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Examining the Area Agencies on Aging nutrition program in response to the COVID-19

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Background & aims. During the COVID-19 pandemic in the U.S., Area Agencies on Aging (AAA) became an essential source for older adults to maintain a healthy life after social isolation. It has developed different programs in response to the COVID-19 outbreak, such as home delivered meals to support older adults' nutrition supply. The purpose of this study was to examine how well AAA has managed such important nutrition plans facing the COVID-19 changes.
Methods. We integrated three databases, including 49 weeks (6 April 2020 - 14 March 2021) 33 Planning and Service Area (PSA) meal data, PSAs' key characteristics from the California Department of Aging, and the COVID-19 cases from the California Department of Public Health. We examined the association between the number of meals and people served and the COVID-19 cases and PSA features, using the univariate analysis and the random effect model.
Results. We observed a positive relationship between the number of meals served and the number of the COVID-19 cases, however, not the number of people served. We found a negative relationship between the number of rural older adults with both the number of meals served and people served. Additionally, non-English-speaking and minority played a positive and negative role respectively as to the number of meals served.
Conclusions. These results indicated that the AAA should cover a wider population, especially in rural areas experiencing a shortage of volunteers in the pandemic, urging the collaboration with high-tech and third-party companies to improve delivery efficiency.

Key words: area agencies on aging, home delivered meals, COVID-19, random effect model

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INTRODUCTION

Area Agencies on Aging (AAA) was established under the Older Americans Act (OAA) to accommodate the needs of Americans of 60 years or older in every local community. It has provided access to a range of options, such as nutrition, transportation, in-home supports, and socialization, to allow older adults to "age in peace" in their communities. Older adults have greatly depended on AAAs for many aspects of their lives, so the success of AAA is essential, especially in helping the older adults in the COVID-19 pandemic. As the state with the largest population in the U.S., California

has 33 AAAs, which were partnering with the California Department of Aging (CDA) to manage a wide array of federal and state-funded programs and services in each of the Planning and Service Area (PSA). In response to the COVID-19, these 33 AAAs have some special plans, for example, home delivered meals for older adults [1]. Comparing with 2019, AAAs largely increased the number of services, aiming to better serve older adults and help them adapt to the COVID-19 changes. The home delivered meals for older adults generated a 51% increase over the 2019 numbers [1]. The major goals of the program were to address food insecurity by providing nutritious meals, nutrition education, nutrition risk screening, and nutrition counseling in order to promote a healthy and functional older adult life. All Americans age 60+ who were homebound due to illness, incapacity, disability, or were otherwise isolated regardless of income level could be the participants. Given the social isolation in COVID-19, home delivered meals have become more and more important and even the main resource for older adults, who were forced to stay home for safety. As a result, it was of researchers' interest to measure how well the meal plan was in response to the pandemic. This paper examined the factors that affect the home delivered meal plan's performance during the COVID-19 and provided insights to AAA organizers in improving the services.

METHODS

Data source

We merged three datasets: 1) the California Department of Aging's (CDA) Home Delivered Meals for Older Adults data (28 March 2021) on both the California Open Data Portal and the CDA Data & Reports page [1,2]; 2) Key Characteristics of Californians Age 60 and Over data (28 March 2021) on California Health and Human Services (CHHS) Open Data Portal and CDA Data & Reports [1,3]; 3) COVID-19 Cases (28 March 2021) data on both the California Department of Public Health (CDPH) and California Open Data Portal [4,5]. The first data set gave us the 33 California AAAs' weekly number of meals and people served for the Home Delivered Meals program in response to COVID-19 ranging from 6 April 2020 to 14 March 2021 (49 weeks). We combined PSA19 (Los Angeles county exclude Los Angeles City) with PSA 25 (Los Angeles City) as one entity, since the third dataset treated these two areas together. The second dataset provided us the key characteristics of the 33 PSAs, for example, the number of older adults who lived alone, who did not speak English, who lived in rural, etc. We also retrieved data of the California daily COVID-19 cases by county, which was further aggregated into weekly COVID-19 cases in each PSA ranging from 6 April 2020 to 14 March 2021.

Methods

Our dependent variable was the number of meals served in the Home Delivered Meals for Older Adults plan. We used the COVID-19 cases as our primary independent variable. Even though we did not have the data for older adults COVID-19 cases in each PSA, the primary independent variable reflected the environment where senior could get nutrition support by themselves. Reports showed that grocery stores were of high risk for senior people to get infected, so they might be worried to shop outside if COVID-19 cases increased [6-8]. When older adults had to stay at home, they had difficulty in using technology to order online, which would be an important reason for older adults to participate in the CDA's nutrition plan [9].

A statistic plot was carried on the independent variable and divided the meals served into three levels: small, medium, and large. Univariate analyses of the independent variables (ANOVA) were conducted for each PSA characteristics based on the meal levels. Except for the primary independent variable of the COVID-19 cases, the independent variables also included key characteristics of the 33 PSAs, which were the number of older adults in rural, non-English-speaking, minority, non-minority, low income, and living alone. Moreover, we did the Hausman test and accordingly fit a random effect model (rather than the fixed effect model) on the balanced panel data with 33 three PSAs and 49 weeks. Our key independent variable was the number of meals served. Given the univariate analysis results, we also adjusted for the number of older adults that were in rural, non-English-speaking, minority, and living alone in each PSA. Furthermore, we chose the number of older adults served as the dependent variable and run the random effect model again with the same independent variables. Analyses were performed using RStudio, version 1.2.5042.

RESULTS

We analyzed the home-delivered meal program in response to the COVID-19 on 33 California AAAs of 49 weeks (combining PSA 19 and 25). This program served older adults with diversity. From the CDA's report for the nutrition program, in the fiscal year 2019-2020, there were 60164 people of age 60+ participating this program. Among them, 53.9% were females and 46.1% were males; 52.4% white, 18.9 Hispanic, 13.5% black, 7.5% Asian, and the others 7.7%; 38.8% age 60-70, 30.5% age 75-84, and the rest 85+; 16.4% in

rural; 50.9% lived alone; 53.2% in poverty; and 68.0% with high nutrition risk [10].

We first did a descriptive analysis on the number of meals served (Fig. 1), based on which we classified the number of meals served in three levels: small (served 0-25,000 meals), medium (served 25,000-100,000 meals), and large (served more than 100,000 meals).

Further, we treated the 33 PSAs and 49 weeks data as 1568 individual observations and the univariate analysis (Tab. I) showed that for a higher meal served level, the mean of COVID-19 cases was larger (1232.79, 2957.94, and 24145.02 on average for small, medium, and large respectively). A similar pattern was observed for the characteristics of living alone (27,841.19, 74,661.23, and 354,475.00 on average for small, medium, and large respectively), Non-English-speaking (6158.75, 21,910.55, and 179,610.00 on average for small, medium, and large respectively), non-minority (99,878.37, 267,188.17, and 862,592.00 on average for small, medium, and large respectively), minority (60,272.53, 197,301.14, 1,347,305.00 on average for small, medium, and large respectively), and low income (18,110.77, 49,337.28, 328,670.00 on average for small, medium, and large respectively). However, for the characteristic of rural, we found the opposite pattern.

Moreover, we checked the relationship between the number of meals served by AAAs and COVID-19 cases and other PSA features, including the number of older adults that were in rural, non-English-speaking, minority, and living alone. To examine the effect of these factors and given the balanced panel data (33 PSAs and 49 weeks), we adopted a random effect model after running a Hausman test and summarized the results in

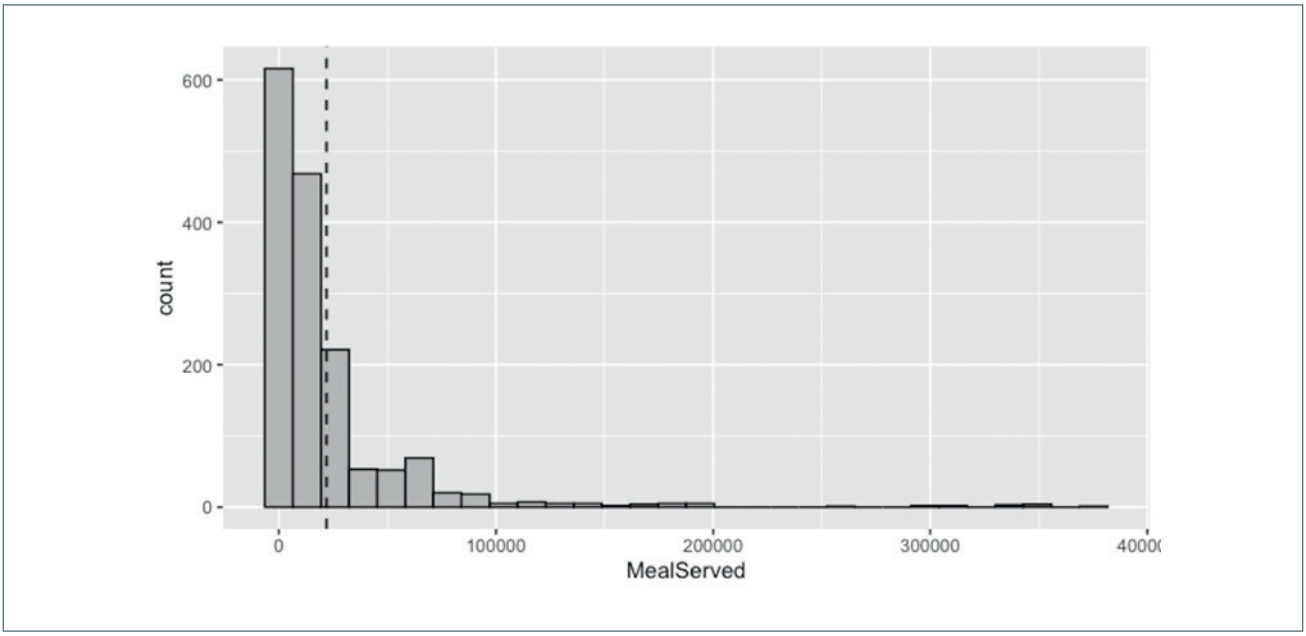

Figure 1 Histogram plot of the number of meals served.

Table I. Univariate analyses of the number of meals served.

	Meals served			
	Small	Medium	Large	*P* value
	1248	272	48	
Cases	1232.79 (2704.02)	2957.94 (4529.19)	24,145.02 (29,005.58)	< 0.001
Lives alone	27,841.19 (23,725.20)	74,661.23 (38214.64)	354,475.00 (0)	< 0.001
Rural	14,930.70 (10,513.86)	8556.95 (9963.37)	11,442.00 (0)	< 0.001
Non-English-speaking	6158.75 (6265.89)	21,910.55 (12,243.20)	179,610.00 (0)	< 0.001
Minority	60,272.53 (63,027.08)	197,301.14 (108,358.34)	1,347,305.00 (0)	< 0.001
Non-minority	99,878.37 (84,187.79)	267,188.17 (154,480.87)	862,592.00 (0)	< 0.001
Low income	18,110.77 (16,412.57)	49,337.28 (28,164.46)	328,670.00 (0)	< 0.001

Note 1: Treated as 1568 individual data; Note 2: Mean (SD) and p value from ANOVA were presented; Note 3: Meals Served Large group is actually AAA19&25

Table II. Random effect model results with the dependent variables.

	Meals served		People served	
Covariates	**Coefficients**	***P* value**	**Coefficients**	***P* value**
Cases	1.03	< 0.001	-0.09	0.126
Lives alone	0.60	< 0.001	0.11	0.001
Rural	-0.59	0.005	-0.12	0.003
Non-English-speaking	1.47	0.007	0.12	0.236
Minority	-0.22	0.025	-0.03	0.160

Table II. Our model indicated that the number of meals served was positively related with the number of COVID-19 cases, the number of non-English-speaking and living-alone older adults. Specifically, the coefficient of the COVID-19 cases was 1.03 with *p* value less than 0.001; the coefficient of non-English-speaking older adults was 1.47 with *p* value 0.007; and the coefficient of living alone older adults was 0.60 with *p* value less than 0.001. However, for the other two characteristics, the number of meals served were negatively related (-0.59 for rural with *p* value 0.05 and -0.22 for minority with *p* value 0.025).

Last but not least, we run the random effect model using the number of older adults served as the dependent variable (Tab. II). Different from the number of meals served, the number of older adults was significantly associated with only the number of people living alone (coefficient = 0.11 and *p* value = 0.001) and in rural (coefficient = -0.12 and *p* value = 0.003).

DISCUSSION

Our study explored the factors that associated with AAAs' number of meals and people served. We found that the number of COVID-19 cases and AAA characteristics (the number of older adults that were in rural, non-English-speaking, minority, and living alone) played a significant role on the number of meals served. However, the number of COVID-19 cases did not lead to more people served and only the number of older adults that were in rural and lived alone affected the number of people served.

First, a positive relationship was observed between the number of COVID cases and the number of meals served, however, not on the number of people served. Previous studies indicated a sharply increasing request for home-delivered meals due to the closing of senior centers and congregate meal programs [11,12]. It could be deduced that when the number of COVID-19 cases increased, older adults were worried to go outside and relied on home-delivered meals for support, leading to the increase demand on meals. However, the number of older adults served did not depend on the number of COVID-19. It was possible because that the social distancing and self-isolation limited AAAs' ability for wider community outreach, so the skyrocketing demand on home-delivered meals came from a smaller group of older adults [13].

Secondly, we found a negative relationship between the number of rural older adults with both the number of meals served and people served. As past papers pointed out, these AAA services highly depended on volunteers and social workers (many were older adults), however, the COVID-19 made the volunteer pool dwindling [11,14]. We knew that for rural areas, delivery was always hard because of lower population density and larger distances, making delivery costly and low efficient [15,16]. The decreasing number of volunteers added the difficulty of home-delivered services to the given fact that resources and services were scarce in rural areas [17,18]. This urged the AAA to design better delivery plans to improve efficiency and reduce cost as other health care organizations did [19,20].

Thirdly, different than the factor of rural, we found a positive relationship between the number of older adults living alone with both the number of meals served and people served. The report showed that more than one-quarter of the aged people (60 years old and above) lived alone [21]. Social isolation during the pandemic hurt the older solo living people more and might lead to an increase dependence on the community support [22]. This finding was consistent with the past evidence that older people, especially living alone, relied more on the community services [23].

Last but not least, non-English-speaking and minority played a positive and negative role respectively in affecting the number of meals served. For non-English-speaking people, they underwent unemployment after the COVID-19 outbreak and had a hard time filing unemployment forms [24,25]. This probably led to the older adults' increasing requests for the AAA nutrition support. Given the start of vaccine for all population, non-English-speaking older adults worth more care, since they will be struggling to get vaccine, and further affecting finding new jobs [26]. However, for minority older adults, there was a negative relationship of the number

of meals served, indicating us to turn our attention to the ethnic factor.

There were several limitations to our study. One was that we did not have the demographic characteristics by PSA and the Comprehensive Geriatric Assessment of the participants to learn their social support network and frailty. Another one was that we did not have the COVID-19 cases by PSA for older adults. These was important information and would add much value to our paper. Further, AAAs did not report how they distributed the meals in each PSA, especially the household information (e.g., gender, address, and income). It is unclear whether they were the same group of people or kept changing. Another was the information on the volunteers. For example, the volunteers' address and ability to delivery. Lastly, we did not know the budget of each PSA's meal plan and the partnership for this program. These data would be helpful to analyze the service outreach scale and efficiency.

CONCLUSIONS

In summary, we found that the home delivered meals program depended on the COVID-19 cases and some key older adults' characteristics, such as living alone and in rural. When the living communities had more COVID-19 cases, AAAs tended to deliver more meals to deal with the social isolation. However, for rural areas, where more people needed such meal plans, the correlation was negative, reflecting weakness in the delivery ability, especially when volunteers were of shortage during the pandemic. This urges the planner to develop collaboration with third-party food delivery companies, local restaurants, or start to adopt advanced technology in keeping safety and delivery efficiency.

Ethical consideration

The research used public data and the unit of the analysis was nutrition delivery.

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Conflict of interest

There is no conflict of interest for this paper.

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