Applied Food Research 3 (2023) 100348

Contents lists available at ScienceDirect

Applied Food Research

journal homepage: www.elsevier.com/locate/afres

The influence of cognitive bias on the use of menu nutritional information among consumers in Mahikeng city, South Africa

S. Dube [a], C.Z. Tsvakirai [b,*], L.M. Mabuza [c], T. Makgopa [b]

[a] Department of Agricultural Economics and Extension, North West University, Private Bag X2046, Mmabatho, Mafikeng, North West Province 2745, South Africa
[b] School of Business Leadership, The University of South Africa, C/O Jadanel and Alexandra Ave, Midrand 1686, South Africa
[c] Centre for the Coordination of Agricultureal Research and Development of Southern Africa, Private Bag 00357, Gaborone, Botswana

ARTICLE INFO

Keywords:
Food labelling
Consumer choices
Healthy eating
Fast-food meals
Health economics
Consumer psychology

ABSTRACT

Previous studies have found that the provision of nutritional information on restaurant menus has had a disparate effect on consumers in various countries. Numerous explanations have been offered to rationalise consumers' failure to incorporate new information during decision-making in developed countries and not much information is availed in the developing world. This study investigates the effect of nutritional information provision on consumers in South Africa, a country that is experiencing an increase in the consumption of food-away-from-home and lifestyle-related diseases similar to some developed countries. The study utilised the Endogenous Treatment Poisson regression model to compare the changes in intended behaviour before and after the provision of nutritional information on typical fast-food meals. The empirical results show that the provision of nutritional information had a significant influence on intended consumption behaviour. However, consumers' cognitive biases with regard to the level of importance of the different nutrient-content information resulted in the over-reliance on calorie information and negligence of sodium and fat content information. These results imply that efforts to encourage healthier food choices by increasing information can be curtailed by cognitive biases. Hence, the study recommends that efforts be made to improve consumer education on how to integrate various nutritional-content information in decision-making. Furthermore, additional research on the best ways to relay nutritional information is recommended.

1. Introduction

As economic activity has increased and work hours have gradually become longer in societies globally, the traditional habit of preparing food in households is becoming less popular while the consumption of food-away-from-home is rising (Blick et al., 2018; Petima et al., 2021; Huang et al., 2021). This has seen an increase in foot traffic in different food services establishments such as restaurants (quick- and full-service establishments), taverns, canteens, pubs, lodging facilities (hotels, motels and bed and breakfasts) and recreational centres (sports clubs) (Cantu-Jungles et al., 2017; Huang et al., 2021). The well-known convenience provided by food-away-from-home, particularly fast foods, continues to be a major appealing factor contributing to its increased consumption (Todd et al., 2021; Stowe & Venter, 2020). Additionally, consumers are drawn to the taste of fast food which is commonly laced with high quantities of fat, sugar and salt (Petimar et al., 2019). The typical high calorie, fat and sodium concentration coupled with low fibre and vitamin quantities, has resulted in the consumption of fast food to be labelled "unhealthy" and has seen rising concerns on its effects on public health. Menu labels have been developed to address the public health concern associated with food-away-from-home's consumption by providing information on nutrients in meals and food items on offer. Upper–middle and high-income countries that include the United States of America (USA), Australia, Saudi Arabia, the United Kingdom, and Brazil have enacted legislation that mandates the provision of menu labels in their food service industries (Patino et al., 2020).

The main motivation for the introduction of menu labelling has been to encourage better-informed food choices (Stowe & Venter, 2020; Thunstrom, 2019). It was envisaged that menu labelling would help increase transparency in the nutritional value of meals outside the home and to assist consumers in making healthier food choices (Kerins et al., 2020; Petima et al., 2021). However, studies have shown that consumers have had disparate reactions to this information. While some studies indicate that the provision of nutrition labelling has had a positive

* Corresponding author.
E-mail addresses: chichitsvakirai@gmail.com, TsvakC@unisa.ac.za (C.Z. Tsvakirai).

https://doi.org/10.1016/j.afres.2023.100348
Received 22 June 2023; Received in revised form 26 September 2023; Accepted 3 October 2023
Available online 6 October 2023

influence on food portion size consumed per sitting (McCann et al., 2013), perceptions (Wie & Gibler, 2014) and calories purchased (Krieger et al., 2013; Auchincloss et al., 2013), others (Cioffi et al., 2015; Byrd, 2018; Burton, 2015; Antonelli & Viera, 2015; Cantu-Jungles et al., 2017; Cawley et al., 2020; Patino et al., 2020) have shown that some consumers have not responded in an predicted manner. The prevailing mixed evidence has called into question the efficacy of policies mandating nutritional information provision (Kerins et al., 2020; Thunstrom, 2019).

The theory of bounded rationality has offered a possible explanation for the negative results of past investigations. This theory explains that an increase in information provision does not necessarily lead to higher consumer utility as consumers are often constrained in their ability to simulate new information and reconcile it with the existing knowledge due to contradictions with established beliefs, prevailing circumstances, unmet expectations or conflicting emotions (Stewart et al., 2014). This behavioural economics theory recognizes that consumers do not always understand the intricacies of nutrition science and instead utilize relatively simple heuristics or rules-of-thumb that can be easily understood and applied in nearly every situation (Stewart et al., 2014; Todd et al., 2021). This oversimplification of the decision-making process often imposes an anchoring effect (a rejection of the new information and trust in established beliefs), a health halo effect (a stronger belief in a few good indicators placed among a myriad of warning signals) and/or white hat bias (an under-playing of the health warning implied by information provided) on consumption decisions (Allison, 2011; Cioffi et al., 2015). The over-simplification of the decision-making process is reductionist, inefficiently leaves out critical information and often leads to suboptimal choices. These effects present a cognitive bias that prevents consumers from altering their behaviour after receiving information that should lead to aversive action (Thunstrom, 2019; Stewart et al., 2014).

Despite the work that has been done in this area of research, much of it remains concentrated in the developed world (Patino et al., 2020). Hence, there is a lack of information that can enable the development of legislation that would promote menu labelling in developing nations. Studies such as Cioffi et al. (2015) and Byrd et al. (2018) have pointed out the importance of the context-specific nature of consumption decisions and the need to provide studies that capture different circumstances and backgrounds. This was emphasized in a review carried out by Cantu-Jungles et al. (2017) that reported dissimilar outcomes acquired from studies carried in different parts of the USA, where menu labelling is mandated. Therefore, it is imperative that an investigation be carried out in different communities as the results from other parts of the world may not be applicable (Petima et al., 2021). The objective of the study was to investigate the effect of cognitive bias on the effectiveness of nutrition information provision on consumers' intention to consume fast food meals. The study aims to provide insights on how consumers would respond to nutritional content information on menu labels.

Research on this phenomenon is also needed in the South African market as it has experienced high growth in food-away-from-home and the country has alarming statistics in obesity and hypertension prevalence (Otterbach et al., 2021; Zhou et al., 2021). As non-communicable and lifestyle diseases form a significant part of South Africa's health bill (Ware et al., 2019; Zhou et al., 2021), it is important to understand how cognitive bias manifests in this country to ensure the development of effective policies that are aimed to safeguard the interests of public health. Given that several provincial and federal bills have recommended various forms of menu labelling that would require information beyond just calories (Scourboutakos et al., 2014), it is important that research analyses consumer response to the provision of information on diverse nutrients.

2. Methodology

2.1. Study area and sampling

The study was conducted in the city of Mahikeng, South Africa. Mahikeng is the capital city of the North West province and is located 400 km east of Botswana's capital, Gaborone, and 260 km west of Johannesburg. The city has a population of 49,300. The study used the Krejcie & Morgan (1970) procedure (represented in Eq. (1)) to calculate the sample that would provide an adequate representation of this city's population.

$$s = X^2\frac{NP(1-P)}{d^2(N-1)} + X^2P(1-P) \quad (1)$$

where: s represents the required sample size; X^2 represents the table chi-square value for 1degree of 95 % confidence level; N represents the population size; P represents the population proportion to the size assumed to have a probability of 0.5; and d represents the degree of accuracy, in this case 50 % response distribution.

The calculation determined a sample size of 380. The sample was drawn using a two-stage sampling method which stratified the sample according to the number of wards in the city in the first stage and subsequently selected respondents in the wards randomly. Data was collected at the respondents' place of residence. During data collection, a data collection start point was randomly picked in each ward and data was collected from the fifth house from every start point. One response was collected per household. Data collection was done using a one-on-one interview with an individual who was above the consenting age of 18. Consent to participate in the survey was acquired before the commencement of each interview. Ethical clearance for the study was granted by the North West University's ethics committee for the Faculty of Natural and Agricultural Sciences.

2.2. Data collection

The data was collected in August 2018. Four hundred responses were collected and 29 were discarded after data cleaning as they were incomplete. The questionnaire used to conduct the survey had two sections. The first enquired into various socio-economic characteristics of interest. These included the respondents' age, gender, vocation, highest education level attained, household size, income and the percentage of income spent on food-away-from-home. The second section requested information on the respondent's lifestyle, nutrition and health. This included inquiries on the frequency of consuming food-away-from-home, level of nutritional education, frequency of exercise, special diet, awareness of nutrition labelling, opinions on nutrition labelling regulations and the willingness to pay for nutritional information. To measure the consumption behaviour, respondents were first asked to provide an estimation of their average frequency of consuming fast foods in a 7-day cycle. Respondents were then provided with pictures of three typical and comparable fast-food meals (pizza, hamburger and chips, chicken wrap and chips meals with a soft drink). They were asked how many times a week they would consume their preferred meal given unlimited financial resources. Respondents were then provided nutritional information for all three meals. They were given time to study the information and were then asked whether the provided information on fat, dietary fibre, protein, sodium (salt) and calorie content would either increase, decrease or cause no change to their typical 7-day consumption. Lastly, survey respondents were asked if they would change the number of fast-food meals they would consume given all the nutritional information shared.

2.3. Data analysis

To analyse the effects of nutrient information on consumption

behaviour, the following model was employed:

$$Y = \beta' x + \delta t + \varepsilon \quad (2)$$

where, Y represents the number of fast food meals consumed, x is the vector of exogenous socio-economic characteristics, and t is a dummy variable ($t = 1$, if the individual uses nutrition information on the menu label when shopping, and 0 otherwise). β and δ are vectors of parameters to be estimated, and ε is an error term. Given that the data used in the analysis was non-experimental, Eq. (2) was likely to be subject to misinterpretation because the menu label use decision was not randomly assigned, but voluntary, thus resulting in self-selectivity bias (Wooldridge, 2010). If the menu label use decision is not randomly assigned, it is also likely that label users may have systematically different characteristics from non-label users. These attributes may not be observable to the researcher, implying that the treatment variable (use of nutrient information) may be endogenous (Kenkel & Terza, 2001; Wooldridge, 2010). Selectivity bias and endogeneity may result in inconsistent estimates of the effect of nutrient information use on consumption behaviour.

To correct for such challenges and considering that the outcome variable was in count form while the endogenous treatment variable was binary, an Endogenous Treatment Poisson regression model (ETpoisson) was employed, following the procedure by Terza (1998) and Kenkel and Terza (2001).

The outcome (consumption frequency $= Y_j$) and treatment equation (use of nutrient information $= t_j$) are expressed as follows:

$$E(Y_j|x_j, t_j, \varepsilon_j) = \exp(\beta x_j + \delta t_j + \varepsilon_j) \quad (3)$$

$$t_j = \begin{cases} 1, & \gamma w_j + u_j > 0 \\ 0, & otherwise \end{cases} \quad (4)$$

The x_j represents the covariates used to model the outcome, w_j the covariates used to model the treatment assignment, and error terms ε_j and u_j are bivariate normal with a mean of zero and covariance matrix $\begin{bmatrix} \sigma^2 & \sigma^\rho \\ \sigma^\rho & 1 \end{bmatrix}$. The covariates x_j and w_j are unrelated to the error terms, meaning they are exogenous. Even though this joint model can be estimated even if the vector of covariates in the outcome and treatment equations are the same, additional variables were included so that the model could be identified *via* exclusion restrictions.

To ensure the appropriateness of the model selected for the analysis, pre-and post-estimation tests were conducted. During the former, the mean and the variance of the ETpoisson were measured. As a rule of thumb, the mean and variance should be more or less the same (Long, 1997). The *estat gof* Stata command was also used to confirm if these results satisfy the Poisson distribution. Post-estimation tests included the Deviance and Pearson goodness-of-fit analyses. The use of an ETpoisson was further justified by the likelihood of selectivity bias and endogeneity. The Wald χ^2-value test was conducted to measure the level of collective influence that the regressors had on the regressand.

3. Results

3.1. Descriptive statistics

The study's results showed that a greater proportion of the sample (60.9 %) was composed of female respondents, while the remaining 39.1 % was made up of male survey participants. As shown in Table 1, the majority (59 %) of these survey respondents were below the age of 35. The category of 18–25 years made up 21.7 % of the sample, followed by the categories of 26–30 years and 31–35 years categories which made up 20.1 % and 17.2 %, respectively. Almost two thirds (64 %) of the respondents represented had a monthly income of below R5,000 and over half (59 %) spent over R1,500 of their income on food-away-from-home. The majority of the survey respondents (64 %) said that they would support the introduction of mandatory menu labelling while 23 % said they would prefer menu labelling to be voluntary and the remaining 13 % were indifferent about nutrition information's provision. The provision of nutritional information had a marked effect on respondents' intension to consumer their preferred meal. As shown in Fig. 1, the proportion of respondents who had indicated that, in the absence of financial constraints, they would consume their preferred meal 0–1 times a week increased from 21 % to 52 % after the provision of nutritional information while, the proportion of consumers who had indicated that they would probably consume their preferred meal 6–7 times a week decreased from 17 % to 4 % after the provision nutritional information. Two-thirds of the respondents indicated that they would be willing to pay a price premium for the provision of nutritional information while the remaining third were not willing to incur any additional costs resulting from menu labelling.

Table 1
Summary of statistics.

Variable	Categories	Distribution ($n = 371$)	Distribution (%)
Gender of respondent			
	Male	145	39.1 %
	Female	226	60.9 %
Age of respondent			
	18–25	80	21.6 %
	26–30	75	20.2 %
	31–35	63	16.9 %
	35 – 40	37	10.0 %
	41 – 45	29	7.8 %
	46 – 50	33	8.9 %
	50+	54	14.6 %
Monthly income of respondent			
	R0 – R500	50	13.5 %
	R501 – R1,000	85	22.9 %
	R1,001 – R1,500	103	27.8 %
	R1,501 – R2,000	62	16.7 %
	R2,001 +	71	19.1 %
Respondents' monthly expenditure on fast foods			
	R0 – R100	85	22.9 %
	R101 – R150	67	18.1 %
	R151 – R200	45	12.1 %
	R201 – R250	48	12.9 %
	R251 +	126	34.0 %
Menu labelling policy			
	Mandatory	239	64.4 %
	Voluntary	86	23.2 %
	Undecided/ unconcerned	46	12.4 %
If respondent is on a special diet			
	Yes	275	74.1 %
	No	96	25.9 %
If respondent regularly plays sport			
	Yes	155	41.8 %
	No	216	58.2 %
Willingness to pay for nutrient information			
	Not willing	116	31.3 %
	Less willing (ny)	72	19.4 %
	Moderately willing (yn)	95	25.6 %
	More willing (yy)	88	23.7 %
Household size (Adult equivalent)	Mean 1.762		

Note: R13.30 was approximately equal to $1USD during the reporting period.

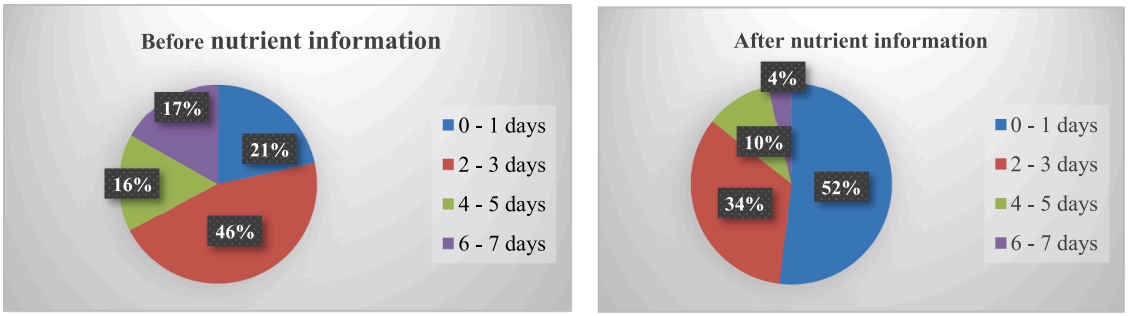

Fig. 1. Meal consumption per month.

3.2. Empirical results

Table 2 shows the results of the regression models that estimated the influence of nutritional information provision on consumption. The outcome function models past consumption function on fast food consumption patterns while the treatment function shows the intended behaviour after the provision of nutritional information. The two models also show the various factors that influence consumer behaviour. The following discussions highlights the main findings of the two analyses as well as the results of the robustness tests.

The results show that the respondents' past frequency of eating fast food meals depended on whether individuals had embraced the lifestyle of eating away from the home and the size of the household consumers lived in. As shown, the estimates for adult equivalents and income spent on fast food were significant at the 1 % level of probability. The outcome function's results indicate that consumers from relatively small

Table 2
ETpoisson model estimates of factors that influence consumer behaviour.

Variables	Outcome function			Treatment function		
	Coeff.	Robust Std. Errors	z-value	Coeff.	Robust Std. Errors	z-value
Monthly expenditure on fast food						
R1000 and Less (Yes=1) [a]	0.0741	0.0918208	0.81			
R1501 and above (Yes=1)[a]	0.0482***	0.0915871	0.53			
Demographics						
Household size (Adult equivalent)	−0.0612***	0.0465277	−1.32	0.1755	0.1405516	1.25
Age of household head (18 to 40 = 1) [a]	0.0587	0.0894957	0.66	−0.1807	0.2988137	−0.60
Education level (Metric and above = 1) [a]	0.1305	0.1405147	0.93	0.5352	0.4397175	1.22
Lifestyle, nutrition and health						
Active in sports (Yes=1) [a]	−0.0708	0.0749161	−0.95			
Meal planner (Yes =1) [a]	−0.1411	0.0916325	−1.54	−0.3923	0.338753	−1.16
Awareness of food label (Yes = 1) [a]	−0.5740***	0.0772875	−7.43	−4.9266***	0.3807294	12.94
Special diet (Yes = 1) [a]				−0.1875	0.3546027	−0.53
Use of fat content information (Yes=1)[a]				0.5405	0.3584695	1.51
Use of carbohydrates (calorie) content information (Yes=1)[a]				−0.8932***	0.2884717	−3.10
Use of salt (sodium) content information (Yes=1)[a]				−0.1917	0.3511675	−0.55
Impact variable						
Use of nutrition information	−0.4294**	0.1734922	−2.48			
Constant	1.5228***	0.2433329	6.26	0.9978***	0.5804782	1.72
Combined model indicators						
/athrho	−1.4555	0.5043415	−2.89			
/lnsigma	−4.4159	4.816462	−0.92			
rho	−0.8968	0.0987498				
sigma	0.0121	0.0581988				
Average treatment effects						
Average treatment effect (ATE)						
Use of nutrition information (1 vs 0)	−1.002803					
Contrast	.4819064					
Unconditional Standard Errors	−1.947322 −0.0582832					
[95 % Confidence interval]						
Average treatment effect on the treated (ATET)						
Constant	−0.9846856					
Margin	.4787327					
Unconditional Stand. Err.	−2.06					
Z-value	0.040					
P>|z|	−1.922985 −0.0463867					
[95 % Conf. Interval]						
Measures of model fit						
Observations	371					
Wald χ^2 (10)	114.02***					
Log pseudo likelihood	−632.47846					
Wald test of independent equations	8.33***					
(rho = 0): χ^2 (1)						

[a] $\partial y/\partial x$ is for discrete change of dummy variable from 0 to 1.
*, **, and *** denote significance at the 10 %, 5 %, and 1 % levels of probability, respectively.

households and respondents that spend more than R1501 of their income on fast foods, were more likely to continue buying fast foods. These results concur with past literature (see Otterbach et al. 2021, Todd et al. 2021, Blick et al. 2018).

The results from the treatment function show that in the absence of income constraints, the intended consumption of fast food was influenced by nutrient information provision. The results indicate that the decision to increase future consumption of fast food was negatively associated with information on high calorie and sodium content in food. This means the provision of nutrient information had an expected result of making individuals more cautious in their decisions about food. However, the results show that only the information on calorie content had a statistically significant effect ($p < 0.01$) and this result indicates that consumers' decisions were anchored on calories as opposed to sodium information. The significant influence of calorie content information on consumers' intended behaviour was also reported by Petimar et al. (2019) and Cawley et al. (2020). It was interesting to note that the provision of fat content information was associated with an intention to increase fast food consumption. Although the estimate for fat content information did not have a statistically significant influence on the dependent variable, it was surprising that a negative relationship between the variables was not found as high fat content is normally negatively associated with fast food consumption intentions. This finding can be explained by consumers' choice to ignore fat content information in decision-making and basing their consumption intentions on calorie information.

3.3. Robustness test results

A marginal difference of 0.4 was found between the variance (2.347155) and the variance (1.93531) of the ETpoisson. This result confirmed the suitability of the model selected for the analysis. The post-estimation results produced a Deviance goodness-of-fit with a χ^2-value of 309.6903 (360 df), p-value = 0.9741. The Pearson goodness-of-fit χ^2-value was 312.1902 (360 df), p-value = 0.9673. The non-significance of the χ^2-values was observed to suggest that the outcome variable indeed had a poisson distribution. As shown in Table 2, the significant Wald χ^2-value (114.02) shows that collectively the regressors had a strong influence on the use of nutrient information by survey participants and the frequency of consuming ready-to-eat meals in the study area. Hence, the model fitted the data reasonably well. The second significant Wald χ^2-value (8.33) indicates that the null hypothesis of no correlation between the treatment errors and the outcome errors can be rejected.

4. Discussion

The study's findings indicate that efforts to provide nutritional information using menu labels can motivate consumers to make healthier food choices. However, consumers' cognitive biases can curtail those efforts as consumers have bounded rationality which can limit their ability to integrate new information with existing knowledge and beliefs during the decision-making process. Consumers employ numerous information sources such as experience, tacit knowledge and explicit information provided about the product on food labels to make choices (Stewart et al., 2014). In this study, the consumers' cognitive bias was expressed in two instances when consumers exhibited a limited ability to digest all the information on the nutrition content and make a decision that would promote their good health. In the first instance, in line with expectations, consumers made negative associations between fast food consumption and high sodium and calorie content. However, the bias was observed in the lack of significant influence of the sodium content information on intended fast food consumption. This intended behaviour was not in line with expectations because the high sodium (salt content), which is associated with the prevalence of hypertension, could ordinarily make the community very sensitive to the sodium content (Ware et al., 2019). This is expected to be true in South Africa where the prevalence of hypertension has doubled from the first Demographic and Health Survey (DHS) in 1998 (23 %) to the most recent data from 2016 (48.3 %) (Zhou et al., 2021).

This type of cognitive bias is called anchoring (Stewart et al., 2014). It occurs when individuals create a positive perception about a food choice based on information on a single attribute, on (verified or unverified) correlations of attributes, or on only accepting certain pieces of information as superior because they received that information first (Burton et al., 2015). In this study, consumers anchored their decision-making on calorie content information and did not allow nutritional information about sodium to significantly influence their choices. Such an observation is commensurate with findings from various previous studies. Alexander et al. (2010) reported that anchoring often occurs as a result of frustration and confusion that was caused by an influx of nutritional information. Musicus et al. (2019) explained that the anchoring observed in their study emanated from consumers' assumption that meals with relatively high calories would also have higher quantities of sodium. Byrd et al. (2018) report that consumers' anchoring on calorie content information is due to consumers' limited ability to interpret sodium content information as their study showed an increase in the use of sodium information with graphical, easy-to-understand illustrations. Marty et al. (2021) and Burton et al. (2015) report that there has been much popularism of energy labelling by businesses that look to make profits from consumers trying to lose weight such that calorie-content has been advertised to the extent that popular media promoted the narrative that lower calories are the most import indicator to note.

In the second instance, the study noted that higher fat content in fast food meals was positively associated with consumers' intentions to consume fast food meals. This could have been a result of a type of cognitive bias called the white hat bias which causes consumers to distort research information in the service of seemingly necessary ends or strong beliefs (Allison, 2011). Similar to findings reported by Cioffi et al. (2015), consumers' intended behaviour in the current study could be explained being as being a result of consumers rationalising high-fat content's necessity in the preparation of a meal to their satisfaction. Burton et al. (2015) explain that nutrients such as fats are considered necessary for enhancing flavour and preparing delicious food (e.g., French fries) hence information about high quantities of these nutrients is accepted without stimulating any behavioural change. Burton et al. (2015) and Musicus et al. (2019) add that consumers also generally underestimate nutrient content in ready-made meals and further underestimate the effect these quantities could have on their health.

5. Limitations

This study is not without limitations. First, it measured hypothetical (not actual) choices and failed to take into consideration other factors that could influence decision-making in a typical set-up. For example, emotions and introducing the use of money may result in different eating behaviour (Cantu-Jungles et al., 2017). Second, the association between self-perception was not taken into consideration. As shown by Stewart et al. (2014) and Thunstrom (2019), individuals that reflect a basic interest in healthy eating and generally care more about the impact of food intake on their health, tend to be sensitive to specific nutrients' amounts on the nutrition facts table, which leads them to search that information initiatively. Lastly, the study's sample is representative of the population in Mahikeng city and may have limited generalizability with other populations.

6. Conclusion and recommendations

Overall, the study concludes that access to and use of nutrient information can significantly reduce the consumption of unhealthy foods. These findings were further justified by the ATE and ATET results, which reflected that providing consumers with nutrient information can

significantly reduce the frequency of consuming ready-to-eat or fast foods by at least one meal in a period of seven days.

The study results have policy implications. Firstly, they mainly point to the public's receptiveness to new regulations requiring menu labelling. Secondly and more importantly, they warn of possible misinterpretations that can have disastrous effects on public health, hence, they point out the need to give thought to the manner in which the nutritional information is provided. In light of this, it is recommended that efforts be made to increase consumer education on how to interpret nutritional information in an integrated manner. This should be done ahead of the development of a mandatory policy on menu labelling as food eateries have already provided information which is already influencing consumer decision-making. Furthermore, consumer education should also be aimed at raising awareness that consumers have the right to demand less fat in food without compromising its taste and price would be necessary for a consumer-driven change in the market. Focus is often turned towards the governments to provide healthcare and less is on the prevention through healthier food consumption.

Future studies can improve on the current study by using nationally representative data. Such studies will provide information that can be used to make inferences about the whole country's population. As menu labels are making their way into high-end restaurants, a study on how the nutritional information provided on the current consumption as well as the compatibility of the different types of formats would be useful in taking the debate on the introduction of a policy that makes their provision compulsory. Studies on how to make the introduction of nutritional information in restaurants cost-effective could assist in the wider use of menu labels.

Declaration of Competing Interest

I declare that I have no conflicting interests and the study has not received any financial assistance (or otherwise) from third party that may have any conflicting interests.

Data availability

Data will be made available on request.

Acknowledgments

The authors would like to thank Dr H Der Beer for her input in the project from which this paper was written.

References

Alexander, M., O'Gorman, K., & Wood, K. (2010). Nutritional labelling in restaurants: Whose responsibility is it anyway? *International Journal of Contemporary Hospitality Management, 22*(4), 572–579. https://doi.org/10.1108/09596111011042758

Allison, D. B. (2011). Evidence, discourse and values in obesity-oriented policy. Menu labelling as a conversation starter. *International Journal of Obesity, 35*(4), 464–471.

Antonelli, R., & Viera, A. J. (2015). Potential effect of Physical Activity Calorie Equivalent (PACE) labelling on adult fast food ordering and exercise. *PLOS One, 10* (7), Article e0134289. https://doi.org/10.1371/journal.pone.0134289

Auchincloss, A. M., Young, C., Davis, A. L., Wasson, S., Chilton, M., & Karamanian, V. (2013). Barriers and facilitators of consumer use of nutrition labels at sit-down restaurant chains. *Public Health Nutrition, 16*(12), 2138–2145. https://doi.org/10.1017/S1368980013000104

Blick, M., Abidoye, B. O., & Kirsten, J. F. (2018). An investigation into food-away-from-home consumption in South Africa. *Development Southern Africa, 35*(1), 39–52.

Burton, S., Tangari, A. H., Howlett, E., & Turri, A. M. (2015). How the perceived healthiness of restraint menu items influences sodium and calorie msiconceptions: Implications for nutrition disclosures in chain restuarants. *The Journal of Consumer Affairs, 48*(1), 62–95. https://doi.org/10.1111/joca.12015

Byrd, K., Almanza, B., Ghiselli, R. F., Behnke, C., & Eicher-Miller, H. A. (2018). Adding sodium information to casual dining restaurant menus: Beneficial or detrimental for consumers? *Appetite, 125*, 474–485. https://doi.org/10.1016/j.appet.2018.02.025

Cantu-Jungles, T. M., McCormack, L. A., Slaven, J. E., Slebodnik, M., & Eicher-Miller, H. A. (2017). A meta-analysis to determine the impact of restaurant menu labeling on calories and nutrients (ordered or consumed) in U.S. adults. *Nutrients, 9*, 1088. https://doi.org/10.3390/nu9101088

Cawley, J., Susskind, A.M., & Willage, B. (2020). Does disclosure improve consumers' knowledge? Evidence from randomized experiment of restuarent menu calorie labels. bureau of economic research. A working paper. Massachusetts, USA. Available on http://www.nber.org/papers/w27126. Accessed on 09 September 2023.

Cioffi, C. E., Levitsky, D. A., Pacanowski, C. R., & Bertz, F. (2015). A nudge in a healthy direction. The effect of nutrition labels on food purchasing behaviors in university dining facilities. *Appetite, 92*, 7–14. https://doi.org/10.1016/j.appet.2015.04.053

Huang, Z., Huang, B., & Huang, J. (2021). The relationship between nutrition knowledge and nutrition facts table use in China: A structural equation model. *International Journal of Environmental Research and Public Health, 18*, 6307. https://doi.org/10.3390/ijerph18126307

Kenkel, D. S., & Terza, J. V. (2001). The effect of physician advice on alcohol consumption: Count regression with an endogenous treatment effect. *Journal of Applied Econometrics, 16*(2), 165–184.

Kerins, C., McHugh, S., McSharry, J., Reardon, C. M., Hayes, C., Perry, I. J., Geaney, F., Seery, S., & Kelly, C. (2020). Barriers and facilitators to implementation of menu labelling interventions from a food service industry perspective: A mixed methods systematic review. *International Journal of Behavioral Nutrition and Physical Activity, 17*(48). https://doi.org/10.1186/s12966-020-00948-1

Krejcie, R. V., & Morgan, D. W. (1970). Determining sample size for research activities. *Educational and Psychological Measurement, 30*(3), 607–610.

Krieger, J. W., Chan, N. L., Saelens, B. E., Ta, M. L., Solet, D., & Fleming, D. W. (2013). Menu labeling regulations and calories purchased at chain restaurants. *American Journal of Preventive Medicine, 44*(6), 595–604.

Long, J. S. (1997). *Regression models for categorical and limited dependent variables*. Sage Publications. London.

Marty, L., Reed, S. M., Jones, A. J., & Robinson, E. (2021). Increasing availability of lower energy meals vs. energy labelling in virtual full-service restaurants: Two randomized controlled trials in participants of higher and lower socioeconomic position. *Public Health, 21*(975). https://doi.org/10.1186/s12889-021-11007-0

McCann, M. T., Wallace, J. M., Robson, P. J., Rennie, K. L., McCaffrey, T. A., Welch, R. W., & Livingstone, M. B. E. (2013). Influence of nutrition labelling on food portion size consumption. *Appetite, 65*, 153–158.

Musicus, A. A., Moran, A. J., Lawman, H. G., & Roberto, C. A. (2019). Online randomized controlled trials of restaurant sodium warning labels. *American Journal of Preventative Medicine*, 181–193. https://doi.org/10.1016/j.amepre.2019.06.024

Otterbach, S., Oskorouchi, H. R., Rogan, M., & Qaim, M. (2021). Using Google data to measure the role of Big Food and fast food in South Africa's obesity epidemic. *World Development*, 140. https://doi.org/10.1016/j.worlddev.2020.105368

Patino, S. R., Zhou, M., Gomes, F. D., Lemaire, R., Hedrick, V., Serrano, E., & Kraak, V. I. (2020). Effects of menu-labeling policies on trans-national restaurant chains to promote a healthy diet: A scoping review to inform policy and research. *Nutrients, 12*, 1544. https://doi.org/10.3390/nu12061544

Petimar, J., Zhang, F., Rimm, E. B., Simon, D., Cleveland, L. P., Gortmaker, S. L., et al. (2021). Changes in the calorie and nutrient content of purchased fast food meals after calorie menu labeling: A natural experiment. *PLOS Med, 18*(7), Article e1003714. https://doi.org/10.1371/journal.pmed.1003714

Petimar, J., Zhang, F., Rimm, E. B., Simon, D., Cleveland, L. P., Gortmaker, S. L., et al. (2019). Estimating the effect of calorie menu labeling on calories purchased in a large restaurant franchise in the southern United States: Quasi-experimental study. *BMJ, 367*, L5837. https://doi.org/10.1136/bmj.l5837, 2019.

Scourboutakos, M. J., Corey, P. N., Mendoza, J., Henson, S. J., & L'Abb, M. R (2014). Restaurant menu labelling: Is it worth adding sodium to the label? *Canadian Journal of Public Health, 105*(5), 354–361.

Stewart, H., Hyman, J., & Dong, D. (2014). USDA economic research services. report. In *USDA economic research services. report, 179*.

Stowe, K., & Venter, I. (2020). Factors influencing a healthier fast food choice intention after the provision of energy and extended nutritional information among working young adults in the city of Cape Town, South Africa. *Journal of Consumer Sciences, 5* (1), 19–39.

Terza, J. V. (1998). Estimating count data models with endogenous switching: Sample selection and endogenous treatment effects. *Journal of Econometrics, 84*(1), 129–154.

Thunstrom, L. (2019). Welfare effects of nudges: The emotional tax of calorie menu labelling. *Judgment and Decision Making, 14*, 11–25. https://doi.org/10.1017/S1930297500002874

Todd, J. E., Mancino, L., Restrepo, B. J., Kavanaugh, C., Dicken, C., & Brenman, V. (2021). Food away from home and calory intake: The role of restaurant menu labelling laws. *Western Economic Association International: An Economic Enquiry, 59* (1), 53–71. https://doi.org/10.1111/ecin.12923

Ware, L. J., Chidumwa, G., Charlton, K., et al. (2019). Predictors of hypertension awareness, treatment and control in South Africa: Results from the WHO-SAGE population survey (wave 2). *Journal of Human Hypertension, 33*, 157–166. https://doi.org/10.1038/s41371-018-0125-3

Wie, S., & Giebler, K. (2014). College students' perceptions and behaviours toward calorie counts on menu. *Journal of Foodservice Business Research, 17*(1), 56–65.

Wooldridge, J. M. (2010). *Econometric analysis of cross section and panel data*. The MIT Press. London.

Zhou, B., et al. (2021). Worldwide trends in hypertension prevalence and progress in treatment and control from 1990 to 2019: A pooled analysis of 1201 population-representative studies with 104 million participants. *Lancet, 98*(10304), 957–980. https://doi.org/10.1016/S0140-6736(21)01330-1