



Abt Associates Inc.

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# National Nursing Home Quality Measures

## USER'S MANUAL

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(consolidation of original User's Manual and Technical User's Manual)

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*Prepared by:*

Abt Associates Inc.  
55 Wheeler Street  
Cambridge, MA 02138

# Quality Measure (QM) User's Manual

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# Chapter 1

## Introduction and Overview of the QMs Recommended by the National Quality Forum for Public Reporting

This User's Manual contains information on how each quality measure is defined, the criteria for Minimum Data Set (MDS) record selection, and technical details about how each quality measure is calculated. A brief introduction to the quality measures calculated for national public reporting as part of the Centers for Medicare and Medicaid Services' (CMS) Nursing Home Quality Initiative follows.

The quality measures described in this manual reflect October 2003 recommendations by the National Quality Forum. Fourteen MDS-based quality measures (QMs) were endorsed by NQF and recommended for use by CMS. These indicators target both the chronic and post-acute care populations served by nursing facilities.

- “Chronic” care” refers to those types of patients who enter a nursing facility typically because they are no longer able to care for themselves at home. These patients (or residents) tend to remain in the nursing facility anywhere from several months to several years. The chronic QMs were calculated on any residents with a full or quarterly MDS in the target quarter.
- “Post-acute” care (PAC) refers to those types of patients who are admitted to a facility and typically stay less than 30 days. They are also referred to as “short-stay residents”. These admissions typically follow an acute care hospitalization and involve high-intensity rehabilitation or clinically complex care. The Post-Acute QMs were calculated on any patients with a 14-day PPS MDS in the last six months.

There are seven “chronic” care quality measures to be used for national reporting. These include the following.

- Percent of residents whose need for help with daily activities has increased;
- Percent of residents who have moderate to severe pain;
- Percent of residents who were physically restrained;
- Percent of residents who spent most of their time in bed or in a chair during the assessment period;
- Percent of residents whose ability to move about in and around their room got worse;
- Percent of residents with a urinary tract infection; and
- Percent of residents who have become more depressed or anxious.

There are four “chronic” care quality measures that the NQF believes should only be reported in conjunction with each other, as pairs of QMs. They include:

- Percent of high-risk residents who have pressure sores AND percent of low-risk residents who have pressure sores; and
- Percent of low-risk residents who lose control of their bowels or bladder AND percent of residents who have/had a catheter inserted and left in their bladder.

There are three “post-acute” care quality measures recommended by the NQF to be used in national public reporting. These include the following:

- Percent of short-stay residents with delirium;
- Percent of short-stay residents who had moderate to severe pain; and
- Percent of short-stay residents who have pressure sores.

The operational definitions for each quality measure are provided in the “Chronic Care (CC) QM Definitions”(Chapter 2) and “Post Acute Care (PAC) QM Definitions” (Chapter 3) sections of this User’s Manual. In those sections, numerators, denominators, and exclusion criteria are described. In general, the numerator is the count of patients with the condition of interest, and the denominator is the count of patients in the facility or a group of patients in the facility considered to be “at risk” of the condition of interest.

This User’s Manual also contains the criteria that were used to select MDS records to calculate the chronic and post-acute care QMs (Chapter 4), technical details regarding how the QMs are calculated (Appendix A) and calculation parameters (or coefficients) (Appendix B).

QMs calculated for every facility in the U.S. for which we have MDS data in the target period. Some QMs are risk adjusted, using resident-level covariates. The reported quality score for measures with resident-level covariates may be thought of as an estimate of the percentage of a facility’s residents that would trigger the QM if the facility had residents with the average risk of all residents in all U.S. nursing facilities.

# Chapter 2

## Chronic Care (CC) QM Definitions

This chapter contains a matrix giving the definitions for the NQF-endorsed Chronic Care QMs. For each QM, the matrix gives the information necessary to calculate the QM and any covariates used in the QM calculation.

For each QM, the first column of the matrix, labeled “Measure Description” provides the following information:

- **QM description.** The first entry in the column is a brief description of the QM.
- **QM short label.** The short label for the QM is the first entry in parentheses.

The second column, labeled “Measure Specifications,” gives the information for calculating the QM:

- **Numerator.** The numerator entry gives the logic used to determine whether a resident triggers the QM (if the resident is included in the numerator for the QM rate in the facility).
- **Denominator.** The denominator entry defines whether a resident has the necessary records available to be a candidate for the QM (inclusion of the resident in the denominator for the QM rate for the facility).
- **Exclusions.** The exclusions entry provides clinical conditions and missing data conditions that preclude a resident from consideration for the QM. An excluded resident is excluded from both the numerator and denominator of the QM rate for the facility.
- **Technical comments.** Entries here provide additional technical details pertaining to the QM numerator, denominator, and exclusions. Examples of the type of information provided include specific details for calculating scale scores, definition of missing data values for an MDS item, and selection of the value for an MDS item that may come from different assessments for a resident.

The third column, labeled “Covariates” gives the information for calculating covariate scores (when used) for a QM:

- **Covariates.** The covariates entry defines the calculation logic for covariates. Covariates are always prevalence indicators with a value of 1 if the condition is present and a value of 0 if the condition is not present.

**Other notes pertaining to QM calculations:** Chronic Care QMs are only calculated for facilities that submitted non-PPS admission assessments in the year ending with the target quarter. Thus, all Chronic Care QMs exclude residents from the calculation of the QM if the resident is in a facility with a Chronic Care Admission Sample size of 0 (i.e., there are no admission assessments with AA8a=01 in the facility over the previous 12 months).

**Notes regarding interpreting the specifications table:** In the Chronic Care specifications table, the items referred to are from the MDS 2.0. The symbol [t] indicates target assessment, and [t-1] indicates prior assessment.

QUALITY MEASURES SPECIFICATIONS — January 2004

MEASURES FOR CHRONIC CARE

MEASURE DESCRIPTION	MEASURE SPECIFICATIONS	COVARIATES
<p><b>Percent of residents whose need for help with daily activities has increased</b></p> <p><b>(CADL01)</b></p>	<p><b>Numerator:</b> Percent of residents with worsening (increasing MDS item score) in Late-Loss ADL self performance at target relative to prior assessment.</p> <p>Residents meet the definition of Late-Loss ADL worsening when at least two of the following are true:</p> <ol style="list-style-type: none"> <li>1. Bed mobility – [Level at target assessment (G1a(A)[t]) – [Level at previous assessment (G1a(A)[t-1])] &gt; 0, or</li> <li>2. Transfer - [Level at target assessment (G1b(A)[t]) – [Level at previous assessment (G1b(A)[t-1])] &gt; 0, or</li> <li>3. Eating - [Level at target assessment (G1h(A)[t]) – [Level at previous assessment (G1h(A)[t-1])] &gt; 0, or</li> <li>4. Toileting - [Level at target assessment (G1i(A)[t]) – [Level at previous assessment (G1i(A)[t-1])] &gt; 0,</li> </ol> <p>OR at least one of the following is true:</p> <ol style="list-style-type: none"> <li>1. Bed mobility – [Level at target assessment (G1a(A)[t]) – [Level at previous assessment (G1a(A)[t-1])] &gt; 1, or</li> <li>2. Transfer - [Level at target assessment (G1b(A)[t]) – [Level at previous assessment (G1b(A)[t-1])] &gt; 1, or</li> <li>3. Eating - [Level at target assessment (G1h(A)[t]) – [Level at previous assessment (G1h(A)[t-1])] &gt; 1, or</li> <li>4. Toileting - [Level at target assessment (G1i(A)[t]) – [Level at previous assessment (G1i(A)[t-1])] &gt; 1.</li> </ol> <p><b>Denominator:</b> All residents with a valid target and a valid prior assessment.</p>	

MEASURE DESCRIPTION	MEASURE SPECIFICATIONS	COVARIATES
	<p><b>Exclusions:</b> Residents meeting any of the following conditions:</p> <ol style="list-style-type: none"> <li>1. None of the four Late-Loss ADLs (G1a(A), G1b(A), G1h(A), and G1i(A)) can show decline because each of the four have a value of 4 (total dependence) or a value of 8 (activity did not occur) on the prior assessment [t-1].</li> <li>2. The QM did not trigger (resident not included in the numerator) AND there is missing data on any one of the four Late-Loss ADLs (G1a(A), G1b(A), G1h(A), or G1i(A)) on the target assessment [t] or prior assessment [t-1].</li> <li>3. The resident is comatose (B1 = 1) or comatose status is unknown (B1 = missing) on the target assessment.</li> <li>4. The resident has end-stage disease (J5c = checked) or end-stage disease status is unknown (J5c = missing) on the target assessment.</li> <li>5. The resident is receiving hospice care (P1ao = checked) or hospice status is unknown (P1ao = missing) on the target assessment or the most recent full assessment.</li> </ol>	

MEASURE DESCRIPTION	MEASURE SPECIFICATIONS	COVARIATES
<p><b>Percent of residents who have moderate to severe pain (CPAI0X)</b></p>	<p><b>Numerator:</b> Percent of residents with moderate pain at least daily (J2a=2 AND J2b=2) OR horrible/excruciating pain at any frequency (J2b=3) on the target assessment.</p> <p><b>Denominator:</b> All residents with a valid target assessment.</p> <p><b>Exclusions:</b> Residents satisfying any of the following conditions:</p> <ol style="list-style-type: none"> <li>1. The target assessment is an admission (AA8a = 01) assessment.</li> <li>2. Either J2a or J2b is missing on the target assessment.</li> <li>3. The values of J2a and J2b are inconsistent on the target assessment.</li> </ol>	<p><b>Covariates:</b></p> <ol style="list-style-type: none"> <li>1. Indicator of independence or modified independence in daily decision making on the prior assessment:  Covariate = 1 if B4 = 0 or 1.  Covariate = 0 if B4 = 2 or 3.</li> </ol>

MEASURE DESCRIPTION	MEASURE SPECIFICATIONS	COVARIATES
<p><b>Pressure sores – paired measures:</b></p> <p><b>Percent of high-risk residents who have pressure sores (CPRU02)</b></p> <p><b>and</b></p> <p><b>Percent of low-risk residents who have pressure sores (CPRU03)</b></p>	<p><b>Percent of high-risk residents who have pressure sores:</b></p> <p><b>Numerator:</b> Percent of residents with pressure sores (Stage 1-4) on target assessment (M2a &gt;0 OR I3a-I3e = 707.0)</p> <p><b>Denominator:</b> All residents with a valid target assessment and any one of the following inclusion criteria:</p> <ol style="list-style-type: none"> <li>1. Impaired in bed mobility or transfer on the target assessment as indicated by G1a(A) = 3, 4, or 8 OR G1b(A) = 3, 4, or 8.</li> <li>2. Comatose on the target assessment as indicated by B1 = 1.</li> <li>3. Suffer malnutrition on the target assessment as indicated by I3a through I3e = 260, 261, 262, 263.0, 263.1, 263.2, 263.8, or 263.9.</li> </ol> <p><b>Percent of low-risk residents who have pressure sores:</b></p> <p><b>Numerator:</b> Percent of residents with pressure sores (Stage 1-4) on target assessment (M2a &gt;0 OR I3a-I3e = 707.0)</p> <p><b>Denominator:</b> All residents with a valid target assessment and not qualifying as high risk.</p> <p><b>Exclusions for both measures:</b> Residents satisfying any of the following conditions are excluded from all risk groups (high and low):</p> <ol style="list-style-type: none"> <li>1. The target assessment is an admission (AA8a = 01) assessment.</li> <li>2. The QM did not trigger (resident is not included in the QM numerator) AND the value of M2a is missing on the target assessment.</li> <li>3. The resident does not qualify as high-risk AND the value of G1a(A) or G1b(A) is missing on the target assessment.</li> <li>4. The resident does not qualify as high-risk AND the value of B1 is missing on the target assessment.</li> </ol>	

MEASURE DESCRIPTION	MEASURE SPECIFICATIONS	COVARIATES
<p><b>Percent of residents who were physically restrained (CRES01)</b></p>	<p><b>Numerator:</b> Percent of residents who were physically restrained daily (P4c or P4d or P4e = 2) on target assessment.</p> <p><b>Denominator:</b> All residents with a valid target assessment.</p> <p><b>Exclusions:</b> Residents satisfying the following conditions:</p> <ol style="list-style-type: none"> <li>1. The target assessment is an admission (AA8a = 01) assessment.</li> <li>2. The QM did not trigger (resident is not included in the QM numerator) AND the value of P4c or P4d or P4e is missing on the target assessment.</li> </ol>	

MEASURE DESCRIPTION	MEASURE SPECIFICATIONS	COVARIATES
<p><b><i>Incontinence and Catheters – Paired Measures</i></b></p> <p><b>Percent of low-risk residents who lose control of their bowels or bladder</b></p> <p><b>(CCNT06)</b></p> <p><b>and</b></p>	<p><b><i>Numerator:</i></b> Percent of residents who were frequently incontinent or fully incontinent on target assessment (H1a = 3 or 4, or H1b = 3 or 4).</p> <p><b><i>Denominator:</i></b> All residents with a valid target assessment and not qualifying as high risk.</p> <p><b><i>Exclusions:</i></b></p> <ol style="list-style-type: none"> <li>1. Residents who qualify as high risk are excluded from the denominator: <ol style="list-style-type: none"> <li>a. Severe cognitive impairment on the target assessment as indicated by B4 = 3 AND B2a = 1; OR</li> <li>b. Totally dependent in mobility ADLs on the target assessment: G1a(A) = 4 or 8 AND G1b(A) = 4 or 8 AND G1e(A) = 4 or 8.</li> </ol> </li> <li>2. Residents satisfying any of the following conditions are also excluded from the risk group: <ol style="list-style-type: none"> <li>a. The target assessment is an admission (AA8a = 01) assessment.</li> <li>b. The QM did not trigger (resident is not included in the QM numerator) AND the value of H1a or H1b is missing on the target assessment.</li> <li>c. Residents who are comatose (B1 = 1) or comatose status are unknown (B1 = missing) on the target assessment.</li> <li>d. The resident has an indwelling catheter (H3d = checked) or indwelling catheter status is unknown (H3d = missing) on the target assessment.</li> <li>e. The resident has an ostomy (H3i = checked) or ostomy status is unknown (H3i = missing) on target assessment.</li> <li>f. The resident does not qualify as high risk and the cognitive impairment items (B2a or B4) are missing on the target assessment.</li> <li>g. The resident does not qualify as high risk and any of the mobility ADLs (G1a(A), G1b(A) and G1e(A)) are missing on the target assessment.</li> </ol> </li> </ol>	

MEASURE DESCRIPTION	MEASURE SPECIFICATIONS	COVARIATES
<p><b>Percent of residents who have/had a catheter inserted and left in their bladder (CCAT02)</b></p>	<p><b>Numerator:</b> Percent of residents with indwelling catheters on target assessment (H3d = checked).</p> <p><b>Denominator:</b> All residents with a valid target assessment.</p> <p><b>Exclusions:</b> Residents satisfying any of the following conditions:</p> <ol style="list-style-type: none"> <li>1. The target assessment is an admission (AA8a = 01) assessment.</li> <li>2. H3d is missing on the target assessment.</li> </ol>	<p><b>Covariates:</b></p> <ol style="list-style-type: none"> <li>1. Indicator of bowel incontinence on the prior assessment: Covariate = 1 if H1a = 4 Covariate = 0 if H1a = 0,1,2, or 3</li> <li>2. Indicator of pressure sores on the prior assessment: Covariate = 1 if M2a = 3 or 4 Covariate = 0 if M2a = 0, 1 or 2</li> </ol>

MEASURE DESCRIPTION	MEASURE SPECIFICATIONS	COVARIATES
<p><b>Percent of residents who spent most of their time in bed or in a chair during the assessment period (CBFT01)</b></p>	<p><b>Numerator:</b> Percent of residents who are bedfast (G6a is checked) on target assessment.</p> <p><b>Denominator:</b> All residents with a valid target assessment.</p> <p><b>Exclusions:</b></p> <ol style="list-style-type: none"> <li>1. The target assessment is an admission (AA8a = 01) assessment.</li> <li>2. G6a is missing on the target assessment.</li> <li>3. The resident is comatose (B1=1), or comatose status is unknown (B1= missing) on the target assessment.</li> </ol>	

MEASURE DESCRIPTION	MEASURE SPECIFICATIONS	COVARIATES
<p><b>Percent of residents whose ability to move about in and around their room got worse (CMOB01)</b></p>	<p><b>Numerator:</b> Percent of residents whose value for locomotion self-performance is greater at target relative to prior assessment (<math>G1e(A)[t] &gt; G1e(A)[t-1]</math>).</p> <p><b>Denominator:</b> All residents with a valid target assessment and a valid prior assessment.</p> <p><b>Exclusions:</b> Residents satisfying any of the following conditions:</p> <ol style="list-style-type: none"> <li>1. The G1e(A) value is missing on the target assessment [t].</li> <li>2. The G1e(A) value is missing on the prior assessment [t-1] and the G1e(A) value shows some dependence on the target assessment (<math>G1e(A)[t] &gt; 0</math>).</li> <li>3. The G1e(A) value on the prior assessment is 4 (total dependence) or 8 (activity did not occur).</li> <li>4. The resident is comatose (B1 = 1) or comatose status is unknown (B1 = missing) on the target assessment.</li> <li>5. The resident has end-stage disease (J5c = checked) or status is unknown (J5c = missing) on the target assessment.</li> <li>6. The resident is receiving hospice care (P1ao = checked) or hospice status is unknown (P1ao = missing) on the target assessment or the most recent full assessment.</li> </ol>	<p><b>Covariates:</b></p> <ol style="list-style-type: none"> <li>1. Indicator of recent falls on the prior assessment: Covariate = 1 if J4a checked or J4b checked Covariate = 0 if J4a not checked AND J4b not checked</li> <li>2. Indicator of extensive support or more dependence in eating on the prior assessment: Covariate = 1 if G1h(A) = 3,4, or 8 Covariate = 0 if G1h(A) = 0,1, or 2</li> <li>3. Indicator of extensive support or more dependence in toileting on the prior assessment: Covariate = 1 if G1i(A) = 3,4, or 8 Covariate = 0 if G1i(A) = 0,1, or 2</li> </ol>

MEASURE DESCRIPTION	MEASURE SPECIFICATIONS	COVARIATES
<p><b>Percent of residents with a urinary tract infection (CCNT04)</b></p>	<p><b>Numerator:</b> Percent of residents with urinary tract infection on target assessment (I2j = checked).</p> <p><b>Denominator:</b> All residents with a valid target assessment.</p> <p><b>Exclusions:</b> Residents satisfying any of the following conditions:</p> <ol style="list-style-type: none"> <li>1. The target assessment is an admission (AA8a = 01) assessment.</li> <li>2. I2j is missing on the target assessment.</li> </ol>	

MEASURE DESCRIPTION	MEASURE SPECIFICATIONS	COVARIATES
<p><b>Percent of residents who have become more depressed or anxious (CMOD03)</b></p>	<p><b>Numerator:</b> Percent of residents whose Mood Scale scores are greater on target assessment relative to prior assessment (Mood Scale [t] &gt; Mood Scale [t-1]). [The Mood Scale is defined in the Technical Comments.]</p> <p><b>Denominator:</b> All residents with a valid target assessment and a valid prior assessment.</p> <p><b>Exclusions:</b> Residents satisfying any of the following conditions:</p> <ol style="list-style-type: none"> <li>1. The Mood Scale score is missing on the target assessment [t].</li> <li>2. The Mood Scale score is missing on the prior assessment [t-1] and the Mood Scale score indicates symptoms present on the target assessment (Mood Scale [t] &gt; 0).</li> <li>3. The Mood Scale score is at a maximum (value 8) on the prior assessment.</li> <li>4. The resident is comatose (B1 = 1) or comatose status is unknown (B1 = missing) on the target assessment.</li> </ol> <p><b>Technical Comments</b></p> <p><b>Mood Scale Definition:</b></p> <p>Mood Scale score is defined as the count of the number of the following eight conditions that are satisfied (range 0 through 8) on the target assessment:</p> <ol style="list-style-type: none"> <li>1. Any verbal expression of distress (E1a&gt;0, E1c&gt;0, E1e&gt;0, E1f&gt;0, E1g&gt;0, or E1h&gt;0).</li> <li>2. Shows signs of crying, tearfulness (E1m&gt;0).</li> <li>3. Motor agitation (E1n&gt;0).</li> <li>4. Leaves food uneaten (K4c=checked) on target or last full assessment.</li> <li>5. Repetitive health complaints (E1h&gt;0).</li> <li>6. Repetitive/recurrent verbalizations (E1a&gt;0, E1c&gt;0, or E1g&gt;0).</li> <li>7. Negative statements (E1a&gt;0, E1e&gt;0, or E1f&gt;0).</li> <li>8. Mood symptoms not easily altered (E2=2).</li> </ol>	

# Chapter 3

## Post-Acute Care (PAC) QM Definitions

This chapter contains a matrix giving the definitions for the Post Acute Care QMs recommended by the National Quality Forum. For each QM, the matrix gives the information necessary to calculate the QM and any covariates used in the QM calculation.

For each QM, the first column of the matrix, labeled “Measure Description”, provides the following information:

- **QM description.** The first entry in the column is a brief description of the QM.
- **QM short label.** The short label for the QM is the first entry in parentheses.

The second column, labeled “Measure Specifications”, gives the information for calculating the QM:

- **Numerator.** The numerator entry gives the logic used to determine whether a resident triggers the QM (if the resident is included in the numerator for the QM rate in the facility).
- **Denominator.** The denominator entry defines whether a resident has the necessary records available to be a candidate for the QM (inclusion of the resident in the denominator for the QM rate for the facility).
- **Exclusions.** The exclusions entry provides clinical conditions and missing data conditions that preclude a resident from consideration for the QM. An excluded resident is excluded from both the numerator and denominator of the QM rate for the facility.
- **Technical comments.** Entries here provide additional technical details pertaining to the QM numerator, denominator, and exclusions. Examples of the type of information provided include specific details for calculating scale scores, definition of missing data values for an MDS item, and selection of the value for an MDS item that may come from different assessments for a resident.

The third column, labeled “Covariates”, gives the information for calculating covariate scores (when used) for a QM:

- **Covariates.** The covariates entry defines the calculation logic for covariates. Covariates are always prevalence indicators with a value of 1 if the condition is present and a value of 0 if the condition is not present.

**Other notes pertaining to QM calculations:** Post-acute Care QMs are only calculated for facilities that submitted SNF PPS 5-day assessments in the year ending with the target quarter. Thus, all PAC QMs exclude patients from the calculation of the QM if the patient is in a facility with a Post-acute Care Admission Sample size of 0 (i.e., there are no SNF PPS 5-day assessments with AA8b=01 in the facility over the previous 12 months).

**Notes regarding interpreting the Post-acute Care specifications table:** In the Post-acute Care specifications table, the items referred to are from the MDS 2.0. The symbol [t] indicates SNF PPS 14-day assessment and [t-1] indicates SNF PPS 5-day assessment.

QUALITY MEASURES SPECIFICATIONS — January 2004

MEASURES FOR POST-ACUTE CARE

MEASURE DESCRIPTION	MEASURE SPECIFICATIONS	COVARIATES
<p><b>Percent of short-stay residents with delirium</b> <b>(PAC-DEL0X)</b></p>	<p><b>Numerator:</b> Percent of short-stay residents at SNF PPS 14-day assessment with at least one symptom of delirium that represents a departure from usual functioning (at least one B5a through B5f = 2).</p> <p><b>Denominator:</b> All patients with a valid SNF PPS 14-day assessment (AA8b = 7).</p> <p><b>Exclusions:</b> Patients satisfying any of the following conditions:</p> <ol style="list-style-type: none"> <li>1. Patients who are comatose (B1 = 1) or comatose status unknown (B1 = missing) on the SNF PPS 14-day assessment.</li> <li>2. Patients with end-stage disease (J5c = checked) or unknown (J5c = missing) on the SNF PPS 14-day assessment.</li> <li>3. Patients who are receiving hospice care (P1ao = checked) or hospice status is unknown (P1ao = missing) on the SNF PPS 14-day assessment.</li> <li>4. The QM did not trigger (patient not included in the numerator) and there is a missing value on any of the items B5a through B5f on the SNF PPS 14- day assessment.</li> </ol>	<p><b>Covariates:</b></p> <ol style="list-style-type: none"> <li>1. Indicator of NO prior residential history preceding the current SNF stay for the patient: <ul style="list-style-type: none"> <li>Covariate = 1 if there is NO prior residential history indicated by the following condition being satisfied: <ul style="list-style-type: none"> <li>There is a recent admission assessment (AA8a = 01) AND AB5a through AB5e are not checked (value 0) and AB5f is checked (value 1).</li> </ul> </li> <li>Covariate = 0 if there is prior residential history indicated by either of the following conditions being satisfied: <ul style="list-style-type: none"> <li>a. There is a recent admission assessment (AA8a = 01) AND any of the items AB5a through AB5e are checked (value 1) OR AB5f is not checked (value 0).</li> <li>b. There is no recent admission assessment (AA8a = 01).</li> </ul> </li> </ul> </li> </ol>

MEASURE DESCRIPTION	MEASURE SPECIFICATIONS	COVARIATES
<p><b>Percent of short-stay residents who had moderate to severe pain</b></p> <p><b>(PAC-PAI0X)</b></p>	<p><b>Numerator:</b> Percent of short-stay residents at SNF PPS 14-day assessment with moderate pain at least daily (J2a = 2 and J2b = 2) OR horrible/excruciating pain at any frequency (J2b = 3).</p> <p><b>Denominator:</b> All patients with valid SNF PPS 14-day assessment (AA8b = 7).</p> <p><b>Exclusions:</b> Patients satisfying any of the following conditions:</p> <ol style="list-style-type: none"> <li>1. Either J2a or J2b is missing on the 14-day assessment.</li> <li>2. The values of J2a and J2b are inconsistent on the 14-day assessment.</li> </ol>	

MEASURE DESCRIPTION	MEASURE SPECIFICATIONS	COVARIATES
<p><b>Percent of short-stay residents with pressure sores (PAC-PRU0X)</b></p>	<p><b>Numerator:</b> Percent of short-stay residents at SNF PPS 14-day assessment who satisfy either of the following conditions:</p> <ol style="list-style-type: none"> <li>1. On the SNF PPS 5-day assessment, the patient had no pressure sores (M2a[t-1] = 0) AND, on the SNF PPS 14-day assessment, the patient has at least a Stage 1 pressure sore (M2a[t] = 1,2,3, or 4).</li> <li>2. On the SNF PPS 5-day assessment, the patient had a pressure sore (M2a[t-1] = 1,2,3, or 4) AND on the SNF PPS 14-day assessment, pressure sores worsened or failed to improve (M2a[t]&gt;= M2a[t-1]).</li> </ol> <p><b>Denominator:</b> All patients with a valid SNF PPS 14-day assessment (AA8b = 7) AND a valid preceding SNF PPS 5-day assessment (AA8b = 1).</p> <p><b>Exclusions:</b> Patients satisfying any of the following conditions:</p> <ol style="list-style-type: none"> <li>1. M2a is missing on the 14-day assessment [t].</li> <li>2. M2a is missing on the 5-day assessment [t-1] and M2a shows presence of pressure sores on the 14-day assessment (M2a = 1,2,3, or 4).</li> </ol>	<p><b>Covariates:</b></p> <ol style="list-style-type: none"> <li>1. Indicator of history of resolved pressure sore on the SNF PPS 5-day assessment: Covariate = 1 if M3 = 1 Covariate = 0 if M3 = 0</li> <li>2. Indicator of requiring limited or more assistance in bed mobility on the SNF PPS 5-day assessment: Covariate = 1 if G1a(A) = 2,3,4, or 8 Covariate = 0 if G1a(A) = 0 or 1</li> <li>3. Indicator of bowel incontinence at least one/week on the SNF PPS 5-day assessment: Covariate = 1 if H1a = 2,3, or 4 Covariate = 0 if H1a = 0 or 1</li> <li>4. Indicator of diabetes or peripheral vascular disease on the SNF PPS 5-day assessment: Covariate = 1 if I1a checked (value 1) OR I1j checked (value 1) Covariate = 0 if I1a not checked (value 0) AND I1j not checked (value 0).</li> <li>5. Indicator of Low Body Mass Index (BMI) on the SNF PPS 5- day assessment: Covariate = 1 if BMI &gt;= 12 AND &lt;= 19 Covariate = 0 if BMI &gt; 19 AND &lt;= 40 Where: BMI = weight (kg)/height<sup>2</sup> (m<sup>2</sup>) = ((K2b*0.45)/(K2a)*.0254)<sup>2</sup></li> </ol> <p>(Note: An implausible BMI value &lt;12 or &gt;40 will be treated as a missing value on this covariate.)</p>

# Chapter 4: QM Record Selection Methodology for NQF-endorsed Measures

## Chronic Care QM Calculation Sample

The chronic care QM calculation sample involves selection of residents with a target assessment in the target quarter. For a selected resident, three different assessment records are then selected: target assessment, prior assessment and most recent full assessment.

Assessment Selected		Selection Specifications
Target Assessment	Selection period	Most recent 3 months (target quarter)
	Qualifying Reasons for Assessment (AA8a/AA8b)	01/*, 02/*, 03/*, 04/*, 05/*, 10/* (* indicates any value accepted)
	Selection Logic	Latest assessment with qualifying reasons for assessment and assessment reference date (A3a) within selection period.
	Rationale	Select a normal (OBRA) assessment from the target quarter. Normal OBRA assessments that are coupled with a PPS assessment (item AA8b = 1,2,3,4,5,7, or 8) are still selected. Selection ignores whether an assessment is also a PPS assessment or not.
Prior Assessment	Selection period	46 to 165 days before the target assessment
	Qualifying Reasons for Assessment (AA8a/AA8b)	01/*, 02/*, 03/*, 04/*, 05/*, 10/* (* indicates any value accepted)
	Selection Logic	Latest assessment with qualifying reasons for assessment and assessment reference date (A3a) in the window of 46 days to 165 days preceding the target assessment reference date (A3a).

Assessment Selected	Selection Specifications	
	Rationale	<p>Select a normal (OBRA) assessment in the 4-month window ending 46 days before the target assessment. This window insures that the gap between the prior and target assessment will not be small (gaps of 45 days or less are excluded).</p> <p>A 4-month window is employed to allow sufficient time to find an OBRA assessment. OBRA assessments are required every 3 months. A grace month has been added to yield a window of 4 months to account for late assessments. In the last half of 2000, scheduled OBRA assessments were late about 8% of the time.</p> <p>A relative window based on the assessment reference date (A3a) of the target assessment is used to accommodate cases in which scheduled assessments are performed early or a significant change occurs.</p> <p>Normal OBRA assessments that are coupled with a PPS assessment (item AA8b = 1,2,3,4,5,7, or 8) are still selected. Selection ignores whether an assessment is also a PPS assessment or not.</p>
Most Recent Full Assessment	Selection period	Most recent 18.5 months preceding target assessment
	Qualifying Reasons for Assessment (AA8a/AA8b)	01/*, 02/*, 03/*, 04/* (* indicates any value accepted)
	Selection Logic	Latest assessment with qualifying reasons for assessment and assessment reference date (A3a) in the 18.5-month (or 562-day) period preceding the target assessment reference date (A3a).

Assessment Selected		Selection Specifications
	Rationale	<p>Select a normal (OBRA) full assessment.</p> <p>Normal OBRA full assessments that are coupled with a PPS assessment (item AA8b = 1,2,3,4,5,7, or 8) are still selected. Selection ignores whether a full assessment is also a PPS assessment or not.</p> <p>If the target assessment is a quarterly assessment, it will at times be necessary to carry-forward items (not available on the quarterly assessment) from the most recent full assessment to that target assessment. The most recent full assessment will be used to carry forward values to a target quarterly assessment, but only if the most recent full assessment is in the 395 day period (approximately 13 months) preceding the target assessment reference date (A3a). A 13-month look-back period is employed to allow sufficient time to find an earlier OBRA full assessment. OBRA full assessments are required every 12 months. A grace month has been added to yield a look-back period of 13 months to account for late full assessments.</p> <p>If the prior assessment is a quarterly assessment, it will at times be necessary to carry-forward items (not available on the quarterly assessment) from the most recent full assessment from the most recent full assessment to that prior assessment. The most recent full assessment will be used to carry forward values to a prior quarterly assessment, but only if the most recent full assessment is in the 395 day period (approximately 13 months) preceding the prior assessment reference date (A3a). A 13-month look-back period is employed to allow sufficient time to find an earlier OBRA full assessment. OBRA full assessments are required every 12 months. A grace month has been added to yield a look-back period of 13 months to account for late full assessments.</p>

## Chronic Care Facility Admission Sample

The chronic care facility admission sample involves selection of residents with an admission assessment in the year ending with the target quarter. For each selected resident, the latest admission assessment in that year is selected. The Chronic Care facility admission sample is drawn to determine if there are any admission assessments for the facility during the year. If there are no Chronic Care admission assessments then it is assumed that the facility does not provide Chronic Care services and Chronic Care QM values are not reported.

<b>Assessment Selected</b>		<b>Selection Specifications</b>
Facility Admission Sample Assessment	Selection period	Most recent 12 months
	Qualifying Reasons for Assessment (AA8a/AA8b)	01/blank, 01/6
	Selection Logic	Latest assessment with qualifying reasons for assessment and assessment reference date (A3a) within selection period.
	Rationale	<p>Select a normal (OBRA) admission assessment that is NOT also a PPS assessment. A non-PPS admission assessment will have AA8b values of 6 (other state required assessment) and blank (neither PPS or other state required assessment). If the admission assessment has AA8b = 1,2,3,4,5,7, or 8, then it is also a PPS assessment and will not be selected in the Chronic Care facility admission sample.</p> <p>If a resident has multiple qualifying admission assessments in the year ending with the target quarter, then only the most recent is selected. If multiple admissions were selected for a resident, then this would over represent those residents in the facility admission sample and cause bias in that sample.</p>

## Post-Acute Care QM Calculation Sample

The post-acute QM calculation sample involves selection of residents with a 14-day SNF PPS assessment in the standard 6-month post-acute care target period. If a resident has more than one 14-day assessment in the 6-month post acute care target period, then the latest 14-day assessment is selected. The appropriate 5-day assessment preceding the 14-day assessment is also selected, if available. One additional record is also selected, that record being the most recent admission assessment on the same date or before the selected 14-day assessment.

Assessment Selected		Selection Specifications
14-day PPS Assessment	Selection period	Most recent 6 months (target period)
	Qualifying Reasons for Assessment (AA8a/AA8b)	*/7 (*indicates any value accepted)
	Selection Logic	Select the latest 14-day assessment (*/7) with assessment reference date (A3a) in the selection period
	Rationale	If there are multiple qualifying assessments, the latest assessment is selected.
5-Day PPS Assessment	Selection period	The interval from 3 to 18 days before the selected 14-day assessment.
	Qualifying Reasons for Assessment (AA8a/AA8b)	*/1  (* indicates any value accepted)
	Selection Logic	Latest 5-day assessment with assessment reference date (A3a) in the selection period for the same resident and facility.
	Rationale	Select a 5-day assessment (AA8b = 1) in the selection window preceding the selected 14-day assessment.  The selection window (3 to 18 days prior to the 14-day assessment) allows for the 5-day to be completed on day 1 through day 8 of the stay and the 14-day to be completed on day 11 through 19 of the stay, according to the SNF PPS assessment requirements. These requirements indicate that the gap between the 2 assessments should have a minimum of 3 and a maximum of 18 days.  If there is more than one qualifying 5-day assessment in the selection window, then select the latest one.

## Post-Acute Care QM Calculation Sample (continued)

Assessment Selected		Selection Specifications
Recent MDS Admission Assessment	Selection period	50-day period ending with the date of the selected 14-day assessment.
	Qualifying Reasons for Assessment (AA8a/AA8b)	01/* (* indicates any value accepted)
	Selection Logic	Select the latest admission assessment with assessment reference date (A3a) in the selection period.
	Rationale	<p>This admission assessment is needed to capture the facesheet item AB5 (prior institutional history). The facesheet must be completed on an admission assessment.</p> <p>If no facesheet record is found in the selection period, then assume that AB5a = 1, indicating residence in this facility prior to the SNF stay.</p> <p>The selection period allows sufficient look back to encounter a new resident's admission associated with the SNF covered stay. A SNF covered stay must begin within 30 days of the end of a qualifying hospitalization and the 14-day assessment must be performed by day 19 of the stay. This yields a look back period of 30 days plus 19 days, and this was rounded up 1 day to 50.</p>

## Post-Acute Care Facility Admission Sample

The post-acute care facility admission sample involves selection of residents with a 5-day PPS assessment in the 12-month period ending with the target quarter. For each selected resident, the latest 5-day PPS assessment in that period is selected. The Post-acute Care facility admission sample is drawn to determine if there are any admission assessments for the facility during the year. If there are no Post-acute Care 5-day assessments then it is assumed that the facility does not provide Post-acute Care services and Post-acute Care QM values are not reported.

Assessment Selected		Selection Specifications
Facility Admission Sample Assessment	Selection period	Most recent 12 months
	Qualifying Reasons for Assessment (AA8a/AA8b)	*/1  (* indicates any value accepted)
	Selection Logic	Latest assessment with qualifying reasons for assessment and assessment reference date (A3a) within the selection period.
	Rationale	Select a 5-day PPS assessment.  If a resident has multiple 5-day PPS assessments in the selection period, then only the most recent is selected. If multiple 5-day PPS assessments were selected for a resident, then this would over represent those residents in the facility admission sample and cause bias in that sample.

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# National Nursing Home Quality Measures

## Technical Details

### APPENDIX A

**January 2004 (v1)**

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# Quality Measures (QM) Technical Details

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# Section 1

## Introduction

This appendix describes technical details of steps followed to create the output files for the Centers for Medicare and Medicaid Services' (CMS) Nursing Home Quality Initiative (NHQI) project. The purpose of this Technical Details Appendix is to describe the calculation methods and processing steps applied to MDS assessment data to produce the 14 facility-level Quality Measures (QMs) recommended for public reporting by the National Quality Forum (NQF).

### Overview of QM Calculations

The QMs recommended for use by the NQF are created from counts of nursing facility chronic care residents or post-acute care patients who have certain conditions or problems (for example, pressure sores). For example, facility-level scores for a chronic care pressure sore QM are built up by: 1) summing over all residents in the facility with pressure sores and 2) calculating ratios of residents with pressure sores to all residents of the facility who were at risk for pressure sores. The detailed logic for defining the resident level outcomes for each QM is presented in Chapters 2 and 3 of this Manual. This logic is listed under the "Numerator" entry for each QM.

### A Note on Risk Adjustment

Risk adjustment refines raw QM scores to better reflect the prevalence of problems that facilities should be able to address. Two complementary approaches to risk adjustment were applied to the NQF-recommended QMs.

One approach involves exclusion of residents whose outcomes are not under nursing facility control (e.g., outcome is evidenced on admission to the facility) or the outcome may be unavoidable (e.g., the resident has end-stage disease or is comatose). All 14 QMs have been shaped by one or more exclusions.<sup>1</sup> (See Chapters 2 and 3 of this Manual for details). For each QM, the prevalence of the outcome across all residents in a nursing facility, after exclusions, is the *facility-level observed QM score*.

A second approach involves adjusting QM scores directly, using logistic regression. This method of adjustment employs *resident-level covariates* that have been found to increase the risks of an outcome. Detailed specifications for resident-level covariates are presented in Chapters 2 and 3 of this Manual.

- First, resident-level covariates were used in a logistic regression model to calculate a *resident-level expected QM score* (the probability that the resident will evidence the outcome, given the presence or absence of characteristics measured by the covariates).

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<sup>1</sup> Not all exclusions are made for risk adjustment purposes. Some exclude residents when key assessments or MDS items are missing.

- Then, an average of all resident-level expected QM scores for the nursing facility was calculated to create a *facility-level expected QM score*. Section 3 of this Appendix presents the details for calculating expected scores for residents.

The final *facility-level adjusted QM score* was based on a calculation which combines the *facility-level expected score* and the *facility-level observed score*. The details for calculating facility-level adjusted scores are presented in Section 4 of this Appendix. The parameters used for each release of the QMs are in Appendix B.

Only five of the QMs recommended for public reporting by the NQF were adjusted using resident level covariates for public reporting:

- Percent of residents who have moderate to severe pain (CPAI0X)
- Percent of residents who have/had a catheter inserted and left in their bladder (CCAT02)
- Percent of residents whose ability to move about in and around their room get worse (CMOB01)
- Percent of short-stay residents with delirium (PAC-DEL0X)
- Percent of short-stay residents with pressure sores (PAC-PRU0X)

Nine QMs were not adjusted using resident-level covariates. For these nine, facility-level observed QM scores will be reported.

## Section 2

### Steps Used In National QM Calculation

#### Introduction

This section outlines the processing steps used to calculate QMs for the NHQI. The description below uses the 3rd Quarter of calendar year 2003 (Q3 2003) as the target period. The dates associated with these steps would be updated, as appropriate, for subsequent quarterly releases of the QMs.

It is important to note two items that recurred throughout the process:

- Every step in file construction and QM calculation proceeded in parallel for two samples of residents and facilities: a “Chronic Care” (CC) sample and a “Post-acute Care” (PAC) sample.
- Two “target periods” were defined:
  - a “Current Period” which was one quarter, Q3 2003, for CC residents and two quarters, Q2 and Q3 2003, for PAC patients. Data from the current periods were used as the target period for final QM reporting;
  - a “Prior Year”, Q4 2001 through Q3 2002, data from which were used to estimate logistic regressions for risk adjustment.

#### Processing Steps:

1. **MDS Selection.** All MDS records for U.S. nursing facilities from Q1 2000 through Q3 2003 were selected.
2. **Sampling for CC QMs.** Nursing facilities and residents were sampled to provide data for CC QM and covariate calculations.
  - a. CC samples of residents: selection was based on specifications in Chapter 4, pages 4-1 of this Manual. Samples for two “target periods” were drawn:
    - i. “Current Period” sample for computing QMs: all U.S. nursing facilities and residents selected from the target quarter.
    - ii. “Prior Year” sample for estimating logistic regressions: residents from a 20 percent random sample of all U.S. nursing facilities with an admission in the period Q4 2001 through Q3 2002.
  - b. CC resident records included, for each target period:
    - i. A target assessment (most recent).
    - ii. A prior assessment preceding the target assessment, if available.
    - iii. A most recent full assessment, if available.

3. **Sampling for PAC QMs.** Nursing facilities and residents were sampled to provide data for PAC QM and covariate calculations.
  - a. PAC samples of patients: selection was based on specifications in Chapter 4, pages 4-4 through 4.6 of this Manual. Samples for two “target periods” were created:
    - i. “Current Period” sample for computing QMs: all U.S. nursing facilities and PAC patients, selected from the target quarter (Q3 2003) and the preceding quarter.
    - ii. “Prior Year” sample for estimating logistic regressions: PAC patients from a 20 percent random sample of all nursing facilities with an admission in the period Q4 2001 through Q3 2002.
  - b. All PAC patient records included, for each target period:
    - i. A 14-day SNF PPS assessment (most recent) in the target period.
    - ii. A 5-day SNF PPS assessment from the same stay, if available.
    - iii. A recent admission assessment, if available.
4. **Resident-level QM Calculation Files.** At this point, resident-level QM calculation files were created, separately for CC residents and PAC patients, for the two target periods, using the specified target, prior, full and admission assessments for each resident/patient record, if available.
5. **Resident-level QM and Covariate Calculation Files.** Next, resident-level QM scores were calculated (and covariate scores were calculated for the five risk-adjusted QMs), separately for each CC resident and PAC patient, in the current and prior year periods.
  - a. Resident-level QM calculation (all QMs):
    - i. Resident exclusions: (See Chapters 2 and 3 in the Manual) -- for each QM, excluded residents were assigned a missing value for that QM.
    - ii. QM values: does the resident/patient “trigger” the QM? (See Chapters 2 and 3 in this Manual)
      1. If “Yes”, then store a value of 1 for that QM in the resident-level QM calculation record appropriate to that resident for a target period.
      2. If “No”, then store a value of 0 for that QM in the resident-level QM calculation record appropriate to that resident for a target period.
  - b. Resident-level covariate calculation (risk-adjusted QMs):
    - i. Resident exclusions: (See Chapters 2 and 3 in this Manual) -- for each QM, excluded residents were assigned a missing value for that QM.
    - ii. Covariate: does the resident/patient “trigger” the covariate? (see Chapters 2 and 3, User’s Manual).

1. If “Yes”, then store a value of 1 for that covariate in the resident-level QM calculation record appropriate to that resident for a target period.
  2. If “No”, then store a value of 0 for that covariate in the resident-level QM calculation record appropriate to that resident for a target period.
6. **Admission Assessments.** Because it was needed for exclusions, the total number of unique residents admitted (AA8a = 1 for CC, AA8b = 1 for PAC) to a nursing facility over the 12 months prior to both target periods (Q4 2002 through Q3 2003 for the current period, and Q4 2001 through Q3 2002 for the prior year) was calculated:
- a. This total was merged onto each resident record.
  - b. If this total was 0, the resident was excluded from QM calculations.
7. **Logistic Regressions.** With the resident-level files complete, and all relevant exclusions applied, logistic regressions for the five risk-adjusted QMs were estimated.
- a. Input: resident-level file from the 20 percent nursing facility sample from the prior year.
  - b. Dependent variable: was the QM triggered? (yes = 1, no = 0).
  - c. Predictors: resident-level covariates: (See Chapters 2 and 3 in this Manual)
  - d. Calculation of logistic regressions: (See Section 3 in this Appendix).
  - e. Output values: logistic regression constant term and resident-level covariate coefficients for each of the five risk-adjusted QMs.
8. **Resident-level Expected QM Scores.** For the five QMs that were risk adjusted, resident-level expected QM scores were calculated for each resident for the target period. (See Section 3 in this Appendix for calculation formulas).
- a. Input: logistic regression constant term and resident-level covariate coefficients from Step 7 and resident-level covariate values from Step 5, for each adjusted QM.
  - b. Output values: resident-level expected QM scores for each resident, for each of the five risk-adjusted QMs.
9. **National Mean QMs.** National mean observed QMs were needed for calculating the facility-level adjusted QM scores in Step 12, below. The overall national mean observed QM scores for the target periods were calculated, for each risk adjusted QM:
- a. Numerator: for each QM, count the total number of residents that triggered the QM and sum for the nation.
  - b. Denominator: for each QM, count the total number of residents retained after exclusions and sum for the nation.

- c. Overall national mean observed QM score: divide the numerator by the denominator.
10. **Facility-level Observed QM Scores.** For all QMs, the facility-level observed QM scores were calculated for the target period -- for the nine QMs that were not risk adjusted, these are the measures that will be publicly reported.
- a. Numerator: for each QM, count the total number of residents that triggered the QM in each facility and sum for the nursing facility.
  - b. Denominator: for each QM, count the total number of residents retained after exclusions for each facility and sum for the nursing facility.
  - c. Facility-level observed QM scores: divide the numerator by the denominator for each QM and nursing facility.
11. **Facility-level Expected QM Scores.** For the five risk-adjusted QMs, the facility-level expected QM scores were calculated for the target period. This was done by averaging the resident-level expected QM scores for each QM and each nursing facility.
12. **Facility-level Adjusted QM Scores.** Finally, for the five risk-adjusted QMs, the facility-level adjusted QM scores were calculated for the target period
- a. Input -- for each of the five risk-adjusted QMs
    - i. Facility numerator count
    - ii. Facility denominator count
    - iii. Facility-level observed QM scores
    - iv. Facility-level expected QM scores
    - v. National mean observed QM scores
    - vi. Logit model parameters (See Appendix B)
    - vii. Count of admission assessments over the previous 12 months (used as an exclusion criterion)
  - b. Calculation: (See Section 4 of this Appendix for calculation formulas)
  - c. Output: Facility-level adjusted QM scores for the five risk-adjusted QMs
13. **Final Facility-level Output File.** The final facility-level output files for the target CC and PAC periods contained the following:
- a. For all QMs:
    - i. Facility numerator counts
    - ii. Facility denominator counts
    - iii. Facility-level observed QM scores (publicly reported for the nine unadjusted QMs)
  - b. For the five risk-adjusted QMs: Facility-level adjusted QM scores (publicly reported)

## Section 3 Calculation of the Expected QM Score

For the QMs adjusted with resident-level covariates, the resident-level expected QM score was calculated as an intermediate step to obtaining an adjusted QM score for the facility. In the NQF-recommended QMs for Q3 2003, five of the 14 QMs were risk-adjusted using resident-level covariates. Chapters 2 (Chronic Care QMs) and 3 (Post-acute Care QMs) of this Manual present the resident-level covariates associated with each QM and the logic for calculating each covariate. This section describes the technical details of Step 8, referred to in Section 2 of this Technical Appendix.

### Calculating Resident-level Expected QM Scores

The resident-level expected score for a QM is an estimate of the risk that a resident will trigger the QM. This estimate is based on consideration of the resident-level covariates associated with the QM.

For each of the five risk-adjusted QMs, a resident-level logistic regression was estimated. Data came from the chronic or short-stay residents in the 20 percent random samples of all facilities for a one-year period, Quarter 4 of 2001 (Q4 2001) through Quarter 3 of 2002 (Q3 2002). The resident-level observed QM score was the dependent variable. The predictor variables were one or more resident-level covariates associated with the QM. Calculation of the QM and covariate scores is described in Section 2 (Step 5) of this Appendix.

Each logistic regression had the following form:

$$(1) \text{ QM triggered (yes} = 1, \text{ no} = 0) = C_0 + C_1 * \text{COV}_A + C_2 * \text{COV}_B + \dots + C_N * \text{COV}_N$$

where  $C_0$  is the logistic regression constant,  $C_1$  is the logistic regression coefficient for the first covariate (where applicable),  $\text{COV}_A$  is the resident-level score for the first covariate (where applicable),  $C_2$  is the logistic regression coefficient for the second covariate (where applicable), and  $\text{COV}_B$  is the resident-level score for the second covariate (where applicable), and so on.

Each resident's expected QM score could then be calculated with the following formula:

$$(2) \text{ Resident-level expected QM score} = 1 / [1 + e^{-X}]$$

where  $e$  is the base of natural logarithms and

$X$  is a linear combination of the constant and the logistic regression coefficients and the predictor variables (from Formula 1, above), with each resident's covariate values inserted to compute that resident's unique QM score (these values will be 1 if the covariate is triggered for that resident, and 0 if not).

As an example, consider the actual calculation used for the expected score for the

CC "Percent of residents who have moderate to severe pain" QM (CPAI0X). The covariate for that QM is an indicator of independence in daily decision-making on the prior assessment. The equation used for this QM (with the parameters from the Q3 2003 target period) is:

$$\text{CPAI0X Score} = 1 / [1 + e^{-(-2.42206 + 0.86700 * \text{IndpDec})}]$$

Where IndpDec is the resident-level covariate indicating independence in daily decision-making.

The CPAI0X score for a resident who triggers the independence covariate (covariate score = 1) is expected to be

$$.1758 = 1 / [1 + e^{-(-2.41206 + 0.86700 * 1)}]$$

For a resident who does not trigger the independence covariate (covariate score = 0), the CPAI0X score is expected to be:

$$.0823 = 1 / [1 + e^{-(-2.41206 + 0.86700 * 0)}]$$

Thus a resident with independence deficits is over twice as likely to experience severe pain (17.58 percent, compared to 8.23 percent for a resident who does not have these deficits).

The parameters used for calculating the resident-level expected QM scores are presented in Appendix B.

### **Calculating Facility-level Expected QM Scores**

Once an expected QM score has been calculated for all residents at risk, the facility-level expected QM score is simply the average of all resident-level scores for each of the five risk-adjusted QMs.

## Section 4 Calculation of the Adjusted QM Score

The risk-adjusted QM score is a facility-level QM adjusted for the specific risk for that QM in the nursing facility. The risk-adjusted QM score can be thought of as an estimate of what the nursing facility's QM rate would be if the facility had residents with average risk.

The facility-level adjusted score is calculated on the basis of

- The facility-level observed QM score,
- The facility-level average expected QM score, and
- The national average observed QM score.

Note that there is an Excel spreadsheet available that allows a user to calculate an adjusted score from the observed rate, expected rate, and national average. This spreadsheet is named: "Adjusted Score Calculator and Examples 2.3.xls" (September 2002), and may be found at <http://www.cms.hhs.gov/quality/nhqj/>. This spreadsheet also provides a number of examples to facilitate understanding and interpretation of adjusted scores.

The actual calculation of the adjusted score uses the following equation:

$$(3) \text{ Adj} = 1 / [1 + e^{-y}]$$

where **Adj** is the facility-level adjusted QM score, and

$$y = (\text{Ln}(\text{Obs}/(1-\text{Obs})) - \text{Ln}(\text{Exp}/(1-\text{Exp})) + \text{Ln}(\text{Nat}/(1-\text{Nat})))$$

**Obs** is the facility-level observed QM rate,

**Exp** is the facility-level expected QM rate,

**Nat** is the national observed QM rate, and

**Ln** indicates a natural logarithm.

**e** is the base of natural logarithms

Note that the adjusted QM rate (**Adj**) is calculated differently in two special cases:

1. When **Obs** equals 0.00, then **Adj** is set to 0.00 (without using the equation).
2. When **Obs** equals 1.00, then **Adj** is set to 1.00 (without using the equation).

The adjusted QM score equation will produce adjusted scores in the range of 0 to 1. These adjusted scores can then be converted to percentages for ease of interpretation.

These adjusted score calculations are applied to QMs that use expected scores based on resident-level covariates (See Section 3 of this Appendix). The national average observed QM rates, required for these calculations, are presented in Appendix B.

## Section 5

### Data Dictionary for National QM SAS Output

This section presents a data dictionary for the SAS Quality Measure output table generated for the NQF-recommended national QMs. The results in this table are for Quarter 3 of 2003 (Q3 2003). This table contains a record for each facility. The record for a facility contains the MDS facility ID, which consists of the state code (ST\_CODE) and the internal facility ID (FAC\_ITL). For each of the 14 QMs for this period, three variables are reported:

1. The numerator (i.e., the number of cases at the facility that triggered the QM), named N\_qm-name.
2. The denominator (i.e., the number of cases at the facility that were considered), named D\_qm-name.
3. The reported value of the QM, named Q\_qm-name.

<qm-name> values used in the SAS variable names are presented in Table A.1. For each QM, this table gives <qm-name> (the SAS name), “Label” (the label used for the QM in the definition matrices in Chapters 2 and 3 of this Manual, and “Description” (brief description). Table A.2 describes the contents of the Facility QM Output Table.

**Table A.1 QM Name and Label Conventions**

<qm-name>	Label	Description
CADL1	CADL01	% residents whose need for help with daily activities has increased (CC)
CBFT1	CBFT01	% residents who spent most of their time in bed or in a chair during the assessment period (CC)
CCAT2	CCAT02	% residents who have/had a catheter inserted and left in their bladder (CC) (paired measure)
CCNT4	CCNT04	% residents with a urinary tract infection (CC)
CCNT6	CCNT06	% low-risk residents who lose control of their bowels or bladder (CC) (paired measure)
CMOB1	CMOB01	% residents whose ability to move about in and around their room got worse (CC)
CMOD3	CMOD03	% residents who have become more depressed or anxious (CC)
CPAIX	CPAI0X	% residents who have moderate to severe pain (CC)

<qm-name>	Label	Description
CPRU2	CPRU02	% high-risk residents who have pressure sores (CC) (paired measure)
CPRU3	CPRU03	% low-risk residents who have pressure sores (CC) (paired measure)
CRES1	CRES01	% residents who were physically restrained (CC)
PDELX	PAC_DELOX	% short-stay residents with delirium (PAC)
PPAIX	PAC_PAIOX	% short-stay residents who had moderate to severe pain (PAC)
PPRUX	PAC_PRU0X	% short-stay residents with pressure sores (PAC)

**Table A.2 Facility QM Output Table  
(1 Record per Facility)**

SAS Name	Type	Length	SAS Label/Description
<b>Facility Id Codes</b>			
ST_CODE	CHAR	2	SAS Label: STATE ID CODE Description: Facility state
FAC_ITL	CHAR	10	SAS Label: SYSTEM INTERNAL FACILITY ID Description: MDS System unique facility ID code
<b>Facility-Level Measures Repeated for Each of the 14 QMs</b>			
D_<qm-name>	NUM	8	SAS Label: DENOMINATOR,<qm-name> Description: Complete-data QM denominator. Number of residents for QM calculation, after QM exclusions <b>AND</b> exclusion of cases with any missing covariate scores (if applicable). <b>Note:</b> Value for a CC QM is set to missing if there are no residents in the CC facility admission sample. Value for a PAC QM is set to missing if there are no residents in the PAC facility admission sample.
N_<qm-name>	NUM	8	SAS Label: NUMERATOR,<qm-name> Description: Complete-data QM numerator. Number of residents triggering the QM, after QM exclusions <b>AND</b> exclusion of cases with any missing covariate scores (if applicable). <b>Note:</b> Value for a CC QM is set to missing if there are no residents in the CC facility admission sample. Value for a PAC QM is set to missing if there are no residents in the PAC facility admission sample.
Q_<qm-name>	NUM	8	SAS Label: QM SCORE,<QM-NAME> Description: Complete-data QM rate. Percent of residents triggering the QM, after QM exclusions <b>AND</b> exclusion of cases with any missing covariate scores (if applicable); adjusted if applicable.

# **National Nursing Home Quality Measures**

## **Parameters Used for Each Quarter**

### **APPENDIX B**

**January 2004 (v1)**

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## Introduction

This appendix presents the model parameters estimated for the Centers for Medicare and Medicaid Services' (CMS) Nursing Home Quality Initiative (NHQI) project. Facility-level Quality Measures (QMs) have been calculated for the following time period:

- The period ending September 30, 2003, referred to as Q3 2003.

The purpose of this document is to present the parameters used in the risk adjustment calculations that were applied to five risk-adjusted QMs. Two sets of parameters were used: logistic regression coefficients and national observed QM means. These parameters are presented in the following two sections. For details regarding the use of these parameters, please refer to Appendix A.

## Logistic Regression Coefficients

For Q3 2003, five QMs were risk adjusted. The logistic regression coefficients used are presented in Table B.1. Where risk adjustment involves the use of more than one resident-level covariate, coefficients are listed in the order presented in the CC and PAC matrices, Chapters 2 and 3 in this Manual.

**Table B.1. Logistic Regression Coefficients**

<b>QM</b>	<b>Constant (Intercept)</b>	<b>Resident-Level Covariates</b>
CC CAT02	<b>-2.91915</b>	<b>0.62826</b> <b>2.10187</b>
CC MOB01	<b>-1.98187</b>	<b>0.31039</b> <b>0.42301</b> <b>0.40746</b>
CC PAI0X	<b>-2.41206</b>	<b>0.86700</b>
PAC DEL0X	<b>-3.01425</b>	<b>-0.30717</b>
PAC PRU0X	<b>-2.66671</b>	<b>0.76163</b> <b>0.96908</b> <b>0.75814</b> <b>0.41386</b> <b>0.49302</b>

## National Observed Means

The national observed QM means are updated for each quarterly release. Table B.2 presents these means for Q3 2003, as an example.

**Table B.2. National Observed QM Means**

<b>QM</b>	<b>2003-Q3</b>
CC CAT02	<b>0.06368</b>
CC MOB1	<b>0.14141</b>
CC PAI0X	<b>0.08683</b>
PAC DEL0X	<b>0.03604</b>
PAC PRU0X	<b>0.21478</b>

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