Changes in household food grocery shopping patterns in Melbourne, Australia during COVID-19 restrictions in 2020

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Submitted: 10 January 2023; Revision requested: 30 July 2023; Accepted: 15 August 2023

Abstract

Objective: To investigate the impact of COVID-19 restrictions in Melbourne, 2020, on food grocery purchases.

Methods: Grocery purchase data for 2019 and 2020 were accessed for 1,413 Melbourne households (NielsenIQ Homescan Consumer Panel) and linked to a nutrition composition database (FoodSwitch).

Results: Per capita expenditure and dietary energy from groceries increased by 21.2% and 17.7%, respectively, during lockdowns, with marginally larger increases in expenditure and energy purchases from unhealthy products than healthy products (21.9% and 18.0% v 20.2% and 17.5%). The most socioeconomically disadvantaged households spent the least on but purchased the most energy from unhealthy products during lockdowns ($108 and 109MJ per capita per month), with the inverse found for the most advantaged households ($121 and 102MJ per capita per month). An increase in the overall proportion of total expenditure from unhealthy products during lockdowns was identified (+0.7%); however, there was no evidence of a difference in the proportion of energy purchased from unhealthy products. For most quintiles of household socioeconomic disadvantage/advantage, there were no statistically significant changes in the contribution of unhealthy products to total expenditure and energy purchases.

Conclusions: There was no substantial deterioration in the healthiness of grocery purchases during COVID-19 lockdowns in Melbourne. However, any additional purchases of unhealthy products are a concern. Further research on other sources of foods and drinks is also required to ascertain impacts on broader dietary patterns.

Implications for public health: The increase in energy purchased may have implications for overweight and obesity as a risk factor for COVID-19 and chronic diseases. Governments and retailers may need to consider measures to encourage improved diet quality during future crises.

Key words: COVID-19, dietary patterns, grocery shopping, food retail

Introduction

The COVID-19 pandemic dramatically disturbed the way that many people lived, with individual and institutional responses to the pandemic considerably disrupting social and economic activity. Australian governments' initial responses to COVID-19 generally involved the relatively rapid introduction of stringent restrictions,[1–3] although there were considerable differences in approaches across jurisdictions. These experiences have been reported to have affected Australians' dietary patterns.[4–9] During lockdowns, expenditure on food retailing increased (with a significant and sustained shift towards online shopping), while purchases of food prepared outside of the home decreased due to restrictions on dine-in services.[10] Alongside this, there was a surge in the use of food order/delivery platforms,[11] which are overwhelmingly skewed towards unhealthy products.[12] Economic disruption also impacted the availability and affordability of healthy foods for some,[13–16] while for others, temporarily increased government supports improved access.[17–20] Furthermore, there is evidence that food corporations leveraged the pandemic to further promote unhealthy products, for instance by utilising themes of shared hardship to justify increased purchases of "treats" such as fast food or encouraging the consumption of unhealthy food as a coping mechanism.[21–24]

Australians ordinarily consume too much unhealthy processed food,[25–28] which is reflected in 67% of Australian adults being overweight or obese.[29] Poor diet and overweight/obesity are more

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Aust NZ J Public Health. 2023; Online; https://doi.org/10.1016/j.anzjph.2023.100088

common among those experiencing greater socioeconomic disadvantage.[26,28,30–33] Supermarkets are the primary source of foods and beverages for Australians,[10] accounting for approximately two-thirds of food-related expenditure.[34] Government data indicate that supermarket purchasing patterns changed during the early stages of the pandemic, with large increases in purchases of most food types;[27] however, the aggregated data provided do not allow a detailed investigation of the extent to which strict, localised, and prolonged restrictions affected supermarket purchases. Given the increased expenditure on food and beverages from supermarkets during the COVID-19 pandemic,[10] it is important to assess how the overall healthiness of grocery purchases was impacted during periods of intensive restrictions.

The aim of this study was to empirically evaluate whether and how household grocery shopping patterns changed between lockdown and non-lockdown periods, comparing grocery purchasing data collected during the first year of the COVID-19 pandemic (2020) against the pre-COVID-19 control period of 2019. This study used metropolitan Melbourne, Victoria, as a case study as this was the only Australian region to experience long stretches of 2020 under lockdowns involving prohibitions on dine-in hospitality and public and in-home gatherings.

Methods

Study population and purchase data

This study used two years of data (2019 and 2020) from the NielsenIQ Homescan Consumer Panel, a commercial dataset that contains household-level food and beverage purchase data from a large sample of Australian households. Data on grocery purchases are frequently applied as a proxy for food consumption by researchers,[35,36] and Homescan data have been used in multiple studies from Australia and overseas.[37–43] Purchasing data have also been adopted by the Australian Bureau of Statistics to estimate household consumption.[44,45]

This dataset continuously captures data on grocery purchases from households recruited to be demographically and geographically representative of the Australian population. Using a handheld electronic scanner, participating households scan the barcode of all foods and beverages brought into the home from all retail grocery outlets, including supermarkets, bakeries, and greengrocers. No information is collected on food purchased and consumed outside of the home such as food from restaurants and take-away outlets. The NielsenIQ dataset also collects sociodemographic characteristics, including household income, life stage, age, and gender of all household members.

NielsenIQ household reliability criteria were applied, according to which households must have recorded one barcode each week for at least 50% of weeks and spent at least $5 on foods and beverages every week to be included in our analyses. Only households in metropolitan Melbourne that participated in the panel in both years were included. Ethics approval for use of the NielsenIQ dataset was provided by the University of New South Wales Human Research Ethics Committee (HC200244).

Nutrition data

The Australian FoodSwitch database contains information on products for sale from five large supermarket retailers in Australia. Trained data collectors visit these stores annually and take photographs of all available packaged food and beverage products. This is supplemented by crowd-sourced data, where users of the FoodSwitch app encountering foods or beverages not found in the database are prompted to take photographs of the new product/s. The product photographs are coded to capture information available on packaging such as nutrition data and ingredient declarations. Protocols for data entry and quality checks have been described in detail elsewhere.[46]

Merging of purchase and nutrient data

Using previously established methods,[34,37,47,48] packaged food and beverage products in the NielsenIQ Homescan data were initially matched to FoodSwitch data using the unique barcode associated with each product. Additional steps were then applied to further increase the number of products matched, including linking products by name. Following these steps, 98.0% and 97.4% of the products purchased in 2019 and 2020, respectively, were able to be matched and included in analyses. Match rates for products were similar between years across all months (Supplementary Table 1).

Core and discretionary classification

Products were categorised as "core" (healthy products, sufficient and appropriate for a healthy diet) or "discretionary" (unhealthy and unnecessary for a healthy diet, to be consumed rarely and only in small quantities) according to the Australian Dietary Guidelines.[49,50]

Socioeconomic position

To investigate the influence of socioeconomic position on outcomes, we used the Index of Relative Socioeconomic Advantage and Disadvantage (IRSAD),[51] which considers a range of social and economic factors. A lower IRSAD score indicates greater disadvantage or a lack of advantage, and a higher IRSAD score indicates greater advantage or a lack of disadvantage. IRSAD scores are based on area-level advantage/disadvantage and were mapped to households in the NielsenIQ panel through postcode-level data linkage.

Lockdown periods

Local restrictions to control the spread of COVID-19 were introduced across much of Australia in March 2020, before some loosening in May and a return to near-normalcy in most states in June 2020. Renewed outbreaks in Melbourne saw the reintroduction of restrictions in July, which were further tightened in August. By mid-September, the situation had improved considerably, and restrictions were progressively relaxed until the lockdown ended on 28th October. Remaining restrictions, for example on patron capacity in hospitality settings, continued to be removed across November and December 2020.[52] To account for these events, we considered Melbourne to be under lockdown conditions in March–May and July–October 2020. Combined, these months in aggregate are, hereafter, referred to as the "combined lockdown period". This period was compared to the equivalent period in 2019 for our study.

Statistical analysis

We compared the mean total expenditure on groceries and energy content of purchases per capita between 2019 and 2020. We assessed expenditure and energy content annually, for the combined

lockdown period overall (expressed as the monthly average for the period) and by month. Differences in mean expenditure and energy purchased per capita were further assessed by healthiness (core/discretionary). We also assessed differences by IRSAD quintile for the combined lockdown period. The mean proportion of total expenditure and energy purchases from discretionary products were calculated using the average of proportions across households. All data were reported on a per capita basis.

Results were projected to the Melbourne population using NielsenIQ-supplied frequency survey weights, which were based on the 2016 Australian census[53] and projected annually to account for population growth. Prices of household purchases in 2020 were inflation-adjusted to the 2019 Australian dollar, with all expenditures reported in 2019 dollars.

Differences in mean expenditure and energy purchased per capita were assessed using the Wald test, with a two-sided $p<0.05$ considered statistically significant. Data manipulation and statistical analyses were conducted using Stata/IC version 15.1 and figures generated using Microsoft Excel.

Results

Households included

In total, 1,413 households met the eligibility criteria and were included in this study. The characteristics of included households were largely consistent across years (Supplementary Table 2).

Expenditure and energy content of purchases across the full year (2020 v 2019)

Total average expenditure and total average energy content of purchases per capita were both higher in 2020 than in 2019 (Supplementary Table 3). Expenditure per capita on both core and discretionary products was higher in 2020 than in 2019, with the increase greater in discretionary products ($190.5, +17.2% per year) than core products ($132.7, +15.6% per year). Similarly, the increase in total energy value of purchases per capita was greater in discretionary products (140.54MJ, +13.6% per year) than core products (119.04MJ, +13.1% per year) in 2020 than in 2019. Overall, the proportion of total expenditure and energy purchased per capita from discretionary products slightly increased in 2020 than in 2019, although the differences were not statistically significant.

Expenditure and energy content of purchases during combined lockdown period (2020 v 2019)

During the combined lockdown period in 2020, total per capita expenditure per month and total per capita energy purchased per month were higher than over the same period in 2019 (Table 1, see Supplementary Tables 4–5 for full results). Expenditure and energy purchased increased from both core and discretionary products, with the increase greater in discretionary products ($20.6 per month, +21.9%; 15.92MJ per month, +18.0%) than core products ($14.8 per month, +20.2%; 13.80MJ per month, +17.5%). The proportion of total expenditure on discretionary products increased slightly during the combined lockdown period in 2020, compared to 2019; however, there was no evidence of a difference in the proportion of energy purchased from discretionary products.

Table 1: Changes in average per capita expenditure and energy content purchased per month, by food type and IRSAD quintile, combined lockdown period, 2020 compared to same period in 2019.

		Mean expenditure							Mean energy						
		Core products		Discretionary products		All products		Discretionary as proportion of total	Core products		Discretionary products		All products		Discretionary as proportion of total
		Change ($)	Change (%)	Change ($)	Change (%)	Change ($)	Change (%)	Change (%)	Change (MJ)	Change (%)	Change (MJ)	Change (%)	Change (MJ)	Change (%)	Change (%)
Lockdown period, *all households*		14.8**	20.2	20.6**	21.9	35.3**	21.2	0.7*	13.80**	17.5	15.92**	18.0	29.72**	17.7	0.4
IRSAD quintile	1 (Low)	9.3**	13.3	12.0**	12.6	21.3**	12.9	-0.2	6.08*	7.4	11.61**	11.9	17.69*	9.8	0.6
	2	13.1**	18.3	22.8**	26.1	36.0**	22.6	1.6	12.37**	16.0	18.65**	22.3	31.02**	19.3	1.7*
	3	12.5**	17.2	20.1**	21.9	32.6**	19.8	1.3*	11.60**	14.6	16.20**	18.0	27.80**	16.4	0.8
	4	17.6**	24.0	21.9**	23.6	39.5**	23.8	0.3	15.65**	19.7	15.67**	17.7	31.32**	18.6	0.0
	5 (High)	16.0**	21.4	21.6**	21.7	37.6**	21.6	0.5	17.08**	22.1	16.41**	19.2	33.49**	20.6	-0.1

Note: * p<0.05, ** p<0.001.

Expenditure and energy content of purchases by IRSAD quintiles during combined lockdown period (2020 v 2019)

On average, households in all IRSAD quintiles saw increases in total, core, and discretionary expenditure and energy purchases during the combined lockdown period in 2020, compared to 2019 (Table 1, see Supplementary Tables 4–5 for full results). The largest absolute and relative increases in total expenditure and core products expenditure were amongst the 4th quintile ($39.5, +23.8%; $17.6, +24.0%) and the largest increases in discretionary products expenditure were in the 2nd quintile ($22.8, +26.1%). For energy purchases, the largest increases overall and from core products were in the top quintile (33.49MJ, +20.6%; 17.08MJ, +22.1%) and from discretionary products in the 2nd quintile (18.65MJ, +22.3%).

Across all measures, the smallest increases were found in the bottom quintile (Table 1, see Supplementary Tables 4–5 for full results). During the combined lockdown period in 2020, households in the bottom IRSAD quintile spent the least on discretionary products but had the highest purchases of energy from discretionary products, while households in the top quintile had the highest expenditure on discretionary products but the lowest purchases of energy from discretionary products.

For most IRSAD quintiles, there was no statistically significant change in the proportion of expenditure and energy purchases from discretionary products, aside from small increases in the proportion of expenditure from discretionary products in the 3rd quintile and the proportion of energy purchased from discretionary products in the 2nd quintile (Table 1, see Supplementary Tables 4–5 for full results).

Expenditure and energy content of purchases by month (2020 v 2019)

Average expenditure per capita per month was higher in all months in 2020 than the same months in 2019, other than December (Supplementary Table 6). Energy content of purchases per capita per month was also higher in all months in 2020 than in the same months in 2019, aside from November and December (Supplementary Table 7). Increases in expenditure and energy content were consistently larger in lockdown months than non-lockdown months. Significant increases were found in expenditure on both core and discretionary products in all months other than December. The energy value of purchases was higher for core products in all months aside from November and December and for discretionary products in all months other than December.

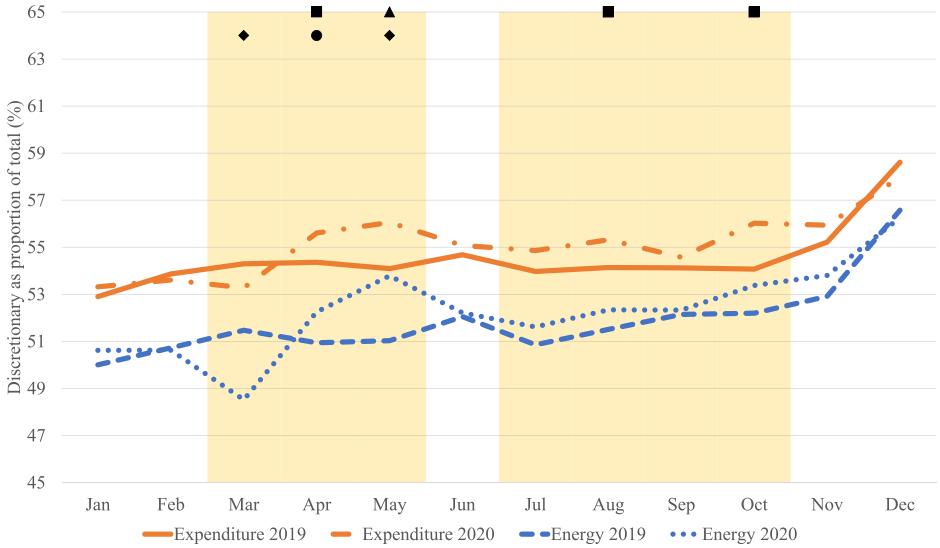
Comparing by month between 2019 and 2020, discretionary products as a proportion of expenditure increased in April, May, August, and October, while discretionary products as a proportion of energy purchases increased in April and May but decreased in March, noting that the magnitude of all differences was small (**Figure 1**, see Supplementary Tables 6–7 for full results). All of the months exhibiting significant differences between years were during the combined lockdown period.

Discussion

To examine the impacts of prolonged COVID-19 restrictions on food grocery purchases, our study focussed on Melbourne in 2020, during which there were two strict lockdowns, and 2019, a pre-COVID-19 control period. Findings indicate that Melburnians increased supermarket purchases during lockdowns, with increases in per capita expenditure on and energy content from groceries during such periods. Although expenditure on and energy content from discretionary products increased more than for core foods, we did not find any large changes to the overall proportion of expenditure on and energy derived from discretionary products. The absence of any substantial deterioration in the healthiness of food purchases during lockdowns is a welcome result, highlighting that while there were substantial disruptions to daily life during the COVID-19 pandemic, the overall mix of products in shopping trolleys remained largely unchanged.

Our findings of increases in expenditure on and energy content from supermarket purchases are potentially expected, given the mandated closure of eat-in hospitality services at the time. However, there is also

Figure 1: Discretionary products as proportion of total expenditure and total energy content of grocery purchases per capita by month, Melbourne, 2019 vs 2020. Note: ■ = significant difference in expenditure (p<0.05), ▲ = significant difference in expenditure (p<0.001), ● = significant difference in energy purchases (p<0.05), ◆ = significant difference in energy purchases (p<0.001), shading indicates months in which Melbourne was in lockdown in 2020.



the possibility that disruptions to food supply chains during the pandemic (from, for instance, increased consumer demand, staff shortages, and restrictions on movement of goods) also contributed to changes in consumer purchasing patterns.

When the data were analysed by month, we found that expenditure and energy purchases from groceries increased in 2020 outside of months during which Melbourne was in lockdown, other than at the end of the year (potentially reflecting an enthusiasm for eat-in hospitality services upon reopening[54–56]). This bleeding of effect into other months may be attributable to the looming prospect of restrictions and/or continuing concerns over mingling in public spaces.[57–59] However, increases in non-lockdown months were consistently lower than those seen in lockdown months.

Aggregated government records also documented increases in the volume and energy content of purchases early in the pandemic, when most Australians were living under some form of COVID-19 restrictions.[27] These show that the relative contribution of discretionary products to total energy purchases decreased in March 2020, compared to March 2019,[27] as per our analysis. This temporary improvement may have been due to increased purchases of bulkier, shelf-stable products such as plain rice, pasta, and flours and dried legumes and pulses,[27] all largely core products. There were also reports of stockpiling at this time,[60,61] so these bulk purchases may not have been consumed immediately, meaning that the apparent increases may not have translated into actual changes in dietary intakes. The extent to which increased energy from grocery purchases was offset or compounded by reduced out-of-home purchases or the growth of food delivery services during this period is unknown. Nonetheless, the patterns of discretionary purchases identified in our study suggest that the average Melbourne household consumes a diet that does not align with the Australian Dietary Guidelines,[49] as has also been found by other Australian studies, both before and during the pandemic.[26–28]

The current study also explored the relative contribution of discretionary products to total expenditure and energy purchases by socioeconomic position. Our finding that more disadvantaged Australians purchased more discretionary products compared to more advantaged Australians is consistent with prior research.[28,30–32]

Although the bottom 20% of households by relative socioeconomic disadvantage and advantage in our study increased relative expenditure on core products during lockdowns, the additional energy provided by these core purchases was outweighed by a much larger increase in energy from discretionary products. These changes meant that, while these households spent the least on discretionary products during lockdowns, they purchased the most energy from discretionary products. Furthermore, households in the bottom IRSAD quintile also saw the smallest increases in expenditure and energy purchases overall and from both core and discretionary products between 2019 and 2020.

Food insecurity, including a lack of access to nutritious foods, is already particularly prevalent amongst people who are experiencing socioeconomic disadvantage in Australia.[13,62–70] Results from our analysis may suggest that the temporarily improved social and financial supports available at the time were insufficient to support healthier grocery purchasing patterns, with the most disadvantaged households potentially relying on purchases of cheaper but more energy-dense discretionary products despite spending relatively more on core products altogether. Unhealthy products are more likely to be promoted using price-based strategies,[71] while an Australian study has previously found that unhealthy products are more commonly purchased when price promoted,[43] with comparatively greater energy purchases from unhealthy price-promoted products amongst more disadvantaged households. Our quantitative results also align with the findings of contemporary qualitative research with people receiving government support in Victoria.[72]

The possibility remains that health systems could be overwhelmed by new variants of COVID-19 in the future, requiring further lockdowns to manage increases in infections, hospitalisations and deaths. In addition, other infectious disease pandemics or crises that may necessitate similar responses are also predicted to become increasingly common.[73,74] During such periods, governments and retailers could support consumers in shifting their additional grocery purchases towards healthy, minimally processed foods and beverages, such as by restricting discounts and other marketing promotions on discretionary products.

Strengths of our research include the use of objectively recorded grocery purchasing data from a large sample of households weighted to be representative of the source population, potentially overcoming previously identified issues with underreporting of energy intake by Australians experiencing socioeconomic disadvantage in surveys.[30,75,76] Additionally, through linking purchases to nutrition information at the time of purchase, we were able to assess changes in the energy content of household purchases. The use of a per capita analysis also mitigated the influence of changes in household composition. High product matching rates across both years ensured that nearly all purchases were included in analyses, and by including only households residing in Melbourne in both years, we were able to directly compare changes in purchasing habits.

Limitations include the focus on a relatively novel, if prolonged, period, which restricts generalisability; it would be valuable to understand whether a similar pattern occurred as lockdowns were re-introduced in Melbourne and elsewhere in Australia for an extended period in 2021. Previous literature suggests that NielsenIQ Homescan data likely has some under-reporting (~10-20%).[77,78] While under-reporting is likely consistent across time periods and we attempted to account for this by setting a threshold for expenditure; the figures here may still represent underestimates. On the other hand, purchasing data in general may overestimate consumption as it do not consider other post-purchase factors such as preparation and waste,[35,79] as well as the possibility of consumption by a household other than the purchasing household.

Although supermarkets likely remained the largest source of food in 2020, this study also does not detail purchases from other sectors, such as foods from takeaway outlets and delivery services. Given this sector, particularly home delivery is a growing area of the food supply,[80,81] this is an important area for future research.

Conclusion

Restrictions on social and economic activity introduced to control COVID-19 in Melbourne saw an increase in expenditure on and total energy from grocery purchases. Reassuringly, we found no wholesale deterioration in the healthiness of these purchases. However, any additional energy purchases, particularly from discretionary products, remain a concern, with implications for overweight, obesity, and diet-

related disease both as a short-term risk factor for COVID-19 and in the longer term. Further investigations of purchasing behaviours and dietary patterns during later outbreaks or reintroduced restrictions will be critical to better prepare for and mitigate food industry and community responses to future crises. Additionally, there is a clear need for further research into the impacts of COVID-19 on changes in purchases from other sources of foods and drinks, particularly delivery services, to gain a comprehensive picture of the impact of lockdowns on overall dietary patterns.

Funding sources

No funding has been provided for this study and no external source has had any input into trial design, conduct, analysis, or reporting. The authors take full responsibility for all aspects of the study and are solely responsible for the drafting and editing of this paper and its final contents.

Data sharing statement

Deidentified data may be shared after contacting study investigators, subject to relevant policies of the host organisation.

Ethical statement

Ethics approval for use of the NielsenIQ dataset was provided by the University of New South Wales Human Research Ethics Committee (HC200244).

Acknowledgements

The authors thank Luke Starick from NielsenIQ for their assistance and provision of Homescan data.

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Conflict of interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.anzjph.2023.100088.