


COVID-19 Across the Landscape of Long-Term Care in Alameda County: Heterogeneity and Disparities

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Abstract

Throughout the pandemic, public health and long-term care professionals in our urban California county have linked local and state COVID-19 data and performed observational exploratory analyses of the impacts among our diverse long-term care facilities (LTCFs). Case counts from LTCFs through March 2021 included 4309 (65%) in skilled nursing facilities (SNFs), 1667 (25%) in residential care facilities for the elderly (RCFEs), and 273 (4%) in continuing care retirement communities (CCRCs). These cases led to 582 COVID-19 resident deaths and 12 staff deaths based on death certificates. Data on decedents' age, race, education, and country of birth reflected a hierarchy of wealth and socioeconomic status from CCRCs to RCFEs to SNFs. Mortality rates within SNFs were higher for non-Whites than Whites. Staff accounted for 42% of LTCF-associated COVID-19 cases, and over 75% of these staff were unlicensed. For all COVID-19 deaths in our jurisdiction, both LTCF and community, 82% of decedents were age 65 or over. Taking a comprehensive, population-based approach across our heterogenous LTCF landscape, we found socioeconomic disparities within COVID-19 cases and deaths of residents and staff. An improved data infrastructure linking public health and delivery systems would advance our understanding and potentiate life-saving interventions within this vulnerable ecosystem.

Keywords

COVID-19, long-term care, inequality, workforce, public health

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Introduction

COVID-19 studies have been more common for nursing homes (Konetzka et al., 2021) than assisted living facilities (Thomas et al., 2021) and have only rarely combined the two settings (Resciniti et al., 2021; Telford et al., 2020). Population-based studies comparing COVID-19's differential impacts across types of settings have been missing. Early in the COVID-19 pandemic, we began to map our local landscape of long-term care facilities (LTCFs) using publicly available quality and ownership information in order to inform public health and delivery system interventions. Gradually this work shifted to looking for patterns in Alameda County's own COVID-19 data. In a separate paper (Hill & Farrell, 2022), we describe our labor-intensive processes for data acquisition, cleaning, and matching. Here, we illustrate the benefits of taking a uniform analytical approach across the landscape of licensed LTCFs

and across the entire pre-vaccination era. Our goal has been leveraging the data available from test reports and death certificates for insights regarding differential impacts across settings as well as racial and economic disparities among long-term care residents and staff.

Setting

Our setting is Alameda County in the San Francisco Bay Area, which continues to be among the top 10 most diverse

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counties in the U.S. (Jensen et al., 2021). Its population age 65 and older includes 31% Asian, 11% Black, 11% Hispanic/Latino, 1% Native Hawaiian and Other Pacific Islander, and 44% White (U.S. Census Bureau, 2021a).

Table 1 lists the volumes of licensed LTCF types and beds in the Alameda County local health jurisdiction, which excludes Berkeley. For our analyses we used three categories that largely house older adults—skilled nursing facilities (SNFs), residential care facilities for the elderly (RCFEs), and continuing care retirement communities (CCRCs)—and two that house younger populations—adult residential facilities (ARFs) and intermediate care facilities (ICFs). Only SNFs and ICFs are defined in federal regulations. California regulations distinguish RCFEs with six beds or less from those with more. The former are also known as board-and-care homes, and the latter as assisted living.

The vast majority of RCFE residents are private pay because California offers Medicaid coverage for a negligible number of beds. For SNFs, on the other hand, Medicaid covers 66% of Alameda County beds (California Office of Statewide Health Planning and Development, 2021). CCRCs encompass both RCFE and SNF licensing levels. A CCRC “continuing care” contract typically offers a comprehensive continuum of care for the life of the resident in return for substantial upfront and ongoing payments. The wealth required to enter a CCRC is thus more than required for other RCFEs.

Methods

For purposes of COVID-19 surveillance in the Alameda County local health jurisdiction, we compiled two datasets: (1) a master line list with the names, birthdates, and gender of residents and staff reported by LTCFs as testing positive for COVID-19 and (2) a confirmed match file with all the names that could be confirmed as COVID-19 positive in California’s COVID-19 databases. Testing early in the pandemic was inadequate, so we believe that the master line list represents a conservative lower bound for COVID-19 cases for the Alameda County jurisdiction from March 2020 through March 2021. The confirmed match file includes a nearly complete compilation of all those with LTCF-associated COVID-19 who subsequently died and had COVID-19 documented as an underlying cause of death or significant contributing condition on the death certificate.

A small number of deaths occurred out of county following COVID-19 infection within county. For a conservative comparison of LTCF versus community deaths, we restricted analysis to deaths specifically attributed to the Alameda County jurisdiction.

Variables

Variables from the master line list include the LTCF type for each case; status as resident, staff, or visitor; gender; month of test; age at test; and staff role. Additional variables from the confirmed match file include race and home address. For

decedents, the confirmed match file includes month of death, age, education level, and place of death. For COVID-19 cases, we used race and ethnicity as submitted on confidential morbidity reports by testing sites or providers. The California Comprehensive Death File deploys a single death certificate-derived race field that is non-uniform, for example, Mexican-American, Salvadoran, Hispanic, and Latinx. We grouped these descriptors into Hispanic/Latino, Asian, Black, White categories or an “other” category that includes American Indian or Alaska Native, Native Hawaiian or Other Pacific Islander, and Multiracial. Our volumes did not allow for public disaggregation of this “other” grouping.

Analyses

In what follows we share descriptive population statistics with particular attention to variation across LTCF types and across time. We treated the CCRCs, which have both SNF and RCFE beds, as a separate category both because they comprise a distinctive type and because we could not accurately distinguish their two licensing levels. We performed overall significance testing across SNFs, RCFEs, and CCRCs and followed up when appropriate with pairwise Chi-square and F-tests. All coding and analyses were conducted using Excel; statistical significance was assessed using $p < 0.05$.

For most of our LTCF types, we lacked reliable census data, that is, denominators, that would enable mortality rate calculations. The notable exception was for SNFs, which are required to submit utilization data to California’s Office of Statewide Health Planning and Development at year’s end. We obtained the file for December 31, 2020, and used these data to calculate mortality, following the method of the Centers for Medicare and Medicaid Services. Although the denominator of this formula is point-in-time rather than cumulative and thus overstates mortality (Miller et al., 2021), it did allow us to gauge relative mortality across races. For this calculation we eliminated hospital distinct-part units, behavioral health facilities, and CCRCs so as to examine our more typical SNFs, leaving 47 facilities for which we had the requisite data.

We have suppressed or aggregated small values as needed to protect confidentiality in accordance with state and national guidelines and/or to achieve adequate numbers for analysis, for example, using “other” for LTCF types and “non-White” for races.

This work was done in the course of public health surveillance and is exempt from institutional review as outlined by the Centers for Disease Control and Prevention (2010).

Results

Cases and Deaths Across Long-Term Care Facility Types

The master line list of COVID-19 cases reported by all LTCF types from March 2020 through March 2021 included 3879

Table 1. Alameda County Long-Term Care Facility (LTCF) Types and their COVID-19 Cases and Deaths Among Residents and Staff, with Available Demographic and Socioeconomic Characteristics.

	Older Adult Facilities			Other Facilities			Total
	Skilled Nursing Facility (SNF)	Residential Care Facility for the Elderly (RCFE)	Continuing Care Retirement Community (CCRC)	Adult Residential Facility (ARF)	Intermediate Care Facility (ICF)	Other ^c	
Facilities	60	247	6	228	36	15	592
Beds (%)	4937 (31)	6759 (42)	2394 (15)	1527 (9)	216 (1)	265 (2)	16,098 (100)
Resident cases							
Cases (%)	2603 (67)	971 (25)	103 (3)	96 (2)	77 (2)	29 (1)	3879 (100)
Average age	74 ^a	83 ^a	86 ^a	48	55	44	76
Female (%)	55 ^a	70 ^a	68	43	36	— ^d	58
Resident deaths							
Deaths (%)	415 (71)	144 (25)	22 (4)	—	—	—	582 (100)
Average age	81 ^a	88 ^a	90	—	—	—	83
Female (%)	53 ^b	64 ^b	68	—	—	—	56
White (%)	37 ^a	66 ^a	73	—	—	—	46
Bachelor's degree or higher (%)	20 ^b	30 ^b	45	—	—	—	23
Born in U.S. (%)	65 ^d	75 ^b	82	—	—	—	68
Died in hospital (%)	57 ^a	42 ^a	18 ^b	—	—	—	52
Staff cases							
Cases (%)	1703 (61)	695 (25)	169 (6)	111 (4)	75 (3)	26 (1)	2779 (100)
Average age	46	45	43	52	54	43	46
Female (%)	79	79 ^b	70 ^b	61	65	59	77
Unlicensed (%)	66 ^a	92 ^a	75 ^a	79	93	24	73

^a $p < 0.01$.

^b $p < 0.05$. We used significance testing (Yates' corrected Chi-square and analysis of variance) for the three older adult settings, comparing SNF versus RCFE and RCFE versus CCRC. For several characteristics, the trend toward significant difference for CCRCs was limited by the small number of CCRC deaths.

^cOther includes community treatment facilities, mental health rehabilitation facilities, and psychiatric health facilities.

^dCharacteristics of 12 staff deaths and cell sizes < 10 are suppressed to protect confidentiality in accordance with state and national guidelines.

residents and 2779 staff (Table 1). SNF residents and staff accounted for 65% of the cases. From this universe of cases, there were 582 deaths of residents and 12 deaths of staff as confirmed by COVID-19 as an underlying cause of death or significant contributing condition on death certificates.

From these data we can derive an overall resident case fatality rate of 15.0%. There were no statistically significant differences in case fatality rates across the three sites of care for older adults. As noted above, the case count reflects a conservative lower bound, while the death count is no more than a dozen short, so the true case fatality rate may be lower than 15%.

Markers of Wealth Across Sites of Care

Table 1 reveals differences in demographics and socioeconomic characteristics across sites of care. Decedents in RCFEs were

older than decedents in SNFs and more likely to be female, to be White, to have bachelor's degrees, and to be born in the United States. CCRC decedents were older than those in RCFEs and more likely to be female, to be White, to have bachelor's degrees, and to be born in the United States, but these trends did not reach significance.

This hierarchy of wealth is reflected in significant differences in site of death: 57% of SNF residents died in hospitals compared with 42% of RCFE residents and 18% of CCRC residents. Our data do not allow us to illuminate the dynamics of this finding. Dying in an RCFE is sanctioned by California's licensing agency if the resident is under hospice care, but it can also occur unexpectedly or with inadequate care. Unlike other investigators (Temkin-Greener et al., 2021; Estrada et al., 2021), we did not find an association between race and hospitalization at end of life.

Table 2. COVID-19 Resident Deaths, Census on 12/31/2020, and Deaths/1000 by Race for 47 Typical Skilled Nursing Facilities in the Alameda County Jurisdiction.

	Asian	Black	Hispanic/Latino	White	Non-White	Total
Deaths	80	86	38	124	209	328
Census	579	702	270	1225	1583	2808
Deaths/1000	138.2	122.5	140.7	101.2 ^a	132.0 ^a	118.9

^ap < 0.05 (Yates' corrected Chi-square).

Table 3. Alameda County COVID-19 Deaths Associated with Long-Term Care Facilities (LTCF) and Community (non-LTCF), by Race.

	LTCF COVID-19 Deaths				Community COVID-19 Deaths			
	Number (%)	Age	65+ (%)	Age, 65+	Number (%)	Age	65+ (%)	Age, 65+
Asian	136 (23)	83 ^a	122 (23)	86	182 (27)	76 ^a	148 (31)	81
Black	134 (23)	80	120 (22)	82	107 (16)	73	79 (16)	79
Hispanic/Latino	46 (8)	82	41 (8)	85	224 (34)	69	138 (29)	78
White	258 (44)	84 ^a	246 (46)	85	128 (19)	77 ^a	103 (21)	82
Other	— ^b	—	—	—	26 (4)	64	14 (3)	76
Total	581 (100)	83 ^a	536 (100)	85	667 (100)	73 ^a	482 (100)	80

^ap < 0.01 (F-test) for LTCF versus community comparisons.

^bValues < 10 are suppressed to protect confidentiality in accordance with state and national guidelines.

Racial and Immigration Differences Among COVID-19 Decedent Populations

Resident race among all LTCF COVID-19 deaths in our confirmed match file was 22% Asian, 23% Black, 8% Hispanic/Latino, and 46% White. The Asian category had the highest proportion of immigrants and the highest educational attainment. Among the Asian resident decedents, 37% were born in China or Taiwan, and 23% in the Philippines. Of the 12 COVID-19 deaths among staff, all were people of color, 10 were Asian immigrants, and 10 were unlicensed.

We were able to calculate mortality by race only for the SNF site of care, where we have the December 2020 racial census for each facility. Table 2 reveals variation by race for COVID-19 deaths in our 47 “typical” SNFs (excluding distinct-part units and behavioral health). These differences did not reach statistical significance, but we did find significantly higher mortality for non-White than for White populations. Ranking facilities by race, size, or Medicaid proportion did not yield consistent patterns of mortality.

Comparisons of Community versus Long-Term Care Facility Deaths

Table 3 is restricted to COVID-19 deaths attributed to the Alameda County jurisdiction from March 2020 through April 2021 and thus has 13 fewer LTCF deaths than our confirmed match file. Asian, White, and overall LTCF decedents were significantly older than their community counterparts. When limited to the 65 and older population, however, there were

no significant differences in ages of LTCF and community decedents. Overall, 82% of deaths were age 65 or older, including 536 LTCF deaths (92% of total LTCF deaths) and 482 community deaths (72% of total community deaths). The LTCF deaths include 12 staff members with an average age of 61.

Differential Impacts by Facility Type Over Time

Figure 1 reveals that SNF deaths comprised a decreasing percentage—and RCFE deaths an increasing percentage—of the SNF plus RCFE totals as the pandemic progressed. This temporal lag pattern was evident in our 165 small RCFEs in particular (6-bed board-and-care homes), which comprise 14% of RCFE beds. They accounted for 13% of deaths over the entire period of study, but prior to the December surge they had only 11 resident cases and 2 deaths. Our other small facilities—ICFs and ARFs—had a similar lag for cases prior to the winter surge.

Characteristics of Long-Term Care Facility Staff With COVID-19

Of 2356 infected staff for whom we had job roles, 73% were unlicensed, 17% were licensed clinical staff, and 5% were management and office staff. Over 90% of RCFE staff cases were unlicensed (Table 1). Hispanic/Latino staff had the highest unlicensed percentage and White the lowest.

Of 1595 staff for whom we had home addresses, 17% commuted from out of county, most commonly from San

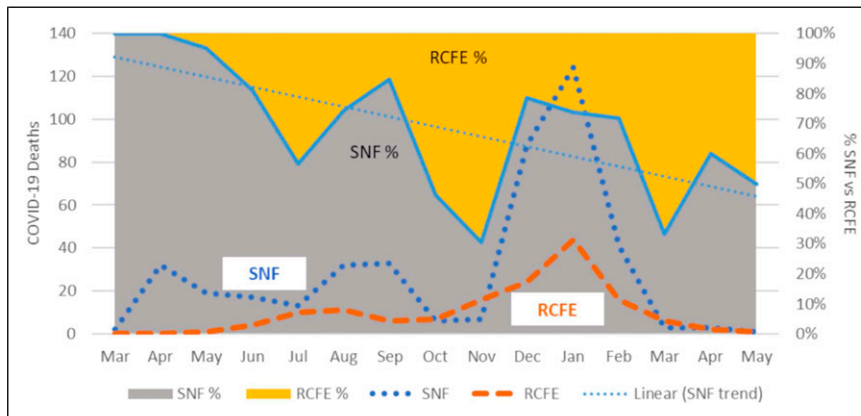


Figure 1. COVID-19 deaths in skilled nursing facilities (SNF) and residential care facilities for the elderly (RCFE) and the SNF versus RCFE percent of monthly totals.

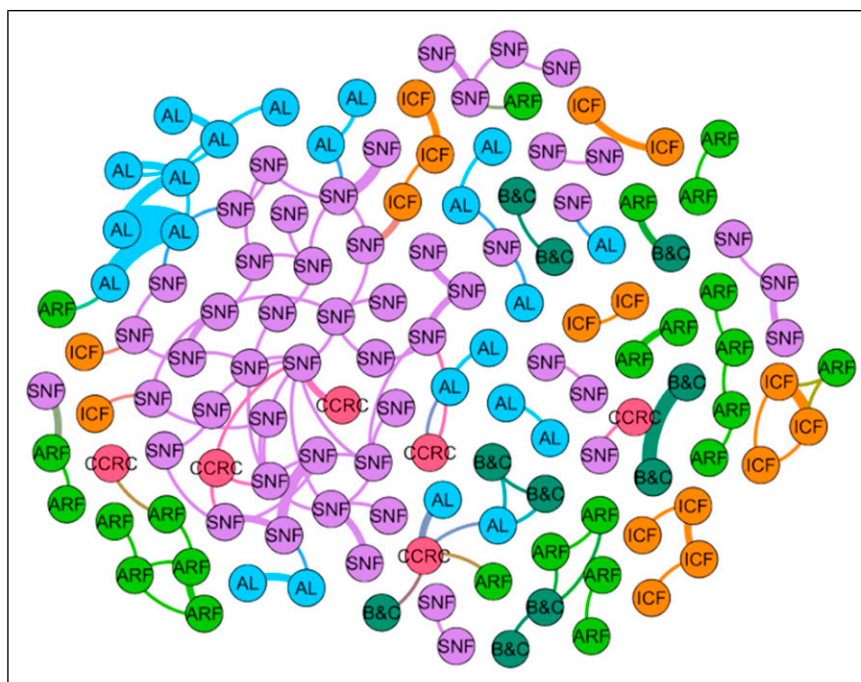


Figure 2. Social network analysis of staff reported by 2 or 3 different facilities for the same COVID-19 infection. Each circle (node) represents a unique LTCF. The lines between circles represent shared staff members with COVID-19 infections. The line thickness represents the number of shared staff. AL = assisted living or residential care facility for the elderly (RCFE) with more than 6 beds; ARF = adult residential facility; B&C = board-and-care home or 6-bed residential care facility for the elderly (RCFE); CCRC = continuing care retirement community; SNF = skilled nursing facility.

Joaquin County, 60-plus miles away, where housing costs are half that of Alameda County (U.S. Census Bureau, 2021b). Of these 1595 staff, 12% lived in a single-family home or apartment with another staff member reported as positive. Of those in shared housing with other infected staff, 85% were unlicensed.

Of the 2779 unique staff members reported as COVID-19 positive, 156 (6.5%) were reported by 2 or 3 different facilities for the same COVID-19 infection, representing 319 sharing incidents involving staff working 2 or 3 jobs. Figure 2

illustrates the movements of these infected staff between LTCFs and across different levels of care.

Discussion

Our report illustrates how a population-based approach using routine public health surveillance data can illuminate differential pandemic impacts across the LTCF landscape and point to socioeconomic disparities among these residents and their caregivers. To our knowledge, ours is the first report to

leverage the information available from test reports and death certificates in mapping the totality of the LTCF ecosystem during the pandemic.

The primary strength of our approach has been using a standardized methodology across LTCF types and a single definition for COVID-19 deaths in LTCFs and the community, including a case-by-case and death-by-death focus on accuracy. SNFs were responsible for 65% of LTCF cases and 71% of LTCF deaths, but the proportions associated with other LTCF settings—35% and 29%, respectively—were far from negligible.

Our population approach to multiple LTCF types can serve as a corrective to the endemic fragmentation of news, policy, and research regarding various levels of long-term care and to the relative paucity of research on non-SNF settings (Konetzka et al., 2021). These data challenge the impression that different levels of care hold clinically distinct populations; rather, a person's place in the long-term care system may depend as much on family wealth and support as on medical conditions and function. Our finding that a higher proportion of SNF residents than RCFE residents died in hospitals deserves more study, both because of concern about hospital capacity and because of concern as to whether residents received care concordant with their preferences.

Other strengths of our approach have been attention to the race, immigration status and markers of wealth among LTCF COVID-19 decedents, as well as facility-by-facility attention to staff, including job roles and race. Analyses by geography and race may yield figures too small to post publicly but adequate for internally motivating tailored intervention efforts (Quint et al., 2021).

Sharing these data within and beyond our public health department has helped shape our pandemic response. The data have supplemented publicly available data on SNFs, and they comprise most of what we can quantify regarding the other LTCF settings. Identifying the most vulnerable providers has enabled a more rational and equitable distribution of our limited resources, for example, testing supplies, pulse oximeters, and mobile testing and vaccination teams. Our most valuable but scarcest resource is staff time; the data have helped justify on-site visits that promulgate best practices, and we have built these visits into our ongoing prevention model that now encompasses threats beyond COVID-19.

These data can also serve as correctives to misconceptions of race and racism relative to LTCF resident and staff dynamics. For our SNFs in particular, a mostly immigrant, mostly female workforce cares for a resident population that is mostly poor people of color. Although our data cannot explain why mortality from COVID-19 was higher for non-White SNF residents, interpersonal white racism is not the proximate cause. If we expand the explanatory frame, however, disparities in our families' socioeconomic status can be explained in part by Alameda County's well-documented history of race-based discrimination in employment, housing, education, taxation, and community investment (Self, 2005). Disparities in wealth and education resulting from racialized

economic segregation are strongly linked to health outcomes (Krieger et al., 2020; Jurkowski & Guest, 2021).

Staff infections accounted for 42% of our LTCF-associated COVID-19 cases, and over 75% of these staff were unlicensed. Our findings point to important dynamics that put both staff and residents at risk, including shared staff living quarters and jobs in multiple facilities (Chen et al., 2021). Staff often work two jobs or registry per-diem because they need work-schedule flexibility to care for their children or parents (Van Houtven et al., 2020). Staff vulnerability is also reflected in 2013–2018 data from the National Health Interview Survey showing that 22.7% of unlicensed staff in LTCFs experienced food insecurity (Srinivasan et al., 2021). Our LTCF staff incurred 12 deaths, yet did not enjoy the same public support as hospital staff, who faced lower risks of acquiring COVID-19 (Lee, Althomsons, et al., 2021).

Limitations

Small volumes limited the power of our analyses, and we lacked denominators for most mortality rate calculations. The uniqueness of Alameda County precludes the generalizability of our quantitative findings. Even across the several adjacent counties with which we collaborate, the proportions of LTCF types can vary widely, as do the patterns of wealth and poverty. Contra Costa County, for example, has half as many SNFs and twice as many RCFEs. What is consistent is the fundamental complexity of each county's LTCF ecosystem, which is a product of historical, socioeconomic, and political contingencies (Jurkowski & Guest, 2021).

Although we have assayed a population-wide view, we did not characterize our community-dwelling older adults who died from COVID-19, many of whom are highly vulnerable. Community-dwelling older adults in California's adult day health centers, for example, have nearly as much chronic disease burden and functional impairment as residents in RCFEs (Harris-Kojetin et al., 2019). Nor have we discussed the LTCF-related roles played by our large delivery systems either before or during the pandemic (Hill et al., 2020).

As with other bottom-up approaches, we have no way to quantify undercounts of COVID-19 cases. Because testing capacity and requirements arrived first in SNFs, then larger RCFEs, and finally to small facilities, we believe that undercounting explains some of what appears to be better performance of these latter settings. Recent reports that staff size predicts infections in SNFs, however, suggest that many RCFEs and smaller facilities in particular may truly have been spared, at least until the overwhelming winter surge (McGarry et al., 2021; Zimmerman et al., 2021). Delays in test turnaround times exacerbated the winter surge impacts in both small and large facilities. Although testing capacity in small facilities has always been limited, we have no evidence that it contributed to significant undercounts in our winter data.

From the perspective of our public health goals for population well-being, we were frustrated by multiple limitations

in our data. We tracked the size of outbreaks and repeat outbreaks for our internal use, but we had no reliable, quantifiable information on infection control practices at any of the LTCFs. We lacked clinical information on resident populations, for example, functional status and frailty. We had no information on the pandemic's mental health impacts on residents and staff. We could not determine how staff were infected, whether from infected residents, other staff in workplace, home, or community. We lacked information on languages, cultural backgrounds, immigration status, and socioeconomic status of staff, all of which can help with outreach efforts (Oronce et al., 2021). It would also be helpful to know the factors that enable unlicensed staff to improve their skills, quality of their work lives and family lives, and their place in the socioeconomic hierarchy (Lee, Podury, et al., 2020; Muench et al., 2021). We had no information on the community-based caregiver workforce, which overlaps with the direct caregiver workforce in LTCFs (Scales et al., 2020).

These information deficits speak to the need for integration of public health and delivery system data. In the short run, linking public health data to clinical data from large delivery systems would yield richer pictures than we have assembled here (Stoto et al., 2021). In the longer term, we should redesign our public health and delivery system infrastructures with population well-being as the core design principle (Kadokia et al., 2021).

Conclusions

The LTCF landscape includes multiple levels of care with marked heterogeneity of populations, resources, and vulnerability. COVID-19's impact in our county has reflected long-standing racial and socioeconomic inequities. For the workforce, the brunt of its impact has fallen on unlicensed staff. Data such as ours can contribute to prioritization of public health and delivery system resources based on need.

We encourage other public health and long-term care professionals to take a wide-angle population view of the long-term care landscape, gather accurate data, and adapt their interventions accordingly. At a policy level, if we are to reimagine our long-term care systems (Fried, 2021; Grabowski, 2021), we need reliable images: we need to know who is currently getting care, where and why, and we need to know who is currently providing that care.

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