Title: The Impact of the COVID-19 Pandemic on State-Level Food Spending: The Role of Disease Incidence and Restriction Factors

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The Impact of the COVID-19 Pandemic on State-Level Food Spending: The Role of Disease Incidence and Restriction Factors

Abstract

This study investigates the effects of the COVID-19 pandemic-related deaths and restrictions on State-level food spending in the U.S. during 2020. Using fixed-effects regression analysis on quarterly State-level data, the study shows that higher COVID-19 deaths are associated with increased food-at-home (FAH) sales and decreased food-away-from-home (FAFH) sales. Lockdowns have no significant effect on FAH sales but decrease FAFH sales. Mask mandates increase both FAH and FAFH sales. Finally, restaurants restrictions decrease sales at full-service establishments more than limited-service ones. The results highlight the diverse and intricate nature of the pandemic's effects on food spending.

Introduction

In the U.S., the first case of the Novel Coronavirus (COVID-19) was confirmed on January 21, 2020,[1] and by early March, a pandemic was declared by the World Health Organization.[2] To slow the spread of COVID-19, the U.S. government announced federal social distancing guidelines in mid-March 2020, and many U.S. jurisdictions followed suit with the implementation of stay-at-home orders.[3] In 2020, many people had lost their jobs or had their hours reduced, leading to a decrease in household income and a reduction in overall spending, including food (Zeballos et al., 2021; Zeballos and Dong, 2022). Mobility restrictions in the form of lockdowns, stay-at-home orders, and consumers' fear of infection from a contagious virus altered shopping patterns and associated consumption decisions (Chenarides et al., 2020; Ellison et al. 2021; Lusk and McFadden 2021; McFadden et al. 2021). At various points throughout the pandemic, consumers opted for options that tended to bolster their ability to maintain social distancing, such as online grocery shopping or purchases at limited-service restaurants (Jensen et al. 2021; Cohen et al. 2022; Ellison et al. 2022).

At the outset of the pandemic, many U.S. consumers were concerned about the

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[1] https://www.cdc.gov/media/releases/2020/p0121-novel-coronavirus-travel-case.html
[2] https://www.who.int/director-general/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19---11-march-2020
[3] https://www.defense.gov/Explore/Spotlight/Coronavirus/Timeline/

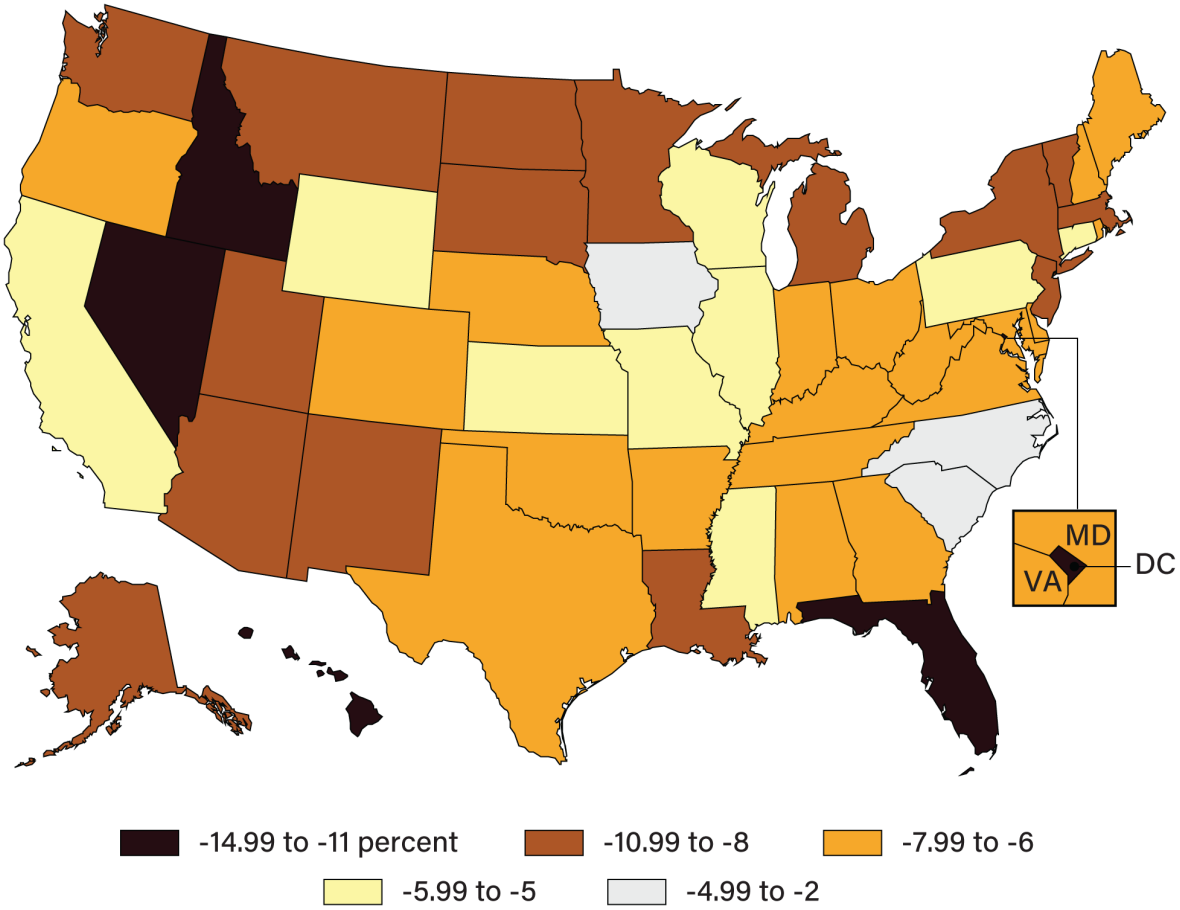
transmission of COVID-19 and increased their spending on food-at-home (FAH) items such as pantry staples and non-perishable goods (Chenarides et al., 2021; McLaughlin et al., 2022). This trend is reflected in the USDA-Economic Research Service's (ERS) Food Expenditure Series (FES), which indicates that FAH purchases at grocery stores, supercenters, and other FAH retailers were up 4 percent in 2020 compared to 2019. Conversely, pandemic-related measures such as social distancing requirements and indoor capacity limits imposed by many governments to curb the spread of the virus created significant challenges for many restaurants and food service establishments. Consequently, some FAFH establishments closed, either temporarily or permanently. In addition, many consumers opted to forgo FAFH options due to fear of contracting COVID-19 or as a way to stretch budgets as has been observed during other times of economic uncertainty (Todd, 2014; Chenarides et al., 2021; Restrepo et al., 2021; Ellison et al., 2022). As a result, FAFH spending decreased, as reflected in the FES, which shows a 17 percent drop in food purchases at FAFH establishments in 2020 compared to 2019. This decrease, however, varied by restaurant type. Limited-service restaurants saw a smaller decline of 6 percent, while full-service restaurants experienced a more significant drop of 27 percent. Overall, the COVID-19 pandemic has had a profound impact on food spending, altering consumers' behavior and the operations of restaurants and food service establishments. The resulting changes in spending patterns and composition are evidence of the far-reaching impact of the pandemic on the U.S. economy.

The effects of the COVID-19 pandemic on food spending have been diverse and

intricate, shaped by a multitude of elements such as personal situations, regional market conditions, and local restrictions. While several studies have provided micro-level evidence throughout the pandemic of behavior shifts, few have highlighted the macro-economic impacts and the variation across States. The extent of the impact on food spending and its makeup is expected to be heterogeneous across geographic locations as the effects are likely influenced by the degree of local restrictions, prevalence of the disease, and local economic impact, which can differ significantly across States.

A recent publication by the USDA, Economic Research Service indicates that States experienced varying degrees of food spending decline from 2019 and 2020. The smallest decreases in inflation-adjusted, per capita food spending were in Iowa (2.2 percent), South Carolina (2.6 percent), and North Carolina (4.1 percent). The States that saw the largest decreases in inflation-adjusted, per-capita food spending were Hawaii (15 percent), Washington, DC (13.9 percent), Florida (11.8 percent), and Nevada (11.6 percent). The median change of total food spending occurred in Delaware, with a decrease of 7.2 percent (Figure 1).

Figure 1: Percent change in inflation-adjusted per capita total food spending, 2019 vs. 2020



Note: The percent change is calculated suing 2019 as the base year for inflation adjustments. These estimates are sales only and exclude food furnished, donated, produced at home, and/or served at education institutions.
Source: USDA, Economic Research Service using data from the State-level Food Expenditure Series.

This paper investigates the extent to which State-specific disease incidence and pandemic-related restrictions explains the varying decline in food sales across States.

Specifically, this paper answers three policy-relevant and related questions: (1) What are the pandemic-related effects on FAH and FAFH sales, measured by the incidence of the disease, (2) What is the impact of pandemic-related restrictions on FAH and FAFH sales at the State level?, and (3) What is the economic impact of the COVID-19 pandemic on FAH and FAFH sales in 2020, measured by unemployment rates? These three questions provide us insights to better understand (1) how much of these changes in aggregate food spending were driven by individual fear of infection or of the disease itself, (2) how much of these changes were driven by local restrictions, and (3) how the local economic conditions such as a recession led to changes in aggregate food spending While the pandemic related restrictions and policy responses may be coming to an end, understanding how recessionary effects, individual fears and perceptions of disease, and how policies themselves impact food spending could provide policymakers with a better understanding of the diverse and complex consumer behavior.

We answer these three questions using a fixed-effects regression analysis on quarterly State-level data. Food spending at FAH and FAFH establishments come from the USDA-ERS, State-level FES from 2018 to 2020. We use the Bureau of Labor Statistics' (BLS) Quarterly Census of Employment and Wages (QCEW)—a high-frequency indicator—to convert the annual State-level FES to quarterly data. We perform a regression analysis at the State level to examine the relationship between quarterly sales of FAH and FAFH and three key variables: 1) Quarterly unemployment rate –calculated using BLS's monthly unemployment numbers at the State level; 2) quarterly COVID-19 deaths per 100,000 individuals at the State level –calculated

using the COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University; and 3) quarterly pandemic-related restrictions at the State level –gathered from the Restaurant Association and Ballotpedia.

This study makes several contributions to the existing literature and sheds light on the economic challenges faced by different States. First, this research expands upon previous studies on the impact of economic shocks on aggregate household food expenditures and FAH and FAFH spending by focusing specifically on unemployment rates at the State level. Second, this study examines the effects of pandemic-related restrictions, specifically those implemented at the State level, on food spending. Finally, it also assesses the impact of the incidence of the disease on food spending at the State level. This information is valuable from a policy perspective, as it highlights the heterogenous impacts of various policy measures and public health risks on food spending at the State level. Moreover, it provides insight into how food sales may change in response to the lifting of restrictions, a reduction in disease incidence, and economic recovery at the State level. Overall, the results of this study have significant implications for policymakers, economists, and industry professionals, and offer valuable insights into the complex interplay among economic conditions, pandemic-related restrictions, and the incidence of disease on food spending at the State level.

Data

In this study, we integrate several datasets to gain a comprehensive understanding of the

relationship between various factors and food expenditure patterns. These datasets include:

1. The USDA-ERS's Food Expenditure Series at the State level provides information on Food at Home (FAH) and Food Away from Home (FAFH) spending.
2. The BLS's Quarterly Census of Employment and Wages (QCEW) is used to convert the annual State-level Food Expenditure Series data into quarterly data.
3. The BLS's monthly unemployment data at the State level is used to calculate the quarterly unemployment rate at the State level.
4. Johns Hopkins' daily and cumulative COVID-19 deaths at the State level are used to determine quarterly deaths per 100,000 individuals at the State level.
5. Various measures of pandemic-related restrictions, such as lockdowns and mask mandates, as well as indoor restaurant capacity restrictions gathered from the Restaurant Association and Ballotpedia.

State-Level Food Expenditure Series (FES)

The USDA's State-Level Food Expenditure Series (FES) measures the total value of food acquired in each State in the U.S. as well as the District of Columbia. The State-Level FES provides information about consumer food acquisitions and spending behavior across States and time and follows a similar methodology to that used in the national-level FES but with a different underlying dataset. The national-level estimates are based primarily on food sales

reported in the U.S. Department of Commerce, Bureau of the Census's Economic Census, which is published every 5 years, and uses three annual surveys to interpolate between years and extrapolate lagged data forward. The State-level FES estimates also use a retail sales approach but are based largely on sales reported in the National Establishment Time Series Database (NETS). NETS provides time-series data on establishments across all sectors, including grocery stores and food service outlets (Walls & Associates, 2022). Establishments are selected under the same North American Industry Classification System (NAICS) codes as the national-level FES and aggregated at the State level. The sales in NETS are first adjusted following the methodology developed by Zeballos and Marchesi (2022), who developed a two-step process to minimize differences between NETS and FES sales information. Further adjustments are made to the sales data within each industry to exclude nonfood sales and avoid double counting. Finally, to make the national- and State-level estimates comparable, the State-level estimates are benchmarked to the FES at the national level each year. To make sensible comparisons across time periods, each nominal value is deflated by the BLS' Consumer Price Index (CPI). The FAH expenditures are deflated with the CPI for FAH and the FAFH expenditures, with the CPI for FAFH using 1988 as the base year (Zeballos and Sinclair, 2023b).

The State-level FES estimates present information only on food sales and excludes non-food sales: for FAH, home production, and donations; for FAFH, food revenues at schools and colleges, the value of FAFH furnished to employees or part of a secondary activity, and

donations and government assistance (Zeballos and Sinclair, 2023b).

Quarterly Census of Employment and Wages (QCEW)

The BLS's Quarterly Census of Employment and Wages (QCEW) provides a quarterly count of employment and wages reported by employers covering more than 95 percent of U.S. jobs, available at the county, MSA, State, and national levels by industry. To convert the annual State-level FES to quarterly data, we calculate the number of employees at the State level by quarter for the main industries that comprise FAH and FAFH sales in the FES. We use the following North American Industry Classification System (NAICS) codes:

- 445110: Supermarkets and other grocery (except convenience) stores
- 445120: Convenience Stores
- 452311: Warehouse clubs and supercenters
- 722511: Full-service restaurants
- 722513: Limited-service restaurants
- 722514: Cafeterias, grill buffets, and buffets
- 722515: Snack and nonalcoholic beverage bars
- 722410: Drinking places

Unemployment data

The Burau of Labor Statistics (BLS) constructs monthly State employment and unemployment estimates from State-level data from its current population survey. With this data, we construct quarterly unemployment rates equal to the unemployment count divided by the labor force at the State level.

COVID-19 data

The Johns Hopkins University (JHU) Center for Civic Impact COVID-19 United States Cases by County Dashboard provides the cumulative number of confirmed deaths, and population. These data are at the county level and subsequently aggregated to the State level.[4] We use the daily cumulative counts to generate new daily measures of deaths for each State.[5] We generate quarterly measures of the average, total, and median number of deaths and new deaths throughout 2020 by State. Furthermore, we calculate the incidence of the disease by

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[4] These data contain two additional categories per State – "Out of State" and "Unassigned". Those from "Out of State" consist deaths of individuals who are out of their State of residence. Those deaths that were "Unassigned" are not assigned to a specific county within a given State. Those that are "Out of State" may have passed while away from their home State but may also have a more direct impact on individuals where they reside in terms of changes in health risk behavior. We include both categories in our totals.

[5] Due to the nature of reporting, there are instances where a negative value is calculated. For each measure used throughout this report, we utilize measures that keep the daily tallies as negative and a measure where any negative values are changed to zero.

measuring COVID-19 related deaths per 100,000 individuals.

Restrictions

Ballotpedia provides summary data on start and end dates for State-wide lockdown restrictions and start and end dates for masking restrictions. With this information, we construct quarterly restrictions on lockdowns and mask mandates, which are evaluated on a binary scale, with a value of 1 indicating that the restriction was enforced during the specified quarter and a value of 0 indicating otherwise. We also use summary information from the Restaurant Association to obtain information about indoor dining restrictions such as the indoor dining capacity limits and whether there were additional restrictions on indoor dining. [6] The impact of indoor restaurant capacity restrictions is quantified by constructing a discrete variable that captures the level of restrictions. This variable takes the value of 0 for no restrictions (pre-pandemic), 1 when restrictions were low, and 2 when restrictions were high. The intensity of the restriction was established through a principal component analysis of these two measures. We provide a summary of these measures and dates associated with these restrictions in Table 1.

[6] The Restaurant Association report provided an indicator for whether restaurants were required to have tables 6 feet apart, social distancing measures, masking guidance, and cleaning guidance. We are unable to differentiate between these measures, but rather assign a single indicator for these restrictions being present in a State.

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	Ballotpedia				Restaurant Association	
State	Lockdown-start	Lockdown-end	Mask-start	Mask-end	Indoor dining capacity (%)	Additional Indoor Dining Restrictions* (1 = yes)
Alabama	4/4/2020	4/30/2020	7/16/2020	4/9/2021	50	1
Alaska	3/28/2020	4/24/2020			25	1
Arizona	3/31/2020	5/15/2020			50	0
Arkansas			7/20/2020	3/30/2021	66	0
California	3/19/2020	8/28/2020	6/18/2020	3/1/2022	0	0
Colorado	3/26/2020	4/26/2020	7/17/2020	5/14/2021	50	0
Connecticut	3/23/2020	5/20/2020	4/17/2020	2/28/2022	50	0
Delaware	3/24/2020	5/31/2020	5/1/2020	5/21/2021	60	0
District of Columbia	3/16/2020	5/15/2020			50	0
Florida	4/2/2020	5/4/2020			50	0
Georgia	4/3/2020	4/30/2020			100	1
Hawaii	3/25/2020	5/31/2020	4/20/2020	3/26/2022	50	0
Idaho	3/25/2020	4/30/2020			100	1
Illinois	3/21/2020	5/29/2020	5/1/2020	6/11/2021	25	0
Indiana	3/24/2020	5/1/2020	7/27/2020	4/6/2021	75	0
Iowa			11/17/2020	2/7/2021	100	1
Kansas	3/30/2020	5/3/2020	7/3/2020	4/1/2021	100	1
Kentucky	3/26/2020	6/29/2020	7/10/2020	6/11/2021	50	0
Louisiana	3/23/2020	5/15/2020	7/13/2020	4/28/2021	50	0
Maine	4/2/2020	5/31/2020	5/1/2020	5/24/2021	100	1
Maryland	3/30/2020	5/15/2020	4/18/2020	5/15/2021	50	0
Massachusetts	3/24/2020	5/18/2020	5/6/2020	5/29/2021	100	1
Michigan	3/24/2020	6/1/2020	4/26/2020	6/22/2021	100	1
Minnesota	3/27/2020	5/17/2020	7/25/2020	5/14/2021	50	0
Mississippi	4/3/2020	4/27/2020	8/5/2020	9/30/2020	50	0
Missouri	4/6/2020	5/3/2020			25	0
Montana	3/28/2020	4/26/2020	7/15/2020	2/12/2021	75	0

Nebraska					100	1
Nevada	4/1/2020	5/15/2020	6/25/2020	2/10/2022	50	0
New Hampshire	3/27/2020	6/15/2020	11/20/2020	4/16/2021	100	0
New Jersey	3/21/2020	6/9/2020	4/10/2020	5/28/2021	0	0
New Mexico	3/24/2020	11/30/2020	5/15/2020	2/17/2022	0	0
New York	3/20/2020	6/27/2020	4/15/2020	2/10/2022	0	0
North Carolina	3/30/2020	5/22/2020	6/26/2020	5/14/2021	50	0
North Dakota			11/14/2020	1/18/2021	75	0
Ohio	3/23/2020	5/19/2020	7/23/2020	6/2/2021	100	1
Oklahoma	4/1/2020	5/6/2020			100	1
Oregon	3/23/2020	6/19/2020	7/1/2020	6/30/2021	50	0
Pennsylvania	4/1/2020	6/4/2020	4/17/2020	6/28/2021	25	0
Rhode Island	3/28/2020	5/8/2020	4/20/2020	7/6/2021	66	0
South Carolina	4/7/2020	5/4/2020			50	0
South Dakota					0	0
Tennessee	3/31/2020	4/30/2020			100	1
Texas	4/2/2020	4/30/2020	7/3/2020	3/10/2021	50	0
Utah			11/9/2020	4/10/2021	50	0
Vermont	3/24/2020	5/15/2020	8/1/2020	6/14/2021	50	0
Virginia	3/30/2020	5/29/2020	5/29/2020	5/15/2021	50	0
Washington	3/24/2020	5/31/2020	6/26/2020	3/12/2022	50	0
West Virginia	3/24/2020	5/4/2020	7/7/2020	6/20/2021	50	0
Wisconsin	3/25/2020	5/13/2020	8/1/2020	3/31/2021	100	1
Wyoming			12/9/2020	3/16/2021	100	1

Note: * indicates additional restriction such as having tables that are 6 feet apart, social distancing, mask, cleaning guidelines.

Source: Authors recompilation using data from Ballotpedia and the Restaurant Association accessed in November 2022.

Methodology

We perform a fixed-effects regression analysis on quarterly State-level data to examine the relationship between FAH and FAFH sales and three key variables: 1) Quarterly unemployment rate; 2) quarterly COVID-19 deaths per 100,000 individuals; and 3) quarterly lockdowns, mask mandates, and indoor restaurant capacity restrictions.

To econometrically estimate the relationship between FAH and FAFH expenditures and these three key variables, we use the following specification.

$$\begin{aligned}\text{Log}(Sales_{sq}) - \log(Sales_{sq-4}) \\ = \beta_0 + \beta_1[\log(unemployment_{sq}) \\ - \log(unemployment_{sq-4})] + \beta_2 Deaths_{sq} + \beta_3 Mask_{sq} + \beta_4 Lockdown_{sq} \\ + \beta_5 RestRes_{sq} + StateFixedEffects_s + \epsilon_{sq}\end{aligned}$$

We analyze the growth rate of food sales (FAH or FAFH) where s indexes State and q indexes quarter/year. To estimate the growth rate, we calculate the difference between the log of food sales in a given quarter of one year and the log of food sales in the same quarter of the previous year. By doing this, we control for potential seasonality and non-stationarity in the data. Similarly, we approximate the growth rate of the unemployment rate by differencing the log of unemployment rate in a given quarter of one year and the log of unemployment rate in the same quarter of the previous year. We further regress on $Mask_{sq}$ and $Lockdown_{sq}$ which are evaluated on a binary scale, with a value of 1 indicating that the restriction was enforced

during quarter q in State s and a value of 0 indicating otherwise. Finally, $RestRes_{sq}$ captures the intensity of restrictions on restaurants in State s during quarter q. Specifically, it is derived based on how many people were allowed indoors at restaurants, and whether other safety measures were in place such as distances between tables, indoor dining restrictions, such as tables being 6 feet apart, social distancing measures, masking guidance, and cleaning guidance. The variable takes the value of 0 for no restrictions (pre-pandemic), 1 for low restrictions, and 2 for high restrictions. Finally, we control for local time-invariant characteristics with State fixed effects.

Results

The main findings of the regression analysis are summarized in Table 2.[7] Column 1 focuses on food-at-home (FAH) spending and reveals that higher unemployment rates are associated with a significant increase in the growth of FAH sales. Additionally, a higher incidence of the disease, as measured by deaths per 100,000 individuals, is also significantly related to an increase in FAH sales. Mask mandates are also significantly related to an increase in FAH sales. In contrast, the analysis suggests that lockdown mandates do not have a statistically significant impact on the growth of FAH sales.

[7] Appendix table 1 presents the results adding one restriction at a time. Restaurant restrictions are added to the food-away-from-home analysis.

Moving on to Column 2 which examines food away from home (FAFH) spending, the analysis indicates that higher unemployment rates are significantly associated with a decrease in the growth of FAFH sales. Further, a higher incidence of the disease, as measured by deaths per 100,000 individuals, is also found to be significantly related to a decrease in FAFH sales. This potentially highlights consumers' aversion to infection. While mask mandates are significantly related to an increase in the growth of FAFH sales, lockdowns are found to be significantly related to a decrease in FAFH sales. The analysis suggests that restaurant restrictions are significantly related to a decrease in the growth of FAFH sales, with higher restrictions leading to a significantly larger decrease in the growth of FAFH spending.

Given previous research which highlighted the disparity in consumer spending by restaurant type (Marchesi and McLaughlin, 2022; Zeballos and Sinclair, 2023a), we expand our analysis to investigate differences between full-service and limited-service restaurants separately (Columns 4 and 5, respectively). Our findings indicate similar patterns to those presented in Column 3, where higher unemployment rates are significantly associated with a decrease in the growth of sales at both full-service and limited-service restaurants. However, results show that a higher incidence of the disease are associated with heterogenous shifts in spending between restaurant types, with there only being a significant negative association with sales growth for full-service restaurants. Additionally, lockdown mandates are also found to be significantly related to a decrease in sales, and mask mandates are associated with a significant increase in sales at both types of restaurants. Interestingly, our results also suggest that both low

and high restaurant restrictions are associated with a decrease spending at full-service restaurants, but it is not the case for limited-service restaurants, where low restaurant restrictions are not statistically significant.

Table 2: Coefficients and SE from first difference regressions of unemployment rate growth, incidence of the disease, and pandemic-related restrictions on food at home, food away spending, and by outlet type.

	(1)	(2)	(3)	(4)	(5)
		Food away from home			
	Food at home	All		Full-service	Limited service
Unemployment rate growth	0.01*	-0.24***	-0.18***	-0.18***	-0.15***
	(0.004)	(0.010)	(0.014)	(0.019)	(0.017)
Deaths per 100,000 individuals	0.01**	-0.08***	-0.04***	-0.05**	-0.03
	(0.006)	(0.016)	(0.016)	(0.021)	(0.019)
Mask mandate	0.02***	0.02*	0.05***	0.06***	0.05***
	(0.005)	(0.011)	(0.012)	(0.016)	(0.015)
Lockdown mandate	0.00	-0.10***	-0.10***	-0.10***	-0.12***
	(0.005)	(0.012)	(0.012)	(0.015)	(0.014)
Low restaurant restrictions			-0.08***	-0.19***	-0.03
			(0.018)	(0.023)	(0.021)
High restaurant restrictions			-0.11***	-0.22***	-0.05**
			(0.018)	(0.023)	(0.022)
Constant	0.02***	-0.01*	0.00	-0.03***	0.03***
	(0.002)	(0.004)	(0.004)	(0.005)	(0.005)
Observations	408	408	408	408	408
R-squared	0.209	0.868	0.88	0.883	0.748
Number of States	51	51	51	51	51

Note: Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1
Source: authors calculations.

Conclusion and Discussion

This study examines the impact of the COVID-19 pandemic on sales at food-at-home (FAH) and food-away-from-home (FAFH) establishments, with a focus on pandemic-related restrictions, incidence of the disease, and recessionary employment loss. For FAH sales, our results indicate the following: 1) higher unemployment rates and a greater incidence of COVID-19 are associated with an increase in FAH sales; 2) mask mandates are associated with an increase in FAH sales; and 3) lockdown mandates have no significant association with FAH sales. The increase in FAH sales associated with higher unemployment rates aligns with prior research on food sales during recessionary periods (Kumcu and Kaufman, 2011; Dave and Kelly, 2012; Beatty and Senauer, 2013; Cho et al., 2018; Zeballos et al., 2021; Zeballos and Dong, 2022). The differences observed in spending driven by the spread of the disease and mitigation factors compared to lockdown measures are unsurprising when contextualized with the fact that grocery shopping remained a necessity throughout the pandemic, even early on, so stay-at-home orders would not be expected to impact FAH sales. It is also possible that some of the increase in FAH that was associated with unemployment could be driven by the numerous nutritional assistance programs that were implemented following the passage of several laws including the Families First Coronavirus Response Act, and the Coronavirus Aid, Relief, and Economic Security Act (Toossi et al., 2021).

For FAFH sales, our results show that: 1) higher unemployment rates and greater

incidence of the disease are associated with a decrease in FAFH sales; 2) while lockdowns are associated with a decrease in FAFH sales, mask mandates are associated with an increase in FAFH sales; 3) restaurants restrictions are associated with a decrease in FAFH sales; and 4) the association between restaurants restrictions and FAFH sales differ by outlet type—the decrease in expenditures at full-service restaurants is larger than the decrease at limited-service restaurants. These results align well with previous research which found spending at limited-service restaurants reverted to pre-pandemic levels sooner than at full-service (Cosgrove and Wharton, 2021; Bhutani et al., 2021; Marchesi and McLaughlin, 2022; Zeballos and Sinclair, 2023a).

Our findings also expand upon those findings by highlighting shifts due to different policy measures. The discrepancy in findings between full- and limited-service restaurants may be attributed to the inherent differences between these two types of establishments. Full-service restaurants typically offer food and alcohol to seated customers who pay after eating and receive amenities such as ceramic dishware and non-disposable utensils. In contrast, limited-service or fast-food restaurants prioritize convenience and have limited menus, sparse dining amenities, and no wait staff. When restaurants were required to put in a variety of safety measures that primarily impacted their dining rooms, or shut them down completely, it is unsurprising to see this disproportionately impact full-service restaurants. The limited physical interaction with customers, as they can quickly obtain their food via other methods like a drive-thru, made it easier for fast-food establishments to adapt to these restrictions. Full-service restaurants had to

reinvent themselves to expand takeout and delivery services. Although it has been documented that while limited-service restaurants tended to see an increase in spending outside of on-premises, such as drive-thru or delivery, full-service restaurants also saw a shift towards carry-out and delivery, however, that shift was not large enough to offset the decrease in on-premises spending (Marchesi and McLaughlin, 2023).

Lastly, our results contribute to the interplay between FAH and FAFH spending. Generally, we observe that local economic conditions are the largest contributor to changes in overall FAFH expenditure trends. While consumers cut their limited-service restaurant spending as a result of the local economic conditions, these economic shifts were the largest contributor to overall limited-service spending, highlighting that in times of economic hardship, consumers cut back on even lower cost version types of meals (Cho et al., 2018). While the impact due to restaurant restrictions was also a large contributor to the decline in full-service restaurant expenditures, the impact from local economic conditions was similarly large. Despite the declines in FAFH, we do not observe large shifts towards FAH, which could indicate that consumers cut back total food spending rather than shifted away from FAFH toward FAH resulting in the decline in total food spending as we observed in Figure 1.

In conclusion, the influence of the COVID-19 pandemic on food spending at the State level in 2020 was complex and varied, with a multitude of factors contributing to changes in spending patterns. These findings underscore the significant impact of the COVID-19 pandemic and its related economic and public health consequences on consumer behavior in the food

366 industry, with different factors playing a role in FAH and FAFH spending patterns. Overall, this
367 study provides valuable insights for policymakers and industry stakeholders seeking to
368 understand the impact of pandemics on consumer behavior and make informed decisions about
369 how to respond to such crises in the future.

370 Finally, to estimate the effects of unemployment, pandemic-related, and restriction-
371 related factors on FAH and FAFH spending, we use a fixed-effects model, which is essentially a
372 first difference model, with 8 observations for each State (4 quarters in 2019 and 4 quarters in
373 2020). We calculated the difference between variables over these eight periods which removes
374 all unobservable State characteristics that do not change during this time (e.g., demographic
375 variables, political affiliation, etc.). What remains are variables that vary during this time and
376 the model estimates how changes in these factors affect the dependent variables (i.e., FAH and
377 FAFH spending). A potential limitation of this work is that although we use a fixed-effects
378 estimation to tease out unobservable time-invariant State unobserved characteristics, some
379 varying, unobservable disturbances may still be correlated with the explanatory variables. For
380 example, local ordinances in major cities could have been put in place when State-wide
381 restrictions were removed, which we are unable to capture. Further, while we are able to
382 aggregate these restrictions up to the quarterly level, many changes were occurring at a more
383 rapid, daily pace, which could lead to additional unobservable shifts within a State over time.
384

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Appendix

Appendix Table 1: Coefficients and SE from first difference regressions of unemployment rate growth, incidence of the disease, and pandemic-related restrictions on food at home and food away spending.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Food at home			Food away from home			
Unemployment rate growth	0.01***	0.01**	0.02***	-0.28***	-0.29***	-0.23***	-0.25***
	(0.003)	(0.003)	(0.004)	(0.008)	(0.009)	(0.009)	(0.015)
Deaths per 100,000 individuals	0.02***	0.01**	0.02***	-0.09***	-0.11***	-0.06***	-0.07***
	(0.006)	(0.006)	(0.006)	(0.016)	(0.017)	(0.014)	(0.018)
Mask mandate		0.02***			0.04***		
		(0.004)			(0.012)		
Lockdown mandate			0.00			-0.10***	
			(0.005)			(0.012)	
Low restaurant restrictions							-0.03*
							(0.018)
High restaurant restrictions							-0.04**
							(0.018)
Constant	0.02***	0.02***	0.02***	-0.01	-0.01*	-0.01	0
	(0.002)	(0.002)	(0.002)	(0.004)	(0.004)	(0.004)	(0.004)
Observations	408	408	408	408	408	408	408
R-squared	0.176	0.209	0.178	0.838	0.844	0.867	0.841
Number of States	51	51	51	51	51	51	51

Note: Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Source: authors calculations.