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Neither Race nor Ethnicity Impact the Mortality of Residents of Veterans Affairs Community Living Center with COVID-19

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1 **Title:** Neither Race nor Ethnicity Impact the Mortality of Residents of Veterans Affairs
2 Community Living Center with COVID-19
3
4 **Running Title:** COVID-19 Racial Disparities absent in VA CLCs
5

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33
34 **Brief Summary:** In the pre-vaccine period, increased age and comorbid conditions but not
35 frailty, race, or ethnicity were independently associated with 30-day all-cause mortality among
36 VA CLC residents with a positive COVID-19 test.
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64 **Author contributions**
65 • Study concept and design: Ukwen Akpoji, Robin Jump, Federico Perez
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68 • Drafting of the manuscript: Mayyadah Alabdely, Sonya Kothadia
69 • Critical revision of the manuscript for important intellectual content: all authors

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1   **ABSTRACT**

2   **Objectives:** COVID-19 disproportionately affected nursing home residents and people from

3   racial and ethnic minorities in the US. Nursing homes in the Veterans Affairs (VA) system,

4   termed Community Living Centers (CLCs), belong to a national managed care system. In the

5   period prior to the availability of vaccines, we examined whether residents from racial and ethnic

6   minorities experienced disparities in COVID-19 related mortality.

7   **Design:** Retrospective cohort study.

8   **Setting and Participants:** Residents at 134 VA CLCs from April 14 to December 10, 2020

9   **Methods**: We used the VA's Corporate Data Warehouse to identify VA CLC residents with a

10   positive SARS-CoV-2 PCR test during or 2 days prior to their admission and without a prior case

11   of COVID-19. We assessed age, self-reported race/ethnicity, frailty, chronic medical conditions,

12   Charlson comorbidity index, the annual quarter of the infection, and all-cause 30-day mortality.

13   We estimated odds ratios (OR) and 95% confidence intervals (CIs) of all-cause 30-day mortality

14   using a mixed-effects multivariable logistic regression model.

15   **Results:** During the study period, 1133 CLC residents had an index positive SARS-CoV-2 test.

16   Mortality at 30 days was 23% for White non-Hispanic residents, 15% for Black non-Hispanic

17   residents, 10% for Hispanic residents, and 16% for other residents. Factors associated with

18   increased 30-day mortality were age ≥70, Charlson comorbidity index ≥6, and a positive SARS-

19   CoV-2 test between April 14 and June 30, 2020. Frailty, Black race, and Hispanic ethnicity were

20   not independently associated with an increased risk of 30-day mortality.

21   **Conclusions and Implications**: Among a national cohort of VA CLC residents with COVID-

22   19, neither Black race nor Hispanic ethnicity had a negative impact on survival. Further research

23   is needed to determine factors within the VA healthcare system that mitigate the influence of

24   systemic racism on COVID-19 outcomes in US nursing homes.

25

26 **INTRODUCTION**

27 The COVID-19 pandemic disproportionately affected residents in nursing homes. Although

28 nursing homes provide care for <1% of the adult population in the United States, 14% of deaths

29 due to COVID-19 occurred in nursing homes.[1,2] Prior to vaccines, nursing home residents

30 accounted for over 33% of COVID-19 related deaths.[3] SARS-CoV-2 infections also

31 disproportionately affected people from racial and ethnic minorities relative to White non-

32 Hispanics. The degree to which racial and ethnic disparities, a reflection of the influences of

33 systemic racism on healthcare, were observed among nursing home residents is less clear.

34

35 Several studies that considered the period prior to the availability of an effective SARS-CoV-2

36 vaccine reported that nursing homes with higher proportions of non-White residents had higher

37 rates of COVID-19 infections and mortality.[4–7] A systematic review of studies that included

38 facility-level characteristics concluded that nursing homes' size and community prevalence of

39 COVID-19 were among the most important factors influencing outcomes.[8] The review also

40 noted that outcomes varied by the facility racial composition. In contrast, studies that included

41 resident-level factors found that age as well as impaired cognitive and physical function, but not

42 race or ethnicity, were associated with an increased risk of COVID-19 related mortality among

43 nursing home residents.[9,10] Considering both facility- and resident-level characteristics, Lu *et al.*

44 assessed risk factors for COVID-19 deaths among Medicare beneficiaries aged ≥65 and living in

45 a nursing home. The authors reported that for-profit ownership and low health inspection ratings

46 (facility characteristics) as well as age, gender, and cognitive impairment (resident

47 characteristics) were all risk factors for COVID-19 related mortality.[11] Lu *et al.* proposed that

48   equal access to care, such as that provided by Medicare benefits for older persons, would

49   mitigate the impacts of systemic racism observed in prior studies of nursing home residents.

50

51   The Veterans Health Administration is a national managed care system that offers eligibility and

52   benefits based on prior military service. The Department of Veterans Affairs (VA) has 134

53   nursing homes, termed Community Living Centers (CLCs). We hypothesized that among VA

54   CLC residents with COVID-19, age, frailty, and chronic medical conditions, but not race nor

55   ethnicity, would be associated with mortality. To test our hypothesis, we conducted a

56   retrospective cohort study of VA CLC residents with documented SARS-CoV-2 infection prior

57   to the availability of COVID-19 vaccines and assessed 30-day all-cause mortality.

58

59   **METHODS**

60   **Study Design, Setting, and Data Sources.** We conducted a retrospective cohort study of

61   residents living in any of 134 VA CLCs from April 14, 2020 to December 10, 2020. On April

62   14, 2020 the VA issued a memorandum calling for widespread SARS-CoV-2 testing of all CLC

63   residents. After December 10th 2020, COVID-19 vaccines became available to VA CLC

64   residents.

65

66   We used the Veterans Affairs Informatics and Computing Infrastructure (VINCI) to access

67   clinical databases from the US Veterans Healthcare Administration (VHA). Data were extracted

68   from the VHA's Corporate Data Warehouse (CDW), the VHA's Vital Status File, and the VA

69   COVID-19 Shared Data Resource. The Institutional Review Board (IRB) at the VA [Redacted

70   for review] Healthcare System approved the study protocol.

71

72   **Case Ascertainment and Clinical Characteristics**. The cohort included all VA CLC residents

73   with an RT-PCR-based assay that was positive for SARS-CoV-2 within 2 days prior to or during

74   their admission to a VA CLC. Particularly in the early phase of the pandemic, residents may

75   have been asymptomatic or pre-symptomatic while in the CLC and subsequently found to be

76   positive while admitted to other settings within the same VA medical center (*i.e.*, acute care).

77   Therefore, residents who tested positive for SARS-CoV-2 in the week following transfer from

78   the CLC to another unit in a VA medical center were also included in the cohort. For each CLC

79   resident, only the index case (first case) was included, and individuals with a prior positive

80   SARS-CoV-2 PCR test or prior documentation of a COVID-19 case were excluded. We assessed

81   age, gender, self-reported race, self-reported ethnicity, annual quarter of the positive test, and,

82   based on *International Classification of Diseases* (*ICD*) and/or procedure codes, the VA Frailty

83   Index, the Charlson comorbidity index (CCI), and chronic comorbid conditions.[12,13] All-cause

84   mortality was evaluated at 30 days following a resident's first positive SARS-CoV-2 test.

85

86   **Statistical Analysis.** Case patient characteristics were summarized by race and ethnicity.

87   Differences in mean age, frailty index, and CCI were compared using least-squares regression

88   and, when omnibus differences were detected, we performed Tukey-adjusted pair-wise

89   comparisons. Kaplan-Meier survival curves, stratified by race and ethnicity and considering

90   mortality events within 30 days of positive SARS-CoV-2 PCR test, were compared using an

91   omnibus log-rank test. A mixed-effects multivariable logistic regression model was used to

92   estimate odds ratios (OR) and 95% confidence intervals (CI) for all-cause 30-day mortality,

93   which included age, gender, race and ethnicity, VA Frailty Index, CCI, and the date of the

5

94   positive test (stratified by quarter from April to December 2020) as fixed effects. With the

95   mixed-effects model, we estimated random facility effects as patient outcomes within a single

96   facility may be correlated. Statistical analyses were performed using R (version 4.1.2; Vienna,

97   Austria) including functions from additional packages.[14]

98

99   **RESULTS**

100 After excluding patients with prior positive SARS-CoV-2 PCR tests or documented COVID-19

101 cases, we identified 1,133 CLC residents with an index positive SARS-CoV-2 PCR test between

102 April 14th and December 10th, 2020. The majority were male (1105, 98%) and their mean age

103 was 75.6 years (± 10.4) (**Table 1**). The average age of White non-Hispanic residents 77.0 years

104 (± 10.2) was greater than that of Black non-Hispanic (72.4 (± 9.7); P < 0.001) and Hispanic

105 residents (72.4 (± 9.7); P < 0.001; **Supplemental Table 1**). The mean CCI for White non-

106 Hispanic residents (4.53 (± 2.7) was lower than that observed for Black non-Hispanic residents

107 (5.12 (± 3.1); P = 0.021).

108

109   All-cause 30-day mortality for CLC residents following a positive SARS-CoV-2 PCR test was

110 20% (229/1133). When stratified by race and ethnicity, all-cause mortality at 30 days was higher

111 among White non-Hispanic residents (175/758, 23%) compared to Black non-Hispanic residents

112 (36/246, 15%), Hispanic residents (4/42, 10%), and all other residents (14/87, 16%; **Figure 1**).

113 To assess the independent contribution of factors influencing mortality, we used a mixed-effects

114 multivariable logistic regression model in which CLC facility was a random effect; all other

115 variables were fixed effects. Among CLC residents with a positive SARS-CoV-2 PCR test, the

116 most notable factor impacting 30-day all-cause mortality was advanced age, increasing from an

6

117 OR of 5.98 (95% CI 1.407 - 25.433) for residents aged 70-79 years to an OR of 19.0 (95% CI

118 4.309 - 83.854) for residents aged ≥ 90 years relative to residents aged < 60 (**Table 2**). Residents

119 with a CCI score ≥6 had increased odds of 30-day mortality (OR 1.57; 95% CI 1.021 - 2.413). In

120 contrast, frailty was not associated with increased odds of mortality, and a positive test after

121 October-December 2020 was associated with decreased odds of mortality (OR 0.560; 95% CI

122 0.359 - 0.874). Of note, neither Black race nor Hispanic ethnicity (versus White-Non-Hispanic)

123 was associated with increased odds of mortality in our multivariate logistic regression model.

124

125 **DISCUSSION**

126 This retrospective study of VA CLC residents with positive SARS-CoV-2 PCR tests during the

127 pre-vaccine period found an overall all-cause 30-day mortality rate of 20%, and advanced age

128 was the resident-level factor most strongly associated with mortality. Infection early in the

129 epidemic and a high burden of comorbid medical conditions, but not frailty, were also associated

130 with increase odds of mortality. Importantly, we found that in this national cohort of VA CLC

131 residents with COVID-19, Black or Hispanic race and ethnicity were not associated with

132 increased odds of 30-day all-cause mortality.

133

134 Previous studies reported increased mortality among White compared to Black Veterans

135 hospitalized for common conditions, including pneumonia and exacerbations of congestive heart

136 failure or chronic obstructive pulmonary disease.[15–17] In these studies, the mean age of White

137 non-Hispanic patients was greater than that of Black non-Hispanic patients. Attempts to account

138 for age and several other demographic, clinical, and social variables did not alter the findings

139 supporting similar or better outcomes for Black Veterans. Our results differ somewhat in that our

140   multivariable logistic regression model implicated advanced age as an independent risk factor for

141   mortality for CLC residents with a positive SARS-CoV-2 test. Additionally, two assessments

142   from the pre-vaccine period found that people from racial and ethnic minorities were more likely

143   to get tested for COVID-19 through the VA and were more likely to have a positive test

144   compared to White non-Hispanic people.[18,19] Similar to our results, the rates of all-cause 30-day

145   mortality among those with positive tests did not differ by Veterans' race or ethnicity. Taken

146   together, these studies indicate that – in a healthcare system where access to care is based on

147   qualifying military service rather than employment or personal finances – people from racial and

148   ethnic minorities do not appear to have worse outcomes compared to White non-Hispanic

149   people.

150

151   The literature describing differences in outcomes prior to the availability of vaccines among

152   nursing home residents from racial and ethnic minorities is mixed. Among nursing home

153   residents with symptomatic COVID-19 infections, Panagiotou *et al.* found a lower risk of 30-day

154   all-cause mortality among non-White residents.[10] Mehta *et al.* noted an increased risk of

155   hospitalization, but not death, among Black, Asian, and Hispanic or Latino nursing home

156   residents with a COVID-19 infection.[9] Both teams indicated that risk of mortality among

157   nursing home residents with COVID-19 increased with age, impaired cognition, and limited

158   physical function. Three other studies assessed the communities in which nursing homes are

159   located and found that residents of nursing homes with the highest proportion of non-White

160   residents also had the highest rates of COVID-19 related mortality.[4–6] Together, these findings

161   suggest that the racial segregation that continues to affect the communities surrounding nursing

162   homes has a negative influence on the health of nursing home residents from racial and ethnic

163   minorities.[20]

164

165   The results reported here may also reflect characteristics of the VA healthcare system. While

166   most nursing homes care for people that came from the same local community, VA CLCs

167   typically have a much larger geographic catchment area and reside on a large campus that also

168   offers acute and ambulatory care services. Additionally, while VA CLCs also experienced

169   staffing shortages and challenges related to obtaining adequate testing supplies and personal

170   protective equipment, being part of an integrated healthcare system with a unionized nursing

171   staff may have mitigated some of these shortfalls.[21] Specifically, within each VA institution, staff

172   from other areas could be reassigned to care for CLC residents. Additionally, regional networks

173   within the VA system, termed Veterans Integrated Service Networks (VISNs), could help direct

174   personnel protective equipment (PPE) to the VA medical centers with the greatest need.

175

176   Our study has important limitations. First, our cohort consists of VA healthcare users, a

177   predominantly male and White non-Hispanic population with a high burden of comorbidities.[22,23]

178   While all-cause mortality at 30 days among VA CLC residents with a positive SARS-CoV-2

179   PCR test was similar to that reported for residents of community nursing homes,[9,10] other

180   differences between Veteran and non-Veteran population, such as the higher proportion of males,

181   affects the comparability of our findings to those of studies among nursing home residents in

182   community settings.[24] Second, our cohort of VA CLC residents was relatively small; especially

183   cases among veterans who identified as Hispanics or Other were very few, and may reflect

184   perceived ambiguity in these classifications. While extending the study period would have

185   permitted a larger cohort, we restricted our analysis to the period during which CLC residents

186   were routinely tested for SARS-CoV-2 and prior to the available of effective vaccines. These

187   restrictions limited the statistical power to detect differences between groups, especially for

188   people included in the Hispanic and Other categories.

189

190   **CONCLUSIONS AND IMPLICATIONS**

191   Among residents of VA CLCs with a positive SARS-CoV-2 PCR test, Black and Hispanic

192   residents did not experience higher all-cause 30-day mortality compared to White non-Hispanic

193   residents. Rather, factors such as advanced age, high comorbidity burden, conditions and

194   infection early in the epidemic were independently associated with increased mortality. The VA

195   is the largest integrated healthcare system in the US and differs from other healthcare

196   organizations in that eligibility is based on prior military service, rather than age, socioeconomic

197   status, or location. Greater understanding of aspects of the VA healthcare system that have the

198   potential to abate racial and ethnic disparities among VA CLC residents with COVID-19 may

199   help inform efforts to mitigate systemic racism on outcomes across non-VA nursing homes and

200   other healthcare sectors.

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266

267 **FIGURE LEGEND**

268 **Figure 1:** Survival Curves of VA Community Living Center Residents with a Positive SARS-

269 CoV-2 PCR test. White = grey continuous line; Black = black continuous curve; Hispanic =

270 black dotted curve; Other = grey dotted curve. Other includes American Indian or Alaska

271 Native, Asian, Multiple, Unknown, Missing, or Declined. Note that the y-axis starts at 0.5.

272 Comparing the survival curves with an omnibus log-rank test yielded a P-value of 0.01.
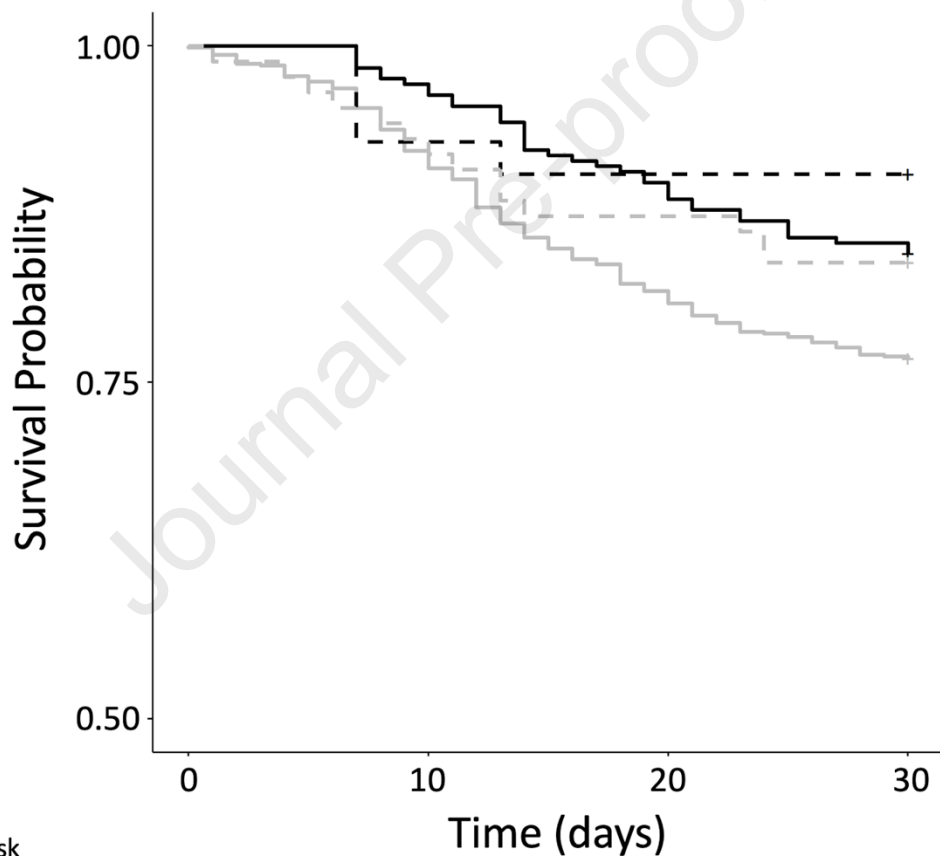
Number at risk				
White, non-Hispanic	758	699	620	583
Black, non-Hispanic	246	239	221	210
Hispanic	42	39	38	38
Other	87	81	76	73

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274 **TABLES**

275 **Table 1:** VA CLC Residents with a Positive SARS-CoV-2 PCR Test, April 14th – December
276 10th, 2020

Characteristics	All Cases N = 1133	White Non-Hispanic n = 758	Black Non-Hispanic n = 246	Hispanic n = 42	Other[a] n = 87
Age, mean (± SD)	75.6 (± 10.4)	77.0 (± 10.2)	72.4 (± 9.7)	70.6 (± 11.9)	75.4 (± 11.3)
Male, No. (%)	1084 (97%)	719 (98%)	241 (96%)	41 (98%)	83 (99%)
Frailty Index (± SD)	0.41 (± 0.1)	0.42 (± 0.1)	0.40 (± 0.1)	0.40 (± 0.1)	0.39 (± 0.1)
Charlson Comorbidity Index, mean (± SD)	4.65 (± 2.8)	4.53 (± 2.7)	5.12 (± 3.1)	4.60 (± 2.9)	4.43 (± 2.3)
Chronic Medical Conditions					
Dementia	681 (60%)	459 (61%)	145 (59%)	25 (60%)	52 (60%)
Diabetes	578 (51%)	368 (49%)	142 (58%)	23 (55%)	45 (52%)
Chronic pulmonary disease	447 (39%)	314 (41%)	85 (35%)	14 (33%)	34 (39%)
Stroke	394 (35%)	234 (31%)	110 (45%)	18 (43%)	32 (37%)
Peripheral vascular disease	374 (33%)	250 (33%)	75 (30%)	18 (43%)	31 (36%)
Renal disease	342 (30%)	229 (30%)	75 (30%)	9 (21%)	29 (33%)
Congestive heart failure	339 (30%)	235 (31%)	73 (30%)	9 (21%)	22 (25%)
Cancer	262 (23%)	175 (23%)	60 (24%)	10 (24%)	17 (20%)
Liver disease	153 (14%)	80 (11%)	53 (22%)	10 (24%)	10 (11%)
Paralysis	102 (9%)	61 (8%)	29 (12%)	4 (10%)	8 (9%)
Myocardial infarction	100 (9%)	79 (10%)	14 (6%)	1 (2%)	6 (7%)
Peptic ulcer disease	58 (5%)	38 (5%)	15 (6%)	2 (5%)	3 (3%)
Rheumatic disease	28 (2%)	17 (2%)	5 (2%)	3 (7%)	3 (3%)
HIV	8 (1%)	0 (0%)	7 (3%)	1 (2%)	0 (0%)

277 [a] Other includes American Indian or Alaska Native, Asian, Multiple, Unknown, Missing, or
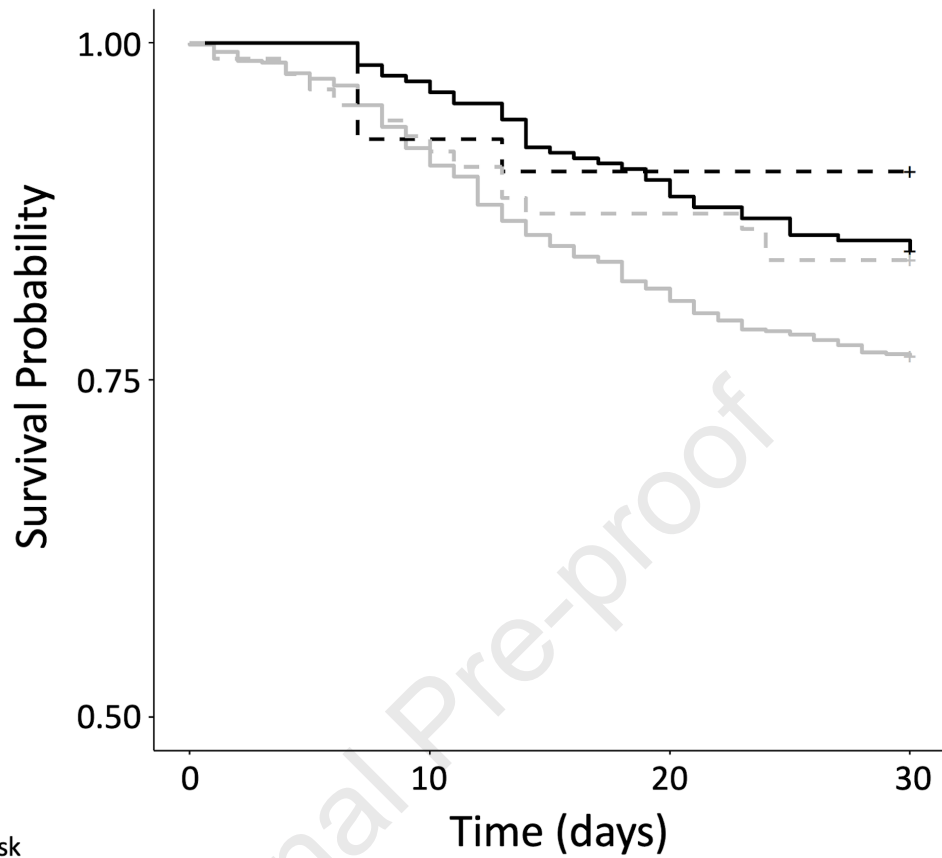278 Declined
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14

285 **Table 2.** Mixed-effects Multivariable Logistic Regression Odds Ratio for 30-Day All-Cause
286 Mortality Among VA CLC Residents with a Positive SARS-CoV-2 PCR Test Between April
287 14th and December 10th, 2020, CLC facility as random effect, fixed effects shown

Characteristics	Adjusted Odds Ratio	95% Confidence Interval	P-value[a]
Age (reference: <60 years)			
60 – 69 years	2.790	(0.629,12.382)	0.177
70 – 79 years	5.981	(1.407,25.433)	**0.015**
80 – 89 years	9.559	(2.215,41.254)	**0.002**
≥ 90 years	19.008	(4.309,83.854)	**<0.0001**
Male gender (reference: female)	0.546	(0.195,1.535)	0.251
Race & Ethnicity (reference: White, non-Hispanic)			
Black, non-Hispanic	0.720	(0.466,1.111)	0.138
Hispanic	0.473	(0.156,1.439)	0.187
Other[b]	0.726	(0.384,1.371)	0.323
Frailty (reference: non- or pre-frail)			
Mild frailty	1.267	(0.567,2.832)	0.565
Moderate frailty	1.174	(0.539,2.558)	0.687
Severe frailty	1.266	(0.581,2.758)	0.552
Charlson comorbidity index (reference: <4)			
4-5	1.371	(0.900,2.089)	0.142
≥6	1.570	(1.021,2.413)	**0.040**
Time (reference: April 14th – June 30th 2020)			
July 1st – September 30th 2020	0.687	(0.412,1.144)	0.149
October 1st – December 14th 2020	0.560	(0.359,0.874)	**0.011**

288 [a]P-values < 0.05 are considered statistically significant; these values are noted in **bold text**
289 within the table.
290 [b]Other includes American Indian or Alaska Native, Asian, Multiple, Unknown, Missing, or
291 Declined
292

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Number at risk

White, non-Hispanic	758	699	620	583
Black, non-Hispanic	246	239	221	210
Hispanic	42	39	38	38
Other	87	81	76	73