

Mercy Housing Resident Emergency Department Utilization

National Resident Services

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Introduction

Frequent Emergency Department (ED) utilization is a common concern in healthcare access and cost studies. Mercy Housing has a unique longitudinal dataset of ED utilization among residents, with over 25,000 responses from 17,000 residents in 3 national health surveys over the past five years (this represents about 35% with repeated measures). It would be beneficial to know how resident demographics and health access factors are associated with ED use on a crude and adjusted basis. Further, it would be valuable to know if this provides evidence that housing stability is associated with less ED use, both in terms of the likelihood of any ED visits and the average number of visits for those with one or more.

Executive Summary

- Self-assessed health has the single strongest association of any term and ED utilization and average visits of those with one or more.
 - 62% of respondents classifying their health as *poor*, reported an ED visit in the prior 12 months, and an average of 2.41 visits among those with one or more.
- Supportive housing residents are more likely than senior and family populations to have an ED visit in the past 12 months.
 - Nearly 50% of supportive housing residents reported one or more visits in the past 12 months.
 - Adjusting for demographics and health factors this drops to 35%, suggesting a substantial amount of *supportive housing* visits are associated with health and other explanatory factors.
- The strong and expected associations between *self-assessed health* and *population served* with ED use demonstrates internal and external validity of this data.
- Length of residency on a crude/unadjusted basis does not immediately show a difference between new, medium, and longer-term residents, with all reporting about 33% with an ED visit in the past 12 months.
 - However, after adjustment for health factors and demographics, longer-term residents show significantly fewer ED visits than new residents, **an absolute reduction of 10%**.
- Healthcare access and utilization, including health insurance, having a primary care provider, and reporting a routine checkup, are all paradoxically associated with a greater probability of an ED visit. Adjusting for demographics and health attenuate that relationship, but it remains statistically significant. (This is a known association in the ED utilization literature, for example).
- Therefore, Mercy Housing health and wellness services pertaining to healthcare access and utilization are also associated with more ED visits, even after adjustments.

Primary Associations

Self-Assessed Health

Term	Category	Crude % 1+ ED Visits	Adjusted % 1+ ED Visits	Crude Avg 1+ ED Visits	Adjusted Avg 1+ ED Visits	% Sig. Grp.	Avg Sig. Grp.
Health Self-Assessment	Poor	61.6%	54.3%	2.41	1.83	d	d
Health Self-Assessment	Fair	44.8%	35.0%	2	1.54	c	c
Health Self-Assessment	Good	30.9%	21.7%	1.71	1.37	b	b
Health Self-Assessment	Very Good	25.9%	17.2%	1.61	1.27	a	a
Health Self-Assessment	Excellent	24.1%	16.2%	1.58	1.28	a	a

Self-assessed health is a research-validated CDC question used on the state-based Behavioral Risk Factor Surveillance System (BRFSS). On a crude and adjusted basis, it has the strongest association with any ED utilization and average number of visits for those with one or more. Further, the ordinal rank of the scale was not imposed by any modeling, e.g., 'fair' health could have measured fewer ED visits than 'good' health, but the validity and coherence of the question are such that the scale is clearly and significantly demonstrated in the data. Each level of health was significantly different than the others with the exception of *excellent* and *very good* not reaching a clear difference. This strong and coherent association lends internal and external validity to this dataset. (Description of the data and the methods for statistical adjustments are described in the appendixes).

Population Served

Term	Category	Crude % 1+ ED Visits	Adjusted % 1+ ED Visits	Crude Avg 1+ ED Visits	Adjusted Avg 1+ ED Visits	% Sig. Grp.	Avg Sig. Grp.
Population Served	Supportive Housing	49.7%	35.2%	2.23	1.56	b	b
Population Served	Senior	36.4%	23.5%	1.77	1.38	a	a
Population Served	Family	28.6%	23.5%	1.76	1.4	a	a

The second strongest association with ED utilization was by *population served*. As anticipated, *supportive housing* residents have a much higher tendency to use the ED and a higher average number of visits for those with one or more. Two notable aspects of the adjusted rates where that, the attenuation of the probability of an ED

visit for *supportive housing* after adjusting for other terms suggests 15% (absolute basis) of ED users are associated with general explanatory factors such as poor health and age. After adjustments, *senior* and *family housing* are indistinguishable in terms of ED use.

Key Outcomes

Length of Residency

Term	Category	Crude % 1+ ED Visits	Adjusted % 1+ ED Visits	Crude Avg 1+ ED Visits	Adjusted Avg 1+ ED Visits	% Sig. Grp.	Avg Sig. Grp.
Length of Residency	0-2 years	35.5%	32.1%	1.91	1.46	b	a
Length of Residency	2-5 years	32.2%	29.5%	1.86	1.39	b	a
Length of Residency	5+ years	32.7%	20.6%	1.75	1.48	a	a

On initial review, the crude percentage of those with an ED visit does not appear to vary substantially by length of residency. However, once adjustments are considered for other factors, there is a notable decline for those with *5+ years* residency, about a **10% absolute reduction in the number of residents using the ED**. This is a remarkable decline, not just significant in statistical terms, but also substantive in terms of total reduction.

This uses a standard categorical grouping of length of residency, and while this association is promising, analyzing the continuous association between ED visits and length of residency may provide a more granular cutoff point. (i.e., perhaps the notable decline starting at three years residency).

Healthcare Access, Utilization, and Services

Term	Category	Crude % 1+ ED Visits	Adjusted % 1+ ED Visits	Crude Avg 1+ ED Visits	Adjusted Avg 1+ ED Visits	% Sig. Grp.	Avg Sig. Grp.
Health Insurance	Yes	34.0%	29.2%	1.85	1.47	b	a
Health Insurance	No	26.4%	25.1%	1.66	1.42	a	a
Primary Care Provided	Yes	34.8%	28.2%	1.85	1.45	b	a
Primary Care Provided	No	29.0%	26.0%	1.83	1.44	a	a
Routine Checkup	Within past year	34.8%	32.3%	1.85	1.44	b	a
Routine Checkup	Not in past year	24.9%	22.5%	1.83	1.44	a	a

Services	Yes	37.6%	28.1%	1.9	1.47	b	b
Services	None	31.7%	26.1%	1.81	1.42	a	a

Mercy Housing residents reflect a paradoxical association between healthcare access and utilization and ED visits that has been noted in recent years in various studies. Initially, with the rollout of the Affordable Care Act and expansion of Medicaid, the hope was, increased access to insurance would reduce ED use. However, the inverse has typically been observed, with acquisition of insurance, and primary care provider, and routine checkups all being associated with increased ED use. This relationship now is also evident in our survey data. Unsurprisingly therefore, Mercy Housing services associated with healthcare access are also associated with higher use. The services considered here are a subset of 7 Mercy Housing health and wellness services including ADL activities for seniors, behavioral healthcare, health benefits acquisition, group health education, individual risk reduction coaching, physical activity services, and primary and preventative healthcare services.

Demographics

Race Ethnicity

Term	Category	Crude % 1+ ED Visits	Adjusted % 1+ ED Visits	Crude Avg 1+ ED Visits	Adjusted Avg 1+ ED Visits	% Sig. Grp.	Avg Sig. Grp.
Race Eth	Black	39.2%	34.0%	1.92	1.56	c	b
Race Eth	White	38.0%	31.5%	1.9	1.5	c	b
Race Eth	Other-Unknown	31.7%	30.2%	1.85	1.48	c	b
Race Eth	Hispanic	26.9%	24.7%	1.78	1.45	b	b
Race Eth	Asian	27.2%	17.5%	1.62	1.25	a	a

On an unadjusted basis, black residents have the highest ED utilization. However, after taking into account confounding factors, there is no significant difference between black, white, and other-unknown residents. Hispanic and Asian residents do have significantly lower rates of ED use, and among those who do use the ER, Asians have a significantly lower average number of visits.

Region

Term	Category	Crude % 1+ ED Visits	Adjusted % 1+ ED Visits	Crude Avg 1+ ED Visits	Adjusted Avg 1+ ED Visits	% Sig. Grp.	Avg Sig. Grp.
GBC	MHMP	34.4%	29.9%	1.86	1.49	b	a
GBC	MHSE	38.9%	29.6%	1.75	1.45	b	a
GBC	MHC	33.9%	29.1%	1.86	1.47	b	a
GBC	MHLF	45.0%	26.3%	2.05	1.38	ab	a

GBC	MHNW	25.4%	21.3%	1.72	1.42	a	a
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On a crude basis, Mercy Housing regions appear to have quite varying rates of ED utilization. However, this ignores substantial differences in resident populations. After taking into account confounding variables and demographics, the regions are very similar, with only Mercy Housing Northwest (MHNW) significantly less likely to have an ED visit. Notably, there is no statistical difference in the average number of visits among those with one or more by region.

Age Group

Term	Category	Crude % 1+ ED Visits	Adjusted % 1+ ED Visits	Crude Avg 1+ ED Visits	Adjusted Avg 1+ ED Visits	% Sig. Grp.	Avg Sig. Grp.
Age Group	Adults	36.3%	28.5%	2.02	1.5	b	b
Age Group	Seniors	36.4%	27.6%	1.75	1.43	ab	ab
Age Group	Children	24.8%	25.3%	1.57	1.4	a	a

Children are the least likely to visit the ED and have the lowest adjusted average number of visits. On a crude basis seniors and adults appear to have similar utilization rates, with seniors slightly higher. However, on an adjusted basis, seniors are marginally lower, suggesting their ED visits may have more explanatory factors such as health status, than those of adults.

Gender

Term	Category	Crude % 1+ ED Visits	Adjusted % 1+ ED Visits	Crude Avg 1+ ED Visits	Adjusted Avg 1+ ED Visits	% Sig. Grp.	Avg Sig. Grp.
Gender	Female	34.9%	28.4%	1.84	1.44	b	a
Gender	Male	31.7%	25.9%	1.86	1.45	a	a

On a crude and adjusted basis, women are slightly, but significantly, more likely to visit the ER. However, their average number of visits is not significantly higher among ED users.

Summary

Mercy Housing Annual Resident Survey data from the past five years demonstrates internal and external validity through its significant associations between ED utilization and program models and self-assessed health. Promisingly, residencies of five years or longer were associated with a 10% absolute reduction in ED utilization compared to newer residents, after adjusting for demographic and health factors. This is promising data that shows housing stability through affordable housing to be associated with less ED use and a reduction in healthcare costs.

Appendixes

Data

Data in this analysis is from the national implementations of the Mercy Annual Resident Survey from 2014, 2015, and 2017 (there are non-national regional implementations that have occurred in 2016 and 2018 which were not included). Missing responses and demographics were dropped as these are independently collected and assumed to be non-informative missing. One exception was the largest missing demographic, *race* and *ethnicity*, where missing values were lumped into an *unknown-other* category, comprising about 6% of that variable.

Data Composition Total and by Survey Year

Term	Total	ARS 2014	ARS 2015	ARS 2017
	n = 25432	n = 7723	n = 8318	n = 9391
ER Visits				
None	16,886 (66.4%)	5,142 (66.6%)	5,438 (65.4%)	6,306 (67.1%)
One or More	8,546 (33.6%)	2,581 (33.4%)	2,880 (34.6%)	3,085 (32.9%)
Gender				
Female	15,053 (59.2%)	4,584 (59.4%)	4,883 (58.7%)	5,586 (59.5%)
Male	10,379 (40.8%)	3,139 (40.6%)	3,435 (41.3%)	3,805 (40.5%)
Race Ethnicity				
Asian	3,960 (15.6%)	982 (12.7%)	1,298 (15.6%)	1,680 (17.9%)
Black	6,367 (25%)	1,896 (24.6%)	2,138 (25.7%)	2,333 (24.8%)
Hispanic	6,030 (23.7%)	2,047 (26.5%)	1,963 (23.6%)	2,020 (21.5%)
Other-Unknown	1,583 (6.2%)	473 (6.1%)	503 (6%)	607 (6.5%)
White	7,492 (29.5%)	2,325 (30.1%)	2,416 (29%)	2,751 (29.3%)
Age Group				
Adults	10,740 (42.2%)	3,381 (43.8%)	3,556 (42.8%)	3,803 (40.5%)
Children	6,021 (23.7%)	2,014 (26.1%)	1,959 (23.6%)	2,048 (21.8%)
Seniors	8,671 (34.1%)	2,328 (30.1%)	2,803 (33.7%)	3,540 (37.7%)
Length of Residency				
0-2 years	9,439 (37.1%)	3,368 (43.6%)	3,364 (40.4%)	2,707 (28.8%)
2-5 years	7,775 (30.6%)	2,162 (28%)	2,458 (29.6%)	3,155 (33.6%)
5+ years	8,218 (32.3%)	2,193 (28.4%)	2,496 (30%)	3,529 (37.6%)
Region				
MHC	12,231 (48.1%)	3,672 (47.5%)	4,035 (48.5%)	4,524 (48.2%)
MHLF	1,471 (5.8%)	399 (5.2%)	598 (7.2%)	474 (5%)
MHMP	4,767 (18.7%)	1,518 (19.7%)	1,519 (18.3%)	1,730 (18.4%)
MHNW	4,559 (17.9%)	1,458 (18.9%)	1,418 (17%)	1,683 (17.9%)
MHSE	2,404 (9.5%)	676 (8.8%)	748 (9%)	980 (10.4%)
Population Served				
Family	14,152 (55.6%)	4,668 (60.4%)	4,598 (55.3%)	4,886 (52%)
Senior	8,362 (32.9%)	2,237 (29%)	2,702 (32.5%)	3,423 (36.4%)
Supportive Housing	2,918 (11.5%)	818 (10.6%)	1,018 (12.2%)	1,082 (11.5%)
Health Self Assessment				

Excellent	4,625 (18.2%)	1,357 (17.6%)	1,511 (18.2%)	1,757 (18.7%)
Very Good	5,588 (22%)	1,750 (22.7%)	1,833 (22%)	2,005 (21.4%)
Good	8,124 (31.9%)	2,532 (32.8%)	2,626 (31.6%)	2,966 (31.6%)
Fair	5,334 (21%)	1,568 (20.3%)	1,747 (21%)	2,019 (21.5%)
Poor	1,761 (6.9%)	516 (6.7%)	601 (7.2%)	644 (6.9%)
Health Insurance				
No	1,267 (5%)	696 (9%)	201 (2.4%)	370 (3.9%)
Yes	24,165 (95%)	7,027 (91%)	8,117 (97.6%)	9,021 (96.1%)
Primary Care Provider				
No	5,060 (19.9%)	1,819 (23.6%)	1,622 (19.5%)	1,619 (17.2%)
Yes	20,372 (80.1%)	5,904 (76.4%)	6,696 (80.5%)	7,772 (82.8%)
Checkup				
Not in past year	3,066 (12.1%)	978 (12.7%)	1,029 (12.4%)	1,059 (11.3%)
Within past year	22,366 (87.9%)	6,745 (87.3%)	7,289 (87.6%)	8,332 (88.7%)
Health Wellness Services				
None	17,192 (67.6%)	4,875 (63.1%)	4,735 (56.9%)	7,582 (80.7%)
Yes	8,240 (32.4%)	2,848 (36.9%)	3,583 (43.1%)	1,809 (19.3%)

Repeated Measures

Given residents can participate multiple times in the Annual Resident Survey, this provides an interesting longitudinal repeated measures scenario. Sixty-three percent of respondents participated in one year, but about 26% participated in two different years, and about 12% participated in all three years in this analysis. Individual variance was incorporated into the modeling using mixed effects, which is reviewed next.

Distinct Response Years	Number of Residents	Percent
1	10,694	62.7%
2	4,387	25.7%
3	1,988	11.6%
Total	17,069	100.0%

Modeling

Two primary models were used for this analysis. The first model was a mixed effect generalized linear model with a random effect by respondents for the probability of any ED visits using a binomial family and logit link. The second model was also a mixed effect generalized linear model with a random effect by respondent, but for count of ED visits for those with one or more visits using a gamma family (for exponential distribution) and log link (selected by best fit AIC). Mixed-effects were used because of the repeated measures data. The primary variable interest being length of residency, both models included an interaction between length of residency and all other terms. Those models were used to produce the estimated marginal means for the adjusted values in the tables above. Non-interaction versions of each model coefficients are used here for ease of presentation (note: the interaction models were used because of a prior determination to investigate residency interaction, but they also had lower AICs than the purely main-effect models and had multiple significant interaction terms).

	Binomial logit GLMER Model: Probability of Any ED Visits		Gamma log GLMER Model: Estimated Count of One or More ED Visits	
(Intercept)	-2.298 ***	CI (-2.527,-2.070)	0.099 *	CI (0.008,0.190)
race_ethBlack	0.823 ***	CI (0.691,0.954)	0.182 ***	CI (0.120,0.245)
race_ethHispanic	0.385 ***	CI (0.262,0.508)	0.139 ***	CI (0.079,0.199)
race_ethOther-Unknown	0.680 ***	CI (0.512,0.848)	0.172 ***	CI (0.092,0.251)
race_ethWhite	0.726 ***	CI (0.612,0.840)	0.156 ***	CI (0.101,0.210)
GenderMale	-0.143 ***	CI (-0.213,-0.074)	0.003	CI (-0.030,0.036)
age_grpChildren	-0.149 **	CI (-0.247,-0.051)	-0.067 **	CI (-0.114,-0.020)
age_grpSeniors	-0.031	CI (-0.154,0.092)	-0.047	CI (-0.098,0.005)
lor_grp2-5 years	-0.223 ***	CI (-0.302,-0.145)	-0.032 *	CI (-0.058,-0.006)

lor_grp5+ years	-0.304 ***	CI (-0.389,-0.219)	-0.044 *	CI (-0.079,-0.008)
GBCMHLF	-0.197 *	CI (-0.369,-0.025)	-0.069	CI (-0.141,0.003)
GBCMHP	0.058	CI (-0.036,0.152)	0.017	CI (-0.026,0.060)
GBCMHNW	-0.399 ***	CI (-0.502,-0.295)	-0.044	CI (-0.094,0.006)
GBCMHE	0.046	CI (-0.092,0.183)	-0.021	CI (-0.083,0.040)
PopulationServedSenior	0.020	CI (-0.110,0.149)	-0.019	CI (-0.075,0.037)
PopulationServedSupportive Housing	0.624 ***	CI (0.489,0.759)	0.124 ***	CI (0.068,0.180)
survey_yearAnnual Resident Survey 2015	0.011	CI (-0.067,0.089)	0.015	CI (-0.006,0.036)
survey_yearAnnual Resident Survey 2017	-0.012	CI (-0.091,0.068)	0.038 **	CI (0.013,0.063)
health_insuranceYes	0.160 *	CI (0.001,0.320)	0.055	CI (-0.003,0.114)
pcpYes	0.084	CI (-0.004,0.172)	0.012	CI (-0.018,0.043)
checkupWithin past year	0.487 ***	CI (0.378,0.595)	0.001	CI (-0.037,0.038)
health_self_assessmentVery Good	0.051	CI (-0.056,0.158)	-0.001	CI (-0.044,0.042)
health_self_assessmentGood	0.347 ***	CI (0.245,0.449)	0.071 ***	CI (0.030,0.112)
health_self_assessmentFair	1.005 ***	CI (0.890,1.120)	0.187 ***	CI (0.144,0.231)
health_self_assessmentPoor	1.838 ***	CI (1.683,1.993)	0.363 ***	CI (0.313,0.413)
hw_servicesYes	0.094 *	CI (0.014,0.173)	0.034 *	CI (0.007,0.062)
N	25432		8546	
logLik	-15030.308		-8164.881	

Coefficients on log scale. *** p < 0.001; ** p < 0.01; * p < 0.05.

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This analysis was performed in R and made free use of the following packages in this analysis.

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