Home Health Prospective Payment System

Technical Expert Panel
February 1, 2018, 9:00 a.m. – 4:15 p.m.

Abt Associates
4550 Montgomery Ave # 800N
Bethesda, MD 20814

Agenda

9:00 – 9:15 **Welcome and Introductions (Michael Plotzke)**

9:15 –10:00 **Summary of public comments from CY 2018 Home Health Prospective Payment System Proposed Rule (82 FR 35270) (T.J. Christian)**

- **Overview of main themes related to the Home Health Grouping Model's case-mix adjustment methodology**
- **Comments from the audience**

10:00 – 10:45 **Calculation of Resource Use (Michael Plotzke)**

- **Comparison of the BLS and CPM + NRS approaches to calculating resource use**
- **Comments from the audience**

10:45 – 11:00 **Break**

11:00 – 11:45 **Clinical Groups (Michael Plotzke)**

- **Description of clinical groups**
- **Discussion of the size of the MMTA clinical group**
- **Comments from audience**

11:45 – 12:30 **Lunch**

12:30 – 1:15 Comorbidity Adjustment (Michael Plotzke)

- **Explanation of comorbidity adjustment**
- **Alternative approaches to adjusting for comorbidity**
- **Comments from audience**

1:15 – 1:45 Admission Source (Michael Plotzke)

- **Explanation of Admission Source**
- **Comments from audience**

1:45 – 2:00 Break

2:00 – 2:45 Episode Length and Timing (Michael Plotzke)

- **Comparison of 30-day periods versus 60-day episodes**
- **Comments from audience**

2:45 – 3:15 Case-mix Comparisons Between HHGM and Current Payment System (T.J. Christian)

- **Examination of case-mix weights across the HHGM and the current payment system by characteristics of home health agencies**
- **Comments from audience**

3:15 - 4:15 Free response and next steps (Michael Plotzke)

- **Ideas for alternative case-mix systems**
- **Discussion of any topics previously or not previously discussed**
- **Next steps**

Home Health Prospective Payment System
Technical Expert Panel Meeting
February 1, 2018
Meeting Attendees

Participants

Evan Christman
Medicare Payment Advisory Commission (MEDPAC)

William Dombi
National Association for Home Care & Hospice (NAHC)

Kathleen Holt
Center for Medicare Advocacy

Luke James
Representing the Partnership for Quality Home Healthcare

Bud Langham
Representing the American Physical Therapy Association

Jenny Loehr
Representing the American Speech-Language-Hearing Association (ASHA)

Melanie Morris
Representing Elevating Home

Peter Notarstefano
LeadingAge

Timothy Peng
Visiting Nurse Service of New York

Karen Vance
Representing the American Occupational Therapy Association (AOTA)

Observers

Jennifer Bogenrief
Representing the American Occupational Therapy Association (AOTA)

Joy Cameron
Representing Elevating Home

Mary Carr
Representing the National Association for Homecare & Hospice

Kara Gainer
Representing the American Physical Therapy Association (APTA)

Steve Guenther
Representing the Partnership for Quality Home Healthcare

Sara Warren
Representing the American Speech-Language-Hearing Association (ASHA)

Researchers:

David Grabowski, Ph.D.
Professor of Health Care Policy
Harvard Medical School

Bruce Kinosian, MD
Associate Professor of Medicine
University of Pennsylvania

Sally Clark Stearns, Ph.D.
Professor of Health Policy and management
University of North Carolina, Chapel Hill

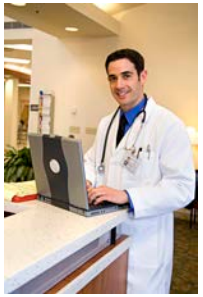
Abt Associates, Inc.

Michael Plotzke, Ph.D., Principal Investigator
Allison Muma, MHA, Project Director
Thomas Christian, Ph.D., Associate
Seyoun Kim, MHS, Analyst
Erica Granor, Associate Analyst

Home Health Groupings Model

Technical Expert Panel

February 1, 2018



Purpose of the Meeting

- Gather perspectives on the Home Health Groupings Model (HHGM) as described in the 2018 Home Health Prospective Payment System Proposed Rule (82 FR 35270)
- Abt and CMS will use feedback received today to strengthen the Home Health Grouping Model and/or consider alternative payment models

Introductions

- Please provide a short introduction and describe what you are hoping to achieve during today's meeting

Ground Rules

- CMS is observing the TEP meeting but will not participate in the discussions
- Abt is recording the audio of the meeting today.
  - We will provide a publically available summary of the main points made at the meeting
  - Notes will not attribute comments to individual people or organizations
- Topics discussed will relate to technical aspects of the case-mix adjustment model
  - Issues related to CMS policy decisions (i.e. budget neutrality adjustments) are better discussed in a different venue as those topics are unrelated to the work Abt does
- Do not distribute material provided or discussed in this meeting

Ground Rules

- We have a very large group today
  - Only participants seated at the table can participate in the conversation
  - We want to make sure everyone and every organization has the opportunity to participate
  - During the meeting I will be doing my best to make sure we hear from a variety of different people
  - We will have time at the end to circle back to unfinished topics if I need to limit the length of a conversation

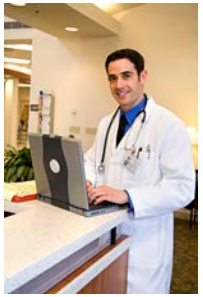
Please consider the following

- Case-mix adjustment is only one aspect of a payment system – but it is the aspect we are tasked with discussing
- Additionally, by law, CMS is to:
  - "The Secretary shall establish appropriate case mix adjustment factors for home health services in a manner that explains a significant amount of the variation in cost among different units of services."
- Approaches to case-mix adjustment need to be actionable
  - CMS cannot case-mix adjust using data they aren't collecting

Agenda

1. Introductions
2. Background
3. Summary of Public Comments
4. Resource Use
5. Clinical Groups
6. Comorbidity Adjustments
7. Admission Source
8. Episode Length and Timing
9. Case-Mix Weights
10. Free Response and Next Steps

Background



Motivation – Section 3131(d) Report to Congress

- Examined costs associated with beneficiaries who were: low-income, lived in underserved areas, had high severity of illness

- Report found current payment system produced lower margins for those
  - needing parenteral nutrition
  - with traumatic wounds or ulcers
  - who required substantial assistance in bathing
  - admitted to HH following an acute or post-acute stay
  - who have a high Hierarchical Condition Category score
  - who had certain poorly controlled clinical conditions
  - who were dual eligible

Motivation – MedPAC Annual Reports (2011, 2015)

- The Medicare HH Benefit is ill-defined
- HH payment should not be based on the number of therapy visits
  - Current system incentivizes more therapy visits and fewer non-therapy visits
- HH payment should be determined by patient characteristics

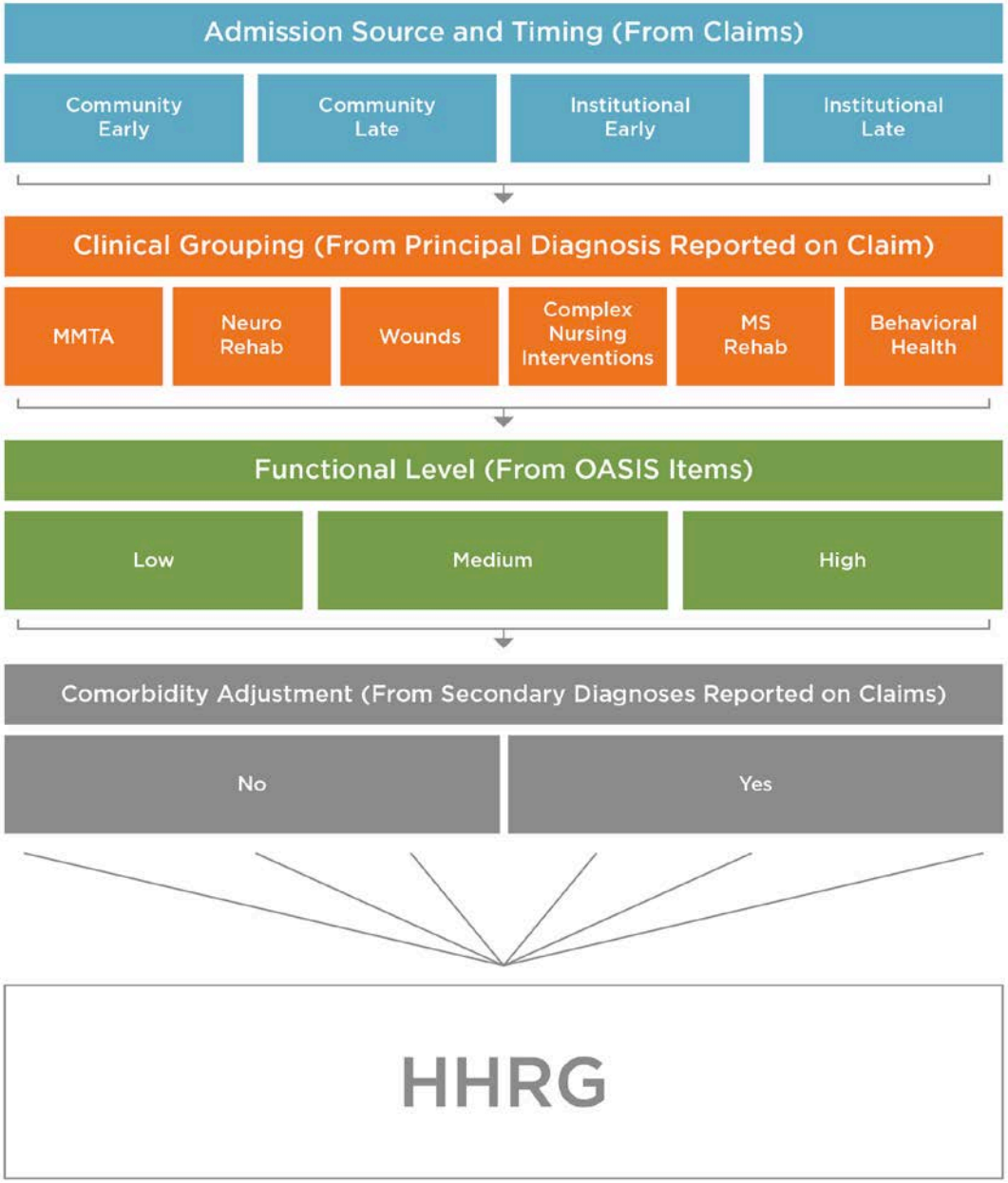
Overview of HHGM

- Each HH period is categorized into different sub-groups within each of the five categories below:
  - Timing (early or late; period is placed into 1 of 2 groups)
  - Referral source (community or institutional source; period is placed into 1 of 2 groups)
  - Clinical grouping (musculoskeletal (MS) rehab, neuro/stroke rehab, wounds, Medication Management Teaching and Assessment (MMTA), behavioral, or complex nursing care; period is placed into 1 of 6 groups)
  - Functional level (low or high; low, medium, or high; period is placed into 1 of 3 groups)
  - Comorbidity adjustment (no or yes; based on secondary diagnoses; period is placed into 1 of 2 groups)

- In total, HHGM produces 2*2*6*3*2 = 144 different payment groups

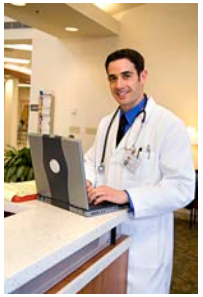
Data Used

- Home health episodes (matched to OASIS) from 2016
- Home health cost reports from 2015
- Provider of services files



Under the Home Health Groupings Model, a 30-day period is grouped into one (and only one) subcategory under each larger colored category. A 30-day period's combination of subcategories groups the 30-day period into one of 144 different payment groups.

Summary of Public Comments from CY 2018 Home Health Prospective Payment System Proposed Rule (82 FR 35270)



Comments from the HH Proposed Rule for FY 2018

- HHGM proposed in the FY 2018 rule published in June 2017
- Received 1,347 of comments from stakeholders
- We summarize and discuss comments related to technical components of HHGM
- Purpose: obtain feedback on topics brought up by stakeholders, further analyses needed, additional considerations

HHGM Comments Topics

1. Length of payment period
2. Admission source
3. Episode timing
4. Clinical groupings
5. Comorbidity adjustment
6. LUPA thresholds
7. NRS bundling
8. Regression-determined case-mix weights
9. Resource use data sources and methods
10. Other

Length of Payment Period

- From 60-day episode to 30-day period
  - 60-day episodes are split into equal payments for each 30-day period
  - If only visits during the first 30-day period, only paid for one period
- Concerns
  - Frontloading can be beneficial for the patient; would result in incentive to not frontload to generate a second period
  - Or, may discourage taking patients needing complex care that need multiple periods

Timing

- First 30-day period is early; subsequent periods are late
  - Currently, first and second 60-day episodes are early
  - Early period is paid more than late periods
- Concerns/Recommendations
  - Discourage necessary therapy or other service provision needed after the first 30-day period
  - 60-day gap should be reevaluated to allow for a new sequence to start with hospitalization

Admission Source

- 14-day admission source determines grouping
  - Institutional entrants receiving higher weight/payment
- Concerns/Recommendations
  - Disincentivizes providers from taking community admissions (mixed comments on whether this is beneficial)
  - Recommend including emergency room and observational stays as “institutional”
  - Late period with institutional admission source paid more than early period with community admission source
    - Recommend a 5-day window instead of 14 for designating institutional/community admission

Clinical Groupings

- Six clinical groupings based on principal diagnosis code
  - Two are more therapy heavy (Neuro and MS rehab)
  - MMTA accounts for over 60 percent of episodes
- Concerns/Recommendations
  - MMTA too broad a category (includes too many periods)
  - Not enough therapy groups
  - MMTA and behavioral health paid too low
  - Too much reliance on principal diagnosis

Comorbidity Adjustment

- Secondary diagnosis used to adjust for one of 15 comorbidities, covering these areas:
  - Heart Disease, Cerebral Vascular Disease, Circulatory Disease and Blood Disorders, Endocrine Disease, Neoplasm, Neurological Disease and Associated Conditions, Respiratory Disease, Skin Disease
- Concerns/Recommendations
  - Many patients have multiple comorbidities and adjustment should be made for multiple comorbidities
  - Same adjustment should not be made for all patients (i.e. some comorbidities are more severe, or there are interactions with comorbidities and other characteristics of the patient)

Comorbidities

- **Heart Disease 1:** includes hypertensive heart disease.
- **Cerebral Vascular Disease 4:** includes sequelae of cerebrovascular disease.
- **Circulatory Disease and Blood Disorders 9:** includes venous embolism and thrombosis.
- **Circulatory Disease and Blood Disorders 10:** includes varicose veins of lower extremities with ulcers and inflammation, and esophageal varices.
- **Circulatory Disease and Blood Disorders 11:** includes lymphedema.
- **Endocrine Disease 2:** includes diabetes with complications due to an underlying condition.
- **Neoplasm 18:** includes secondary malignant neoplasms.
- **Neurological Disease and Associated Conditions 5:** includes secondary parkinsonism.
- **Neurological Disease and Associated Conditions 7:** includes encephalitis, myelitis, encephalomyelitis, and hemiplegia, paraplegia, and quadriplegia.
- **Neurological Disease and Associated Conditions 10:** includes diabetes with neurological complications.
- **Respiratory Disease 7:** includes pneumonia, pneumonitis, and pulmonary edema.
- **Skin Disease 1:** includes cutaneous abscesses, and cellulitis.
- **Skin Disease 2:** includes stage one pressure ulcers.
- **Skin Disease 3:** includes atherosclerosis with gangrene.
- **Skin Disease 4:** includes unstageable and stages two through four pressure ulcers.

LUPA Thresholds

- LUPA thresholds will depend on case mix group
  - Currently: one threshold (5 visits) applies to all episodes
  - Proposed: higher of 10th percentile value of visits or 2 visits by payment group (for 30-day period)
- Concerns/Recommendations
  - Single LUPA threshold was simpler
  - Concerns with the upper threshold of 7 for some payment groups
  - Other commenters did support LUPA thresholds by payment group

Non-Routine Supplies Bundling

- NRS payments
  - Currently, NRS is paid separately using a payment model. However, 2/3s of NRS payments are made when no NRS were actually provided
  - Proposed to be included with base payment rate (cost per visit + NRS would be used to determine payment)
- Concerns/Recommendations
  - Commenter felt this would result in overpaying for some cases and underpaying for others (similar to the current system)

Regression-Determined Weights

- Regression method used to determine payment weights for each group
  - Regression used since 2000, inception of HH PPS
  - Smooths the payment weights and allows for adjustment of various HHA-level characteristics
- Concerns/Recommendations
  - One commenter recommended using actual costs in each payment group, rather than a regression-adjusted cost

Resource Use Data and Methods

- HHGM uses cost reports to determine costs per visits
  - Current model using wage-weighted minutes of care (WWMC) from the Bureau of Labor Statistics (BLS)
  - Propose to replace with Cost per Minute + NRS using cost report data
- Concerns/Recommendations
  - Questionable cost report data
  - Favors facility-based versus freestanding HHAs (facility-based can allocate costs differently)

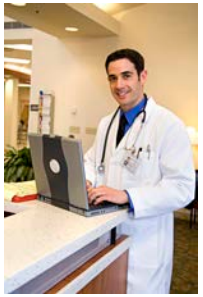
Other

- Disincentivizes therapy provision by removing the utilization component from the current payment model
- Incorporate age, caretaker's availability, vision, cognitive status in the payment model
- Eliminate PEP
- Ensure adequate payments for rural HHAs

Discussion

- Which comments should be explored further?
- What further analyses do you recommend?
- Other comments you have?

Calculation of Resource Use



Measuring Episode Costs

- Need to measure episode costs to design a payment system
- Resource use is an estimate of episode costs
- Multiple approaches considered; two main candidates:
  - Wage Weighted Minutes of Care (WWMC) [payment system currently uses this method]
  - Cost per Minute plus Non-Routine Supplies (CPM + NRS)

Comparison of Approaches

	Wage Weighted Minutes of Care (WWMC)	Cost per Minute plus Non-Routine Supplies (CPM + NRS)
Data Sources	BLS wage estimates, Home Health Medicare claims	Cost Reports, Home Health Medicare claims
General Approach	Wages multiplied by amount of care provided for each discipline	Total costs multiplied by amount of care provided for each discipline
Costs Represented	Wages and fringe benefits directly related to patient visit	Wages, fringe benefits, overhead costs, transportation costs, other non-visiting services labor costs
Imputation Needed?	No	Yes
Non-Routine Supply	Determined through separate model, used NRS cost-to-charge ratio to help set weights	Use NRS cost-to-charge ratio to obtain NRS costs per episode

Resource Use Distribution

	Mean	5th Percentile	25th Percentile	50th Percentile	75th Percentile	95th Percentile
Average Resource Use (WWMC)	$347.44	$42.71	$128.13	$266.23	$492.28	$907.23
Average Resource Use (CPM + NRS)	$1,404.45	$162.43	$528.80	$1,080.80	$1,941.27	$3,674.27
Average Resource Use (CPM)	$1,353.70	$153.38	$509.19	$1,040.43	$1,881.37	$3,543.12

Selecting a Resource Use Approach

- High correlation between methods (0.86 correlation coefficient)

WWMC advantages

- Incorporates labor categories (e.g., LPN versus RN)
- BLS data are available more quickly
- No imputation needed

CPM+NRS advantages

- NRS is incorporated into one payment system, rather than a separate model
- Includes direct (e.g. staffing) and indirect (e.g. transportation) costs
- More evenly weights skilled nursing and therapy services

- HHGM findings use the CPM+NRS method
- Exploration of differences and their implications continues

Resource Use Ratios by Discipline

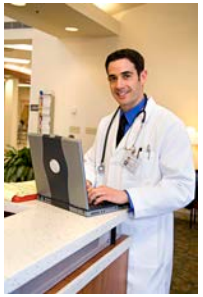
Estimated Cost per Hour	Skilled Nursing	Physical Therapy	Occupational Therapy	Speech Therapy	Medical Social Service	Home Health Aide
Average Resource Use (WWMC)	1.00	1.42	1.42	1.55	0.95	0.36
Average Resource Use (CPM + NRS)	1.00	1.19	1.20	1.30	1.69	0.50

- Ratio of therapy to skilled nursing costs per hour is lower for CPM + NRS
- Ratio of MSS to skilled nursing costs per hour is different directions for CPM+NRS and WWMC methods

Discussion

- Do you favor one resource use method over another – and why?
- Do you have suggestions for improving the measurement of resource use?
- What (if any) are the unintended consequences of selecting either approach?

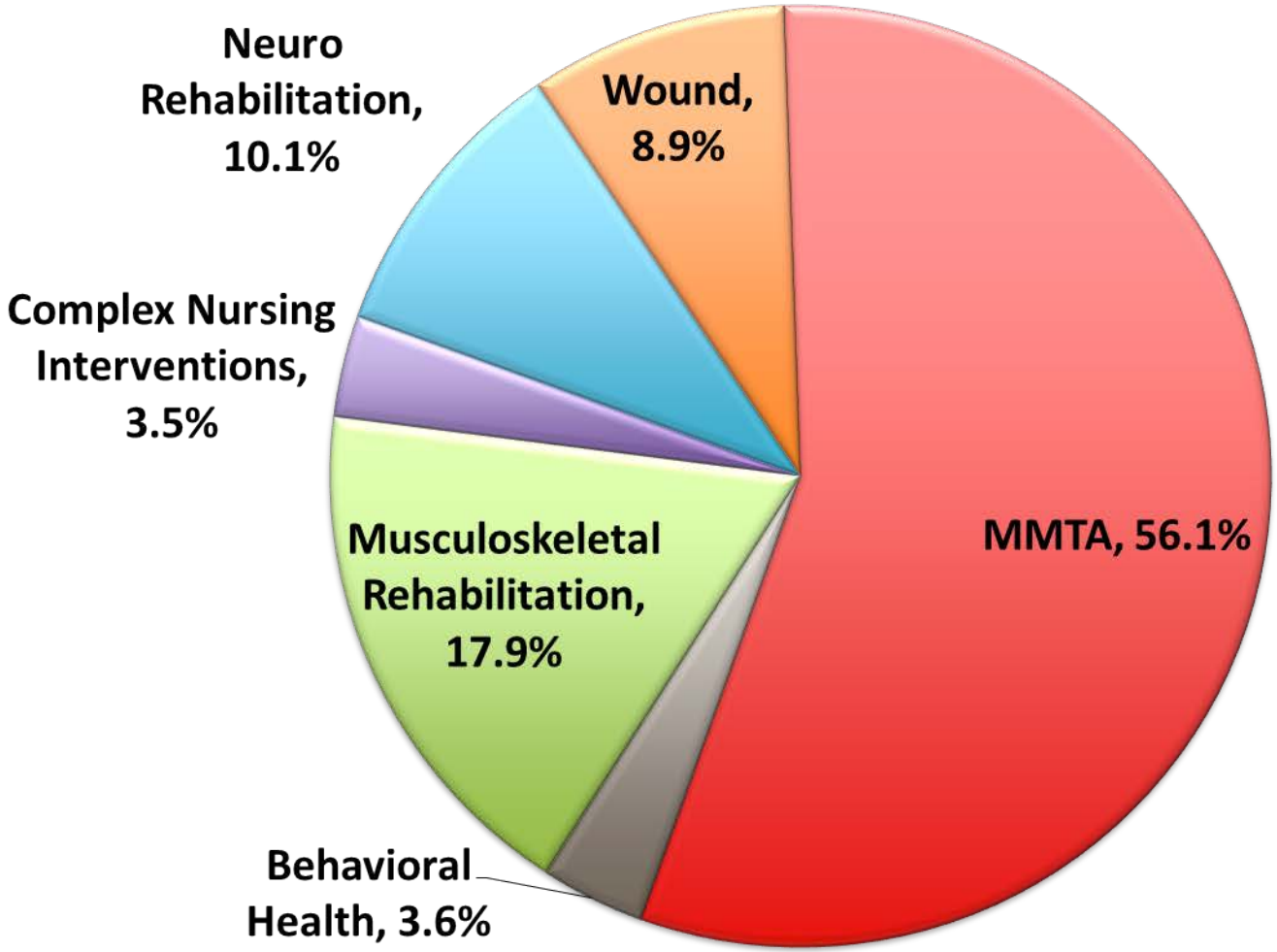
Clinical Groups



Description of the Six Clinical Groups

Clinical Group	Main reason for HH encounter is to provide:
Musculoskeletal Rehabilitation	Therapy (PT/OT/SLP) for a musculoskeletal condition
Neuro/Stroke Rehabilitation	Therapy (PT/OT/SLP) for a neurological condition or stroke
Wounds—Post-Op Wound Aftercare and Skin/Non-Surgical Wound Care	Assessment, treatment and evaluation of a surgical wound(s); assessment, treatment and evaluation of non-surgical wounds, ulcers burns and other lesions
Complex Nursing Interventions	Assessment, treatment, and evaluation of complex medical and surgical conditions including IV, total parenteral nutrition, enteral nutrition, ventilator, and ostomies
Behavioral Health Care	Assessment, treatment, and evaluation of psychiatric conditions
Medication Management, Teaching and Assessment (MMTA)	Assessment, evaluation, teaching, and medication management for a variety of medical and surgical conditions not classified in one of the above groups

Percentage of Periods by Clinical Group



MMTA Subgroups

Average Resource Use by MMTA Subgroup

Subgroup	N	%	Mean	Median
Surgical/Procedural Aftercare	306,069	6.0%	$1,602.37	$1,321.56
Cardiac/Circulatory	1,610,900	31.8%	$1,423.45	$1,108.80
Endocrine	435,313	8.6%	$1,493.07	$1,027.65
Infectious/Blood Forming Diseases/Neoplasms	488,469	9.6%	$1,439.33	$1,133.12
Other	1,518,941	30.0%	$1,362.78	$1,034.10
Respiratory	705,118	13.9%	$1,403.24	$1,111.27
Total	5,064,810	100.0%	$1,420.77	$1,095.87

Most Common Diagnoses: Surgical/Procedural Aftercare

- Encounter for surgical aftercare following surgery on the circulatory system (Z48.812): 42.3%
- Aftercare following surgery for neoplasm (Z48.3): 22.1%
- Encounter for surgical aftercare following surgery on the digestive system (Z48.815): 19.3%

Cumulative Percentage is 83.7%

Most Common Diagnoses: Cardiac

- Heart failure, unspecified (I50.9): 16.9%
- Unspecified atrial fibrillation (I48.91): 9.4%
- Hypertensive chronic kidney disease with stage 1 through stage 4 chronic kidney disease, or unspecified chronic kidney disease (I12.9): 7.5%
- Atherosclerotic heart disease of native coronary artery without angina pectoris (I25.10): 6.8%
- Venous insufficiency (chronic) (peripheral) (I87.2): 6.5%
- Hypertensive heart disease without heart failure (I11.9): 5.4%

Cumulative Percentage is 52.6%

Most Common Diagnoses: Respiratory

- Chronic obstructive pulmonary disease, unspecified (J44.9): 33.9%
- Chronic obstructive pulmonary disease with (acute) exacerbation (J44.1): 32.9%
- Pneumonia, unspecified organism (J18.9): 11.2%
- Chronic obstructive pulmonary disease with acute lower respiratory infection (J44.0): 5.7%

Cumulative Percentage is 83.7%

Most Common Diagnoses: Endocrine

- Type 2 diabetes mellitus with hyperglycemia (E11.65): 24.3%
- Type 2 diabetes mellitus with diabetic neuropathy, unspecified (E11.40): 20.3%
- Type 2 diabetes mellitus with diabetic polyneuropathy (E11.42): 17.6%
- Type 2 diabetes mellitus with diabetic chronic kidney disease (E11.22): 15.2%
- Type 2 diabetes mellitus with diabetic peripheral angiopathy without gangrene (E11.51): 3.4%

Cumulative Percentage is 80.7%

Most Common Diagnoses: Infectious /Blood Forming Diseases/Neoplasms

- Urinary tract infection, site not specified (N39.0): 29.7%
- Anemia, unspecified (D64.9): 5.3%
- Vitamin B12 deficiency anemia due to intrinsic factor deficiency (D51.0): 4.6%
- Malignant neoplasm of prostate (C61.): 3.1%
- Infection following a procedure, subsequent encounter (T81.4XXD): 3.1%
- Enterocolitis due to Clostridium difficile (A04.7): 2.8%
- Multiple myeloma not having achieved remission (C90.00): 1.8%

Cumulative Percentage is 50.3%

Most Common Diagnoses: Other

- Essential (primary) hypertension (I10.): 40.5%
- Type 2 diabetes mellitus without complications (E11.9): 21.7%
- Benign prostatic hyperplasia with lower urinary tract symptoms (N40.1): 1.7%
- Other chronic pain (G89.29): 1.7%

Cumulative Percentage is 65.6%

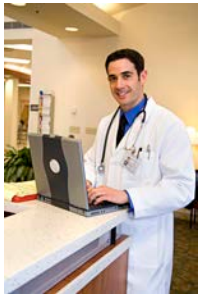
MMTA Subgroups

- If nothing else about the HHGM model changed, each additional clinical group would result in 2*2*3*2 = 24 additional case-mix groups
- Separation in case-mix weights between the groups likely would not be large due to the limited difference in resource use across the MMTA subgroups
  - Surgical/Procedural Aftercare looked like the MMTA sub-group with the largest difference in resource use, but it was only $100-$200 larger than the other groups

Questions

- How should periods be grouped in order to account for differences amongst patient diagnoses?
- Should the MMTA clinical group be divided into additional sub-groups?
  - Is the added complexity of having additional case-mix groups worthwhile?

Comorbidity Adjustment



Comorbidity Adjustment: Motivation

- The primary HH diagnosis determines the HHGM clinical group
- However, secondary diagnoses also contain relevant information indicating patient need for case-mix adjustment, even after accounting for other aspects of the HHGM
- A **comorbidity** is defined as a medical condition coexisting in addition to a primary diagnosis
  - Comorbidity is tied to worse health outcomes, more complex medical need and management, and higher care costs

Most Common CCW Chronic Condition Flags for Beneficiaries Receiving Home Health	% of Beneficiaries
Hypertension	94.7%
Hyperlipidemia	87.3%
Anemia	82.8%
Rheumatoid Arthritis/Osteoarthritis	79.5%
Ischemic Heart Disease	71.1%
Cataract	70.8%
Chronic Kidney Disease	60.5%
Depression	57.5%
Diabetes	55.4%
Heart Failure	55.0%
Chronic Obstructive Pulmonary Disease and Bronchiectasis	48.7%
Asthma	41.6%
Alzheimer's Disease and Related Disorders or Senile Dementia	38.9%

Most Common CCW Chronic Condition Flags for Beneficiaries Receiving Home Health	% of Beneficiaries
Acquired Hypothyroidism	38.5%
Osteoporosis	33.3%
Stroke	31.1%
Atrial Fibrillation	30.1%
Glaucoma	26.9%
Benign Prostatic Hyperplasia	23.2%
Alzheimer's Disease	14.9%
Hip/Pelvic Fracture	11.4%
Acute Myocardial Infarction	10.8%
Female/Male Breast Cancer	7.4%
Prostate Cancer	6.4%
Colorectal Cancer	5.0%
Lung Cancer	3.7%
Endometrial Cancer	1.6%

Comorbidities Specific to Home Health

- A HH specific comorbidity list was developed with broad clinical categories used to group comorbidities within the HHGM:
  - heart disease
  - respiratory disease
  - circulatory disease
  - cerebrovascular disease
  - gastrointestinal disease
  - neurological conditions
  - endocrine disease
  - neoplasms
  - genitourinary/renal disease
  - skin disease
  - musculoskeletal disease
  - behavioral health
  - infectious diseases

Comorbidities Specific to Home Health

- When evaluating comorbidities for HHGM inclusion, we assigned those with at least 0.1% of periods to subcategories

- For remaining comorbidities, we determined each subcategory's associated average resource use and flagged those with higher than average increased costs for a **comorbidity adjustment group**

- Periods having at least one comorbidity included with the adjustment group will receive an adjustment (roughly 16.7%)

Frequency of Periods and Resource Use Estimates by Comorbidity Presence

Comorbidity Group	# 30-Day Periods	% 30-Day Periods	Mean Resource Use	Median Resource Use
No Comorbidity Adjustment	7,522,067	83.26%	$1,486.34	$1,197.93
Comorbidity Adjustment	1,512,902	16.74%	$1,822.68	$1,466.23
Total	9,034,969	100.00%	$1,542.66	$1,239.91

Additional Approaches to Comorbidity Adjustment

- Comorbidity adjustment currently causes case-mix weight to increase by 0.174.
- Alternative Approach - Set it up just like functional levels
  - Each comorbidity contributes points to a comorbidity score
  - Multiple comorbidity levels (low, medium, high)
    - Medium comorbidity level increases case-mix weight by 0.0193
    - High comorbidity level increases case-mix weight by 0.1217
  - This approach causes the case-mix adjustment to impact weights less than previous approach
    - More 30-day periods receive an adjustment though

Additional Approaches to Comorbidity Adjustment

- Alternative Approach - Set it up just like functional levels
  - Three levels, but low is 80% of 30-day periods, medium is 10% of 30-day periods, and high is 10% of 30-day periods
    - Medium comorbidity level increases case-mix weight by 0.0741
    - High comorbidity level increases case-mix weight by 0.2301

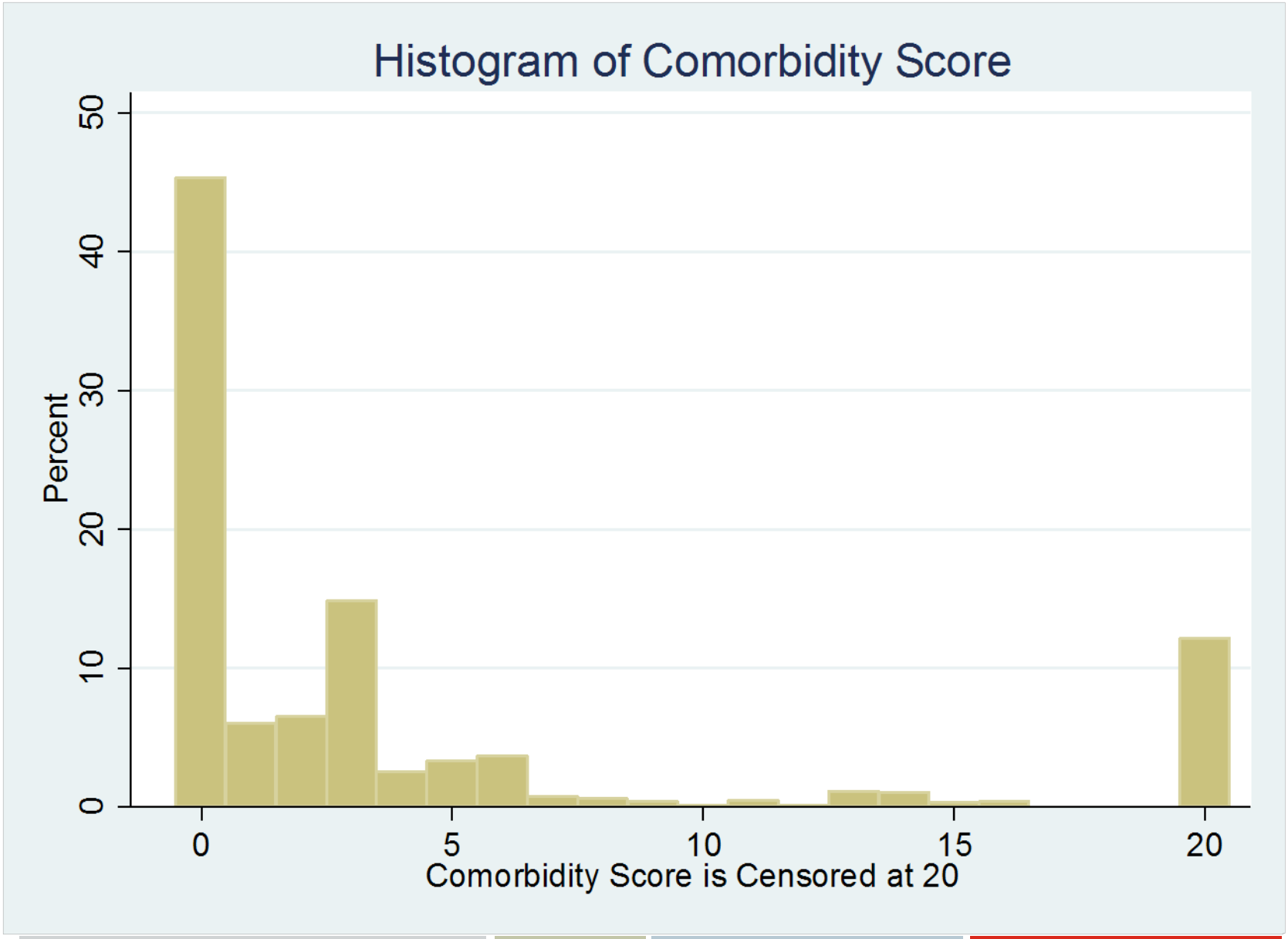
Additional Approaches to Comorbidity Adjustment

- Alternative Approach – Make comorbidity adjustment vary depending on clinical group.

	Option 1		Option 2	
	Medium (33% of Periods)	High (33% of Periods)	Medium (10% of periods)	High (10% of periods)
MMTA	0.0132	0.1023	0.0456	0.2357
Behavioral Health	0.062	0.0582	0.0321	0.0646
Complex	0.0143	0.0779	0.0089	0.2168
MS Rehab	0.0168	0.1113	0.0588	0.1942
Neuro	0.0348	0.2276	0.2613	0.3234
Wound	0.051	0.1838	0.1084	0.2358

Questions

- Is it more desirable to have more 30-day periods receive a smaller comorbidity adjustment or fewer periods receive a larger comorbidity adjustment – and why?
- What is the best approach to adjust for comorbidities?



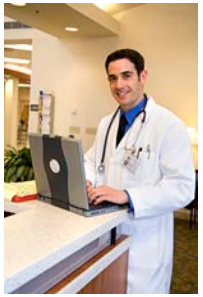
Option 1 - Points needed to be grouped into comorbidity levels

	Low (~33% of 30-day periods)	Medium (~33% of 30-day periods)	High (~33% of 30-day periods)
MMTA	0	1-3	4+
Behavioral Health	0	1	2+
Complex	0	1-3	4+
MS Rehab	0	1-2	3+
Neuro Rehab	0	1-3	4+
Wound	0-2	3-22	23+

Option 2 - Points needed to be grouped into comorbidity levels

	Low (~80% of 30-day periods)	Medium (~10% of 30-day periods)	High (~10% of 30-day periods)
MMTA	0-5	6-16	17+
Behavioral Health	0-3	4-5	6+
Complex	0-6	7-17	18+
MS Rehab	0-3	4-6	7+
Neuro Rehab	0-13	14-17	18+
Wound	0-41	42-45	46+

Admission Source



Admission Source

- **Institutional:** Acute or post-acute (skilled nursing facility, inpatient rehabilitation facility, long term care hospital) care in the 14 days prior to the HH admission

- **Community:** No acute or post-cute care in the 14 days prior to the HH admission

Admission Source	Average Resource Use	Number of Periods	Percent	SD	25th Percentile	Median	75th Percentile
Institutional	$2,125.21	2,295,678	25.4%	$1,289.02	$1,206.72	$1,875.19	$2,737.54
Community	$1,344.22	6,739,291	74.6%	$1,113.00	$559.97	$1,034.91	$1,792.79
Total	$1,542.66	9,034,969	100.0%	$1,209.05	$660.61	$1,239.91	$2,080.72

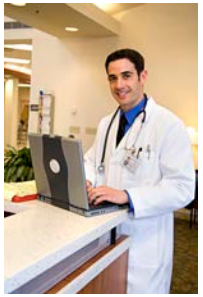
Admission Source

- Observational stays occur infrequently before a 30-day period of care
  - Roughly 2% of periods
  - Average resource use is very similar to the community admission source
  - Including observational stays with institutional admissions would slightly lessen the impact of institutional admission source

Questions

- How should admission source be controlled for?
- Are there concerns with only accounting for institutional versus community admission source?
- Should a shorter or longer lookback be used?

Episode Length and Timing



30 Day Periods: Overview and Motivation

- In the HH PPS, HHAs are paid for each (up to) 60 day episode of care
- However, we found significant resource usage differences across 60 day episodes' first and second halves
  - Separately paying each half in accordance with differential resource use better aligns payments with cost
- For the HHGM analysis, we simulate 30 day periods

Mean Visits & Resource Use in each 15 Day Segment of a (Full) and First 60-Day Episode among CY 2016 Episodes; n=856,014

	Days 1-15	Days 16-30	Days 31-45	Days 46-60
Total Visits	8.1	6.4	5.1	4.6
SN Visits	3.9	2.5	2.2	2.3
PT Visits	2.6	2.4	1.7	1.4
OT Visits	0.8	0.8	0.5	0.4
SLP Visits	0.1	0.2	0.1	0.1
Aide Visits	0.5	0.5	0.5	0.4
MSS Visits	0.1	0.1	0.0	0.0
Resource Use	$328.99	$233.01	$184.52	$171.60

Timing

- In the current payment system, early episodes are first or second in a sequence of episodes
  - When the most recent case-mix refinements went into effect in 2008, late episodes (3rd or later) had higher resource use on average (and therefore higher case-mix weights)
  - In recent years, the relationship is more mixed – sometimes late episodes have lower case-mix weight than a comparable early episode
- In the HHGM, early periods are only the first in a sequence of episodes
  - This was done to simplify the model and best reflect the relationship between episode timing and resource use

Benefits of Transition to 30 Day Periods

1. HHGM fit statistics (e.g., R^2) improve from reduced variation arising from a more constrained time window; in turn this creates more accurate case mix weights
2. Shorter episodes may promote HHAs to more frequently review patients' status and thereby respond more diligently to patient needs

Methodology

- Simulated 30 day periods were constructed using segments of current 60 day episodes
  1. A 30 day period comprised of days 1-30
  2. Where applicable (depending on episode length), a second period comprised of days 31-60
- *Example: a 58 day episode yields two new segments: a initial 30 day period (days 1-30) and a second 28 day period (days 31-58)*
- Home health episodes from the current payment system that are 30 days or less will not yield a second period in the HHGM

Results

- Overall, there were 5,710,726 60-day episodes
  - Of these, 1,513,958 episodes are 30 days or less
    - Those only produce a single 30-day period
  - The remaining 4,196,768 episodes exceed 30 days
    - Each produces two 30-day periods
    - However, we excluded 872,525 periods without visits or that would be considered a LUPA under the HHGM
- 1,513,958+2*4,196,768-872,525 = 9,034,969 30-day periods

Regression Results

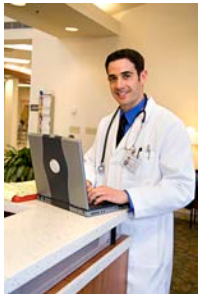
- Handout contains regression models showing coefficients from a HHGM 30-day period model and a HHGM 60-day episode model
- Results are similar across different models

Questions?

- What time period should episodes cover? What are the trade-offs between having a shorter versus a longer episode?
- How should episode timing be accounted for?
- Other thoughts?

Case-mix Comparisons Between HHGM and Current Payment System

T.J. Christian



Objectives

- Examine the case-mix weights across the HHGM and the current payment system by characteristics of episodes and home health agencies
- Collect feedback from TEP

Case-Mix Weights in Home Health Groupings Model Overview

- The **Home Health Groupings Model** (**HHGM**) assigns separate payment weights to episodes for patients with similar characteristics and needs

  1. Separate episodes into grouping "buckets"

     - Accounts for clinical grouping, functional level, timing, admission source, and comorbidity adjustment: 144 total "buckets" or buckets

  2. Calculate each group's **case-mix weight** as the group's predicted mean cost relative to the overall average

     - A group with higher (lower) than average cost is assigned a case-mix weight above (below) "1.00"

- Eventually, we will use the new case-mix weights to adjust the home health base payment amount

  - Higher resource need episodes are assigned higher case-mix weights and thereby receive more payment

Case-Mix Weights Calculation

- Calculate each group's **case-mix weight** as the group's predicted mean cost relative to the overall average
  - ***Resource use*** is our measure of episode cost
  - Groups with higher (lower) than average resource use are assigned case-mix weights above (below) "1.00"

Grouping	**Group 1**	**Group 2**	**Group 3**
Predicted Resource Use:	$600	$1,800	$4,800
Relative to Average: [= $2,400]	$600/$2,400 =	$1,800/$2,400 =	$4,800/$2,400 =
Implied ***Case-Mix Weight***:	0.250	0.750	2.000

Case-Mix Weights Impact on Payment

- Case-mix weights adjust the home health base payment amount
  - Higher case-mix weights → Higher episode payments

Home Health Groupings Model Episode Payment Determination
(Episode Base Payment Amount) x (***Case-Mix Weight***) x (Wage Index)
+
Outlier Payment Amount
=
Home Health Episode Total Episode Payment

Analytic Sample to Compare HHGM Payment Weights

- Medicare home health episodes ending in 2016
  - Exclude Low Utilization Payment Amount episodes (<5 visits) in the current payment system

- To current payment system case-mix weights, we compare HHGM weights (30-day and 60-day weights)

- We average 30-day weights to their originating 60-day episode for comparison

Simulating Case-Mix Weights: Two 30-day Periods

Current Payment System	HHGM (30-Day) System	Case-Mix Weight Comparison
60-day Episode (Case-mix Weight="X")	30-day Period #1 (Case-mix Weight="A")	"X" vs. [("A"+"B")/2]
	30-day Period #2 (Case-mix Weight="B")	

Simulating Case-Mix Weights: One 30-day Period

Current Payment System	HHGM (30-Day) System	Case-Mix Weight Comparison
60-day Episode (Case-mix Weight="X")	30-day Period #1 (Case-mix Weight="A")	"X" vs. "A"
	< Missing >	

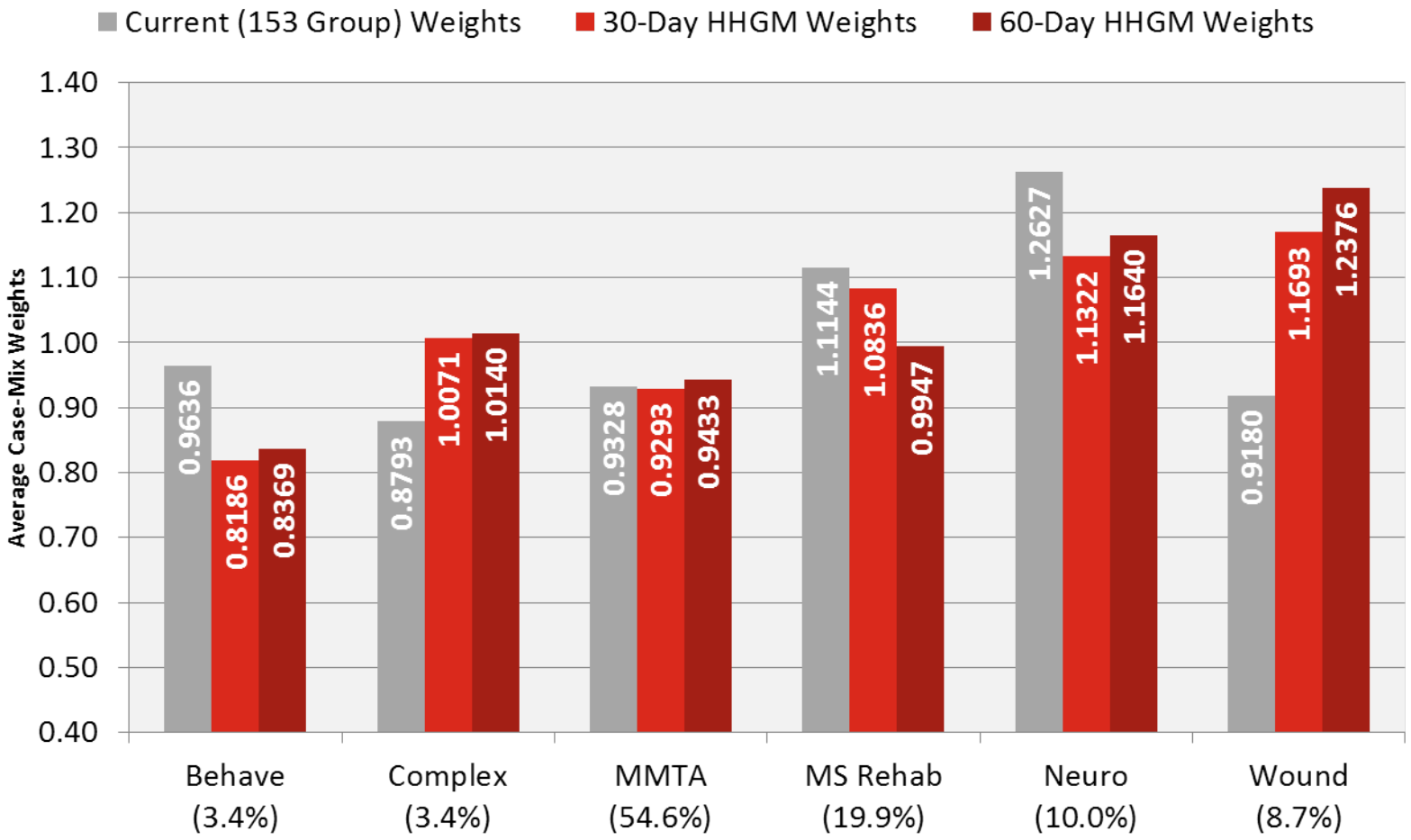
Results

- Three sets of results: Average Case-Mix Weights across…
  1. HHGM episode characteristics
  2. Home health agency characteristics
  3. Clinical characteristics of patients

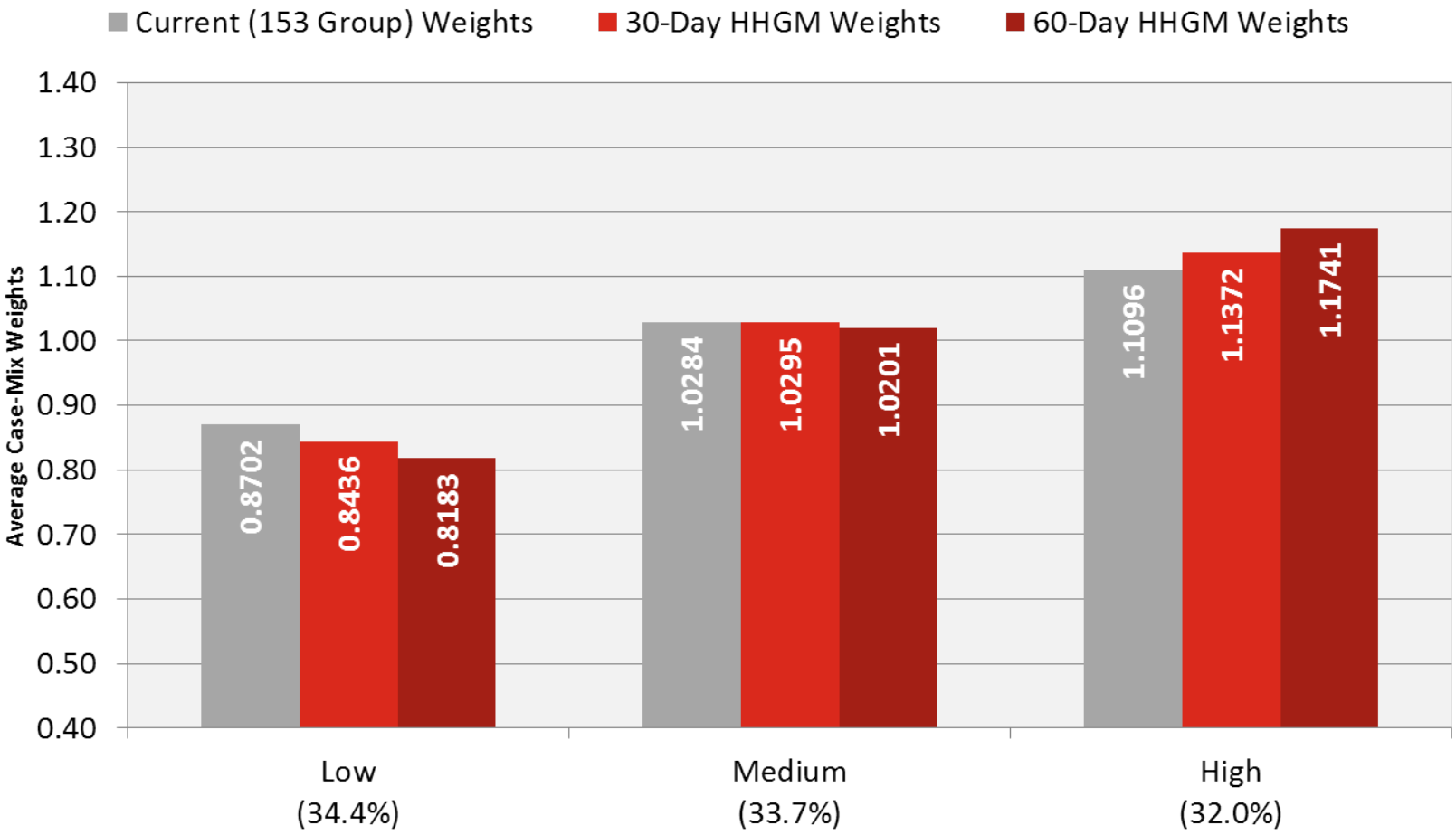
Average Case-Mix Weights across HHGM Episode Characteristics

- In this section we examine changes in case-mix weights across the characteristics that determine HHGM buckets/groupings:
  - Clinical grouping
  - Functional level
  - Admission source
  - Timing
  - Comorbidity adjustment

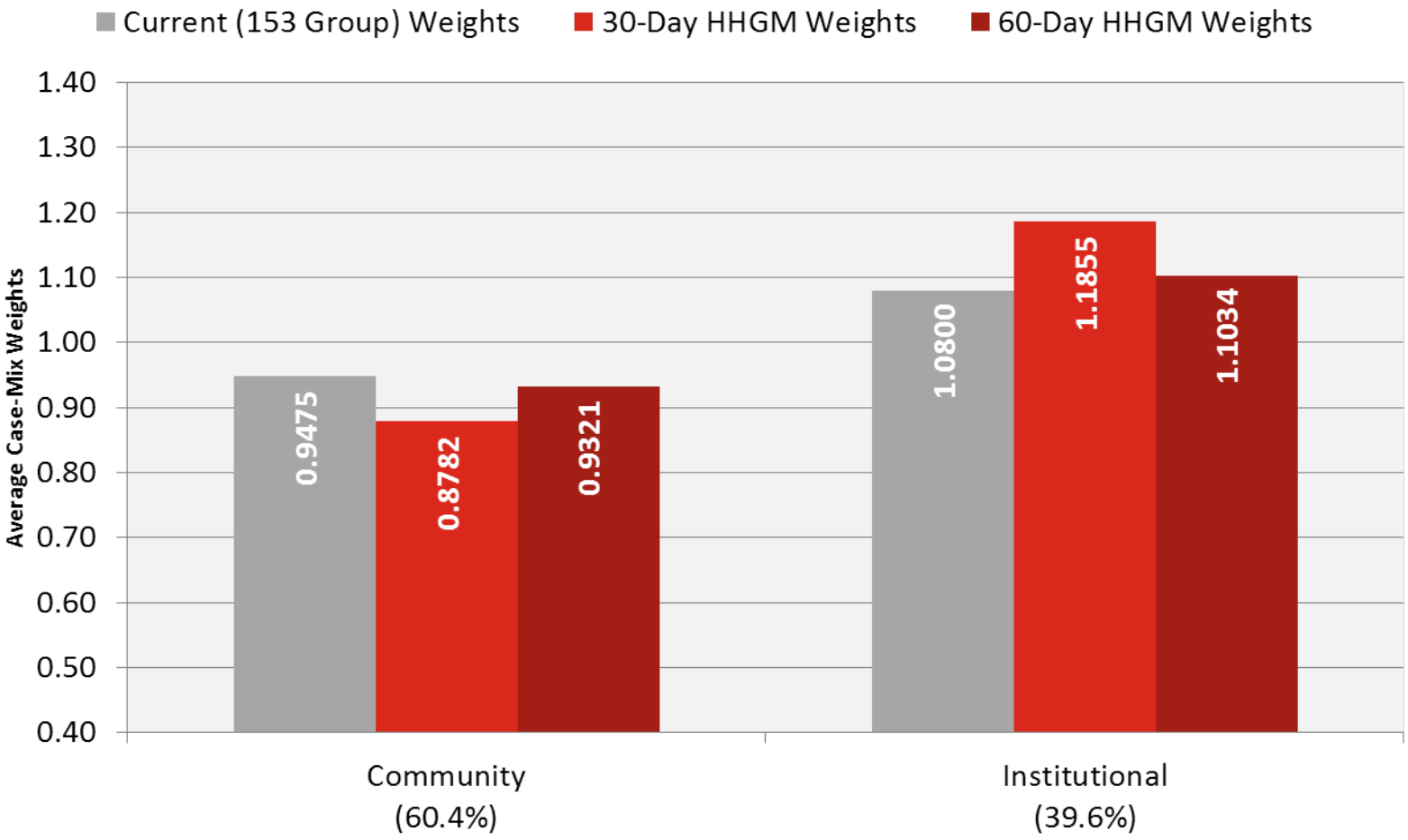
Average Case-Mix Weights, by Clinical Grouping



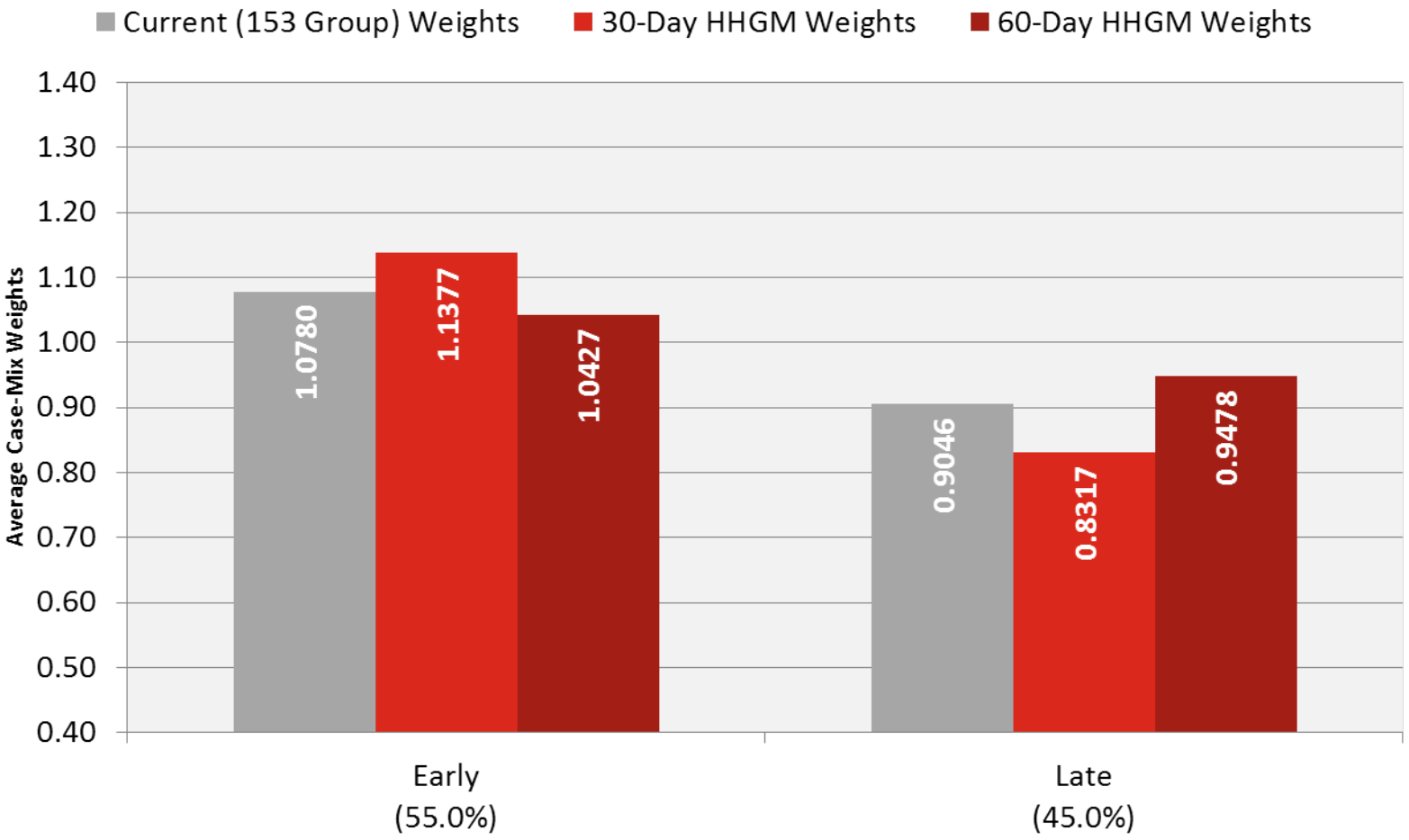
Average Case-Mix Weights, by Level of Functional Limitations



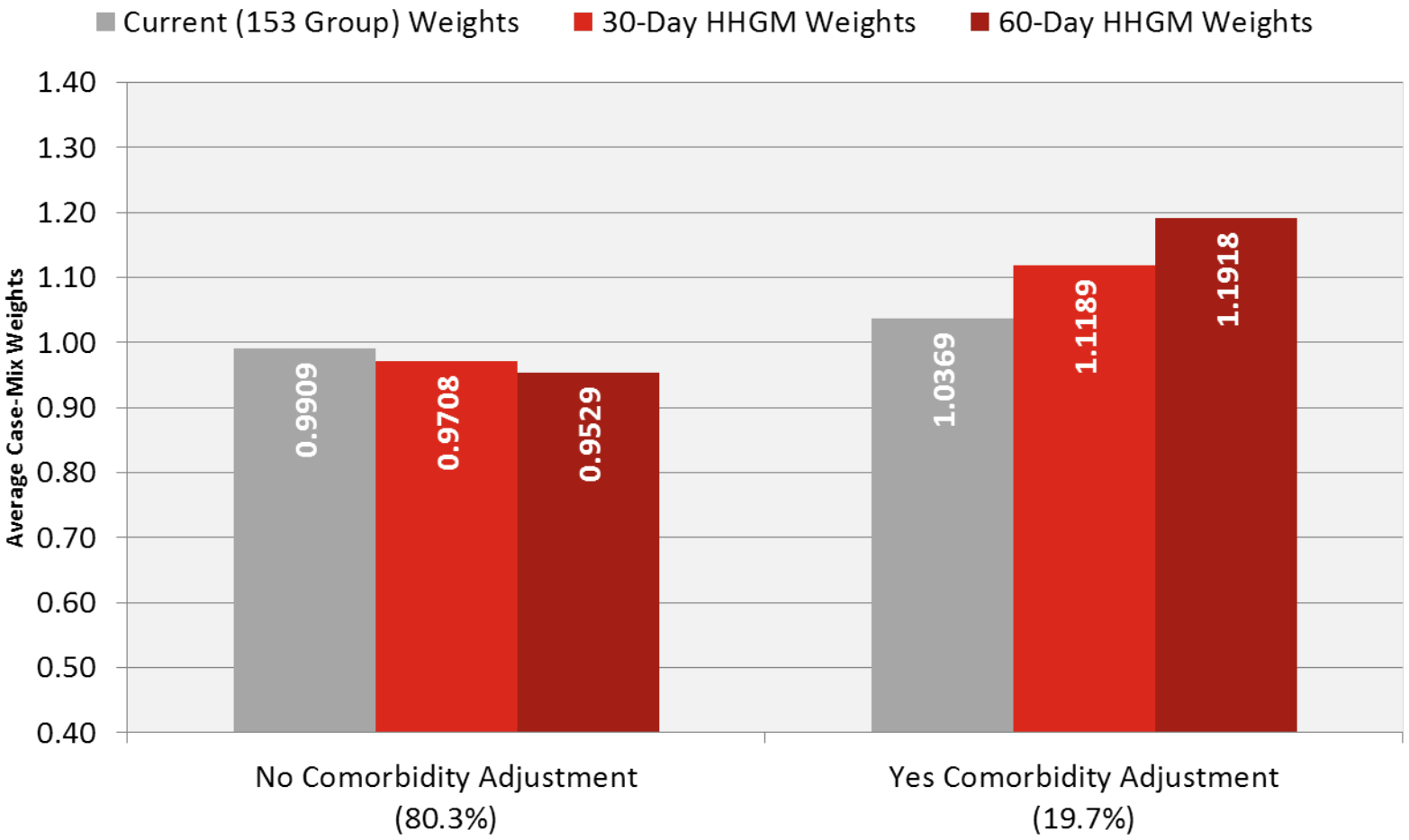
Average Case-Mix Weights, by Admission Source



Average Case-Mix Weights, by Timing



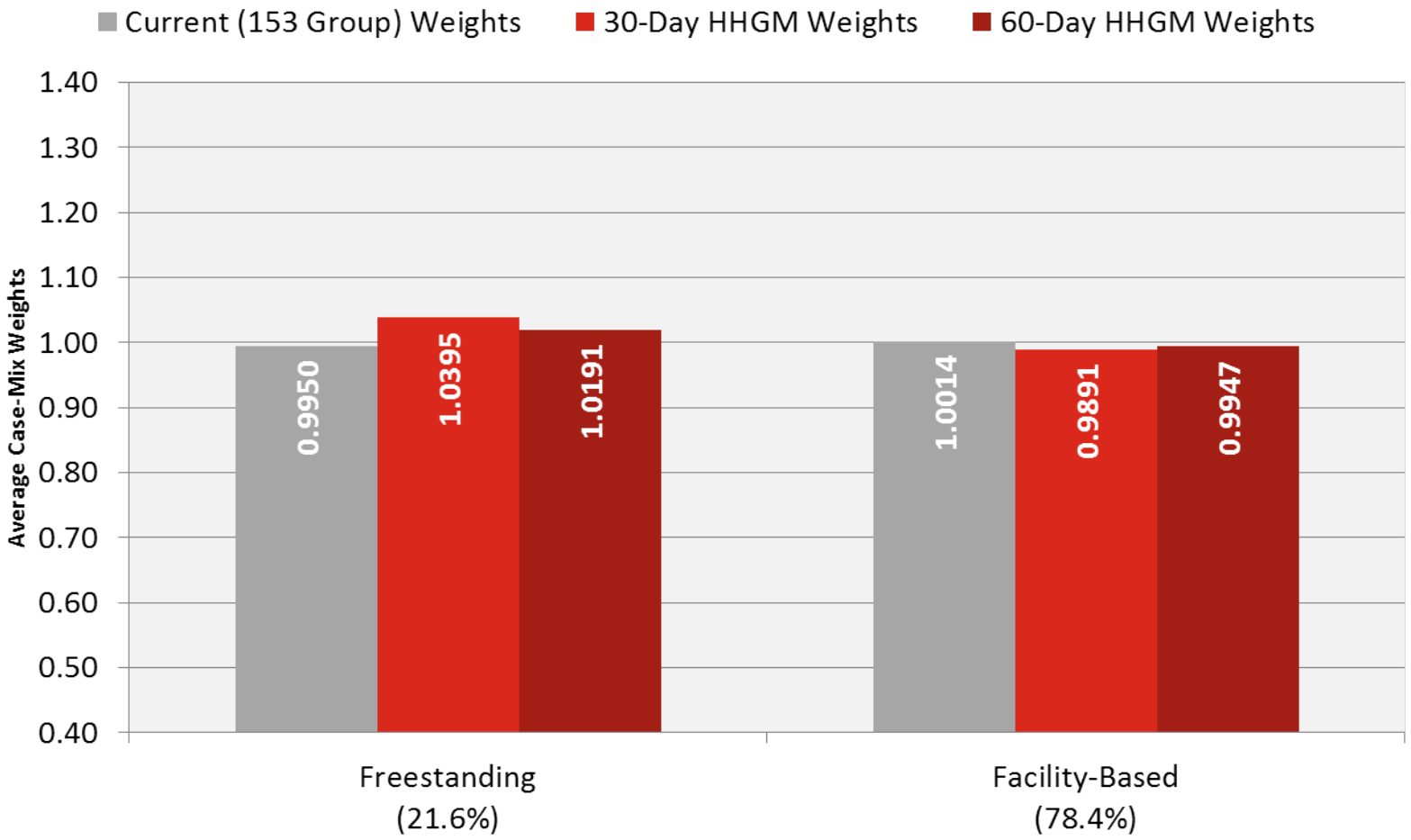
Average Case-Mix Weights, by Comorbidity Adjustment



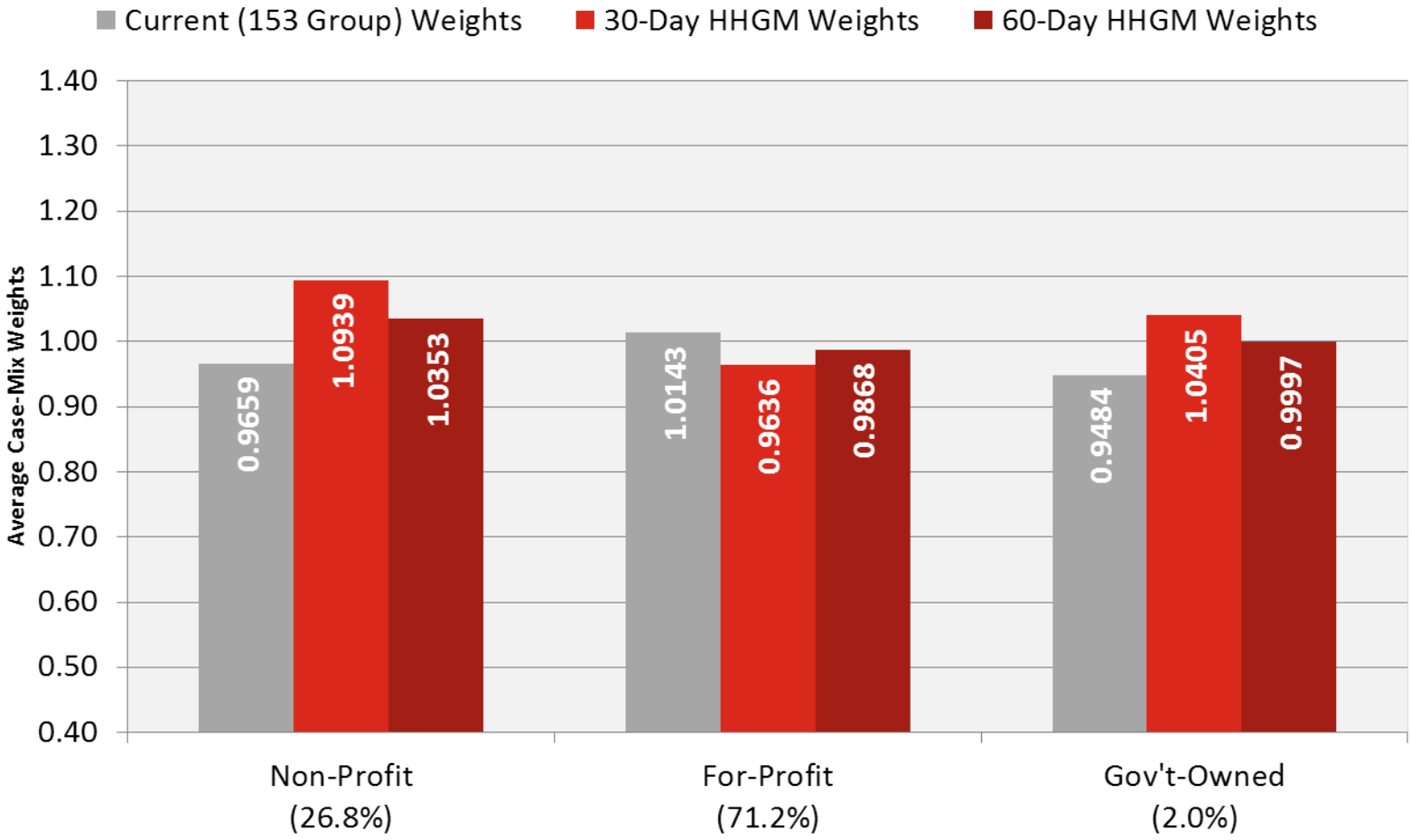
Average Case-Mix Weights across Home Health Agency Characteristics

- In this section we examine changes in case-mix weights across characteristics of home health agencies
  - Freestanding vs. facility-based status
  - Ownership type
  - Census region
  - Urban/rural status
  - Agency total nursing/therapy visits ratio
  - Size (# of episodes served)

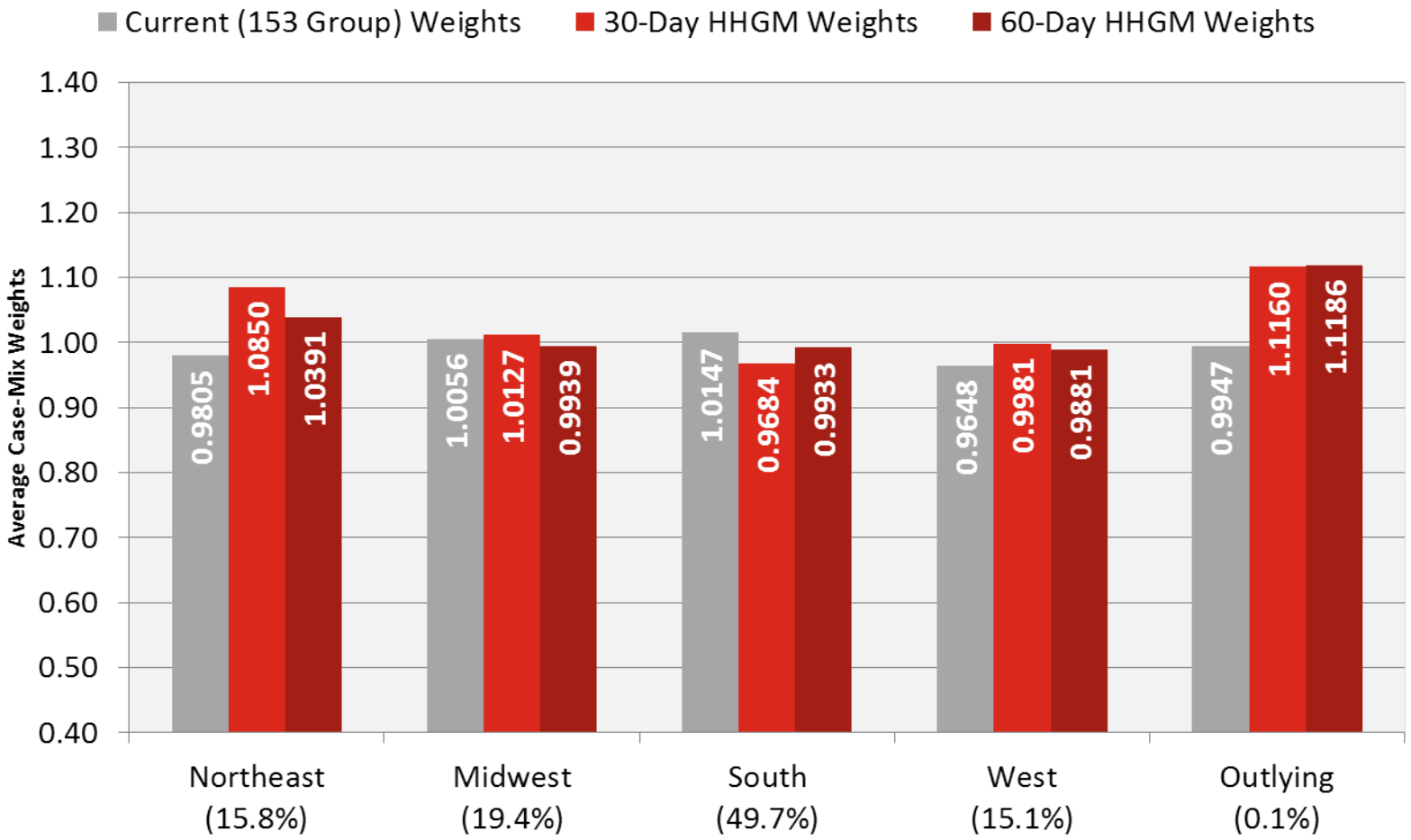
Average Case-Mix Weights, by Facility Type



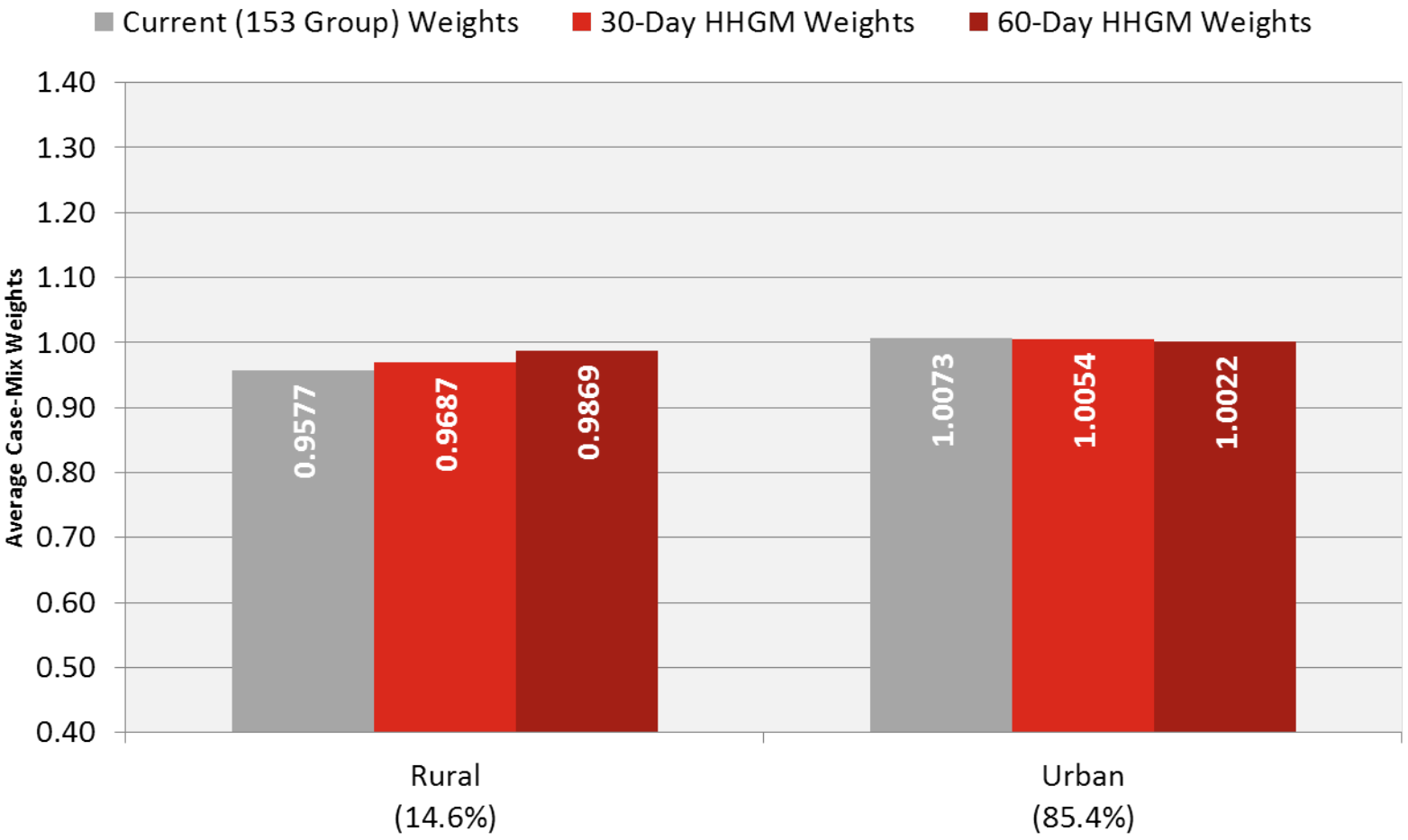
Average Case-Mix Weights, by Ownership Type



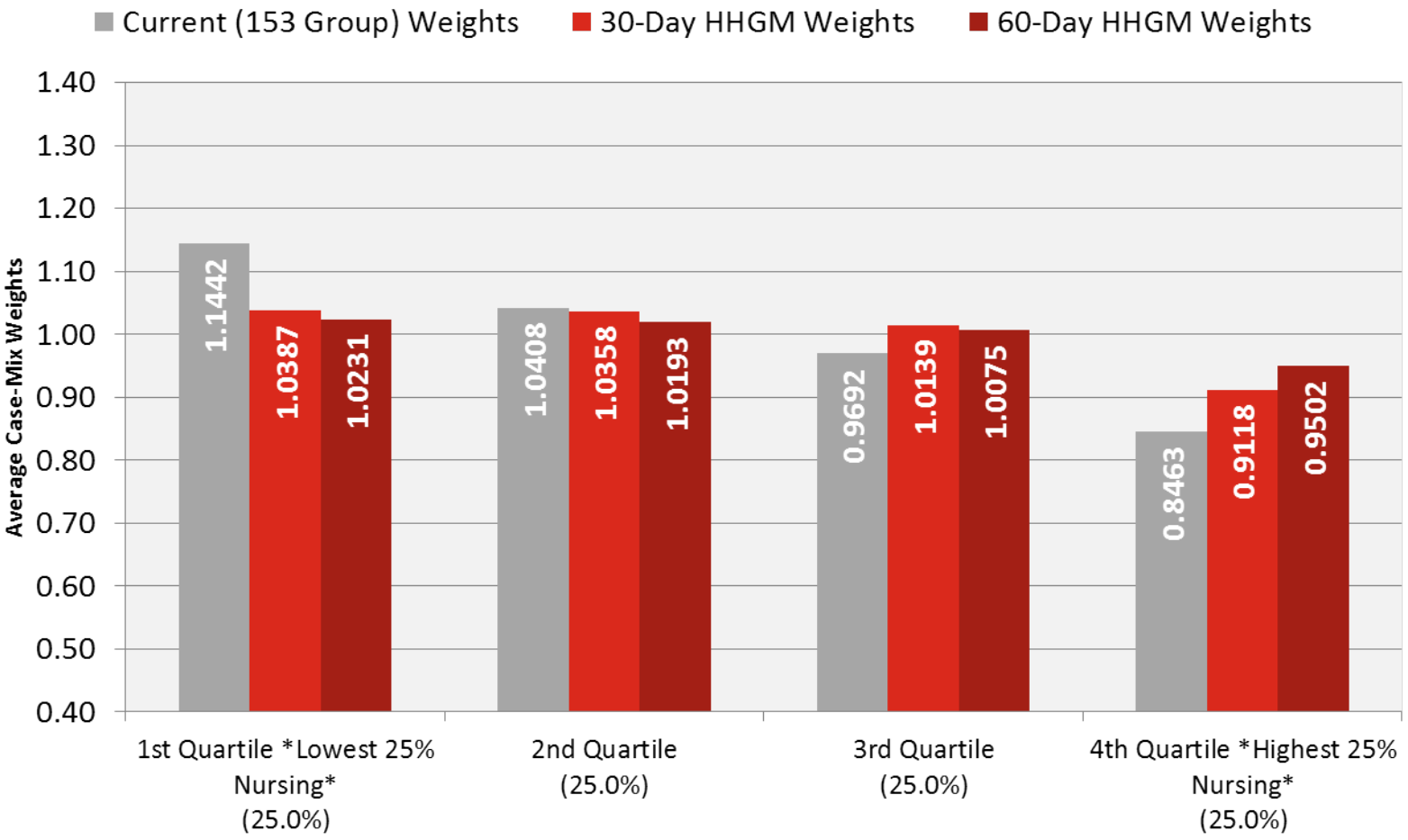
Average Case-Mix Weights, by Region



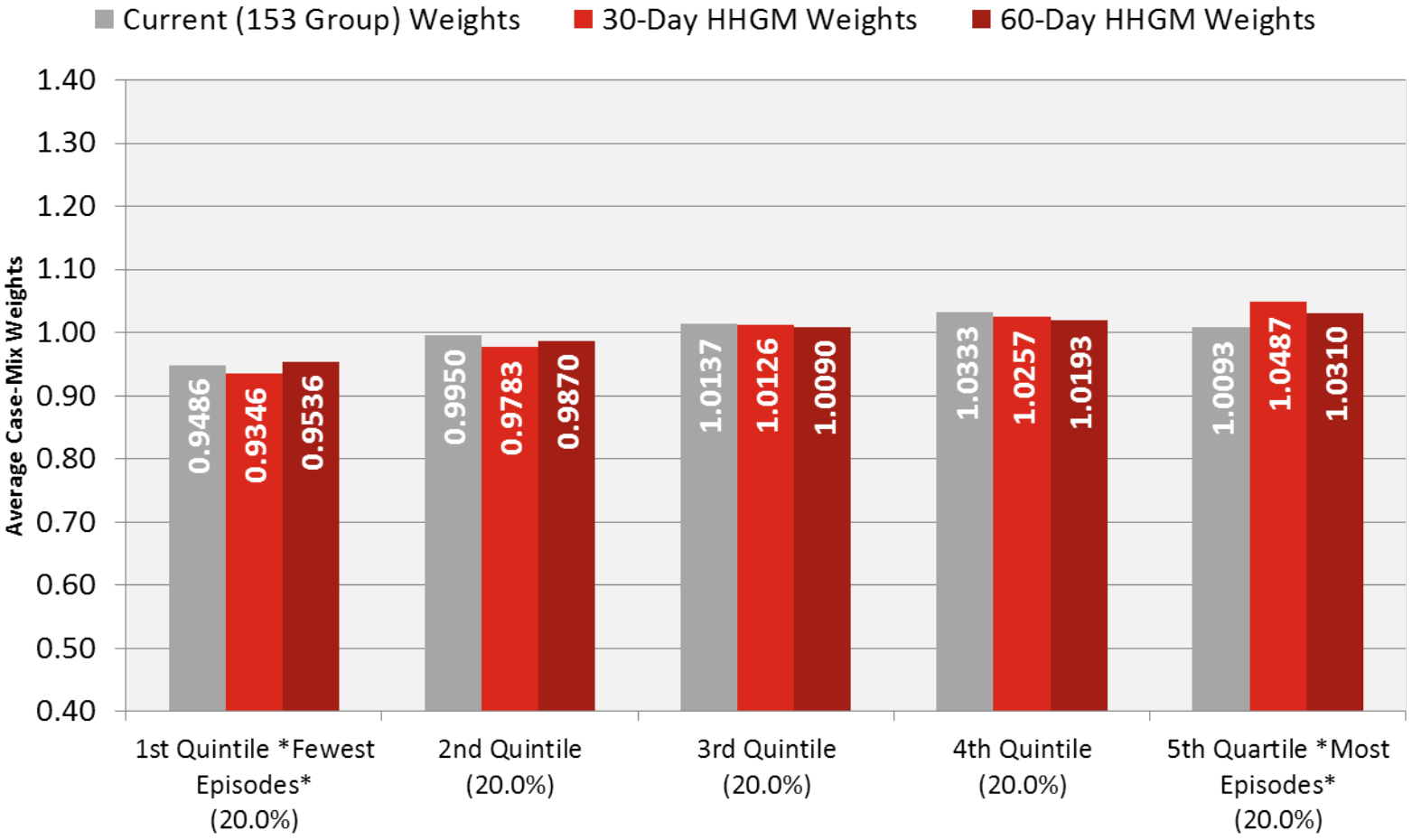
HHGM Case-Mix Changes, by Urban/Rural Status



HHGM Case-Mix Changes, by Total Nursing to Therapy Visits Ratio



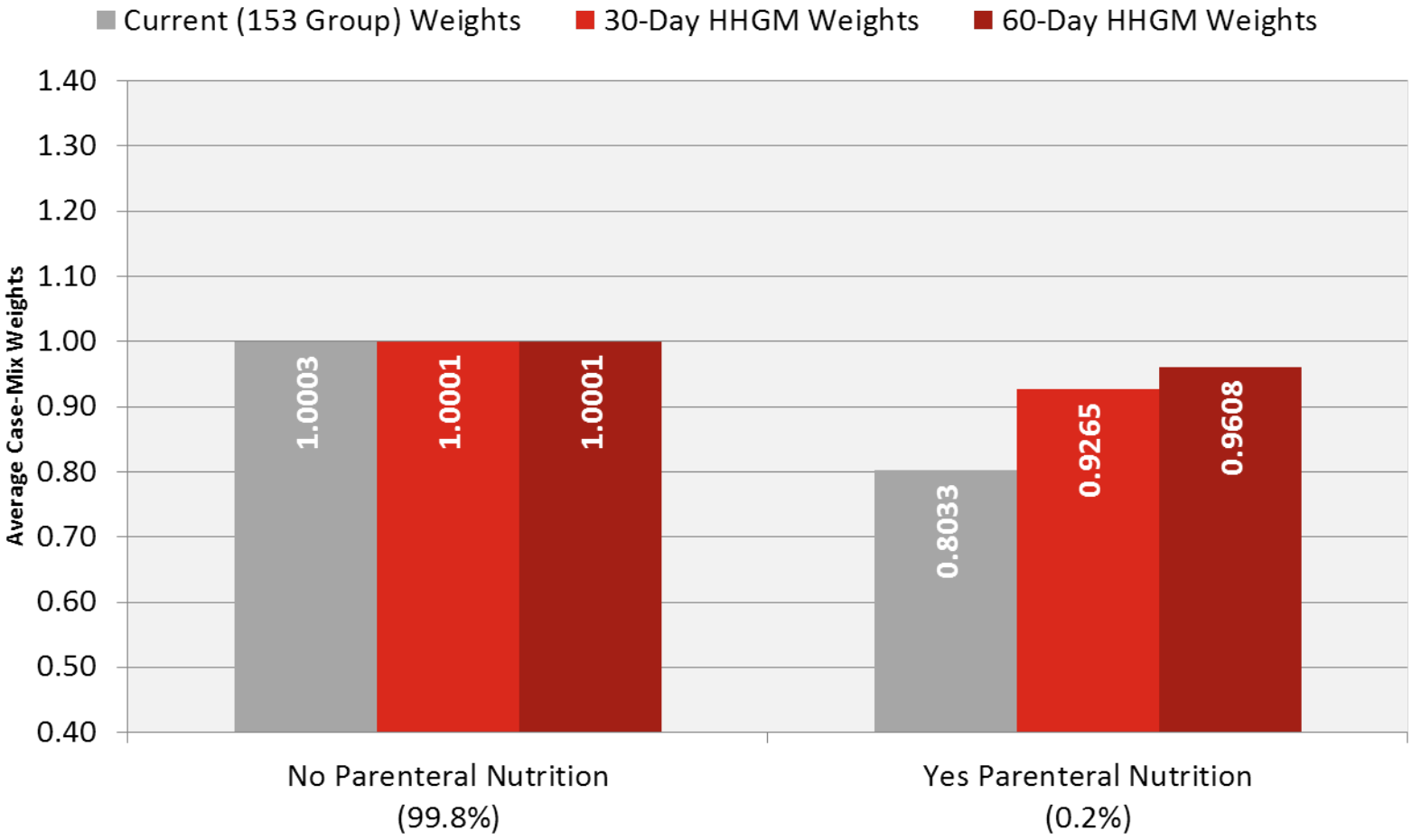
Average Case-Mix Weights, by Facility Size (in Episodes)



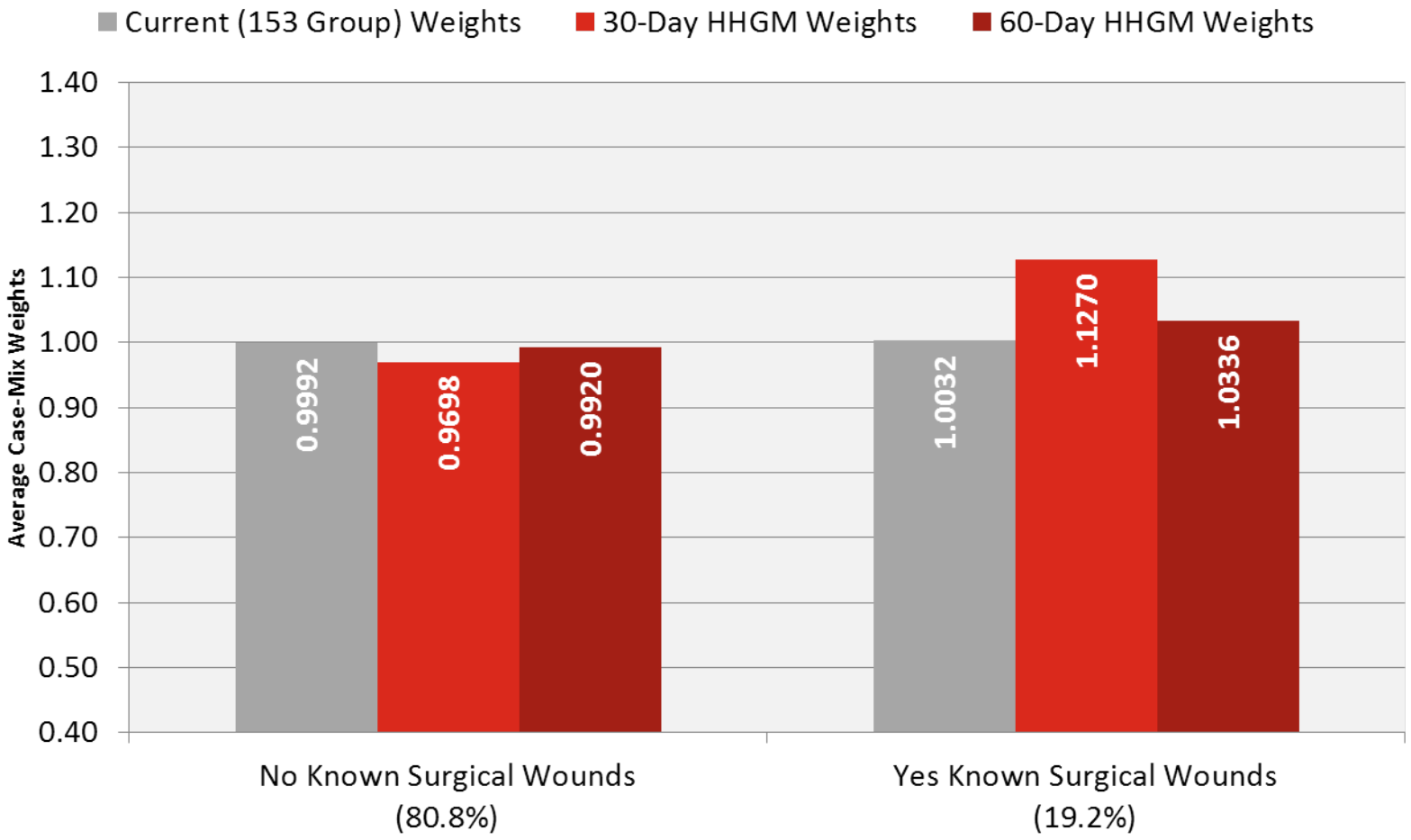
Average Case-Mix Weights across Patient Characteristics

- In this section we examine HHGM case-mix weight changes across clinical characteristics of the patient:
  - Parenteral nutrition
  - Surgical wounds
  - Ulcers
  - Bathing independence
  - Poorly-controlled cardiac dysrhythmia, diabetes, peripheral vascular disease, or pulmonary disorder
  - Open wound/lesion
  - Temporary or fragile/serious health risk
  - Grooming
  - Risk of hospitalization
  - Cognitive functioning

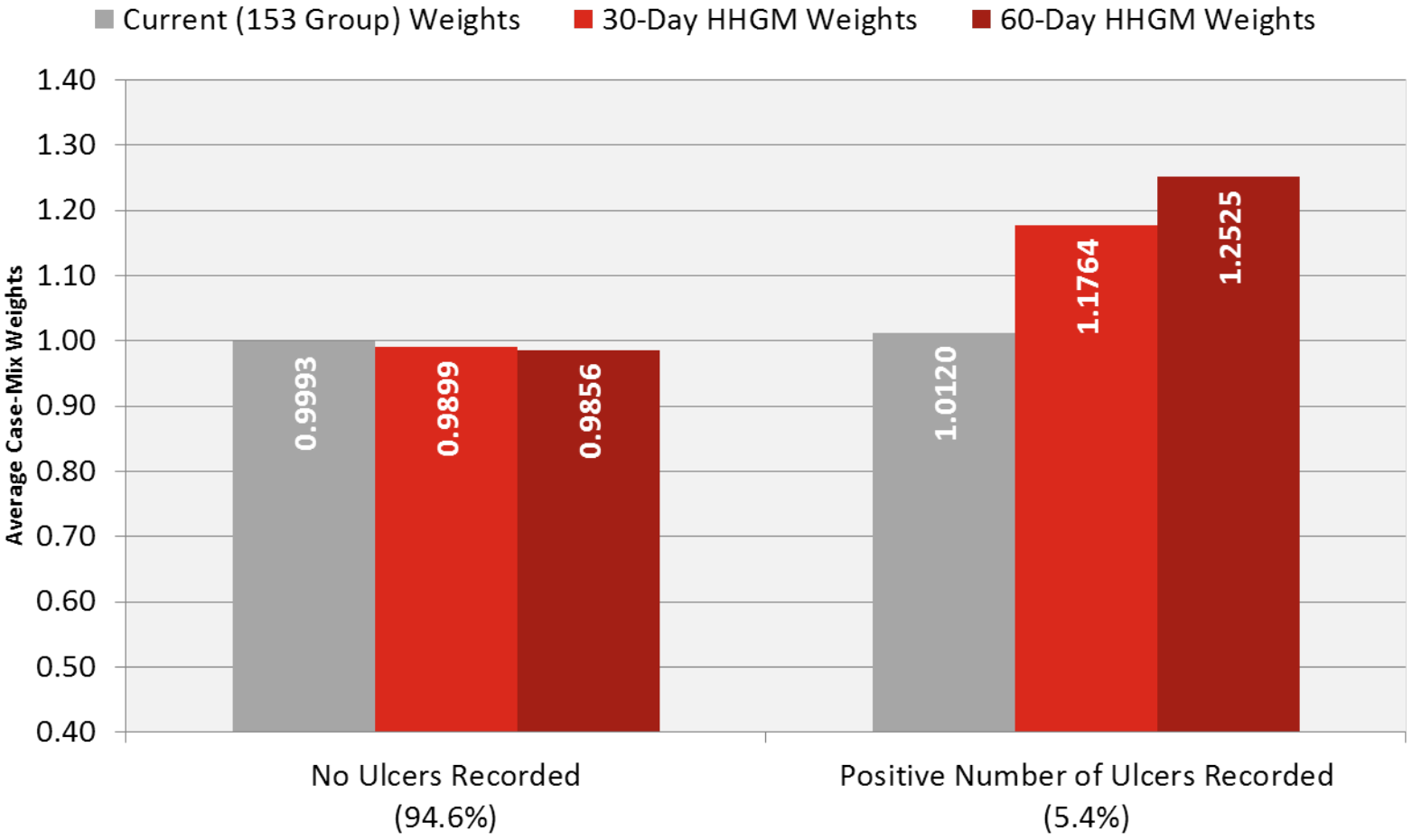
Average Case-Mix Weights, by Parenteral Nutrition



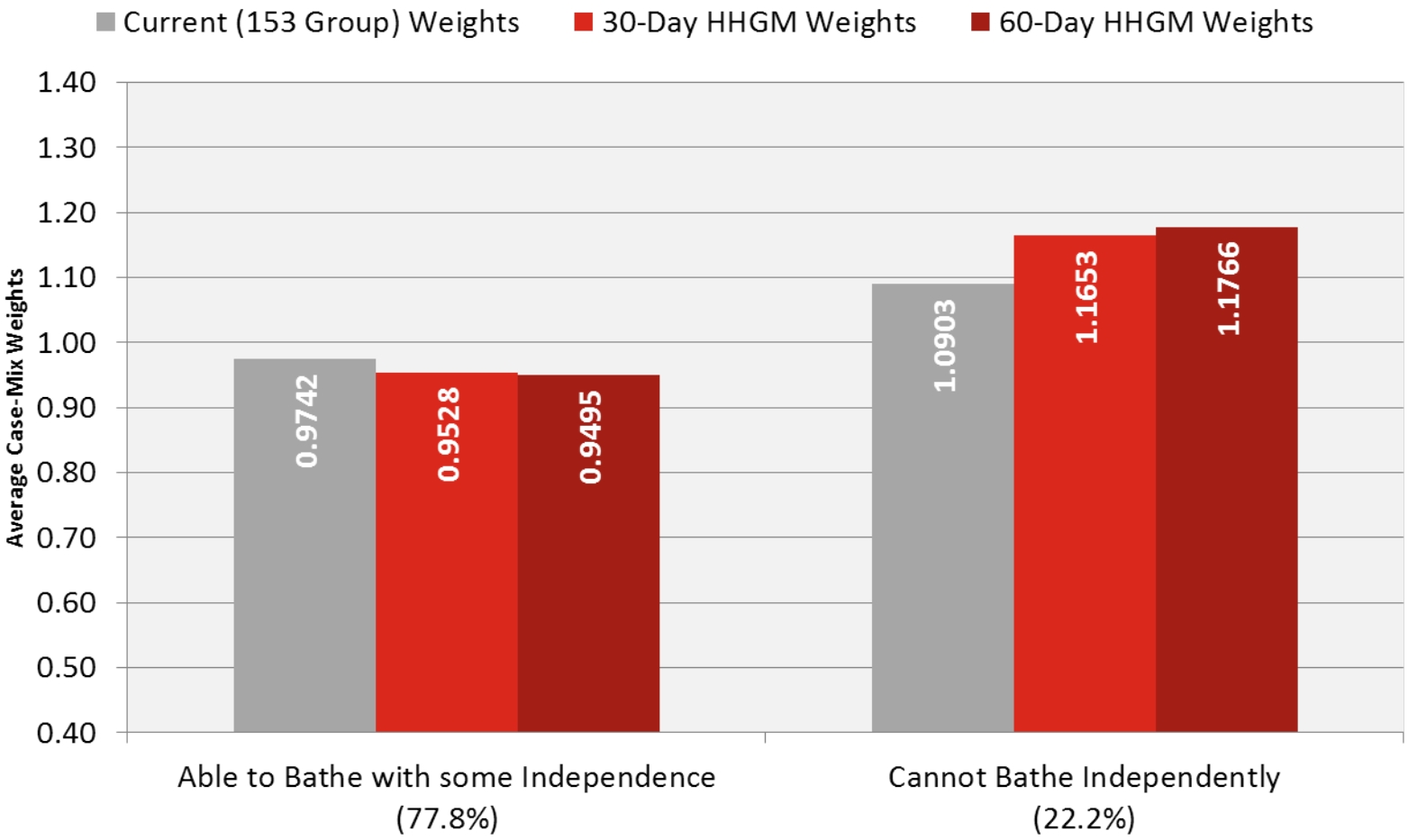
Average Case-Mix Weights, by Surgical Wounds



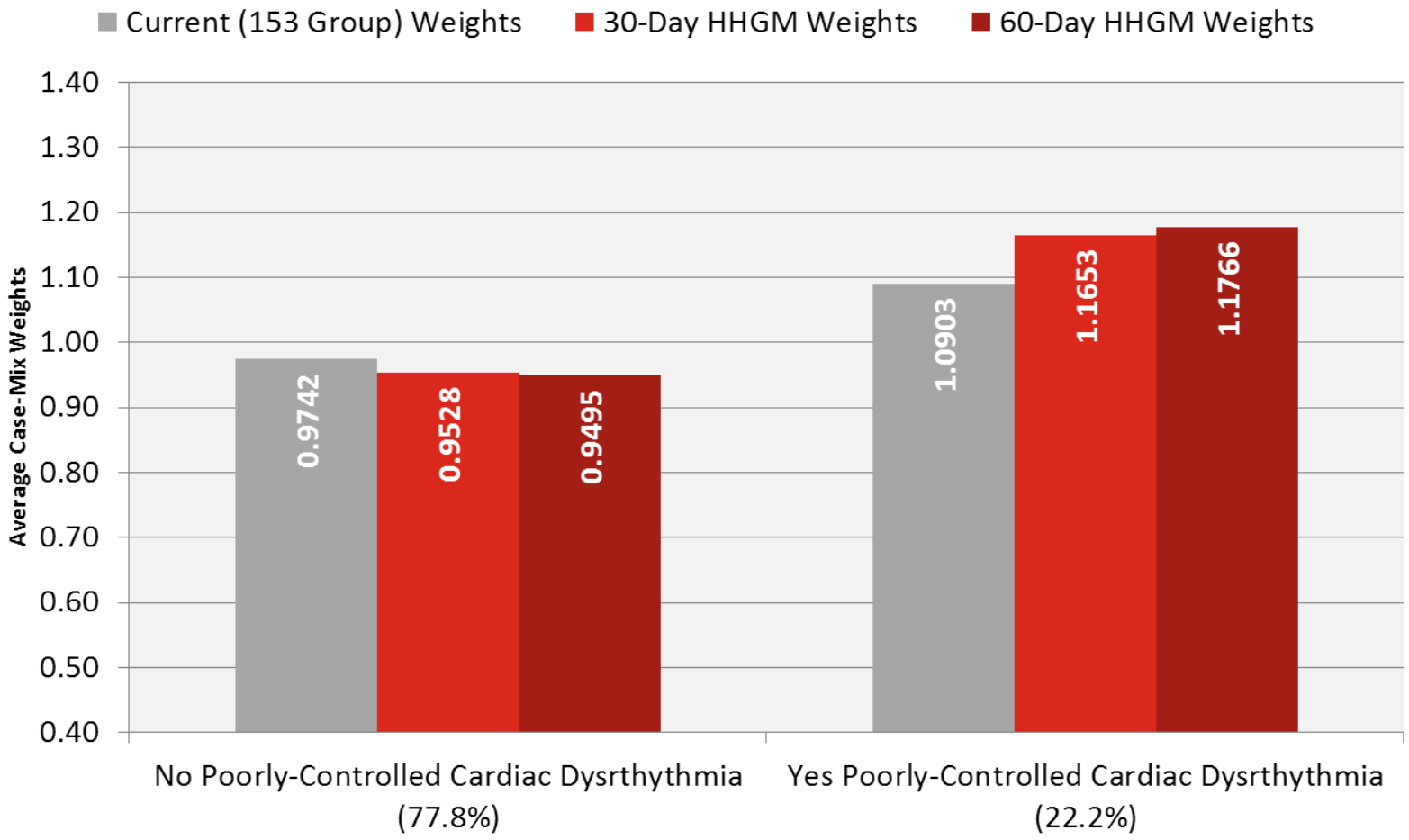
Average Case-Mix Weights, by Ulcers



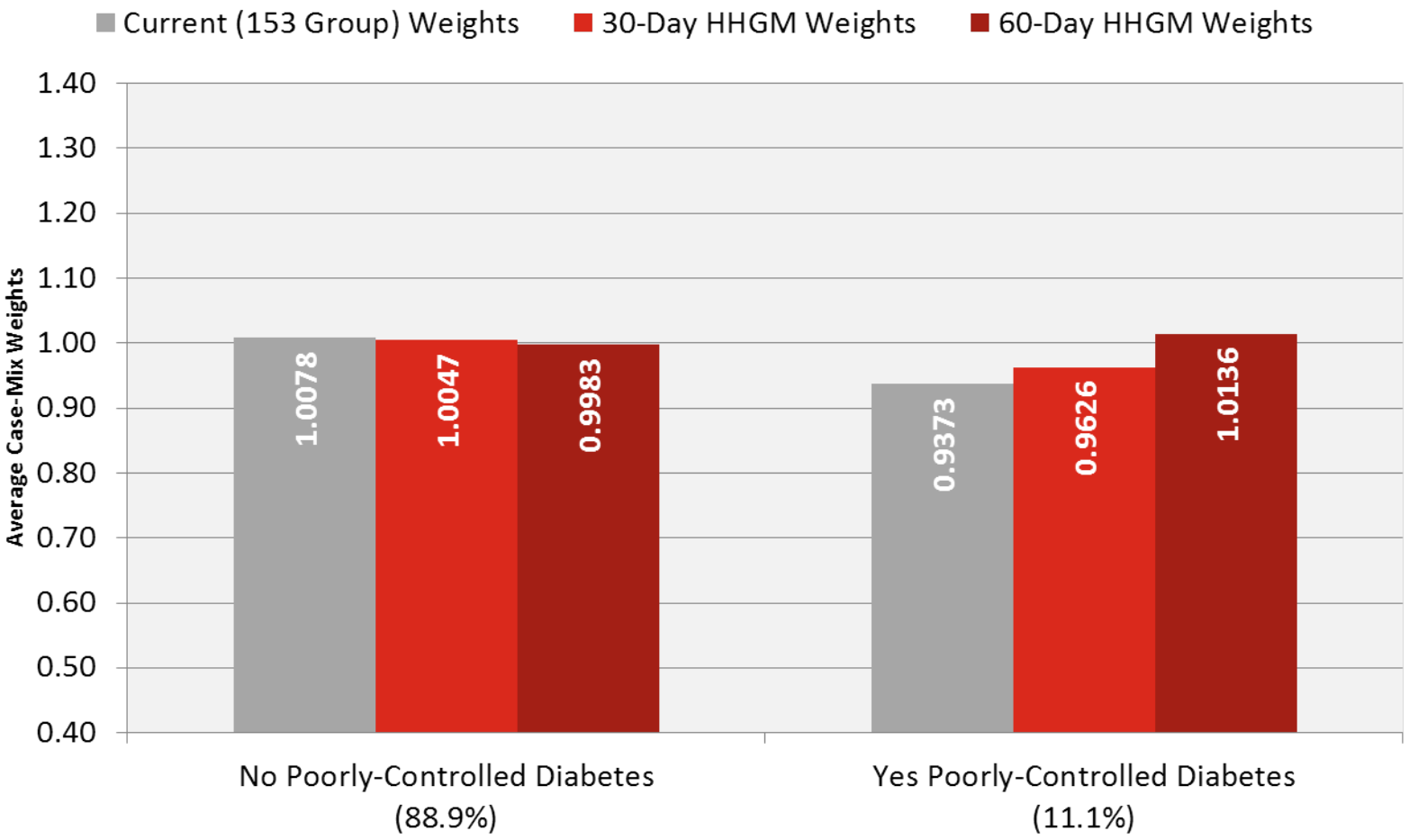
Average Case-Mix Weights, by Bathing



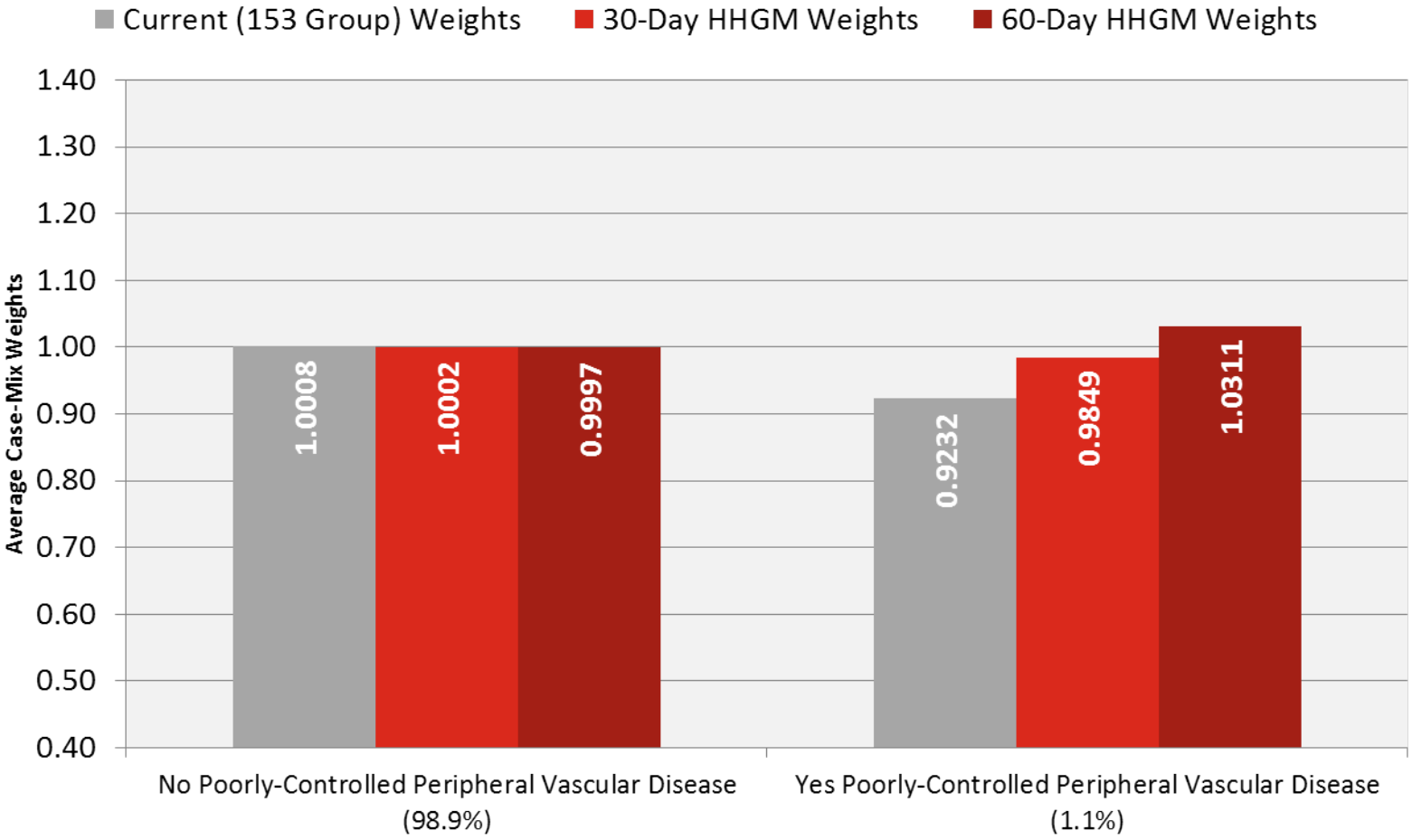
Average Case-Mix Weights, by Cardiac Dysrhythmia



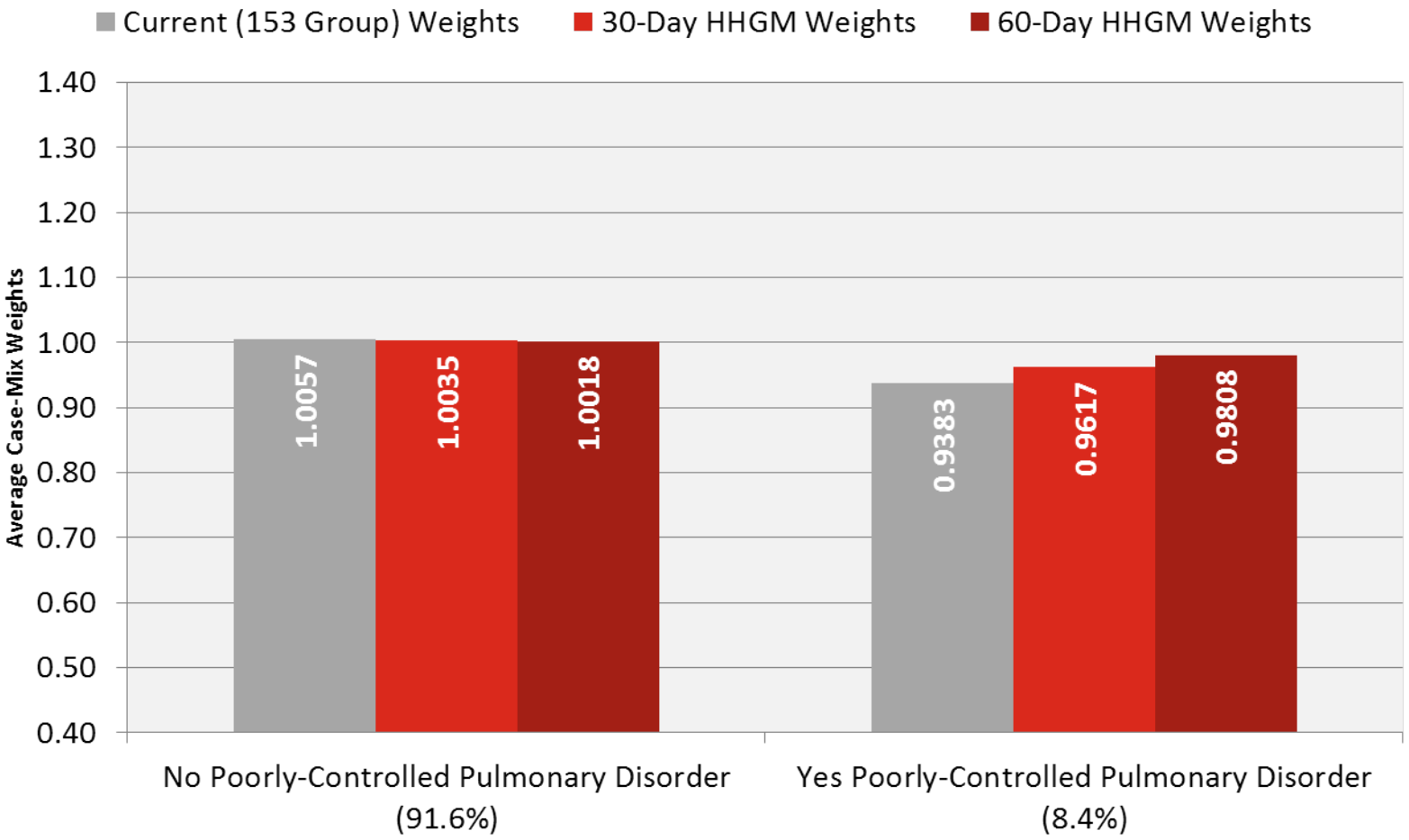
Average Case-Mix Weights, by Diabetes



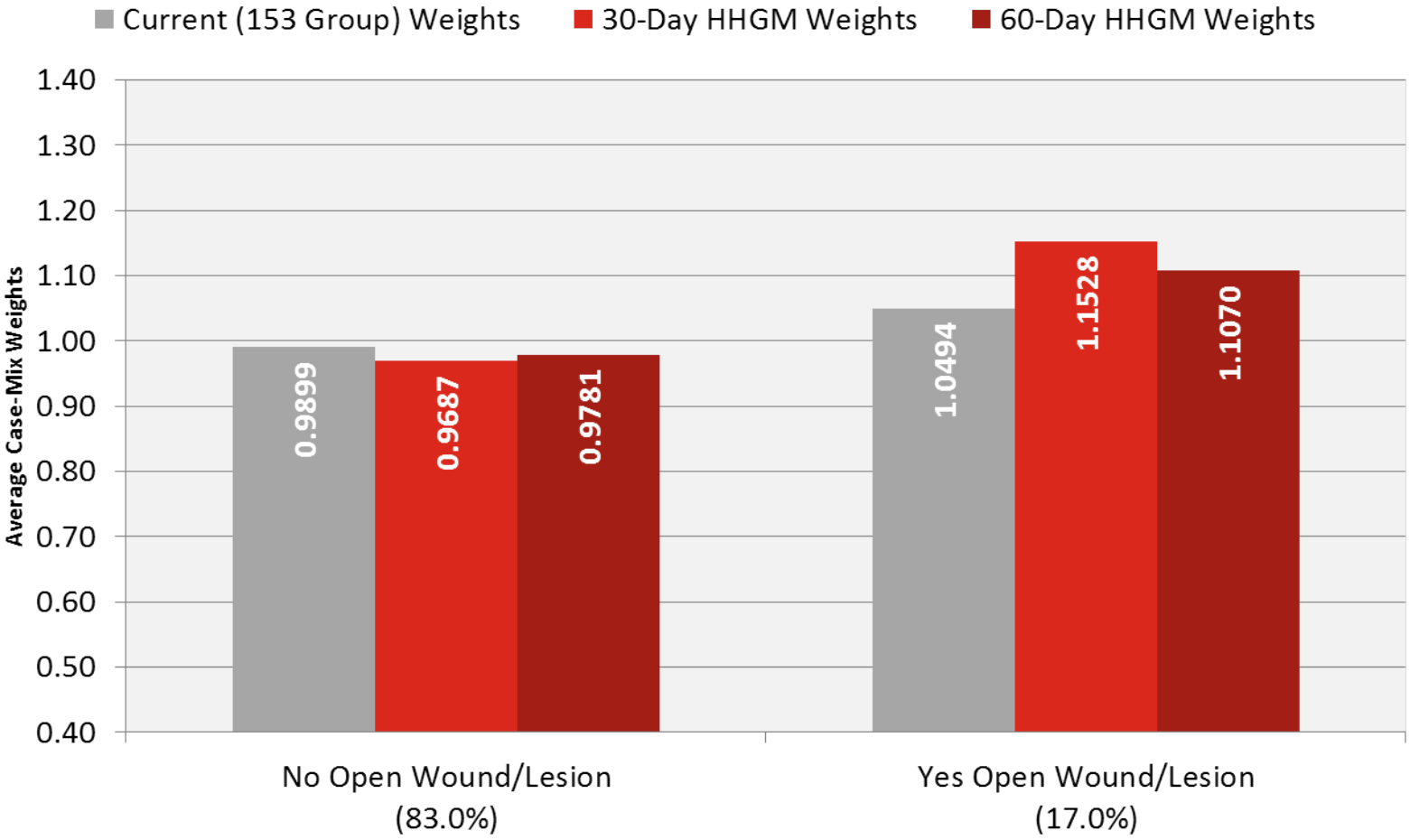
Average Case-Mix Weights, by Peripheral Vascular Disease



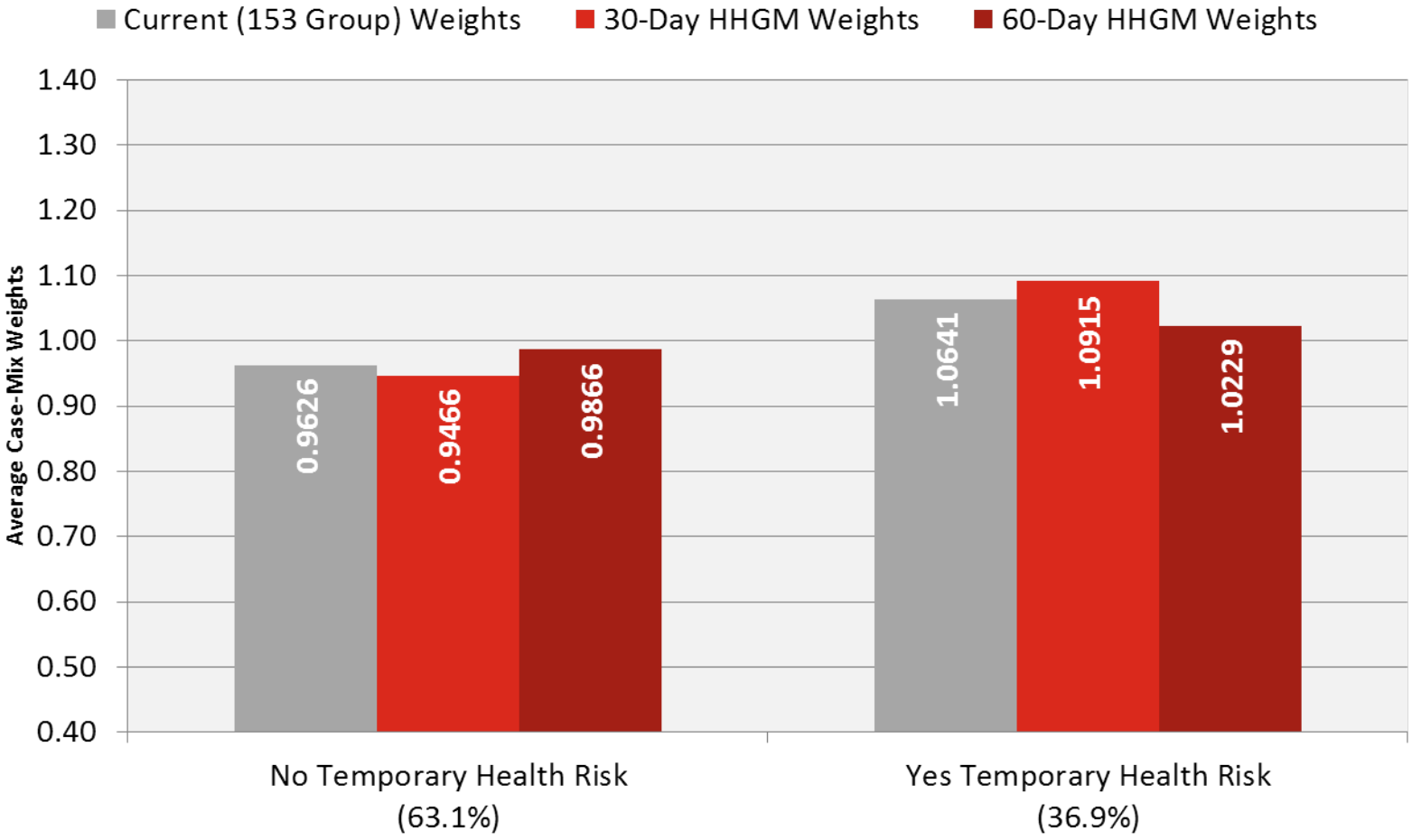
Average Case-Mix Weights, by Pulmonary Disorder



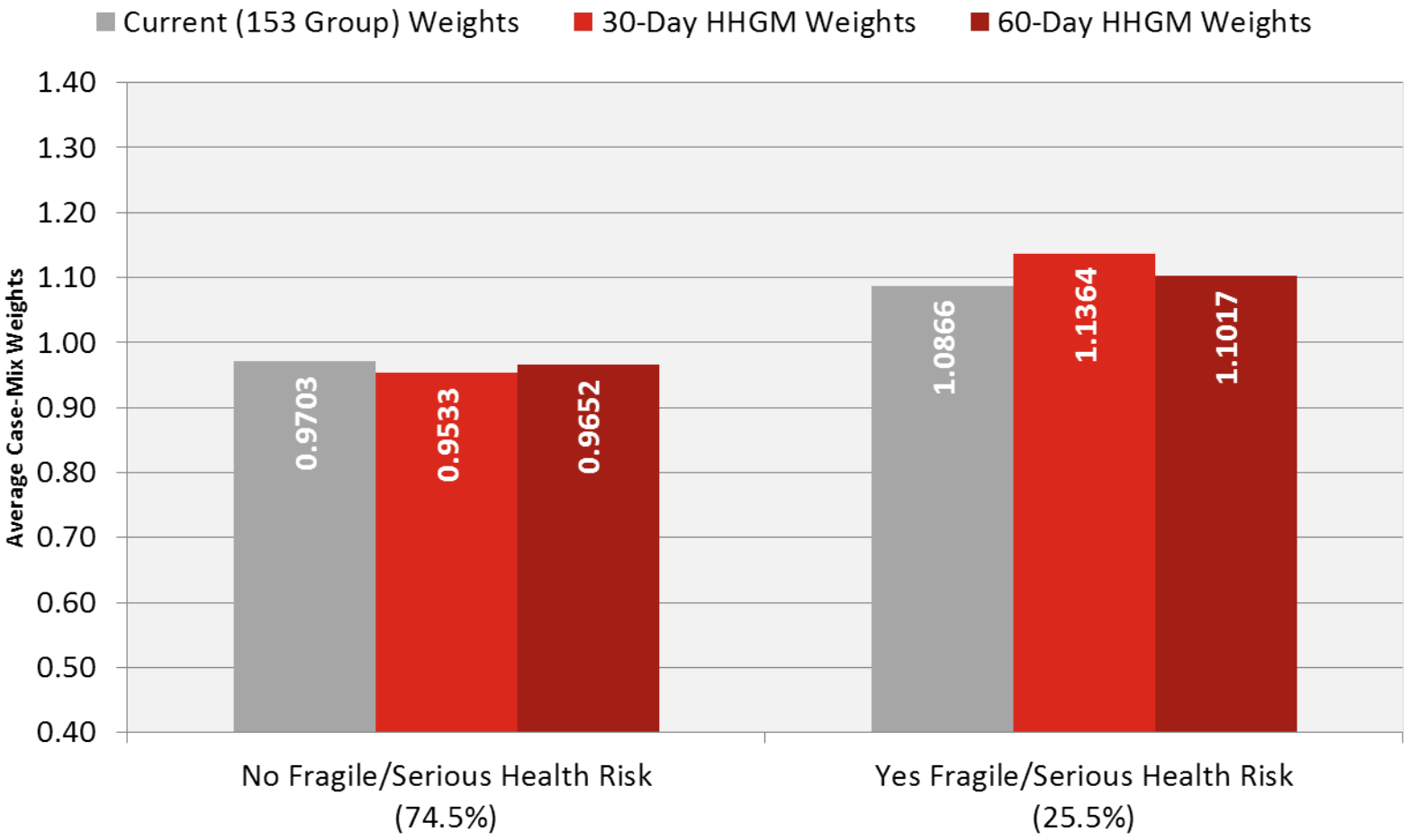
Average Case-Mix Weights, by Open Wound Presence



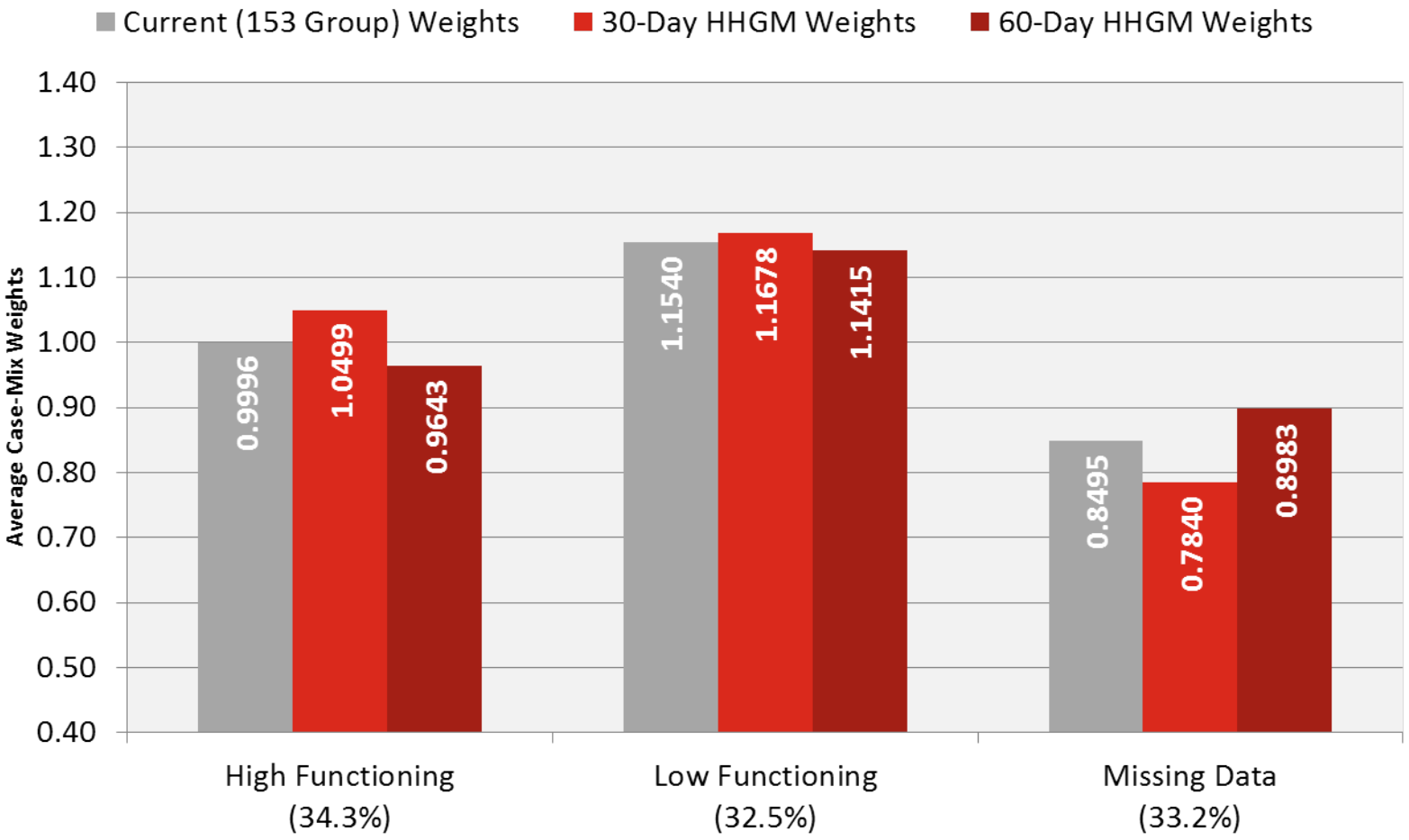
Average Case-Mix Weights, by Temporary Health Risk Status



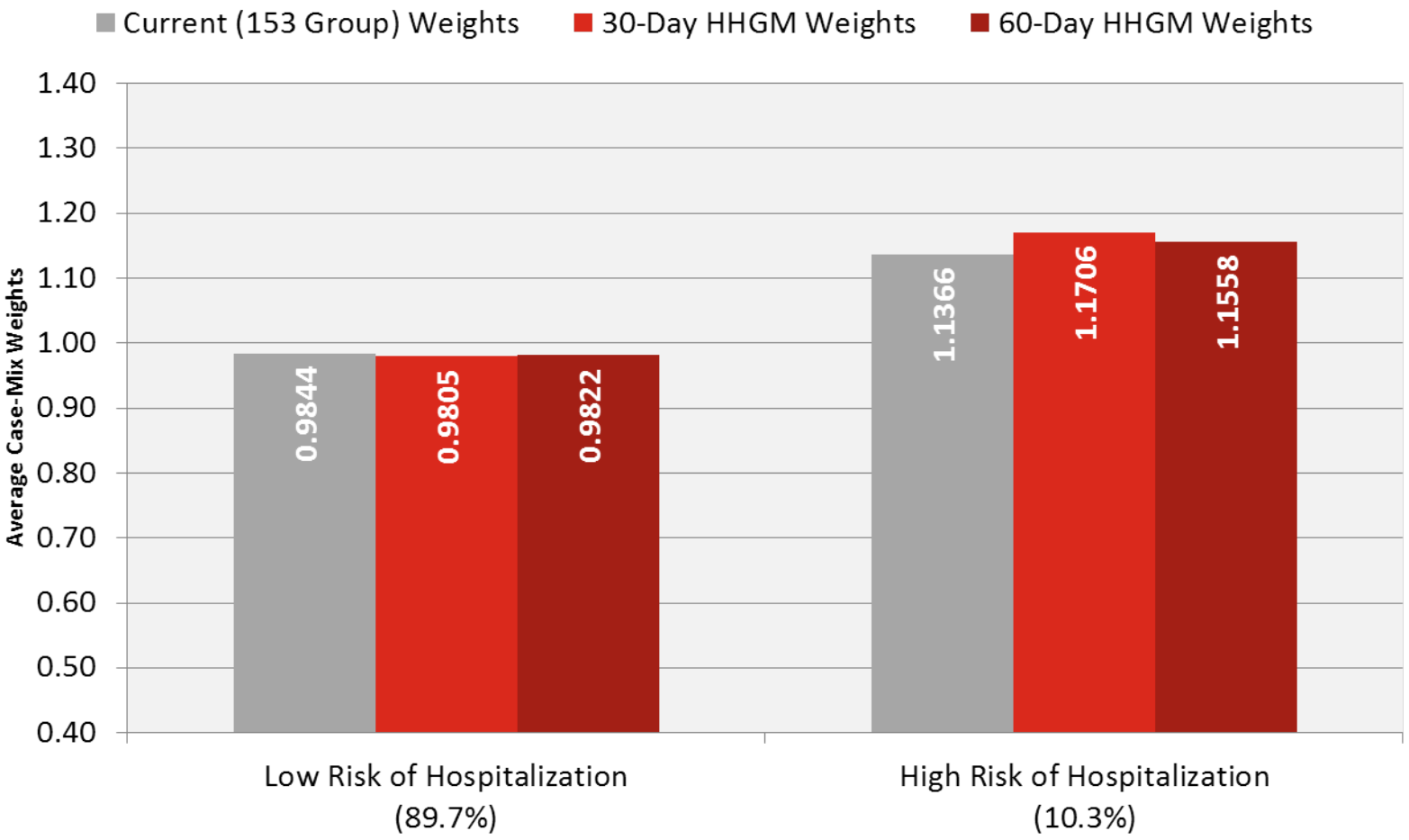
Average Case-Mix Weights, by Serious Health Risk Status



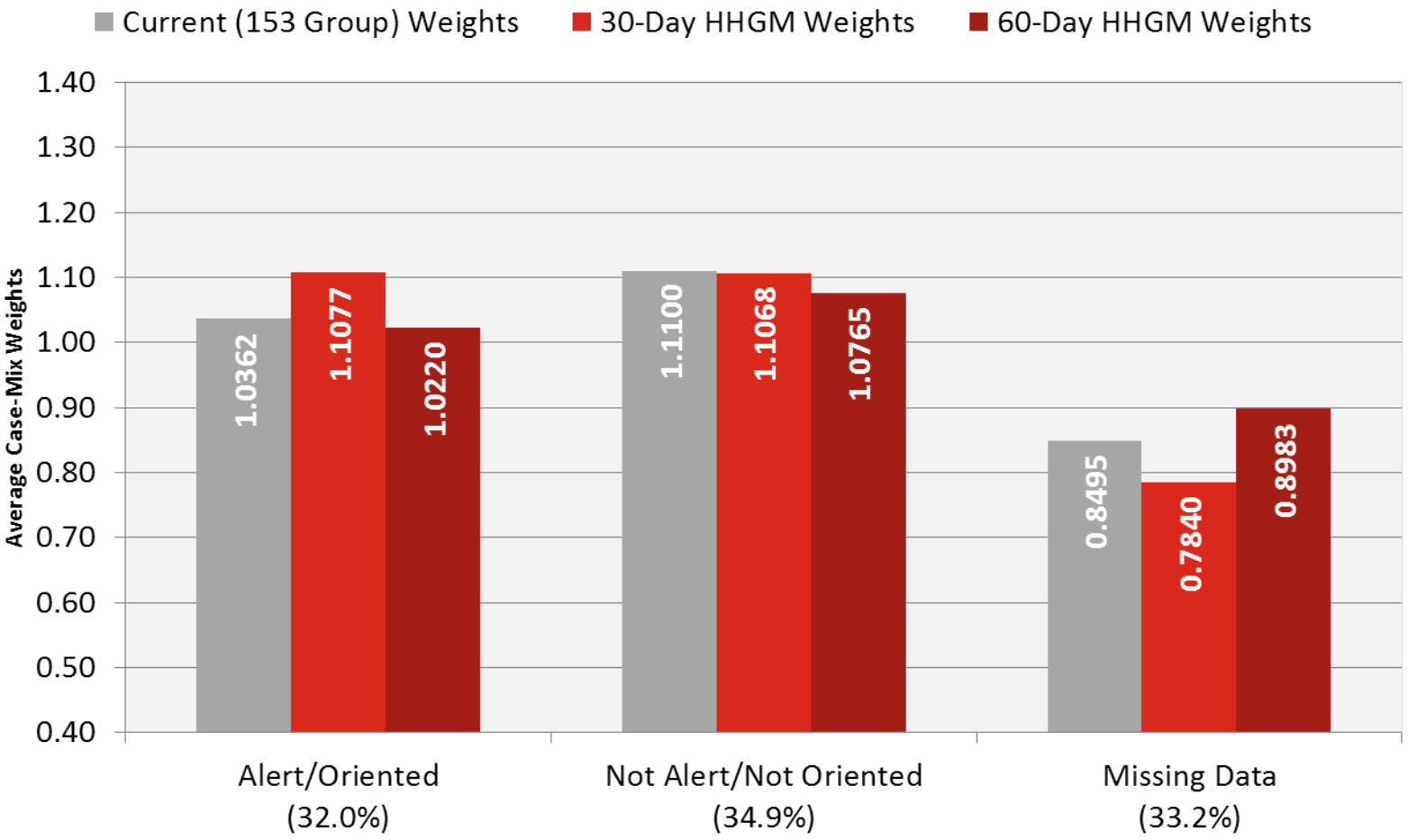
Average Case-Mix Weights, by Grooming



Average Case-Mix Weights, by Hospitalization Risk



Average Case-Mix Weights, by Cognitive Functioning



Summary of Findings

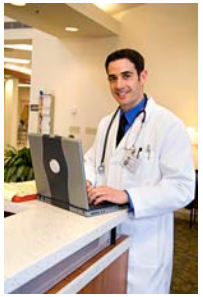
- Wound and complex episodes have higher payment weight, behavioral health, MS rehab and neuro rehab have lower; higher weights also with other indicators or higher severity

- Episodes treated by non-profits and those in the Northeast are simulated to have higher weights, agencies with a higher ratio of nursing will also have an average higher weight

Case-Mix Discussion

- Thoughts or comments?

Free Response



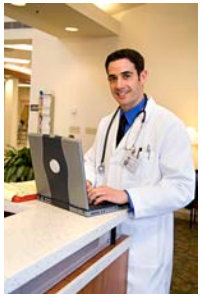
Alternative Approaches to Case-Mix Adjustment

- Tie payments to outcomes?
  - Beyond CMS's statutory authority
    - CMS is supposed to tie payments to costs. Case-mix adjustment is supposed to reflect variation in the cost of providing service
  - Difficult to pay claims timely
    - CMS will not know outcomes until well after the episode

Other topics?

- What other topics have we not discussed in relation to the case-mix model?
- How can the HHGM be improved?

Conclusions



Questions?

Please contact Erica Granor (Erica_Granor@abtassoc.com) and Michael Plotzke (Michael_Plotzke@abtassoc.com) regarding any questions you have

Thank you!

The regression results shown on pages 2–17 show the payment regression from the Home Health Groupings Model (HHGM). The payment regression estimates the relationship between resource use and the independent variables that make up the HHGM. Many different variations of the payment regression are shown.

- Pages 2–5 show regressions using the HHGM estimated using 30-day periods and where the Low Utilization Payment Adjustment (LUPA) threshold is set so that all 30-day periods with 2 or fewer visits are considered LUPAs.
- Pages 6–9 show regressions using the HHGM estimated using 30-day periods and where the LUPA threshold for each payment group is set using the 10th percentile value of visits to create a payment group specific LUPA threshold with a minimum threshold of at least 2 visits for each group.
- Pages 10–13 show regressions using the HHGM estimated using 60-day episodes and where the LUPA threshold is set so that all 60-day episodes with 4 or fewer visits are considered LUPAs.
- Pages 14–17 show regressions using the HHGM estimated using 60-day episodes and where the LUPA threshold for each payment group is set using the 10th percentile value of visits to create a payment group specific LUPA threshold with a minimum threshold of at least 4 visits for each group.

LUPAs are not included in the estimation of these models. Within each set of regressions, there are also many variations including estimates of the model:

- Using the Bureau of Labor Statistics (BLS) approach to construct resource use and using the Cost Per Minute + Non-Routine Supplies (CPM + NRS) approach to construct resource use
- With different sets of independent variables
- With and without the fixed effects term

The comorbidity regression on pages 18–22 show regression coefficients of the comorbidity model used to assign the comorbidity adjustment to the HHGM. The dependent variable in this model is resource use (calculated using CPM+NRS) and the HHGM adjustors besides comorbidity (timing, clinical level, functional level, and admission source) are included as independent variables. The highlighted variables and coefficients indicate those variables that have a coefficient above the median (where the median is calculated only looking at the positive coefficients). These highlighted variables are the comorbidity groups that trigger the comorbidity adjustment under this estimate of the HHGM model.

Pages 23–27 describe each comorbidity group that is included in the estimate of the comorbidity adjustment model.

30-Day Periods

All Periods with 2 or Fewer Visits are LUPAs

Variable	Model 1 Coefficient	Model 1 Impact on Case-Mix Weight (Coefficient Divided by Avg Resource Use)	Model 2 Coefficient	Model 2 Impact on Case-Mix Weight (Coefficient Divided by Avg Resource Use)	Model 3 Coefficient	Model 3 Impact on Case-Mix Weight (Coefficient Divided by Avg Resource Use)
MMTA - Medium Functional	$66.96	0.1699	$275.58	0.1736		
MMTA - High Functional	$113.48	0.2879	$483.29	0.3045		
Behavioral Health - Low Functional	-$19.21	-0.0487	-$157.64	-0.0993		
Behavioral Health - Medium Functional	$61.15	0.1551	$141.50	0.0892		
Behavioral Health - High Functional	$100.68	0.2554	$322.10	0.2029		
Complex - Low Functional	-$33.23	-0.0843	$29.62	0.0187		
Complex - Medium Functional	$60.27	0.1529	$438.30	0.2761		
Complex - High Functional	$108.27	0.2747	$607.23	0.3826		
MS Rehab - Low Functional	$59.84	0.1518	$202.26	0.1274		
MS Rehab - Medium Functional	$111.20	0.2821	$424.76	0.2676		
MS Rehab - High Functional	$163.22	0.4141	$645.72	0.4068		
Neuro - Low Functional	$106.73	0.2708	$309.92	0.1953		
Neuro - Medium Functional	$180.00	0.4567	$605.08	0.3812		
Neuro - High Functional	$204.94	0.5200	$745.16	0.4695		
Wound - Low Functional	$32.43	0.0823	$319.26	0.2011		
Wound - Medium Functional	$101.61	0.2578	$591.17	0.3724		
Wound - High Functional	$121.40	0.3080	$739.80	0.4661		
Community - Late	-$137.71	-0.3494			-$497.48	-0.3134
Institutional - Early	$70.64	0.1792			$234.62	0.1478
Institutional - Late	$16.08	0.0408			$140.52	0.0885
Comorbidity Adjustment	$43.38	0.1101				
Constant	$372.21	0.9444	$1,251.22	0.7883	$1,823.81	1.1490
Avg Resource Use	$394.13		$1,587.25		$1,587.25	
N	8,754,919		8,754,919		8,754,919	
Adj R-Squared	0.2503		0.1959		0.2248	
BLS or CPM+NRS?	BLS		CPM+NRS		CPM+NRS	
Fixed Effects	Yes		Yes		Yes	

Variable	Model 4 Coefficient	Model 4 Impact on Case-Mix Weight (Coefficient Divided by Avg Resource Use)	Model 5 Coefficient	Model 5 Impact on Case-Mix Weight (Coefficient Divided by Avg Resource Use)	Model 6 Coefficient	Model 6 Impact on Case-Mix Weight (Coefficient Divided by Avg Resource Use)
MMTA - Medium Functional			$246.79	0.1555	$270.63	0.1705
MMTA - High Functional			$448.14	0.2823	$463.19	0.2918
Behavioral Health - Low Functional			-$112.92	-0.0711	-$147.13	-0.0927
Behavioral Health - Medium Functional			$161.20	0.1016	$149.58	0.0942
Behavioral Health - High Functional			$326.04	0.2054	$321.69	0.2027
Complex - Low Functional			$16.22	0.0102	$34.43	0.0217
Complex - Medium Functional			$384.58	0.2423	$431.44	0.2718
Complex - High Functional			$591.86	0.3729	$557.63	0.3513
MS Rehab - Low Functional			$118.05	0.0744	$211.70	0.1334
MS Rehab - Medium Functional			$307.22	0.1936	$431.32	0.2717
MS Rehab - High Functional			$550.65	0.3469	$639.34	0.4028
Neuro - Low Functional			$308.67	0.1945	$298.46	0.1880
Neuro - Medium Functional			$589.64	0.3715	$585.38	0.3688
Neuro - High Functional			$753.41	0.4747	$703.77	0.4434
Wound - Low Functional			$402.12	0.2533	$252.14	0.1589
Wound - Medium Functional			$644.80	0.4062	$517.62	0.3261
Wound - High Functional			$827.83	0.5215	$642.41	0.4047
Community - Late			-$501.34	-0.3159		
Institutional - Early			$251.74	0.1586		
Institutional - Late			$107.10	0.0675		
Comorbidity Adjustment	$294.26	0.7466			$210.43	0.1326
Constant	$1,537.19	3.9002	$1,512.26	0.9528	$1,229.33	0.7745
Avg Resource Use	$1,587.25		$1,587.25		$1,587.25	
N	8,754,919		8,754,919		8,754,919	
Adj R-Squared	0.1719		0.2572		0.1998	
BLS or CPM+NRS?	CPM+NRS		CPM+NRS		CPM+NRS	
Fixed Effects	Yes		Yes		Yes	

Variable	Model 7 Coefficient	Model 7 Impact on Case-Mix Weight (Coefficient Divided by Avg Resource Use)	Model 8 Coefficient	Model 8 Impact on Case-Mix Weight (Coefficient Divided by Avg Resource Use)	Model 9 Coefficient	Model 9 Impact on Case-Mix Weight (Coefficient Divided by Avg Resource Use)
MMTA - Medium Functional			$189.29	0.1193	$240.55	0.1516
MMTA - High Functional			$334.03	0.2104	$423.92	0.2671
Behavioral Health - Low Functional			-$136.31	-0.0859	-$99.98	-0.0630
Behavioral Health - Medium Functional			$133.38	0.0840	$170.68	0.1075
Behavioral Health - High Functional			$270.40	0.1704	$325.18	0.2049
Complex - Low Functional			$44.12	0.0278	$22.35	0.0141
Complex - Medium Functional			$342.58	0.2158	$376.46	0.2372
Complex - High Functional			$473.62	0.2984	$533.25	0.3360
MS Rehab - Low Functional			$171.53	0.1081	$127.52	0.0803
MS Rehab - Medium Functional			$309.63	0.1951	$312.85	0.1971
MS Rehab - High Functional			$478.34	0.3014	$541.37	0.3411
Neuro - Low Functional			$306.55	0.1931	$294.35	0.1854
Neuro - Medium Functional			$535.31	0.3373	$565.26	0.3561
Neuro - High Functional			$675.02	0.4253	$703.54	0.4432
Wound - Low Functional			$350.57	0.2209	$322.23	0.2030
Wound - Medium Functional			$529.80	0.3338	$556.92	0.3509
Wound - High Functional			$685.30	0.4318	$712.09	0.4486
Community - Late	-$522.51	-1.3257	-$588.35	-0.3707	-$515.11	-0.3245
Institutional - Early	$240.14	0.6093	$250.28	0.1577	$250.30	0.1577
Institutional - Late	$112.26	0.2848	$58.22	0.0367	$91.85	0.0579
Comorbidity Adjustment	$359.98	0.9133	$262.21	0.1652	$254.30	0.1602
Constant	$1,778.16	4.5115	$1,571.02	0.9898	$1,495.54	0.9422
Avg Resource Use	$1,587.25		$1,587.25		$1,587.25	
N	8,754,919		8,754,919		8,754,919	
Adj R-Squared	0.237		0.1288		0.2628	
BLS or CPM+NRS?	CPM+NRS		CPM+NRS		CPM+NRS	
Fixed Effects	Yes		No		Yes	

30-Day Periods

LUPA Thresholds Vary by Payment Group (10th Percentile of Visits)

Variable	Model 1 Coefficient	Model 1 Impact on Case-Mix Weight (Coefficient Divided by Avg Resource Use)	Model 2 Coefficient	Model 2 Impact on Case-Mix Weight (Coefficient Divided by Avg Resource Use)	Model 3 Coefficient	Model 3 Impact on Case-Mix Weight (Coefficient Divided by Avg Resource Use)
MMTA - Medium Functional	$66.84	0.1746	$281.21	0.1823		
MMTA - High Functional	$112.57	0.2940	$489.06	0.3170		
Behavioral Health - Low Functional	-$21.91	-0.0572	-$173.00	-0.1121		
Behavioral Health - Medium Functional	$61.60	0.1609	$145.69	0.0944		
Behavioral Health - High Functional	$100.05	0.2613	$325.50	0.2110		
Complex - Low Functional	-$38.54	-0.1007	-$5.07	-0.0033		
Complex - Medium Functional	$56.73	0.1482	$421.11	0.2730		
Complex - High Functional	$99.39	0.2596	$563.57	0.3653		
MS Rehab - Low Functional	$61.23	0.1599	$223.82	0.1451		
MS Rehab - Medium Functional	$116.48	0.3042	$464.09	0.3008		
MS Rehab - High Functional	$169.28	0.4421	$687.78	0.4458		
Neuro - Low Functional	$105.84	0.2764	$313.86	0.2035		
Neuro - Medium Functional	$184.78	0.4826	$633.46	0.4106		
Neuro - High Functional	$208.69	0.5451	$767.16	0.4973		
Wound - Low Functional	$41.72	0.1090	$355.65	0.2305		
Wound - Medium Functional	$117.17	0.3060	$666.25	0.4319		
Wound - High Functional	$135.36	0.3535	$806.45	0.5228		
Community - Late	-$167.19	-0.4367			-$622.28	-0.4034
Institutional - Early	$75.60	0.1975			$249.57	0.1618
Institutional - Late	$7.43	0.0194			$102.35	0.0663
Comorbidity Adjustment	$47.33	0.1236				
Constant	$381.82	0.9972	$1,196.54	0.7756	$1,871.76	1.2133
Avg Resource Use	383		1,543		1,543	
N	9,034,969		9,034,969		9,034,969	
Adj. R-Squared	0.276		0.1925		0.2418	
BLS or CPM+NRS?	BLS		CPM+NRS		CPM+NRS	

Variable	Model 4 Coefficient	Model 4 Impact on Case-Mix Weight (Coefficient Divided by Avg Resource Use)	Model 5 Coefficient	Model 5 Impact on Case-Mix Weight (Coefficient Divided by Avg Resource Use)	Model 6 Coefficient	Model 6 Impact on Case-Mix Weight (Coefficient Divided by Avg Resource Use)
MMTA - Medium Functional			$247.44	0.1604	$275.80	0.1788
MMTA - High Functional			$447.22	0.2899	$467.69	0.3032
Behavioral Health - Low Functional			-$122.35	-0.0793	-$162.07	-0.1051
Behavioral Health - Medium Functional			$165.43	0.1072	$153.78	0.0997
Behavioral Health - High Functional			$326.31	0.2115	$324.73	0.2105
Complex - Low Functional			-$13.99	-0.0091	-$0.26	-0.0002
Complex - Medium Functional			$366.89	0.2378	$413.41	0.2680
Complex - High Functional			$557.44	0.3614	$510.39	0.3309
MS Rehab - Low Functional			$126.69	0.0821	$233.33	0.1512
MS Rehab - Medium Functional			$331.19	0.2147	$470.39	0.3049
MS Rehab - High Functional			$576.37	0.3736	$681.35	0.4417
Neuro - Low Functional			$310.12	0.2010	$301.85	0.1957
Neuro - Medium Functional			$611.59	0.3965	$614.07	0.3981
Neuro - High Functional			$772.33	0.5006	$725.72	0.4704
Wound - Low Functional			$442.04	0.2865	$286.50	0.1857
Wound - Medium Functional			$716.12	0.4642	$588.62	0.3816
Wound - High Functional			$894.64	0.5799	$703.73	0.4562
Community - Late			-$620.59	-0.4023		
Institutional - Early			$270.54	0.1754		
Institutional - Late			$73.01	0.0473		
Comorbidity Adjustment	$313.09	0.8177			$220.95	0.1432
Constant	$1,490.23	3.8922	$1,550.78	1.0053	$1,173.90	0.7610
Avg Resource Use	1,543		1,543		1,543	
N	9,034,969		9,034,969		9,034,969	
Adj. R-Squared	0.1656		0.2774		0.1966	
BLS or CPM+NRS?	CPM+NRS		CPM+NRS		CPM+NRS	

Variable	Model 7 Coefficient	Model 7 Impact on Case-Mix Weight (Coefficient Divided by Avg Resource Use)	Model 8 Coefficient	Model 8 Impact on Case-Mix Weight (Coefficient Divided by Avg Resource Use)
MMTA - Medium Functional			$240.61	0.1560
MMTA - High Functional			$421.30	0.2731
Behavioral Health - Low Functional			-$108.81	-0.0705
Behavioral Health - Medium Functional			$175.00	0.1134
Behavioral Health - High Functional			$325.04	0.2107
Complex - Low Functional			-$7.74	-0.0050
Complex - Medium Functional			$357.77	0.2319
Complex - High Functional			$494.16	0.3203
MS Rehab - Low Functional			$136.43	0.0884
MS Rehab - Medium Functional			$336.73	0.2183
MS Rehab - High Functional			$567.05	0.3676
Neuro - Low Functional			$295.07	0.1913
Neuro - Medium Functional			$587.45	0.3808
Neuro - High Functional			$722.05	0.4681
Wound - Low Functional			$359.03	0.2327
Wound - Medium Functional			$622.55	0.4036
Wound - High Functional			$771.46	0.5001
Community - Late	-$645.91	-1.6870	-$633.78	-0.4108
Institutional - Early	$255.26	0.6667	$269.23	0.1745
Institutional - Late	$72.89	0.1904	$57.37	0.0372
Comorbidity Adjustment	$382.93	1.0001	$268.57	0.1741
Constant	$1,823.05	4.7614	$1,532.92	0.9937
Avg Resource Use	1,543		1,543	
N	9,034,969		9,034,969	
Adj. R-Squared	0.2554		0.2835	
BLS or CPM+NRS?	CPM+NRS		CPM+NRS	

60-Day Episodes

All Periods with 4 or Fewer Visits are LUPAs

	Model 1		Model 2		Model 3	
	Coefficient	Impact on Case-Mix Weight (Coefficient Divided by Avg Resource Use)	Coefficient	Impact on Case-Mix Weight (Coefficient Divided by Avg Resource Use)	Coefficient	Impact on Case-Mix Weight (Coefficient Divided by Avg Resource Use)
MMTA - Medium Functional	$116.40	0.1639	$451.21	0.1583		
MMTA - High Functional	$205.56	0.2894	$860.19	0.3018		
Behavioral Health - Low Functional	-$13.20	-0.0186	-$181.53	-0.0637		
Behavioral Health - Medium Functional	$115.77	0.1630	$262.24	0.0920		
Behavioral Health - High Functional	$175.91	0.2476	$542.02	0.1902		
Complex - Low Functional	-$43.73	-0.0616	$115.61	0.0406		
Complex - Medium Functional	$116.75	0.1643	$787.27	0.2763		
Complex - High Functional	$227.13	0.3197	$1,269.98	0.4456		
MS Rehab - Low Functional	$47.65	0.0671	-$3.11	-0.0011		
MS Rehab - Medium Functional	$129.09	0.1817	$328.68	0.1153		
MS Rehab - High Functional	$244.36	0.3440	$857.21	0.3008		
Neuro - Low Functional	$168.41	0.2371	$444.72	0.1561		
Neuro - Medium Functional	$300.51	0.4230	$976.19	0.3426		
Neuro - High Functional	$371.78	0.5233	$1,359.90	0.4772		
Wound - Low Functional	$51.48	0.0725	$667.48	0.2342		
Wound - Medium Functional	$179.00	0.2520	$1,141.95	0.4007		
Wound - High Functional	$228.64	0.3219	$1,537.68	0.5396		
Community - Late	-$33.28	-0.0468			$41.52	0.0146
Institutional - Early	$57.65	0.0812			$170.34	0.0598
Institutional - Late	$114.94	0.1618			$647.74	0.2273
Comorbidity Adjustment	$85.03	0.1197				
Constant	$538.30	0.7578	$2,305.32	0.8090	$2,725.29	0.9563
Avg Resource Use	$710.38		$2,849.75		$2,849.75	
N	4,643,196		4,643,196		4,643,196	
Adj R-Squared	0.1605		0.1744		0.14	
BLS or CPM+NRS?	BLS		CPM+NRS		CPM+NRS	
Fixed Effects	Yes		Yes		Yes	

	Model 4		Model 5		Model 6	
	Coefficient	Impact on Case-Mix Weight (Coefficient Divided by Avg Resource Use)	Coefficient	Impact on Case-Mix Weight (Coefficient Divided by Avg Resource Use)	Coefficient	Impact on Case-Mix Weight (Coefficient Divided by Avg Resource Use)
MMTA - Medium Functional			$428.72	0.1504	$441.46	0.1549
MMTA - High Functional			$815.42	0.2861	$818.00	0.2870
Behavioral Health - Low Functional			-$142.44	-0.0500	-$153.92	-0.0540
Behavioral Health - Medium Functional			$295.62	0.1037	$287.65	0.1009
Behavioral Health - High Functional			$559.07	0.1962	$549.74	0.1929
Complex - Low Functional			$87.19	0.0306	$132.74	0.0466
Complex - Medium Functional			$723.92	0.2540	$779.43	0.2735
Complex - High Functional			$1,188.04	0.4169	$1,175.85	0.4126
MS Rehab - Low Functional			-$7.45	-0.0026	$17.60	0.0062
MS Rehab - Medium Functional			$303.37	0.1065	$344.44	0.1209
MS Rehab - High Functional			$820.32	0.2879	$843.62	0.2960
Neuro - Low Functional			$461.63	0.1620	$417.53	0.1465
Neuro - Medium Functional			$977.49	0.3430	$934.23	0.3278
Neuro - High Functional			$1,356.54	0.4760	$1,274.29	0.4472
Wound - Low Functional			$704.19	0.2471	$517.45	0.1816
Wound - Medium Functional			$1,153.85	0.4049	$979.20	0.3436
Wound - High Functional			$1,545.28	0.5423	$1,324.98	0.4649
Community - Late			$12.72	0.0045		
Institutional - Early			$208.53	0.0732		
Institutional - Late			$542.02	0.1902		
Comorbidity Adjustment	$649.14	0.9138			$466.05	0.1635
Constant	$2,721.29	3.8308	$2,200.17	0.7721	$2,242.10	0.7868
Avg Resource Use	$2,849.75		$2,849.75		$2,849.75	
N	4,643,196		4,643,196		4,643,196	
Adj R-Squared	0.1497		0.1798		0.1822	
BLS or CPM+NRS?	CPM+NRS		CPM+NRS		CPM+NRS	
Fixed Effects	Yes		Yes		Yes	

	Model 7		Model 8		Model 9	
	Coefficient	Impact on Case-Mix Weight (Coefficient Divided by Avg Resource Use)	Coefficient	Impact on Case-Mix Weight (Coefficient Divided by Avg Resource Use)	Coefficient	Impact on Case-Mix Weight (Coefficient Divided by Avg Resource Use)
MMTA - Medium Functional	$299.28	0.4213			$417.79	0.1466
MMTA - High Functional	$580.25	0.8168			$773.37	0.2714
Behavioral Health - Low Functional	-$170.90	-0.2406			-$115.06	-0.0404
Behavioral Health - Medium Functional	$213.23	0.3002			$319.02	0.1119
Behavioral Health - High Functional	$418.05	0.5885			$565.11	0.1983
Complex - Low Functional	$50.24	0.0707			$104.28	0.0366
Complex - Medium Functional	$578.41	0.8142			$715.93	0.2512
Complex - High Functional	$905.84	1.2752			$1,097.92	0.3853
MS Rehab - Low Functional	$40.50	0.0570			$8.28	0.0029
MS Rehab - Medium Functional	$233.65	0.3289			$312.61	0.1097
MS Rehab - High Functional	$628.17	0.8843			$801.49	0.2812
Neuro - Low Functional	$403.02	0.5673			$433.09	0.1520
Neuro - Medium Functional	$813.92	1.1458			$933.18	0.3275
Neuro - High Functional	$1,149.22	1.6178			$1,270.95	0.4460
Wound - Low Functional	$497.50	0.7003			$558.86	0.1961
Wound - Medium Functional	$842.93	1.1866			$994.77	0.3491
Wound - High Functional	$1,186.43	1.6701			$1,340.32	0.4703
Community - Late	-$23.14	-0.0326	-$25.38	-0.0089	-$24.57	-0.0086
Institutional - Early	$124.69	0.1755	$177.10	0.0621	$204.04	0.0716
Institutional - Late	$465.54	0.6553	$580.85	0.2038	$502.31	0.1763
Comorbidity Adjustment	$458.25	0.6451	$648.67	0.2276	$464.90	0.1631
Constant	$2,285.66	3.2175	$2,621.24	0.9198	$2,154.89	0.7562
Avg Resource Use	$2,849.75		$2,849.75		$2,849.75	
N	4,643,196		4,643,196		4,643,196	
Adj R-Squared	0.0472		0.1562		0.1876	
BLS or CPM+NRS?	CPM+NRS		CPM+NRS		CPM+NRS	
Fixed Effects	No		Yes		Yes	

60-Day Episodes

LUPA Thresholds Vary by Payment Group (10th Percentile of Visits)

Variable	Model 1 Coefficient	Model 1 Impact on Case-Mix Weight (Coefficient Divided by Avg Resource Use)	Model 2 Coefficient	Model 2 Impact on Case-Mix Weight (Coefficient Divided by Avg Resource Use)	Model 3 Coefficient	Model 3 Impact on Case-Mix Weight (Coefficient Divided by Avg Resource Use)
MMTA - Medium Functional	$127.35	0.1943	$525.57	0.1992		
MMTA - High Functional	$214.36	0.3270	$933.99	0.3540		
Behavioral Health - Low Functional	-$44.30	-0.0676	-$299.47	-0.1135		
Behavioral Health - Medium Functional	$120.13	0.1833	$314.36	0.1191		
Behavioral Health - High Functional	$184.85	0.2820	$615.85	0.2334		
Complex - Low Functional	-$46.74	-0.0713	$90.43	0.0343		
Complex - Medium Functional	$112.21	0.1712	$771.69	0.2925		
Complex - High Functional	$230.14	0.3511	$1,307.13	0.4954		
MS Rehab - Low Functional	$73.30	0.1118	$153.66	0.0582		
MS Rehab - Medium Functional	$173.14	0.2642	$577.24	0.2188		
MS Rehab - High Functional	$288.89	0.4408	$1,111.08	0.4211		
Neuro - Low Functional	$181.66	0.2772	$531.68	0.2015		
Neuro - Medium Functional	$333.63	0.5090	$1,151.05	0.4362		
Neuro - High Functional	$388.49	0.5927	$1,463.03	0.5545		
Wound - Low Functional	$86.20	0.1315	$773.65	0.2932		
Wound - Medium Functional	$219.19	0.3344	$1,298.51	0.4921		
Wound - High Functional	$257.21	0.3924	$1,624.53	0.6157		
Community - Late	-$94.08	-0.1435			-$253.85	-0.0962
Institutional - Early	$60.57	0.0924			$177.50	0.0673
Institutional - Late	$108.09	0.1649			$603.94	0.2289
Comorbidity Adjustment	$84.75	0.1293				
Constant	$500.23	0.7632	$2,023.22	0.7668	$2,633.11	0.9979
Avg Resource Use	655.4387		2638.562		2638.562	
N	5,247,601		5,247,601		5,247,601	
Adj R-Squared	0.1836		0.1804		0.1452	
BLS or CPM+NRS?	BLS		CPM+NRS		CPM+NRS	

Variable	Model 4 Coefficient	Model 4 Impact on Case-Mix Weight (Coefficient Divided by Avg Resource Use)	Model 5 Coefficient	Model 5 Impact on Case-Mix Weight (Coefficient Divided by Avg Resource Use)	Model 6 Coefficient	Model 6 Impact on Case-Mix Weight (Coefficient Divided by Avg Resource Use)
MMTA - Medium Functional			$481.71	0.1826	$515.14	0.1952
MMTA - High Functional			$862.53	0.3269	$892.48	0.3382
Behavioral Health - Low Functional			-$243.92	-0.0924	-$275.66	-0.1045
Behavioral Health - Medium Functional			$334.33	0.1267	$334.31	0.1267
Behavioral Health - High Functional			$612.32	0.2321	$619.50	0.2348
Complex - Low Functional			$53.12	0.0201	$106.26	0.0403
Complex - Medium Functional			$693.67	0.2629	$766.11	0.2904
Complex - High Functional			$1,204.75	0.4566	$1,217.18	0.4613
MS Rehab - Low Functional			$111.68	0.0423	$170.69	0.0647
MS Rehab - Medium Functional			$491.19	0.1862	$589.29	0.2233
MS Rehab - High Functional			$1,011.41	0.3833	$1,095.92	0.4153
Neuro - Low Functional			$535.55	0.2030	$507.08	0.1922
Neuro - Medium Functional			$1,121.89	0.4252	$1,113.64	0.4221
Neuro - High Functional			$1,442.15	0.5466	$1,384.49	0.5247
Wound - Low Functional			$833.72	0.3160	$630.84	0.2391
Wound - Medium Functional			$1,318.09	0.4996	$1,144.44	0.4337
Wound - High Functional			$1,660.56	0.6293	$1,423.52	0.5395
Community - Late			-$238.91	-0.0905		
Institutional - Early			$215.65	0.0817		
Institutional - Late			$511.70	0.1939		
Comorbidity Adjustment	$624.09	0.9522			$433.71	0.1644
Constant	$2,516.41	3.8393	$2,041.30	0.7736	$1,965.61	0.7450
Avg Resource Use	2638.562		2638.562		2638.562	
N	5,247,601		5,247,601		5,247,601	
Adj R-Squared	0.1469		0.1921		0.1873	
BLS or CPM+NRS?	CPM+NRS		CPM+NRS		CPM+NRS	

Variable	Model 7 Coefficient	Model 7 Impact on Case-Mix Weight (Coefficient Divided by Avg Resource Use)	Model 8 Coefficient	Model 8 Impact on Case-Mix Weight (Coefficient Divided by Avg Resource Use)
MMTA - Medium Functional			$83.80	0.0318
MMTA - High Functional			$134.78	0.0511
Behavioral Health - Low Functional			-$25.77	-0.0098
Behavioral Health - Medium Functional			$86.43	0.0328
Behavioral Health - High Functional			$130.03	0.0493
Complex - Low Functional			-$38.93	-0.0148
Complex - Medium Functional			$68.21	0.0258
Complex - High Functional			$137.20	0.0520
MS Rehab - Low Functional			$83.02	0.0315
MS Rehab - Medium Functional			$151.75	0.0575
MS Rehab - High Functional			$208.70	0.0791
Neuro - Low Functional			$131.40	0.0498
Neuro - Medium Functional			$225.54	0.0855
Neuro - High Functional			$244.74	0.0928
Wound - Low Functional			$39.86	0.0151
Wound - Medium Functional			$126.28	0.0479
Wound - High Functional			$140.28	0.0532
Community - Late	-$313.28	-0.4780	-$118.45	-0.0449
Institutional - Early	$185.44	0.2829	$74.22	0.0281
Institutional - Late	$537.80	0.8205	$57.93	0.0220
Comorbidity Adjustment	$655.80	1.0006	$41.13	0.0156
Constant	$2,529.49	3.8592	$359.21	0.1361
Avg Resource Use	2638.562		450.4626	
N	5,247,601		5,247,601	
Adj R-Squared	0.1619		0.2745	
BLS or CPM+NRS?	CPM+NRS		CPM+NRS	

Comorbidity Regression

Regression of Resource Use on Comorbidity Groups and other HHGM Adjustment Variables (Other Adjustment variables not shown)

30-Day Periods - CPM + NRS

Description	Coefficient	P-Value	% of 30-Day Periods	Points
Behavioral 11: Intellectual Disabilities	-$170.44	0	0.1%	0
Infectious 2: HIV	-$133.49	0	0.1%	0
Renal 4: Pyelonephritus and other disorders of the kidney and ureter	-$129.13	0	0.1%	0
Infectious 4: Viral Hepatitis	-$121.30	0	0.3%	0
Neoplasm 4: Malignant neoplasms of pancreas	-$97.10	0	0.1%	0
Resp 2: Whooping cough	-$96.00	0	1.0%	0
Behavioral 3: Delusional and Non-mood Disorders	-$92.13	0	0.0%	0
Cerebral 1: Occlusion/Stenosis of Pre-cerebral/Cerebral Arteries w/o Cerebral Infarction	-$85.99	0	0.1%	0
Behavioral 1: Schizophrenia and Schizoaffective Disorders	-$72.29	0	0.7%	0
Neuro 3: Dementia in diseases classified elsewhere	-$69.31	0	10.5%	0
Heart 9: Valve Disorders	-$67.91	0	0.9%	0
GI 4: Alcoholic Liver Disease, Chronic Hepatitis, Fibrosis and Cirrhosis of the Liver	-$66.43	0	0.6%	0
Heart 4: Angina Pectoris	-$64.61	0	0.2%	0
Neuro 8: Epilepsy	-$63.02	0	1.5%	0
Neoplasm 6: Malignant neoplasms of trachea, bronchus, lung, and mediastinum	-$61.64	0	0.8%	0
Heart 5: Atherosclerotic Heart Disease with Angina	-$60.02	0	1.2%	0
Neoplasm 17: Secondary neoplasms of respiratory and GI systems.	-$58.35	0	0.4%	0
Endocrine 1: Hypothyroidism	-$55.60	0	3.0%	0
Renal 1: Chronic kidney disease and ESRD	-$50.78	0	10.1%	0
Behavioral 5: Phobias, Other Anxiety and Obsessive Compulsive Disorders	-$48.74	0	5.8%	0
GI 5: Hepatic Failure and Other Inflammatory Liver Disorders	-$47.56	0	0.1%	0
Neuro 2: Delirium due to known physiological conditions	-$45.63	0.004	0.0%	0
Heart 7: Chronic Ischemic Heart Disease	-$42.78	0	0.8%	0
Resp 5: COPD and asthma	-$41.32	0	5.1%	0
Resp 4: Bronchitis and emphysema	-$40.19	0	0.5%	0
Resp 1: Obstructive sleep apnea	-$39.84	0	0.7%	0
Circulatory 1: Nutritional, Enzymatic, and Other Heredity Anemias	-$35.29	0	2.1%	0
MS 5: Osteoporosis	-$32.67	0	2.7%	0
Behavioral 4: Psychotic, Major Depressive, and Dissociative Disorders	-$32.40	0	0.2%	0
Neoplasm 9: Malignant neoplasm of breast	-$30.96	0	0.4%	0
Heart 12: Other Heart Diseases	-$30.84	0	15.2%	0

Description	Coefficient	P-Value	% of 30-Day Periods	Points
Behavioral 6: Schizotypal, Persistent Mood, and Adult Personality Disorders	-$30.76	0	0.2%	0
Neoplasm 11: Malignant neoplasms of female genital organs and prostate	-$30.59	0	0.6%	0
Resp 9: Respiratory Failure	-$28.05	0	1.1%	0
Neuro 1: Vascular Dementia and Delirium due to known physiological conditions	-$28.03	0	0.7%	0
Heart 8: Other Pulmonary Heart Diseases	-$25.95	0	0.9%	0
Neoplasm 22: Follicular and other non-Hodgkin's lymphoma, and leukemia	-$24.22	0	0.7%	0
Neuro 4: Alzheimer's disease and related dementias	-$23.06	0	2.9%	0
Behavioral 2: Mood Disorders	-$22.82	0	2.9%	0
Circulatory 2: Hemolytic, Aplastic, and Other Anemias	-$22.51	0	5.1%	0
Renal 5: Neuromuscular dysfunction of bladder, urinary tract infection, and benign prostatic hyperplasia	-$21.96	0	3.2%	0
Circulatory 7: Atherosclerosis	-$21.61	0	0.3%	0
Endocrine 5: Obesity, and Disorders of Metabolism and Fluid Balance	-$15.07	0	2.5%	0
Neoplasms 1: Malignant neoplasms of lip, oral cavity and pharynx	-$13.36	0.249	0.1%	0
Renal 2: Unspecified renal failure	-$11.55	0.383	0.1%	0
Resp 6: Bronchiectasis	-$11.47	0	10.6%	0
Neuro 11: Diabetic retinopathy and macular edema	-$8.07	0.028	0.8%	0
Behavioral 10: Major Depression, single episode	-$5.43	0	8.6%	0
Neoplasm 2: Malignant neoplasms of digestive organs	-$3.11	0.502	0.6%	0
MS 1: Lupus	-$1.57	0.813	0.3%	0
Resp 8: Pulmonary fibrosis	-$1.41	0.81	0.3%	0
Circulatory 12: Hypotension	-$1.25	0.743	0.8%	0
Endocrine 3: Type 1, Type 2, and Other Specified Diabetes	-$0.86	0.301	23.0%	0
Neoplasm 5: Malignant neoplasms of peritoneum and retroperitoneum	$0.00			0
Behavioral 7: Mental and Behavioral Disorders Due to Psychoactive Substance Abuse	$0.00			0
Behavioral 8: Eating Disorders	$0.00			0
Behavioral 9: Personality and Behavioral Disorders due to known Physiological Condition	$0.00			0
Cerebral 2: Transient Ischemic Attacks and Vascular Syndromes in Cerebrovascular Diseases	$0.00			0
Cerebral 3: Other Cerebrovascular Diseases	$0.00			0
Circulatory 3: Coagulation Defects	$0.00			0
GI 2: Intestinal Obstruction and Ileus	$0.00			0
GI 3: Constipation	$0.00			0
GI 6: Other Disorders of the Liver	$0.00			0
GI 7: Cholelithiasis and Cholecystitis	$0.00			0

Description	Coefficient	P-Value	% of 30-Day Periods	Points
GI 8: Pancreatitis	$0.00			0
GI 9: Celiac Disease	$0.00			0
Heart 3: Unstable Angina, Acute Coronary Thrombosis, and Acute Ischemic Heart Disease	$0.00			0
Heart 6: Aneurysm of Heart/Coronary Artery	$0.00			0
Infectious 3: Herpes Zoster	$0.00			0
Neoplasm 10: Kaposi's sarcoma	$0.00			0
Neoplasm 12: Malignant neoplasms of urinary tract	$0.00			0
Neoplasm 13: Malignant neoplasms of brain	$0.00			0
Neoplasm 14: Malignant neoplasm of spinal cord, cranial nerves and other parts of central nervous system	$0.00			0
Neoplasm 15: Malignant neoplasm of adrenal gland, endocrine glands and related structures	$0.00			0
Neoplasm 16: Secondary neoplasm of lymph nodes	$0.00			0
Neoplasm 19: Secondary neoplasms of other specified sites	$0.00			0
Neoplasm 20: Non-Hodgkin's Lymphoma	$0.00			0
Neoplasm 21: Hodgkin's Lymphoma	$0.00			0
Neoplasm 23: Merkel cell and neuroendocrine carcinoma	$0.00			0
Neoplasm 24: Secondary carcinoid and neuroendocrine carcinoma	$0.00			0
Neoplasm 3: Malignant neoplasms of liver and intrahepatic bile ducts	$0.00			0
Neoplasm 7: Malignant neoplasms of bone and articular cartilage	$0.00			0
Neoplasm 8: Malignant neoplasms of peripheral nerves, autonomic nervous system, and other Connective Tissue	$0.00			0
Neuro 6: Demyelinating diseases of the central nervous system	$0.00			0
Neuro 9: Encephalopathy	$0.00			0
Renal 3: Diabetes Insipidus	$0.00			0
Resp 3: Influenza and pneumonia	$0.00			0
Resp 7: Pneumonitis and chronic pulmonary edema	$0.00		0.1%	0
Skin 5: Non-pressure chronic ulcers	$0.00			0
GI 1: Crohn's, Ulcerative Colitis, and other Functional Intestinal Disorders	$1.30	0.844	0.3%	0
MS 4: Lumbar Spinal Stenosis	$1.89	0.519	1.2%	0
Endocrine 4: Other Combined Immunodeficiencies and Malnutrition	$4.05	0.32	0.8%	0
Circulatory 8: Aneurysms and Peripheral Vascular Disease	$7.11	0	3.4%	1
MS 3: Joint Pain	$7.52	0	2.5%	1
Circulatory 5: Hypertensive Heart and Chronic Kidney Disease w/o Heart Failure	$7.98	0.02	1.2%	1
Infectious 1: C-diff, MRSA, E-coli	$16.60	0	1.0%	2
Circulatory 4: Hypertensive Chronic Kidney Disease	$17.27	0	11.3%	2
MS 2: Rheumatoid Arthritis	$19.30	0	2.2%	2
Heart 11: Heart Failure	$25.38	0	14.6%	3

Description	Coefficient	P-Value	% of 30-Day Periods	Points
Heart 10: Dysrhythmias	$27.47	0	13.6%	3
Circulatory 6: Pulmonary Embolism	$28.01	0	0.3%	3
Neuro 10: Diabetes with neuropathy	$32.92	0	5.0%	3
Heart 1: Hypertensive Heart Disease with Heart Failure	$33.64	0	1.7%	3
Neoplasm 18: Secondary neoplasms of urinary and reproductive systems, skin, brain, and bone	$44.01	0	0.5%	4
Endocrine 6: Graft vs. Host Disease	$59.15	0.265	0.0%	0
Endocrine 2: Diabetes due to a Known Underlying Condition	$60.51	0	0.2%	6
Circulatory 9: Other Venous Embolism and Thrombosis	$72.49	0	0.6%	7
Skin 1: Cutaneous abscess, cellulitis, and lymphangitis	$104.79	0	1.3%	10
Neuro 5: Parkinson's Disease	$133.65	0	2.0%	13
Skin 2: Stage One and unspecified stage pressure ulcers by site	$140.00	0	0.8%	14
Neuro 7: Hemiplegia, paraplegia, and quadiplegia	$147.92	0	1.2%	15
Cerebral 4: Sequelae of Cerebrovascular Diseases	$174.83	0	4.9%	17
Circulatory 10: Varicose Veins of Lower Extremities with Ulceration	$193.98	0	0.2%	19
Circulatory 11: Lymphedema	$278.94	0	0.7%	28
Skin 3: Diseases of arteries, arterioles and capillaries with ulceration and non-pressure chronic ulcers	$364.29	0	3.6%	36
Skin 4: Stages Two-Four and unstageable pressure ulcers by site	$411.06	0	3.0%	41

Comorbidity Subgroup Descriptions for February, 2018 TEP:

Behavioral 1: Schizophrenia and Schizoaffective Disorders

Behavioral 2: Mood Disorders

Behavioral 3: Delusional and Non-mood Disorders

Behavioral 4: Psychotic, Major Depressive, and Dissociative Disorders

Behavioral 5: Phobias, Other Anxiety and Obsessive Compulsive Disorders

Behavioral 6: Schizotypal, Persistent Mood, and Adult Personality Disorders

Behavioral 7: Mental and Behavioral Disorders Due to Psychoactive Substance Abuse

Behavioral 8: Eating Disorders

Behavioral 9: Personality and Behavioral Disorders due to known Physiological Condition

Behavioral 10: Major Depression, single episode

Cerebral 1: Occlusion/Stenosis of Pre-cerebral/Cerebral Arteries w/o Cerebral Infarction

Cerebral 2: Transient Ischemic Attacks and Vascular Syndromes in Cerebrovascular Diseases

Cerebral 3: Other Cerebrovascular Diseases

Cerebral 4: Sequelae of Cerebrovascular Diseases

Circulatory 1: Nutritional, Enzymatic, and Other Heredity Anemias

Circulatory 2: Hemolytic, Aplastic, and Other Anemias

Circulatory 3: Coagulation Defects

Circulatory 4: Hypertensive Chronic Kidney Disease

Circulatory 5: Hypertensive Heart and Chronic Kidney Disease w/o Heart Failure

Circulatory 6: Pulmonary Embolism

Circulatory 7: Atherosclerosis

Circulatory 8: Aneurysms and Peripheral Vascular Disease

Circulatory 9: Other Venous Embolism and Thrombosis

Circulatory 10: Varicose Veins of Lower Extremities with Ulceration

Circulatory 11: Lymphedema

Circulatory 12: Hypotension

Endocrine 1: Hypothyroidism

Endocrine 2: Diabetes due to a Known Underlying Condition

Endocrine 3: Type 1, Type 2, and Other Specified Diabetes

Endocrine 4: Other Combined Immunodeficiencies and Malnutrition

Endocrine 5: Obesity, and Disorders of Metabolism and Fluid Balance

Endocrine 6: Graft vs. Host Disease

GI 1: Crohn's, Ulcerative Colitis, and other Functional Intestinal Disorders

GI 2: Intestinal Obstruction and Ileus

GI 3: Constipation

GI 4: Alcoholic Liver Disease, Chronic Hepatitis, Fibrosis and Cirrhosis of the Liver

GI 5: Hepatic Failure and Other Inflammatory Liver Disorders

GI 6: Other Disorders of the Liver

GI 7: Cholelithiasis and Cholecystitis

GI 8: Pancreatitis

GI 9: Celiac Disease

Heart 1: Hypertensive Heart Disease with Heart Failure

Heart 2: None (these are now part of Circulatory 5)

Heart 3: Unstable Angina, Acute Coronary Thrombosis, and Acute Ischemic Heart Disease

Heart 4: Angina Pectoris

Heart 5: Atherosclerotic Heart Disease with Angina

Heart 6: Aneurysm of Heart/Coronary Artery

Heart 7: Chronic Ischemic Heart Disease

Heart 8: Other Pulmonary Heart Diseases

Heart 9: Valve Disorders

Heart 10: Dysrhythmias

Heart 11: Heart Failure

Heart 12: Other Heart Diseases

Infectious 1: C-diff, MRSA, E-coli

Infectious 2: HIV

Infectious 3: Herpes Zoster

Infectious 4: Viral Hepatitis

MS 1: Lupus

MS 2: Rheumatoid Arthritis

MS 3: Joint Pain

MS 4: Lumbar Spinal Stenosis

MS 5: Osteoporosis

Neoplasms 1: Malignant neoplasms of lip, oral cavity and pharynx

Neoplasm 2: Malignant neoplasms of digestive organs

Neoplasm 3: Malignant neoplasms of liver and intrahepatic bile ducts

Neoplasm 4: Malignant neoplasms of pancreas

Neoplasm 5: Malignant neoplasms of peritoneum and retroperitoneum

Neoplasm 6: Malignant neoplasms of trachea, bronchus, lung, and mediastinum

Neoplasm 7: Malignant neoplasms of bone and articular cartilage

Neoplasm 8: Malignant neoplasms of peripheral nerves, autonomic nervous system, and other Connective Tissue

Neoplasm 9: Malignant neoplasm of breast

Neoplasm 10: Kaposi's sarcoma

Neoplasm 11: Malignant neoplasms of female genital organs and prostate

Neoplasm 12: Malignant neoplasms of urinary tract

Neoplasm 13: Malignant neoplasms of brain

Neoplasm 14: Malignant neoplasm of spinal cord, cranial nerves and other parts of central nervous system

Neoplasm 15: Malignant neoplasm of adrenal gland, endocrine glands and related structures

Neoplasm 16: Secondary neoplasm of lymph nodes

Neoplasm 17: Secondary neoplasms of respiratory and GI systems.

Neoplasm 18: Secondary neoplasms of urinary and reproductive systems, skin, brain, and bone

Neoplasm 19: Secondary neoplasms of other specified sites

Neoplasm 20: Non-Hodgkin's Lymphoma

Neoplasm 21: Hodgkin's Lymphoma

Neoplasm 22: Follicular and other non-Hodgkin's lymphoma, and leukemia

Neoplasm 23: Merkel cell and neuroendocrine carcinoma

Neoplasm 24: Secondary carcinoid and neuroendocrine carcinoma

Neuro 1: Vascular Dementia and Delirium due to known physiological conditions

Neuro 2: Delirium due to known physiological conditions

Neuro 3: Dementia in diseases classified elsewhere

Neuro 4: Alzheimer's disease and related dementias

Neuro 5: Parkinson's Disease

Neuro 6: Demyelinating diseases of the central nervous system

Neuro 7: Hemiplegia, paraplegia, and quadiplegia

Neuro 8: Epilepsy

Neuro 9: Encephalopathy

Neuro 10: Diabetes with neuropathy

Neuro 11: Diabetic retinopathy and macular edema

Renal 1: Chronic kidney disease and ESRD

Renal 2: Unspecified renal failure

Renal 3: Diabetes Insipidus

Renal 4: Pyelonephritus and other disorders of the kidney and ureter

Renal 5: Neuromuscular dysfunction of bladder, urinary tract infection, and benign prostatic hyperplasia

Resp 1: Obstructive sleep apnea

Resp 2: Whooping cough

Resp 3: Influenza and pneumonia

Resp 4: Bronchitis and emphysema

Resp 5: COPD and asthma

Resp 6: Bronchiectasis

Resp 7: Pneumonitis and chronic pulmonary edema

Resp 8: Pulmonary fibrosis

Resp 9: Respiratory Failure

Skin 1: Cutaneous abscess, cellulitis, and lymphangitis

Skin 2: Stage One and unspecified stage pressure ulcers by site

Skin 3: Diseases of arteries, arterioles and capillaries with ulceration and non-pressure chronic ulcers

Skin 4: Stages Two-Four and unstageable pressure ulcers by site

Skin 5: Non-pressure chronic ulcers