

# **Technical Report: Analysis of Nursing Home Clinical Quality Indicators**

## **Evaluation of the NF Payment Reform Legislation 2021 Report to the Legislature**

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## Executive Summary

The Minnesota Nursing Home Report Card provides two clinical quality indicator (QI) ratings: one focused on the quality of care during long-term stays (LS) with 19 indicators, and one focused on the quality of care during short-term stays (SS) with 2 indicators. Currently, face validity and expert opinions are employed to group the 19 long-stay QIs into 10 different domains or aspects of care. However, we do not know whether these domains are supported by the data. Under the current scoring program, the best performing 20% of facilities statewide get full points on each QI, the worst performing 10% get no points, and the rest are sorted and given a prorated point value. However, some QIs may not discriminate very well between facilities.

The main objective was to explore the dimensionality of the clinical QIs and the possibility of reducing the number of QIs using exploratory factor analysis (EFA), Cronbach's alpha, correlation, scatter plots, descriptive and trends analysis. Risk-adjusted facility-level QIs including 19 long-stay QIs and 2 short-stay QIs over the 2012-2019 period (four quarters in each year) were used. The number of nursing facilities in each quarter ranged from 369 to 382.

The EFA results indicate it is reasonable to categorize the 19 long-stay QIs into 4 underlying dimensions or domains rather than the 10 domains currently used: *incontinence* (4 QIs: bladder incontinence, bowel incontinence, absence of a toileting plan for residents with bowel incontinence, and absence of a toileting plan for residents with bladder incontinence), *physical functioning* (5 QIs: improved walking, functional decline, mobility dependence, range of motion limitation, and falls), *restraints and behavioral symptoms* (4 QIs: physical restraints, behavioral problems, depressive symptoms, and use of antipsychotics without a supporting psychiatric diagnosis), and *care for specific conditions* (6 QIs: pain, pressure sores, unexplained weight loss, indwelling catheters, urinary tract infections, and infections). The new domain structure has two advantages. First, the new domains are more consistent with underlying patterns in the data, indicating that the domains are more valid and reliable. Second, the new domain structure increases the balance across the domains. The number of QIs within each domain ranges from 4 to 6, which makes the contributions of individual QIs to the domain and total QI scores similar (either 1.0, 1.2, or 1.5), not as exaggerated as previously assigned. Previously some QIs had a 5-time greater influence on the domain and total QI scores than other QIs.

The two long-stay QIs "incidence of worsening or serious bladder incontinence" and "incidence of worsening or serious bowel incontinence" have a correlation coefficient of 0.657. The two long-stay QIs "prevalence of occasional to full bladder incontinence without a toileting plan" and "prevalence of occasional to full bowel incontinence without a toileting plan" have a correlation coefficient of 0.683. The two long-stay physical functioning QIs "incidence of worsening or serious functional dependence" and "incidence of worsening or serious mobility dependence" have a correlation coefficient of 0.508. Given two highly correlated QIs, if a facility had a high rate of one QI, the facility would have a corresponding high rate of the other QI. Two highly correlated QIs suggest they may be measuring some redundant aspects of quality of care. It may be reasonable to combine them into one QI.

Nine of the 21 QIs display an approximately normal distribution and 12 QIs display a skewed distribution with facilities tightly grouped at the very bottom (floor) or top (ceiling) of the QI distribution. Eight QIs also display minimal variation in QI rates. Our findings suggest that the

current scoring approach may distort or exaggerate the differences in the QI rates with skewed distributions, assigning widely varying points to facilities that vary little in their QI rates. Regarding the normally distributed QIs, we recommend using the current scoring approach. For the extreme case of the physical restraint QI, we recommend discontinuing it because of the near-total elimination of restraint use and coverage of this problem by state inspections. When QIs are highly skewed and many facilities are able to achieve the best QI rate (a QI rate of 0%), we recommend using zero deficit for facilities to receive full points. That is, facilities with a QI rate of 0% receive full points, the worst performing 10% of facilities receive no points, and facilities in between receive points proportional to their rates. For the two QIs (“prevalence of antipsychotic medications without a diagnosis of psychosis” and “prevalence of depressive symptoms”), more than half of facilities are able to achieve a better QI rate (use of antipsychotics QI: 6%; depressive symptoms QI: 3%). So the worst 50% of facilities, instead of the worst 10%, should receive no points. The best performing 20% of facilities receive full points, and facilities in between receive points proportional to their rates.

Besides discontinuing the “prevalence of physical restraints” QI, we recommend discontinuing 2 QIs: “prevalence of occasional to full bladder incontinence without a toileting plan” and “prevalence of occasional to full bowel incontinence without a toileting plan”. We recommend combining two highly correlated QIs (incidence of worsening or serious bowel incontinence” and “incidence of worsening or serious bladder incontinence”) into one QI “incidence of worsening or serious bowel or bladder incontinence”. We recommend replacing the long-stay “prevalence of falls with injury” QI with two new QIs “prevalence of any fall” and “prevalence of two or more falls or fall with injury”. We also recommend adding two new QIs for short-stay residents which have been used in the federal quality measures: “prevalence of any fall” and “prevalence of antipsychotic medications without a diagnosis of psychosis”.

The current QIs, with the exception of the improved walking QI, focus on avoiding poor care practices or outcomes. These negatively framed QIs convey a message of avoiding harm, essentially penalizing facilities for poor care. Positively framed QIs are intended to reward facilities for better care, with better care processes and outcomes. Earlier versions of the QIs, prior to 2016, had several positively focused QIs, emphasizing improvement in functioning and continence. We recommend re-introducing the following positively-framed QIs: “incidence of improved or maintained functional independence” and “incidence of improved or maintained bowel or bladder continence”.

## 1. Background

The Minnesota Nursing Home Report Card provides two clinical quality indicator (QI) ratings: one focused on the quality of care during long-term stays (LS) with 19 indicators, and one focused on the quality of care during short-term stays (SS) with 2 indicators. These QIs are risk adjusted to account for differences between the types of residents served in nursing homes (NHs). Examples of the adjustors used are, but are not limited to: age, gender, cognitive performance (mental functioning), Alzheimer’s disease, stroke, and ADL ability (Minnesota Nursing Home Report Card Technical User Guide).

The scoring program used for the Nursing Home Report Card compares facilities against each other and combines QIs with very different ranges into one score. Basically, the best performing 20% of facilities statewide get full points on each QI, the worst performing 10% get no points, and the rest are sorted and given a prorated point value using the following equation. As shown in Table 1, there are 10 domains of 19 long-stay QIs. Each long-stay domain is assigned 10 points and within each domain the points are distributed equally. Finally, the domains are added into a total score for a maximum 100 points.

$$\frac{(\text{Adjusted Facility Rate} - \text{Rate for No Points})}{(\text{Rate for Full Points} - \text{Rate for No Points})} \times \text{Possible QI Points}$$

Currently face validity and expert opinions are employed to group the 19 long-stay QIs into 10 different domains or aspects of care. However, we do not know whether these domains are supported by the data. Individual QIs vary widely in their contributions to the domain and total QI scores. When multiple QIs are grouped under a single domain, their contribution is diminished. The number of QIs within each domain varies considerably, ranging from 1 to 5. Consequently different weights are assigned to the individual QIs. For example, the “prevalence of pressure sores in high-risk residents” QI gets 10 points, while the “prevalence of worsening or serious bladder incontinence” QI gets 2 points. Based on the points assigned, the pressure sore QI is five times as important as the bladder incontinence QI.

The current scoring approach is best suited for a facility QI distribution that is normal, i.e., bell-shaped curve. The best performing 20% of facilities statewide get full points on each QI, the worst performing 10% get no points, and the rest are sorted and given a prorated point value. If a QI is normally distributed with relatively large variation in rates, the scoring program discriminates well between facilities. Facilities that receive full points are exhibiting better quality relative to their peers, and facilities receiving no points are exhibiting poor quality. However, if the distribution of the QI rate is highly skewed with a floor effect (a large number of facilities have a QI rate at or near 0%) or ceiling effect (a large number of facilities have a QI rate at or near 100%), the scoring program will distort and exaggerate the differences in the low rates or high rates.

**Table 1. Domains of long-stay quality indicators in Report Card**

<b>Domain</b>	<b>19 Long-stay Quality Indicators</b>	<b>Points</b>
Psychosocial	Incidence of Worsening or Serious Resident Behavior Problems	5
	Prevalence of Depressive Symptoms	5
Quality of Life	Prevalence of Physical Restraints	10
Continence	Incidence of Worsening or Serious Bowel Incontinence	2
	Incidence of Worsening or Serious Bladder Incontinence	2
	Prevalence of Occasional to Full Bladder Incontinence Without a Toileting Plan	2
	Prevalence of Occasional to Full Bowel Incontinence Without a Toileting Plan	2
	Prevalence of Indwelling Catheters	2
Infections	Prevalence of Urinary Tract Infections	5
	Prevalence of Infections	5
Accidents	Prevalence of Falls with Major Injury	10
Nutrition	Prevalence of Unexplained Weight Loss	10
Skin Care	Prevalence of Pressure Sores in High-Risk Residents	10
Psychotropic Drugs	Prevalence of Antipsychotics Without a Diagnosis of Psychosis	10
Physical Functioning	Incidence of Walking as Well or Better than Previous Assessment	2.5
	Incidence of Worsening or Serious Functional Dependence	2.5
	Incidence of Worsening or Serious Mobility Dependence	2.5
	Incidence of Worsening or Serious Range of Motion Limitation	2.5
Pain	Prevalence of Residents who Report Moderate to Severe Pain	10

## 2. Objectives

The main objective was to explore the dimensionality of the clinical QIs and the possibility of reducing the number of QIs. We also examined the distribution of the current QIs and offered recommendations for reforming the scoring program. We were working with the current QIs as defined. We were not evaluating the need for new QIs or proposing a major re-defining of the current QIs.

## 3. Data and Methods

Risk-adjusted facility-level QIs including 19 long-stay QIs and 2 short-stay QIs over the 2012-2019 period (four quarters in each year) were used. The number of NHs in each quarter ranged from 369 to 382. Exploratory factor analysis (EFA), Cronbach's alpha, correlation, scatter plots, descriptive and trends analysis were conducted for this report.

Exploratory factor analysis is a statistical method used to identify a set of latent constructs underlying a battery of measured variables. In this report, EFA was used to investigate the dimensionality of NH quality, which may usefully summarize the multiplicity of QIs. Principal component factor methods with orthogonal rotation were used in the EFA. In addition, Cronbach's alpha was calculated to assess the internal consistency of QIs loaded on the same

factor or domain. Internal consistency, one of the measures to assess reliability, measures whether several QIs that propose to measure the same general quality construct produce similar scores.

## 4. Results

### 4.1 New Dimensionality or Domains of NH Clinical Quality Indicators

Table 2 presents the EFA results of 19 long-stay QIs. There were five factors or domains underlying the 19 QIs:

- **Factor/Domain 1:** incontinence, including 2 QIs:
  - Incidence of worsening or serious bowel incontinence
  - Incidence of worsening or serious bladder incontinence
- **Factor/Domain 2:** no toileting plan for incontinence, including 2 QIs:
  - Prevalence of occasional to full bowel incontinence without a toileting plan
  - Prevalence of occasional to full bladder incontinence without a toileting plan
- **Factor/Domain 3:** physical functioning, including 5 QIs:
  - Incidence of walking as well or better than previous assessment
  - Incidence of worsening or serious functional dependence
  - Incidence of worsening or serious mobility dependence
  - Incidence of worsening or serious range of motion limitation
  - Prevalence of falls with major injury
- **Factor/Domain 4:** restraints and behavioral symptoms, including 5 QIs:
  - Incidence of worsening or serious resident behavior problems
  - Prevalence of depressive symptoms
  - Prevalence of physical restraints
  - Prevalence of antipsychotic medications without a diagnosis of psychosis
  - Prevalence of infections
- **Factor/Domain 5:** care for specific conditions, including 5 QIs:
  - Prevalence of moderate to severe pain
  - Prevalence of pressure sores in high risk residents
  - Prevalence of unexplained weight loss
  - Prevalence of indwelling catheters
  - Prevalence of urinary tract infections

The five factors explained 44.03% of variance in QIs. The eigenvalues for these 5 factors were 2.48, 2.08, 1.48, 1.23, and 1.10. The signs of factor loading were consistent and as expected in each factor, with the QI “incidence of walking as well or better than previous assessment” having a negative loading score. Contrary to expectation, the QI “prevalence of infections” loaded on factor 4 “restraints and behavioral symptoms” and did not load on the same factor with the QI “prevalence of urinary tract infections”. The Cronbach’s alpha for these 5 factors were 0.79, 0.81, 0.47, 0.41, and 0.36. Usually, the internal consistency is acceptable when Cronbach’s alpha is 0.7 or greater, although some researchers suggested 0.4 is acceptable for the reliability of MDS items (Hawes et al, 1995).

**Table 2. EFA results of 19 long-stay QIs**

<b>19 Long-Stay Quality Indicators</b>	<b>Factor1</b>	<b>Factor2</b>	<b>Factor3</b>	<b>Factor4</b>	<b>Factor5</b>
Adjusted Incidence of Worsening or Serious Bowel Incontinence	<b>0.818</b>	0.126	0.124	0.022	-0.017
Adjusted Incidence of Worsening or Serious Bladder Incontinence	<b>0.816</b>	0.166	0.066	0.003	0.019
Adjusted Prevalence of Occasional to Full Bowel Incontinence without a Toileting Plan	0.071	<b>0.867</b>	-0.054	0.002	-0.003
Adjusted Prevalence of Occasional to Full Bladder Incontinence without a Toileting Plan	0.181	<b>0.878</b>	0.011	0.013	-0.036
Adjusted Incidence of Walking as Well or Better than on Previous Assessment	<b>-0.424</b>	-0.113	<b>-0.305</b>	0.331	-0.083
Adjusted Incidence of Worsening or Serious Functional Dependence	0.312	-0.048	<b>0.713</b>	0.080	0.023
Adjusted Incidence of Worsening or Serious Mobility Dependence	0.089	-0.046	<b>0.685</b>	0.111	0.039
Adjusted Incidence of Worsening or Serious Range of Motion Limitation	-0.079	0.053	<b>0.351</b>	0.056	0.170
Adjusted Prevalence of Falls with Injury	-0.227	0.042	<b>0.409</b>	-0.175	-0.023
Adjusted Incidences of Worsening or Serious Resident Behavior Problems	-0.099	0.069	0.209	<b>0.598</b>	-0.266
Adjusted Prevalence of Depressive Symptoms	-0.074	0.052	0.117	<b>0.538</b>	0.080
Adjusted Prevalence of Physical Restraints	0.044	-0.154	-0.114	<b>0.401</b>	0.253
Adjusted Prevalence of Antipsychotic Medications Without a Diagnosis of Psychosis	0.168	0.039	0.016	<b>0.596</b>	0.123
Adjusted Prevalence of Infections	0.062	-0.180	0.263	<b>0.310</b>	0.083
Adjusted Prevalence of Moderate to Severe Pain	-0.200	<b>0.312</b>	0.224	0.196	<b>0.302</b>
Adjusted Prevalence of Pressure Sores in High Risk Residents	0.202	0.131	0.026	-0.044	<b>0.521</b>
Adjusted Prevalence of Unexplained Weight Loss	0.149	-0.019	0.129	0.247	<b>0.361</b>
Adjusted Prevalence of Indwelling Catheters	0.018	-0.050	0.016	-0.104	<b>0.679</b>
Adjusted Prevalence of Urinary Tract Infections	-0.265	-0.185	0.089	0.238	<b>0.524</b>

**Note:** Factor loadings in bolded red indicate the recommended QI placement. Factor loadings in bolded black represent instances in which a QI loaded higher on one factor, but was recommended for placement on another factor because the QI was perceived to fit better conceptually with the other QIs in that factor.

In summary, after considering the EFA results and content validity, it is reasonable to categorize the 19 long-stay QIs into 4 underlying dimensions or domains rather than the 10 domains currently used: incontinence (4 QIs), physical functioning (5 QIs), restraints and behavioral symptoms (4 QIs), and care for specific conditions (6 QIs).

- **Factor/Domain 1:** incontinence, including 4 QIs:
  - Incidence of worsening or serious bowel incontinence
  - Incidence of worsening or serious bladder incontinence
  - Prevalence of occasional to full bowel incontinence without a toileting plan
  - Prevalence of occasional to full bladder incontinence without a toileting plan
- **Factor/Domain 2:** physical functioning, including 5 QIs:
  - Incidence of walking as well or better than previous assessment
  - Incidence of worsening or serious functional dependence
  - Incidence of worsening or serious mobility dependence
  - Incidence of worsening or serious range of motion limitation
  - Prevalence of falls with major injury
- **Factor/Domain 3:** restraints and behavioral symptoms, including 4 QIs:
  - Prevalence of physical restraints
  - Incidence of worsening or serious resident behavior problems
  - Prevalence of depressive symptoms
  - Prevalence of antipsychotic medications without a diagnosis of psychosis
- **Factor/Domain 4:** care for specific conditions, including 6 QIs:
  - Prevalence of moderate to severe pain
  - Prevalence of pressure sores in high risk residents
  - Prevalence of unexplained weight loss
  - Prevalence of indwelling catheters
  - Prevalence of urinary tract infections
  - Prevalence of infections

The new domain structure has two advantages. First, the new domains are more consistent with underlying patterns in the data, indicating that the domains are more valid and reliable. Second, the new domain structure increases the balance across the domains. The number of QIs within each domain ranges from 4 to 6, which makes the contributions of individual QIs to the domain and total QI scores similar (either 1.0, 1.2, or 1.5), not as exaggerated as previously assigned. Previously some QIs had a 5-time greater influence on the domain and total QI scores than other QIs.

Besides the 19 long-stay QIs, there are 2 short-stay QIs in the Report Card: prevalence of moderate to severe pain and prevalence of new or worsening pressure sores. Table 3 presents the EFA results of 21 QIs. There were 6 factors or domains underlying the 21 QIs. As expected, the short- and long-stay pain QIs loaded together on the same factor (Factor 3) and the short- and long-stay pressure sore QIs loaded together on the same factor (Factor 6). The six factors explained 47.46% of variance in QIs. The eigenvalues for these 6 factors were 2.49, 2.28, 1.65, 1.27, 1.20 and 1.07. The Cronbach's alpha for these 6 factors were 0.79, 0.81, 0.75, 0.49, 0.41, and 0.36.



**Table 3. EFA results of 21 QIs**

<b>21 Quality Indicators</b>	<b>Factor1</b>	<b>Factor2</b>	<b>Factor3</b>	<b>Factor4</b>	<b>Factor5</b>	<b>Factor6</b>
Adjusted Incidence of Worsening or Serious Bowel Incontinence (LS)	<b>0.847</b>	0.101	-0.021	0.104	0.011	-0.029
Adjusted Incidence of Worsening or Serious Bladder Incontinence (LS)	<b>0.849</b>	0.146	-0.009	0.041	-0.007	0.033
Adjusted Prevalence of Occasional to Full Bladder Incontinence w/o a Toileting Plan (LS)	0.187	<b>0.873</b>	0.092	0.025	0.009	-0.035
Adjusted Prevalence of Occasional to Full Bowel Incontinence w/o a Toileting Plan (LS)	0.053	<b>0.881</b>	0.023	-0.019	0.019	0.014
Adjusted Prevalence of Moderate to Severe Pain (LS)	0.004	0.079	<b>0.866</b>	0.028	0.016	0.028
Adjusted Prevalence of Moderate to Severe Pain (SS)	-0.034	0.035	<b>0.857</b>	0.009	0.054	0.044
Adjusted Incidence of Walking as Well or Better than on Previous Assessment (LS)	<b>-0.391</b>	-0.116	0.026	<b>-0.351</b>	0.359	-0.032
Adjusted Incidence of Worsening or Serious Functional Dependence (LS)	0.261	-0.031	0.028	<b>0.754</b>	0.070	0.010
Adjusted Incidence of Worsening or Serious Mobility Dependence (LS)	-0.027	0.022	0.017	<b>0.788</b>	0.090	0.077
Adjusted Prevalence of Falls with Injury (LS)	-0.093	-0.082	0.160	<b>0.264</b>	-0.126	-0.155
Adjusted Incidence of Worsening or Serious Range of Motion Limitation (LS)	0.049	-0.067	0.186	<b>0.227</b>	0.059	0.065
Adjusted Incidence of Worsening or Serious Resident Behavior Problems (LS)	-0.076	0.067	0.094	0.165	<b>0.610</b>	-0.267
Adjusted Prevalence of Depressive Symptoms (LS)	0.054	-0.048	0.214	0.008	<b>0.522</b>	-0.008
Adjusted Prevalence of Physical Restraints (LS)	-0.065	-0.082	0.008	0.024	<b>0.342</b>	0.298
Adjusted Prevalence of Antipsychotic Medications Without a Diagnosis of Psychosis (LS)	0.025	0.145	-0.067	0.178	<b>0.569</b>	0.220
Adjusted Prevalence of Infections (LS)	0.219	-0.299	0.133	0.098	<b>0.360</b>	0.008
Adjusted Prevalence of New or Worsening Pressure Sores (SS)	0.007	-0.024	0.230	-0.099	0.180	<b>0.397</b>
Adjusted Prevalence of Pressure Sores in High Risk Residents (LS)	0.232	0.100	0.056	0.009	-0.043	<b>0.540</b>
Adjusted Prevalence of Unexplained Weight Loss (LS)	0.151	-0.033	0.068	0.158	0.247	<b>0.311</b>
Adjusted Prevalence of Indwelling Catheters (LS)	-0.054	-0.026	0.041	0.130	-0.146	<b>0.641</b>
Adjusted Prevalence of Urinary Tract Infections (LS)	-0.252	-0.227	0.167	0.098	0.225	<b>0.456</b>

**Note:** Factor loadings in bolded red indicate the recommended QI placement. Factor loadings in bolded black represent instances in which a QI loaded higher on one factor, but was recommended for placement on another factor because the QI was perceived to fit better conceptually with the other QIs in that factor.

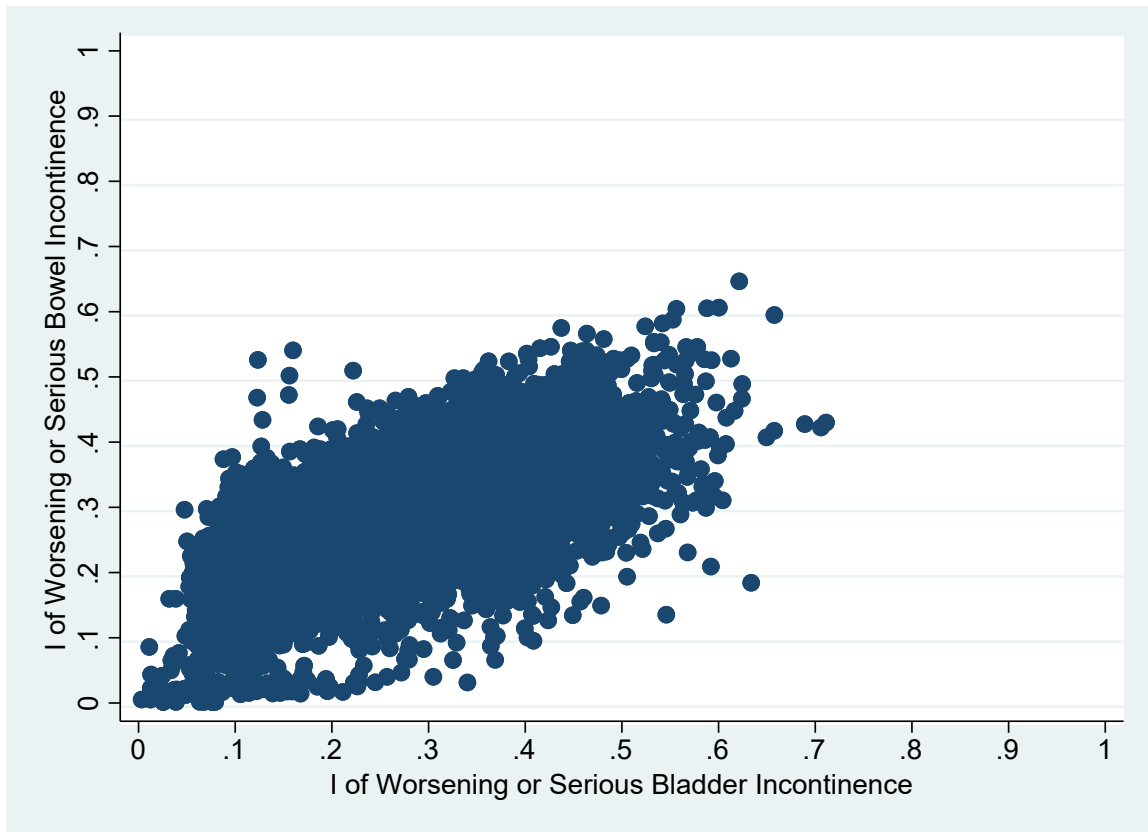
## 4.2 Highly Correlated QIs

As shown in Table 4, the two long-stay QIs “incidence of worsening or serious bladder incontinence” and “incidence of worsening or serious bowel incontinence” have a correlation coefficient of 0.657. As presented in the scatter plot (Figure 1), if a facility had a high incidence of bowel incontinence, the facility would have a corresponding high incidence of bladder incontinence. Moreover, the two QIs loaded on the same factor of incontinence (Table 2 and Table 3). It may be reasonable to combine these two QIs into one QI: “incidence of worsening or serious bowel or bladder incontinence”.

**Table 4. Correlation coefficients between specific QIs related to incontinence**

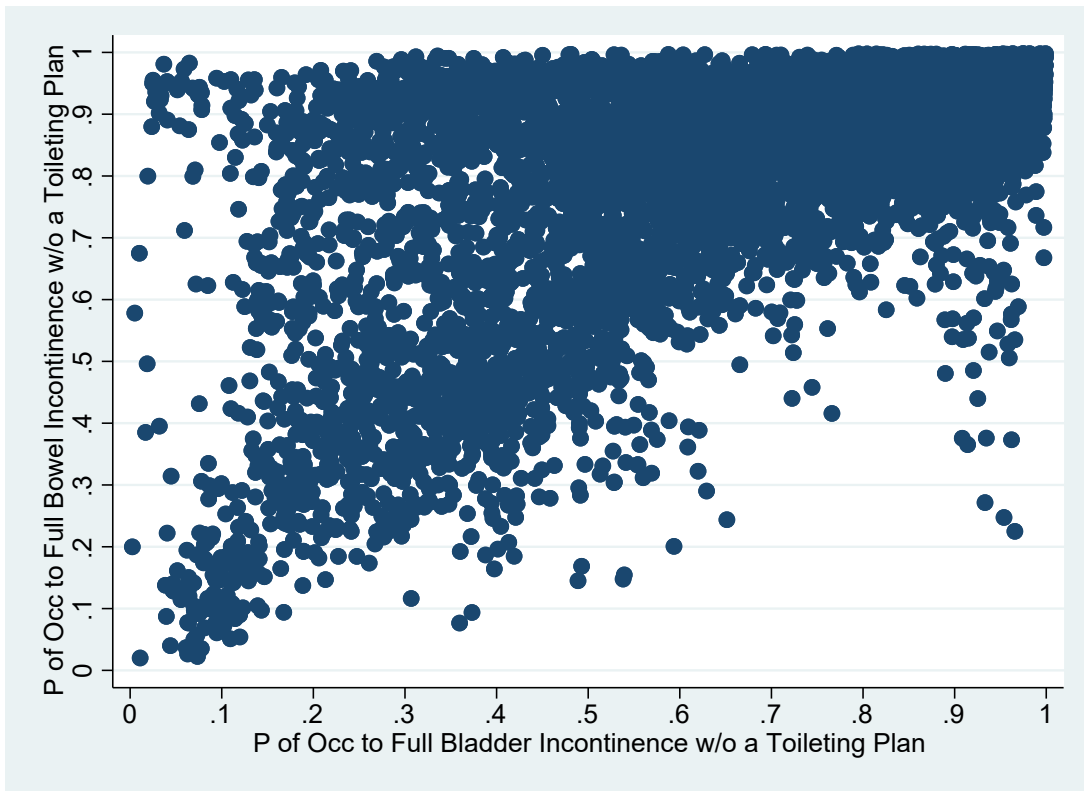
<b>Domain: Incontinence</b>	<b>CNTA</b>	<b>CNTB</b>	<b>CNTE</b>	<b>CNTF</b>
<b>CNTA:</b> Adjusted Incidence of Worsening or Serious Bowel Incontinence (LS)	1			
<b>CNTB:</b> Adjusted Incidence of Worsening or Serious Bladder Incontinence (LS)	<b>0.657</b>	1		
<b>CNTE:</b> Adjusted P of Occasional to Full Bladder Incontinence without a Toileting Plan (LS)	0.222	0.276	1	
<b>CNTF:</b> Adjusted P of Occasional to Full Bowel Incontinence without a Toileting Plan (LS)	0.157	0.173	<b>0.683</b>	1

**Figure 1. Scatter plot of two QIs: bowel incontinence and bladder incontinence**



The two long-stay QIs “prevalence of occasional to full bladder incontinence without a toileting plan” and “prevalence of occasional to full bowel incontinence without a toileting plan” have a correlation coefficient of 0.683 (Table 4). These two QIs loaded on the same factor (Table 2 and Table 3). Although the scatter plot does not show a linear relationship (Figure 2), it might be reasonable to combine these two QIs into one QI: “prevalence of occasional to full bladder or bowel incontinence without a toileting plan”.

**Figure 2. Scatter plot of two QIs: bowel and bladder incontinence without a toileting plan**

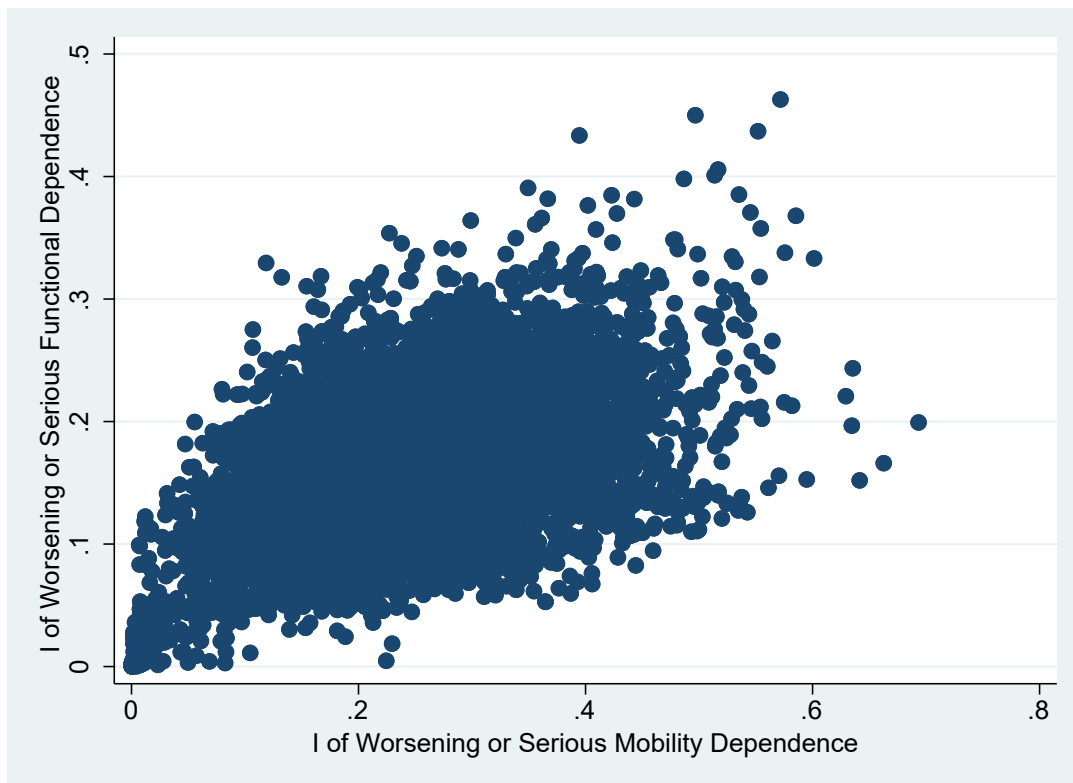


Two long-stay physical functioning QIs “incidence of worsening or serious functional dependence” and “incidence of worsening or serious mobility dependence” are moderately correlated (correlation coefficient 0.508, Table 5 and scatter plot in Figure 3). These two QIs loaded on the same factor of physical functioning (Table 2 and Table 3). It may be reasonable to combine these two QIs into one QI: “incidence of worsening or serious functional or mobility dependence”. If keeping both, we recommend clarifying the “incidence of worsening or serious functional dependence” QI focuses on late functional loss.

**Table 5. Correlation coefficients between specific QIs related to physical functioning**

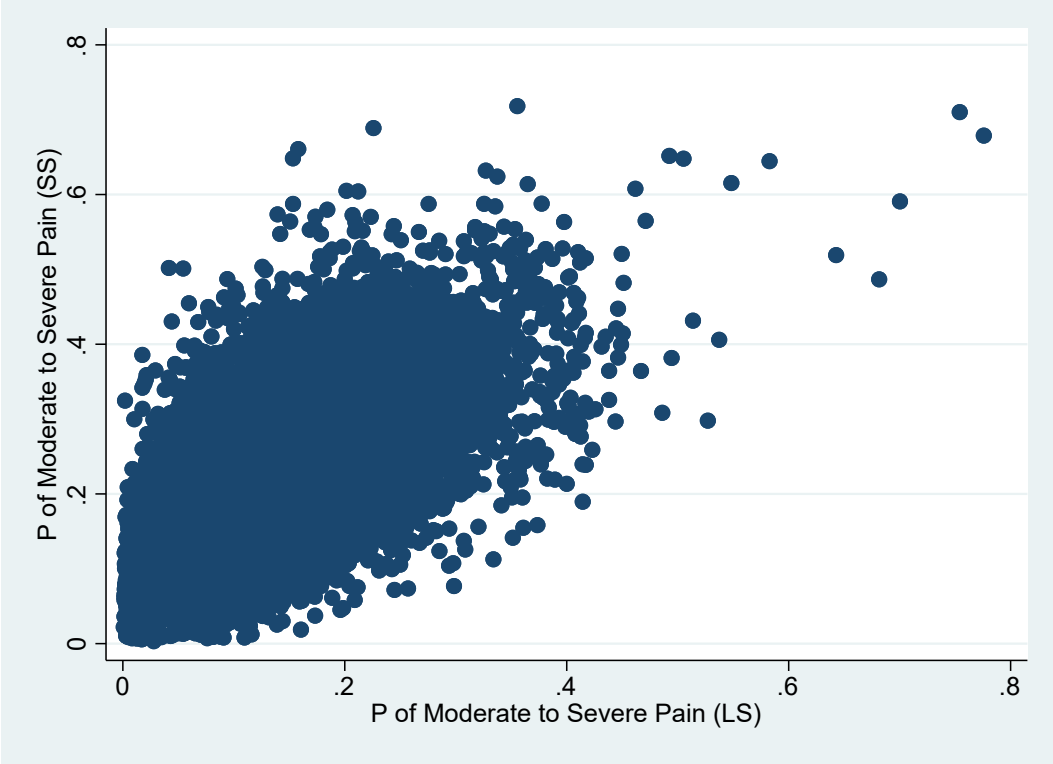
<b>Domain: Physical Functioning</b>	<b>WALX</b>	<b>ADLA</b>	<b>MOBA</b>	<b>ROMA</b>	<b>FAL1</b>
<b>WALX:</b> Adjusted Incidence of Walking as Well or Better than on Previous Assessment (LS)	1				
<b>ADLA:</b> Adjusted Incidence of Worsening or Serious Functional Dependence (LS)	-0.303	1			
<b>MOBA:</b> Adjusted Incidence of Worsening or Serious Mobility Dependence (LS)	-0.170	<b>0.508</b>	1		
<b>ROMA:</b> Adjusted Incidence of Worsening or Serious Range of Motion Limitation (LS)	-0.082	0.152	0.139	1	
<b>FAL1:</b> Adjusted Prevalence of Falls with Injury (LS)	-0.013	0.045	0.045	0.012	1

**Figure 3. Scatter plot of two QIs: functional dependence and mobility dependence**



Although the short- and long-stay pain QIs are moderately correlated with correlation coefficient 0.600 (scatter plot in Figure 4) and these two QIs loaded on the same factor of pain (Table 3), they should remain separate QIs because the QIs assessed two different populations: short-stay residents and long-stay residents.

**Figure 4. Scatter plot of two short- and long-stay pain QIs**



### 4.3 Eight QIs with Skewed Distribution and Minimal Variation in QI Rates

If a QI is normally distributed with relatively large variation in rates, the current scoring program discriminates well between facilities. If the distribution of the QI rate is highly skewed with a floor effect (a large number of facilities have a QI rate at or near 0%) or ceiling effect (a large number of facilities have a QI rate at or near 100%), the scoring program will distort and exaggerate the differences in the low or high QI rates.

To identify QIs that do not discriminate well among facilities, the distribution of each QI was first explored, starting with the 8 QIs with too little variance, then the QIs with skewed distributions (floor or ceiling effects), and the QIs with approximately normal distributions.

Next, the trends (line graphs) of each QI rate over the 2012-2019 period were drawn comparing the average score of the worst performing 10% of facilities, the median, and the average score of the best performing 20% of facilities. The line graphs indicate thresholds for achieving 0, 5, or 10 points (QIs: “prevalence of physical restraints”, “prevalence of pressure sores in high risk residents”, “prevalence of falls with injury”, and “prevalence of unexplained weight loss”), thresholds for achieving 0, 2.5, or 5 points (QIs: “prevalence of new or worsening pressure sores”, “prevalence of infections”, and “prevalence of urinary tract infection”), or thresholds for achieving 0, 1, or 2 points (QI: “prevalence of indwelling catheters”). The spread between the lines gives an indication of how well the points are distributed under the current scoring program. For example, if the spread between the average score for the median facilities and the best performing 20% of facilities is small, then the QIs may not discriminate very well between facilities. The point threshold should be re-adjusted, so that the points are a better reflection of facility performance.

Moreover, one of the quality measure evaluation criteria recommended by the National Quality Forum is substantial potential for improvement. As shown in Table 6, there are 8 QIs with too little variation in QI rates: variance less than 0.001.

- Prevalence of physical restraints (long-stay)
- Prevalence of new or worsening pressure sores (short-stay)
- Prevalence of pressure sores in high risk residents (long-stay)
- Prevalence of indwelling catheters (long-stay)
- Prevalence of infections (long-stay)
- Prevalence of falls with injury (long-stay)
- Prevalence of urinary tract infection (long-stay)
- Prevalence of unexplained weight loss (long-stay)

**Table 6. The descriptive results of 21 QIs (ranked by standard Deviation from largest to smallest)**

<b>21 Long- and Short-Stay Quality Indicators</b>	<b>N</b>	<b>Mean</b>	<b>SD</b>	<b>Min</b>	<b>Max</b>	<b>Range</b>	<b>Variance</b>
Adjusted Prevalence of Occasional to Full Bladder Incontinence w/o a Toileting Plan (LS)	11,584	0.749	0.233	0.002	0.999	0.997	0.0544
Adjusted Prevalence of Occasional to Full Bowel Incontinence w/o a Toileting Plan (LS)	11,432	0.848	0.168	0.020	0.998	0.978	0.0282
Adjusted Incidence of Walking as Well or Better than on Previous Assessment (LS)	11,688	0.691	0.115	0.136	1	0.863	0.0133
Adjusted Incidence of Worsening or Serious Bladder Incontinence (LS)	11,717	0.271	0.103	0.003	0.711	0.708	0.0107
Adjusted Prevalence of Moderate to Severe Pain (SS)	11,446	0.249	0.103	0.003	0.718	0.715	0.0105
Adjusted Incidence of Worsening or Serious Mobility Dependence (LS)	11,726	0.238	0.090	<0.001	0.693	0.693	0.0080
Adjusted Incidence of Worsening or Serious Bowel Incontinence (LS)	11,726	0.283	0.081	0.005	0.649	0.644	0.0066
Adjusted Prevalence of Moderate to Severe Pain (LS)	11,725	0.153	0.081	0.001	0.776	0.775	0.0066
Adjusted Incidence of Worsening or Serious Range of Motion Limitation (LS)	11,690	0.115	0.077	<0.001	0.618	0.617	0.0059
Adjusted Incidence of Worsening or Serious Resident Behavior Problems (LS)	11,729	0.125	0.067	0.001	0.622	0.621	0.0045
Adjusted Prevalence of Antipsychotic Medications Without a Diagnosis of Psychosis (LS)	11,558	0.082	0.063	0.001	0.702	0.701	0.0039
Adjusted Incidence of Worsening or Serious Functional Dependence (LS)	11,726	0.157	0.053	<0.001	0.463	0.463	0.0028
Adjusted Prevalence of Depressive Symptoms (LS)	11,728	0.051	0.047	<0.001	0.688	0.688	0.0022
Adjusted Prevalence of Unexplained Weight Loss (LS)	11,727	0.052	0.030	0.001	0.258	0.258	0.0009
Adjusted Prevalence of Urinary Tract Infections (LS)	11,727	0.041	0.030	0.001	0.268	0.268	0.0009
Adjusted Prevalence of Falls with Injury (LS)	10,931	0.034	0.027	0.001	0.239	0.238	0.0007
Adjusted Prevalence of Infections (LS)	11,727	0.028	0.027	0.001	0.373	0.373	0.0007
Adjusted Prevalence of Indwelling Catheters (LS)	11,722	0.027	0.024	<0.001	0.185	0.185	0.0006
Adjusted Prevalence of Pressure Sores in High Risk Residents (LS)	11,520	0.039	0.020	0.001	0.165	0.164	0.0004
Adjusted Prevalence of New or Worsening Pressure Sores (SS)	11,677	0.020	0.018	<0.001	0.216	0.216	0.0003
Adjusted Prevalence of Physical Restraints (LS)	11,732	0.006	0.013	<0.001	0.200	0.199	0.0002

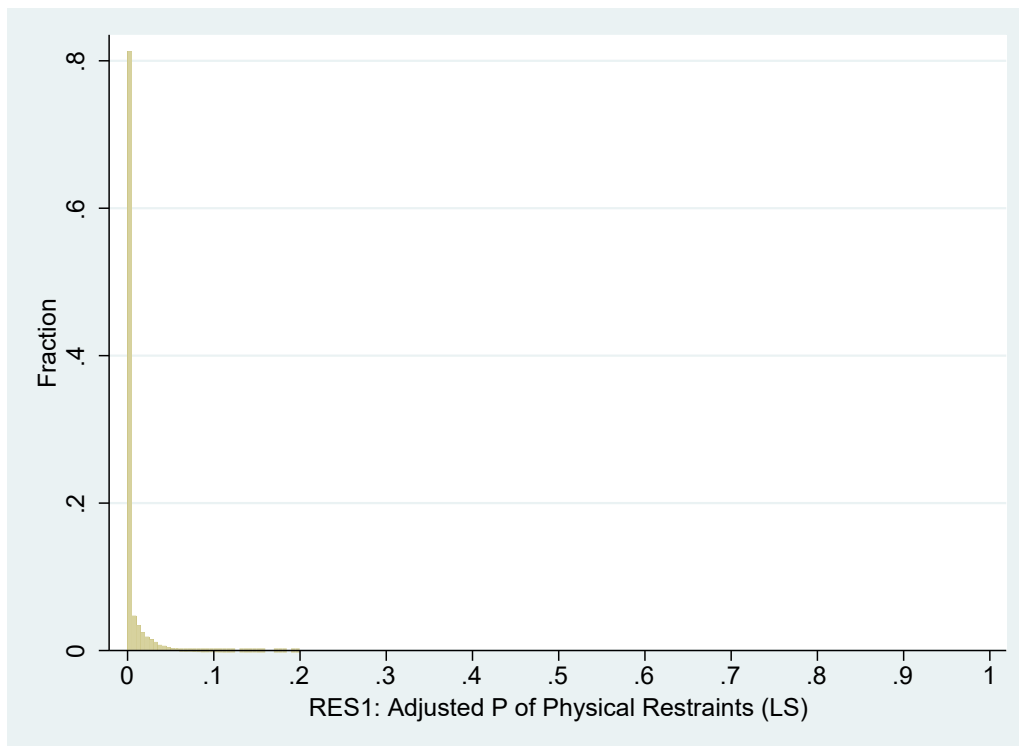
**Note:** The orange highlighting refers to QIs with too little variation in scores. SD: standard deviation; LS: long-stay; SS: short-stay.

### 4.3.1 Prevalence of Physical Restraints (Long-Stay)

As presented in Figure 5, the distribution of the QI “prevalence of physical restraints” is highly skewed with a floor effect (mean: 0.006; variance: 0.0002). Figure 6 shows that there is almost no difference between the median and the average score of the worst performing 10% of facilities. This QI defines the percent of long-stay residents who were physically restrained. Because of too little variance, on average the difference between the best performing and the worst performing facilities in the number of residents with physical restraints is less than 6 per 100 long-stay residents (Figure 6). Starting at 2017, as the worst performing 10% of facilities made improvements in this QI, the difference was less than 2 per 100 long-stay residents.

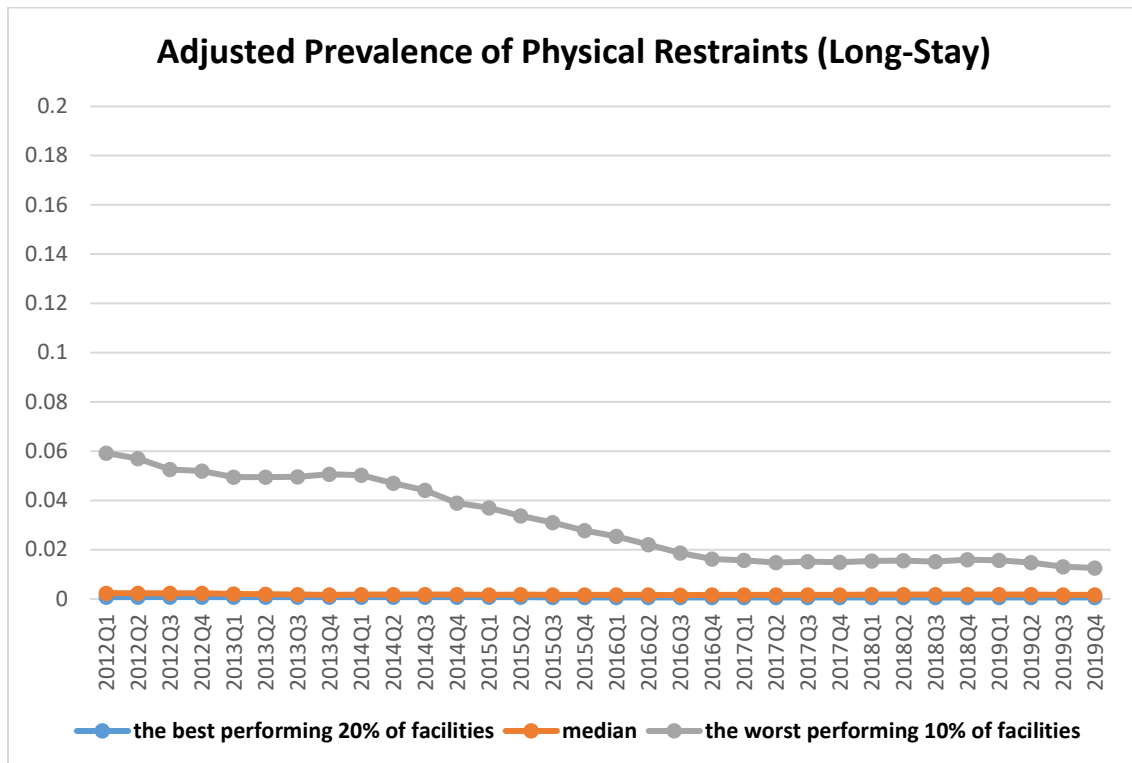
The prevalence of physical restraints is an example of a QI with minimal variation and an extreme floor effect. In the fourth quarter of 2019, nearly all facilities (94.4%, n = 337) have completely eliminated restraint use. The remaining 5.6% of facilities (n = 20) have a very low level of restraint use (about 2% on average). We recommend discontinuing this QI because of the near-total elimination of restraint use. This problem could be addressed adequately through the regulatory system of nursing home inspections. If keep it, we recommend facilities with a QI rate of 0% or no restrained residents receive full points and the rest facilities (with even one restrained resident) receive no points.

**Figure 5. The distribution of QI: physical restraints**





**Figure 6: The trends of QI: physical restraints**



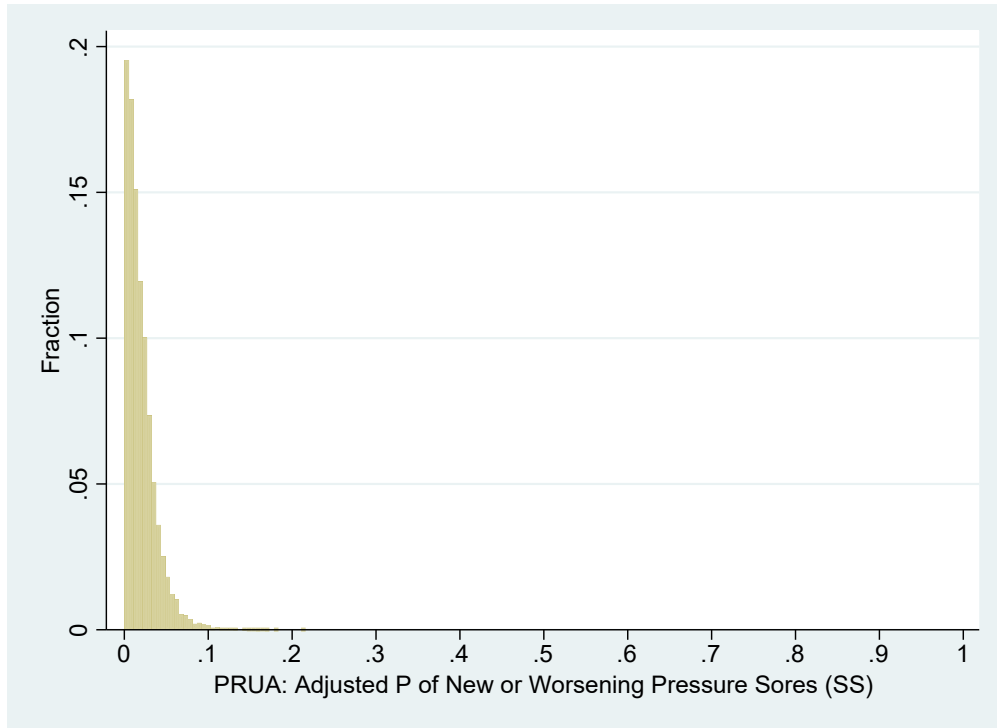
#### 4.3.2 Prevalence of New or Worsening Pressure Sores (Short-Stay)

As presented in Figure 7, the distribution of the QI “prevalence of new or worsening pressure sores” is highly skewed with a floor effect (mean: 0.020; variance: 0.0003). This is the percent of short-stay residents who have developed pressure sores or who had pressure sores that got worse since admission. Because of too little variance, on average the difference between the best performing 20% of facilities and the worst performing 10% of facilities in the number of residents with new or worsening pressure sores is less than 7 per 100 short-stay residents (Figure 8). In the fourth quarter of 2019, many facilities (37.5%, n = 135) had no short-stay residents with new or worsening pressure sores.

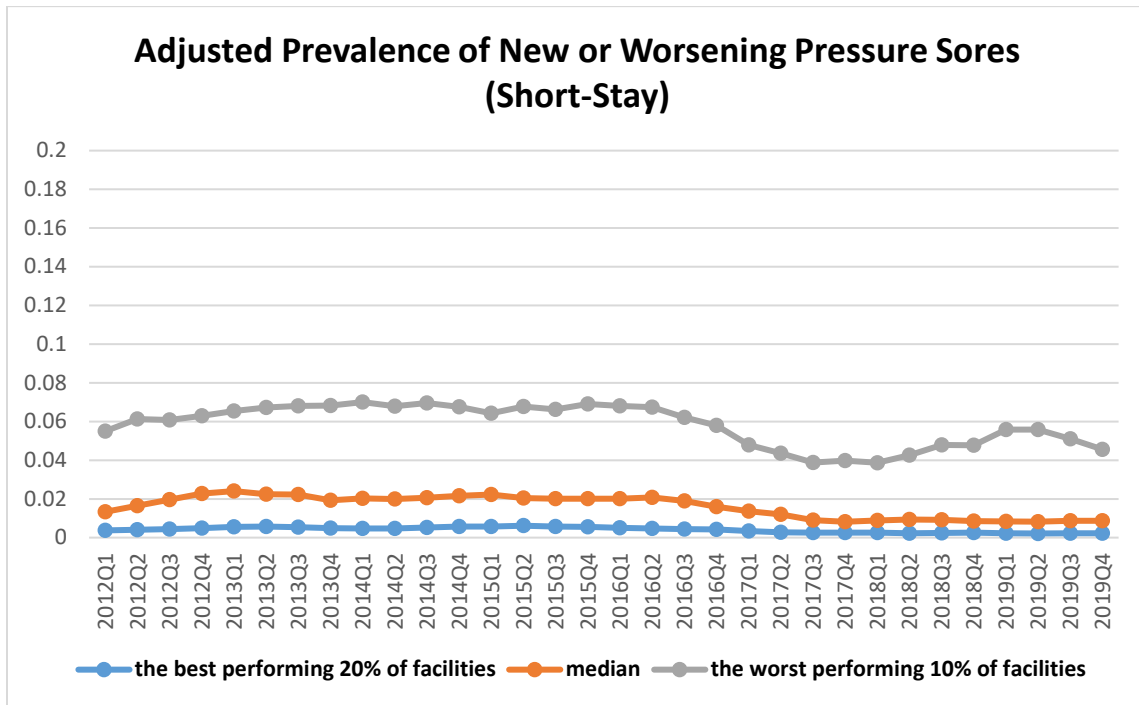
When a QI has a skewed distribution and when many facilities are able to achieve a perfect score, i.e., not a single resident failing on a QI, then it may be appropriate to set the top performance threshold at an absolute value of zero problem cases. For example, in order for a facility to achieve full points, it would have to have no residents with pressure sores. The poorer performing facilities (with even one resident with pressure sores) should not receive full points. This viewpoint sets a target of a zero error rate, recognizing that every facility may not achieve the target every time, but all facilities should be striving to achieve it.

Only facilities with zero QI rate receive full points, the worst performing 10% of facilities receive no points, and facilities in between receive points proportional to their rates.

**Figure 7. The distribution of QI: new or worsening pressure sores**



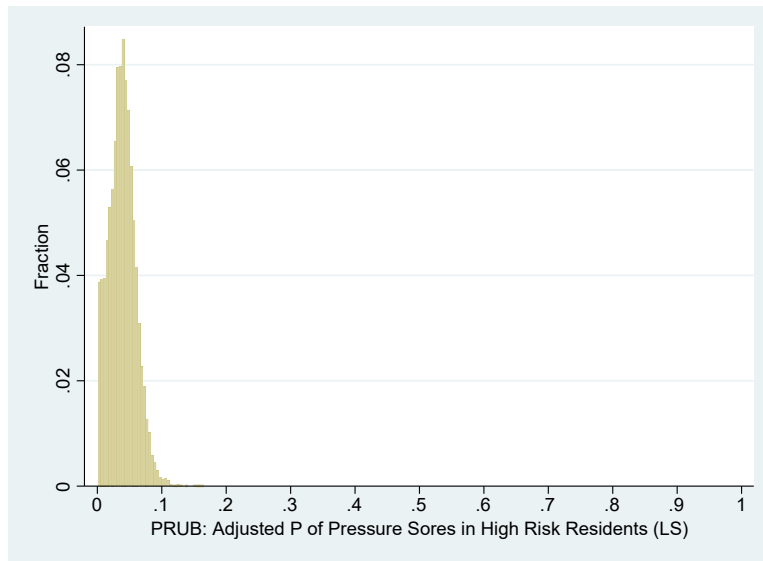
**Figure 8: The trends of QI: new or worsening pressure sores**



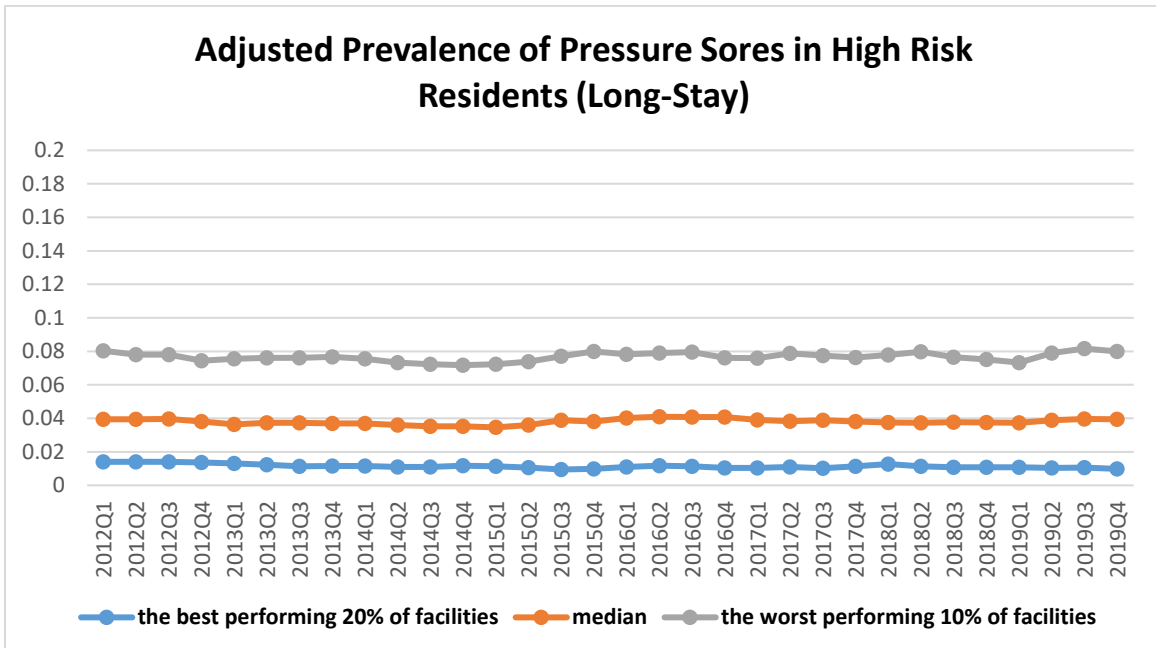
### 4.3.3 Prevalence of Pressure Sores in High Risk Residents (Long-Stay)

As presented in Figure 9 and Figure 10, the distribution of the “prevalence of pressure sores in high risk residents” QI is skewed with a floor effect (mean: 0.039; variance: 0.0004). The trends were stable over time. In the fourth quarter of 2019, about 10.2% of facilities (n = 36) had no long-stay high-risk residents with pressure sores. We recommend that facilities with zero QI rate (no high-risk residents with pressure sores) receive full points, the worst performing 10% of facilities receive no points, and facilities in between receive points proportional to their rates.

**Figure 9. The distribution of QI: pressure sores in high risk residents**



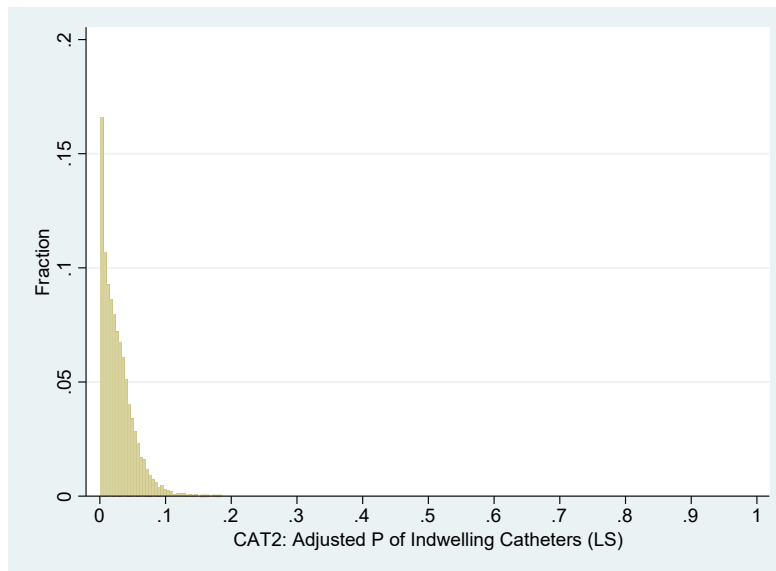
**Figure 10: The trends of QI: pressure sores in high risk residents**



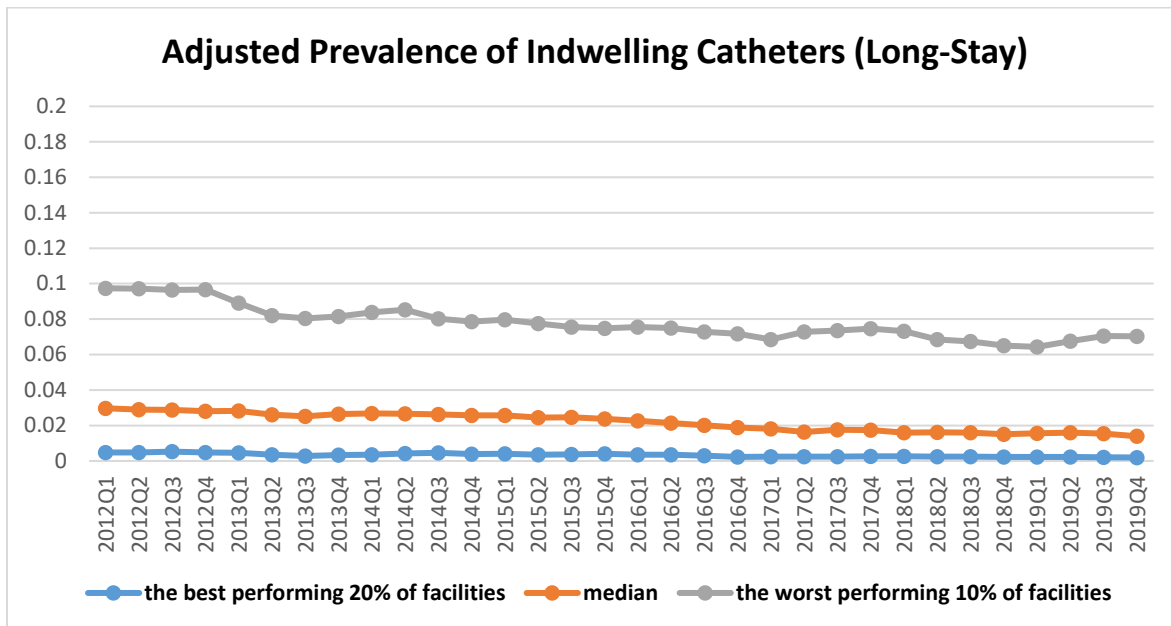
### 4.3.4 Prevalence of Indwelling Catheters (Long-Stay)

As presented in Figure 11 and Figure 12, the distribution of the QI “prevalence of indwelling catheters” is skewed with a floor effect (mean: 0.027; variance: 0.0006). The worst performing 10% facilities were improving over time. In the fourth quarter of 2019, about 24.2% of facilities (n = 86) had no long-stay residents with indwelling catheters. We recommend that facilities with zero QI rate (no residents with indwelling catheters) receive full points, the worst performing 10% of facilities receive no points, and facilities in between receive points proportional to their rates.

**Figure 11. The distribution of QI: indwelling catheters**



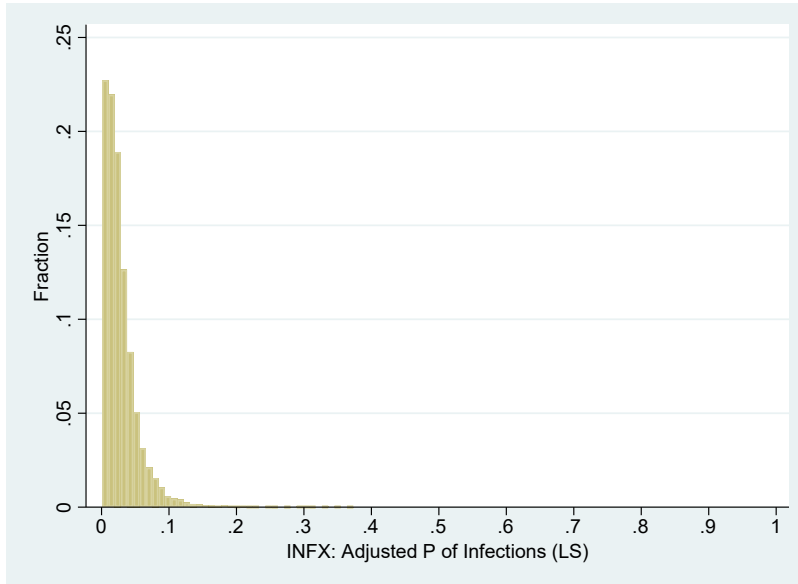
**Figure 12: The trends of QI: indwelling catheters**



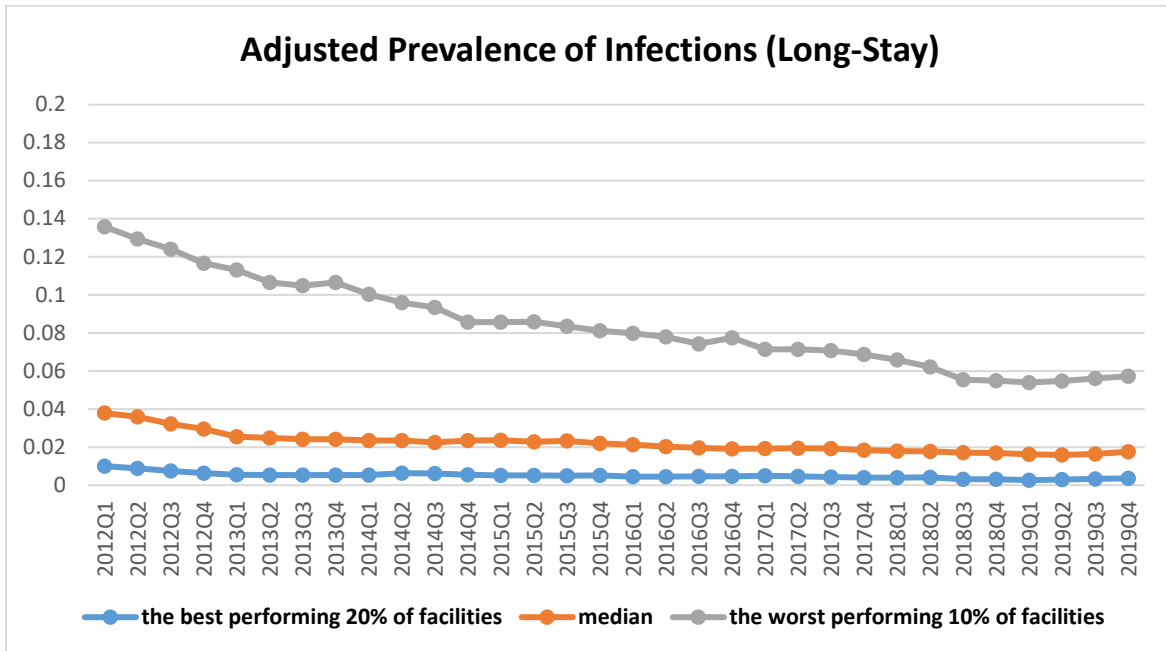
### 4.3.5 Prevalence of Infections (Long-Stay)

As presented in Figure 13 and Figure 14, the distribution of the QI “prevalence of infections” is skewed with a floor effect (mean: 0.028; variance: 0.0007). The worst performing 10% facilities were improving over time. In the fourth quarter of 2019, about 14.9% of facilities (n = 53) had no long-stay residents with infection. We recommend that facilities with zero QI rate (no infected residents) receive full points, the worst performing 10% of facilities receive no points, and facilities in between receive points proportional to their rates.

**Figure 13. The distribution of QI: infections**



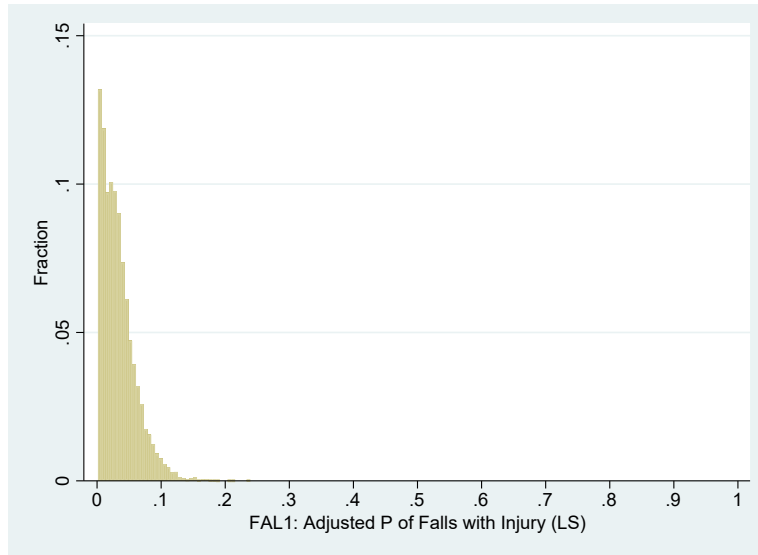
**Figure 14: The trends of QI: infections**



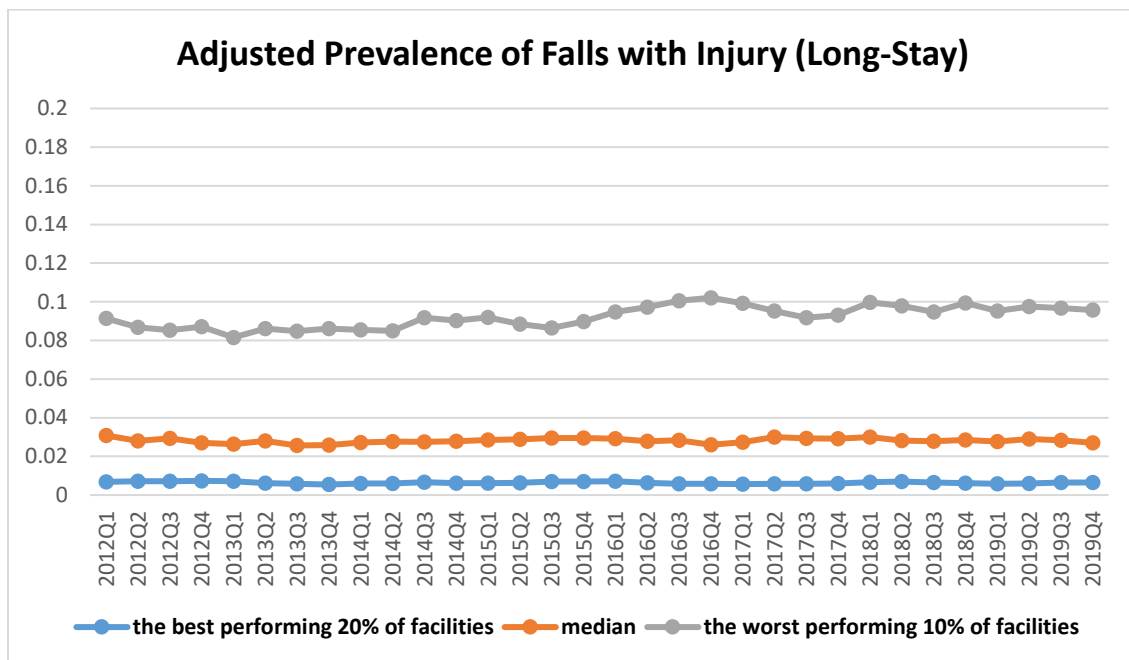
### 4.3.6 Prevalence of Falls with Injury (Long-Stay)

As presented in Figure 15 and Figure 16, the distribution of the QI “prevalence of falls with injury” is skewed with a floor effect (mean: 0.034; variance: 0.0007). The trends were stable over time. In the fourth quarter of 2019, about 21.1% of facilities (n = 70) had no long-stay residents who sustained a fall with injury. We recommend that facilities with zero QI rate (no residents sustaining a fall with injury) receive full points, the worst performing 10% of facilities receive no points, and facilities in between receive points proportional to their rates.

**Figure 15. The distribution of QI: fall with injury**



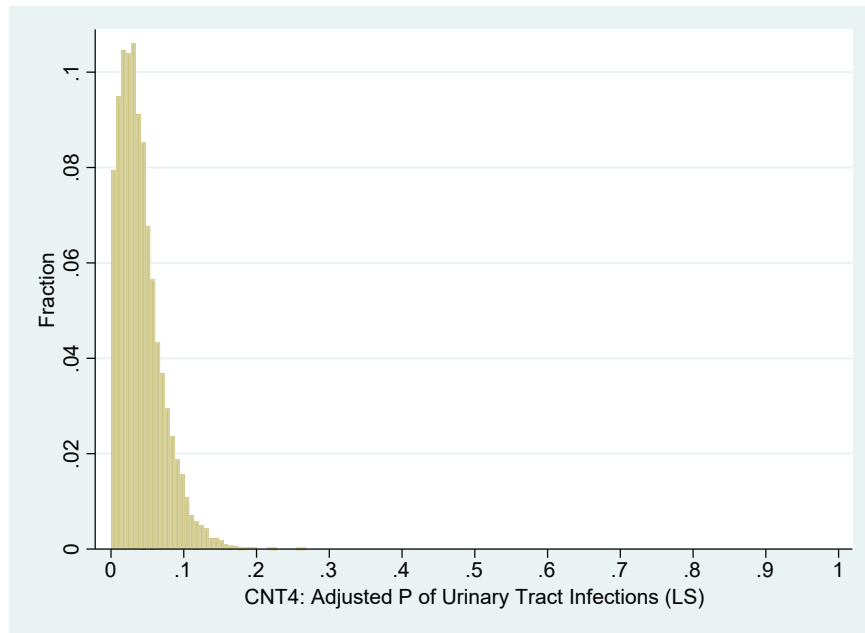
**Figure 16: The trends of QI: fall with injury**



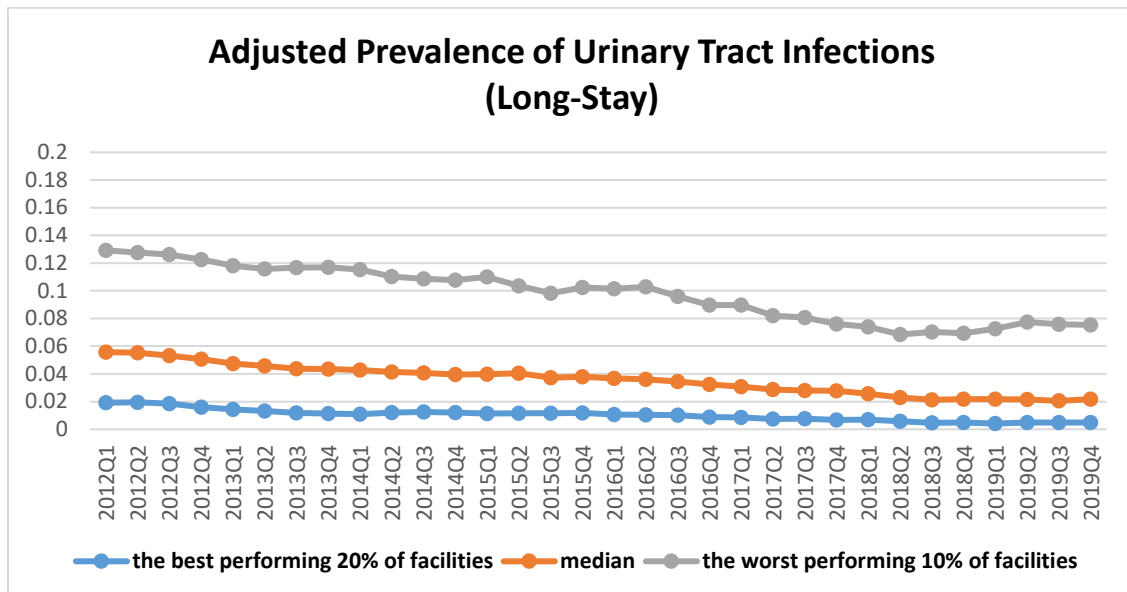
### 4.3.7 Prevalence of Urinary Tract Infections (LS)

As presented in Figure 17 and Figure 18, the distribution of the QI “prevalence of urinary tract infections” has a floor effect (mean: 0.041; variance: 0.0009). The worst performing 10% facilities were improving over time. In the fourth quarter of 2019, about 8.4% of facilities (n = 30) had no long-stay residents with urinary tract infections. We recommend that facilities with zero QI rate (no residents with urinary tract infections) receive full points, the worst performing 10% of facilities receive no points, and facilities in between receive points proportional to their rates.

**Figure 17. The distribution of QI: urinary tract infections**



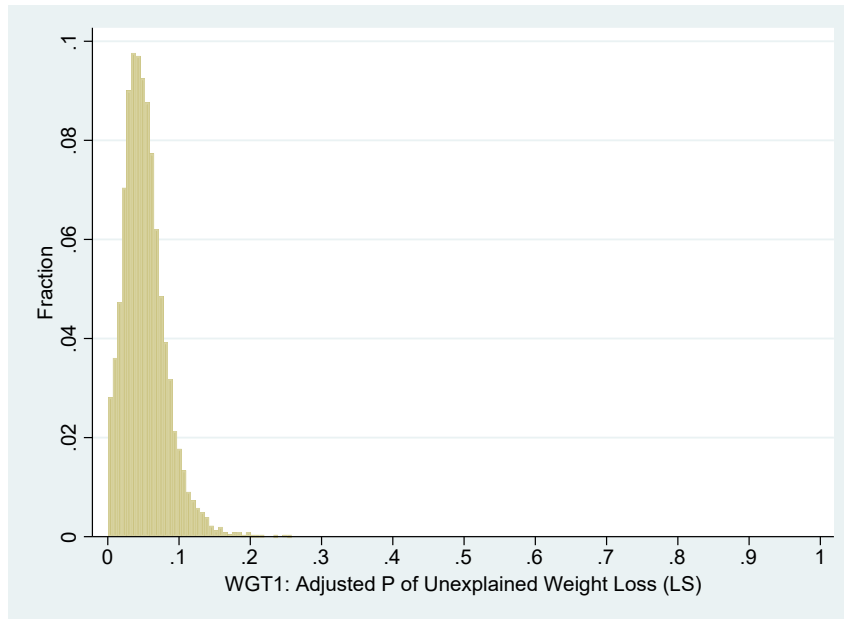
**Figure 18: The trends of QI: urinary tract infections**



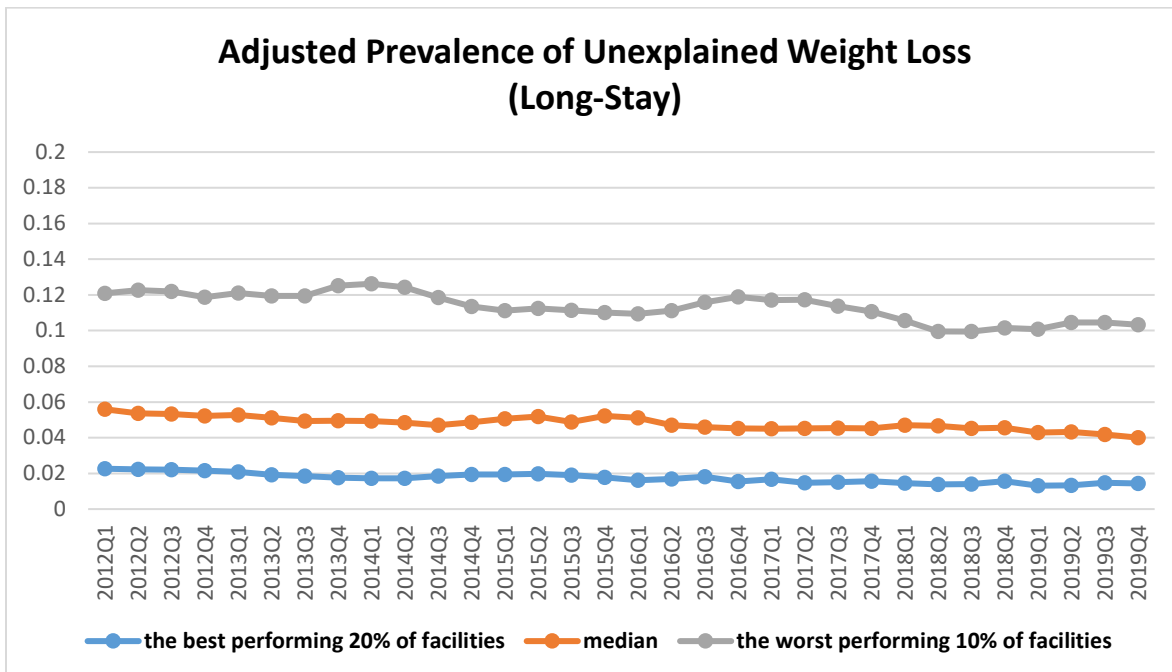
### 4.3.8 Prevalence of Unexplained Weight Loss (Long-Stay)

As presented in Figure 19 and Figure 20, the distribution of the QI “prevalence of unexplained weight loss” has a floor effect (mean: 0.052; variance: 0.0009). However, the distribution is not highly skewed, we recommend using the current scoring approach. The best performing 20% of facilities statewide get full points on each QI, the worst performing 10% get no points, and the rest are sorted and given a prorated point value.

**Figure 19. The distribution of QI: unexplained weight loss**



**Figure 20: The trends of QI: unexplained weight loss**





#### **4.4 Four Long-Stay QIs with Non-Normal Distribution**

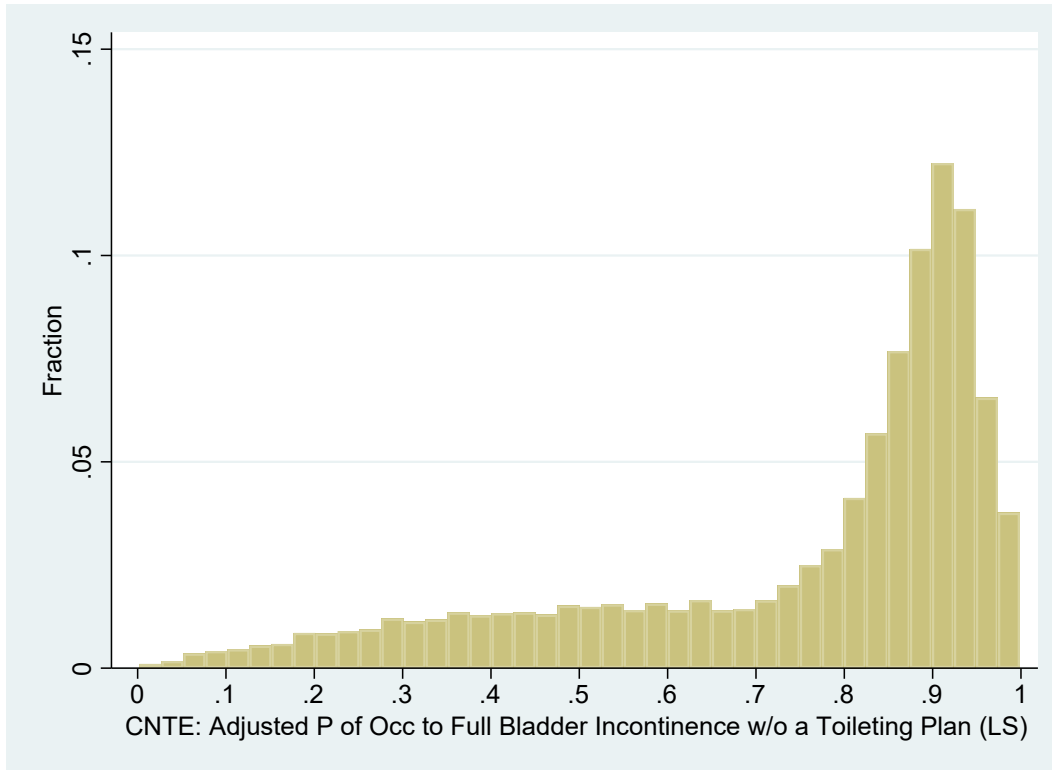
There are 4 QIs which do not follow a normal distribution, but rather exhibit with ceiling or floor effects.

- Prevalence of occasional to full bladder incontinence without a toileting plan (Figures 21 & 22, ceiling effect)
- Prevalence of occasional to full bowel incontinence without a toileting plan (Figures 23 & 24, ceiling effect)
- Prevalence of antipsychotic medications without a diagnosis of psychosis (Figures 25 & 26, floor effect)
- Prevalence of depressive symptoms (Figures 27 & 28, floor effect)

##### **4.4.1 The Two QIs Involving Toileting for Incontinent Residents**

There are two QIs (“prevalence of occasional to full bladder incontinence without a toileting plan” and “prevalence of occasional to full bowel incontinence without a toileting plan”) that exhibit a ceiling effect (a large number of facilities have a QI rate at or near 100%), although they have relatively large variance (Figures 21-24). There are smaller differences between median and the average score of the worst performing 10% of facilities, compared with the differences between median and the average score of the best performing 20% of facilities. However, using the current scoring program, the worst performing 10% of facilities got 0 points, the median got about 1 point, and the best performing 20% of facilities got 2 points (full points). Facilities getting 0 points (the worst performing 10% of facilities) are so close to the 1-point threshold (median), they are not very distinguishable. When taking measurement error into account, there is almost no difference in the performance of the 0 and 1-point facilities on the two QIs. Thus, the 2 bladder and bowel incontinence without a toileting plan QIs do not discriminate very well. For example, in the fourth quarter of 2019, the percentage of long-stay residents with bladder incontinence without a toileting plan ranged from 6% to 77% among facilities receiving full points. Only facilities with a percentage as high as 96% or above received no points (the worst 10% facilities). Moreover, the absence of a toileting plan QI is trending upward during the 2012-2019 period. Even the performance of the best 20% facilities is getting worse over time.

**Figure 21. The distribution of QI: bladder incontinence without a toileting plan**



**Figure 22. The trends of QI: bladder incontinence without a toileting plan**

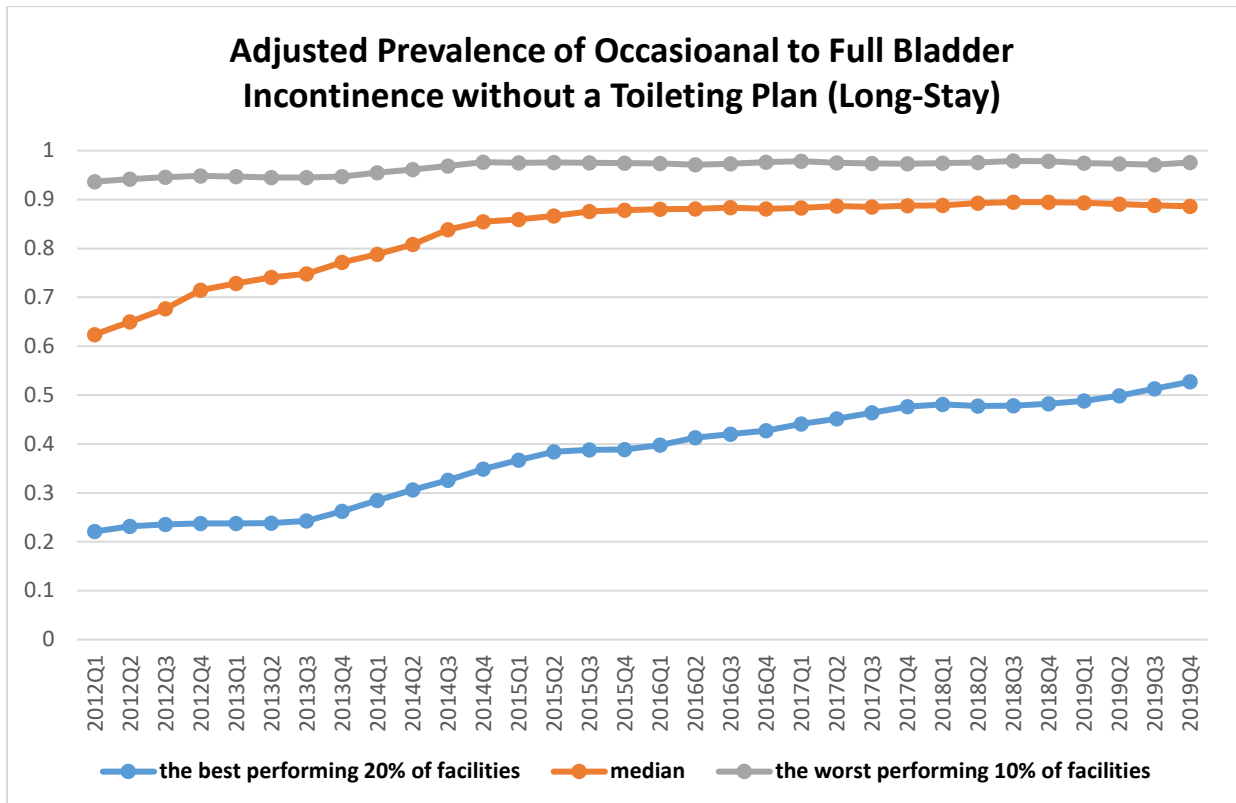


Figure 23. The distribution of QI: bowel incontinence without a toileting plan

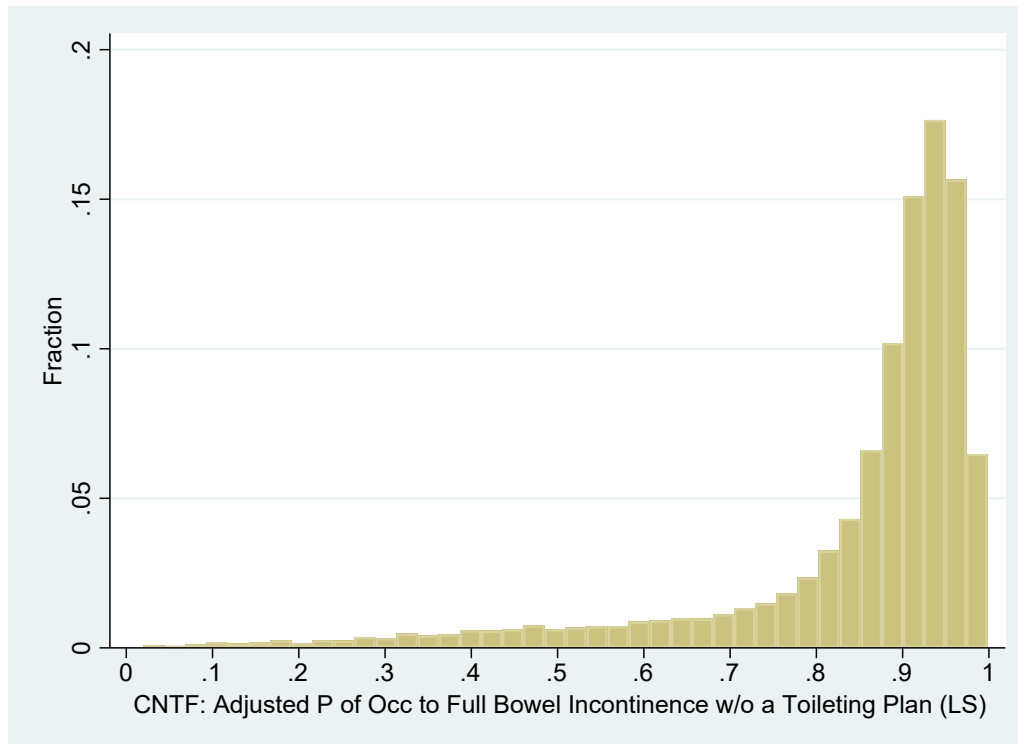
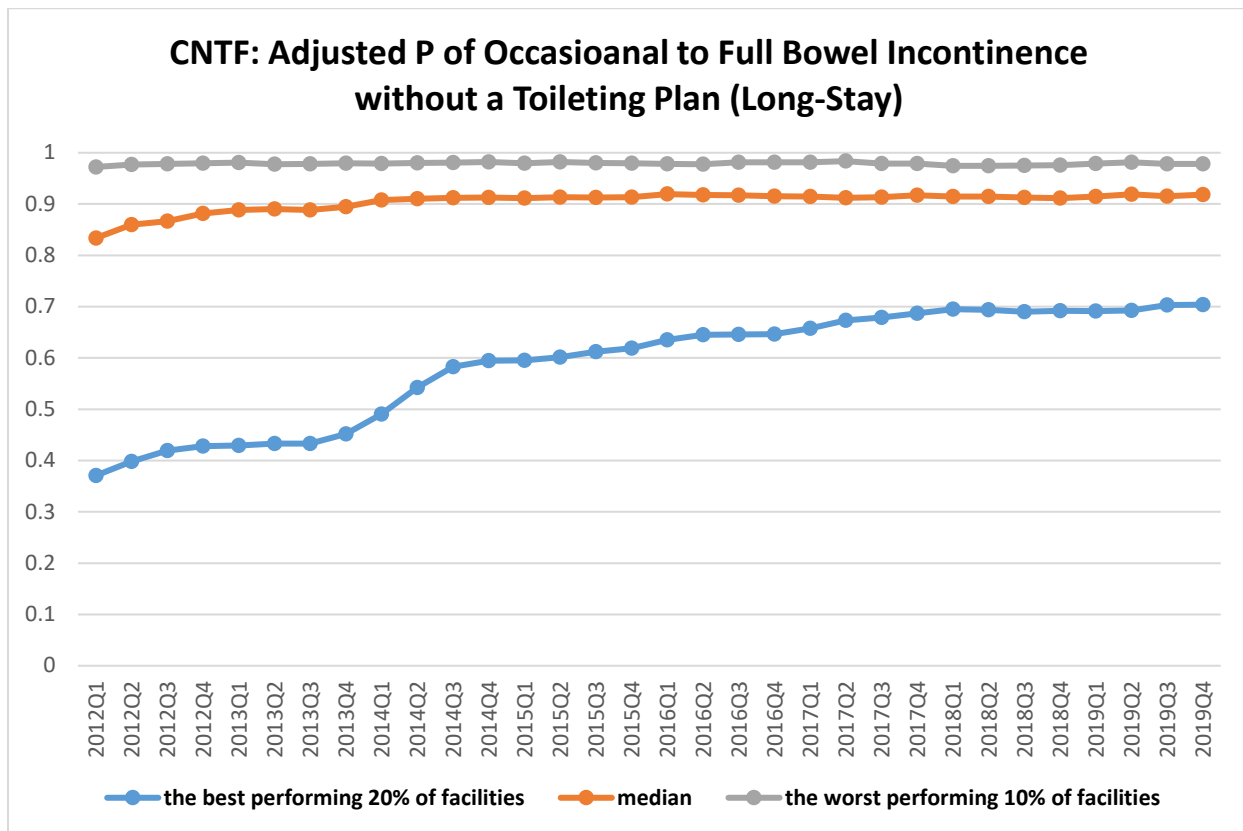


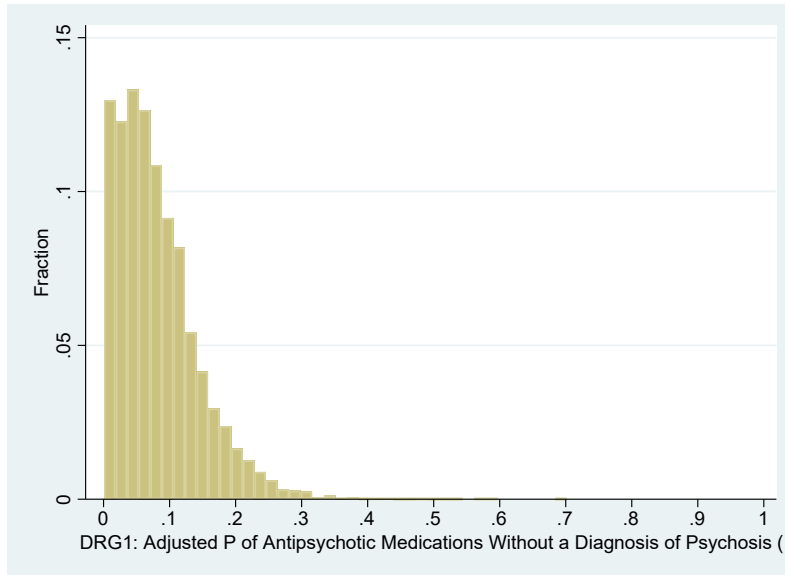
Figure 24. The trends of QI: bowel incontinence without a toileting plan



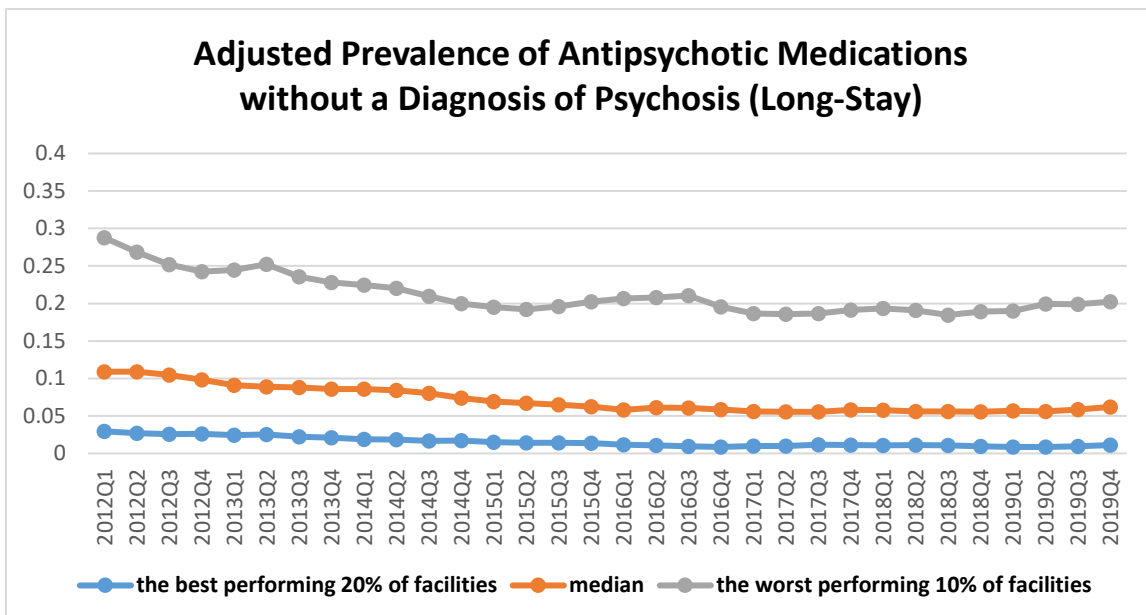
#### 4.4.2 Prevalence of Antipsychotic Medications without a Diagnosis of Psychosis (Long-Stay)

The QI “prevalence of antipsychotic medications without a diagnosis of psychosis” display a floor effect (Figures 25). There are smaller differences between median and the average score of the best performing 20% of facilities, compared with the differences between median and the average score of the worst performing 10% of facilities (Figure 26). The worst performing 10% facilities were improving over time. More than half facilities are able to achieve a better QI rate (6% in the fourth quarter of 2019). So the worst 50% of facilities, instead of the worst 10%, should receive no points. The best performing 20% of facilities should receive full points, and facilities in between should receive points proportional to their rates.

**Figure 25. The distribution of QI: antipsychotic medications**



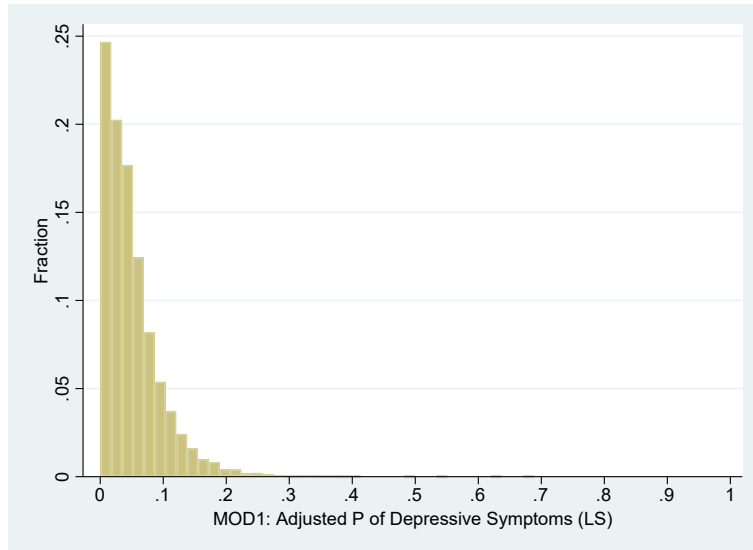
**Figure 26. The trends of QI: antipsychotic medications**



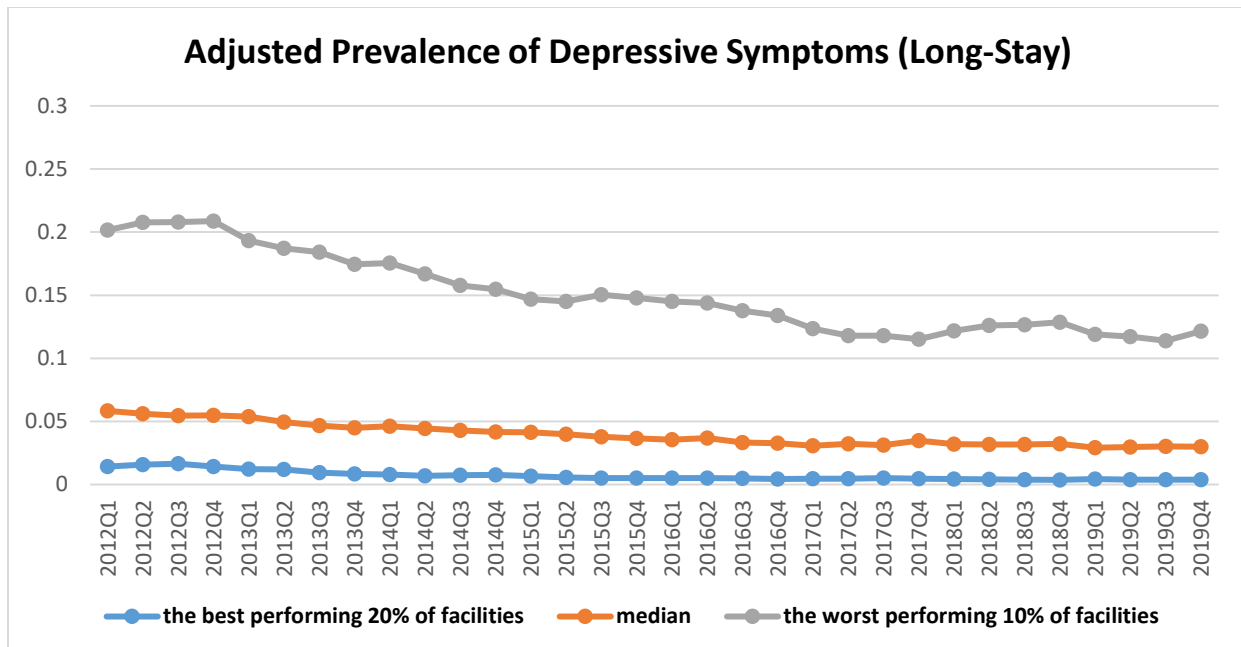
### 4.4.3 Prevalence of Depressive Symptoms (Long-Stay)

The QI “prevalence of depressive symptoms” display a floor effect (Figures 27). There are smaller differences between median and the average score of the best performing 20% of facilities, compared with the differences between median and the average score of the worst performing 10% of facilities (Figure 28). The worst performing 10% facilities were improving over time. More than half facilities are able to achieve a better QI rate (3% in the fourth quarter of 2019). So the worst 50% of facilities, instead of the worst 10%, should receive no points. The best performing 20% of facilities should receive full points, and facilities in between should receive points proportional to their rates.

**Figure 27. The distribution of QI: depressive symptoms**



**Figure 28. The trends of QI: depressive symptoms**



#### 4.5. Nine QIs with Approximate Normal Distribution

There are 9 QIs which have an approximate normal distribution and considerable variation (Appendix Figures 1-18). The current scoring program worked well for these QIs. The best performing 20% of facilities statewide get full points on each QI, the worst performing 10% get no points, and the rest are sorted and given a prorated point value.

- Incidence of worsening or serious bowel incontinence (long-stay)
- Incidence of worsening or serious bladder incontinence (long-stay)
- Prevalence of moderate to serious pain (short-stay)
- Prevalence of moderate to serious pain (long-stay)
- Incidence of worsening or serious mobility dependence (long-stay)
- Incidence of worsening or serious functional dependence (long-stay)
- Incidence of worsening or serious range of motion limitation (long-stay)
- Incidence of worsening or serious resident behavior problems (long-stay)
- Incidence of walking as well or better than previous assessment (long-stay)

#### 5. Summary

Expert opinions were employed to group the 19 long-stay QIs into 10 domains. However, the underlying patterns of facility QI rates, as determined by exploratory factor analysis, support a different structure of domains. We recommend adopting a new domain structure for the 19 long-stay QIs. Our findings indicate it is reasonable to categorize these QIs into 4 rather than 10 domains currently used: *incontinence* (4 QIs: bladder incontinence, bowel incontinence, absence of a toileting plan for residents with bowel incontinence, and absence of a toileting plan for residents with bladder incontinence), *physical functioning* (5 QIs: improved walking, functional decline, mobility dependence, range of motion limitation, and falls), *restraints and behavioral symptoms* (4 QIs: physical restraints, behavioral problems, depressive symptoms, and use of antipsychotics without a supporting psychiatric diagnosis), and *care for specific conditions* (6 QIs: pain, pressure sores, unexplained weight loss, indwelling catheters, urinary tract infections, and infections). The new domain structure has two advantages. First, the new domains are more consistent with underlying patterns in the facility QI rates, indicating that they are more reliable and valid. Second, the new domain structure results in more balanced domains, with the number of QIs within each domain ranging from 4 to 6. The new domain structure makes the contributions of individual QIs to the domain and total QI scores similar (either 1.0, 1.2, or 1.5) and not as exaggerated as the current domain structure (some QIs had a 5-time greater influence on the domain and total QI scores than other QIs). If we assume that individual QIs are equally important and contribute equally to the domain and total QI scores, we recommend creating facility domain points by averaging the QI points within each domain. The facility domain points are either summed or averaged to create an overall QI score for each facility.

Nine of the 21 QIs display an approximately normal distribution and 12 QIs display a skewed distribution. Eight QIs also display minimal variation in QI rates. Our findings suggest that the current scoring approach may distort or exaggerate the differences in the QI rates with skewed distributions, assigning widely varying points to facilities that vary little in their QI rates. Table 7

presents the proposed thresholds and points for the current QIs based on the observed QI rates in the fourth quarter of 2019. Regarding the normally distributed QIs, we recommend using the current scoring approach. For the extreme case of the physical restraint QI, we recommend discontinuing it because of the near-total elimination of restraint use and coverage of this problem by state inspections. When QIs are highly skewed and many facilities are able to achieve the best QI rate (a QI rate of 0%), we recommend using zero deficit for facilities to receive full points. That is, facilities with a QI rate of 0% receive full points, the worst performing 10% of facilities receive no points, and facilities in between receive points proportional to their rates. For the two QIs (“prevalence of antipsychotic medications without a diagnosis of psychosis” and “prevalence of depressive symptoms”), more than half of facilities are able to achieve a better QI rate (use of antipsychotics QI: 6%; depressive symptoms QI: 3%). So the worst 50% of facilities, instead of the worst 10%, should receive no points. The best performing 20% of facilities receive full points, and facilities in between receive points proportional to their rates.

Table 7. Proposed thresholds and points based on observed QI rates in the fourth quarter of 2019

QI	Full Points			Points In Between	No Points		Comments
	Threshold	% facility	QI Rate (%)		Threshold	QI Rate (%)	
<b>Keep QIs in Present Form</b>							
Prevalence of New or Worsening Pressure Sores (Short-Stay)	Zero Deficit	37.5%	0	Linear Interpolation	Worst 10 %tile	2.4	Skewed distribution with floor effect
Prevalence of Pressure Sores in High Risk Residents (Long-Stay)	Zero Deficit	10.2%	0	Linear Interpolation	Worst 10 %tile	8.7	Skewed distribution with floor effect
Prevalence of Indwelling Catheters (Long-Stay)	Zero Deficit	24.2%	0	Linear Interpolation	Worst 10 %tile	5.2	Skewed distribution with floor effect
Prevalence of Infections (Long-Stay)	Zero Deficit	14.9%	0	Linear Interpolation	Worst 10 %tile	4.6	Skewed distribution with floor effect
Prevalence of Falls with Injury (Long-Stay)	Zero Deficit	21.1%	0	Linear Interpolation	Worst 10 %tile	6.6	Skewed distribution with floor effect
Prevalence of Urinary Tract Infections (LS)	Zero Deficit	8.4%	0	Linear Interpolation	Worst 10 %tile	5.6	Skewed distribution with floor effect
Prevalence of Unexplained Weight Loss (Long-Stay)	Best 20 %tile		2.4	Linear Interpolation	Worst 10 %tile	8.2	floor effect, relative performance
Prevalence of antipsychotic medications without a diagnosis of psychosis (Long-Stay)	Best 20 %tile		2.4	Linear Interpolation	Worst 50 %tile	6.0	floor effect
Prevalence of depressive symptoms (Long-Stay)	Best 20 %tile		0.8	Linear Interpolation	Worst 50 %tile	3.0	floor effect



QI	Full Points			Points In Between	No Points		Comments
	Best 20 %tile				Worst 10 %tile		
Incidence of worsening or serious bowel incontinence (long-stay)	Best 20 %tile		22.1	Linear Interpolation	Worst 10 %tile	41.9	Normally distributed, relative performance
Incidence of worsening or serious bladder incontinence (long-stay)	Best 20 %tile		17.9	Linear Interpolation	Worst 10 %tile	45.0	Normally distributed, relative performance
Prevalence of moderate to serious pain (short-stay)	Best 20 %tile		12.7	Linear Interpolation	Worst 10 %tile	35.0	Normally distributed, relative performance
Prevalence of moderate to serious pain (long-stay)	Best 20 %tile		5.8	Linear Interpolation	Worst 10 %tile	23.1	Normally distributed, relative performance
Incidence of worsening or serious mobility dependence (long-stay)	Best 20 %tile		16.3	Linear Interpolation	Worst 10 %tile	31.5	Normally distributed, relative performance
Incidence of worsening or serious functional dependence (long-stay)	Best 20 %tile		10.6	Linear Interpolation	Worst 10 %tile	20.3	Normally distributed, relative performance
Incidence of worsening or serious range of motion limitation (long-stay)	Best 20 %tile		4.7	Linear Interpolation	Worst 10 %tile	21.0	Normally distributed, relative performance
Incidence of walking as well or better than previous assessment (long-stay)	Best 20 %tile		72.7	Linear Interpolation	Worst 10 %tile	48.9	Normally distributed, relative performance
Incidence of worsening or serious resident behavior problems (long-stay)	Best 20 %tile		4.9	Linear Interpolation	Worst 10 %tile	19.2	Normally distributed, relative performance
<b>Drop/Significantly Revise these QIs</b>							

QI	Full Points			Points In Between	No Points		Comments
Prevalence of Physical Restraints (Long-Stay)							Skewed distribution with floor effect, target: no resident fails the QI
Prevalence of occasional to full bladder incontinence without a toileting plan (Long-Stay)							Skewed distribution, systemic problem with vast majority of facilities doing poorly on this QI
Prevalence of occasional to full bowel incontinence without a toileting plan (Long-Stay)							Skewed distribution, systemic problem with vast majority of facilities doing poorly on this QI

*Notes:* The second column is the threshold for facilities to receive full points: either the facilities have a QI rate of zero or the best performing 20% of facilities. The third column is the percentage of facilities that receive full points. If we use the “Best 20 %tile” threshold, the percentage of facilities is 20%, which is blank. The fourth column is the actual QI rate (%). If a facility QI rate is equal or lower than this QI rate, the facility receives full points. The only exception is the positive walking QI rate. If a facility walking QI rate is equal or greater than 72.7%, the facility receives full points.

Table 8 summarizes the findings about the current 21 facility-level QIs from the qualitative (described in the technical report: Qualitative Component Report) and quantitative studies. Besides discontinuing the “prevalence of physical restraints” QI, we recommend considering a substantial revision of the 2 QIs: “prevalence of occasional to full bladder incontinence without a toileting plan” and “prevalence of occasional to full bowel incontinence without a toileting plan”. The two toileting QI rates exhibit ceiling effects and receive the lowest ratings from the provider survey in terms of importance and usability. During focus groups with nursing facility administrators and quality experts, concerns about the two QIs were raised; specifically, some felt that the two QIs were not a reflection of assistance provided with toileting. However, there is clinical evidence that a well designed and implemented toileting plan can be an effective way of addressing incontinence. An effective toileting plan can be resource-intensive and require considerable skill to implement. What message are the quality experts delivering: an effective toileting plan is unimportant or unmeasurable, or the current QIs and perhaps the MDS do not provide a valid measure of toileting? Moreover, the two QIs are trending upward during the 2012-2019 period. Even the performance of the best 20% facilities is getting worse over time. We hesitate to recommend dropping the two QIs. Yet, given the very high failure rate on the QIs and resistance to it from the industry, it is not workable in its current form.

We recommend combining the two incontinence QIs (“incidence of worsening or serious bowel incontinence” and “incidence of worsening or serious bladder incontinence”) into one QI “incidence of worsening or serious bowel or bladder incontinence”, because they are highly correlated (if a facility has a high rate of bowel incontinence, the facility would have a corresponding high rate of bladder incontinence) and they both are representative of the incontinence construct. Although nursing facility administrators and quality experts expressed concerns about the two incontinence QIs that they were challenging to change, we recommend keeping them due to clinical significance and important correlations with resident and family satisfaction.

Regarding the two correlated QIs “incidence of worsening or serious functional dependence” and “incidence of worsening or serious mobility dependence”, we recommend either combining them or clarifying them if keeping both. Nursing facility administrators and quality experts felt that decline in function was inevitable given the resident population and did not reflect poor care. However, the functional decline QI is significantly related to other quality measures. Therefore, we recommend keeping it and clarify this QI focuses on late functional loss. Regarding the mobility QI, nursing facility administrators and quality experts felt it was highly responsive and was a good focus to engage therapy staff with nursing, but thought risk adjustment could be improved if residents with neurological conditions were excluded.

Regarding the “prevalence of falls with injury” QI, nursing facility administrators and quality experts felt the amount of injury incurred was more an effect of resident frailty than staff supervision; overall number of falls was important to measure, as opposed to only falls with injury, because it was an example of an adverse event with potential impact, had a close connection with quality of care, and could impact quality of life. In addition, the “prevalence of falls with injury” QI rate is highly skewed with a floor effect and has too little variation. Therefore, we recommend replacing it with two new QIs: “prevalence of any fall” and “prevalence of two or more falls or fall with injury”.

Although nursing facility administrators and quality experts expressed concerns with the QIs including pain (difficult to achieve no pain despite nursing efforts) and behaviors (often occur despite staff intervention), we recommend keeping them due to clinical significance and important correlations with other quality measures. We also recommend exploring development of an opioid use QI given the current focus on addiction issues.

The current QIs, with the exception of the improved walking QI, focus on avoiding poor care practices or outcomes. These negatively framed QIs convey a message of avoiding harm, essentially penalizing facilities for poor care. Positively framed QIs are intended to reward facilities for better care, with better care processes and outcomes. Earlier versions of the QIs, prior to 2016, had several positively focused QIs, emphasizing improvement in functioning and continence. We recommend re-introducing the following positively-framed QIs: “incidence of improved or maintained functional independence” and “incidence of improved or maintained bowel or bladder continence”. We also recommend adding two new QIs for short-stay residents which have been used in the federal quality measures: “prevalence of any fall” and “prevalence of antipsychotic medications without a diagnosis of psychosis”.

Besides the summary, there are two additional points worth discussing. First, the line graphs also paint a picture of change in the QIs over time. Some of the change may be due to a change in the Minimum Data Set (MDS) or the way the QIs are defined. Some of the trends in the QIs may indicate changes in true care quality. For example, the physical restraints QI tends to be trending downward, while absence of a toileting plan QI is trending upward. Second, since the thresholds are based on percentiles, they will move with overall QI trends. A specific QI rate (10% incidence or prevalence) could move up or down in the point system over time depending on how the distribution changes. Conversely, a facility may be improving in its QI rate, but since others are improving as well, that facility will not get any higher points. Should the thresholds possibly be fixed, such that they are based on the same QI rates over time? This is a potential area for future analysis.

Table 8. Summary of 21 facility-level QIs from the qualitative and quantitative studies

21 Quality Indicators	Care domain (Factor)	Problems identified in quantitative studies	Findings from qualitative studies	Correlation with other quality measures	Recommendations
Incidence of Worsening or Serious Bowel Incontinence (LS)	Incontinence	moderate correlation	<p>Incontinence is challenging to change and frustrates staff; measured too rigidly and staff unlikely to choose as a QI focus due to difficulty moving the score; inconsistent case mix reviews have exacerbated the problems with the QI, as have differences between federal and state measures.</p> <p>Regarding <i>responsiveness</i>, both QIs had a mean score lower than 3.</p> <p>Regarding <i>importance and usability</i>, both QIs had the lowest or second lowest scores.</p> <p>Regarding <i>validity</i>, bladder incontinence QI had a mean score of 2.4.</p>	<p>Bowel incontinence QI is significantly correlated with QOL (-0.31), family satisfaction (-0.35), long-stay total quality score (-0.31), short-stay resident survey (-0.36), and VBR score (-0.32).</p>	Keep QI due to significant correlations with other quality measures. Combine with bladder continence
Incidence of Worsening or Serious Bladder Incontinence (LS)		moderate correlation			Combine with bowel continence

Prevalence of Occasional to Full Bladder Incontinence without a Toileting Plan (LS)	Incontinence without a toileting plan	ceiling effect, moderate correlation	<p>Some residents refuse active toileting plans in exchange for sleep or activities if incontinence management products are working well. Complete continence is a challenge and often not the resident's goal.</p>	Bladder incontinence QI is significantly correlated with total QI score (-0.31), long-stay total quality score (-0.32), and VBR score (-0.30).	Discontinue QI due to the identified problems and concerns with how QI data is collected.
Prevalence of Occasional to Full Bowel Incontinence without a Toileting Plan (LS)		ceiling effect, moderate correlation	<p>Some incontinence is normal with aging and not a reflection of assistance provided with toileting.</p> <p>Regarding <i>responsiveness</i>, both QIs had a mean score lower than 3.</p> <p>Regarding <i>importance</i> and <i>usability</i>, both QIs had the lowest or second lowest scores.</p>		Discontinue QI due to the identified problems and concerns with how QI data is collected.

Prevalence of Moderate to Severe Pain (LS)	Pain		<p>Pain is subjective, it is difficult to obtain the goal of no pain, and the differences between federal and state QIs in this area are confusing.</p> <p>Addiction issues are important to address, and reports of pain often vary depending upon who is asking and in what context. The 7-day 'look back' on the MDS exacerbates the problem of pain measurement. Some pain may be inevitable with some conditions, such as arthritis.</p> <p>Regarding <i>responsiveness</i>, it had a mean score of 2.7.</p>	<p>It is significantly correlated with total QI score (-0.52), long-stay total quality score (-0.43), and VBR score (-0.33).</p>	<p>Keep QI due to clinical significance. Might create an opioid use QI</p>
Prevalence of Moderate to Severe Pain (SS)			<p>Short stay pain is very dependent upon your population and unstable over time as the population changes.</p> <p>Regarding <i>responsiveness</i>, it had a mean score of 2.9.</p>	<p>It is significantly correlated with total QI score (-0.35).</p>	<p>Keep QI due to clinical significance. Might create an opioid use QI</p>

Incidence of Walking as Well or Better than on Previous Assessment (LS)	Physical Functioning	the only positive QI	Walking and range of motion are particularly hard to move in the long stay population, which depresses scores, but progress can be made with effort and the measures reflect that effort.		It might be redefined negatively as worsening walking
Incidence of Worsening or Serious Functional Dependence (LS)		correlation	<p>Decline in function is frustrating to staff given some decline may be inevitable and not a reflection of poor care.</p> <p>Nursing staff tend to document the highest level of function and may underestimate the amount of care or supervision they are providing.</p> <p>Regarding <i>responsiveness</i>, it had a mean score of 2.6.</p>	It is significantly correlated with total QI score (-0.32), long-stay total quality score (-0.36), and VBR score (-0.36).	Keep QI due to significant correlations with other quality measures. Combine with mobility dependence. If keeping both, clarify that this QI focuses on “late loss” functional loss vs. mobility (rename QI?).



<p>Incidence of Worsening or Serious Mobility Dependence (LS)</p>	<p>correlation</p>	<p>Mobility measures are highly responsive and are a good focus to engage therapy staff with nursing.</p> <p>Mobility was one of the most commonly noted measures of clarity.</p> <p>Risk adjustment could be improved if excluding residents with neurological conditions.</p> <p>Regarding <i>validity</i>, it had a mean score of 2.9.</p>	<p>Combine with functional dependence. If keeping both, clarify them. Consider risk-adjustment by excluding residents with neurological conditions.</p>
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<p>Prevalence of Falls with Injury (LS)</p>	<p>too little variance, floor effect</p>	<p>Overall number of falls is important to measure, as opposed to only falls with injury, because it is an example of an adverse event with potential impact, has a close connection with quality of care, and can impact QOL. One time big falls with injury are often related to other comorbidities, and frequent falls without injury allows for examination of the root cause of a quality problem. Frequent falls are important to families and also insurance companies.</p> <p>The amount of injury incurred is more an effect of resident frailty than staff supervision.</p> <p>Regarding <i>responsiveness</i> and <i>validity</i>, it had the lowest mean scores.</p>	<p>Keep due to clinical significance and consider scoring changes. Consider replacing with new “all falls” QI.</p>
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<p>Incidence of Worsening or Serious Range of Motion Limitation (LS)</p>		<p>Walking and range of motion are particularly hard to move in the long stay population, which depresses scores, but progress can be made with effort and the measures reflect that effort.</p> <p>Regarding <i>responsiveness</i>, it had a mean score of 2.7.</p>		<p>Keep QI</p>
<p>Incidence of Worsening or Serious Resident Behavior Problems (LS)</p>	<p>Restraints and Behavioral Symptoms</p>	<p>Behavior score is very dependent upon your population, and is determined by your population more than your overall quality. A resident's behavior may be dealt with appropriately and still continue daily depending on the resident's diagnosis. Not always changeable or a measure of care quality.</p> <p>Behaviors often occur despite staff intervention.</p> <p>Regarding <i>validity</i>, it had a mean score of 2.7.</p> <p>Regarding <i>responsiveness</i>, it had the lowest mean score.</p>	<p>It is significantly correlated with total QI score (-0.37), and long-stay total quality score (-0.33).</p>	<p>Keep QI due to significant correlations with other quality measures.</p>

Prevalence of Depressive Symptoms (LS)	floor effect	<p>Regarding <i>responsiveness</i>, it had a mean score of 2.7.</p> <p>Regarding <i>importance</i>, it has the highest mean score.</p>	It is significantly correlated with total QI score (-0.41), long-stay total quality score (-0.41), and VBR score (-0.35).	Consider scoring changes.
Prevalence of Physical Restraints (LS)	too little variance, floor effect	<p>Restraints are so infrequently used that it is an easy success, but not reflective of overall quality.</p> <p>Regarding <i>responsiveness</i>, it had a mean score of 2.7.</p> <p>Regarding <i>usability</i>, it had the lowest mean score.</p>		Discontinue QI due to near-total elimination of restraint use and coverage of this topic by state inspections.

<p>Prevalence of Antipsychotic Medications without a Diagnosis of Psychosis (LS)</p>	<p>floor effect</p>	<p>Antipsychotics (when prescribers are on board) were described as well-measured and responsive QI.</p> <p>Adjusters/exclusions can have a large effect on some scores (particularly weight loss and anti-psychotics).</p> <p>Excluding some multi-use drugs such as Abilify from the anti-psychotic QI when used for depression</p> <p>Antipsychotic domain should be adjusted for behavioral health facilities.</p>	<p>It is significantly correlated with total QI score (-0.42), long-stay total quality score (-0.41), and VBR score (-0.36).</p>	<p>Consider scoring changes. Consider risk-adjustment</p>
<p>Prevalence of Infections (LS)</p>	<p>too little variance, floor effect</p>	<p>Infections were described as well-measured and responsive QI.</p> <p>Infections were one of the most commonly noted measures of clarity.</p> <p>It has the highest mean score in terms of <i>importance</i>, <i>validity</i>, and <i>usability</i>, and the second highest mean score of <i>responsiveness</i>.</p>		<p>Consider scoring changes</p>

Prevalence of New or Worsening Pressure Sores (SS)	Care for Specific Conditions	too little variance, floor effect	<p>A challenge to the validity of the measures is the variation in interpretation between facilities on some MDS items such as pressure ulcers, incontinence, and functional independence.</p> <p>It has the highest mean score in terms of <i>importance</i>, <i>validity</i>, <i>responsiveness</i> and <i>usability</i> among short-stay measures.</p>		Keep QI due to clinical significance and consider scoring changes
Prevalence of Pressure Sores in High Risk Residents (LS)		too little variance, floor effect	<p>A challenge to the validity of the measures is the variation in interpretation between facilities on some MDS items such as pressure ulcers, incontinence, and functional independence.</p>	It is significantly correlated with total QI score (-0.49), long-stay total quality score (-0.47), and VBR score (-0.44).	Keep QI due to clinical significance and consider scoring changes

<p>Prevalence of Unexplained Weight Loss (LS)</p>	<p>too little variance, floor effect</p>	<p>Weight loss was described as well-measured and responsive QI. Weight loss was helpful in that it creates a warning sign that can be acted upon to avoid clinical decline.</p> <p>Weight loss, mobility and infections were the most commonly noted measures of clarity.</p> <p>Adjusters/ exclusions can have a large effect on some scores (particularly weight loss and anti-psychotics).</p> <p>Weight loss makes an excellent PIPP outcome; it is clearly measured, responsive to efforts, and pairs well with other important aspects of quality such as skin care.</p>	<p>It is significantly correlated with total QI score (-0.45), long-stay total quality score (-0.48), and VBR score (-0.41).</p>	<p>Keep QI due to clinical significance and consider scoring changes</p>
<p>Prevalence of Indwelling Catheters (LS)</p>	<p>too little variance, floor effect</p>	<p>Regarding <i>responsiveness</i>, it had the highest mean score.</p>		<p>Keep QI due to clinical significance and consider scoring changes</p>

Prevalence of Urinary Tract Infections (LS)		too little variance, floor effect	UTIs were described as well-measured and responsive QI. It has the highest mean score in terms of <i>validity</i> , and the second highest mean score of <i>usability</i> .	Keep QI due to clinical significance and consider scoring changes
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**Notes:** Correlation: 2 or more QIs are similar enough to question the need to include both/all of them

Ceiling effect: a large number of providers have a QI rate at or near 100%

Floor effect: a large number of providers have a QI rate at or near 0%

Positive QI: QI that is coded to trigger when a resident has a positive or good outcome

Too little variance: nursing home providers are performing very similarly statewide

Importance: This measure addresses an important area of clinical quality. The measure addresses a key aspect of care quality.

(1=Strongly Disagree; 2=Disagree; 3=Neutral; 4=Agree; 5=Strongly Agree)

Validity: This measure reflects actual care quality. (1=Strongly Disagree; 2=Disagree; 3=Neutral; 4=Agree; 5=Strongly Agree)

Responsiveness: It is easy to achieve improvements in this measure with appropriate efforts and actions. (1=Strongly Disagree;

2=Disagree; 3=Neutral; 4=Agree; 5=Strongly Agree)

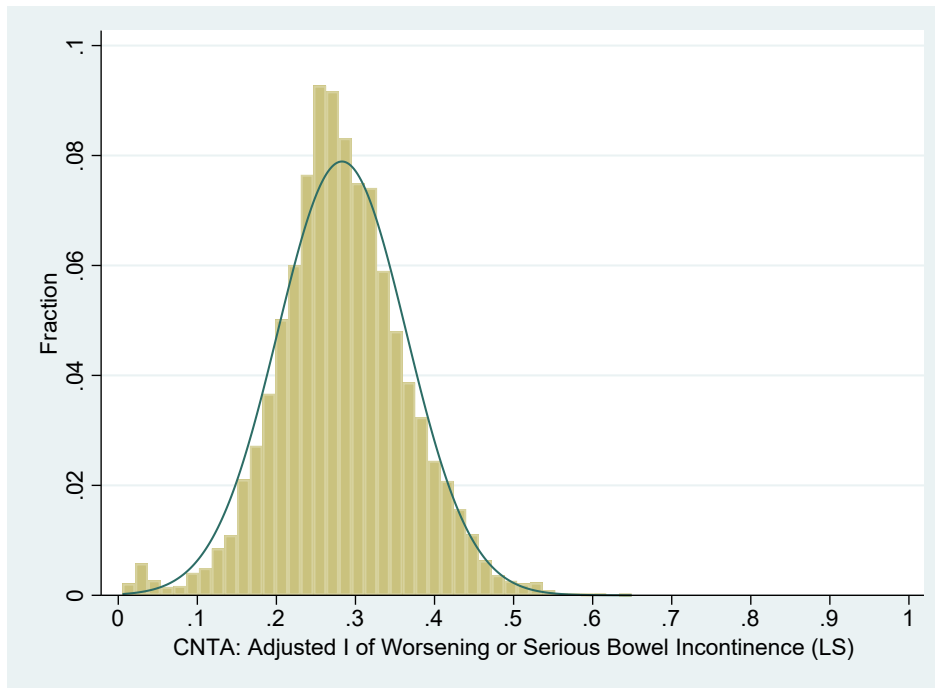
Usability: This measure is useful in decision making. Tracking our data in this area help to improve care. (1=Strongly Disagree;

2=Disagree; 3=Neutral; 4=Agree; 5=Strongly Agree)

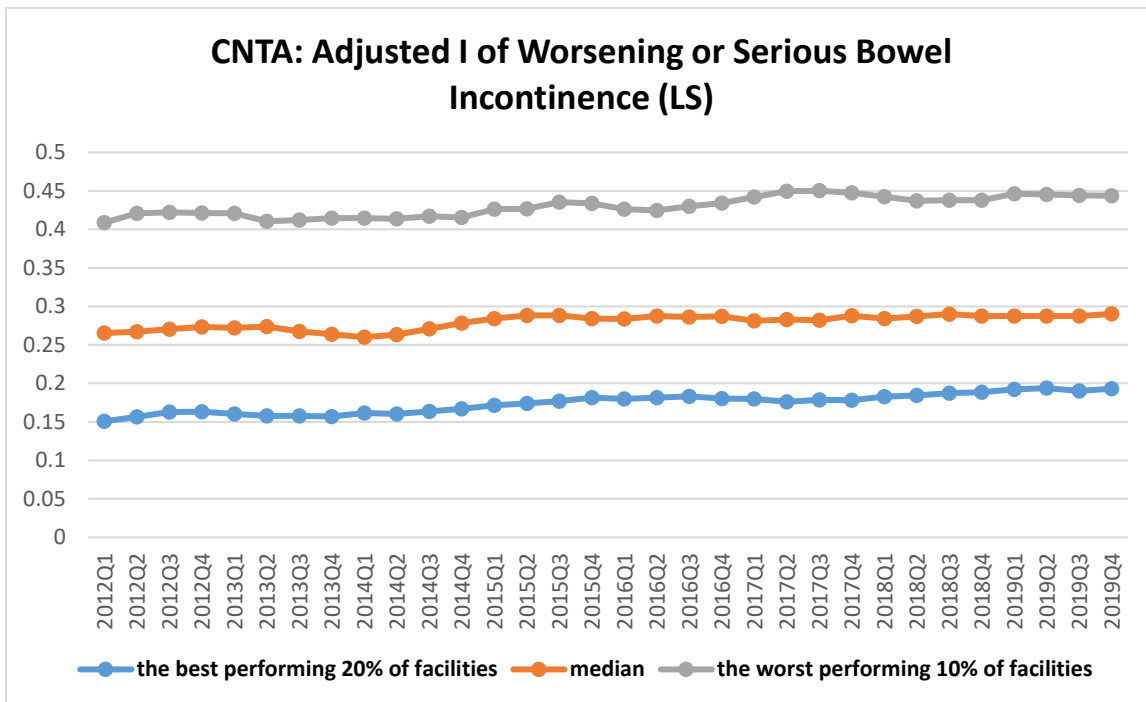


**Appendix**

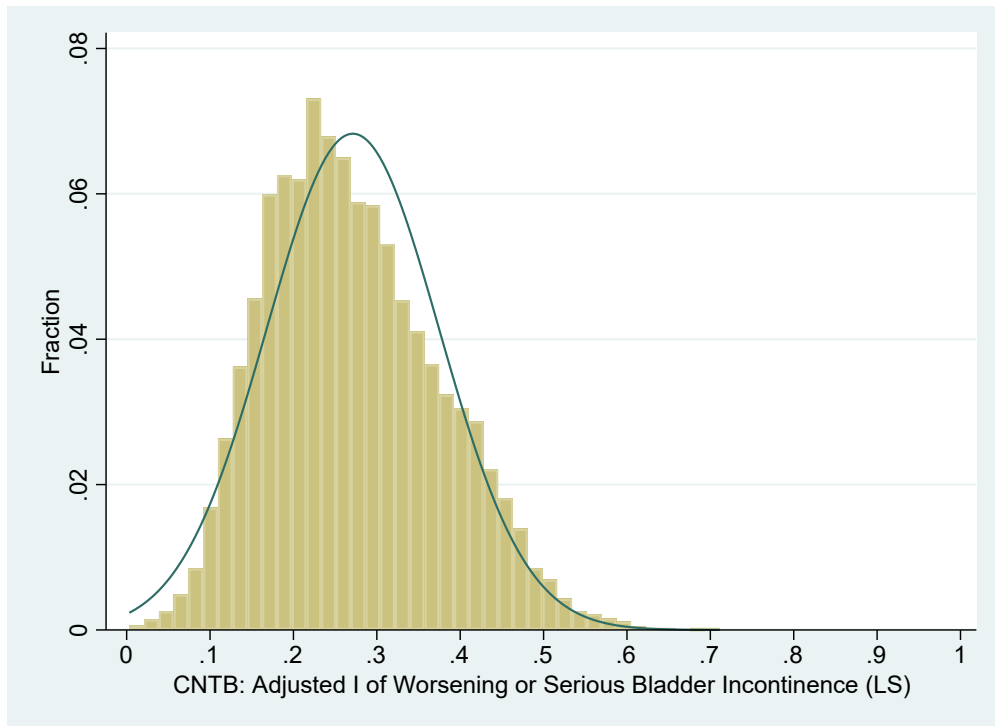
**Figure 1. The distribution of QI: worsening or serious bowel incontinence**



**Figure 2. The trends of QI: worsening or serious bowel incontinence**



**Figure 3. The distribution of QI: worsening or serious bladder incontinence**



**Figure 4. The trends of QI: worsening or serious bladder incontinence**

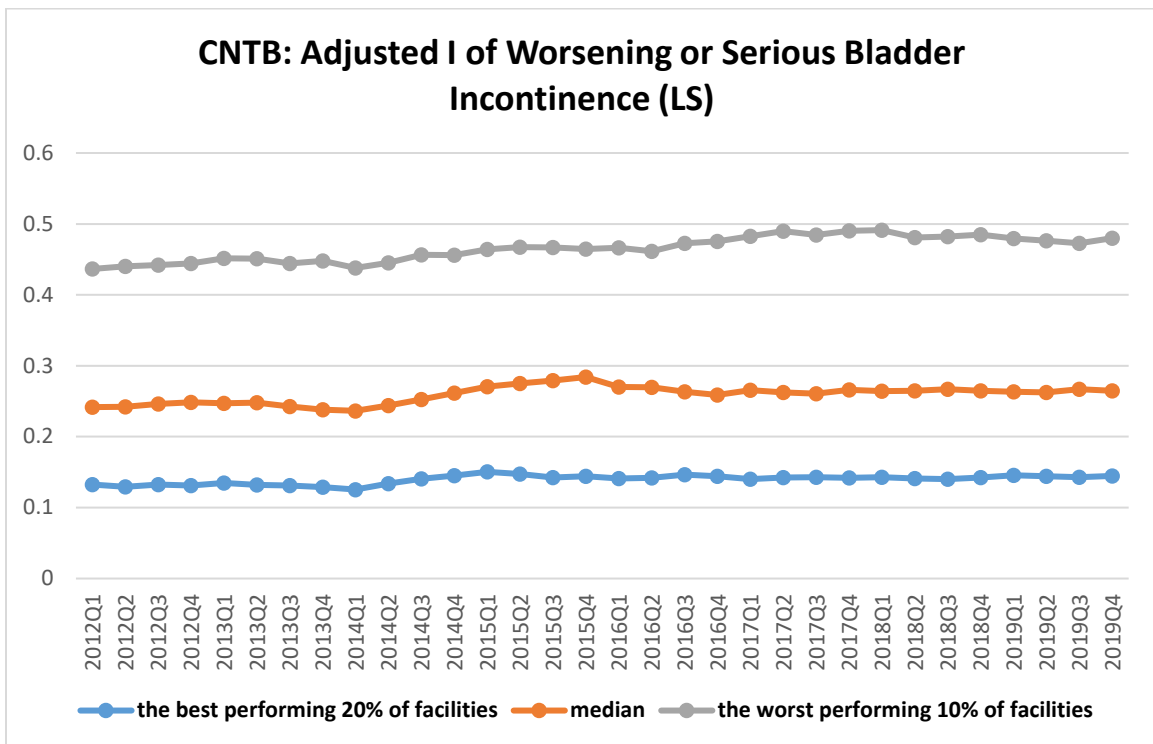


Figure 5. The distribution of QI: short-stay pain

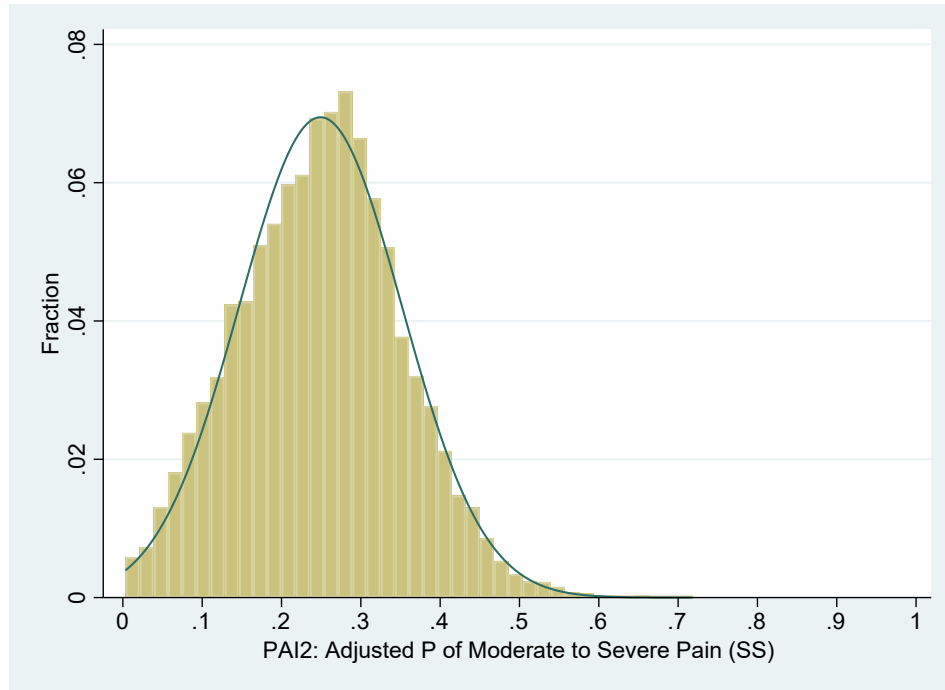
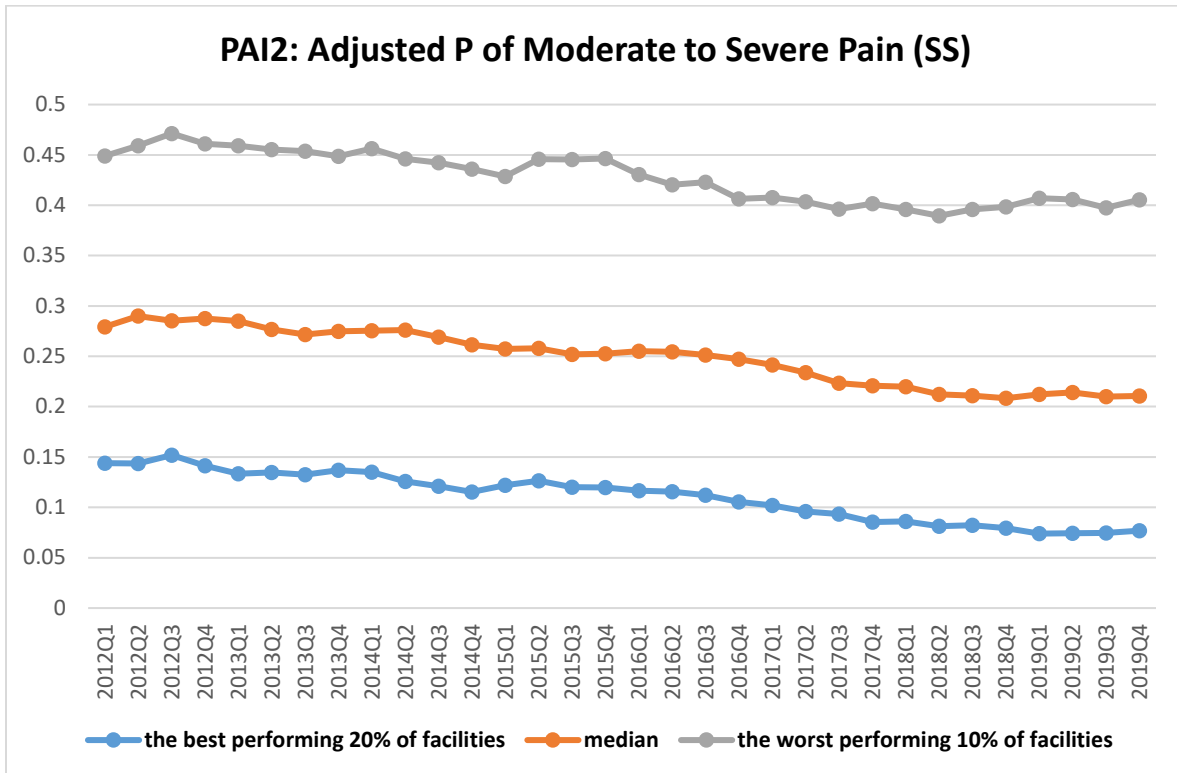
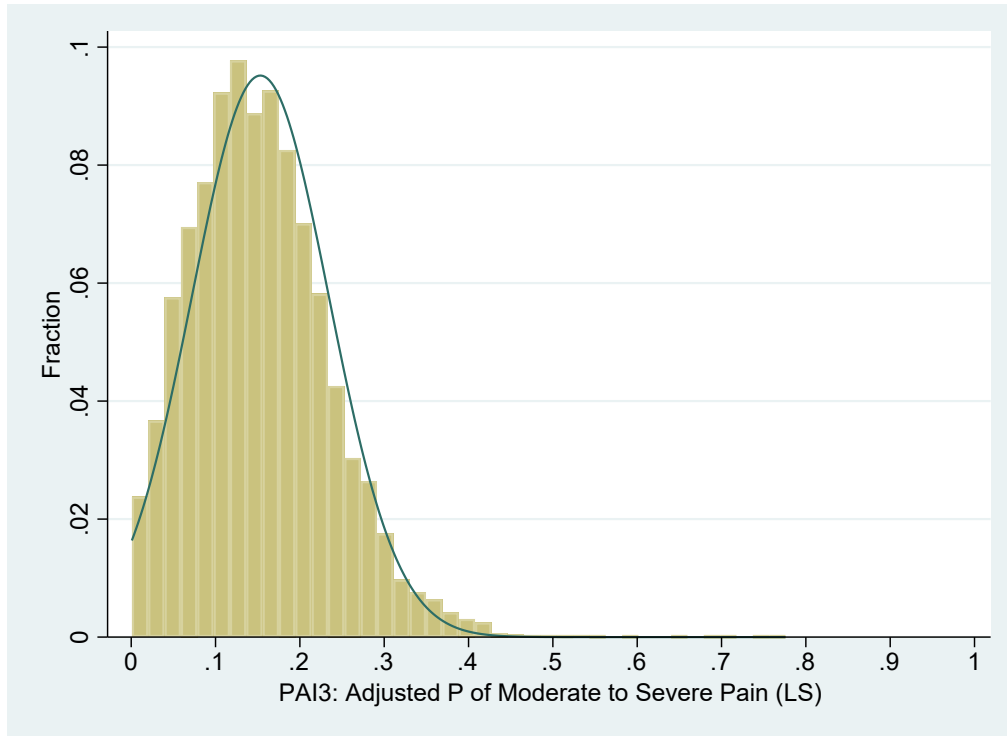


Figure 6. The trends of QI: short-stay pain



**Figure 7. The distribution of QI: long-stay pain**



**Figure 8. The trends of QI: long-stay pain**

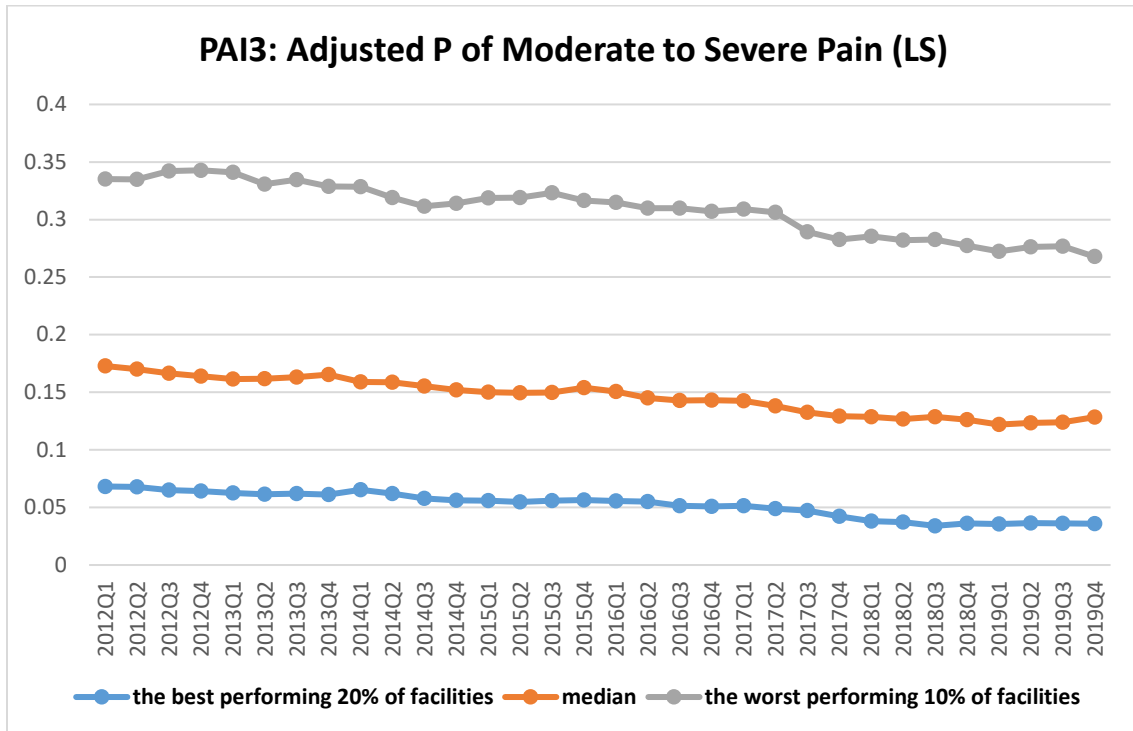


Figure 9. The distribution of QI: mobility dependence

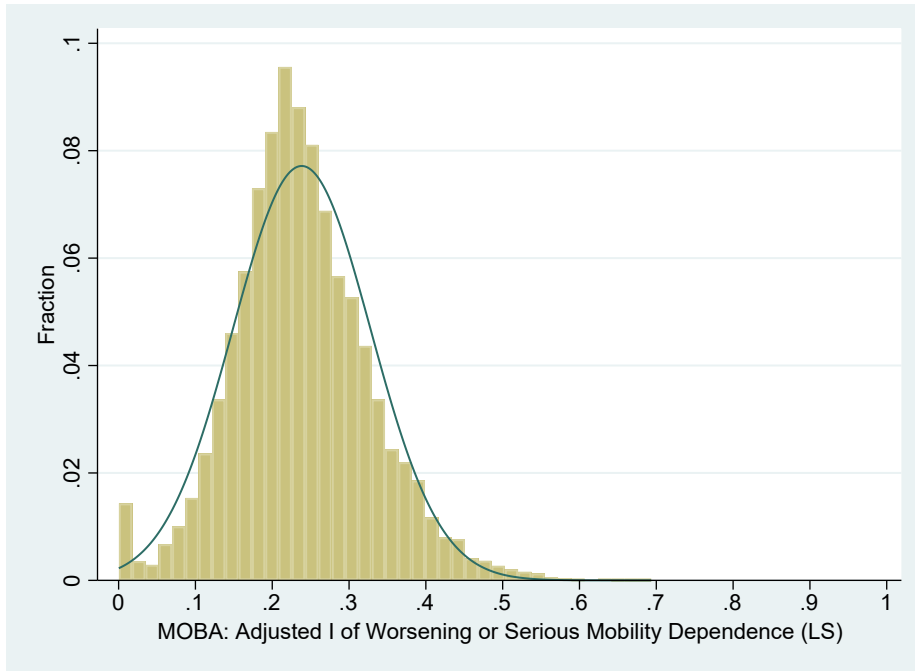
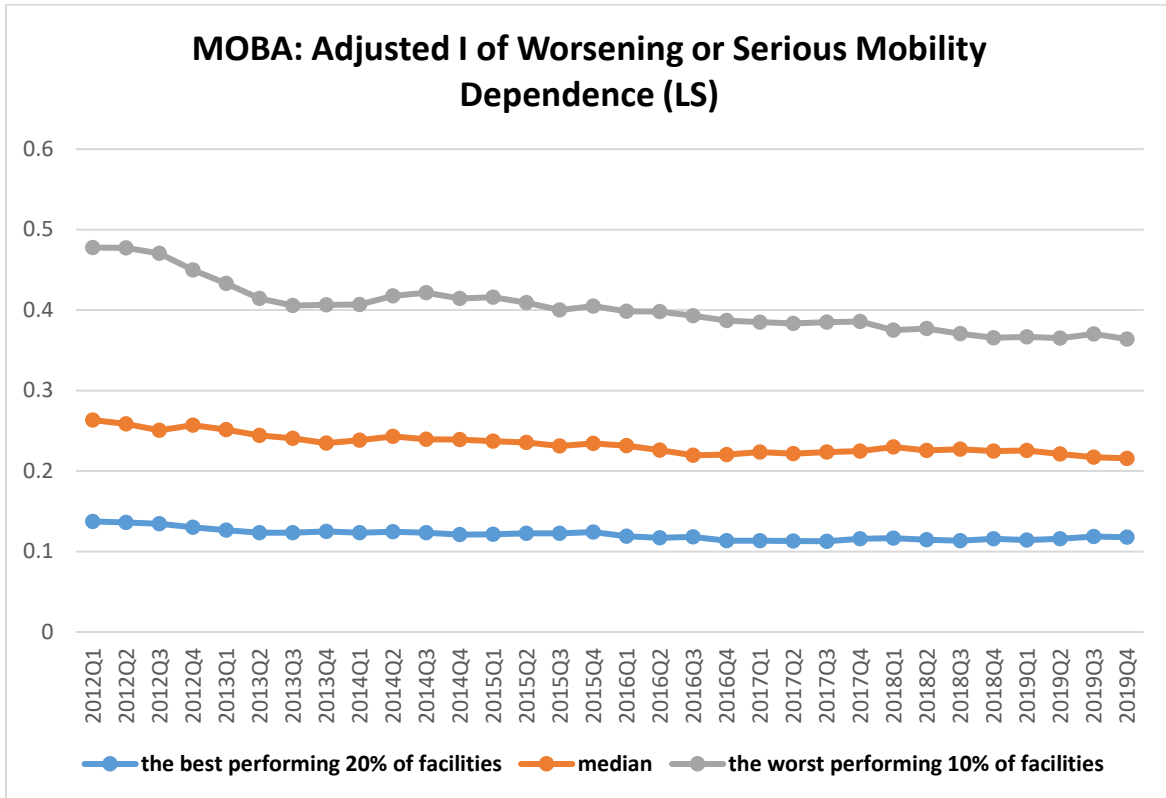
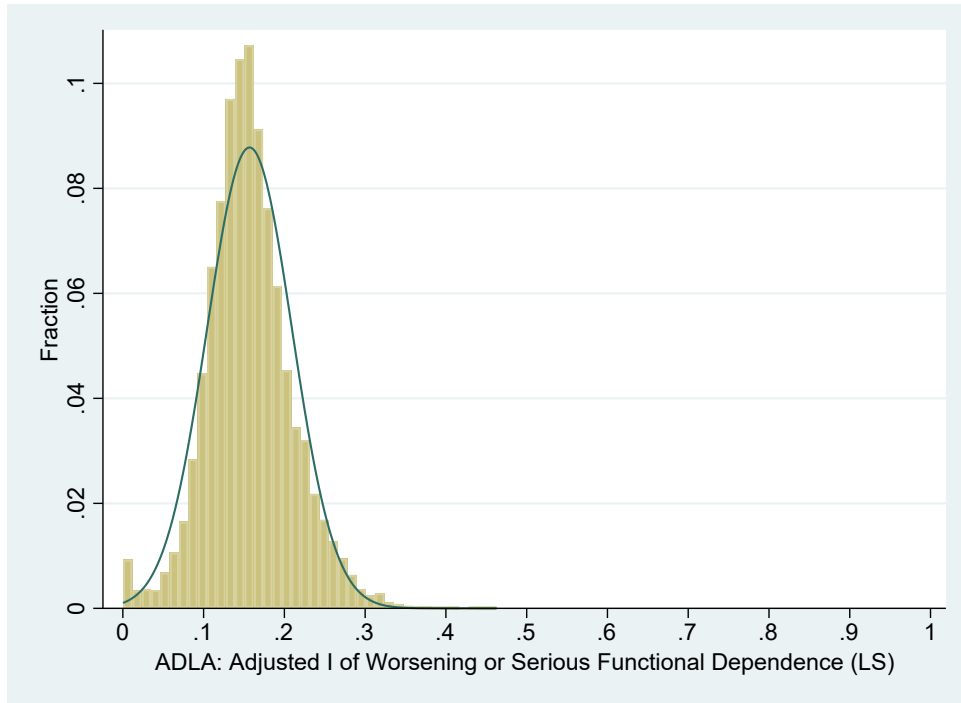


Figure 10. The trends of QI: mobility dependence



**Figure 11. The distribution of QI: functional dependence**



**Figure 12. The trends of QI: functional dependence**

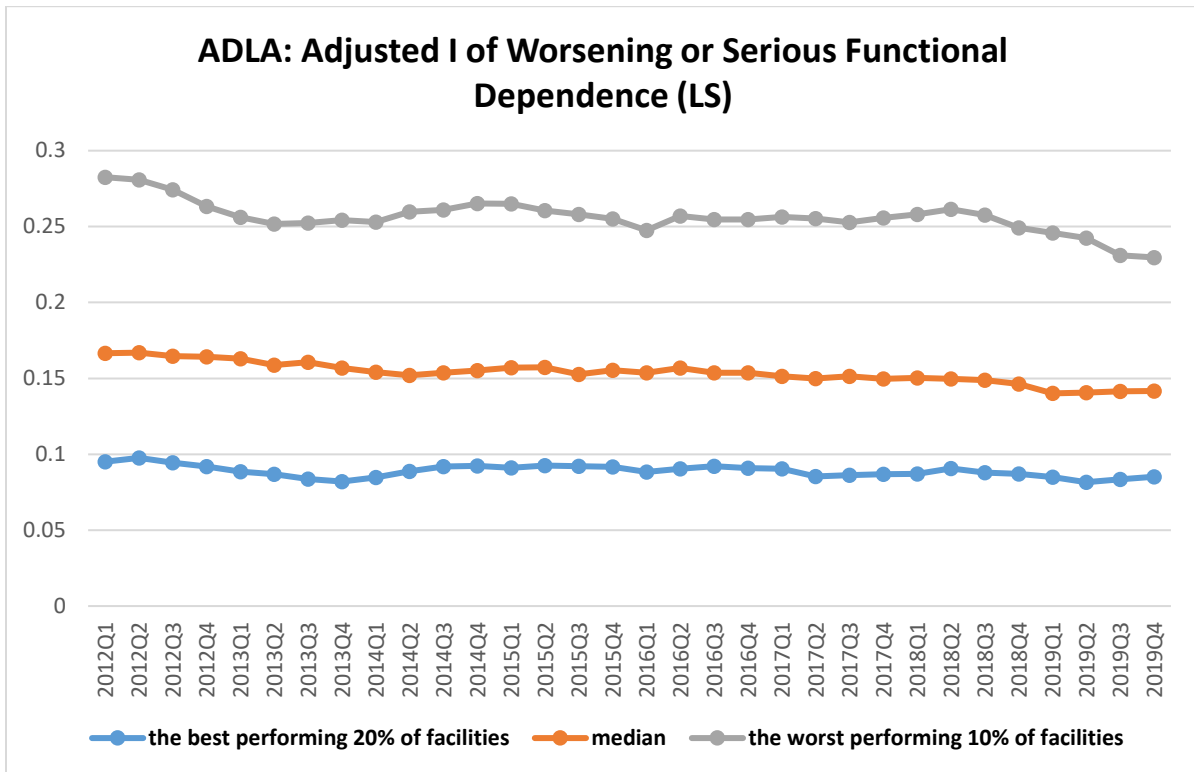


Figure 13. The distribution of QI: range of motion limitation

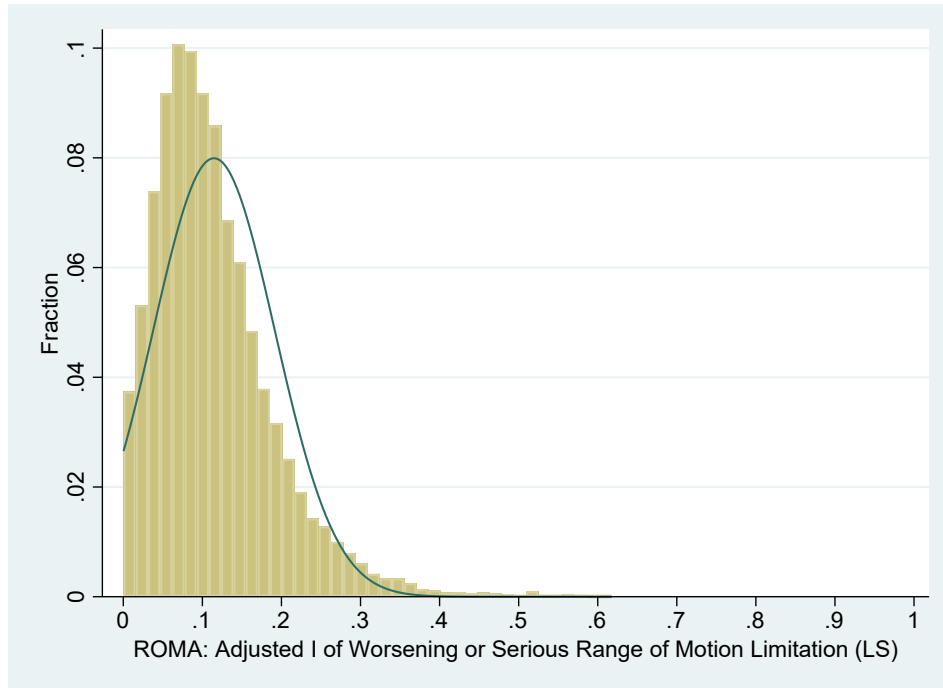


Figure 14. The trends of QI: range of motion limitation

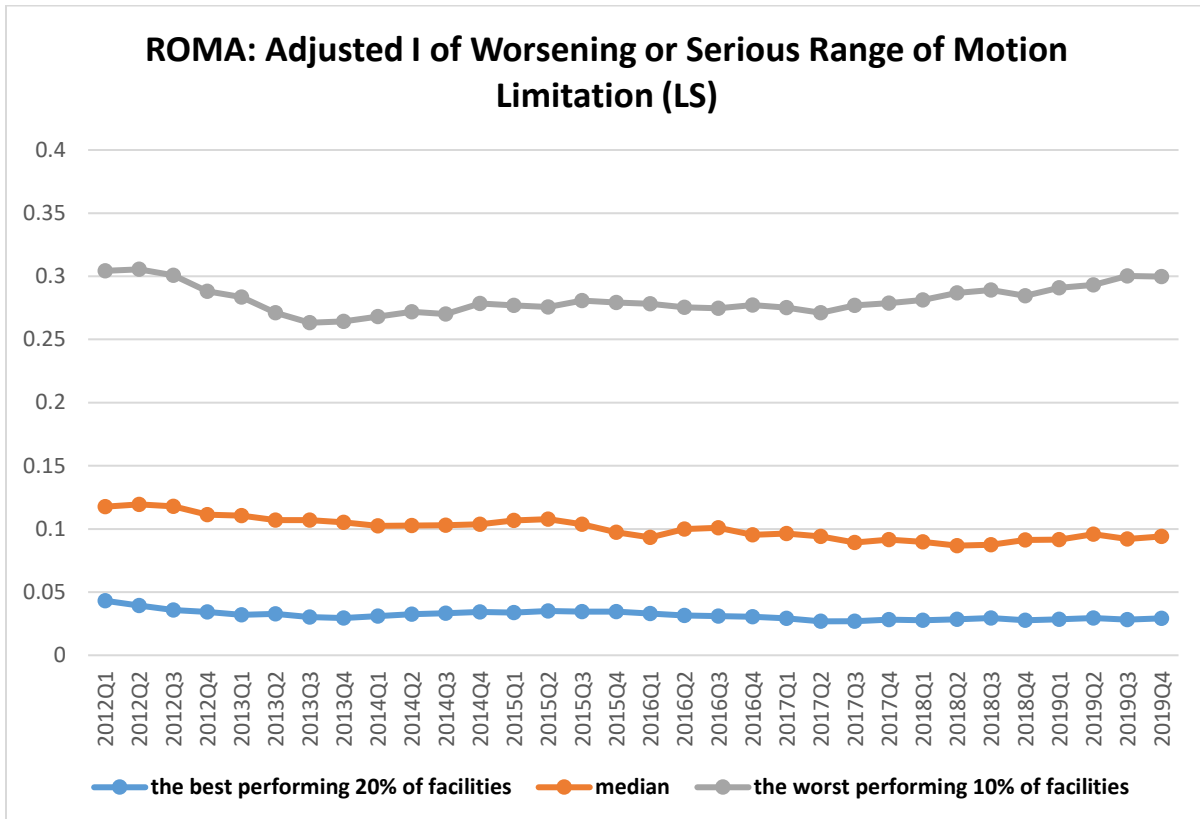


Figure 15. The distribution of QI: resident behavior problems

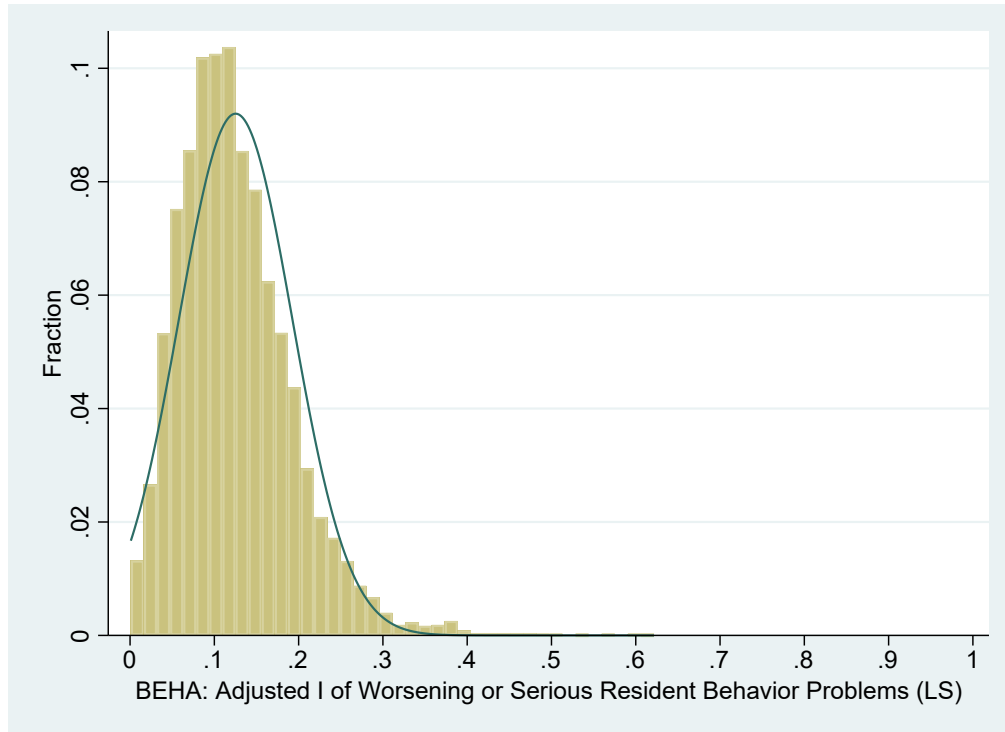


Figure 16. The trends of QI: resident behavior problems

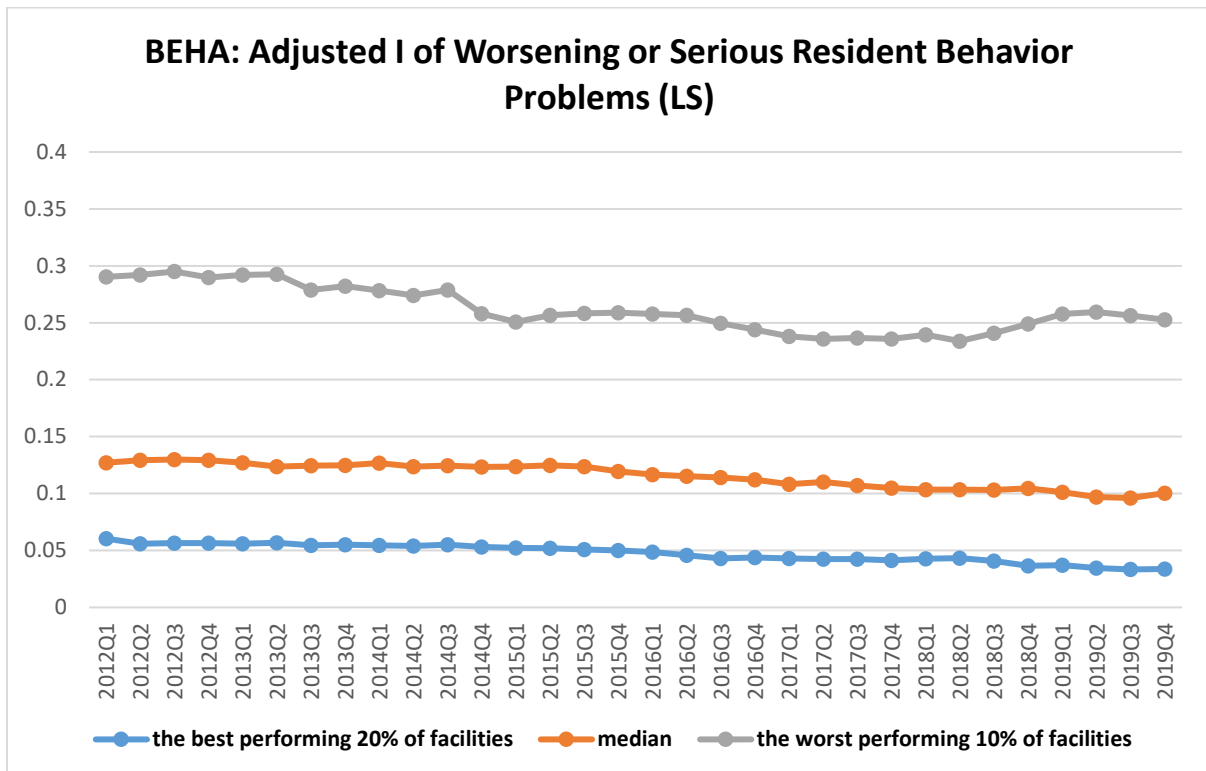




Figure 17. The distribution of QI: walking as well or better

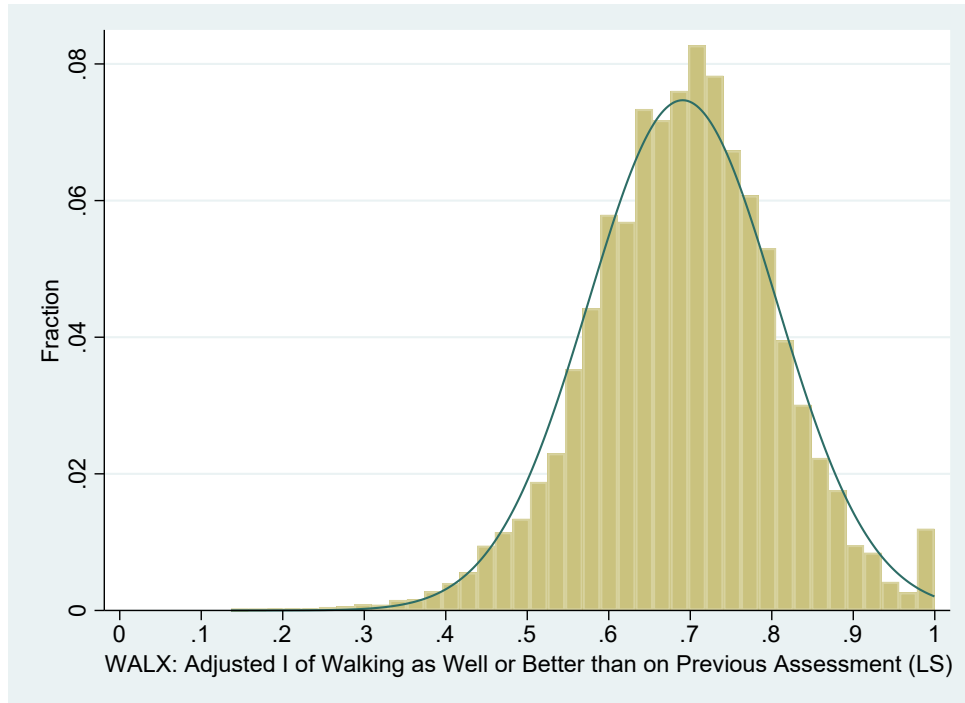


Figure 18. The trends of QI: walking as well or better

