

Disparities of Quality of Services between Urban and Non-Urban Home Health Care Agencies

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Objectives

1. Investigate differences of urban and non-urban HHAs in selected measures
2. Examine if rurality has an impact on utilization outcomes
3. Identify significant measures affect utilization outcomes for urban and non-urban HHA respectively

Methods

- Data collection:
 - **Rural-Urban Commuting Area Codes from University of Washington**
 - **Data of quality of measures for HHAs from year 2016-2019 published by CMS**
 - ❖ Data from year 2016-2019 was chosen because there is a potential discrepancy in data of season 3 and 4 in year 2015, which is, maybe column names of *admitted in hospital* and *receive urgent care in ER* are switched by mistake.
 - **Two data sets are merged by zip code, each HHA was designated to rurality with two levels: urban and non-urban**

Methods

- Measures change by year in the datasets downloaded, only measures exists in all datasets are selected:
 - 1 characteristic measure
 - Type of HHA
 - 6 service offered measures
 - Off.nursing
 - Off.physical
 - Off.occupational
 - Off.speech
 - Off.medical
 - Off.hha
 - 7 clinical process measures
 - Timely
 - Taughtdrugs
 - Checkfall
 - Checkdepression
 - Flutshot
 - Pneumococcal
 - Taughtfootcare
- 7 clinical outcome measures
 - Betterwalking
 - Betterbed
 - Betterbathing
 - Lesspain
 - Betterbreathing
 - Betterhealing
 - Betterdrug
- 2 utilization outcome measures
 - Admitted
 - ER

Methods

- Objective 1
 - Calculate count and percentage of characteristic measure and service offered measures
 - Calculate mean, median, standard deviation, and Wil-Cox value for clinical process, clinical outcome, and utilization outcome measures

Methods

- Objective 2
 - Create regression tree models with admitted and ER being the predict variable
 - The models are with 1 depth level to see if RUCA is the top measure on the node
 - Measures selected in regression tree models are service offered measures and clinical process measures except *flushot* and *pnumococcal*
 - ❖ There are two reasons to remove these two measures:
 - ❖ Statements in previous paper *Facilitating Focused Process Improvement Efforts in Home Health Agencies to Improve Utilization Outcomes Effectively and Efficiently*. Reference:

Two variables about checking for vaccinations, flu and pneumococcal, were excluded from analysis. These two practices are selectively applied to severe patients. However, the analysis conducted was at the HHA level and we do not have severity data at the HHA level; thus, these two variables had to be excluded from the analysis to prevent confounding effects.

- ❖ *The high standard deviations of these two variables confirmed the above statement*

Methods

- Objective 3
 - Create regression tree models for the two unitization outcomes for urban and non-urban HHAs respectively
 - Same prediction variables selected as in models created in objective 2, because these services and processes can be improved/changed. Other variables such as type of HHA, cannot be changed easily, and clinical outcomes variables does not provide guidance for HHAs, so they are excluded.
 - Off.nursing
 - Off.physical
 - Off.occupational
 - Off.speech
 - Off.medical
 - Off.hha
 - Timely
 - Taughtdrugs
 - Checkfall
 - Checkdepression
 - Taughtfootcare
 - Complex parameter (cp) are selected with lowest 10-fold cross-validation error
 - Models are trimmed to have level of depth = 2, thus, to investigate the most significant measures that have impacts on response variable

Results: Objective 1

- Table of characteristic measure
- Urban HHA are mostly proprietary type
- Non-urban HHA are also mostly in proprietary type but has more percentage in all other types than urban HHA

	typeCount_Urban	typePerc_Urban	typeCount_Rural	typePerc_Rural
Government - Combination Government & Voluntary	83	0.06%	140	0.35%
Government - Local	400	0.29%	2111	5.30%
Government - State/ County	747	0.54%	4126	10.36%
Non - Profit Other	4234	3.06%	4007	10.06%
Non - Profit Private	6830	4.93%	4578	11.49%
Non - Profit Religious	3384	2.44%	2016	5.06%
Proprietary	122882	88.69%	22858	57.38%

Results: Objective 1

- Table of service offered measures
- All HHAs in both urban and non-urban area offer nursing services
- More urban HHAs offer occupational, speech, and medical services than non-urban HHAs
- More non-urban HHAs offer physical and hha services than urban HHAs

	offCount_Urban	offPerc_Urban	offCount_Rural	offPerc_Rural
off.nursing	138560	100.00%	39836	100.00%
off.physical	134622	97.16%	38928	97.72%
off.occupational	131411	94.84%	35264	88.52%
off.speech	125808	90.80%	33599	84.34%
off.medical	122697	88.55%	28969	72.72%
off.hha	131984	95.25%	38361	96.30%

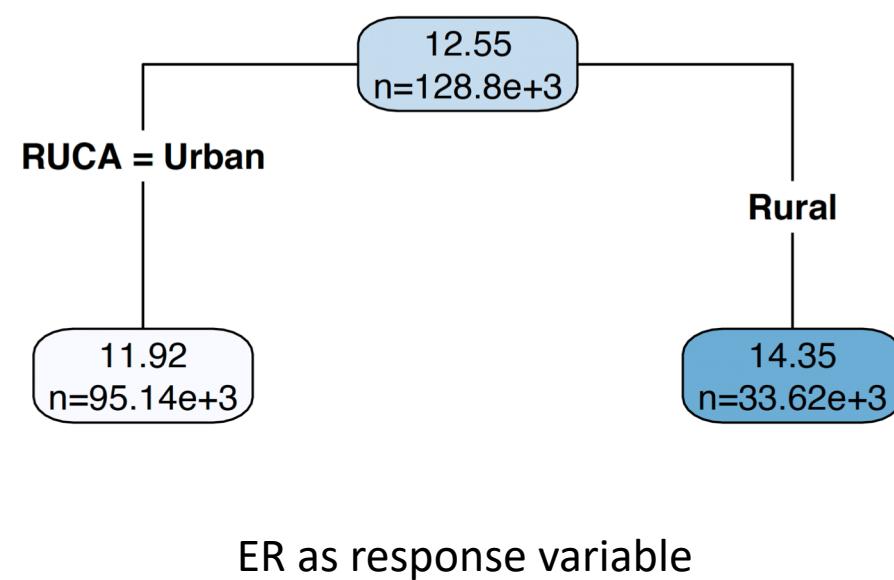
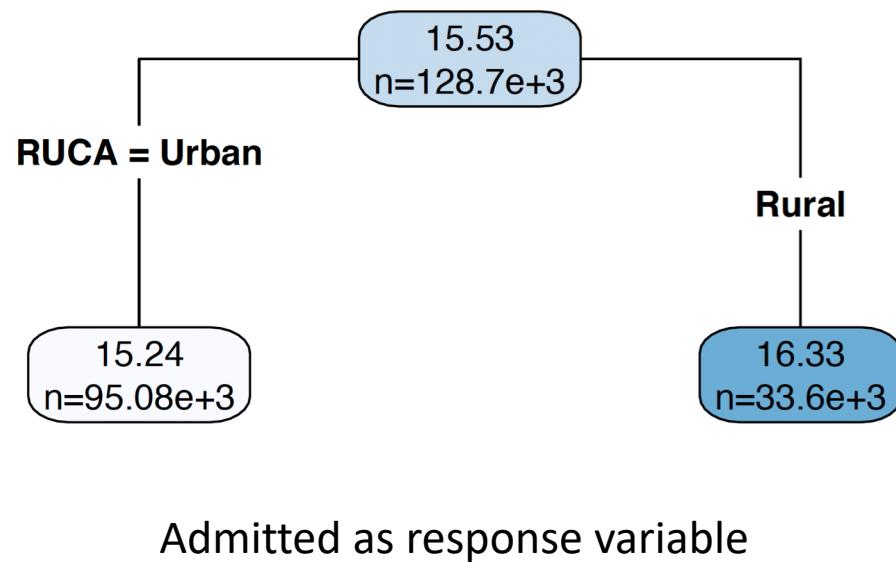
Results: Objective 1

- Table of clinical process measures, clinical outcome measures, and utilization outcome measures

	valueMean_Urban	valueMedian_Urban	valueStd_Urban	valueMean_Rural	valueMedian_Rural	valueStd_Rural	valueWil
rating	3.27	3.50	0.93	3.23	3.00	0.86	3.25E-20
timely	91.61	94.50	9.05	93.14	95.20	6.95	1.83E-84
taughtdrugs	95.61	98.40	8.60	95.54	98.30	7.85	2.36E-15
checkfall	99.13	100.00	2.95	99.25	100.00	2.85	0.2271547
checkdepression	96.38	99.10	9.03	97.43	99.20	6.05	6.95E-09
flushot	69.33	74.70	21.27	72.84	75.00	14.22	7.31E-19
pnumococcal	71.17	78.70	24.06	78.62	82.20	15.59	0
taughtfootcare	96.28	98.80	7.74	96.02	98.50	7.34	1.52E-55
betterwalking	76.61	75.90	17.33	77.39	76.10	15.27	0.0045086
betterbed	74.54	74.40	19.38	76.26	75.20	16.91	1.64E-23
betterbathing	79.03	80.20	17.92	79.75	79.40	15.61	0.0389012
lesspain	70.81	72.20	17.90	68.27	68.80	14.69	1.17E-237
betterbreathing	66.20	69.30	19.15	66.82	68.80	15.82	0.0150358
betterheal	80.08	85.50	17.04	81.93	87.30	15.15	3.91E-28
betterdrug	57.21	58.30	16.73	58.15	58.50	13.85	3.11E-09
admitted	15.24	15.30	4.10	16.33	16.20	4.15	0
ER	11.92	11.80	4.12	14.35	14.20	4.34	0

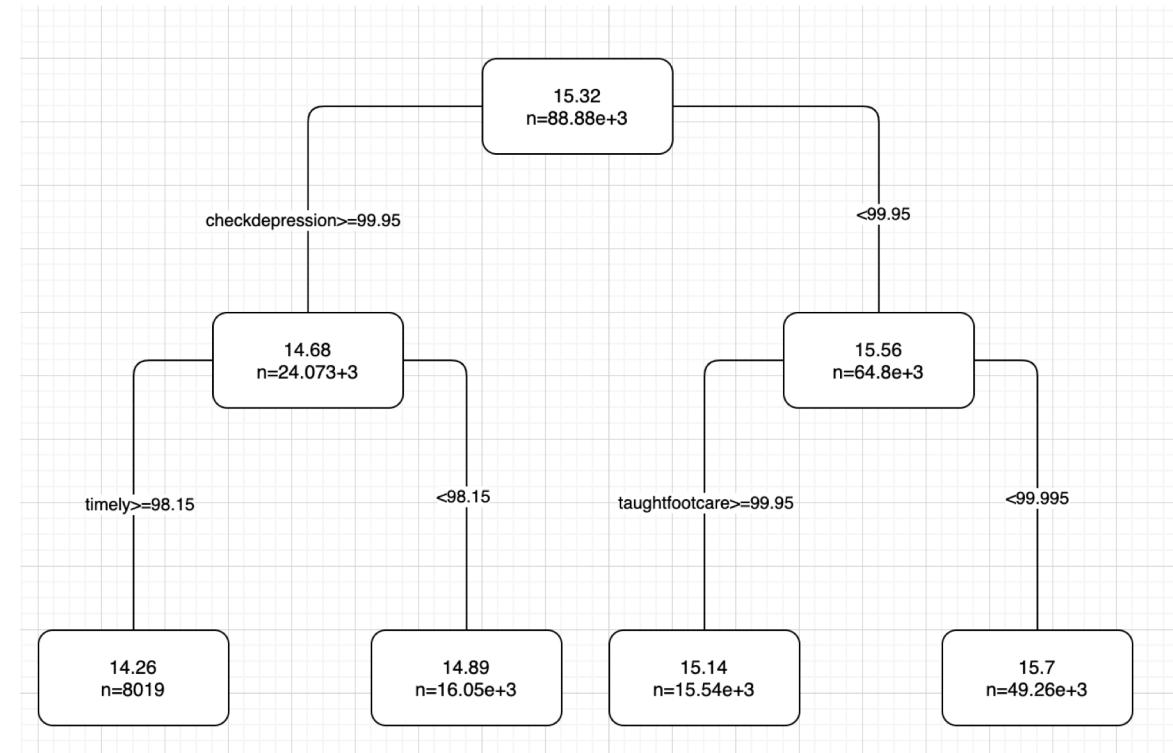
Results: Objective 2

- Rurality is important to effect utilization outcomes
- The first node has different observations because records with NA value in response variable are omitted



Results: Objective 3

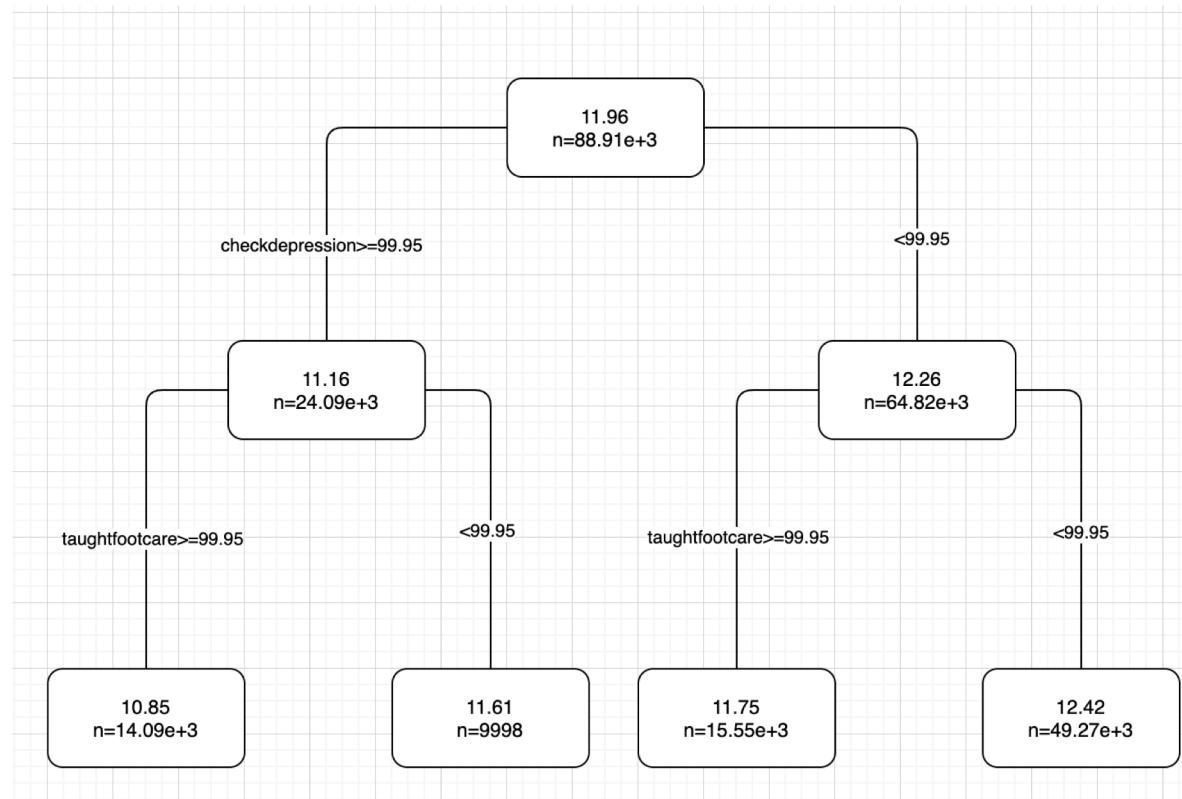
- Higher Checkdepression, timely and taughfootcare rates can lower admission rate in urban area
- Most urban HHAs have not reached best rate: (checkdepression=99.95 and timely = 98.15) vs median 99.1 and 94.5



Regression tree with admission as response variable for urban data

Results: Objective 3

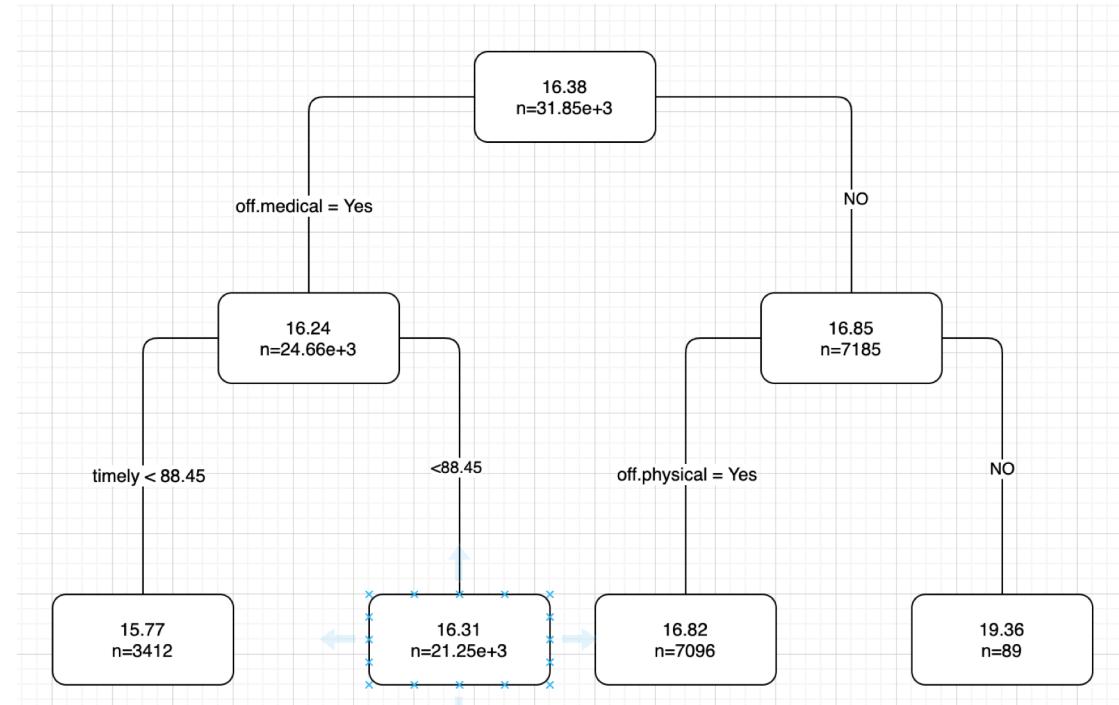
- Higher Checkdepression and taughtfootcare rates can lower ER rate in urban area
- Most urban HHAs have not reached best rate: (checkdepression=99.95 and taughtfootcare = 99.95) vs median 99.1 and 98.8



Regression tree with ER as response variable
for urban data

Results: Objective 3

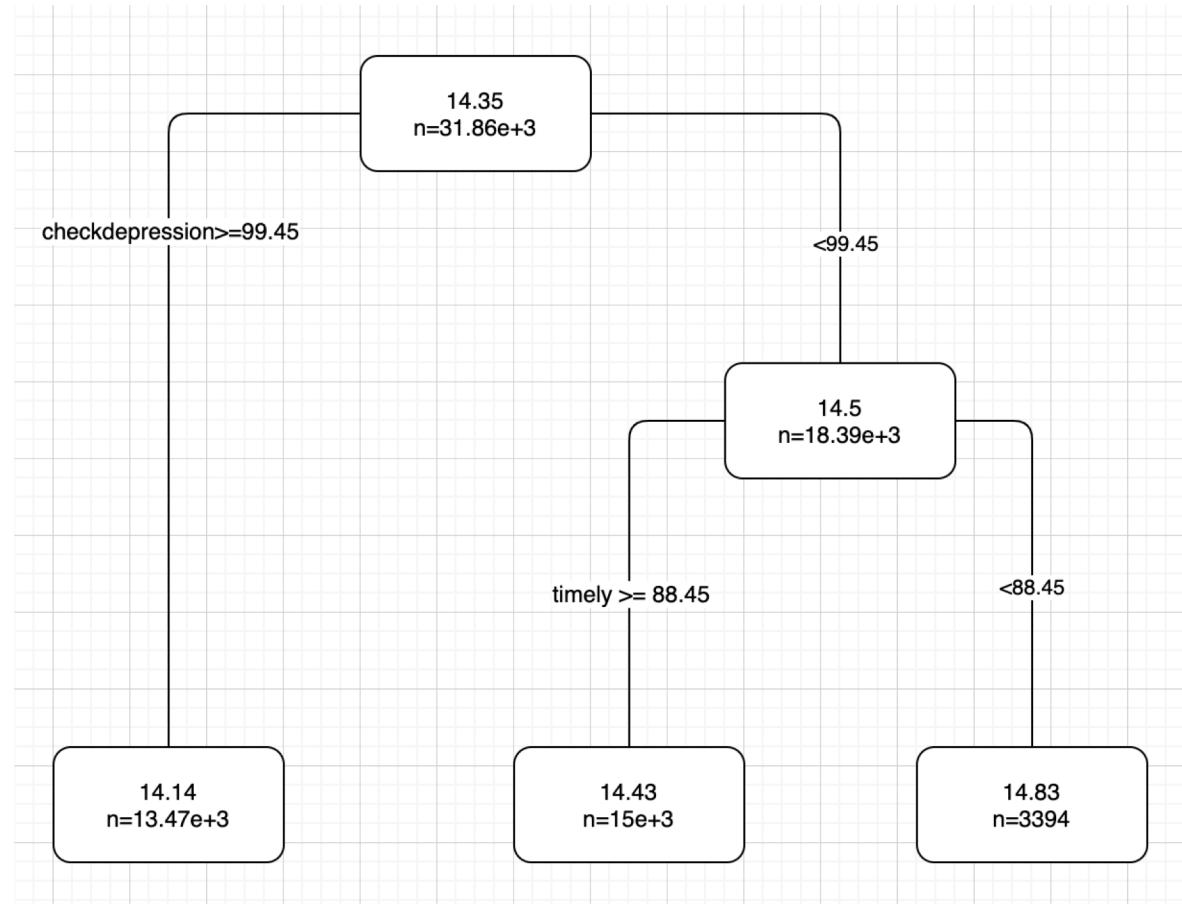
- Higher off.medical, off.physical rates and **lower?** (it needs a good explanation) timely rate can lower admission rate in non-urban area
- 72.72% of non-urban HHAs offer medical service and 92.72% non-urban HHAs offer physical service



Regression tree with admission as response variable for non-urban data

Results: Objective 3

- Higher Checkdepression and timely rates can lower ERrate in non-urban area
- Most non-urban HHAs have not reached best rate:
(checkdepression=99.95) vs median 99.2
- but reached (timely = 88.45) vs median 98.5



Regression tree with ER as response variable
for non-urban data