma/COPD (1.21) Potentially preventable infections composite (2.66) Bacterial Pneumonia (3.89) Infection due to device/implant (1.38) Dehydration (6.61)	Short-term Complications of Diabetes (0.73) CHF (0.83) UTI (0.81) Pressure Ulcer (0.88)
Urban residence		Asthma/COPD (0.84) Potentially preventable infections composite (0.84) Bacterial Pneumonia (0.81) Dehydration (0.80) ACSC Chronic conditions composite (0.88) ACSC Acute conditions composite (0.79) ACSC Overall composite (0.84) Injurious Falls (0.64)
Chronic disease	Short-term Complications of Diabetes (6.09) Asthma/COPD (3.66) CHF (3.19) Potentially preventable infections composite (1.65) Bacterial Pneumonia (1.90) UTI (1.26)	

Characteristic	Greater Odds of Hospitalization[1]	Smaller Odds of Hospitalization[2]
	Infection due to device/implant (3.25) Dehydration (1.72) ACSC Chronic conditions composite (3.57) ACSC Acute conditions composite (1.75) ACSC Overall composite (2.66) Pressure Ulcer (1.37) Injurious Falls (1.34)	
Quarters of Eligibility		
1 quarter	Potentially preventable infections (1.13) Bacterial Pneumonia (1.18) Pressure Ulcer (1.84)	Asthma/COPD (0.81) Infection due to device/implant (0.81) Injurious Falls (0.88)
2 quarters	Short-term Complications of Diabetes (1.54) Asthma/COPD (1.12) CHF (1.44) Potentially preventable infections composite (1.31) Bacterial Pneumonia (1.32) UTI (1.25) Infection due to device/implant (1.64) Dehydration (1.43) ACSC Chronic conditions composite (1.36) ACSC Acute conditions composite (1.23) ACSC Overall composite (1.34) Pressure Ulcer (2.12) Injurious Falls (1.33)	
3 quarters	Short-term Complications of Diabetes (1.86) Asthma/COPD (1.22) CHF (1.59) Potentially preventable infections composite (1.44) Bacterial Pneumonia (1.41) UTI (1.45) Infection due to device/implant (1.76) Dehydration (1.64) ACSC Chronic conditions composite (1.51) ACSC Acute conditions composite (1.34) ACSC Overall composite (1.48) Pressure Ulcer (2.19) Injurious Falls (1.54)	
4 quarters	Referent	Referent

Values in parentheses are odds ratios (OR). P-values for all observed ORs were <0.0001 due to the large sample size (n=1,625,750). Effect sizes between 0.90 and 1.10 (inclusive) are not listed due to marginal clinical significance.
Numerator events are defined based on version 1.8d specifications.
Data sources: 2005 MAX data and 2005 MedPAR files.
[1]p-value<0.0001 and OR >1.10.
[2]p-value<0.0001 and OR <0.90
[3]Other race includes American Indian or Alaskan Native, Asian, Hawaiian/Pacific Islander or those of mixed races.
ACSC – Ambulatory Care Sensitive Condition; CHF – Congestive Heart Failure; COPD – Chronic Obstructive Pulmonary Disease; MAX – Medicaid Analytic eXtract Data; MedPAR – Medicare Provider Analysis and Review file; UTI – Urinary Tract Infection.

Age did not demonstrate a clinically meaningful effect in any model. Comorbid chronic disease was consistently associated with increased risk of hospitalization, with effect sizes ranging from 26% greater chance of hospitalization (UTI) to more than 6 times greater risk (Short-Term Complications of Diabetes), compared to those without such co-morbidities. Urban residence was associated with a lower chance of hospitalization for 8 of 13 QIs (range of ORs 0.64 to 0.88); it was never associated with an increased chance of hospitalization. Hispanic ethnicity and Asian, American Indian or Hawaiian/Pacific Islander and mixed race were frequently associated with a decreased chance of hospitalization, compared to White race. Missing race was also frequently associated with a decreased chance of hospitalization, although the effect sizes were moderate (range of ORs 0.71 to 0.89). Results were mixed for African American race, which was associated with an increased chance of hospitalization for some QIs, such as Short-Term Complications of Diabetes (OR=2.01), Pressure Ulcer (OR=1.66) and Infection due to Device or Implant (OR=1.67), and a decreased chance of hospitalization for others, such as Injurious Falls (OR=0.48), compared to White race.

Results were also mixed for gender, where for half of the QIs, no clinically meaningful effect sizes were observed. Of those indicators where a meaningful effect size was observed, men had a greater chance of hospitalization compared to women for Short-Term Complications of Diabetes, Bacterial Pneumonia and Pressure Ulcer, but a decreased chance for Asthma/ COPD, UTI, and Injurious Falls. In general, individuals with intellectual and developmental disabilities had an increased chance of hospitalization for the acute condition QIs, but a lower chance for the chronic condition QIs. Individuals with mental illness and those with brain or spinal cord injuries had an increased chance for hospitalization for most QIs.

Individuals who were not eligible for HCBS in all 4 quarters generally had an increased risk of hospitalization for all conditions. Those qualifying for only one quarter had a slightly lower chance of hospitalization for 3 conditions (Asthma/COPD, Infection due to Device or Implant, Injurious Falls) compared to individuals eligible for the full year, but all other QIs demonstrated an increased chance of hospitalization among those with part-year eligibility. The mixed results for individuals eligible during only one quarter may be the result of competing impacts on the regression coefficients. Although results clearly show a trend towards increased chances of hospitalization with part-year eligibility, those qualifying for only one quarter have less time in which to experience an event.

To explore differences between beneficiaries with greater and lesser resource use, we also performed an ordered logistic regression analysis, predicting the odds of experiencing multiple hospitalizations over experiencing no or just one admission. We limited this analysis to the chronic conditions composite indicator only. Four percent of the HCBS denominator population

had a single admission for a condition included in the chronic conditions composite indicator, while 2% had 2 or more such admissions. The remainder had no admission for this indicator. Results of the ordered logistic regression were nearly identical to those for the binary logistic regression.

In summary, presence of comorbid chronic disease was consistently associated with greater risk of hospitalization for all QI events, with the largest magnitude of association for the chronic disease QIs. In contrast, age, dual eligible status and income were not associated with any QIs in a clinically meaningful way. For the other patient characteristics examined, large effects were observed for a few QIs, but were generally weaker for the remainder. For example, African American race was strongly associated with an increased risk of hospitalization for Short-Term Complications of Diabetes and a decreased risk for Injurious Falls, but effects were weaker for the other QIs. Intellectual and developmental disabilities were strongly associated with a higher risk for Bacterial Pneumonia and a lower risk for Asthma/COPD, CHF, and Infections due to Device or Implant, but associations were weaker for other QIs. Similarly, brain and spinal cord injuries were very strongly associated with increased risk of hospitalization for Bacterial Pneumonia, UTI, Infection due to Device or Implant, Pressure Ulcer and Injurious Falls, but not other QIs. HIV/AIDS was strongly associated with increased risk of hospitalization for Bacterial Pneumonia and Dehydration, but had weaker associations with other QIs.

These regression analyses offer a preliminary view of how key individual characteristics might influence rates of the HCBS QIs and are generally in line with the expected direction and magnitude. If the observed risk factors differed substantially from those anticipated from literature-based and clinical assessments, this might raise validity concerns. The characteristics demonstrating strong associations with hospitalization for particular QI events in these analyses may be considered a starting place for further analyses, such as development of risk models. Although risk adjustment is of utmost importance when comparing programs or states, development of risk models is also integral for quality improvement, research and monitoring applications. Risk models can help assure that efforts are focused on areas where the well-being is less than would be expected and to identify potential target populations. It is important to note that these analyses are considered only preliminary. Specifically, these analyses are limited by the available data. Our definition of comorbid chronic disease is likely an underestimate, as it is based on only one year of MAX outpatient data which includes only two diagnosis fields and did not include Medicare outpatient encounters for dual eligible individuals. (Outpatient Medicare data was not available).

5. CONCLUDING THOUGHTS

The HCBS QI set consists of a variety of hospitalization events, including exacerbations of chronic conditions (diabetes, asthma, COPD, and CHF), acute illnesses (bacterial pneumonia, urinary tract infection, dehydration, infection due to device or implant), pressure ulcers and injurious falls. These events likely reflect chronic disease progression and development and progression of acute events, which in turn reflect the well-being of the HCBS population. Many of these indicators are based on ambulatory care sensitive conditions. In the general population it is theorized that these conditions can typically be well managed on an outpatient basis, avoiding the need for hospitalization. Similar mechanisms may impact hospitalization rates in the HCBS population. In addition, events captured by these indicators, in particular pressure ulcers and falls, should be avoidable with adequate support or preventive care, both within the hospital and within the community. Although not every hospitalization for these events and conditions is preventable, the rate of hospitalization for the QIs among beneficiaries of Medicaid HCBS programs reflects the health and well-being of that population.

These indicators are not intended for use as measures of the quality of care or support services received under HCBS and should not be used in this way. Rather, they are intended as metrics of the health and well-being of HCBS beneficiaries.

The Need for Risk Adjustment

Our study suggests that evaluations of service quality based on QIs should include risk adjustment. Preliminary analysis of the individual characteristics associated with hospitalization for QI events identified some potentially important risk adjusters, such as clinical subgroups and comorbidities. Inasmuch as these factors systematically vary by program or state, then risk adjustment will be essential for appropriate interpretation of the indicators. The prevalence of chronic disease is known to vary by state in the general population, and likely does so for the HCBS population as well, although it is unknown whether the pattern of variation among HCBS beneficiaries would be similar to that in the general population.

Two additional risk factors could not be assessed due to data limitations, and are arguably the most important predictors of hospitalization events, namely care given in the last months of life (i.e., end-of-life care) and chronic disease severity. Policies will inevitably systematically impact the proportion of HCBS beneficiaries receiving end-of-life care or with advanced chronic disease, yet neither factor can be adequately assessed using administrative data. Adjusting for either is complex, since poor support and access to quality care can speed chronic disease progression and in turn hasten end of life. Thus, adjusting for these factors may mask differences of interest. Using disease severity or provision of end-of-life care on intake into HCBS or more historical data (e.g., 3 years prior to measurement), may be an alternative approach to assessing these risk factors without confounding potential deficits in access to care and support services.

Even if the indicators are not used to assess quality, any comparisons of QI rates across states would also require risk adjustment, to account for differences in the composition of the HCBS QI denominator population across states, as well as differences in Medicaid policy, service availability, and other population-level factors. However, this study only touched on potential bias in the indicators, and did not fully develop risk adjustment models. Such research will require multiple years of data to establish reliable estimates of relative risk given the rare nature of the outcomes examined by some of the HCBS QIs. Second, flexible models may be useful to address some of the unique aspects of measuring within the HCBS QI denominator population. For instance, adjusting for factors such as race or socioeconomic status may be desirable in

some instances and less so in others. Use of multiple approaches may provide a more full picture of well-being, although a full evaluation of this approach is beyond the scope of this study.

When the HCBS QIs were presented to the directors of state Medicaid agencies, feedback received suggested that even with perfect risk adjustment, comparisons across states would likely remain difficult to interpret. For example, differences likely exist in the quality of MAX data across states which could impact QI rates but would not reflect true differences in health and well-being of HCBS beneficiaries.

Given these limitations, the current QI set is intended for use at a national level and for evaluations within states, but not for cross-state comparisons. The Medicaid directors indicated that they may be particularly useful for monitoring health and well-being of the HCBS population over time within states. However, because our analyses relied on only one year of data, we cannot address the reliability of QI rates over time. We recommend this be examined if the QIs will be used in the future for longitudinal analyses. Even within-state comparisons will require attention to changes in the HCBS beneficiary risk factors for proper interpretation.

The HCBS population is highly diverse, ranging from elderly individuals to persons with mental illness, brain or spinal cord injuries, intellectual or developmental disabilities, physical disabilities, and individuals with HIV or AIDS. Our preliminary analysis demonstrated that these clinical subgroups impact hospitalization risk. In theory, the QIs could be considered a composite of each of these subgroups. Examining combined QI rates for all HCBS beneficiaries provides an overview of health and well-being among recipients of such services, but also may mask important differences in rates among these subgroups. For example, HCBS beneficiaries with intellectual or developmental disabilities were 59% less likely to be hospitalized for asthma or COPD, whereas beneficiaries with mental illness or HIV/AIDS were 33% and 21% more likely to be hospitalized for these conditions, respectively. Depending on the composition of the HCBS QI denominator population, the overall rate may seem favorable even if the performance for one subgroup is particularly poor. Appropriate risk adjustment can also help to highlight underperformance, although the most straightforward approach is to examine stratified rates. For small subgroups or those where the event is particularly rare, stratified rates will be less reliable and examining multiple years of data or use of statistical techniques may be desirable.

Refinement and Interpretation of QI Definitions

The HCBS QIs focus predominantly on events or conditions that arise prior to hospitalization, such as exacerbation of chronic conditions like asthma or COPD, or acute illnesses such as pneumonia or urinary tract infection. However, because many of the indicators include some secondary diagnoses in the numerator definition, they may include some events that arise during hospitalization. Our analysis of present on admission status for QI events in the Medicaid and Medicare populations of California and New York using SID data suggest that the vast majority of secondary diagnoses captured by the indicators are present on admission. The exception is Pressure Ulcer, for which our analyses suggest approximately 10-12% develop during the hospitalization. Our expert panelists noted that such cases are still important to capture because they reflect the health and well-being of the population. If only principal diagnoses were included, the indicator would miss approximately 90% of the pressure ulcers documented during a hospitalization. However, including secondary diagnoses also increases the risk of double counting the same event. For instance, our analyses found a short median time to readmission for individuals flagged by the Pressure Ulcer indicator, such that the same ulcer is likely to be flagged during each event. For some applications, assessing Pressure Ulcer at the person level may provide important alternative information.

As defined in the final version of the specifications (version 1.8c), the HCBS QIs do not account for transfers from one hospital to another because MAX and MedPAR data lack the admission source variable used to exclude transfers from the other AHRQ QI sets. Our analyses show that the HCBS QIs may overestimate the rate of events by 2 to 5% for most of the QIs, since this is the range of numerator cases flagged as a transfer in the general population. However, the rate of transfers, and therefore the degree of overestimation in QI rates, is likely higher for the Infection due to Device or Implant and Pressure Ulcer indicators. We found that using same-day readmissions for the same condition is a useful method of identifying transfers. Indeed, our results suggest that same-day readmissions may be a more sensitive method of identifying transfers than the admission source variable, because same-day readmissions will capture transfers through the emergency department, which are missed by admission source. In addition, it is very unlikely that two admissions on the same day would represent unique events. In the future, we recommend counting same-day readmissions for the same condition in the same individual as only one numerator event to avoid overestimating QI rates (using version 1.8d of the QI specifications).

The HCBS QIs report the rate of hospitalization for QI events and conditions. However, in some cases it may be desirable to examine a person-level rate, which masks the impact of frequent users who are admitted multiple times for the same QI. Using both discharge-level and person-level rates provides a more rich picture of health and well-being in the population. For example, our analyses show that person-level rates are substantially lower than discharge-level rates, particularly for the Short-term Complications of Diabetes, chronic conditions (Asthma/COPD, CHF), and Pressure Ulcer QIs. For these indicators, rates are driven partially by frequent users, who experienced multiple QI hospitalizations during the year. Although our initial assessment of predictors of frequent use did not reveal patient factors associated with high use, our analysis set a low threshold of “frequent use.” Nevertheless, these frequent users would represent a potential leverage point for making substantial improvements in health and well-being among a relatively small portion of the population. In general, person-based measures assess the well-being of the population, while event-level rates also assess efficiencies and severity. Hybrid measures should stratify event rates by low users and frequent users.

Admissions for these events may also reflect short-term readmissions after a previous hospital stay. These may be complications stemming from previous hospitalization (e.g. infections), exacerbation of chronic disease potentially linked to the previous hospitalization (e.g. chronic disease indicators), or events potentially linked to inadequate support following discharge (e.g. falls). In each of these cases, the leverage points may differ when events reflect short-term readmissions rather than events more removed from hospitalizations. In addition, individuals who experience these events as short-term readmissions may differ in important ways from those who experience these more remotely. First, individuals with short-term readmissions are more likely to have a current acute clinical issue, which places the individual at higher risk for additional events. Second, these individuals may be more ill as reflected in frequent hospitalizations, or even at the end of life. Administrative data do not allow for exclusions for end-of-life care. We found that for all but one QI, at least 25% of all numerator events occurred within 2 weeks of a previous admission. The Urinary Tract Infection, Injurious Falls, Infection due to Device or Implant and Pressure Ulcer indicators, in particular, appear most likely to capture short-term readmission events, as they had the shortest median and/or 25th percentile times from previous all-cause admission to the QI admission.

6. QI SPECIFICATIONS – Version 1.8c

6.1 Background

These quality indicators are intended to measure the health and welfare of HCBS beneficiaries. They apply only to adults (age 18 and older). All but two of the indicators (Injurious Falls and Infection due to Device or Implant) are based on an existing AHRQ Quality Indicator. Specifically, the measure set includes indicators based on some of the version 4.1 Prevention Quality Indicators and version 3.2 of the Patient Safety Indicator for Pressure Ulcer. We adapted AHRQ QI definitions for use in the HCBS population and the MAX data.

In adapting the indicators, we in general removed data elements not available in the MAX data and identified alternative specifications when required. In addition, we attempted to optimize the indicators to identify hospitalizations reflecting the overall well-being of the HCBS population, rather than the current purposes of the AHRQ QIs (i.e. access to high quality care, identification of in-hospital complications).

The denominator definition is based on a definition of HCBS beneficiaries developed by MPR for use in the Money Follows the Persons Demonstration evaluation, which we adapted for use with this measure set.

The QI rates are calculated by first identifying the QI denominator, then identifying numerator events from among individuals included in the denominator.

The specifications detailed in this document are designed for the HCBS population using MAX and MedPAR data. Application of the QIs to other populations or using other datasets may require adaptation of the specifications and further validity testing. For applications in the general population using HCUP data, we recommend review of the AHRQ PQI and AHRQ PSI specifications materials, available on the AHRQ Quality Indicators website http://www.qualityindicators.ahrq.gov.

6.2 Code Specifications

- These specifications were developed using the ICD-9-CM codes current as of March 2009 (version 26). Because our development process relied on data from 2005, we also include in the specifications relevant codes that were valid during any year between 2004 (version 22) and 2009.
- Throughout this document, we specify a continuous number sequence using a dash ("-"). For example, the range 960.0-960.9 includes 960.0; 960.1; 960.2; 960.3; 960.4; 960.5; 960.6; 960.7; 960.8; 960.9. We separate non-continuous codes with a semi-colon (";"). For example: 960.0; 960.3; 960.9
- We specify the exact number of digits required for the code. That is, if 4 digits are required, we specify all 4 digits; if 5 digits are required, we specify all 5 digits. See below for the limited number of exceptions to this rule.
- When a range of codes is listed, it is included within [brackets]. Single codes are not in brackets.
- For each indicator, the variable name used in the SAS software developed to calculate the QIs is indicated in parentheses at the top of the indicator specification table.
- The QI denominator definition is specified in this document. Preliminary denominator specifications, as defined for analyses, is included in Appendix 3. Final denominator specifications, including slight modifications from the definition included here in Section 6.5

6.3 Additional Notes

- Unless otherwise noted, all numerator or denominator exclusions are based on presence of a specified diagnosis code in any position (principal or secondary diagnosis) of an inpatient claim record.
- The AHRQ PQIs (version 4.1) exclude discharges with Major Diagnostic Category (MDC) 14 (pregnancy, childbirth, and puerperium) from numerators. We do not list this exclusion as part of the HCBS QI numerator definitions because MDC is not available from the MAX Inpatient file. However, if calculating the QIs using HCUP data, we recommend implementing the MDC14 exclusion for all HCBS QIs.
- To maintain consistency with the AHRQ PQIs (version 4.1) during our development process, for all HCBS QIs, we deleted all records missing age or sex before calculating QI rates.
- If calculating these indicators using the HCUP State Inpatient Database (SID), individuals transferred from another hospital or from another health care facility, including long-term care, should be excluded from the denominator. The relevant SID data elements and values are (ASOURCE=2 or 3) OR (POINTOFORIGINUB04='4', '5', or '6'). Admission source variables are not present in MAX data so this exclusion is not listed in the detailed specifications that follow. Instead, we recommend counting discharge and admission for the same QI event on the same day by the same individual (same-day readmissions) as a single numerator event rather than as two unique events because same-day readmissions likely represent transfers from one hospital to another. This recommendation was implemented with version 1.8d of the specifications and not implemented with this version (version 1.8c).
- Individuals with institutional claims but no HCBS claims are excluded from the QI denominator. See details in the denominator specification section in Appendix 3.
- Admission records for some dual eligible individuals are present in both the MAX and MedPAR files. To avoid including duplicate events in the numerator, we ignored all MAX inpatient records for dual eligible individuals. When using the ever-in-year definition of the denominator, we ignored MAX inpatient records for all individuals who were dual eligible at any point during the year. When using the quarterly definition of the denominator, we ignored MAX inpatient records for any quarter when the individual was dual eligible. This approach may miss some unique MAX inpatient records (that is, present in the MAX data but not in MedPAR) data for individuals who become dual eligible late in the year or quarter. We recommend that future analyses investigate the magnitude of potentially missed MAX inpatient records.

These specifications represent version 1.8c (11-5-10). QI numerator specifications begin on the next page (Section 6.4), denominator specifications follow in Section 6.5.

6.4 QI Numerator Specifications – Version 1.8c

Short-term Complications of Diabetes Care (Diab01)

Indicator definition:

Number of patients, age 18 and older, admitted for diabetes short-term complications (ketoacidosis, hyperosmolarity, and coma) per denominator population.

Numerator:

All discharges of denominator population with ICD-9-CM diagnosis codes (principal) for *short-term complications of diabetes* (includes type I and type II, both stated as uncontrolled and not stated as uncontrolled) (see below):

Include ICD-9-CM diagnosis codes:

Short-term Complications of Diabetes	
Diabetes with ketoacidosis	
Diabetes with ketoacidosis, Type 2, controlled	250.10
Diabetes with ketoacidosis, Type 1, controlled	250.11
Diabetes with ketoacidosis, Type 2, uncontrolled	250.12
Diabetes with ketoacidosis, Type 1, uncontrolled	250.13
Diabetes with hyperosmolarity	
Diabetes with hyperosmolarity, Type 2, controlled	250.20
Diabetes with hyperosmolarity, Type 1, controlled	250.21
Diabetes with hyperosmolarity, Type 2, uncontrolled	250.22
Diabetes with hyperosmolarity, Type 1, uncontrolled	250.23
Diabetic coma, not elsewhere classified	
Diabetic coma, not elsewhere classified, Type 2, controlled	250.30
Diabetic coma, not elsewhere classified, Type 1, controlled	250.31
Diabetic coma, not elsewhere classified, Type 2, uncontrolled	250.32
Diabetic coma, not elsewhere classified, Type 1, uncontrolled	250.33

Exclude Numerator Discharges:

- Gestational diabetes

Exclude numerator discharges with the following ICD-9-CM diagnosis codes in any field:

Gestational diabetes	648.8

Denominator:

HCBS QI denominator (see Section 6.5).

Asthma or COPD (Asth15)

Indicator definition:

Number of patients, age 18 to 39, admitted for asthma

AND

Number of patients, age 40 and older, admitted for asthma OR chronic obstructive pulmonary disease (COPD)

per denominator population.

Numerator:

For patients age 18 to 39, all discharges of denominator population with ICD-9-CM diagnosis codes (principal) for *Asthma* (see below).

For patients age 40 and older, all discharges of denominator population with ICD-9-CM diagnosis codes (principal) for *Asthma* OR *COPD* (see below).

Include ICD-9-CM diagnosis codes:

Asthma	
Applies to all patients, age 18 and older	
Extrinsic asthma	
Extrinsic asthma, without status asthmaticus	493.00
Extrinsic asthma, with status asthmaticus	493.01
Extrinsic asthma, with (acute) exacerbation	493.02
Intrinsic asthma	
Intrinsic asthma, without status asthmaticus	493.10
Intrinsic asthma, with status asthmaticus	493.11
Intrinsic asthma, with (acute) exacerbation	493.12
Chronic obstructive asthma	
Chronic obstructive asthma, without status asthmaticus	493.20
Chronic obstructive asthma, with status asthmaticus	493.21
Chronic obstructive asthma, with (acute) exacerbation	493.22
Other forms of asthma	
Exercise induced bronchospasm	493.81
Cough variant asthma	493.82
Asthma, unspecified	
Asthma, unspecified, without status asthmaticus	493.90
Asthma, unspecified, with status asthmaticus	493.91
Asthma, unspecified, with (acute) exacerbation	493.92

Chronic Obstructive Pulmonary Disease (COPD)	
Applies only to patients age 40 and older	
Chronic bronchitis	
Simple chronic bronchitis	491.0
Mucopurulent chronic bronchitis	491.1
Obstructive chronic bronchitis without acute exacerbation	491.20
Obstructive chronic bronchitis with acute exacerbation	491.21
Other chronic bronchitis	491.8
Unspecified chronic bronchitis	491.9
Emphysema	
Emphysematous bleb	492.0
Other emphysema	492.8
Bronchiectasis	
Bronchiectasis without acute exacerbation	494.0
Bronchiectasis with acute exacerbation	494.1
Chronic airway obstruction, not elsewhere classified	496
Bronchitis, not specified as acute or chronic[1]	490
Acute bronchitis[1]	466.0

[1]*Code qualifies only when accompanied by secondary diagnosis code of chronic bronchitis [491.0; 491.1; 491.20; 491.21; 491.8; 491.9], emphysema [492.0; 492.8], bronchiectasis [494.0; 494.1] or chronic airway obstruction, not elsewhere classified [496] (see above).*

Exclude Numerator Discharges:

- With any diagnosis code of cystic fibrosis and anomalies of the respiratory system (see below)[2]

Note: This is a global numerator exclusion. It applies to any discharges for Asthma (age 18 and older) or COPD (age 40 and older).

Exclude numerator discharges with the following ICD-9-CM diagnosis codes in <u>any</u> field:

[2]Cystic Fibrosis and Anomalies of the Respiratory System	
Cystic fibrosis	
Cystic fibrosis, without mention of meconium ileus	277.00
Cystic fibrosis, with meconium ileus	277.01
Cystic fibrosis, with pulmonary manifestations	277.02
Cystic fibrosis, with gastrointestinal manifestations	277.03
Cystic fibrosis, with other manifestations	277.09
Anomalies of respiratory system	
Anomalies of aortic arch	747.21

Other anomalies of larynx, trachea, and bronchus	748.3
Congenital cystic lung	748.4
Agenesis, hypoplasia, and dysplasia of lung	748.5
Other anomalies of lung	
Anomaly of lung, unspecified	748.60
Congenital bronchiectasis	748.61
Other	748.69
Other specified anomalies of respiratory system	748.8
Unspecified anomaly of respiratory system	748.9
Tracheoesophageal fistula, esophageal atresia and stenosis	750.3
Situs inversus	759.3
Chronic respiratory disease arising in the perinatal period	770.7

Denominator:

HCBS QI denominator (see Section 6.5).

Congestive Heart Failure (CHF08)

Indicator definition:

Number of patients, age 18 and older, admitted for congestive heart failure (CHF) per denominator population.

Numerator:

All discharges of denominator population with ICD-9-CM diagnosis codes (principal) for *congestive heart failure* (see below):

Include ICD-9-CM diagnosis codes:

Congestive Heart Failure	
Rheumatic heart failure	398.91
Congestive heart failure, unspecified	428.0
Left heart failure	428.1
Systolic heart failure	
Unspecified	428.20
Acute	428.21
Chronic	428.22
Acute on Chronic	428.23
Diastolic heart failure	
Unspecified	428.30
Acute	428.31
Chronic	428.32
Acute on Chronic	428.33
Combined systolic and diastolic heart failure	
Unspecified	428.40
Acute	428.41
Chronic	428.42
Acute on Chronic	428.43
Other heart failure	
Heart failure, unspecified	428.9
Malignant hypertensive heart disease with heart failure	402.01
Benign hypertensive heart and chronic kidney (CKD) disease with heart failure and with CKD stage I-IV	404.11
Benign hypertensive heart disease with heart failure	402.11
Benign hypertensive heart and chronic kidney disease with heart failure and end-stage renal disease	404.13
Hypertensive heart disease, unspecified, with heart failure.	402.91
Hypertensive heart and chronic kidney disease	404.91

(CKD), not otherwise specified, with heart failure and CKD stage I-IV	
Malignant hypertensive heart and chronic kidney disease (CKD) with heart failure and CKD stage I-IV	404.01
Hypertensive heart and chronic kidney disease, not otherwise specified, with heart failure and end-stage renal disease	404.93
Malignant hypertensive heart and chronic kidney disease with heart failure and end-stage renal disease	404.03

Exclude Numerator Discharges:

- With cardiac procedure codes in any field (see below)[1]

Exclude numerator discharges with the following procedure codes in any field:

[1]**Cardiac Procedure Codes**	
Other cardiovascular procedures	[00.50-00.54; 00.56-00.57]
Procedures on blood vessels	00.66
Operations on valves and septa of heart, Closed heart valvotomy	[35.00-35.04]
Open heart valvuloplasty without replacement	[35.10-35.14]
Replacement of heart valve	[35.20-35.28]
Operations on structures adjacent to heart valves	[35.31-35.35; 35.39]
Production of septal defect in heart	[35.41-35.42]
Repair of atrial and ventricular septa with prosthesis	[35.50-35.55]
Repair of atrial and ventricular septa with tissue graft	[35.60-35.63]
Other and unspecified repair of atrial and ventricular septa	[35.70-35.73]
Total repair of certain congenital cardiac anomalies	[35.81-35.84]
Other operations on valves and septa of heart	[35.91-35.96; 35.98-35.99]
Operations on vessels of heart, Removal of coronary artery obstruction and insertion of stent(s)	[36.01-36.07; 36.09]
Bypass anastomosis for heart revascularization	[36.10-36.17; 36.19]
Heart revascularization by arterial implant	36.2
Other heart revascularization	[36.3; 36.31-36.34; 36.39]
Other operations on vessels of heart	[36.91; 36.99]
Other operations on heart and pericardium, Pericardiectomy and excision of lesion of heart	[37.31-37.36]
Repair of heart and pericardium	37.41
Heart replacement procedures	[37.5; 37.51-37.55]
Implantation of heart and circulatory assist system(s)	[37.60-37.66]
Insertion, revision, replacement, and removal of leads; insertion of temporary pacemaker system; or revision of cardiac device pocket	[37.70-37.79]
Insertion, replacement, removal, and revision of	[37.80-37.83; 37.85-

pacemaker device	37.87; 37.89]
Other operations on heart and pericardium	[37.94-37.98]

Denominator:

HCBS QI denominator (see Section 6.5).

Composite: Potentially Preventable Infections (CpInf)
Composite Definition: This composite is composed of two indicators: (i) *Bacterial Pneumonia (Pneu11)* and (ii) *Urinary Tract Infection (UTI12)*.
Numerator: All cases meeting the numerator definition of (i) *Bacterial Pneumonia (Pneu11)* OR (ii) *Urinary Tract Infection (UTI12)*. (See following pages for specifications)
Denominator: All cases meeting the denominator definition of (i) *Bacterial Pneumonia (Pneu11)* OR (ii) *Urinary Tract Infection (UTI12)*. (See following pages for specifications)

Bacterial Pneumonia (Pneu11)

Indicator definition:

Number of patients, age 18 and older, admitted for bacterial pneumonia per denominator population.

Numerator:

All discharges of denominator population with ICD-9-CM diagnosis codes (principal) for *bacterial pneumonia* (see below):

Include ICD-9-CM diagnosis codes:

[1]**Bacterial Pneumonia**	
Pneumococcal pneumonia	481
Pneumonia due to Hemophilus influenzae	482.2
Methicillin susceptible pneumonia due to Staphylococcusaureus	482.41
Methicillin resistant pneumonia due to Staphylococcusaureus	482.42
Pneumonia due to Streptococcus	
Streptococcus, unspecified	482.30
Group A	482.31
Group B	482.32
Other Streptococcus	482.39
Bacterial pneumonia unspecified	482.9
Pneumonia due to other organism	
Mycoplasma pneumonia	483.0
Chlamydia	483.1
Other specified organism	483.8
Bronchopneumonia, organism unspecified	485
Pneumonia, organism unspecified	486
Aspiration Pneumonia	
Pneumonitis due to solids and liquids, Due to inhalation of food or vomitus	507.0

OR

Discharges with a principal diagnosis of HIV/AIDS[2] and a secondary diagnosis of Bacterial Pneumonia[1] that is designated as Present on Admission.
Note: In 2005, only California and New York have present on admission (POA) data in the SID; no states have POA in the MAX dataset. Therefore, when implementing these specifications we will include a principal diagnosis of HIV/AIDS[2] if accompanied by a secondary diagnosis of Bacterial Pneumonia[1] for any state or dataset that does not have POA information available.

[2]**HIV/AIDS**	042

Exclude Numerator Discharges:
- With diagnosis code for sickle cell anemia or HB-S disease (see below)[3]
- With diagnosis code of immunocompromised state (see below)[4]
- With immunocompromised state procedure code (see below)[5]

Exclude numerator discharges with the following ICD-9-CM diagnosis or procedure codes in any field:

[3] Sickle Cell Anemia or HB-S Disease	
Thalassemias	
Sickle-cell thalassemia without crisis	282.41
Sickle-cell thalassemia with crisis	282.42
Sickle-cell disease	
Sickle-cell disease, unspecified	282.60
Hb-SS disease without crisis	282.61
Hb-SS disease with crisis	282.62
Sickle-cell/Hb-C disease without crisis	282.63
Sickle-cell/HB-C disease with crisis	282.64
Other sickle-cell disease without crisis	282.68
Other sickle-cell disease with crisis	282.69

[4]Immunocompromised States	
Pneumocystosis	136.3
Malignant neoplasm associated with transplanted organ	199.2
Neoplasm of uncertain behavior of other and unspecified sites and tissues, Other lymphatic and hematopoietic tissues	[238.73; 238.76-238.77; 238.79]
Kwashiorkor	260
Nutritional marasmus	261
Other severe protein-calorie malnutrition	262
Disorders involving the immune mechanism, Deficiency of humoral immunity	[279.00-279.06; 279.09]
Deficiency of cell-mediated immunity	[279.10-279.13; 279.19]
Combined immunity deficiency	279.2
Unspecified immunity deficiency	279.3
Autoimmune disease, not elsewhere classified	[279.4; 279.41; 279.49]
Graft-versus-host disease	[279.50-279.53]
Other specified disorders involving the immune mechanism	279.8
Unspecified disorder of immune mechanism	279.9
Aplastic anemia and other bone marrow failure syndromes	[284.0; 284.09; 284.1; 284.8]
Neutropenia	[288.0; 288.00-288.03; 288.09]
Functional disorders of polymorphonuclear neutrophils	288.1
Genetic anomalies of leukocytes	288.2

Hemophagocytic syndromes	288.4
Decreased white blood cell count	[288.50-288.51; 288.59]
Neutropenic splenomegaly	289.53
Myelofibrosis	289.83
Hypertensive chronic kidney disease Malignant, with chronic kidney disease stage V or end stage renal disease	403.01
Benign, with chronic kidney disease stage V or end stage renal disease	403.11
Unspecified, with chronic kidney disease stage V or end stage renal disease	403.91
Hypertensive heart and chronic kidney disease	[404.02-404.03; 404.12-404.13; 404.92-404.93]
Intestinal malabsorption, Other and unspecified postsurgical nonabsorption	579.3
Chronic kidney disease (CKD)	[585; 585.5-585.6]
Complications of transplanted organ	[996.80-996.87; 996.89]
Observation codes for transplants	[V42.0-42.1; V42.6-42.8; V42.81-V42.84; V42.89]
Renal dialysis status	[V45.1; V45.11]
Encounter for dialysis and dialysis catheter care	[V56.0-V56.2]

[5]**Immunocompromised States Procedure Codes**	
Infusion of immunosuppressive antibody therapy	00.18
Lung transplant	[33.5; 33.50-33.52]
Combined heart-lung transplantation	33.6
Heart replacement procedures	[37.5; 37.51]
Bone marrow or hematopoietic stem cell transplant	[41.0; 41.00-41.09]
Liver transplant	[50.51; 50.59]
Transplant of pancreas	[52.80-52.83; 52.85-52.86]
Other kidney transplantation	55.69

Denominator:

HCBS QI denominator (see Section 6.5).

Urinary Tract Infection (UTI12)

Indicator definition:

Number of patients, age 18 and older, admitted for urinary tract infection per denominator population.

Numerator:

All discharges of denominator population with ICD-9-CM diagnosis codes (principal) for *urinary tract infection* (see below):

Include ICD-9-CM diagnosis codes:

[1]Urinary Tract Infection	
Acute pyelonephritis	
Without lesion of renal medullary necrosis	590.10
With lesion of renal medullary necrosis	590.11
Renal and perinephric abscess	590.2
Pyeloureteritis cystica	590.3
Other pyelonephritis or pyonephrosis, not specified as acute or chronic	
Pyelitis or pyelonephritis not otherwise specified	590.80
Pyelitis or pyelonephritis in diseases classified elsewhere	590.81
Infection of kidney, not otherwise specified	590.9
Cystitis	
Acute cystitis	595.0
Cystitis, not otherwise specified	595.9
Urinary tract infection, not otherwise specified	599.0

OR

Patients with a principal diagnosis code of sepsis[2], with a secondary diagnosis of UTI[1] designated as "present on admission."
Note: In 2005, only California and New York have present on admission (POA) data in the SID; no states have POA in the MAX dataset. Therefore, when implementing these specifications we will include a principal diagnosis of sepsis[2] if accompanied by a secondary diagnosis of UTI[1] for any state or dataset that does not have POA information available.

[2]Sepsis	
Streptococcal Septicemia	038.0
Staphylococcal Septicemia	038.1
Staphylococcal Septicemia, Unspecified	038.10
Staphylococcus Aureus Septicemia	038.11
Other Staphylococcal Septicemia	038.19

Pneumococcal Septicemia (Streptococcus Pneumoniae Septicemia)	038.2
Septicemia Due To Anaerobes	038.3
Gram-Negative Organism, Unspecified	038.40
Hemophilus Influenzae	038.41
Escherichia Coli	038.42
Pseudomonas	038.43
Serratia	038.44
Septicemia Due To Other Gram-Negative Organisms	038.49
Other Specified Septicemias	038.8
Unspecified Septicemia	038.9
Septic Shock	785.52
Shock W/O Trauma Nec	785.59
Systemic Inflammatory Response Syndrome Due To Infectious	
Process Without Organ Dysfunction	995.91
Process With Organ Dysfunction	995.92
Postoperative Shock	998.0

OR

Patients with a principal diagnosis code of in-dwelling urinary catheter infection[3], with a secondary diagnosis of UTI[1] designated as "present on admission."
Note: In 2005, only California and New York have present on admission (POA) data in the SID; no states have POA in the MAX dataset. Therefore, when implementing these specifications we will include a principal diagnosis of in-dwelling urinary catheter infection[3] if accompanied by a secondary diagnosis of UTI[1] for any state or dataset that does not have POA information available.

[3] **In-dwelling Urinary Catheter Infection**	996.64

Exclude Numerator Discharges:
- With diagnosis code of kidney/urinary tract disorder[4]
- With diagnosis code of immunocompromised state[5]
- With immunocompromised state procedure code[6]

Exclude numerator discharges with the following ICD-9-CM diagnosis codes and procedure codes in <u>any</u> field:

[4] **Kidney/urinary Tract Disorder**	
Chronic pyelonephritis	[590.00-590.01]
Vesicoureteral reflux	[593.70-593.73]
Renal agenesis and dysgenesis	753.0
Cystic kidney disease	[753.10-753.17; 753.19]
Obstructive defects of renal pelvis and ureter	[753.20-753.23; 753.29]
Other specified anomalies of kidney	753.3
Other specified anomalies of ureter	753.4
Exstrophy of urinary bladder	753.5

Atresia and stenosis of urethra and bladder neck	753.6
Other specified anomalies of bladder and urethra	753.8
Unspecified anomaly of urinary system	753.9

[5] **Immunocompromised States**	
Pneumocystosis	136.3
Malignant neoplasm associated with transplanted organ	199.2
Neoplasm of uncertain behavior of other and unspecified sites and tissues, Other lymphatic and hematopoietic tissues	[238.73; 238.76-238.77; 238.79]
Kwashiorkor	260
Nutritional marasmus	261
Other severe protein-calorie malnutrition	262
Disorders involving the immune mechanism, Deficiency of humoral immunity	[279.00-279.06; 279.09]
Deficiency of cell-mediated immunity	[279.10-279.13; 279.19]
Combined immunity deficiency	279.2
Unspecified immunity deficiency	279.3
Autoimmune disease, not elsewhere classified	[279.4; 279.41; 279.49]
Graft-versus-host disease	[279.50-279.53]
Other specified disorders involving the immune mechanism	279.8
Unspecified disorder of immune mechanism	279.9
Aplastic anemia and other bone marrow failure syndromes	[284.0; 284.09; 284.1; 284.8]
Neutropenia	[288.0; 288.00-288.03; 288.09]
Functional disorders of polymorphonuclear neutrophils	288.1
Genetic anomalies of leukocytes	288.2
Hemophagocytic syndromes	288.4
Decreased white blood cell count	[288.50-288.51; 288.59]
Neutropenic splenomegaly	289.53
Myelofibrosis	289.83
Hypertensive chronic kidney disease	
Malignant, with chronic kidney disease stage V or end stage renal disease	403.01
Benign, with chronic kidney disease stage V or end stage renal disease	403.11
Unspecified, with chronic kidney disease stage V or end stage renal disease	403.91
Hypertensive heart and chronic kidney disease	[404.02-404.03; 404.12-404.13; 404.92-404.93]
Intestinal malabsorption, Other and unspecified postsurgical nonabsorption	579.3
Chronic kidney disease (CKD)	[585; 585.5-585.6]
Complications of transplanted organ	[996.80-996.87; 996.89]
Observation codes for transplants	[V42.0-42.1; V42.6-42.8; V42.81-V42.84; V42.89]
Renal dialysis status	[V45.1; V45.11]

Encounter for dialysis and dialysis catheter care	[V56.0-V56.2]

[6] Immunocompromised States Procedure Codes	
Infusion of immunosuppressive antibody therapy	00.18
Lung transplant	[33.5; 33.50-33.52]
Combined heart-lung transplantation	33.6
Heart replacement procedures	[37.5; 37.51]
Bone marrow or hematopoietic stem cell transplant	[41.0; 41.00-41.09]
Liver transplant	[50.51; 50.59]
Transplant of pancreas	[52.80-52.83; 52.85-52.86]
Other kidney transplantation	55.69

Denominator:

HCBS QI denominator (see Section 6.5).

Infection due to Device or Implant (Prosth)

Indicator definition:

Number of patients, age 18 and older, admitted for infection due to device or implant per denominator population.

Numerator:

All discharges of eligible population with ICD-9-CM diagnosis codes (principal) for *infection due to device or implant* (see below):

Include ICD-9-CM diagnosis codes:

Infection due to Device or Implant	
Due to unspecified device, implant, and graft	996.60
Due to cardiac device, implant, and graft	996.61
Due to other vascular device, implant, and graft	996.62
Due to nervous system device, implant, and graft	996.63
Due to other genitourinary device, implant, and graft	996.65
Due to internal joint prosthesis	996.66
Due to other internal orthopedic device, implant, and graft	996.67
Due to peritoneal dialysis catheter	996.68
Due to other internal prosthetic device, implant, and graft	996.69

Denominator:

HCBS QI denominator (see Section 6.5).

Dehydration or Hypernatremia (Dehy10)

Indicator definition:

Number of patients, age 18 and older, admitted for dehydration or hyperosmolarity/hypernatremia per denominator population.

Numerator:

All discharges of denominator population with ICD-9-CM diagnosis codes (principal) for *dehydration* or *hyperosmolarity/hypernatremia* (see below):

Include ICD-9-CM diagnosis codes:

[1] Dehydration	
Volume depletion	276.5
Volume depletion, unspecified	276.50
Dehydration	276.51
Hypovolemia	276.52

OR

Discharges with a principal diagnosis of Hyperosmolarity and/or hypernatremia[2] with a secondary diagnosis of dehydration[1]

[2] Hyperosmolarity and/or Hypernatremia	276.0

OR

Discharges with a principal diagnosis of gastroenteritis[3] when accompanied by a secondary diagnosis of dehydration[1] designated as "present on admission."
Note: In 2005, only California and New York have present on admission (POA) data in the SID; no states have POA in the MAX dataset. Therefore, when implementing these specifications we will include a principal diagnosis of gastroenteritis if accompanied by a secondary diagnosis of dehydration for any state or dataset that does not have POA information available.

[3] Gastroenteritis	
Enteritis due to specified virus	
Rotavirus	008.61
Adenovirus	008.62
Norwalk virus	008.63
Other small round viruses (SRVs)	008.64
Calicivirus	008.65
Astrovirus	008.66
Enterovirus, not elsewhere classified	008.67
Enteritis, not otherwise specified	008.69
Other organism, not elsewhere classified	008.8

Infectious colitis, enteritis, and gastroenteritis	009.0
Colitis, enteritis, and gastroenteritis of presumed infectious origin	009.1
Infectious diarrhea	009.2
Diarrhea of presumed infectious origin	009.3
Other and unspecified noninfectious gastroenteritis and colitis	558.9

OR

Principal diagnosis of acute renal failure[4], without any other diagnosis of chronic kidney disease,[5] when accompanied by a secondary diagnosis of dehydration[1] designated as "present on admission."
Note: In 2005, only California and New York have present on admission (POA) data in the SID; no states have POA in the MAX dataset. Therefore, when implementing these specifications we will include a principal diagnosis of acute renal failure (without any other diagnosis of chronic kidney disease) if accompanied by a secondary diagnosis of dehydration for any state or dataset that does not have POA information available.

[4] **Acute Renal Failure**	
Acute renal failure with lesion of tubular necrosis	584.5
Acute renal failure with lesion of renal cortical necrosis	584.6
Acute renal failure with lesion of renal medullary (papillary) necrosis	584.7
Unspecified acute renal failure	584.9

[5] **Chronic Kidney Disease**	
Chronic kidney disease	585
Chronic kidney disease, Stage I	585.1
Chronic kidney disease, Stage II	585.2
Chronic kidney disease, Stage III	585.3
Chronic kidney disease, Stage IV	585.4
Chronic kidney disease, Stage V	585.5
End stage renal disease	585.6
Chronic kidney disease, unspecified	585.9

OR

Discharges with a principal diagnosis of HIV/AIDS[6] and a secondary diagnosis of dehydration[1] that is designated as "present on admission."
Note: In 2005, only California and New York have present on admission (POA) data in the SID; no states have POA in the MAX dataset. Therefore, when implementing these specifications we will include a principal diagnosis of HIV/AIDS[6] if accompanied by a secondary diagnosis of Dehydration[1] for any state or dataset that does not have POA information available.

[6]**HIV/AIDS**	042

Denominator:

HCBS QI denominator (see Section 6.5)

Composite: Ambulatory Care Sensitive Conditions - Chronic Conditions (CpChr)

Composite Definition:

Admissions for any of the chronic condition PQIs per denominator population.

Numerator:

Discharges with ICD-9-CM diagnosis code(s) meeting the definition for any of the chronic condition PQIs (see below) and meeting the inclusion rules for the denominator (see below).

Chronic Conditions PQIs
Diabetes, short-term complications (PQI 1)
Diabetes, long-term complications (PQI 3)
COPD (PQI 5)
Hypertension (PQI 7)
Congestive heart failure (PQI 8) [see note below]
Angina without procedure (PQI 13)
Uncontrolled diabetes (PQI 14)
Adult asthma (PQI 15)
Lower extremity amputations among people with diabetes (PQI 16)

Denominator:

HCBS QI denominator (see Section 6.5).

Notes:

- For the purposes of calculating these composites, the current version of the AHRQ PQIs should be used (version 4.1), with one exception (noted below). For further details on the ACSC Composites, see the following report: http://www.qualityindicators.ahrq.gov/downloads/pqi/AHRQ_PQI_Composite_Final.pdf
- This composite is based on the version 4.1 PQI definitions (December 2009). However, the following codes will be included in PQI#8 (Congestive Heart Failure) in the next release of the AHRQ PQI software and therefore are included in the numerator definition of PQI#8 used to calculate this composite: 402.01; 404.11; 402.11; 404.13; 402.91; 404.91; 404.01; 404.93; 404.03.

Composite: Ambulatory Care Sensitive Conditions - Acute Conditions (CpAcute)

Composite Definition:

Admissions for any of the acute condition PQIs per denominator population.

Numerator:

Discharges with ICD-9-CM diagnosis code(s) meeting the definition for any of the acute condition PQIs (see below) and meeting the inclusion rules for the denominator (see below).

Acute Condition PQIs
Dehydration (PQI 10)
Bacterial Pneumonia (PQI 11)
Urinary Tract Infection (PQI 12)

Denominator:

HCBS QI denominator (see Section 6.5).

Notes:

- For the purposes of calculating these composites, version 4.1 of the AHRQ PQIs should be used. For further details on the ACSC Composites, see the following report: http://www.qualityindicators.ahrq.gov/downloads/pqi/AHRQ_PQI_Composite_Final.pdf

Composite: Ambulatory Care Sensitive Conditions - Overall (CpAll)

Composite Definition:

Admissions for any of the chronic or acute PQIs per denominator population.

Numerator:

Discharges with ICD-9-CM diagnosis code(s) meeting the definition for any of the chronic or acute condition PQIs (see below) and meeting the inclusion rules for the denominator (see below).

Chronic and Acute Condition PQIs
Diabetes, short-term complications (PQI 1)
Diabetes, long-term complications (PQI 3)
COPD (PQI 5)
Hypertension (PQI 7)
Congestive heart failure (PQI 8) [see note below]
Dehydration (PQI 10)
Bacterial Pneumonia (PQI 11)
Urinary Tract Infection (PQI 12)
Angina without procedure (PQI 13)
Uncontrolled diabetes (PQI 14)
Adult asthma (PQI 15)
Lower extremity amputations among people with diabetes (PQI 16)

Denominator:

HCBS QI denominator (see Section 6.5).

Notes:

- For the purposes of calculating these composites, the version 4.1 of the AHRQ PQIs should be used, with one exception (noted below). For further details on the ACSC Composites, see the following report: http://www.qualityindicators.ahrq.gov/downloads/pqi/AHRQ_PQI_Composite_Final.pdf
- This composite is based on the version 4.1 PQI definitions (December 2009). However, the following codes will be included in PQI#8 (Congestive Heart Failure) in the next release of the AHRQ PQI software therefore are included in the numerator definition of PQI#8 used to calculate this composite: 402.01; 404.11; 402.11; 404.13; 402.91; 404.91; 404.01; 404.93; 404.03.

Pressure Ulcer (PU03)

Indicator definition:

Number of patients, age 18 and older, hospitalized with pressure ulcer per denominator population

Numerator:

All discharges of denominator population with ICD-9-CM diagnosis codes (principal or secondary) for *pressure ulcer* (see below):

Include ICD-9-CM diagnosis codes:

Pressure Ulcer (location)	
Pressure ulcer	707.0
pressure ulcer, unspecified site	707.00
pressure ulcer, elbow	707.01
pressure ulcer, upper back	707.02
pressure ulcer, lower back	707.03
pressure ulcer, hip	707.04
pressure ulcer, buttock	707.05
pressure ulcer, ankle	707.06
pressure ulcer, heel	707.07
pressure ulcer, other site	707.09

OR

Any secondary diagnosis of stage III or IV pressure ulcer

Stage III or IV Pressure Ulcer	
Pressure ulcer, unspecified stage	707.20
Pressure ulcer, stage III	707.23
Pressure ulcer, stage IV	707.24
Pressure ulcer, unstagable	707.25

Denominator:

HCBS QI denominator (see Section 6.5).

Notes:

- This indicator is based on a modified version of the AHRQ Patient Safety Indicator 3 (version 3.2, March 2008) definition.
- Codes for pressure ulcer stage were not implemented until October 2008. When using data prior to 2008, this indicator is based on just the pressure ulcer location codes.

Injurious Falls (Falls)

Indicator definition:

Number of patients, age 18 and older, admitted for injurious falls per denominator population.

Numerator:

All discharges of denominator population with ICD-9-CM diagnosis codes for *injurious falls* (see below):

Include any ICD-9-CM diagnosis codes (principal or secondary) for *injuries* when accompanied by an E code (secondary diagnosis) for *falls*:

Injuries	
Fracture of vault of skull	[800.00-800.06; 800.09; 800.10-800.16; 800.19; 800.20-800.26; 800.29; 800.30-800.36; 800.39; 800.40-800.46; 800.49; 800.50-800.56; 800.59; 800.60-800.66; 800.69; 800.70-800.76; 800.79; 800.80-800.86; 800.89; 800.90-800.96; 800.99]
Fracture of base of skull	[801.00-801.06; 801.09; 801.10-801.16; 801.19; 801.20-801.26; 801.29; 801.30-801.36; 801.39; 801.40-801.46; 801.49; 801.50-801.56; 801.59; 801.60-801.66; 801.69; 801.70-801.76; 801.79; 801.80-801.86; 801.89; 801.90-801.96; 801.99]
Fracture of face bones	[802.0-802.1; 802.20-802.29; 802.30-802.39; 802.4-802.9]
Other and unqualified skull fractures	[803.00-803.06; 803.09; 803.10-803.16; 803.19; 803.20-803.26; 803.29; 803.30-803.36; 803.39; 803.40-803.46; 803.49; 803.50-803.56; 803.59; 803.60-803.66; 803.69; 803.70-803.76; 803.79; 803.80-803.86; 803.89; 803.90-803.96; 803.99]
Multiple fractures involving skull or face with other bones	[804.00-804.06; 804.09; 804.10-804.16; 804.19; 804.20-804.26; 804.29; 804.30-804.36; 804.39; 804.40-804.46; 804.49; 804.50-804.56; 804.59; 804.60-804.66; 804.69; 804.70-804.76; 804.79; 804.80-804.86; 804.89; 804.90-804.96; 804.99]
Fracture of vertebral column without mention of spinal cord injury	[805.00-805.08; 805.10-805.18; 805.2-805.9]
Fracture of vertebral column	[806.00-806.09; 806.10-806.19; 806.20-

	with spinal cord injury	806.29; 806.30-806.39; 806.4-806.5; 806.60-806.62; 806.69; 806.70-806.72; 806.79; 806.8-806.9]	
	Fracture of ribs, sternum, larynx and trachea	[807.00-807.09; 807.10-807.19; 807.2-807.6]	
	Fracture of pelvis	[808.0-808.3; 808.41-808.43; 808.49; 808.51-808.53; 808.59; 808.8-808.9]	
	Ill-defined fractures of bones and trunk	[809.0-809.1]	
	Fracture of clavicle	[810.00-810.03; 810.10-810.13]	
	Fracture of scapula	[811.00-811.03; 811.09; 811.10-811.13; 811.19]	
	Fracture of humerus	[812.00-812.03; 812.09; 812.10-812.13; 812.19; 812.20-812.21; 812.30-812.31; 812.40-812.44; 812.49; 812.50-812.54; 812.59]	
	Fracture of radius and ulna	[813.00-813.08; 813.10-813.18; 813.20-813.23; 813.30-813.33; 813.40-813.47; 813.50-813.54; 813.80-813.83; 813.90-813.93]	
	Fracture of hand	[814.00-814.09; 814.10-814.19; 815.00-815.04; 815.09; 815.10-815.14; 815.19; 816.00-816.03; 816.10-816.13; 817.0-817.1; 818.0-818.1; 819.0-819.1]	
	Fracture of femur	[820.00-820.03; 820.09; 820.10-820.13; 820.19; 820.20-820.22; 820.30-820.32; 820.8-820.9; 821.00-821.01; 821.10-821.11; 821.20-821.23; 821.29; 821.30-821.33; 821.39]	
	Fracture of knee	[822.0; 822.1]	
	Fracture of lower leg	[823.00-823.02; 823.10-823.12; 823.20-823.22; 823.30-823.32; 823.40-823.42; 823.80-823.82; 823.90-823.92; 824.0-824.9]	
	Fracture of foot	[825.0-825.1; 825.20-825.25; 825.29; 825.30-825.35; 825.39; 826.0-826.1]	
	Multiple fractures involving lower limb	[827.0-827.1; 828.0-828.1; 829.0-829.1]	
	Dislocation	[830.0-830.1; 831.00-831.04; 831.09; 831.10-831.14; 831.19; 832.00-832.04; 832.09; 832.10-832.14; 832.19; 832.2; 833.00-833.05; 833.09; 833.10-833.15; 833.19; 834.00-834.02; 834.10-834.12;	

		835.00-835.03; 835.10-835.13; 836.0-836.4; 836.50-836.54; 836.59; 836.60-836.64; 836.69; 837.0-837.1; 838.00-838.06; 838.09; 838.10-838.16; 838.19; 839.00-839.08; 839.10-839.18; 839.20-839.21; 839.30-839.31; 839.40-839.42; 839.49; 839.50-839.52; 839.59; 839.61; 839.69; 839.71; 839.79; 839.8; 839.9]	
	Sprains and strains of joints and adjacent muscles	[840.0-840.9; 841.0-841.3; 841.8-841.9; 842.00-842.02; 842.09; 842.10-842.13; 842.19; 843.0-843.1; 843.8-843.9; 844.0-844.3; 844.8-844.9; 845.00-845.03; 845.09; 845.10-845.13; 845.19; 846.0-846.3; 846.8-846.9; 847.0-847.4; 847.9; 848.0-848.3; 848.40-848.42; 848.49; 848.5; 848.8; 848.9]	
	Intracranial injury, excluding those with skull fracture	[850.0; 850.11-850.12; 850.2-850.5; 850.9; 851.00-851.06; 851.09; 851.10-851.16; 851.19; 851.20-851.26; 851.29; 851.30-851.36; 851.39; 851.40-851.46; 851.49; 851.50-851.56; 851.59; 851.60-851.66; 851.69; 851.70-851.76; 851.79; 851.80-851.86; 851.89; 851.90-851.96; 851.99; 852.00-852.06; 852.09; 852.10-852.16; 852.19; 852.20-852.26; 852.29; 852.30-852.36; 852.39; 852.40-852.46; 852.49; 852.50-852.56; 852.59; 853.00-852.06; 853.09; 853.10-853.16; 853.19; 854.00-854.06; 854.09; 854.10-854.16; 854.19]	
	Internal injury of thorax, abdomen, and pelvis	[860.0-860.5; 861.00-861.03; 861.10-861.13; 861.20-861.22; 861.30-861.32; 862.0-862.1; 862.21-862.22; 862.29; 862.31-862.32; 862.39; 862.8-862.9; 863.0-863.1; 863.20-863.21; 863.29; 863.30-863.31; 863.39; 863.40-863.46; 863.49; 863.50-863.56; 863.59; 863.80-863.85; 863.89; 863.90-863.95; 863.99; 864.00-864.05; 864.09; 864.10-864.15; 864.19; 865.00-865.04; 865.09; 865.10-865.14; 865.19; 866.00-866.03; 866.10-866.13; 867.0-867.9; 868.00-868.04; 868.09; 868.10-868.14; 868.19; 869.0-869.1]	
	Open wound of head, neck, and trunk	[870.0-870.4; 870.8-870.9; 871.0-871.7; 871.9; 872.00-872.02; 872.10-872.12; 872.61-872.64; 872.69; 872.71-872.74; 872.79; 872.8-872.9; 873.0-873.1; 873.20-873.23; 873.29; 873.30-873.33; 873.39; 873.40-873.44; 873.49; 873.50-873.54; 873.59; 873.60-873.65; 873.69; 873.70-873.75; 873.79; 873.8-873.9; 874.00-874.02; 874.10-874.12; 874.2-874.5; 874.8-874.9; 875.0-875.1; 876.0-876.1; 877.0-877.1; 878.0-878.9; 879.0-879.9]	

Open wound of upper limb	[880.00-880.03; 880.09; 880.10-880.13; 880.19; 880.20-880.23; 880.29; 881.00-881.02; 881.10-881.12; 881.20-881.22; 882.0-882.2; 883.0-883.2; 884.0-884.2; 885.0-885.1; 886.0-886.1; 887.0-887.7]
Open wound of lower limb	[890.0-890.2; 891.0-891.2; 892.0-892.2; 893.0-893.2; 894.0-894.2; 895.0-895.1; 896.0-896.3; 897.0-897.7]
Injury to blood vessels	[900.00-900.03; 900.1; 900.81-900.82; 900.89; 900.9; 901.0-901.3; 901.40-901.42; 901.81-901.83; 901.89; 901.9; 902.0; 902.10-902.11; 902.19; 902.20-902.27; 902.29; 902.31-902.34; 902.39; 902.40-902.42; 902.49; 902.50-902.56; 902.59; 902.81-902.82; 902.87; 902.89; 902.9; 903.00-903.02; 903.1-903.5; 903.8-903.9; 904.0-904.3; 904.40-904.42; 904.50-904.54; 904.6-904.9]
Superficial injury	[910.0-910.9; 911.0-911.9; 912.0-912.9; 913.0-913.9; 914.0-914.9; 915.0-915.9; 916.0-916.9; 917.0-917.9; 918.0-918.2; 918.9; 919.0-919.9]
Contusion with intact skin surface	[920; 921.0-921.3; 921.9; 922.0-922.2; 922.31-922.33; 922.4; 922.8-922.9; 923.00-923.03; 923.09; 923.10-923.11; 923.20-923.21; 923.3; 923.8-923.9; 924.00-924.01; 924.10-924.11; 924.20-924.21; 924.3-924.5; 924.8-924.9]
Crushing injury	[925.1-925.2; 926.0; 926.11-926.12; 926.19; 926.8-926.9; 927.00-927.03; 927.09; 927.10-927.11; 927.20-927.21; 927.3; 927.8-927.9; 928.00-928.01; 928.10-928.11; 928.20-928.21; 928.3; 928.8-928.9; 929.0; 929.9]
Injury to nerves and spinal cord	[950.0-950.3; 950.9; 951.0-951.9; 952.00-952.09; 952.10-952.19; 952.2-952.4; 952.8-952.9; 953.0-953.5; 953.8-953.9; 954.0-954.1; 954.8-954.9; 955.0-955.9; 956.0-956.5; 956.8-956.9; 957.0-957.1; 957.8-957.9]

AND when accompanied by any secondary diagnosis of:

Fall Codes	
Accidental fall on or from stairs or steps	[E880.0-E880.1; E880.9]
Accidental fall on or from ladders or scaffolding	[E881.0-E881.1]

Accidental fall from or out of building or structure	E882
Accidental fall into hole or other opening in surface	[E883.0-E883.2; E883.9]
Other accidental fall from one level to another	[E884.0-E884.6; E884.9]
Accidental fall on same level from slipping, tripping, or stumbling	[E885.0-E885.4; E885.9]
Accidental fall on same level from collision, pushing, or shoving, by or with another person	[E886.0; E886.9]
Other and unspecified accidental fall	[E888.0-E888.1; E888.8-E888.9]

Exclude Numerator Discharges:

- With any diagnosis code (principal or secondary) for late effects of injuries[1]
- With any diagnosis code (principal or secondary) for other injury exclusons[2]
- With any diagnosis code (principal or secondary) for syncope[3]
- With any diagnosis code (principal or secondary) for seizures[4]
- With any diagnosis code (principal or secondary) for stroke[5]
- With a principal diagnosis code for bacterial pneumonia[6]
- With a principal diagnosis code for dehydration[7]
- With a principal diagnosis code for Chronic Obstructive Pulmonary Disease (COPD)[8]
- With a principal diagnosis code for Congestive Heart Failure (CHF)[9]
- With a principal diagnosis code for Urinary Tract Infection (UTI)[10]

Exclude numerator discharges with the following ICD-9-CM diagnosis and E codes:

[1]**Late Effects of Injuries (principal or secondary)**	
Late effects of musculoskeletal and connective tissue injuries	[905.0-905.9]
Late effects of injuries to skin and subcutaneous tissues	[906.0-906.9]
Late effects of injuries to the nervous system	[907.0-907.5; 907.9]
Late effects of other and unspecified injuries	[908.0-908.6; 908.9]
Late effects of other and unspecified external causes	[909.0-909.5; 909.9]

[2]**Other Injury Exclusions (principal or secondary)**	
Certain early complications of trauma	[958.0-958.8; 958.80-958.93; 958.99]
Foreign body in orifice	[930.0-930.2; 930.8-930.9; 931; 932; 933.0-933.1; 934.0-934.1; 934.8-934.9; 935.0-935.2; 936; 937; 938; 939.0-939.3; 939.9]

[3]Syncope Exclusions (principal or secondary)	
Carotid sinus syndrome	337.01
Syncope and collapse	780.2

[4]Seizures (principal or secondary)	
Generalized nonconvulsive epilepsy	[345.00-345.01]
Generalized convulsive epilepsy	[345.10-345.11]
Petit mal status	345.2
Grand mal status	345.3
Localization-related (focal) (partial) epilepsy and epileptic syndromes with complex partial seizures	[345.40-345.41]
Localization-related (focal) (partial) epilepsy and epileptic syndromes with simple partial seizures	[345.50-345.51]
Infantile spasms	[345.60-345.61]
Epilepsia partialis continua	[345.70-345.71]
Other forms of epilepsy and recurrent seizures	[345.80-345.81]
Epilepsy, unspecified	[345.90-345.91]
Convulsions	780.3; 780.31; 780.32; 780.39

[5]Stroke (principal or secondary)	
Subarachnoid hemorrhage	430
Intracerebral hemorrhage	431
Other and unspecified intracranial hemorrhage	432.0; 432.1; 432.9
Occlusion and stenosis of precerebral arteries with cerebral infarction	433.01; 433.11; 433.21; 433.31; 433.81; 433.91
Occlusion of cerebral arteries with cerebral infarction	434.01; 434.11; 434.91
Transient cerebral ischemia	435.0; 435.1; 435.3
Acute, but ill-defined, cerebrovascular disease	436
Iatrogenic cerebrovascular infarction or hemorrhage	997.02

[6]Bacterial Pneumonia (principal only)	
Pneumococcal pneumonia	481
Pneumonia due to Hemophilus influenzae	482.2
Methicillin susceptible pneumonia due to Staphylococcusaureus	482.41
Methicillin resistant pneumonia due to Staphylococcusaureus	482.42

Pneumonia due to Streptococcus	
Streptococcus, unspecified	482.30
Group A	482.31
Group B	482.32
Other Streptococcus	482.39
Bacterial pneumonia unspecified	482.9
Pneumonia due to other organism	
Mycoplasma pneumonia	483.0
Chlamydia	483.1
Other specified organism	483.8
Bronchopneumonia, organism unspecified	485
Pneumonia, organism unspecified	486
Aspiration Pneumonia	
Pneumonitis due to solids and liquids, Due to inhalation of food or vomitus	507.0

[7] **Dehydration (principal only)**	
Volume depletion	276.5
Volume depletion, unspecified	276.50
Dehydration	276.51
Hypovolemia	276.52

[8] **Chronic Obstructive Pulmonary Disease (COPD) (principal only)**	
Applies only to patients age 40 and older	
Chronic bronchitis	
Simple chronic bronchitis	491.0
Mucopurulent chronic bronchitis	491.1
Obstructive chronic bronchitis without acute exacerbation	491.20
Obstructive chronic bronchitis with acute exacerbation	491.21
Other chronic bronchitis	491.8
Unspecified chronic bronchitis	491.9
Emphysema	
Emphysematous bleb	492.0
Other emphysema	492.8
Bronchiectasis	
Bronchiectasis without acute exacerbation	494.0
Bronchiectasis with acute exacerbation	494.1
Chronic airway obstruction, not elsewhere classified	496
Bronchitis, not specified as acute or chronic	490
Acute bronchitis*	466.0

[9] **Congestive Heart Failure (CHF) (principal only)**	
Rheumatic heart failure	398.91
Congestive heart failure, unspecified	428.0

Left heart failure	428.1
Systolic heart failure	
Unspecified	428.20
Acute	428.21
Chronic	428.22
Acute on Chronic	428.23
Diastolic heart failure	
Unspecified	428.30
Acute	428.31
Chronic	428.32
Acute on Chronic	428.33
Combined systolic and diastolic heart failure	
Unspecified	428.40
Acute	428.41
Chronic	428.42
Acute on Chronic	428.43
Other heart failure	
Heart failure, unspecified	428.9
Malignant hypertensive heart disease with heart failure	402.01
Benign hypertensive heart and chronic kidney (CKD) disease with heart failure and with CKD stage I-IV	404.11
Benign hypertensive heart disease with heart failure	402.11
Benign hypertensive heart and chronic kidney disease with heart failure and end-stage renal disease	404.13
Hypertensive heart disease, unspecified, with heart failure.	402.91
Hypertensive heart and chronic kidney disease (CKD), not otherwise specified, with heart failure and CKD stage I-IV	404.91
Malignant hypertensive heart and chronic kidney disease (CKD) with heart failure and CKD stage I-IV	404.01
Hypertensive heart and chronic kidney disease, not otherwise specified, with heart failure and end-stage renal disease	404.93
Malignant hypertensive heart and chronic kidney disease with heart failure and end-stage renal disease	404.03

[10]**Urinary Tract Infection (principal only)**	
Acute pyelonephritis	
Without lesion of renal medullary necrosis	590.10
With lesion of renal medullary necrosis	590.11
Renal and perinephric abscess	590.2
Pyeloureteritis cystica	590.3

Other pyelonephritis or pyonephrosis, not specified as acute or chronic	
Pyelitis or pyelonephritis not otherwise specified	590.80
Pyelitis or pyelonephritis in diseases classified elsewhere	590.81
Infection of kidney, not otherwise specified	590.9
Cystitis	
Acute cystitis	595.0
Cystitis, not otherwise specified	595.9
Urinary tract infection, not otherwise specified	599.0

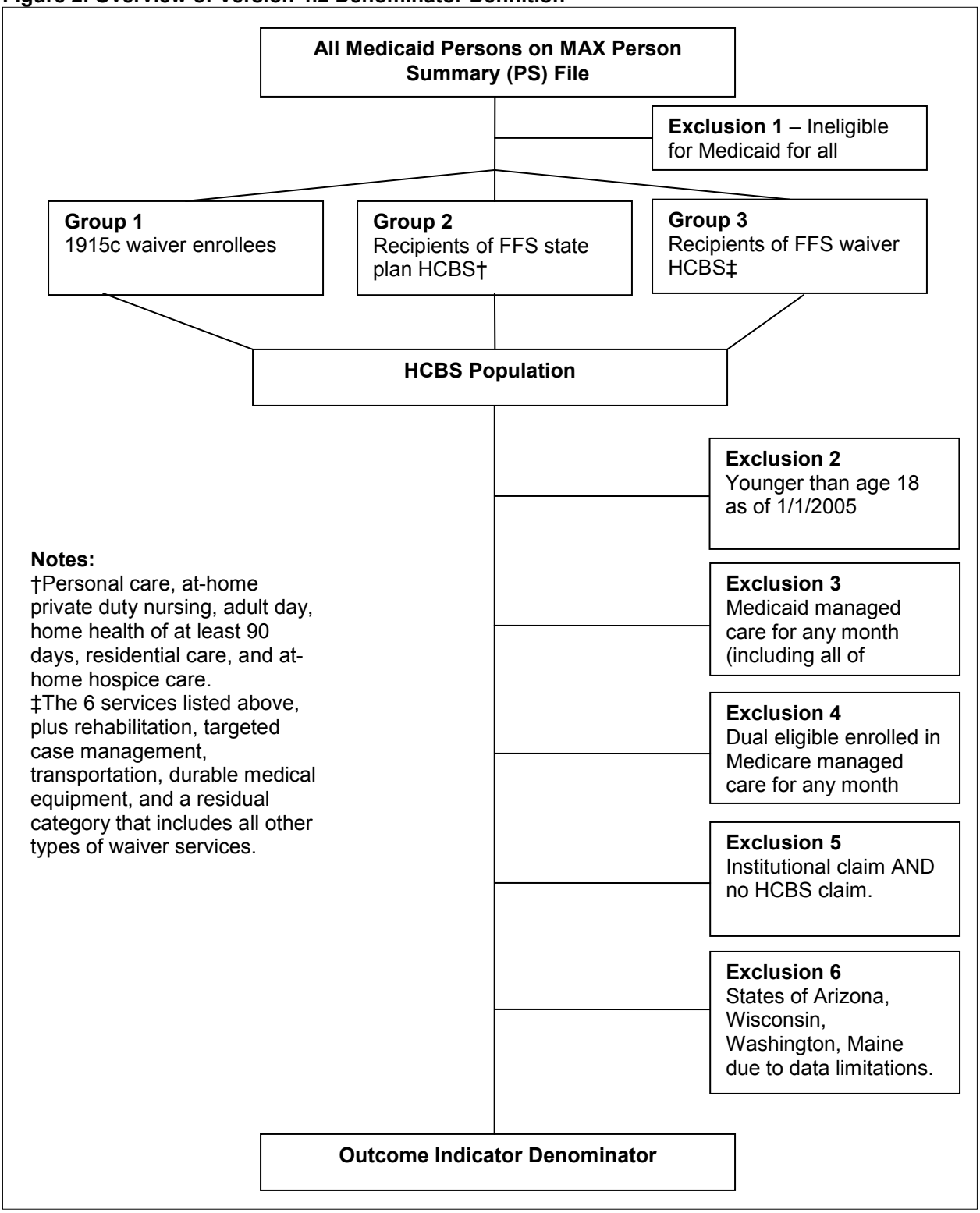
Denominator:

HCBS QI denominator (see Section 6.5).

6.5 QI Denominator Specifications – Version 4.2

Figure 2 provides an overview of the denominator definition. Detailed specifications are laid out on the pages that follow.

Figure 2. Overview of Version 4.2 Denominator Definition



FFS – Fee-for-service; HCBS – Home and Community-based Services; MAX – Medicaid Analytic eXtract Data.

DETAILED SPECIFICATIONS:
We start with all persons listed in the Medicaid MAX person summary (PS) file and exclude those who are listed as ineligible for Medicaid during the entire year (or quarter) [viii].

Exclusion 1: We define ineligible for Medicaid using the MAX uniform eligibility code or an eligible months count ≤ 0.
Data elements used: PS Element 40 – MAX UNIFORM ELIGIBILITY CODE (value=00); **PS Element 53 –** DAYS OF ELIGIBILITY. Occurs for each month. (Value ≤ 0).

We then define the **HCBS Population** during the year (or quarter) as anyone who falls into at least one of the following 3 groups:

Group 1. Any monthly waiver enrollment flag during the year (or quarter) indicates the person was enrolled in a 1915(c) for the aged and disabled; the aged only; the disabled only; people with brain injuries; people with HIV/AIDS; people with mental retardation or developmental disabilities; people with mental illness; people who are technology dependent; or people in an unspecified waiver.
Data elements used: PS Elements 57; 59; 61 - MAX WAIVER TYPE CODE. Any of 3 waivers per month.(values = G, H, I, J, K, L, M, N or O).

Group 2. Person has fee-for-service (FFS) payments greater than zero during any month of the year (or quarter) for at least 1 out of 6 different community-based long-term care services provided through the state plan: personal care, at-home private duty nursing, adult day, home health of at least 90 days, residential care, and at-home hospice.
Data elements used: PS Element 102 - MEDICAID PAYMENT AMOUNT 11 through MEDICAID PAYMENT AMOUNT 15; MEDICAID PAYMENT AMOUNT 19 (value >0) plus the following data elements needed to restrict home health, private duty nursing, and hospice care to those qualifying as HCBS:

a. Home health of at least 90 days. We define the length of home health as the number of days between the service begin date of the earliest home health claim for the year and the service end date for the latest home health claim for the year.
   Data elements used: Other Services (OT) file Element 24 – COMMUNITY-BASED LONG-TERM CARE (CLTC) FLAG (value=14); **OT Element 39 –** SERVICE BEGINNING DATE; **OT Element 40 –** ENDING DATE OF SERVICE.

b. At-home hospice care
   Data elements used: OT Element 24 - COMMUNITY-BASED LONG-TERM CARE (CLTC) FLAG (value=19); **OT Element 49 –** PLACE OF SERVICE CODE (value = 12).

c. At-home private-duty nursing
   Data elements used: OT Element 24 - COMMUNITY-BASED LONG-TERM CARE (CLTC) FLAG (value=12); **OT Element 49 –** PLACE OF SERVICE CODE (value = 12).

[viii] We developed two alternative means of calculating the denominator: (1) based on eligibility at any point during the year ("ever-in-year") and (2) based on eligibility in each quarter. We first specify the ever-in-year definition, but include reference to quarters where appropriate as a reminder that an alternative method exists. We then specify how the ever-in-year method is modified to yield a quarterly denominator.

Group 3. Person has fee-for-service payments greater than zero during any month of the year (or quarter) for at least 1 out of 11 different community-based long-term care services provided through 1915(c) waivers. This set includes the same 6 services as the state plan services (listed above), plus rehabilitation, targeted case management, transportation, durable medical equipment, and a residual category that includes all other types of waiver services.
Data elements used: PS Element 102 - MEDICAID PAYMENT AMOUNT 30 through MEDICAID PAYMENT AMOUNT 40 (value >0).

To derive the **QI Denominator**, we apply five exclusions to everyone identified within the **HCBS Population** (Group 1, Group 2 and Group 3):

Exclusion 2: The HCBS QIs are limited to adults age 18 and older; thus we exclude individuals with age<18 as of 1/1/2005.

Exclusion 3: Exclude anyone who is either

a) Enrolled in Medicaid managed care for any month of the year (or quarter) for Health Maintenance Organization (HMO), Long-term Care (LTC) or Program of All-Inclusive Care for the Elderly (PACE). There are 4 different variables indicating enrollment in capitated plans for each month. All 4 will be considered in identifying individuals enrolled in managed care.
Data elements used: PS Elements 44; 46; 48; 50 – ELIGIBLE PRE-PAID PLAN TYPE. Up to 4 plans can be indicated per month. (Values=01, 05, 06).

Exclusion 4: Exclude persons who are (1) dually enrolled in Medicare and Medicaid (dual eligible) at any point during the year (or quarter) AND who are (2) enrolled in a comprehensive Medicare managed care plan at any point during the year (or quarter).

- We define dual eligible as any person from the MAX 2005 who is found in the Medicare denominator file.
- We define enrollment in comprehensive Medicare managed care as having at least one month out of the year (or quarter) with Medicare HMO coverage, as indicated within the Medicare Denominator file.
  Data elements used: Medicare Denominator File – MEDICARE ENTITLEMENT/BUY-IN INDICATOR BUYIN01 through BUYIN12 (value>0 for any month and **Medicare Denominator File –** HMO INDICATOR HMOIND01 through HMOIND12 (value>0 for any month).

Note that Exclusion 4 applies to all individuals in the State of Arizona.

Exclusion 5: Exclude individuals with evidence of institutional care only**.** We define the Institutional Care Only group as those individuals within the HCBS denominator for the year (or quarter) who have any **Institutional Claim** AND have no **HCBS claim**.

HCBS claim: We define an HCBS claim based on the definitions for **HCBS Population Group 2** and **Group 3**. Specifically, for the year (or quarter), any fee-for-service payments greater than zero for at least 1 out of 6 different community-based long-term care services provided through the state plan (Group 2) or any fee-for-service payments greater than zero for at least 1 out of 11 different community-based long-term care services provided through 1915(c) waivers (Group 3).
Data elements used: PS Element 102 - MEDICAID PAYMENT AMOUNT 11 through MEDICAID PAYMENT AMOUNT 15; MEDICAID PAYMENT AMOUNT 19 (value >0); **PS**

Element 102 - MEDICAID PAYMENT AMOUNT 30 through MEDICAID PAYMENT AMOUNT 40 (value >0).

Institutional claim: We define Institutional claims as claims from the MAX Long-term Care (LT) file at any point during the year (or quarter) with any of the following values:

a. ICF-MR day count >0
b. Nursing facility day count >0
c. Inpatient psych facility for individuals under 21 day count >0
d. Mental hospital for aged day count >0
e. MAX type of service code for any of the following:
    i. 02 mental hospital for aged
    ii. 04 inpatient psych facility for individuals under 21
    iii. 05 ICF-MR
    iv. 07 Nursing facility services

Data elements used: LT Element – 44 INTERMEDIATE CARE FACILITY FOR THE MENTALLY RETARDED DAY COUNT (value >0); **LT Element 45 -** NURSING FACILITY DAY COUNT (value >0); **LT Element 43 -** INPATIENT PSYCHIATRIC FACILITY (AGE < 21) DAY COUNT (value >0); **LT Element 42 -** MENTAL HOSPITAL FOR THE AGED DAY COUNT (value >0); **LT Element 23 –** MAX TYPE OF SERVICE CODE (values=02, 04, 05, 07).

Exclusion 6: We exclude all individuals from the states of Wisconsin, Washington, and Maine due to missing data issues.

We define the **QI Denominator** as the individuals from within the **HCBS Population** who remain after these additional five exclusions.

Quarterly Denominator Definition:
Because the HCBS population is dynamic with individuals changing eligibility, enrollment, and service use throughout the year, it may be more appropriate to calculate the HCBS and QI denominators over quarters rather than for the entire year. Thus, the denominator would be person-quarters, not persons.

As of the conclusion of the QI development phase, we have developed, but not evaluated, a quarterly denominator definition. That method is outlined below. See questions pertaining to this approach in the "Outstanding Issues" section that follows.

Adapting the Ever-in-Year Denominator to Yield Person-Quarters:

- Apply each definition criterion over each of 4 quarters, rather than over 12 months.
- The one exception is defining home health use for eligibility in Group 2 (only home health of at least 90 days). Because by definition home health claims for a quarter will be ≤ 90 days, evaluate this criterion for the entire year, then include individuals with at least 90 days of home health for every quarter.
- To identify the quarter in which a fee-for-service state plan (**Group 2**) claim occurred, a modified method of identifying **Group 2** is required when calculating the HCBS denominator for quarters. For state plan claims, the PS data has only the annual fee-for-service payment variables. The monthly payment variables are not available in the PS data, but they can be created from the OT file by summing MAX OT file Medicaid payment amounts for fee-for-service claims for each of the 6 state plan services with service dates falling within a specified month. Services spanning several months are flagged as present for each month within that time span, then these monthly claims flags are used to determine if a Group 2 claim occurred in a particular quarter. This process is carried out in 3 steps:

a) Subset the OT file to records with a current fee-for-service claim for medical services and total amount of money paid by Medicaid for this service > 0 and a claim for one of the six community-based long-term care services provided through the state plan (non-waiver personal care, non-waiver private duty nursing, non-waiver adult day care, non-waiver home health, non-waiver residential care, or non-waiver hospice care).
b) Create monthly flags indicating whether the service was received during a given month based on the service begin date and service end date.
c) Set the Group 2 Quarter flags to 1 if any of the monthly flags was set to 1 for any month in that quarter.

Data Elements Used: OT Element 28 – TYPE OF CLAIM CODE (value=1); **OT Element 32 –** MEDICAID PAYMENT AMOUNT (value >0); **OT Element 24 -** COMMUNITY-BASED LONG-TERM CARE (CLTC) FLAG (value=11, 12, 13, 14, 15, or 19); **OT Element 39 –** SERVICE BEGINNING DATE; **OT Element 40 –** ENDING DATE OF SERVICE.

- To derive annual rates when using person-quarters as the QI denominator, the number of numerator events can be summed across quarters to derive the annual numerator. The annual denominator can be derived by summing the number of eligible person-quarters and dividing by four. The annual rate is then the annual numerator over the annual denominator, which inherently adjusts for part-year eligibility.

7. REFERENCES

Prevention Quality Indicators Overview. AHRQ Quality Indicators. http://www.qualityindicators.ahrq.gov/pqi_overview.htm. Accessed 5/1710.

Agency for Healthcare Research and Quality HCUPnet website. http://hcupnet.ahrq.gov/. Accessed 5/25/11.

Healthcare Cost and Utilization Project Overview of Nationwide Inpatient Sample (NIS). http://www.hcup-us.ahrq.gov/nisoverview.jsp. Accessed 5/25/11.

Healthcare Cost and Utilization Project Overview of State Inpatient Databases (SID). http://www.hcup-us.ahrq.gov/sidoverview.jsp#States. Accessed 5/25/11.

Billings, J*, et al.* (1996). "Recent findings on preventable hospitalizations." *Health Affairs* 15(3): 239-249.

Burwell, B*, et al.* (1997). Children with Severe Chronic Conditions on Medicaid. Washington, D.C., U.S. Department of Health and Human Services Assistant Secretary for Planning and Evaluation Office of Disability, Aging and Long-Term Care Policy.

Recommended framework for presenting injury mortality data. http://www.cdc.gov/mmwr/preview/mmwrhtml/00049162.htm. Accessed 5/17/10.

Centers for Medicare and Medicaid Services Medicaid Analytic eXtract (MAX) General Information. http://www.cms.gov/MedicaidDataSourcesGenInfo/07_MAXGeneralInformation.asp. Accessed 11/1/10.

Centers for Medicare and Medicaid Services Research Data Assistance Center (ResDAC) Medicare Data Documentation. http://www.resdac.org/ddvh/Index.asp. Accessed 11/1/10.

Elixhauser, A and Owens, P (2007). Adverse Drug Events in U.S. Hospitals, 2004. *HCUP Statistical Brief #29*. Rockville, MD, Agency for Healthcare Research and Quality.

Farley, DO (1997). Survey Issues Regarding Dual Eligible Populations: Design of a Medicare Fee-For-Service CAHPS Survey. Santa Monica, CA, RAND Corporation.

Galantowicz, S*, et al.* (2008). Compendium of Measures and Tools Identified Through the Medicaid Home and Community Based Services Measure Scan (HCBS MS), as of July 5, 2007. Rockville, MD., Agency for Healthcare Research and Quality.

Kaiser State Health Facts. http://www.statehealthfacts.org/. Accessed 2/16/2010.

Kassad, CA*, et al.* (2007). Hospitalizations Related to Drug Abuse, 2005. *HCUP Statistical Brief #39*. Rockville, MD, Agency for Healthcare Research and Quality.

Merrill, CT*, et al.* (2008). Hospital Stays Resulting from Excessive Heat and Cold Exposure Due to Weather Conditions in U.S. Community Hospitals, 2005. *HCUP Statistical Brief #55.* Rockville, MD, Agency for Healthcare Research and Quality.

Milenkovic, M*, et al.* (2007). Hospital Stays for Burns, 2004. *HCUP Statistical Brief #25*. Rockville, MD, Agency for Healthcare Research and Quality.

Ng, T*, et al.* (2008). Medicaid Home and Community-Based Service Programs: Data Update. Washington, D.C, Kaiser Family Foundation.

OECD (2009). Health at a Glance 2009: OECD Indicators, OECD Publishing.

Owens, P*, et al.* (2007). Care of Adults with Mental Health and Substance Abuse Disorders in U.S. Community Hospitals, 2004. *HCUP Fact Book No. 10.* Rockville, MD, Agency for Healthcare Research and Quality.

Russo, A*, et al.* (2008). Violence-Related Stays in U.S. Hospitals, 2005. *HCUP Statistical Brief #48*. Rockville, MD, Agency for Healthcare Research and Quality.

Russo, CA and Elixhauser, A (2006). Hospitalizations for Alcohol Abuse Disorders, 2003. *HCUP Statistical Brief #4*. Rockville, MD, Agency for Healthcare Research and Quality.

Weissman, JS*, et al.* (1992). "Rates of avoidable hospitalization by insurance status in Massachusetts and Maryland." *Journal of the American Medical Association* 268(17): 2388-2394.

APPENDIX 1A: DETAILS OF LITERATURE REVIEW

See separate attachment

APPENDIX 1B: DETAILS OF EXPERT PANEL REVIEW

See separate attachment.

APPENDIX 2: SID TABLES

These analyses were performed using an earlier version of the QI specifications (version 1.7).

Table 2-1. Range of State-level Indicator Rates for General Adult Population

Indicators	Mean (SD)	Minimum Rate (State)	Maximum Rate (State)
Measure Set 1			
Short-term Complications of Diabetes	51.116 (13.191)	27.565 (VT)	78.400 (WV)
Asthma or COPD	324.283 (121.154)	102.247 (UT)	742.271 (WV)
CHF	419.163 (127.252)	163.192 (UT)	702.087 (WV)
Composite: Potentially Preventable Infections	720.820 (178.806)	441.092 (UT)	1,166.024 (WV)
Bacterial Pneumonia	487.748 (126.072)	306.603 (CO)	807.323 (WV)
Urinary Tract Infection	233.072 (61.563)	121.891 (UT)	358.701 (WV)
Infection due to Device or Implant	69.391 (16.039)	41.041 (VT)	105.400 (MD)
Dehydration	192.429 (54.232)	100.669 (UT)	313.347 (KY)
Perforated Appendix**	308.244 (35.014)	239.016 (CT)	404.711 (SD)
ACSC Composite: Chronic Conditions	1,011.309 (311.411)	386.894 (UT)	1874.434 (WV)
ACSC Composite: Acute Conditions	702.284 (182.844)	428.878 (CO)	1,150.007 (WV)
ACSC Composite: Overall	1,713.510 (475.139)	820.749 (UT)	3,024.370 (WV)
Measure Set 2			
*Composite: Intentional Injuries by Others***	31.409 (12.929)	8.673 (NH)	67.132 (MD)
Physical/sexual abuse**	1.655 (0.671)	0.408 (VT)	3.283 (MD)
Intentional trauma or physical violence**	30.164 (12.805)	7.786 (NH)	64.975 (MD)
*Composite: Potential Neglect***	566.372 (102.136)	402.675 (UT)	810.921 (MO)
Medication errors**	48.869 (11.660)	29.570 (NE)	75.357 (OK)
Pressure Ulcer	137.653 (53.172)	55.538 (VT)	245.132 (NY)
*Composite: Accidents***	386.161 (72.799)	234.115 (IL)	577.791 (MO)
Fire, burns**	15.410 (4.609)	6.997 (NH)	29.975 (GA)
Poisoning**	7.921 (1.924)	4.903 (NE)	12.781 (OK)
Fire arm accidents**	2.507 (1.449)	0.408 (VT)	7.510 (AR)
Accidental drowning**	0.338 (0.367)	0 (VT)	2.214 (HI)
Excessive heat/cold exposure**	9.619 (3.074)	2.616 (HI)	18.962 (AR)
Injurious Falls	351.563 (71.502)	202.965 (IL)	528.811 (MO)
*Composite: Potentially Preventable Behavioral Health Events***	481.201 (155.679)	96.914 (IA)	821.638 (MO)
Attempted suicide or self-inflicted harm**	73.534 (15.410)	53.067 (NV)	123.126 (MO)
Serious and persistent mental illness**	420.327 (151.324)	36.689 (IA)	726.306 (MO)
Substance abuse**	188.043 (115.002)	60.045 (NE)	689.027 (NY)
Dual diagnosis of mental illness and substance abuse**	180.078 (69.827)	15.749 (IA)	305.697 (IL)

Rates per 100,000 population, except for perforated appendix, which is per 1000 admissions with appendicitis. Numerator specifications are version 1.7.
Data Sources: Numerator calculated from 2005 SID, all payers. Denominator estimated from U.S. Census Bureau 2006-08 American Community Survey estimates for state populations, adults age 18 and older.
**Candidate indicator not included in final measure set.

States included: AR, AZ, CA, CO, CT, FL, GA, HI, IA, IL, IN, IS, KY, MA, MD, MI, MN, MO, NC, NE, NH, NJ, NV, NY, OH, OK, OR, RI, SC, SD, TN, TX, UT, VT, WA, WI, WV
ACSC – Ambulatory Care Sensitive Condition; CHF – Congestive Heart Failure; COPD – Chronic Obstructive Pulmonary Disease; SD – Standard Deviation; SID – Healthcare Cost and Utilization Project State Inpatient Database.

Table 2-2: Range of State-level Indicator Rates for Adult Medicaid* Population

Indicators	Mean (SD) Rate	Minimum Rate (State)	Maximum Rate (State)
Measure Set 1			
Short-term Complications of Diabetes	159.169 (46.501)	70.423 (VT)	297.852 (NV)
Asthma or COPD	758.053 (253.740)	323.088 (UT)	1,386.395 (KY)
CHF	752.842 (280.569)	269.772 (VT)	1,213.069 (NJ)
Composite: Potentially Preventable Infections	1,413.032 (376.508)	798.483 (VT)	1,995.210 (TN)
Bacterial Pneumonia	907.445 (233.743)	556.239 (MI)	1,328.586 (TN)
Urinary Tract Infection	505.587 (160.926)	206.934 (VT)	838.938 (TX)
Infection due to Device or Implant	168.839 (58.371)	63.922 (VT)	354.414 (MD)
Dehydration	343.152 (109.634)	154.930 (VT)	536.450 (MO)
Perforated Appendix**	299.546 (47.694)	214.646 (WI)	377.551 (KS)
ACSC Composite: Chronic Conditions	2,176.011 (668.543)	947.996 (VT)	3,162.908 (NJ)
ACSC Composite: Acute Conditions	1,290.233 (358.675)	758.397 (VT)	1,893.197 (KY)
ACSC Composite: Overall	3,466.006 (988.293)	1,706.392 (VT)	4,964.172 (KY)
Measure Set 2			
*Composite: Intentional Injuries by Others***	81.516 (55.473)	20.585 (VT)	275.684 (MD)
Physical/sexual abuse**	5.358 (2.820)	1.083 (VT)	13.243 (MD)
Intentional trauma or physical violence**	77.654 (54.623)	19.502 (VT)	266.391 (MD)
Composite: Potential Neglect**	995.668 (260.781)	544.962 (VT)	1,532.884 (MO)
Medication errors**	149.685 (40.034)	79.090 (VT)	250.129 (MD)
Pressure Ulcer	376.633 (162.476)	110.509 (VT)	769.443 (NJ)
*Composite: Accidents***	482.059 (135.251)	239.980 (WV)	819.532 (MO)
Fire, burns**	34.765 (12.823)	16.800 (SC)	62.866 (GA)
Poisoning**	13.037 (4.554)	5.417 (VT)	26.846 (MD)
Fire arm accidents**	5.490 (4.741)	0 (VT)	20.134 (MD)
Accidental drowning**	0.585 (0.511)	0 (VT, KY, CT, MD)	1.867 (NV)
Excessive heat/cold exposure**	21.641 (8.258)	7.584 (VT)	43.624 (MD)
Injurious Falls	408.731 (123.200)	179.374 (WV)	706.022 (MO)
*Composite: Potentially Preventable Behavioral Health Events***	1,763.952 (790.905)	366.013 (NV)	3,418.702 (IL)
Attempted suicide or self-inflicted harm**	220.658 (78.381)	102.000 (SC)	416.799 (MO)
Serious and persistent mental illness**	1,589.713 (771.743)	220.355 (NV)	3,312.679 (IL)
Substance abuse**	545.005 (513.819)	187.465 (TX)	2,390.860 (NY)
Dual diagnosis of mental illness and substance abuse**	735.022 (414.924)	165.266 (NV)	1,636.103 (CT)

Annual rate per 100,000 population, except for Perforated Appendix, which is per 1,000 admissions with appendicitis. Numerator specifications version 1.7.
Data Sources: Numerator calculated from 2005 SID, primary or secondary payer is Medicaid (includes dual eligible persons). Denominator based on estimate of total adult Medicaid population from Kaiser State Health Facts Website (http://www.statehealthfacts.org/).[i] Denominator for Perforated Appendix is number of discharges for appendicitis among Medicaid population in 2005 SID.
**Candidate indicator not included in the final measure set.
States included: AR, CT, GA, IL, IN, KS, KY, MA, MD, MI, MN, MO, NC, NE, NJ, NV, NY, OR, SC, TN, TX, UT, VT, WA, WI, WV
ACSC – Ambulatory Care Sensitive Condition; CHF – Congestive Heart Failure; COPD – Chronic Obstructive Pulmonary Disease; SD – Standard Deviation; SID – Healthcare Cost and Utilization Project State Inpatient Database.

Table 2-3: Range of State-level Indicator Rates for Dual-Eligible Population

Indicators	Mean (SD) Rate	Minimum Rate (State)	Maximum Rate (State)
Measure Set 1			
Short-term Complications of Diabetes	115.115 (36.584)	58.620 (VT)	205.228 (UT)
Asthma or COPD	1,130.187 (371.772)	588.853 (OR)	1,833.868 (KY)
CHF	1,413.263 (512.212)	626.726 (OR)	2,291.772 (AR)
Composite: Potentially Preventable Infections	2,611.694 (746.749)	1,297.745 (MI)	4,364.433 (AR)
Bacterial Pneumonia	1,682.912 (485.905)	800.771 (MI)	2,786.249 (AR)
Urinary Tract Infection	928.782 (311.315)	455.937 (VT)	1,606.191 (TX)
Infection due to Device or Implant	276.140 (107.035)	107.471 (VT)	636.598 (MD)
Dehydration	608.339 (201.729)	245.559 (OR)	1,005.848 (MO)
Perforated Appendix**	457.487 (53.045)	371.429 (CT)	611.111 (KS)
ACSC Composite: Chronic Conditions	3,377.320 (1073.155)	1,650.500 (OR)	5,284.757 (MO)
ACSC Composite: Acute Conditions	2,302.410 (695.777)	1,031.364 (MI)	3,917.330 (AR)
ACSC Composite: Overall	5,679.134 (1714.888)	2,962.731 (MI)	9,031.870 (AR)
Measure Set 2			
*Composite: Intentional Injuries by Others***	29.583 (14.046)	12.187 (KY)	66.820 (MD)
Physical/sexual abuse**	4.678 (3.129)	0 (VT, UT)	12.642 (MD)
Intentional trauma or physical violence**	25.805 (13.033)	9.622 (KY)	55.984 (MD)
*Composite: Potential Neglect***	1,714.879 (540.276)	930.912 (MI)	2,819.618 (MO)
Medication errors**	148.514 (57.781)	78.898 (MI)	316.843 (UT)
Pressure Ulcer	740.331 (325.927)	244.252 (VT)	1,392.097 (NJ)
*Composite: Accidents***	848.494 (297.607)	301.381 (IL)	1,552.663 (MO)
Fire, burns**	34.174 (14.058)	13.286 (NV)	64.298 (MO)
Poisoning**	14.866 (5.747)	6.220 (WV)	31.507 (MD)

[i] The adult Medicaid population is estimated from figures available through the Kaiser State Health Facts website on Medicaid enrollment for 3 groups: adults, elderly, and disabled. The disabled group includes an unknown number of individuals <18 years old who qualify for Medicaid based on a disability. A 1995 report on Medicaid enrollment suggests that 4 to 5% of Medicaid enrollees are disabled children. Decreasing the number of disabled enrollees by 5% for each state results in a 1 to 2.5% decrease in the size of state denominators. Therefore, the rates reported here may be underestimates by approximately 1 to 2.5%.

Fire arm accidents**	1.315 (1.034)	0 (NJ, CT, VT, NV, KS, UT)	3.624 (GA)
Accidental drowning**	0.384 (0.627)	0 (NJ, CT, VT, NV, KS, UT, IL, MI, OR, KY, WV, MN, MD, MO, GA)	2.511 (NE)
Excessive heat/cold exposure**	27.692 (11.941)	9.770 (VT)	55.081 (MD)
Injurious Falls	772.522 (279.890)	251.017 (IL)	1,427.980 (MO)
*Composite: Potentially Preventable Behavioral Health Events***	1,738.516 (804.594)	164.749 (NV)	3,159.677 (MA)
Attempted suicide or self-inflicted harm**	139.561 (73.198)	29.230 (NV)	281.134 (MA)
Serious and persistent mental illness**	1628.972 (775.451)	135.519 (NV)	2931.282 (MA)
Substance abuse**	298.298 (174.633)	79.304 (MI)	732.820 (MA)
Dual diagnosis of mental illness and substance abuse**	572.851 (301.276)	63.774 (NV)	1,255.109 (MA)

Annual rate per 100,000 population, except for Perforated Appendix, which is per 1,000 admissions with appendicitis. Numerator specifications version 1.7.
Data Sources: Numerator calculated from 2005 SID, both Medicaid and Medicare are payers. Denominator estimated from total dual eligible population (Full + Partial) FY2005 (includes those <18 yrs) from Kaiser State Health Facts Website: http://www.statehealthfacts.org/.[ii] Denominator for Perforated Appendix is number of discharges for appendicitis among dual eligible population in 2005 SID.
**Candidate indicator not included in the final measure set.
States included: AR, CT, GA, IL, IN, KS, KY, MA, MD, MI, MN, MO, NC, NE, NJ, NV, NY, OR, SC, TN, TX, UT, VT, WA, WI, WV.
ACSC – Ambulatory Care Sensitive Condition; CHF – Congestive Heart Failure; COPD – Chronic Obstructive Pulmonary Disease; SD – Standard Deviation; SID – Healthcare Cost and Utilization Project State Inpatient Database.

Table 2-4: Comparison of SID and HCUPnet AHRQ QI Rates, 2005

	General Population		Older Adult Population[1]	
Indicators	**Mean (SD) SID Rate**	**Estimated (SE) HCUPnet Rate[2]**	**Mean (SD) SID Rate**	**Estimated (SE) HCUPnet Rate[2]**
Short-term Complications of Diabetes	51.116 (13.191)	56.291 (1.503)	115.115 (36.584)	36.794 (1.093)
CHF	419.163 (127.252)	454.428 (10.231)	1,413.263 (512.212)	2,112.293 (49.971)
Bacterial Pneumonia	487.748 (126.072)	443.670 (9.873)	1,682.912 (485.905)	1,856.591 (41.823)
Urinary Tract Infection[3]	233.072 (61.563)	179.794 (4.216)	928.782 (311.315)	701.192 (17.050)
Dehydration[3]	192.429 (54.232)	117.954 (2.887)	608.339 (201.729)	472.977 (11.875)
Perforated Appendix**	308.244 (35.014)	286.216 (2.187)	457.487 (53.045)	534.046 (7.903)

[ii] Note that children (<18 years) are included in the Kaiser dual eligible population used for the denominators, but are excluded from the numerators, making these rates underestimates. We don't know by how much, but an older report on children with chronic conditions who are enrolled in Medicaid suggested that between 2-4% are also enrolled in Medicare.

ACSC Composite: Chronic Conditions[4]	1,011.309 (311.411)	1,155.84	3,377.320 (1073.155)	4,073.049
ACSC Composite: Acute Conditions[4]	702.284 (182.844)	722.80	2,302.410 (695.777)	2,906.408
ACSC Composite: Overall[4]	1,713.510 (475.139)	1,878.51	5,679.134 (1714.888)	6,978.874
Pressure Ulcer[3]	137.653 (53.172)	24.102 (0.049)	740.331 (325.927)	34.869 (0.079)

Rates are per 100,000 population, except for Perforated Appendix, which is per 1,000 admissions with appendicitis. SID rates use version 1.7 of numerator specifications.

[1] The SID rate is for all dual eligible individuals, which includes individuals <65 (and some <18 years in denominator) who are enrolled in both Medicaid and Medicare (26 states included). The HCUPnet rate is for adults age 65 and older, based on the 2005 NIS.

[2] Risk-adjusted rate calculated from 2005 NIS using version 3.1 of the PQI software.

[3] We implemented changes to the definitions of the Urinary Tract Infection (UTI) and Dehydration indicators that we would expect to lead to higher rates compared to version 3.1 of the PQI software. We also implemented changes to the Pressure Ulcer indicator that we would expect to lead to higher rates compared to version 3.1 of the PSI software.

[4]Comparison figures are from PQI comparative data fact sheet using 2004 NIS data and version 3.1 of the PQI software. Rates for the older adult population were calculated by summing numerators and denominators for the groups age 65-74 and age 75+.

**Candidate indicator not included in the final measure set.

ACSC – Ambulatory Care Sensitive Condition; AHRQ – Agency for Healthcare Research and Quality; CHF – Congestive Heart Failure; NIS – Nationwide Inpatient Sample; PQI – Prevention Quality Indicators; PSI – Patient Safety Indicators; QI – Quality Indicators; SD – Standard Deviation; SE – Standard Error; SID – Healthcare Cost and Utilization Project State Inpatient Database.

APPENDIX 3: NUMERATOR AND DENOMINATOR DEFINITIONS USED IN THIS REPORT

Analyses reported in this document reflect the evolution of numerator and denominator definitions throughout the QI development process. This appendix provides an overview of the differences in numerator and denominator definitions. For the final versions of the numerator and denominator definitions, see the measure specifications detailed in Section 6.

Definitions included in this appendix are preliminary versions and should not be used in future analyses that use the QI measure set. These preliminary definitions are included only for reference, to aid in interpretation of QI development analyses that preceded development of the final measure specifications.

Table 3-1. Overview of Numerator and Denominator Versions

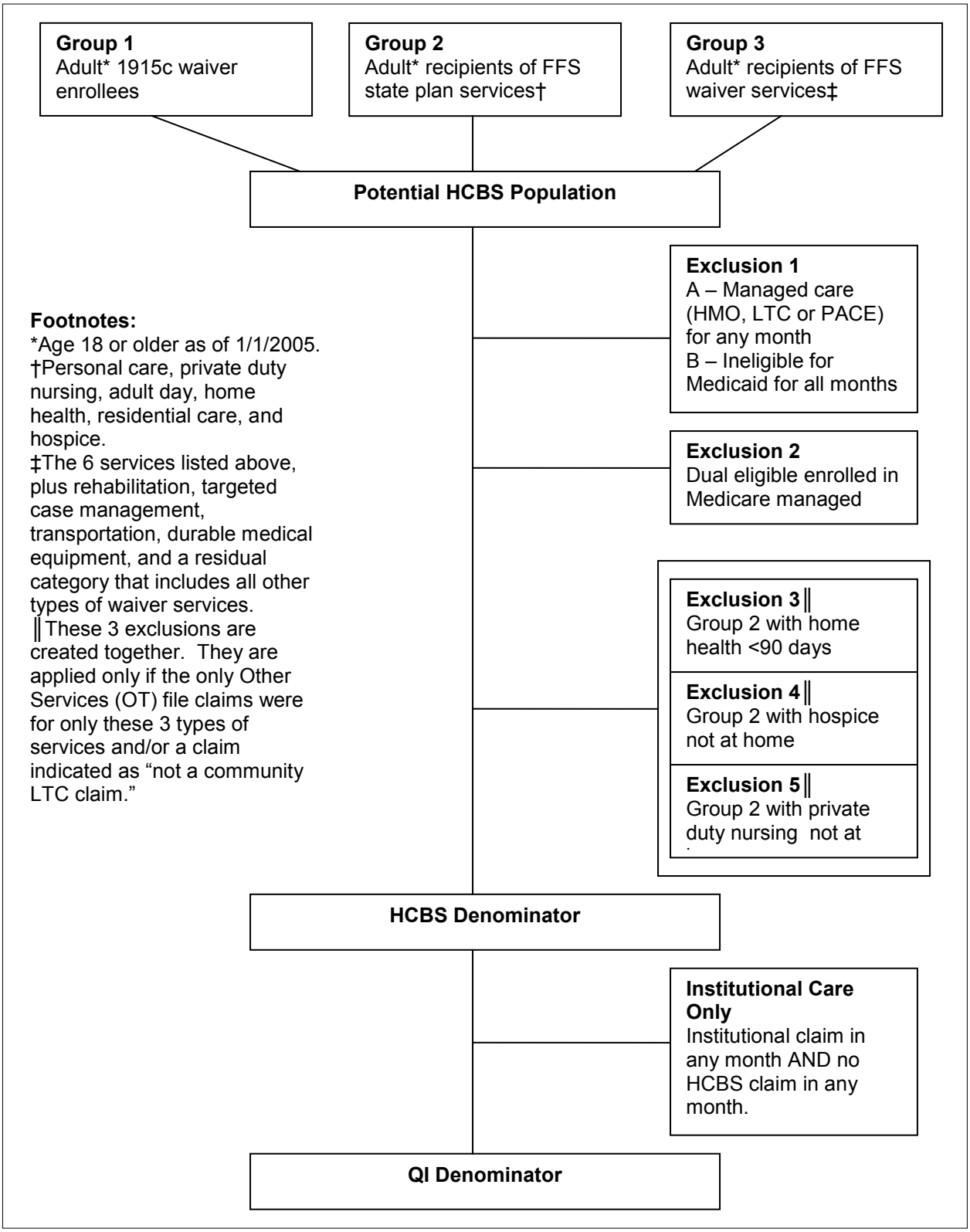
Numerator Version	Notes
1.7	Initial specifications used for preliminary analyses of indicator rates using SID data. Compared to the final version 1.8c specifications, this version does NOT include: • Minor changes made to include relevant diagnosis codes that were still valid in 2005, though no longer valid at the time measure specifications were developed (2009-2010). • Ignoring all MAX inpatient records for dual eligible individuals to avoid double-counting events included in both MAX and MedPAR data. • Changes to inclusion criteria for the Bacterial Pneumonia, UTI, Dehydration and Infection Due to Device or Implant indicators and the exclusion criteria for the Injurious Falls indicator.
1.8	Compared to the final version 1.8c specifications, this version does NOT include: • Ignoring all MAX inpatient records for dual eligible individuals to avoid double-counting events included in both MAX and MedPAR data. • Changes to inclusion criteria for the Bacterial Pneumonia, UTI, Dehydration and Infection Due to Device or Implant indicators and the exclusion criteria for the Injurious Falls indicator.
1.8c – Final Version	See specifications in Section 6.
1.8d	This version was used for some analyses. Compared to the final version 1.8c specifications, this version counts same-day readmissions only once in the numerator definition. Same-day readmissions are cases with a discharge and readmission on the same day for the same individual with the same QI condition.
Denominator Version	**Notes**
3	For the purposes of QI development work, we developed a working definition of the HCBS QI denominator, based on an algorithm originally developed by Mathematica Policy Research. See details below. Key differences from the final version 1.8c denominator definition are: ▪ Persons ineligible for Medicaid for all months are excluded after assessing eligibility based on one of the 3 inclusion

	groups. ▪ Persons with home health <90 days, or hospice or private duty nursing services provided somewhere other than the home are excluded last. ▪ Persons who meet the denominator definition for any month of the year are included in the denominator for the full year (annual implementation only).
4.1	Compared to version 1.8c final denominator definition, quarterly rates using this definition were calculated based on numerator events in each quarter for persons eligible at any point during the year, rather than eligibility in the particular quarter under consideration. There is no difference with version 1.8c in the annual implementation.
4.2 – Final version	See section 6.5 for complete specifications (Figure 2, in section 6.5, provides an overview). This may be implemented in one of two ways:
Annual implementation	Persons included in the annual denominator if meet QI denominator definition for any month of the year. Rates based on this implementation are annual rates.
Quarterly implementation	Persons are included in the quarterly denominator only if eligible for the QI denominator at least one month of that quarter. Quarterly rates are calculated based on numerator events that occur only in the quarter of eligibility, and then are annualized. See complete specifications in section 6.5 for details of how quarterly rates are annualized.

MAX – Medicaid Analytic eXtract Data; MedPAR – Medicare Provider Analysis and Review file; SID – Healthcare Cost and Utilization Project State Inpatient Database; UTI – Urinary Tract Infection.

On the following pages, we provide details of the version 3 denominator definition. Figure 3-1 provides and overview, followed by complete details.

Figure 3-1. Overview of Version 3 Denominator Definition



FFS – Fee-for-service; HCBS – Home and Community-based Services; HMO – Health Maintenance Organization; LTC – Long-term care; PACE – Program of All-inclusive Care for the Elderly; QI – Quality Indicator.

Detailed specifications for Preliminary QI Denominator (Version 3)
The definition that follows for the Version 3 denominator is a preliminary version and should not be used in future analyses that use the QI measure set. This preliminary definition is included only for reference. Figure 3-1 provides an overview of the version 3 denominator definition.

The HCBS QIs are limited to adults age 18 and older as of 1/1/2005.

We define the **Potential HCBS Population** during the year (or quarter) as anyone who falls into at least one of the following 3 groups:

Group 1. Any monthly waiver enrollment flag during the year (or quarter) indicates the person was enrolled in a 1915(c) for the aged and disabled; the aged only; the disabled only; people with brain injuries; people with HIV/AIDS; people with mental retardation or developmental disabilities; people with mental illness; people who are technology dependent; or people in an unspecified waiver.
Data elements used: PS Elements 57; 59; 61 - MAX WAIVER TYPE CODE. Any of 3 waivers per month. (values = G, H, I, J, K, L, M, N or O).

Group 2. Person has fee-for-service payments greater than zero during any month of the year (or quarter) for at least 1 out of 6 different community-based long-term care services provided through the state plan. The 6 services are: personal care, private duty nursing, adult day, home health, residential care, and hospice.
Data elements used: PS Element 102 - MEDICAID PAYMENT AMOUNT 11 through MEDICAID PAYMENT AMOUNT 15; MEDICAID PAYMENT AMOUNT 19 (value >0).

Group 3. Person has fee-for-service payments greater than zero during any month of the year (or quarter) for at least 1 out of 11 different community-based long-term care services provided through 1915(c) waivers. This set includes the same 6 services as the state plan services (listed above), plus rehabilitation, targeted case management, transportation, durable medical equipment, and a residual category that includes all other types of waiver services.
Data elements used: PS Element 102 - MEDICAID PAYMENT AMOUNT 30 through MEDICAID PAYMENT AMOUNT 40 (value >0).

We will apply two exclusions to everyone identified within the **Potential HCBS Population** (Group 1, Group 2 and Group 3):

Exclusion 1: Exclude anyone who is either

a) Enrolled in managed care for any month of the year (or quarter) for Health Maintenance Organization (HMO), Long-term Care (LTC) or Program of All-Inclusive Care for the Elderly (PACE). There are 4 different variables indicating enrollment in capitated plans for each month. All 4 will be considered in identifying individuals enrolled in managed care.
Data elements used: PS Elements 44; 46; 48; 50 – ELIGIBLE PRE-PAID PLAN TYPE. Up to 4 plans can be indicated per month. (Values=01, 05, 06).

--OR—

b) Ineligible (either) for the entire year (or quarter). We define ineligible using the MAX uniform eligibility code or an eligible months count ≤ 0.
Data elements used: PS Element 40 – MAX UNIFORM ELIGIBILITY CODE (value=00); **PS Element 53 –** DAYS OF ELIGIBILITY. Occurs for each month. (Value ≤ 0).

Exclusion 2: Exclude persons who are (1) dually enrolled in Medicare and Medicaid (dual eligible) at any point during the year (or quarter) AND who are (2) enrolled in a comprehensive Medicare managed care plan at any point during the year (or quarter).

- We define dual eligible as any person from the MAX 2005 who is found in the Medicare denominator file.
- We define enrollment in comprehensive Medicare managed care as having at least one month out of the year (or quarter) with Medicare HMO coverage, as indicated within the Medicare Denominator file.
  Data elements used: Medicare Denominator File – MEDICARE ENTITLEMENT/BUY-IN INDICATOR BUYIN01 through BUYIN12 (value>0 for any month); **Medicare Denominator File –** HMO INDICATOR HMOIND01 through HMOIND12 (value>0 for any month).

In addition, we apply three exclusions to non-waiver enrollees (Group 2 AND not Group 1 or Group 3):

These three exclusions are created together. To be eligible for these exclusions, a person must have ONLY the following four types of services in the MAX Other Services (OT) file for the entire year (or quarter):

d. Home health <90 days. We define the length of home health as the number of days between the service begin date of the earliest home health claim for the year and the service end date for the latest home health claim for the year.
Data elements used: OT Element 24 – COMMUNITY-BASED LONG-TERM CARE (CLTC) FLAG (value=14); **OT Element 39 –** SERVICE BEGINNING DATE; **OT Element 40 –** ENDING DATE OF SERVICE.

e. Hospice care not at home
Data elements used: OT Element 24 - COMMUNITY-BASED LONG-TERM CARE (CLTC) FLAG (value=19); **OT Element 49 –** PLACE OF SERVICE CODE (value not equal to 12).

f. Private-duty nursing not at home
Data elements used: OT Element 24 - COMMUNITY-BASED LONG-TERM CARE (CLTC) FLAG (value=12); **OT Element 49 –** PLACE OF SERVICE CODE (value not equal to 12).

g. Not a community-based long-term care claim
Data elements used: OT Element 24 - COMMUNITY-BASED LONG-TERM CARE (CLTC) FLAG (value=00).

If at any point during the year (or quarter) a person has **any** other records in the OT file other than the records listed above, then this person is not eligible for **Exclusion 3**, **Exclusion 4** or **Exclusion 5**. If a person has **a** and/or **b** and/or **c** and/or **d** only, then:

Exclusion 3: Exclude individuals with home heath for less than 90 days (as defined in **a**).
Exclusion 4: Exclude individuals with hospice care not at home (as defined in **b**)

Exclusion 5: Exclude individuals with private-duty nursing not at home (as defined in **c**)

We define the **HCBS denominator** as the individuals from within the **Potential HCBS Population** who remain after applying **Exclusion 1**, **Exclusion 2**, **Exclusion 3**, **Exclusion 4** and **Exclusion 5**.

We define the **QI denominator** as the individuals from within the **HCBS denominator** who remain after excluding individuals receiving **Institutional Care Only**.

Institutional Care Only: We define the Institutional Care Only group as those individuals within the HCBS denominator for the year (or quarter) who have any **Institutional Claim** AND have no **HCBS claim**.

HCBS claim: We define an HCBS claim based on the definitions for **Potential HCBS population Group 2** and **Group 3**. Specifically, for the year (or quarter), any fee-for-service payments greater than zero for at least 1 out of 6 different community-based long-term care services provided through the state plan (Group 2) or any fee-for-service payments greater than zero for at least 1 out of 11 different community-based long-term care services provided through 1915(c) waivers (Group 3).
Data elements used: PS Element 102 - MEDICAID PAYMENT AMOUNT 11 through MEDICAID PAYMENT AMOUNT 15; MEDICAID PAYMENT AMOUNT 19 (value >0); **PS Element 102 -** MEDICAID PAYMENT AMOUNT 30 through MEDICAID PAYMENT AMOUNT 40 (value >0).

Institutional claim: We define Institutional claims as claims from the MAX Long-term Care (LT) file at any point during the year (or quarter) with any of the following values:

f. ICF-MR day count >0
g. Nursing facility day count >0
h. Inpatient psych facility for individuals under 21 day count >0
i. Mental hospital for aged day count >0
j. MAX type of service code for any of the following:
    v. 02 mental hospital for aged
    vi. 04 inpatient psych facility for individuals under 21
    vii. 05 ICF-MR
    viii. 07 Nursing facility services

Data elements used: LT Element – 44 INTERMEDIATE CARE FACILITY FOR THE MENTALLY RETARDED DAY COUNT (value >0); **LT Element 45 -** NURSING FACILITY DAY COUNT (value >0); **LT Element 43 -** INPATIENT PSYCHIATRIC FACILITY (AGE < 21) DAY COUNT (value >0); **LT Element 42 -** MENTAL HOSPITAL FOR THE AGED DAY COUNT (value >0); **LT Element 23 –** MAX TYPE OF SERVICE CODE (values=02, 04, 05, 07).

Adapting Denominator Definition to Person-Quarters:
Because the HCBS population is dynamic with individuals changing eligibility, enrollment, and service use throughout the year, we plan to implement the HCBS and QI denominators over quarters rather than for the entire year. Thus, the denominator is person-quarters, not persons.

- To accomplish this, we apply each definition criterion over each of 4 quarters, rather than over 12 months.
- The one exception is **Exclusion 3** (only home health<90 days). Because by definition home health claims for a quarter will be ≤ 90 days, we evaluate this exclusion for the entire year, then exclude individuals with <90 days of home health for the full year from every quarter.

- To identify the quarter in which a fee-for-service state plan (**Group 2**) claim occurred, a modified method of identifying **Group 2** is required when calculating the HCBS denominator for quarters. For state plan claims, the PS data has only the annual fee-for-service payment variables. The monthly payment variables are not available in the PS data, but they can be created from the OT file by summing MAX OT file Medicaid payment amounts for fee-for-service claims for each of the 6 state plan services with service dates falling within a specified month. Services spanning several months are flagged as present for each month within that time span, then these monthly claims flags are used to determine if a Group 2 claim occurred in a particular quarter. This process is carried out in 3 steps:

  a) Subset the OT file to records with a current fee-for-service claim for medical services (TYPE_CLM_CD=1) and total amount of money paid by Medicaid for this service > 0 (MDCD_PYMT_AMT>0) and a claim for one of the six community-based long-term care services provided through the state plan (CLTC_FLAG=11, 12, 13, 14, 15, or 19).

  b) Create monthly flags (STPAY1-STPAY12) based on the service begin date and service end date. For example, if one record has service begin date=04/15/2005 and service end date=08/01/2005, then STPAY4-STPAY8 are set to 1.

  c) Set the Group 2 Quarter flags to 1 if any of the monthly STPAY flags was set to 1 for any month in that quarter. For example, GROUP2Q1 will be set to 1 if STPAY1=1 or STPAY2=1 or STPAY3=1.

  Data Elements Used: OT Element 28 – TYPE OF CLAIM CODE (value=1); **OT Element 32 –** MEDICAID PAYMENT AMOUNT (value >0); **OT Element 24 -** COMMUNITY-BASED LONG-TERM CARE (CLTC) FLAG (value=11, 12, 13, 14, 15, or 19); **OT Element 39 –** SERVICE BEGINNING DATE; **OT Element 40 –** ENDING DATE OF SERVICE.

APPENDIX 4: SPECIFICATIONS OF QIs NOT INCLUDED IN FINAL HCBS MEASURE SET

To facilitate interpretation of SID and MAX tables reporting rates for the full set of potential HCBS QIs, this appendix includes specifications of those measures that were ultimately not included in the final measure set. These are for reference only.

Perforated Appendix (Apdx02)

Indicator definition:

Number of patients, age 18 and older, admitted for perforated appendix per 100 admissions for appendicitis for denominator population.

Numerator:

All discharges of eligible population with ICD-9-CM diagnosis codes (principal or secondary) for perforations or abscesses of appendix among cases meeting the inclusion rules for the denominator (see below).

Include ICD-9-CM diagnosis codes:

Acute Appendicitis with Perforation	
With generalized peritonitis	540.0
With peritoneal abscess	540.1

Exclude Numerator Cases:

- MDC 14 (pregnancy, childbirth, and puerperium)
- Transferring from another institution (SID ASOURCE=2 or 3; POINTOFORIGINUB04='4', '5', '6')
- All persons admitted to hospital from institutional setting will be excluded from the indicator (numerator and denominator) as per INSTITUTIONAL EXCLUSION in DENOMINATOR DEFINITION. See end of document.

Denominator:

HCBS QI denominator population, as defined by MPR (Version 3 of the denominator), age 18 and older, with diagnosis code for appendicitis in any field of inpatient claims.[1]

[1] Acute Appendicitis	
With generalized peritonitis	540.0
With peritoneal abscess	540.1
Without mention of peritonitis	540.9
Appendicitis not otherwise specified	541

Exclude Denominator Cases:

- MDC 14 (pregnancy, childbirth, and puerperium)
- Transferring from another institution (SID ASOURCE=2 or 3; POINTOFORIGINUB04='4', '5', '6')

All persons admitted to hospital from institutional setting will be excluded from the indicator (numerator and denominator) as per INSTITUTIONAL EXCLUSION in DENOMINATOR DEFINITION. See end of document.

Composite: Intentional Injuries Caused by Others (CpIntInj)
Composite Definition: This composite is composed of two indicators: (i) *Physical or Sexual Abuse (Abuse)* and (ii) *Intentional Trauma or Physical Violence (Viol)*.
Numerator: All cases meeting the numerator definition of (i) *Physical or Sexual Abuse (Abuse)* OR (ii) *Intentional Trauma or Physical Violence (Viol)*. (See following pages for specifications)
Denominator: All cases meeting the denominator definition of (i) *Physical or Sexual Abuse (Abuse)* OR (ii) *Intentional Trauma or Physical Violence (Viol)*. (See following pages for specifications)
Notes: ▪ To maintain consistency with the AHRQ PQIs (version 4.1), for all HCBS QIs, records missing age or sex will be deleted.

Physical or Sexual Abuse (Abuse)

Indicator definition:

Number of patients, age 18 and older, admitted for physical or sexual abuse per denominator population.

Numerator:

All discharges of eligible population with ICD-9-CM diagnosis codes (principal or secondary) for *physical or sexual abuse* (see below):

Include ICD-9-CM diagnosis and E codes:

Physical or Sexual Abuse	
Adult maltreatment	
Adult maltreatment, unspecified	995.80
Adult physical abuse	995.81
Adult emotional/psychological abuse	995.82
Adult sexual abuse	995.83
Adult neglect (nutritional)	995.84
Other adult abuse and neglect	995.85
Criminal neglect	
Abandonment of child, infant or other helpless person with intent to injure or kill	E968.4

Exclude Numerator Cases:
- MDC 14 (pregnancy, childbirth, and puerperium)
- Transferring from another institution (SID ASOURCE=2 or 3; POINTOFORIGINUB04='4', '5', '6')
- All persons admitted to hospital from institutional setting will be excluded from the indicator (numerator and denominator) as per INSTITUTIONAL EXCLUSION in DENOMINATOR DEFINITION. See end of document.

Denominator:

HCBS QI denominator population, as defined by MPR (Version 3 of the denominator), age 18 and older

Exclude Denominator Cases:
- MDC 14 (pregnancy, childbirth, and puerperium)
- Transferring from another institution (SID ASOURCE=2 or 3; POINTOFORIGINUB04='4', '5', '6')
- All persons admitted to hospital from institutional setting will be excluded from the indicator (numerator and denominator) as per INSTITUTIONAL EXCLUSION in DENOMINATOR DEFINITION. See end of document.
-

Notes:
- To maintain consistency with the AHRQ PQIs (version 4.1), for all HCBS QIs, records missing age or sex will be deleted.

Major Validation Questions
- Are these codes sufficiently sensitive? Examine frequency and variation in use.
- Examine the POA frequency for diagnosis in the secondary position.

Intentional Trauma or Physical Violence (Viol)

Indicator definition:

Number of patients, age 18 and older, admitted for intentional trauma or physical violence per denominator population.

Numerator:

All discharges of eligible population with ICD-9-CM diagnosis and E codes (principal or secondary) for *homicide or injuries purposefully inflicted by others* (see below):

Include ICD-9-CM diagnosis and E codes:

Homicide and Injury Purposely Inflicted by Other Persons	
Unarmed fight or brawl	E960.0
Rape	E960.1
Assault by corrosive or caustic substance	E961
Assault by poisoning	[E962.0-E962.2; E962.9]
Assault by hanging or strangulation	E963
Assault by submersion (drowning)	E964
Assault by firearms and explosives	[E965.0-E965.9]
Assault by cutting or piercing instrument	E966
Assault by other unspecified means	[E968.0-E968.9]

Exclude Numerator Cases:

- MDC 14 (pregnancy, childbirth, and puerperium)
- Transferring from another institution (SID ASOURCE=2 or 3; POINTOFORIGINUB04='4', '5', '6')
- All persons admitted to hospital from institutional setting will be excluded from the indicator (numerator and denominator) as per INSTITUTIONAL EXCLUSION in DENOMINATOR DEFINITION. See end of document.

Exclude numerator cases with the following ICD-9-CM diagnosis and E codes in any field:

Numerator Exclusions	
Self-inflicted injuries	[E950.0-E950.9; E951.0-E951.1; E951.8; E952.0-E952.1; E952.8-E952.9; E953.0-E953.1; E953.8-E953.9; E954; E955.0-E955.7; E955.9; E956; E957.0-E957.2; E957.9; E958.0-E958.9; E959]
Late effects of injury purposefully inflicted by other person	E969

Denominator:

HCBS QI denominator population, as defined by MPR (Version 3 of the denominator), age 18 and older

Exclude Denominator Cases:

- MDC 14 (pregnancy, childbirth, and puerperium)
- Transferring from another institution (SID ASOURCE=2 or 3; POINTOFORIGINUB04='4', '5', '6')
- All persons admitted to hospital from institutional setting will be excluded from the indicator (numerator and denominator) as per INSTITUTIONAL EXCLUSION in DENOMINATOR DEFINITION. See end of document.

Notes:

- To maintain consistency with the AHRQ PQIs (version 4.1), for all HCBS QIs, records missing age or sex will be deleted.

Major Validation Questions

- Is use of E-codes valid? Examine variation in E-code usage.
- Examine the POA frequency for diagnosis in the secondary position.
- How many cases of homicide/assault are excluded because of a concurrent diagnosis of self-inflicted injury? Do we really want to exclude the self-inflicted injury cases? (This question is in response to a comment from Leif: The specifications indicate to include cases with a code in any diagnosis field for "Homicide and injury purposely inflicted by other persons", and to exclude cases with a code for "Self-inflicted injuries" in any diagnosis field. To me, the specifications don't explicitly indicate what to do if both conditions are met. The SAS code currently excludes these cases.)

Composite: Unintentional Injuries Potentially due to Neglect (CpNegl)
Composite Definition: This composite is composed of three indicators: (i) *Medication Errors Resulting in Hospital Admission (RxErr)*, (ii) *Pressure Ulcer (PU03)*, and (iii) *Composite: Accidents due to Potential Neglect (CpAccid)*.
Numerator: All cases meeting the numerator definition of (i) *Medication Errors Resulting in Hospital Admission (RxErr)*, (ii) *Pressure Ulcer (PU03)*, OR (iii) *Composite: Accidents due to Potential Neglect (CpAccid)*. (See following pages for specifications)
Denominator: All cases meeting the denominator definition of (i) *Medication Errors Resulting in Hospital Admission (RxErr)*, (ii) *Pressure Ulcer (PU03)*, OR (iii) *Composite: Accidents due to Potential Neglect (CpAccid)*. (See following pages for specifications)
Notes: ▪ To maintain consistency with the AHRQ PQIs (version 4.1), for all HCBS QIs, records missing age or sex will be deleted.

Medication Errors Resulting in Hospital Admission (RxErr)

Indicator definition:

Number of patients, age 18 and older, admitted for medication errors (errors involving wrong drug, wrong dose, wrong patient, wrong time, wrong rate, wrong prep, wrong route of administration) per denominator population.

Numerator:

All discharges of eligible population with ICD-9-CM diagnosis codes (principal or secondary) for *poisoning by drugs, medicinal and biologic substances; accidental poisoning by drugs, medicinal and biological substances*; and *accidents in technique of administration of drug* (see below):

Include ICD-9-CM diagnosis and E codes:

Poisoning by Drugs, Medicinal and Biological Substances	
Antibiotics	[960.0-960.9]
Other anti-infectives	[961.0-961.9]
Hormones and synthetic substitutes	[962.0-962.9]
Primarily systemic agents	[963.0-963.5; 963.8-963.9]
Agents primarily affecting blood constituents	[964.0-964.9]
Analgesics, antipyretics, antirheumatics	[965.02; 965.09; 965.1; 965.4; 965.5; 965.61; 965.69; 965.7-965.9]
Anticonvulsants and anti-Parkinsonism drugs	[966.0-966.4]
Sedatives and hypnotics	[967.0-967.6; 967.8-967.9]
Central nervous system depressants and anesthetics	[968.0-968.7; 968.9]
Psychotropic agents	[969.00-969.05; 969.09; 969.1-969.5; 969.8-969.9]
Central nervous system stimulants	[970.0-970.1; 970.8-970.9]
Drugs primarily affecting the autonomic nervous system	[971.0-971.3; 971.9]
Drugs primarily affecting the cardiovascular system	[972.0-972.9]
Agents primarily affecting the gastrointestinal system	[973.0-973.6; 973.8-973.9]
Water, minerals and uric acid metabolism drugs	[974.0-974.7]
Agents primarily acting on the smooth and skeletal muscles and respiratory system	[975.0-975.8]
Agents primarily affecting skin and mucous membranes, opthalmological, otorhinolaryngological, and dental drugs	[976.0-976.9]
Other and unspecified drugs and medicinal substances	[977.0-977.4; 977.8-977.9]
Bacterial vaccines	[978.0-978.6; 978.8-978.9]
Vaccines and biological substances	[979.0-979.7; 979.9]

Accidental Poisoning by Drugs, Medicinal and Biological Substances	
Analgesics, antipyretics, antirheumatics	[E850.1-E850.9]
Barbiturates	E851
Sedatives and hypnotics	[E852.0-E852.5; E852.8-E852.9]
Tranquilizers	[E853.0-E853.2; E853.8-E853.9]
Other psychotropic agents	[E854.0; E854.3; E854.8]
Other drugs acting on central and autonomic nervous system	[E855.0-E855.6; E855.8-E855.9]
Antibiotics	E856
Other anti-infectives	E857
Other drugs	[E858.0-E858.9]

Accidents in Technique of Administration of Drug	
Accidental cut, puncture, perforation, or hemorrhage during medical care	
kidney dialysis or other perfusion	E870.2
injection or vaccination	E870.3
Failure of sterile precautions during procedure	
kidney dialysis or other perfusion	E872.2
injection or vaccination	E872.3
Failure in dosage	
incorrect dilution of fluid during infusion	E873.1
nonadministration of necessary drug or medicinal substance	E873.6
Poisoning, undetermined whether accidentally or purposefully inflicted	[E980.0-E980.9]

Exclude Numerator Cases:
- MDC 14 (pregnancy, childbirth, and puerperium)
- Transferring from another institution (SID ASOURCE=2 or 3; POINTOFORIGINUB04='4', '5', '6')
- All persons admitted to hospital from institutional setting will be excluded from the indicator (numerator and denominator) as per INSTITUTIONAL EXCLUSION in DENOMINATOR DEFINITION. See end of document.

Exclude numerator cases with the following ICD-9-CM diagnosis and E codes in any field:

Numerator Exclusions	
Poisoning due to opiates and related narcotics	[965.00-965.01]
Poisoning due to psychodysleptics (eg, hallucinogens)	[969.6]
Poisoning due to psychostimulants (eg, caffeine, cocaine)	[969.7; 969.70-969.73; 969.79]
Accidental poisoning due to heroin	[E850.0]
Accidental poisoning due to psychodysleptics (eg, hallucinogens)	[E854.1]
Accidental poisoning due to psychostimulants (eg, caffeine, cocaine)	[E854.2]
Drugs, medicinal, and biologic substances causing adverse effects in	[E930.0-E930.9; E931.0-E931.9; E932.0-E932.9; E933.0-E933.9;

therapeutic use (ie, correct drug properly administered in therapeutic or prophylactic dosage)	E934.0-E934.9; E935.0-E935.9; E936.0-E936.4; E937.0-E937.6; E937.8-E937.9; E938.0-E938.7; E938.9; E939.0-E939.9; E940.0-E940.1; E940.8-E940.9; E941.0-E941.3; E941.9; E942.0-E942.9; E943.0-E943.6; E943.8-E943.9; E944.0-E944.7; E945.0-E945.8; E946.0-E946.9; E947.0-E947.4; E947.8-E947.9; E948.0-E948.6; E948.8-E948.9; E949.0-E949.7; E949.9]
Self-inflicted poisoning	[E950.0-E950.9]
Assault by poisoning	[E962.0-E962.2; E962.9]

Denominator:

HCBS QI denominator population, as defined by MPR (Version 3 of the denominator), age 18 and older

Exclude Denominator Cases:
- MDC 14 (pregnancy, childbirth, and puerperium)
- Transferring from another institution (SID ASOURCE=2 or 3; POINTOFORIGINUB04='4', '5', '6')
- All persons admitted to hospital from institutional setting will be excluded from the indicator (numerator and denominator) as per INSTITUTIONAL EXCLUSION in DENOMINATOR DEFINITION. See end of document.

Notes:
- To maintain consistency with the AHRQ PQIs (version 4.1), for all HCBS QIs, records missing age or sex will be deleted.

Major Validation Questions
- Are undetermined cause codes (E980.x) used more frequently than the determined codes (E850-858]?
- Examine the POA frequency for diagnosis in the secondary position.

Composite: Accidents due to Potential Neglect (CpAccid)
Composite Definition: This composite is composed of six indicators: (i) *fire, burns, smoke inhalation or electronic shock* (ii) *poisoning,* (iii) *fire arm accidents,* (iv) *accidental drowning,* (v) *excessive heat or cold exposure,* and (vi) *injurious fall.*
Numerator: All cases meeting the numerator definition of (i) *fire, burns, smoke inhalation or electronic shock* (ii) *accidental poisoning,* (iii) *fire arm accidents,* (iv) *accidental drowning,* (v) *excessive heat or cold exposure,* OR (vi) *injurious fall.* (See following pages for specifications)
Denominator: All cases meeting the denominator definition of (i) *fire, burns, smoke inhalation or electronic shock* (ii) *accidental poisoning,,* (iii) *fire arm accidents,* (iv) *accidental drowning,* (v) *excessive heat or cold exposure,* OR (vi) *injurious fall.* (See following pages for specifications)
Notes: ▪ To maintain consistency with the AHRQ PQIs (version 4.1), for all HCBS QIs, records missing age or sex will be deleted.

Accidents due to Fire, Burns, Smoke Inhalation or Electronic Shock (Burns)

Indicator definition:

Number of patients, age 18 and older, admitted for accidents due to Fire, Burns, Smoke Inhalation or Electronic Shock per denominator population.

Numerator:

All discharges of eligible population with ICD-9-CM diagnosis codes (principal or secondary) for *accidents due to fire, burns, smoke inhalation or electronic shock* (see below):

Include ICD-9-CM diagnosis and E codes:

Burns	
Burn confined to eye and adnexa	[940.0-940.5; 940.9]
Burn of face, head and neck	[941.00-941.09; 941.10-941.19; 941.20-29; 941.30-941.39; 941.40-941.49; 941.50-941.59]
Burn of trunk	[942.00-942.05; 942.09; 942-10-942.15; 942.19; 942.20-942.25; 942.29; 942.30-942.35; 942.39; 942.40-942.45; 942.49; 942.50-942.55; 942.59]
Burn of upper limb, except wrist and hand	[943.00-943.06; 943.09; 943.10-943.16; 943.19; 943.20-943.26; 943.29; 943.30-943.36; 943.39; 943.40-943.46; 943.49; 943.50-943.56; 943.59]
Burn of wrist(s) and hand(s)	[944.00-944.08; 944.10-944.18; 944.20-944.28; 944.30-944.38; 944.40-944.48; 944.50-944.58]
Burn of lower limb(s)	[945.00-945.06; 945.09; 945.10-945.16; 945.19; 945.20-945.26; 945.29; 945.30-945.36; 945.39; 945.40-945.46; 945.49; 945.50-945.56; 945.59]
Burn of multiple specified sites	[946.0-946.5]
Burn of internal organs	[947.0-947.4; 947.8-947.9]
Burns classified according to extent of body surface involved	[948.00; 948.10-948.11; 948.20-948.22; 948.30-948.33; 948.40-948.44; 948.50-948.55; 948.60-948.66; 948.70-948.77; 948.80-948.88; 948.90-948.99]
Burn unspecified	[949.0-949.5]
Accidents Caused by Fire and Flames	
Conflagration in private dwelling	[E890.0-E890.3; E890.8-E890.9]
Conflagration in other and unspecified building or structure	[E891.0-E891.3; E891.8-E891.9]
Conflagration not in building or structure (eg, forest)	E892
Accident caused by ignition of clothing (eg, from controlled fire)	[E893.0-E893.2; E893.8-E893.9]
Ignition of highly inflammable material	E894

(eg, gasoline, fat)	
Accident caused by controlled fire in private dwelling	E895
Accident cause by controlled fire in other and unspecified building or structure	E896
Accident cause by controlled fire not in building or structure	E897
Accident cause by other specified fire and flames	[E898.0-E898.1]
Accident caused by unspecified fire	E899
Accident Caused by Explosive Materials	
Fireworks	E923.0
Explosive gases (eg, butane, gasoline)	E923.2
Explosion, Not otherwise specified	E923.9
Accident Caused by Hot Substance or Object, Caustic or Corrosive Material, and Steam	
Hot liquids and vapors, including steam	E924.0
Caustic and corrosive substances	E924.1
Hot (boiling) tap water	E924.2
Other (eg, electric heating appliance, light bulb)	E924.8
Unspecified	E924.9
Electrocution and nonfatal effects of electric current	994.8
Accident Caused by Electric Current	
Domestic wiring and appliances	E925.0
Other electric current	E925.8
Unspecified electric current	E925.9
Smoke Inhalation	
Toxic effect of unspecified gas, fume or vapor	987.9

Exclude Numerator Cases:

- MDC 14 (pregnancy, childbirth, and puerperium)
- Transferring from another institution (SID ASOURCE=2 or 3; POINTOFORIGINUB04='4', '5', '6')
- All persons admitted to hospital from institutional setting will be excluded from the indicator (numerator and denominator) as per INSTITUTIONAL EXCLUSION in DENOMINATOR DEFINITION. See end of document.

Exclude numerator cases with the following ICD-9-CM diagnosis and E codes in any field:

Numerator Exclusions	
Accidents involving a motor vehicle	[E810.0-E810.9; E811.0-E811.9; E812.0-E812.9; E813.0-E813.9; E814.0-E814.9; E815.0-E815.9; E816.0-E816.9; E817.0-E817.9; E818.0-E818.9; E819.0-E819.9]
Late effects of burns	[906.5-906.9]

Denominator:

HCBS QI denominator population, as defined by MPR (Version 3 of the denominator), age 18 and older

Exclude Denominator Cases:
- MDC 14 (pregnancy, childbirth, and puerperium)
- Transferring from another institution (SID ASOURCE=2 or 3; POINTOFORIGINUB04='4', '5', '6')
- All persons admitted to hospital from institutional setting will be excluded from the indicator (numerator and denominator) as per INSTITUTIONAL EXCLUSION in DENOMINATOR DEFINITION. See end of document.

Notes:
- To maintain consistency with the AHRQ PQIs (version 4.1), for all HCBS QIs, records missing age or sex will be deleted.

Major Validation Questions (for all accidental injuries)
- Fatal injuries may not result in a hospitalization, so rates of these injury events will be under-reported using administrative data. Using ED data may improve this somewhat, but will still miss cases were a person is pronounced dead on-site. This is particularly a concern for burns, drowning and firearms accidents, which are more likely to be fatal, but it will be a problem to a lesser degree for all the injury indicators. Deaths from injuries at home are reported to occur at a higher rate in the oldest age groups, so the effect of under-reported injury rates from hospitalization data may vary systematically by age.
- Investigate the sensitivity of the E-codes as possible given available data.
- What proportion of injury events are designated as POA (using California, New York or Florida data)?

Accidental Poisoning (Pois)

Indicator definition:

Number of patients, age 18 and older, admitted for accidents due to Accidental Poisoning (excluding medication errors and self-inflicted poisoning) per denominator population.

Numerator:

All discharges of eligible population with ICD-9-CM diagnosis codes (principal or secondary) for *accidental poisoning* (see below):

Include ICD-9-CM diagnosis and E codes:

Accidental Poisoning	
Toxic Effects of Substances Cheifly Nonmedicinal as to Source	
Toxic effects of petroleum products	981
Toxic effects of solvents other than petroleum based	[982.0-982.4; 982.8]
Toxic effects of corrosive aromatics, acids, and caustic alkalis	[983.0-983.2; 983.9]
Toxic effects of lead and its compounds (including fumes)	[984.0-984.1; 984.8-984.9]
Toxic effects of other metals	[985.0-985.6; 985.8-985.9]
Asphyxiation due to carbon monoxide	986
Toxic effects of other gas, fume or vapor	[987.0-987.8]
Noxious Substances Eaten as Food	
Fish and shellfish	988.0
Mushrooms	988.1
Berries and other plants	988.2
Other specified noxious substance eaten as food	988.8
Unspecified specified noxious substance eaten as food	988.9
Poisoning by Other Substances, Chiefly Nonmedicinal as to Source	
Hydrocyanic acid and cyanides	989.0
Strychnine and salts	989.1
Chlorinated hydrocarbons	989.2
Organophosphate and carbamate	989.3
Other pesticides, not elsewhere classified	989.4
Soaps and detergents	989.6
Poisoning due to food contaminants (aflatoxin, mycotoxin)	989.7
Unspecified substance, chiefly nonmedicinal as to source	989.9
Accidental Poisoning by Solid and Liquid Substances	
Alcohol, not elsewhere classified	[E860.1-E860.4; E860.8-E860.9]
Cleansing and polishing agents, disinfectants, paints, and varnishes	[E861.0-E861.6; E861.9]
Petroleum products, other solvents and their vapors, not elsewhere classified	[E862.0-E862.4; E862.9]
Agricultural and horticultural chemical and	[E863.0-E863.9]

pharmaceutical preparations other than plant foods and fertilizers	
Corrosives and caustics, not elsewhere classified	[E864.0-E864.4]
Poisonous foodstuffs and poisonous plants	[E865.0-E865.5; E865.8-E865.9]
Other and unspecified solid and liquid substances	[E866.0-E866.9]
Accidental Poisoning by Gases and Vapors	
Accidental poisoning by gas distributed by pipeline	E867
Accidental poisoning by other utility gas and other carbon monoxide	[E868.0-E868.3; E868.8-E868.9]
Accidental poisoning by other gases and vapors	[E869.0-E869.4; E869.8-E869.9]
Food Poisoning	
Accidental poising due to adverse food reaction	[995.60-995.69]
Food poisoning (bacterial)	[005.0-005.4; 005.81; 005.89; 005.9]

Exclude Numerator Cases:

- MDC 14 (pregnancy, childbirth, and puerperium)
- Transferring from another institution (SID ASOURCE=2 or 3; POINTOFORIGINUB04='4', '5', '6')
- All persons admitted to hospital from institutional setting will be excluded from the indicator (numerator and denominator) as per INSTITUTIONAL EXCLUSION in DENOMINATOR DEFINITION. See end of document.

Exclude numerator cases with the following ICD-9-CM diagnosis and E codes in any field:

Numerator Exclusions	
Poisoning by drugs, medicinal and biological substances	[960.0-960.9; 961.0-961.9; 962.0-962.9; 963.0-963.5; 963.8-963.9; 964.0-964.9; 965.00-965.02; 965.09; 965.1; 965.4; 965.5; 965.61; 965.69; 965.7-965.9; 966.0-966.4; 967.0-967.6; 967.8-967.9; 968.0-968.7; 968.9; 969.0; 969.00-969.05; 969.09; 969.1-969.6; 969.7; 969.70; 969.72-969.73; 969.79; 969.8-969.9; 970.0-970.1; 970.8-970.9; 971.0-971.3; 971.9; 972.0-972.9; 973.0-973.6; 973.8-973.9; 974.0-974.7; 975.0-975.8; 976.0-976.9; 977.0-977.4; 977.8-977.9; 978.0-978.6; 978.8-978.9; 979.0-979.7; 979.9]
Accidental poisoning by drugs, medicinal and biological substances	[E850.0-E850.9; E851; E852.0-E852.5; E852.8-E852.9; E853.0-E853.2; E853.8-E853.9; E854.0; E854.1-E854.3; E854.8; E855.0-E855.6; E855.8-E855.9; E856; E857; E858.0-E858.9]
Assault by poisoning	[E962.0-E962.2; E962.9]
Alcohol poisoning	
Accidental poisoning by alcohol in	E860.0

preparations intended for consumption	
Toxic effects of alcohol	980.0
Non-dependent alcohol abuse	[305.00-305.03]
Poisoning due to venomous bites	989.5
Other	
Accidental poisoning and toxic reactions due to venomous plants	[E905.6-E905.7]
Suicide and self-inflicted poisoning by solid and liquid substances	[E950.0-E950.9; E951.0-E951.1; E951.8; E952.0-E952.1; E952.8-E952.9]
Late effects of accidental poisoning	E929.2

Denominator:

HCBS QI denominator population, as defined by MPR (Version 3 of the denominator), age 18 and older

Exclude Denominator Cases:
- MDC 14 (pregnancy, childbirth, and puerperium)
- Transferring from another institution (SID ASOURCE=2 or 3; POINTOFORIGINUB04='4', '5', '6')
- All persons admitted to hospital from institutional setting will be excluded from the indicator (numerator and denominator) as per INSTITUTIONAL EXCLUSION in DENOMINATOR DEFINITION. See end of document.

Notes:
- To maintain consistency with the AHRQ PQIs (version 4.1), for all HCBS QIs, records missing age or sex will be deleted.

Major Definitional Questions
- Should alcohol poisoning (E860.0 and 980.0) really be exclusions for this indicator? Or is it just that we don't want to include these in the numerator? These may not be serious enough to warrant inclusion in the Substance Abuse indicator, but that doesn't mean all cases with these codes must be excluded from the Accidental Poisoning indicator. (But maybe these codes in addition to some other accidental poisoning code indicates an alcohol-related event, so we do want to exclude?) Look at this more in-depth if time allows.
- Do we really want to exclude cases of poisoning related to venomous bites [989.5] or venomous plants [E905.6-E905.7], or just not include them in the numerator?

Fire Arms Accidents (Guns)

Indicator definition:

Number of patients, age 18 and older, admitted for fire arms accidents per denominator population.

Numerator:

All discharges of eligible population with ICD-9-CM diagnosis codes (principal or secondary) for *fire arms accidents* (see below):

Include ICD-9-CM diagnosis and E codes:

Accident Caused by Firearm or Air Gun Missile	
Handgun	E922.0
Shotgun (automatic)	E922.1
Hunting rifle	E922.2
Military firearms	E922.3
Air gun (eg, BB gun)	E922.4
Paintball gun	E922.5
Other specified firearm missile (eg, flare)	E922.8
Unspecified firearm missile	E922.9

Exclude Numerator Cases:
- MDC 14 (pregnancy, childbirth, and puerperium)
- Transferring from another institution (SID ASOURCE=2 or 3; POINTOFORIGINUB04='4', '5', '6')
- All persons admitted to hospital from institutional setting will be excluded from the indicator (numerator and denominator) as per INSTITUTIONAL EXCLUSION in DENOMINATOR DEFINITION. See end of document.

Denominator:

HCBS QI denominator population, as defined by MPR (Version 3 of the denominator), age 18 and older

Exclude Denominator Cases:
- MDC 14 (pregnancy, childbirth, and puerperium)
- Transferring from another institution (SID ASOURCE=2 or 3; POINTOFORIGINUB04='4', '5', '6')
- All persons admitted to hospital from institutional setting will be excluded from the indicator (numerator and denominator) as per INSTITUTIONAL EXCLUSION in DENOMINATOR DEFINITION. See end of document.

Notes:
- To maintain consistency with the AHRQ PQIs (version 4.1), for all HCBS QIs, records missing age or sex will be deleted.

Accidental Drowning (Drown)

Indicator definition:

Number of patients, age 18 and older, admitted for accidental drowning per denominator population.

Numerator:

All discharges of eligible population with ICD-9-CM diagnosis codes (principal or secondary) for *accidental drowning* (see below):

Include ICD-9-CM diagnosis and E codes:

Accidental Drowning	
Drowning and nonfatal submersion	994.1
Accidental drowning and submersion	
In bathtub	E910.4
Other (ie, in swimming pool)	E910.8
Unspecified (ie, accidental fall into water, NOS)	E910.9

Exclude Numerator Cases:
- MDC 14 (pregnancy, childbirth, and puerperium)
- Transferring from another institution (SID ASOURCE=2 or 3; POINTOFORIGINUB04='4', '5', '6')
- All persons admitted to hospital from institutional setting will be excluded from the indicator (numerator and denominator) as per INSTITUTIONAL EXCLUSION in DENOMINATOR DEFINITION. See end of document.

Exclude numerator cases with the following ICD-9-CM diagnosis and E codes in any field:

Numerator Exclusions	
While water skiing	E910.0
While engaged in other sport or recreational activity with diving equipment	E910.1
While engaged in other sport or recreational activity without diving equipment	E910.2
While swimming or diving for purposes other than recreation or sport	E910.3
Assault by submersion (drowning)	E964]
Accident to water transport causing submersion	[E830.0-E830.9]
Other accidental submersion or drowning in water transport accident	[E832.0-E832.9]

Denominator:

HCBS QI denominator population, as defined by MPR (Version 3 of the denominator), age 18 and older

Exclude Denominator Cases:
- MDC 14 (pregnancy, childbirth, and puerperium)
- Transferring from another institution (SID ASOURCE=2 or 3; POINTOFORIGINUB04='4', '5', '6')

▪ All persons admitted to hospital from institutional setting will be excluded from the indicator (numerator and denominator) as per INSTITUTIONAL EXCLUSION in DENOMINATOR DEFINITION. See end of document.
Notes: ▪ To maintain consistency with the AHRQ PQIs (version 4.1), for all HCBS QIs, records missing age or sex will be deleted.

Excessive Heat or Cold Exposure due to Weather Conditions (Wthr)

Indicator definition:

Number of patients, age 18 and older, admitted for excessive heat or cold exposure due to weather conditions per denominator population.

Numerator:

All discharges of eligible population with ICD-9-CM diagnosis codes (principal or secondary) for *excessive heat or cold exposure due to weather conditions* (see below):

Include ICD-9-CM diagnosis and E codes:

Excessive Exposure due to Weather Conditions	
Excessive Heat	
Due to weather conditions	E900.0
Of unspecified origins	E900.9
Excessive Cold	
Due to weather conditions	E901.0
Of unspecified origins	E901.9
Effects of Heat and Light	
Heat stroke and sunstroke	992.0
Heat syncope (heat collapse)	992.1
Heat cramps	992.2
Heat exhaustion, unspecified	992.5
Heat fatigue, transient	992.6
Heat edema	992.7
Other specified heat effects	992.8
Unspecified	992.9
Effects of Reduced Temperature	
Frostbite	[991.0-991.3]
Immersion foot	991.4
Chilblains	991.5
Hypothermia	991.6
Other specified effects of reduce temperature	991.8
Unspecified effect of reduce temperature	991.9

Exclude Numerator Cases:

- MDC 14 (pregnancy, childbirth, and puerperium)
- Transferring from another institution (SID ASOURCE=2 or 3; POINTOFORIGINUB04='4', '5', '6')
- All persons admitted to hospital from institutional setting will be excluded from the indicator (numerator and denominator) as per INSTITUTIONAL EXCLUSION in DENOMINATOR DEFINITION. See end of document.

Exclude numerator cases with the following ICD-9-CM diagnosis and E codes in any field:

Numerator Exclusions	
Excessive heat due to man-made conditions	E900.1
Excessive cold due to man-made conditions	E901.1
Late effects of natural or environmental factors	E929.5

Denominator:

HCBS QI denominator population, as defined by MPR (Version 3 of the denominator), age 18 and older

Exclude Denominator Cases:

- MDC 14 (pregnancy, childbirth, and puerperium)
- Transferring from another institution (SID ASOURCE=2 or 3; POINTOFORIGINUB04='4', '5', '6')
- All persons admitted to hospital from institutional setting will be excluded from the indicator (numerator and denominator) as per INSTITUTIONAL EXCLUSION in DENOMINATOR DEFINITION. See end of document.

Notes:

- To maintain consistency with the AHRQ PQIs (version 4.1), for all HCBS QIs, records missing age or sex will be deleted.

Attempted Suicide and Serious and Persistent Mental Illness (CpBehav)
Composite Definition: This composite is composed of two indicators: (i) *attempted suicide* and (ii) *serious and persistent mental illness.*
Numerator: All cases meeting the numerator definition of (i) *attempted suicide* OR (ii) *serious and persistent mental illness.* (See following pages for specifications)
Denominator: All cases meeting the denominator definition of (i) *attempted suicide* OR (ii) *serious and persistent mental illness.* (See following pages for specifications)
Notes: ▪ To maintain consistency with the AHRQ PQIs (version 4.1), for all HCBS QIs, records missing age or sex will be deleted.

Attempted Suicide (Suic)

Indicator definition:

Number of patients, age 18 and older, admitted for attempted suicide or self-inflicted injury per denominator population.

Numerator:

All discharges of eligible population with ICD-9-CM diagnosis and E codes (principal or secondary) for *attempted suicide or self-inflicted injury* (see below):

Include ICD-9-CM diagnosis and E codes:

Suicide and Self-Inflicted Injury	
Suicide and self-inflicted injury by	
Poisoning by solid and liquid substances	[E950.0-E950.9]
Poisoning by gases in domestic use	[E951.0-E951.1; E951.8]
Poisoning by other gases and vapors	[E952.0-E952.1; E952.8-E952.9]
Hanging, strangulation and suffocations	[E953.0-E953.1; E953.8-E953.9]
Drowning (submersion)	E954
Firearms, air guns and explosives	[E955.0-E955.7; E955.9]
Cutting and piercing instrument	E956
Jumping from high place	[E957.0-E957.2; E957.9]
Other and unspecified means	[E958.0-E958.9]

Exclude Numerator Cases:
- MDC 14 (pregnancy, childbirth, and puerperium)
- Transferring from another institution (SID ASOURCE=2 or 3; POINTOFORIGINUB04='4', '5', '6')
- All persons admitted to hospital from institutional setting will be excluded from the indicator (numerator and denominator) as per INSTITUTIONAL EXCLUSION in DENOMINATOR DEFINITION. See end of document.

Exclude numerator cases with the following ICD-9-CM diagnosis and E codes in any field:

Late effects of self-inflicted injury	E959

Denominator:

HCBS QI denominator population, as defined by MPR (Version 3 of the denominator), age 18 and older

Exclude Denominator Cases:
- MDC 14 (pregnancy, childbirth, and puerperium)
- Transferring from another institution (SID ASOURCE=2 or 3; POINTOFORIGINUB04='4', '5', '6')
- All persons admitted to hospital from institutional setting will be excluded from the indicator (numerator and denominator) as per INSTITUTIONAL EXCLUSION in DENOMINATOR DEFINITION. See end of document.

Notes:
- To maintain consistency with the AHRQ PQIs (version 4.1), for all HCBS QIs, records missing age or sex will be deleted.

Major Validation Questions

- Many completed suicides may not be captured using hospital administrative data because they may not result in a hospital admission (ie, pronounced dead on-site). Evidence from the literature reports that there is a greater chance that a suicide attempt is likely to be fatal in elderly individuals than in other populations. The ratio of attempted-to-completed suicides in older adults is much lower than the general population (range 2/1 to 4/1 vs. 8/1 to 40/1). This may confound interpretation of the suicide indicator, since the proportion of missed suicides (ie, pronounced dead on-site without a hospital admission) may be higher in older adults than in others.

Serious and Persistent Mental Illness (MentI)

Indicator definition:

Number of patients, age 18 and older, admitted for serious and persistent mental illness per denominator population.

Numerator:

All discharges of eligible population with ICD-9-CM diagnosis codes (principal) for *serious and persistent mental illness* (see below):

Include ICD-9-CM diagnosis and E codes:

Serious and Persistent Mental Illness	
Transient mental disorders due to conditions classified elsewhere	[293.0-293.1; 293.81-293.84; 293.89; 293.9]
Persistent mental disorders due to conditions classified elsewhere	[294.0; 294.10-294.11; 294.8-294.9]
Schizophrenic disorders	[295.00-295.05; 295.10-295.15; 295.20-295.25; 295.30-295.35; 295.40-295.45; 295.50-295.55; 295.60-295.65; 295.70-295.75; 295.80-295.85; 295.90-295.95]
Manic disorders	[296.00-296.06; 296.10-296.16]
Major depressive disorder	[296.20-296.26, 296.30-296.36]
Bipolar disorders	[296.40-296.46; 296.50-296.56; 296.60-296.66; 296.7; 296.80-296.82; 296.89]
Other and unspecified episodic mood disorder	[296.90; 296.99]
Delusional disorders	[297.0-297.3; 297.8-297.9]
Other nonorganic psychoses	[298.0-298.4; 298.8-298.9]
Pervasive developmental disorders	[299.00-299.01; 299.10-299.11; 299.80-299.81; 299.90-299.91]

Exclude Numerator Cases:
- MDC 14 (pregnancy, childbirth, and puerperium)
- Transferring from another institution (SID ASOURCE=2 or 3; POINTOFORIGINUB04='4', '5', '6')
- All persons admitted to hospital from institutional setting will be excluded from the indicator (numerator and denominator) as per INSTITUTIONAL EXCLUSION in DENOMINATOR DEFINITION. See end of document.

Denominator:

HCBS QI denominator population, as defined by MPR (Version 3 of the denominator), age 18 and older

Exclude Denominator Cases:
- MDC 14 (pregnancy, childbirth, and puerperium)
- Transferring from another institution (SID ASOURCE=2 or 3; POINTOFORIGINUB04='4', '5', '6')
- All persons admitted to hospital from institutional setting will be excluded from the indicator (numerator and denominator) as per INSTITUTIONAL EXCLUSION in DENOMINATOR DEFINITION. See end of document.

Notes:

- To maintain consistency with the AHRQ PQIs (version 4.1), for all HCBS QIs, records missing age or sex will be deleted.

Major Validation Questions

- The numerator here is problematic, since patients may be admitted to mental health facilities outside the administrative database. This practice pattern is likely to be systematic, depending on the policies of the health care system in an area. Do we see evidence of this? If any data were available on admissions to psychiatric facilities, we could examine this empirically.

Substance Abuse (SubAb)

Indicator definition:

Number of patients, age 18 and older, admitted for abuse of alcohol or drug abuse per denominator population.

Numerator:

All discharges of eligible population with ICD-9-CM diagnosis codes (principal) for *abuse of alcohol* or *drug abuse* (see below):

Include ICD-9-CM diagnosis and E codes:

Abuse of Alcohol	
Acute alcoholic intoxication	[303.00-303.03]
Other and unspecified alcohol dependence	[303.90-303.93]
Alcohol abuse	[305.00-305.03]
Alcohol-induced Mental Disorders	
Alcohol withdrawal delirium	291.0
Alcohol-induced persisting amnestic disorder	291.1
Alcohol-induced persisting dementia	291.2
Alcohol-induced psychotic disorder with hallucinations	291.3
Idiosyncratic alcohol intoxication	291.4
Alcohol-induced psychotic disorder with delusions	291.5
Other specified Alcohol-induced mental disorders	[291.81-291.82; 291.89]
Unspecified Alcohol-induced mental disorders	291.9

OR

Drug Abuse	
Drug-induced Mental Disorders	
Drug withdrawal	292.0
Drug-induced psychotic disorders	[292.11-292.12]
Pathologic drug intoxication	292.2
Other specified drug-induced mental disorders	[292.81-292.84; 292.89]
Unspecified drug-induced mental disorder	292.9
Drug Dependence by:	
Opioid	[304.00-304.03]
Sedative, hypnotic or anxiolytic	[304.10-304.13]
Cocaine	[304.20-304.23]
Cannabis	[304.30-304.33]
Amphetamine and other psychostimulant	[304.40-304.43]
Hallucinogen	[304.50-304.53]
Other specified drug	[304.60-304.63]
Combinations of opioid type drug with any other	[304.70-304.73]
Combinations of drug dependence excluding opioids	[304.80-304.83]
Unspecified	[304.90-304.93]

Non-dependent Abuse of Drugs	
Cannabis	[305.20-305.23]
Hallucinogen	[305.30-305.33]
Sedative, hypnotic and anxiolytic	[305.40-305.43]
Opioid	[305.50-305.53]
Cocaine	[305.60-305.53]
Amphetamine or related acting psychostimulant	[305.70-305.73]
Antidepressant type	[305.80-305.83]
Other, mixed or unspecified	[305.90-305.93]
Poisoning by Opiates and related narcotics	[965.00-965.02; 965.09]
Poisoning by psychodisleptics (hallucinogen)	969.6
Poisoning by psychostimulant	[969.70; 969.72-969.73; 969.79]

Exclude Numerator Cases:
- MDC 14 (pregnancy, childbirth, and puerperium)
- Transferring from another institution (SID ASOURCE=2 or 3; POINTOFORIGINUB04='4', '5', '6')
- All persons admitted to hospital from institutional setting will be excluded from the indicator (numerator and denominator) as per INSTITUTIONAL EXCLUSION in DENOMINATOR DEFINITION. See end of document.

Exclude numerator cases with the following ICD-9-CM diagnosis and E codes in any field:

Drug-induced sleep disorders	292.85

Denominator:

HCBS QI denominator population, as defined by MPR (Version 3 of the denominator), age 18 and older

Exclude Denominator Cases:
- MDC 14 (pregnancy, childbirth, and puerperium)
- Transferring from another institution (SID ASOURCE=2 or 3; POINTOFORIGINUB04='4', '5', '6')
- All persons admitted to hospital from institutional setting will be excluded from the indicator (numerator and denominator) as per INSTITUTIONAL EXCLUSION in DENOMINATOR DEFINITION. See end of document.

Notes:
- To maintain consistency with the AHRQ PQIs (version 4.1), for all HCBS QIs, records missing age or sex will be deleted.

Major Validation Questions
- Like the serious mental illness indicator, the numerator of the substance abuse indicator is problematic, since patients may be admitted to substance abuse rehabilitation facilities outside the administrative database. This practice pattern is likely to be systematic, depending on the policies of the health care system in an area. Do we see evidence of this? If any data were available on admissions to such facilities, we could examine this empirically.
- Should methadone and "other opiates and related narcotics" be included in the definition of substance abuse? (Whatever we decide, make sure we are consistent for poisoning by, drug dependence on, non-dependent use of, adverse effects of class of codes).
- Should drug-induced sleep disorders really be an exclusion criterion?

Dual Diagnosis of Mental Illness and Substance Abuse (DualDx)

Indicator definition:

Number of patients admitted, age 18 and older, with BOTH (i) serious and persistent mental illness AND (ii) abuse of alcohol or drug abuse within the same admission per denominator population.

Note: To qualify for inclusion in the numerator of this indicator, a particular discharge must include both a serious and persistent mental illness diagnosis code (either principal or secondary diagnosis) AND a drug- or alcohol-abuse code (either principal or secondary diagnosis) with either the mental illness diagnosis code or the substance abuse code in the principal position.

Numerator:

All discharges of eligible population with ICD-9-CM diagnosis and E codes (principal or secondary) for *serious and persistent mental illness* (as defined for MentI) AND with ICD-9-CM diagnosis and E codes (principal or secondary) for *alcohol or drug abuse* (as defined for SubAb) (see below):

Include ICD-9-CM diagnosis and E codes:

Serious and Persistent Mental Illness	As defined for MentI indicator

AND

Abuse of Alcohol or Drug Abuse	As defined for SubAb indicator

Exclude Numerator Cases:
- MDC 14 (pregnancy, childbirth, and puerperium)
- Transferring from another institution (SID ASOURCE=2 or 3; POINTOFORIGINUB04='4', '5', '6')
- All persons admitted to hospital from institutional setting will be excluded from the indicator (numerator and denominator) as per INSTITUTIONAL EXCLUSION in DENOMINATOR DEFINITION. See end of document.

Denominator:

HCBS QI denominator population, as defined by MPR (Version 3 of the denominator), age 18 and older

Exclude Denominator Cases:
- MDC 14 (pregnancy, childbirth, and puerperium)
- Transferring from another institution (SID ASOURCE=2 or 3; POINTOFORIGINUB04='4', '5', '6')
- All persons admitted to hospital from institutional setting will be excluded from the indicator (numerator and denominator) as per INSTITUTIONAL EXCLUSION in DENOMINATOR DEFINITION. See end of document.

Notes:
- To maintain consistency with the AHRQ PQIs (version 4.1), for all HCBS QIs, records missing age or sex will be deleted.

Major Validation Questions
- See comments for serious persistent mental illness and substance abuse indicators.

APPENDIX 5: DETAILS OF CLINICAL SUBGROUP DEFINITIONS

To create clinical subgroups, individuals were first assigned to one of 14* clinical groups based on diagnosis codes contained within MAX inpatient data, MedPAR inpatient data (for dual eligible persons), or MAX outpatient data. (Data on outpatient visits covered by Medicare was not available. For dual eligible persons, we used MAX outpatient data). Some individuals were not included in any of these groups if they did not meet any of the criteria. Complete details of these 14* clinical groups are included below. Then, we aggregated these clinical groups into 4 broader clinical subgroup populations in the following way:

Intellectual or Developmental Disabilities (ID/DD): Individuals included in Groups 1-6.

Mental Illness: Individuals included in Groups 8-9 and 11-13.

Brain or Spinal Cord Injury: Individuals included in ~~in~~ Group 14.

HIV/AIDS: Individuals included in ~~in~~ Group 15.

We used a hierarchy, explained below, to assign individuals to groups before calculating the 4 aggregated subgroups listed above.

*Note: An error in the original specifications mis-numbered the groups, omitting a group 10. Therefore, the 14 groups are labeled 1-9 and 11-15. We have maintained this numbering to avoid confusion after the program creating the groups was developed.

Details of 14* Clinical Subgroups:

The following clinical categories are meant to be used to identify subsets of persons in the HCBS denominator with similar clinical characteristics. This will aid in data analyses intended to investigate issues and rates specific to these groups. These groups roughly line up with waivers, but state-by-state waivers vary and many waivers require functional assessments which cannot be captured in administrative data.

In SID. Any diagnosis code. Starred conditions should not be included. (Note, these clinical groups were not implemented in SID data).

In MAX data. Groups are in order of priority. Individuals assigned to a group higher in the hierarchy should not be assigned to a lower group. These priority assignments are based on the prevalence of waivers for these conditions and propensity of the illness to influence services required.

The starred conditions are for future development in the MAX. Since we only have one year of data, we should include patients with any of these diagnoses (starred and unstarred) in any outpatient or inpatient records. If we had multiple years of data, we would consider dropping these codes if they are the only qualifying diagnosis in the time period. We would also need to determine the number of diagnoses required to qualify for the subgroups. For mental illness (MI), we would likely require more than one diagnosis code for any MI.

[1]These clinical groups represent minor conditions. Patients should be assigned to these groups only if they qualify for the HCBS denominator AND they do not qualify for any other clinical groups.

[2]These codes are most likely to qualify an individual for a waiver and least likely to represent a comorbidity. If subpopulations are to be developed further we should investigate further which codes should qualify if the waiver type is unknown.

Group 1. Developmental Delay: Down's syndrome

758.0 Down's Syndrome

Group 2. Developmental Delay: Chromosomal abnormalities

330.0 Leukodystrophy
330.1 Cerebral lipidoses
330.2 Cerebral degeneration in generalized lipidoses
330.3 Cerebral degeneration of childhood in other diseases classified elsewhere
330.8 Other specified cerebral degenerations in childhood
330.9 Unspecified cerebral degeneration in childhood
758.1 Patau's Syndrome
758.2 Edward's Syndrome
758.31 Cri-du-chat syndrome
758.33 Other microdeletions
758.39 Autosomal deletion syndromes
759.5 Tuberous sclerosis
758.7 Klinefelter's Syndrome
759.81 Prader-Willi Syndrome
759.82 Marfan Syndrome
759.83 Fragile X Syndrome
759.89 Other specified anomalies

Group 3. Developmental Delay: Severe brain injury of childhood

768.5 Severe birth asphyxia
768.73 Severe hypoxic-ischemic encephalopathy
774.7 Kernicterus of fetus or newborn not due to isoimmunization
773.4 Kernicterus due to isoimmunization of fetus or newborn
779.7 Periventricular leukomalacia

Group 4. Developmental Delay: CP/epilepsy/physical disabilities

343.2 Infantile cerebral palsy, quadriplegic
343.3 Infantile cerebral palsy, monoplegic
343.4 Infantile hemiplegia
343.8 Other specified infantile cerebral palsy
343.9 Infantile cerebral palsy, unspecified
345.00 Generalized nonconvulsive epilepsy without mention of intractable epilepsy
345.01 Generalized nonconvulsive epilepsy with intractable epilepsy
345.10 Generalized convulsive epilepsy without mention of intractable epilepsy
345.11 Generalized convulsive epilepsy with intractable epilepsy
345.2 Petit mal status
345.3 Grand mal status
345.40 Localization-related (focal) (partial) epilepsy and epileptic syndromes with complex partial seizures, without mention of intractable epilepsy
345.41 Localization-related (focal) (partial) epilepsy and epileptic syndromes with complex partial seizures, with intractable epilepsy

345.50 Localization-related (focal) (partial) epilepsy and epileptic syndromes with simple partial seizures, without mention of intractable epilepsy
345.51 Localization-related (focal) (partial) epilepsy and epileptic syndromes with simple partial seizures, with intractable epilepsy
345.60 Infantile spasms without mention of intractable epilepsy
345.61 Infantile spasms with intractable epilepsy
345.70 Epilepsia partialis continua without mention of intractable epilepsy
345.71 Epilepsia partialis continua with intractable epilepsy
345.80 Other forms of epilepsy and recurrent seizures, without mention of intractable epilepsy
345.81 Other forms of epilepsy and recurrent seizures, with intractable epilepsy
345.90 Unspecified epilepsy without mention of intractable epilepsy
345.91 Unspecified epilepsy with intractable epilepsy
741.00 Spina bifida with hydrocephalus, unspecified region
741.01 Spina bifida with hydrocephalus, cervical region
741.02 Spina bifida with hydrocephalus, dorsal (thoracic) region
741.03 Spina bifida with hydrocephalus, lumbar region
741.90 Spina bifida without mention of hydrocephalus, unspecified region
741.91 Spina bifida without mention of hydrocephalus, cervical region
741.92 Spina bifida without mention of hydrocephalus, dorsal (thoracic) region
741.93 Spina bifida without mention of hydrocephalus, lumbar region

Group 5. Developmental Delay: Fetal alcohol syndrome

760.71 Noxious influences affecting fetus or newborn via placenta or breast milk, alcohol

Group 6. Developmental Delay: Other cognitive disabilities - major

299.00 Autistic disorder, current or active state
*299.01 Autistic disorder, residual state
299.10 Childhood disintegrative disorder, current or active state
299.80 Other specified pervasive developmental disorders, current or active state
299.90 Unspecified pervasive developmental disorder, current or active state
314.1 Hyperkinesis with developmental delay
318.0 Moderate mental retardation (35-49)
318.1 Severe mental retardation (20-34)
318.2 Profound mental retardation
319 Unspecified mental retardation

[1]Group 7. Developmental Delay: Other cognitive disabilities - minor

315.00 Reading disorder, unspecified
315.01 Alexia
315.02 Developmental dyslexia
315.09 Other reading disorder
315.1 Mathematics disorder
315.2 Other specific learning difficulties
315.31 Expressive language disorder
315.32 Mixed receiptive-expressive language disorder
315.34 Speech and language developmental delay due to hearing loss
315.39 Other language
315.3 Developmental coordination disorder
315.5 Mixed development disorder
315.8 Other specified delays in development
315.9 Unspecified delay in development
317 Mild mental retardation (50-70 iq)

Group 8. Mental Illness: Psychoses except in presence of affective disorders

295.00 Simple schizophrenia, unspecified condition
295.01 Simple schizophrenia, subchronic condition
295.02 Simple schizophrenia, chronic condition
295.03 Simple schizophrenia, subchronic condition with acute exacerbation
295.04 Simple schizophrenia, chronic condition with acute exacerbation
295.05 Simple schizophrenia, in remission
295.10 Disorganized schizophrenia, unspecified condition
295.11 Disorganized schizophrenia, subchronic condition
295.12 Disorganized schizophrenia, chronic condition
295.13 Disorganized schizophrenia, subchronic condition with acute exacerbation
295.14 Disorganized schizophrenia, chronic condition with acute exacerbation
295.15 Disorganized schizophrenia, in remission

295.20 Catatonic schizophrenia, unspecified condition
295.21 Catatonic schizophrenia, subchronic condition
295.22 Catatonic schizophrenia, chronic condition
295.23 Catatonic schizophrenia, subchronic condition with exacerbation
295.24 Catatonic schizophrenia, chronic condition with exacerbation
295.25 Catatonic schizophrenia, in remission
295.30 Paranoid schizophrenia, unspecified condition
295.31 Paranoid schizophrenia, subchronic condition
295.32 Paranoid schizophrenia, chronic condition
295.33 Paranoid schizophrenia, subchronic condition with acute exacerbation
295.34 Paranoid schizophrenia, chronic condition with acute exacerbation
295.35 Paranoid schizophrenia, in remission
295.40 Schizophreniform disorder, unspecified
295.41 Schizophreniform disorder, subchronic
295.42 Schizophreniform disorder, chronic
295.43 Schizophreniform disorder, subchronic with acute exacerbation
295.44 Schizophreniform disorder, chronic with acute exacerbation
295.45 Schizophreniform disorder, in remission
295.50 Latent schizophrenia, unspecified condition
295.51 Latent schizophrenia, subchronic
295.52 Latent schizophrenia, chronic
295.53 Latent schizophrenia, subchronic with acute exacerbation
295.54 Latent schizophrenia, chronic with acute exacerbation
295.55 Latent schizophrenia, in remission
295.60 Schizophrenic disorders, residual type, unspecified
295.61 Schizophrenic disorders, residual type, subchronic
295.62 Schizophrenic disorders, residual type, chronic
295.63 Schizophrenic disorders, residual type, subchronic with acute exacerbation
295.64 Schizophrenic disorders, residual type, chronic with acute exacerbation
295.65 Schizophrenic disorders, residual type, in reamission
295.70 Schizoaffective disorder, unspecified
295.71 Schizoaffective disorder, subchronic
295.72 Schizoaffective disorder, chronic
295.73 Schizoaffective disorder, subchronic with acute exacerbation
295.74 Schizoaffective disorder, chronic with acute exacerbation
295.75 Schizoaffective disorder, in remission
295.80 Other specified types of schizophrenia, unspecified condition
295.81 Other specified types of schizophrenia, subchronic condition
295.82 Other specified types of schizophrenia, chronic condition
295.83 Other specified types of schizophrenia, subchronic condition with acute exacerbation

295.84 Other specified types of schizophrenia, chronic condition with acute exacerbation
295.85 Other specified types of schizophrenia, in remission
295.90 Unspecified schizophrenia, unspecified condition
295.91 Unspecified schizophrenia, subchronic
295.92 Unspecified schizophrenia, chronic condition
295.93 Unspecified schizophrenia, subchronic condition with acute exacerbation
295.94 Unspecified schizophrenia, chronic condition with acute exacerbation
295.95 Unspecified schizophrenia, in remission
297.0 Paranoid state, simple
297.1 Delusional disorder
297.2 Paraphrenia
297.3 Shared psychotic disorder
297.8 Other specified paranoid states
297.9 Un~~p~~specified paranoid state

Group 9. Mental Illness: Major affective disorders

296.00 Bipolar I disorder, single manic episode, unspecified
296.02 Bipolar I disorder, single manic episode, moderate
296.03 Bipolar I disorder, single manic episode, severe, without mention of psychotic behavior
296.04 Bipolar I disorder, single manic episode, severe, specified as with psychotic behavior
296.10 Manic disorder, recurrent episode, unspecified
296.12 Manic disorder, recurrent episode, moderate
[2]296.13 Manic disorder, recurrent episode, severe, without mention of psychotic behavior

[2] 296.14 Manic disorder, recurrent episode, severe, specified as with psychotic behavior
296.20 Major depressive disorder, single episode, unspecified
296.22 Major depressive disorder, single episode, moderate
296.23 Major depressive disorder, single episode, severe, without mention of psychotic behavior

296.24 Major depressive disorder, single episode, severe, specified as with psychotic behavior
296.30 Major depressive disorder, recurrent episode, unspecified
296.32 Major depressive disorder, recurrent episode, moderate
[2]296.33 Major depressive disorder, recurrent episode, severe, without mention of psychotic behavior
[2]296.34 Major depressive disorder, recurrent episode, severe, specified as with psychotic behavior
296.40 Bipolar I disorder, most recent episode (or current) manic, unspecified
296.42 Bipolar I disorder, most recent episode (or current) manic, moderate
[2]296.43 Bipolar I disorder, most recent episode (or current) manic, severe, without mention of psychotic behavior
[2]296.44 Bipolar I disorder, most recent episode (or current) manic, severe, specified as with psychotic behavior
296.50 Bipolar I disorder, most recent episode (or current) depressed, unspecified
296.52 Bipolar I disorder, most recent episode (or current) depressed, moderate
[2]296.53 Bipolar I disorder, most recent episode (or current) depressed, severe, without mention of psychotic behavior
[2]296.54 Bipolar I disorder, most recent episode (or current) depressed, severe, specified as with psychotic behavior
296.60 Bipolar I disorder, most recent episode (or current) mixed, unspecified
296.62 Bipolar I disorder, most recent episode (or current) mixed, moderate
[2]296.63 Bipolar I disorder, most recent episode (or current) mixed, severe, without mention of psychotic behavior
[2]296.64 Bipolar I disorder, most recent episode (or current) mixed, severe, specified as with psychotic behavior
296.7 Bipolar I disorder, most recent episode (or current) unspecified
296.80 Bipolar disorder, unspecified
296.81 Atypical manic disorder

296.82 Atypical depressive disorder
296.89 Other bipolar disorder

Group 11. Mental Illness: Major Anxiety Disorders

300.01 Panic disorder without agoraphobia
300.21 Agoraphobia with panic disorder
300.3 Obsessive-compulsive disorders

[1]Group 12. Mental Illness: Other major disorders due to medical conditions

293.83 Mood disorder in conditions classified elsewhere
294.0 Amnestic disorder in conditions classified elsewhere
294.8 Other persistent mental disorders due to conditions classified elsewhere
310.1 Personality change due to conditions classified elsewhere

[1]Group 13. Mental Illness: Minor affective disorders

296.01 Bipolar I disorder, single manic episode, mild
*296.05 Bipolar I disorder, single manic episode, in partial or unspecified remission
*296.06 Bipolar I disorder, single manic episode, in full remission
296.11 Manic disorder, recurrent episode, mild
*296.15 Manic disorder, recurrent episode, in partial or unspecified remission
*296.16 Manic disorder, recurrent episode, in full remission
296.21 Major depressive disorder, single episode, mild
*296.25 Major depressive disorder, single episode, in partial or unspecified remission
*296.26 Major depressive disorder, single episode in full remission
296.31 Major depressive disorder, recurrent episode, mild
*296.35 Major depressive disorder, recurrent episode, in partial or unspecified remission
*296.36 Major depressive disorder, recurrent episode, in full remission
296.41 Bipolar I disorder, most recent episode (or current) manic, mild
*296.45 Bipolar I disorder, most recent episode (or current) manic, in partial or unspecified remission
*296.46 Bipolar I disorder, most recent episode (or current) manic, in full remission
296.51 Bipolar I disorder, most recent episode (or current) depressed, mild
*296.55 Bipolar I disorder, most recent episode (or current) depressed, in partial or unspecified remission
*296.56 Bipolar I disorder, most recent episode (or current) depressed, in full remission
296.61 Bipolar I disorder, most recent episode (or current) mixed, mild
*296.65 Bipolar I disorder, most recent episode (or current) mixed, in partial or unspecified remission
*296.66 Bipolar I disorder, most recent episode (or current) mixed, in full remission

Group 14. TBI/SCI

907.0 Late effect of intracranial injury without mention of skull fracture
907.1 Late effect of injury to cranial nerve
907.2 Late effect of spinal cord injury
Current TBI (include all 4th and 5th digits) 800.0--801.9, 803.0--804.9, 850.0--854.1, 950.1--950.3, 959.01, and 995.55
Current SCI (include all 4th and 5th digits) 806, 952

Group 15. HIV/AIDs

042 Human Immunodeficiency Virus disease