

Seattle's Minimum Wage Ordinance did not affect supermarket food prices by processing  
category

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**Abstract**

Seattle's Minimum Wage Ordinance did not affect supermarket food prices by processing category

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**Objective:** To examine the impacts of Seattle's minimum wage ordinance on food prices by food processing category.

**Design:** Supermarket food prices were collected for 106 items using a UW Center for Public Health Nutrition market basket at affected and unaffected supermarket chain stores at three time points: March 2015 (1-month pre-policy enactment), May 2015 (1-month post-policy enactment), and May 2016 (1-year post-policy enactment). Food items were categorized into four food processing groups, from minimally to ultra-processed. Data were analyzed across time using a multi-level, mixed effects linear regression model at the store and price level stratified by level of food processing.

**Setting:** Six large supermarket chain stores located in Seattle ("intervention") affected by the policy and six same-chain but unaffected stores in King County ("control").

**Subjects:** 106 food and beverage items.

**Results:** The largest change in average price by food item was +\$0.53 for “processed foods” in King County between 1-month post-policy and 1-year post-policy enactment ( $P < 0.01$ ). The smallest change was \$0.00 for “unprocessed or minimally processed foods” in Seattle between 1-month post-policy and 1-year post-policy enactment ( $P = 0.94$ ). No significant changes in averaged chain price were observed across food processing level strata in Seattle versus King County stores at 1-month or 1-year post-policy enactment.

**Conclusions:** Supermarket food prices by level of processing do not appear to be differentially impacted by Seattle’s minimum wage ordinance. These results suggest that the early implementation of a city-level minimum wage policy does not alter supermarket food prices by level of food processing.

## INTRODUCTION

Effective April 1, 2015, the city of Seattle enacted its multi-step \$15 Minimum Wage Ordinance (MWO) to incrementally increase worker minimum wages to \$15/hour between 2017-2021, depending on the size of the employer and whether they offer medical benefits<sup>(1)</sup>. Many municipalities in the United States are implementing similar policy measures in an attempt to address income inequality and to provide low-income workers with a living wage<sup>(2-6)</sup>.

One counter argument to raising minimum wages is grounded in the concern that while increased labor wages may benefit low-wage workers, the increase in labor wages will be offset by higher prices of basic consumer goods, particularly food, thus burdening the very workers the policy is intended to help<sup>(7-9)</sup>. Food prices are of particular concern because the food system represents the largest employer of minimum wage workers, with nearly one-third of all low-wage workers employed in the food system<sup>(7)</sup>. In particular, highly processed foods might be expected to experience greater increases in price than less processed foods based on the assumption that they must pass through more steps in the food system, and thus involve more low-wage workers<sup>(10,11)</sup>.

The current literature is mixed regarding the pass-through effects of an increase in minimum wage on fast food and restaurant prices. A 1994 study by Card and Krueger found fast food restaurant prices impacted by a 16% increase in minimum wage in New Jersey, rose 4% faster than fast food restaurant prices in unaffected Pennsylvania, suggesting a pass-through effect was a factor<sup>(12)</sup>. However, the study also found the price increase to be consistent across New Jersey fast food restaurants despite differing initial wage rates, suggesting a pass-through effect was not the only factor influencing food prices<sup>(12)</sup>. Another study, which focused on the timing of changes in food prices in response to an increase in minimum wage, found that an

increase in federal minimum wage passes-through to restaurant food prices in the first quarter after the month of enactment, but not prior quarters or quarters thereafter<sup>(13)</sup>. Moreover, a study, which evaluated the impact of a 12% increase in minimum wage in 1992 and 9% increase in minimum wage in 1997, found that food prices increased by less than 1% each time. The authors concluded there was only a slight pass-through effect and that the magnitude of the minimum wage increase did not differentially affect food price increases<sup>(14)</sup>.

Other studies indicate a more robust pass-through effect. One study estimated that an increase in federal minimum wage to \$15/hour would cause a 4% increase in fast food restaurant prices<sup>(15)</sup>. An unpublished study of San Jose, California's increased minimum wage found that for every 10% increase in minimum wage rate, restaurant prices increased by 0.58 percent (Allegretto S, Reich M). Finally, a 2016 study looked at the impact of a 33% increase in federal minimum wage on fast food prices of a burger, pizza, and chicken and found that a burger had the most elastic price, increasing by 3% in response to an increase in minimum wage<sup>(16)</sup>.

By contrast, little is known about the effects of increased wages on supermarket food prices. Preliminary studies on the effects of Seattle's increased minimum wage on supermarket food prices have shown no evidence of changes in supermarket food prices by market basket, supermarket chain, or food group in response to the early implementation of Seattle's ordinance<sup>(17)</sup>. The present study advances these analyses by exploring the effects of Seattle's increased minimum wage on supermarket food prices by level of food processing.

Grouping foods and beverages into categories based on the extent and purpose of food processing is a relatively new concept<sup>(18)</sup>. Past and present dietary guidelines use food groups (fruits, vegetables, grains, protein, dairy) to make dietary recommendations with the goal of improving diet nutrient quality<sup>(19-21)</sup>. More recently, dietary recommendations have begun to

differentiate between fresh, processed, and highly processed foods. This is due to emerging research showing that highly processed foods are strongly linked to obesity, type 2 diabetes, and other diet-related chronic diseases and that, for example, processed foods account for 90% of the daily intake of added sugar in the United States<sup>(22–25)</sup>.

At the same time, diets high in energy dense foods, many of them processed, tend to cost less than do diets high in nutrient dense foods, such as fresh and minimally processed produce<sup>(26)</sup>. Subsequently, low-income shoppers are more likely to buy energy dense and more highly processed foods<sup>(27)</sup>.

Thus, it is important to better understand the potential pass-through effects of increased labor wages on supermarket food prices by level of food processing to understand how it might impact low-wage workers' food purchasing behaviors, and thus, their health. The purpose of this analysis is to investigate whether the increase in minimum wage had a differential effect on supermarket food prices based on level of processing in supermarkets affected and unaffected by the MWO.

## **METHODS**

### **Data Source**

The data for this study come from a market basket survey conducted by the Seattle Minimum Wage Study team to evaluate the effects of Seattle's MWO on supermarket food prices<sup>(28)</sup>. The use of a market basket is a commonly used approach to assess food prices<sup>(29–31)</sup>. This approach is currently used by the United States Bureau of Labor and Statistics to calculate the Consumer Price Index (CPI) as well as in other metropolitan cities such as Chicago<sup>(32,33)</sup>.

The current market basket consisted of 106 food and beverage items and was developed by the University of Washington's Center for Public Health Nutrition based on the CPI and Thrifty Food Plan market baskets<sup>(29)</sup>. The market basket includes common, unhealthy and healthy items, including foods recommended in the Behavioral Risk Factors Surveillance System nutrition module and the 2015 Dietary Guidelines for Americans<sup>(19,20)</sup>.

### **Data Collection**

Details for the data collection are described in detail in an unpublished paper (Otten J, Buszkiewicz J, Tang W *et al.*) and elsewhere<sup>(17,34,35)</sup>. Briefly, data were collected at six affected supermarket chain stores in Seattle and six same-chain but unaffected supermarket chain stores in King County in March 2015 (baseline: one-month pre-policy enactment), May 2015 (follow-up 1: one-month post-policy enactment), and May 2016 (follow-up 2: one-year post-policy enactment) to capture supermarket prices at one-month pre-, one-month post-, and one-year post-MWO enactment. Table 1 shows the phase-in schedule for Seattle's minimum wage at the three time points of data collection. The six supermarket chains were selected for this study based on a prior Seattle study conducted by Drewnowski *et al.* (2012) showing that 65% of a representative sample of Seattle and King County residents identified these six chains as a primary food source<sup>(29)</sup>. These supermarket chains were also selected for inclusion of low price, medium price, and high price total market basket costs, as determined by a 2009 Seattle study<sup>(29,31)</sup>. These chains represent 50 of the 78 supermarkets affected by the MWO in Seattle.

For each market basket item, one researcher trained in the protocol recorded the lowest price available. This was often the store brand price. If store brand price was not the cheapest or not available, the next lowest price was recorded. No sales, promotions, coupons, or discounted prices were recorded. When possible, items recorded were in the same purchasable form as prior

collections. Market basket item prices with variable sizes were based on medium sized items. If an item was not found, the researcher asked a store worker to help locate it. If the item was still unavailable, a similar product was chosen. For example, if a supermarket did not have a Red Delicious apple, the price of a medium sized Fuji apple was recorded. In the rare event a similar product was not available, the researcher left that item price null and documented the attempt to locate it.

**Table 1.** Timeline of Seattle’s minimum wage increase during data collection

Date of data collection:	Minimum wage: <sup>a, b</sup>	Time point:
March, 2015	\$9.47	1-month pre-enactment
May, 2015	\$11.00	1-month post-enactment
May, 2016	\$13.00	1-year post-enactment

<sup>(a)</sup> For large employers who do not pay towards an employee’s medical benefits<sup>(1)</sup>

<sup>(b)</sup> Three other phase-in schedules are possible based on employer size and provision of employee benefits. For more information, please visit: <https://www.seattle.gov/laborstandards/ordinances/minimum-wage/>

### Food Processing Categorization

For this analysis, market basket food items were categorized by level of food processing or degree to which natural food was altered to create food products. Food processing categorization was assigned based on the extent of food processing and was determined using a food classification system commonly used by other studies<sup>(22,31,36,37)</sup>. Based on the food classification system used by Martínez *et al.* (2016), food processing categories, detailed in Table 2, included: unprocessed or minimally processed foods (group 1), processed culinary ingredients (group 2), processed foods (group 3), and ultra-processed foods (group 4)<sup>(22)</sup>.

Market basket items were independently coded by two researchers for data verification purposes. Researchers agreed upon the food processing categorization of 93 (88%) of the 106 market basket items. The remaining 13 (12%) items were decided and agreed upon using a third researcher.

**Table 2.** Food process categorization based on the level of processing

Food processing category:	Defined as:	Market basket examples:
Group 1: unprocessed or minimally processed foods	Foods taken directly from nature; minimally processed to clean, pasteurize, freeze, or other processes that do not alter the composition	coffee, rice, milk, apples, frozen turkey, broccoli (n=60)
Group 2: processed culinary ingredients	Ingredients that can be added to group 1 for flavor or seasoning used in the cooking process	flour, butter, shortening, sugar (n=7)
Group 3: processed foods	Foods from group 1 that are minimally processed, often with salt or oil, with the intent of extending shelf-life or altering palatability; includes fermented alcoholic beverages	tortillas, tofu, canned salmon, canned corn, wine (n=12)
Group 4: ultra-processed foods	Foods that are highly processed with the intent of convenience and ready-to-eat/drink	cookies, ice cream, salad dressing, sausages, cola, potato chips (n=27)

## Statistical Analysis

For the present study, all prices were converted to item-standardized units. For example, all prices collected for canned green beans were standardized to represent the price of a 14.5oz can, the most commonly available item-unit. The ‘total market basket price’ is the sum of the market basket food items per location. The ‘average market basket price per food processing category’ is the mean price of the market basket food processing category per location.

A complete case analysis was conducted to exclude any item that was not consistent over the three data collection time points. Unpaired t-tests were used to detect price differences by location at a fixed time. Paired t-tests were used to detect average price differences, by food processing group and location, across time. A multi-level, linear mixed model with an unstructured covariance matrix was used to detect the changes in the average market basket item food prices between two time points by location. This represents the overall average item price change attributable to the MWO enactment in Seattle (affected) versus King County (unaffected) market basket items between baseline, follow-up 1, and follow-up 2. Robust standard errors

clustered by supermarket were used to account for correlated errors within each store. Statistical significance was set at an alpha level 0.05.

Overall, there were 21 (2%) market basket items out of 1272 items missing from follow-up 2 data collection. Missing data were assumed to be missing at random. A complete case statistical analysis was conducted, dropping missing items which did not have a comparison by time or within store. Missing items were dropped between baseline and follow-up 2 (n=12) and follow-up 1 and follow-up 2 (n=10). No items were missing between baseline and follow-up 1.

## RESULTS

Table 3 shows the range of differences of average market basket price per food processing category between Seattle and King County at each time point. Negative price differences indicate King County had higher prices, positive price differences indicate Seattle had higher prices, on average per food processing category. At baseline, follow-up 1, and follow-up 2, group 1: unprocessed or minimally processed foods had the largest difference in prices between Seattle and King County.

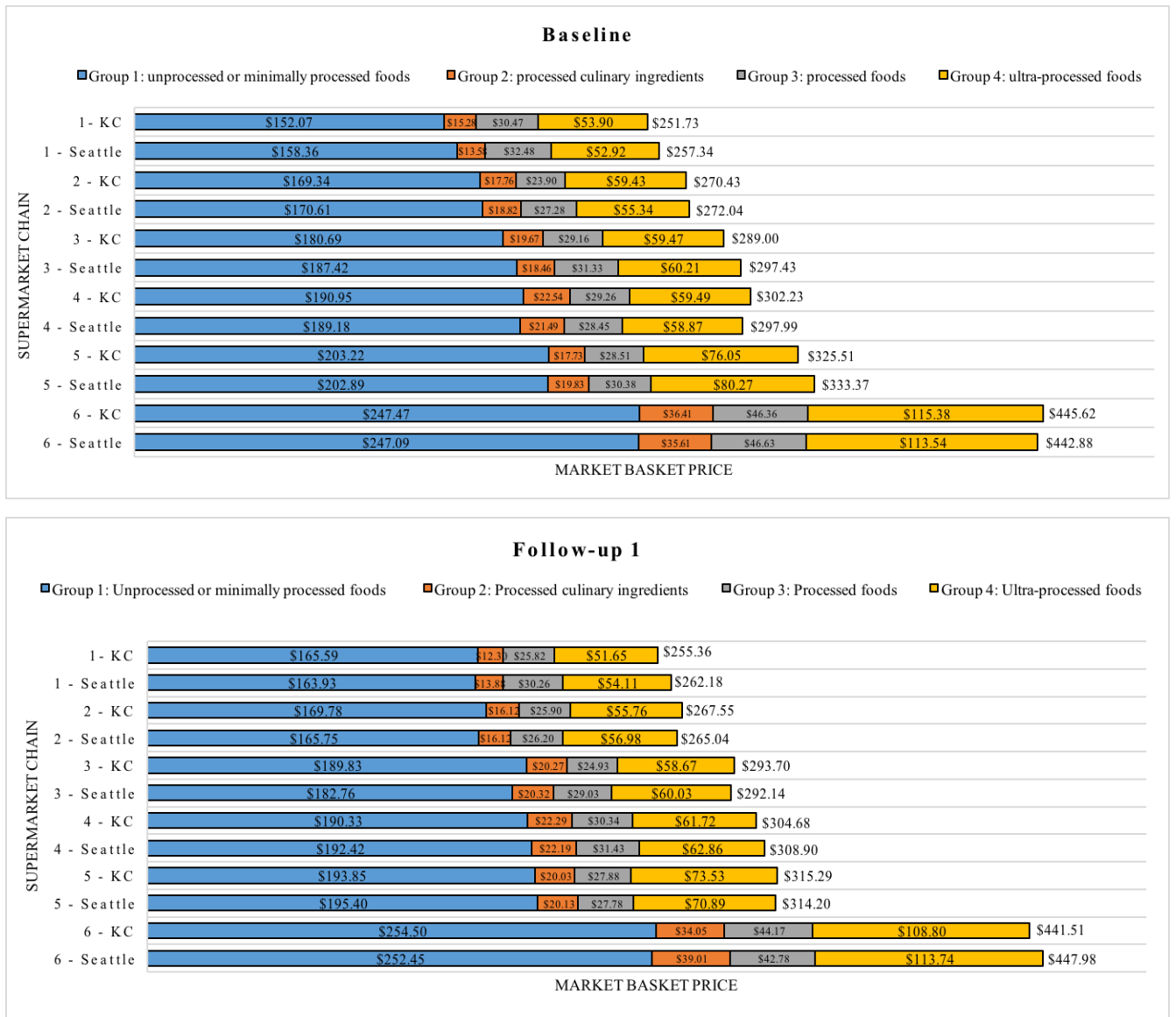
**Table 3.** The range of differences in the average market basket price between Seattle and King County by food processing category

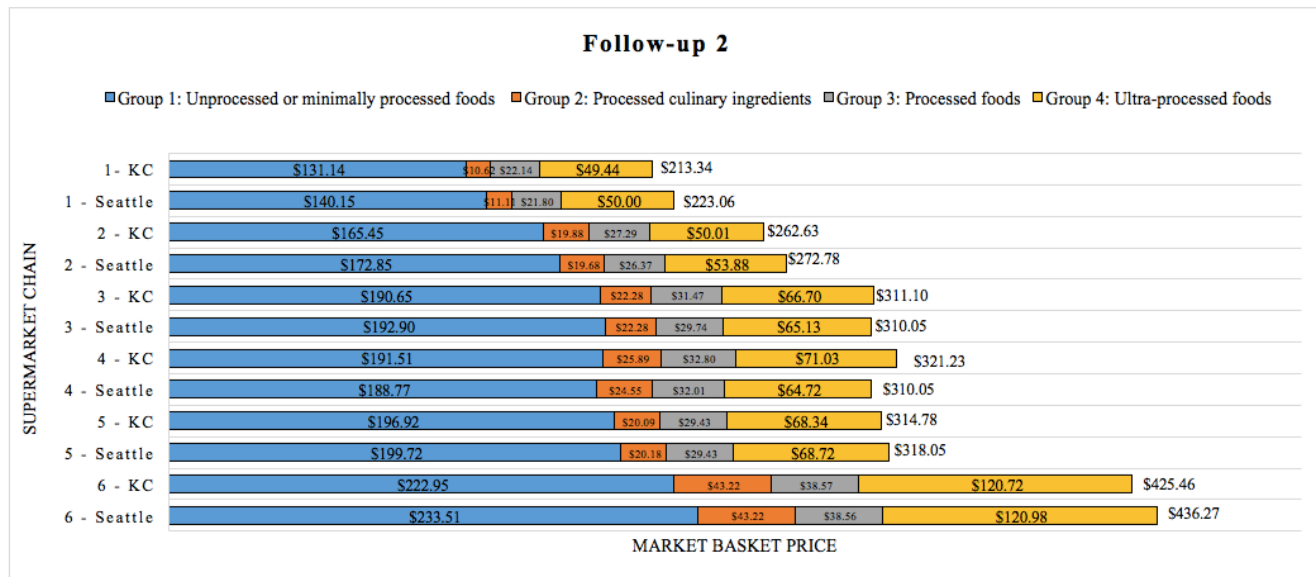
Food processing category	Baseline		Follow-up 1		Follow-up 2	
	Range in differences between price <sup>a</sup>	Mean	Range in differences between price	Mean	Range in differences between price	Mean
Group 1: unprocessed or minimally processed foods	-\$1.77 to \$6.73	\$1.97	-\$7.07 to \$2.10	\$1.86	-\$2.74 to \$10.56	\$4.88
Group 2: processed culinary ingredients	-\$1.71 to \$2.10	-\$0.27	-\$0.01 to \$4.96	\$1.10	-\$1.34 to \$0.49	-\$0.16
Group 3: processed foods	-\$0.81 to \$3.38	\$1.48	-\$1.39 to \$4.44	\$1.41	-\$1.73 to \$0.00	-\$0.63
Group 4: ultra-processed foods	-\$4.09 to \$4.23	-\$0.43	-\$2.64 to \$4.96	\$1.41	-\$6.31 to \$3.87	-\$0.47

<sup>(a)</sup> Differences between prices were computed by subtracting the price of each food processing category (the sum of individual item prices within each category) in King County from the price of the same food processing category in the corresponding Seattle supermarket chain.

Figure 1 shows the sum of market basket item prices within each food processing category by store chain and location at baseline, follow-up 1, and follow-up 2. There were no statistically significant differences in the average food processing category prices between locations or supermarket chains at baseline, follow-up 1, or follow-up 2.

**Figure 1.** Market basket item prices summed within food processing category, by store chain and location at baseline, follow-up 1, and follow-up 2



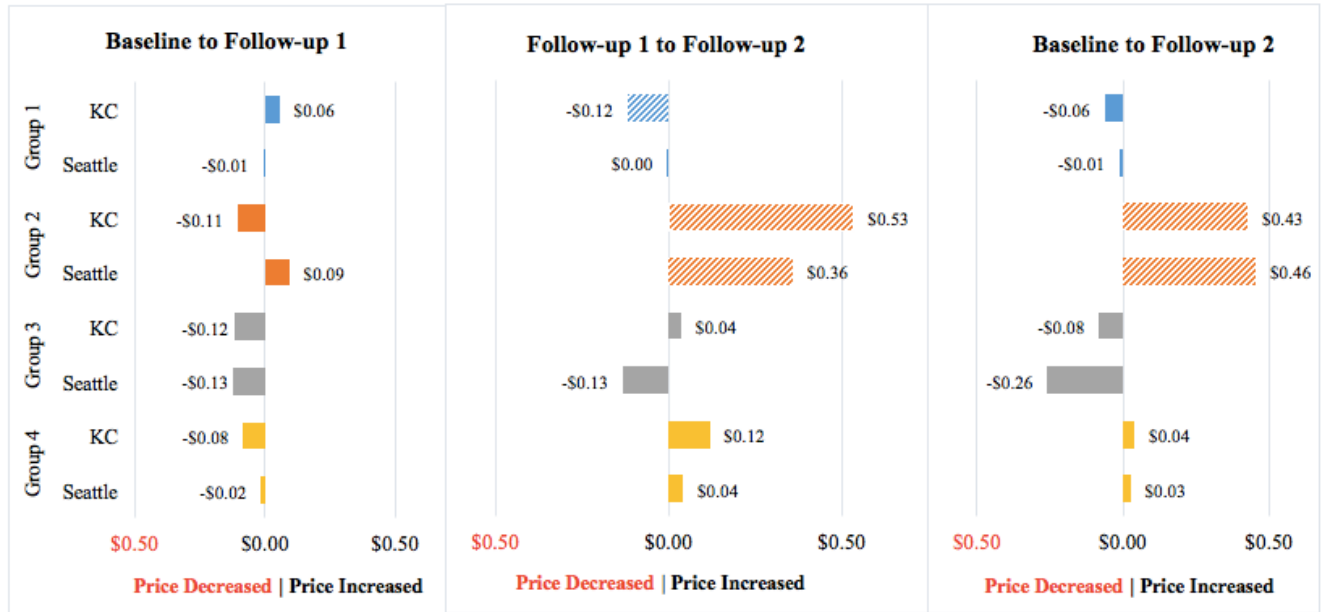



KC, King County

Figure 2 illustrates the change in average price per item by food processing category by location between time points. The largest change in the average item market basket price between baseline and follow-up 1 was  $-\$0.13$  for group 3: processed foods in Seattle; between follow-up 1 and follow-up 2 was  $\$0.53$  for group 2: processed culinary ingredients in King County; and, between baseline and follow-up 2 was  $\$0.46$  for group 2: processed culinary ingredients in Seattle. The smallest change in the average item market basket price between baseline and follow-up 1 and baseline and follow-up 2 was  $-\$0.01$  for group 1: unprocessed or minimally processed foods in Seattle; and between follow-up 1 and follow-up 2 was  $\$0.00$  for group 1: unprocessed or minimally processed foods in Seattle.

There was a statistically significant change in the average price per item for group 2: processed culinary ingredients in both Seattle and King County between follow-up 1 and follow-up 2 and between baseline and follow-up 2 ( $P < 0.01$ ); and, for group 1: unprocessed or minimally processed foods in King County between follow-up 1 and follow-up 2 ( $P = 0.04$ ).

**Figure 2.** Change<sup>a</sup> in average price by food item by food processing category in Seattle and King County between baseline, follow-up 1, and follow-up 2<sup>b</sup>



**Key**  
 Statistically significant

KC, King County; Group 1, unprocessed or minimally processed foods; Group 2, processed culinary ingredients; Group 3, processed foods; Group 4, ultra-processed foods

<sup>(a)</sup> Change was computed by subtracting baseline from follow-up 1, follow-up 1 from follow-up 2, and baseline from follow-up 2

<sup>(b)</sup> Paired t-tests were used to detect differences across time

Table 4 shows the results of the multi-level, linear mixed model. The largest price change between Seattle and King County is  $-\$0.24$  for group 2: processed culinary ingredients between follow-up 1 and follow-up 2 (SE = 0.61). The smallest price change between Seattle and King County is  $\$0.00$  for group 1: unprocessed or minimally processed foods (SE = 0.27) and group 4: ultra-processed foods between baseline and follow-up 2 (SE = 0.26). However, no differences in average price per item between Seattle and King County reached statistical significance for any of the food processing groups between any time point.

**Table 4.** Comparison of the change in average item market basket price between Seattle and King County by food processing categorization at baseline, follow-up 1, and follow-up 2

Food Processing Category	Seattle Market Basket Item Prices		King County Market Basket Item Prices		Difference in Market Basket Item Prices: Seattle-King County <sup>a</sup>		
	Average	SE	Average	SE	Difference	SE	P value <sup>b</sup>
Group 1: unprocessed or minimally processed							
Baseline (B)	\$3.25	0.23	\$3.22	0.23	\$0.03	0.32	0.917
Follow-up 1 (F1)	\$3.25	0.23	\$3.28	0.23	-\$0.03	0.32	0.922
Follow-up 2 (F2)	\$3.21	0.22	\$3.18	0.22	\$0.03	0.32	0.918
Change B & F1	\$0.01	0.19	-\$0.06	0.19	-\$0.06	0.27	0.813
Change B & F2	\$0.05	0.19	\$0.05	0.19	\$0.00	0.27	0.997
Change F1 & F2	\$0.04	0.19	\$0.10	0.19	\$0.06	0.27	0.816
Group 2: processed culinary ingredients							
Baseline (B)	\$3.10	0.45	\$3.14	0.45	-\$0.04	0.64	0.949
Follow-up 1 (F1)	\$3.19	0.50	\$3.03	0.50	\$0.16	0.70	0.822
Follow-up 2 (F2)	\$3.48	0.55	\$3.57	0.55	-\$0.09	0.77	0.912
Change B & F1	-\$0.09	0.43	\$0.11	0.43	\$0.20	0.61	0.743
Change B & F2	-\$0.38	0.44	-\$0.42	0.44	-\$0.04	0.63	0.944
Change F1 & F2	-\$0.29	0.43	-\$0.53	0.43	-\$0.24	0.61	0.689
Group 3: processed foods							
Baseline (B)	\$2.73	0.27	\$2.61	0.27	\$0.12	0.38	0.747
Follow-up 1 (F1)	\$2.60	0.25	\$2.49	0.25	\$0.12	0.35	0.740
Follow-up 2 (F2)	\$2.47	0.23	\$2.52	0.23	-\$0.05	0.33	0.873
Change B & F1	\$0.13	0.28	\$0.12	0.28	-\$0.01	0.40	0.987
Change B & F2	\$0.26	0.29	\$0.08	0.29	-\$0.18	0.40	0.665
Change F1 & F2	\$0.13	0.28	-\$0.04	0.28	-\$0.17	0.40	0.671
Group 4: ultra-processed foods							
Baseline (B)	\$2.60	0.32	\$2.61	0.32	-\$0.02	0.46	0.972
Follow-up 1 (F1)	\$2.58	0.34	\$2.53	0.34	\$0.05	0.48	0.913
Follow-up 2 (F2)	\$2.63	0.35	\$2.64	0.35	-\$0.02	0.50	0.972
Change B & F1	\$0.02	0.18	\$0.08	0.18	\$0.07	0.25	0.789
Change B & F2	-\$0.03	0.18	-\$0.03	0.18	\$0.00	0.26	0.995
Change F1 & F2	-\$0.04	0.18	-\$0.11	0.18	-\$0.07	0.26	0.785

SE, standard error

<sup>(a)</sup> Difference was computed by subtracting baseline from follow-up 1, follow-up 1 from follow-up 2, and baseline from follow-up 2

<sup>(b)</sup> P-values derived from difference-in-difference analysis testing using a linear mixed model with robust standard errors clustered by store

## **DISCUSSION**

This study examined the effect of Seattle's MWO on supermarket food prices by level of food processing as the policy was being implemented and phased-in from \$9.47/hour to \$11/hour to \$13/hour. Results indicate no statistically significant change in supermarket food prices by level of processing between supermarkets affected and unaffected by Seattle's MWO over time. This suggests there was no evidence of a pass-through effect of increased labor wages at 1-year post-policy enactment on supermarket food prices by level of food processing.

Our findings are consistent with Katz and Krueger's 1992 study that found fast food prices were not directly impacted by a 22% increase in federal minimum wage and to Card and Krueger's well-known 1994 study that found changes in fast food prices were not solely attributable to an increase in minimum wage<sup>(12,34)</sup>. However, our findings are inconsistent with a more recent study which found an increase in federal minimum wage to \$15/hour would increase fast food prices by 4%<sup>(15)</sup>. To our knowledge, no prior studies have evaluated the impact of a city-wide increase in minimum wage on supermarket food prices by level of food processing. This study fills this gap in literature and serves as a preliminary study on which future studies can be based and compared. These findings are important in understanding the implications of the minimum wage on public health. Because low-income shoppers are more likely to purchase and consume highly-processed foods rich in fat and sugar, which are linked to obesity and other diet-related chronic diseases, it is important to understand how potential pass-through effects of increased labor wages might differentially impact food prices<sup>(22-24,26)</sup>.

There are many possible explanations for our lack of observed changes in supermarket food prices by level of food processing. First, processed foods are handled by minimum- and low-wage food system workers at both the food processing level and retail level (in-store supermarket employees). Because food processing tends to occur outside of Seattle, these labor wages would not be affected by the MWO. However, retail level employees working in Seattle supermarkets would be impacted by the MWO and their increased wages may pass-through to food prices. Therefore, our findings suggest that an increase in minimum wage for retail supermarket employees does not translate to an increase in supermarket food prices. Second, there was an 11-month time gap from when Seattle's minimum wage policy was proposed to the time of enactment, such that baseline prices may have been preemptively increased to capture predicted wage increases<sup>(2)</sup>. Third, the duration of exposure to MWO may not be sufficient to have a lasting impact on supermarket prices. Fourth, the percentage of supermarket employees receiving minimum wage may not be great enough to impact food prices. Using administrative earnings and hours data from over 500 grocery establishments provided by the Washington Employment Security Department, we find that 14.3% of jobs in grocery stores (NAICS Code 445110) in Seattle and 29.3% in the rest of King County earned less than \$11 per hour in the year preceding the passage of the MWO. Yet, these proportions are higher when compared to all low-wage wage jobs in all industry sectors, 7.2% and 9.9% respectively, and thus the effect of the Ordinance on prices should be greater in grocery stores than in other industries. Fifth, four of the six supermarket chains are unionized and the union contracts or the corporate supermarket chains may have had a higher minimum-wage rate in 2015 than Seattle's \$9.47/hour rate. Consequently, the percent increase in Seattle's minimum wage from baseline to follow-up 2 would not be reflected in these supermarket chains. Sixth, findings from a longitudinal study of

Seattle food prices reveals supermarket food prices change correspondingly with national changes in the CPI<sup>(38)</sup>. Therefore, local economic changes such as an increase in minimum wage may be less impactful to national supermarket chain food prices. Lastly, highly processed foods may require fewer low-wage workers if highly processed foods are made by machines and unprocessed foods are hand-picked by workers.

There were many strengths of this study. First, it is a prospective, longitudinal study that observed the impact of Seattle's incremental minimum wage increases over time at the same stores and across the same market basket items. Second, it used the established methodologies of the market basket approach and the food processing classification system. Despite these strengths, there are some limitations. First, this study is unable to capture wage or wage changes of the food workers in the food processing chain outside of Washington state. Many studies have shown that the food processing chain is largely global in its scope. Second, we did not have information on prepared foods, and thus we cannot comment on whether prices were passed through at the store level. Third, these results may not be generalizable to other localities. Fourth, our data does not capture purchasing habits, food and beverage item consumption, nor health outcomes. However, this data does contribute to the limited research on the effects of minimum wage policies on supermarket food prices.

While not statistically significant, this study found that “unprocessed or minimally processed foods” had the greatest difference in price between affected and unaffected supermarkets at all three time points. This finding, while unrelated to the increase in minimum wage, is interesting in that it suggests that supermarkets set a wider range in price for unprocessed or minimally processed foods by supermarket chain location than other processed food categories. At the same time, these items changed the least in price between time points.

This may be attributed to price elasticity. A study from the United States Department of Agriculture found that compared to “unhealthy” foods, “healthy” foods such as fruits and vegetables are less price-elastic, meaning demand for these goods are less responsive to changes in price<sup>(39)</sup>. Future studies should look at the impact of an increase in minimum wage on supermarket food items by price elasticity and should include prepared foods. Future studies could also study the impact of a citywide increase in minimum wage on local stores or smaller supermarkets where prices do not nationally trend with the CPI<sup>(38)</sup>.

In conclusion, this analysis finds no evidence of a pass-through effect of increased labor wages due to a city-wide minimum wage on supermarket food prices by level of food processing. Future data collection for this study is planned to capture supermarket food prices after longer durations of MWO enactment to provide further insights.

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