

Implementing menu board labelling in Denmark; Experts' perspectives



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Abstract

First implemented in New York City, Menu board labelling (MBL) is quickly being adopted by other local jurisdictions and nations to address the obesity epidemic. Beyond international experience related to the effects of MBL, Danish studies indicating the effects of nutrition labelling on packaged food, and the fact that the majority of Danes want MBL, little other evidence exists to suggest what impact MBL will have in Denmark on reducing total energy ordered or consumed

The aim of this study was to discover, through Danish expert opinion, the extent to which identified impediments to MBL use may be applicable in Denmark.

A literature review based on studies published between 2005 and 2012 was conducted to assess the impact of MBL with regards to reducing calories ordered or consumed.

Expert opinion was sought to translate changes in consumer purchase behaviour from international settings to a Danish context, to discover the extent to which identified impediments to MBL use may be applicable in Denmark.

Though the literature review found mixed results, there was an overall tendency to indicate that MBL could result in meaningful reductions in calories ordered or consumed. Regardless of the study outcome, virtually all the articles reviewed concluded that MBL is potentially a worthwhile strategy to address obesity. The same studies revealed relatively consistent circumstances where MBL is found to be less effective.

Experts agreed that international experience of MBL use would be mimicked to some degree in Denmark. Generally, the experts were optimistic that MBL could assist consumers make healthier choices when eating out. They believed the greatest impacts could be attained through preventing obesity, developing calorie consciousness amongst consumers and subsequently providing industry with the incentive to provide healthier options.

This study also identified consumer attitudes which relate to optimal MBL use. The Danes' demand healthier fast foods and the fact that their food choices are primarily determined by the appeal of convenience, infers that they are more likely to use MBL and choose lower energy options, when they are available, easily identifiable and particularly if they are the default option.



The results suggest that the positive effects of MBL experienced in international settings could be even more profound in Denmark.

The findings legitimately and unequivocally support that MBL efforts should be pursued, whether it is regulated through a voluntary agreement or national law. This document also provides guidance for future consumer research studies ahead of implementation in Denmark.



Table of Contents

1. Introduction.....	1
1.1 Origin of MBL	2
1.2 Existence of MBL	4
1.3 Rationale for MBL.....	5
2. Research Problem.....	6
2.1 Research Questions.....	6
2.2 Research Aim	7
3. Methodology	8
3.1 Phase I: Literature Review	8
3.1.1 Results of the Literature Review	8
3.2 Contextualising the Impediments to MBL Use.....	11
3.3 Phase II: Expert Interviews	13
3.3.1 Results of the Expert Interviews	13
3.4 Anticipated Impact of MBL in Denmark.....	17
4. Discussion.....	19
4.1 First Research Question: Will disclosing energy content on menu boards influence consumers’ food choices by reducing energy ordered or consumed?.....	19
4.2 Second Research Question: According to Danish experts, what impact will MBL have on Danish consumers, in light of international experience?.....	20
4.3 General Discussion	20
4.3.1 Notice	21
4.3.2 Understanding.....	22
4.3.3 Shopper Internal – Who is most and least likely to use MBL?.....	24
4.3.4 Shopper Internal – Expectancy (dis)confirmation	25
4.3.5 External – Pricing structures and incentives.....	27
4.4 Main Outcomes and Implications.....	28
5. Conclusion	30
List of Abbreviations	32
Definition of Terms	34
References	38
Appendix 1	51



1. Introduction

Poor food and nutrition are major risk factors¹ of noncommunicable diseases (NCDs) such as heart disease, stroke, hypertension, diabetes and some cancers (1). These diseases collectively pose the greatest health threat in the European region (1, 2).

Of particular concern is the rising prevalence of overweight and obesity. In 2010, 46.7% of Danish adults were overweight (Body Mass Index (BMI) ≥ 25) and 13.4% were obese (BMI ≥ 30) (3). In the last 20 years, there has been an alarming four-fold increase in the number of overweight and obese children in Denmark. One in five Danish children are now overweight (4). Up to 8% of the Danish health care budget is associated with diseases related to overweight (5) costing an estimated 14.4 billion Danish Kroner annually² (6).

Evidence supports the links between diet and health related outcomes (7), and between food eaten outside the home and obesity (8). Such health concerns have prompted policy makers and public health related organisations to communicate these links through legislative³ or other measures⁴ to promote 'healthier' eating (9).

One such recent intervention is menu board labelling (MBL). MBL, together with reference values, conspicuously provide consumers with energy values for food and beverage items listed on a menu, and inform how the energy content relates to an average adult's daily energy requirement (Figure 1). The evolution of this obesity prevention initiative is founded in the history of nutrition labelling and shares the common purposes of assisting consumers to make informed food choices and exercise personal responsibility, while encouraging industry to reformulate or introduce healthier food items (14, 15). A major aim of MBL is to prevent and reduce overweight and obesity, in this sense 'healthier' ignores all other nutritional values except for energy and is used to describe lower calorie options throughout this document. The following section demonstrates how MBL is a derivative of nutrition labelling and emphasises the close relationship between front-of-pack (FOP) labelling and MBL.

¹ The others being tobacco use, inadequate physical activity and excessive alcohol consumption (2)

² Using the human capital method

³ Including; fiscal policy (e.g., fat and sugar taxes) and advertising controls (e.g., reducing the marketing of unhealthy foods to children) (9)

⁴ Public health campaigns such as promoting increased fibre intake, increased fruit and vegetable intake or salt reduction (9, 10, 11, 12, 13)





Figure 1: Example of MBL with reference values (The Danish Cancer Society, 2013)

1.1 Origin of MBL

Nutrition labelling of processed foods evolved with the increasing reliance on pre-packaged foods. The nutrition facts panel (Figure 2) lists predetermined nutrients and energy content on the back of food packaging (16) and is now deemed mandatory by the European Parliament 'Regulation (EU) No 1169/2011' (17).

Nutrition				
Typical values	100g contains	Each slice (typically 44g) contains	% RI*	RI* for an average adult
Energy	985kJ 235kcal	435kJ 105kcal	5%	8400kJ 2000kcal
Fat	1.5g	0.7g	1%	70g
of which saturates	0.3g	0.1g	1%	20g
Carbohydrate	45.5g	20.0g		
of which sugars	3.8g	1.7g	2%	90g
Fibre	2.8g	1.2g		
Protein	7.7g	3.4g		
Salt	1.0g	0.4g	7%	6g

This pack contains 16 servings
*Reference intake of an average adult (8400kJ / 2000kcal)

Figure 2: Nutrition Facts Panel example (Source: NHS n.d.)

More recently, the nutrition facts panel has been supplemented with simplified nutrition information, referred to as front of pack (FOP) labelling. It is typically based on four key nutrients (fat, saturated fat, sugar and salt) and energy content, which provide summary nutrition information for quick and easy reference (18). FOP labelling is the most frequently noticed and used nutrition information found to enhance healthy product choice (19). A recent observational study showed that more than 60% of European supermarket shoppers looked at it prior to selecting a product (20).



Nutrition labelling is one of the most prominent sources of consumer nutrition information, which is an important, cost-effective, population-wide policy tool for promoting healthy eating and supporting health conscious food choices (21, 22). According to an OECD (Organisation for Economic Co-operation and Development) modelling study, mandatory nutrition labelling of processed foods could reduce European obesity rates by 2.5% and avert up to 15 million disability-adjusted life years (23).

Both the nutrition facts panel and FOP labelling intend to provide consumers with nutrition information about the product, at the point of purchase (POP), which is necessary to apply recommendations from food-based dietary guidelines and public health messages such as 'reduce your salt' or 'limit saturated fat intake' (20).

Nutrition labelling on processed foods also intends to make the food selection environment more conducive to selecting healthier options by encouraging industry to improve the nutrition content of food products through re-formulation or introduction of healthier options. This is considered a 'major instrument' to improve eating habits, where legislation and statutory measures are otherwise limited in controlling what food products industry makes available to consumers (24, 25). The increase in wholegrain food products being available in Denmark and the marked increase in wholegrain consumption, for example, is said to be a direct consequence of the wholegrain logo⁵ (fuldkorn mærke) (Figure 3) being introduced on food packaging in 2009.



Figure 3: The Wholegrain Logo (Source: Vælg fuldkorn først, n.d.)

Since inception, the number of products bearing the wholegrain logo rose from 150 in 2009 to more than 600 products in 2014, while the wholegrain intake of Danes increased from 36-63 grams per day, and the proportion of Danes who met the recommend fibre intake of 75 grams per day increased from around 6% pre-2009 to 30% by 2014 (26, 27).

The frequent use of nutrition labelling, the increasing dependence on food eaten outside the home and rising obesity rates, collectively provide the rationale to extend nutritional labelling to other settings to assist customers in making 'healthier' food choices at chain restaurants, cafés and convenience stores. The introduction of MBL was founded on this reasoning (28).

⁵ Developed by a multi-sectorial partnership, the 'fuldkorn' logo appears on approved wholegrain products, to encourage increased availability of wholegrain products in Denmark, and to increase wholegrain awareness and consumption (10).



The provision of energy content in isolation of other nutrition information is justified since it is the most relevant nutrition information in addressing obesity and is the most frequently sought after information from nutrition labelling (21, 29, 30). Displaying the energy content of menu items becomes especially relevant since most people (31), even dieticians (32) and restaurant owners (33, 34) underestimate the energy content of food eaten outside the home, particularly foods that are 'less healthful' (31).

MBL also has the potential of reducing energy consumption through encouraging the food service industry to provide healthier options (28).

1.2 Existence of MBL

Ahead of federal MBL regulations proposed by The Patient Protection and Affordable Care Act to take effect New York City, was the first location to implement MBL in chain fast food restaurants in 2008, while California was the first to implement a state-wide bill in 2011, (35, 36). MBL now extends to more than 20 States and local jurisdictions in the United States of America (USA) (37). MBL has also gained international interest in countries including the United Kingdom (UK) (14), Australia (38), Canada (39) and Denmark.

In Denmark the 4-Clover Alliance (The Consumer Council, The Heart Foundation, The Diabetes Foundation and The Cancer Society) has developed MBL Recommendations for fast food chains and quick-service outlets. The recommendations, "Kalorier på menuen" (*Calories on the menu*) are intended to initiate and guide voluntary MBL in Denmark with the aim of:

- Enabling consumers to make informed food choice
- Facilitating industry adoption and compliance, and
- Promoting /ensuring consistency across chains

The recommendations, initiated by the 4-Clover Alliance have been based on evidence derived from a review of scientific literature and lessons learned from other international MBL experiences. They also incorporate input from industry, with regards to the practices and challenges for business, and the Danish Food and Veterinary Authority, with regards to Danish and EU legislation relating to food labelling.



1.3 Rationale for MBL

Evidence indicates that nutrition labelling is appreciated by 74% of Danish supermarket shoppers (40), while 64% of Danes support MBL implementation (41,42). Cowburn & Stockley (43) suggest that such interest should be strongly supported by consumers' right to know the nutrient contents of foods purchased.

Cumulative evidence provides the following supporting arguments to justify MBL implementation as detailed below

Rationale for MBL:

- Obliges the consumers' right to know and responds to consumer demand (36, 42)
- Enables consumers to exercise personal responsibility with regards to maintaining a healthy weight and make informed food choices (44, 45)
- Provides more obvious calorie information at the POP. Few customers otherwise seek or notice information when it appears in any other format (tray liners, food wrappers or company websites) (15, 46, 47)
- Assists consumers to more accurately estimate their energy intake, as food eaten outside the home increasingly contributes to overall food intake and energy content of meals eaten outside the home is often underestimated (31, 48)
- Dissuades consumers to supersize, as portion sizes made available increase (49)
- Induces consumer 'calorie consciousness' at the time of ordering and facilitates 'calorie accounting' or 'calorie substitution' at subsequent meals (51)
- MBL, together with reference values, educates consumers about average adult daily calorie requirements (52)
- Facilitates comparisons within and between food service outlets (35).
- Encourages food service industry to reformulate or introduce lower-energy menu items and reduce portion sizes or change default menu options (37, 53, 54)



2. Research Problem

Beyond international experience related to the effects of MBL, Danish studies indicating the effects of nutrition labelling on packaged food⁶ and the fact that the majority of Danes want MBL⁷ and healthier food 'on the go' (56), little other evidence exists to suggest what impact MBL will have in Denmark.

A literature review, commissioned by The Danish Cancer Society, was conducted to assess the feasibility of introducing MBL to Denmark. To supplement this earlier report, *Introduction of Voluntary Menu Board Labelling in Quick Service Outlets in Denmark – A rapid review* (57), which focussed on: a) MBL effectiveness in changing consumer behaviour; b) factors that improved the use of MBL; and c) the financial impact on industry, this study focuses more on the impediments to MBL use.

Based on the literature review, what appears to be relatively consistent are the circumstances that effect MBL use. Consumers' level of MBL awareness, demographic differences, temporal issues, expectancy (dis)confirmation and pricing structures or incentives to purchase more, all influence MBL use. What remains unknown at this point is, in general terms, how Danish consumers will respond to MBL in relation to purchasing/consumption behaviour and, in particular, the extent to which the above-mentioned factors will impede MBL use in Denmark.

2.1 Research Questions

Based on the background information provided, several research questions remain apparent:

- Will disclosing energy content on menu boards influence consumers' food choices by reducing energy ordered or consumed?
- According to Danish experts, what impact will MBL have on Danish consumers, in light of international experience?

Within this overall question, the following sub-questions will be addressed:

⁶ 74% of Danes think that nutrition labelling on foods is important (40). One in three Danes look for products with the keyhole symbol when buying supermarket food (55), while half, often or regularly, buy products displaying the keyhole symbol (56)

⁷ In two consecutive studies Coop found that approximately two out of three Danes want calories to appear on the menu boards of fast food establishments (41, 42)



- To what extent will Danish consumers notice MBL?
- Will long-term repeated exposure to MBL be necessary for customers to understand and become accustomed to using MBL information?
- Who is most and least likely to use MBL?
- Will MBL only impact food and beverage items that are unexpectedly high in energy?
- Will meal-deals, value size pricing and other promotions diminish the potential impact of MBL?

2.2 Research Aim

The aim of this study is to discover through international literature, the impact of MBL on consumer behaviour and through Danish expert opinion, the extent to which international experiences will be applicable in Denmark.



3. Methodology

The study was a phase design where a literature review was first undertaken prior to conducting expert interviews. The methods and results of the literature review will be presented followed by the methods and results of the expert interviews.

3.1 Phase I: Literature Review

To answer the first research question, a systematic literature review was carried out in June 2013, using the same criteria as the systematic review carried out in May 2012 (57), with the exception that included studies were limited to those that reported on consumer behavior change, which was measured calorically in terms of energy ordered (hypothetically or in reality) or consumed. Included studies were further limited to peer-reviewed articles, published after 2005, in English, reporting the findings of empirical data. The cut-off date of 2005 was considered appropriate since this was the time when regulated (as opposed to ad hoc or self-regulated) MBL was first being considered (36).

For the purpose of this study, the **effects of MBL** refers to changes in purchasing behaviour in response to menu labelling, that is, consumers reducing or increasing total energy purchased or consumed. It does not extend to public health outcomes relating to changes in population BMI or NCD rates.

Studies that investigated customer attitudes towards either the provision of MBL or of various formats of MBL were excluded, as were studies that only assessed customer awareness of MBL or considered self-reported 'use' of MBL.

Using the MEDLINE database, search terms included "Menu board labelling", "Menu labelling", "Point of purchase" AND "Fast food", "Calorie posting" OR "Kilojoule posting", and "Nutrition menu labelling".

3.1.1 Results of the Literature Review

The keyword search resulted in 135 articles being identified, of which 15 articles, all originating from North America, met the aforementioned inclusion criteria. Three additional articles were included from a hand search, resulting in a total of 18 documents considered in the review.



Though the literature review found mixed results, there was an overall tendency to indicate that MBL could result in meaningful reductions in calories ordered or consumed. Regardless of the study outcome, virtually all the articles reviewed concluded that MBL is potentially a worthwhile strategy to address obesity.

Largely, there was a small but notable positive effect of MBL. Of the 18 studies reviewed, only three studies reported no positive effect (58, 59, 60) while all remaining studies showed a decrease in calories purchased or consumed for either all, or at least some, subgroups. Five of these studies resulted in significant reductions (31, 46, 51, 61, 62). Summary table of the literature review can be found in appendix I.

What appeared to be relatively consistent were the circumstances where MBL was found to be less effective. Five impediments to MBL use were identified, which included:

- i. Low levels of awareness/noticing MBL,
- ii. An apparent delay in understanding MBL information;
- iii. Being adolescent or male;
- iv. Actual calorie content being consistent with expectations; and
- v. Pricing structures and incentives to increase consumption.

The following sections elaborate on how these factors impeded MBL use.

Low levels of awareness / noticing MBL

Where studies reported customers noticing MBL labelling, higher awareness resulted in greater reductions in calories ordered (46, 63). Put differently, those studies where only around half of the participants noticed (60, 64) were consequently those studies that measured no effects of MBL.

Delay in understanding MBL information

There was an apparent delay between implementing MBL and detecting population-wide reductions in energy ordered. When there was little time between data collection dates, such as one month pre- and one month post-labelling (34, 58, 60, 65) or even three months pre- and three months post-labelling (66), little or no effect was detected. More notable reductions in calories were detected when data was collected at least 12 months after MBL implementation (46, 61, 63).



Being adolescent or male

Women, especially dieters, parents of younger children, younger adults, and those with an interest in health were subgroups shown to respond well to MBL. Lower levels of education and socio-economic status (SES), males and adolescents, however, were more resistant to the information.

- Where females reduced calories ordered, males either showed less response (61) no response (63, 67) or increased calories ordered (64).
- Tandon and colleagues (68) found that providing energy counts on a fast food menus resulted in parents reducing calories ordered for their children (aged three to six years) but not orders for themselves.
- Studies targeting adolescents (65, 69) or children, where parents were not involved in their food selection decisions (66), showed MBL had no effect on energy ordered.
- Those with lower levels of education or SES were shown to be less or not responsive to MBL information (58, 60, 61, 63, 65).

Actual calorie content being consistent with expectations

Consistent with expectancy disconfirmation theory, purchasing behaviour is said to respond to the level of 'surprise'. Expectancy confirmation, where calorie disclosure fails to invoke any level of surprise, is unlikely to affect consumers' food choice. This was demonstrated in a study where consumers more accurately estimated the calorie content of hot beverages (even if they were relatively high in calories), in such instances MBL had no effect on beverages purchases over time (61).

On the other hand, where calories displayed greatly exceed expectations, customers were more likely to purchase something else. Such behaviour was detected in post-labelling conditions, where the most significant decreases were observed in menu items with the highest energy content (31, 46, 61, 62, 70, 71).

Pricing incentives to increase consumption

Value size pricing and product bundling provide consumers with an economic incentive to purchase more (calories) for their money. Coinciding with MBL implementation, Subway introduced value-for-money \$5 foot-long sandwiches. This promotion was cited as a reason why



Subway experienced significant calorie increases in a study, when three other major chains saw significant calorie reductions (63). Similarly, when consumers were provided a menu with value size pricing, they purchased more energy (813 calories) than those whose menu also displayed energy content (761 calories) (64).

3.2 Contextualising the Impediments to MBL Use

The 'Conceptual model of FOP label use' (72), was used to help contextualise the five impediments to MBL use, as identified through the literature review, and develop Phase II of the study.

The framework explains the constraints and operators that influence the use of summary nutrition information appearing on the front of products' packaging. It recognises that FOP label use is dependent on various personal and environmental factors and acknowledges that the provision of nutrition information alone does not necessarily influence food choice.

As precursors of food labelling use (72), questions relating to 'Notice'⁸ and 'Understanding'⁹ together with 'Internal' and 'External' factors that influence MBL use, were explored with the experts. An adapted version of the Conceptual module of FOP label use (Figure 4) indicates how the scenarios were framed to gain insight into how MBL use may be impeded.

⁸ 'Notice' entails the actual sighting of MBL, whether it's conscious or unconscious. It can range from just a fleeting glance to a more detailed observation of the information (72)

⁹ 'Understanding' refers to the accurate comprehension of the information, as it was intended (72)



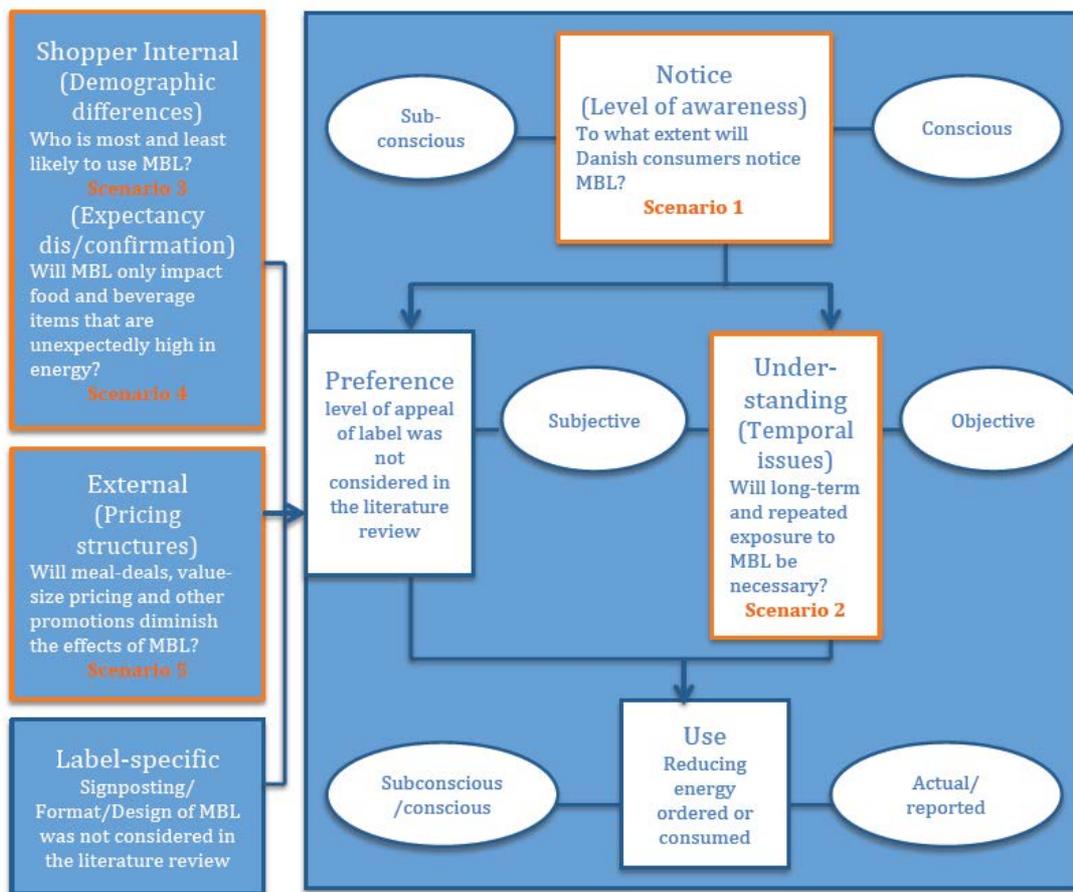


Figure 4: Adapted version of the Conceptual model of FOP label use, incorporating the five interview scenarios (highlighted in orange)

Since the literature review specifically excluded studies focusing on consumer attitudes towards various formats of MBL presentations, no interview questions related to ‘Label-specific’ or ‘Preference’. According to Malam and colleagues (72) these refer to the ‘level of appeal’ or ‘likability’ of a label. This kind of information is better obtained through consumer research by testing different formats. A European review of labelling (29) and studies conducted by the UK’s Food Standard Agency (73), Australia’s NSW Food Authority (52) and Liu and colleagues in the USA (74), show that preferences tend to be country specific.



3.3 Phase II: Expert Interviews

Interviews with experts representing NGO and research were used to answer the second research question in relation to anticipating the extent to which impediments to MBL use, as experienced in international settings, will be applicable to Danish consumers.

Of the seventeen Experts representing private, public and NGO interests invited for interview, four accepted (Table 1).

Table: 1 Profiles of the experts interviewed

Participant, Interview Method and Date	Organisation	Position
Expert 1 Face-to face interview 12 August 2013	FDB/Coop, Albertslund	Analysis manager
Expert 2 Telephone Interview 16 August 2013	Aarhus University, Aarhus	Associate professor Department of Business Administration
Expert 3 Face-to-face interview 27 August 2013	The Danish Cancer Society, Copenhagen	Senior Consultant Physical Activity and Diet Department of Prevention and Documentation
Expert 4 Face-to face interview 11 September 2013	Technical University of Denmark (DTU) National Food Institute Søborg	Head of Department Division of Nutrition

3.3.1 Results of the Expert Interviews

A semi-structured interview guide was developed based on the five impediments to MBL use, as identified through the literature review. To engage expert opinion of MBL potential in a Danish context, projective story technique was used. Drawing on factual data, the scenarios presented instances where MBL was either less, or not, effective. Using 'stories' or scenarios is said to be an effective way to illicit frank responses and transcend barriers that may otherwise bias answers (75), while they also provided a solid and specific base for the experts to speculate the extent to which these factors may impede MBL use in Denmark.



The spectrum of opinion was broad and incorporated views from various stakeholders. There were insights representing industry, academia and non-government organisation and there were views from those who were optimistic that MBL would be effective and those who were 'sceptical'. Overall, there was an agreement that the impediments to MBL use experienced in the USA would be mimicked, to some degree, in Denmark. Differences between the countries that obstructed direct comparisons were said to be the number of meals eaten outside the home and the relative cost of fast food.

The next sections will address each of the research sub-questions (a recap of international experience will be provided for context) before presenting respective expert opinions as to the general impact MBL will have on Danish consumers.

Notice - To what extent will Danish consumers notice MBL?

An apparent precondition to MBL use is that consumers must first see the information. Studies in the USA indicated that between 50% and 82% of customers noticed MBL. In Denmark, the experts believed that it would be noticed by most consumers and generally agreed that awareness will increase over time, especially if supported with appropriate campaigns.

While patrons of full-service restaurants were considered "*more reflective*" (Expert 1) and were expected to "*look more at the menu*" (Expert 3), there were conflicting views regarding the extent to which frequent fast food consumers might notice MBL. Some thought 'heavy users' with hectic schedules could make good use of the information while others thought many would make habitual orders without having to look at the menu.

There was also some concern that industry may attempt to conceal the information or intentionally make it difficult for consumers to notice energy labelling.

Understanding - Will long-term repeated exposure to MBL be necessary for customers to understand and become accustomed to using MBL information?

International experience tends to show improved use of MBL over time, which is somewhat related to improved consumer understanding of MBL over time. There was a consensus amongst the experts that time was similarly needed for Danish consumers to understand and become accustomed to using MBL information.

There were speculative explanations amongst the experts as to why it would take time for consumer understanding to improve. Expert 1 suggested MBL could become a new "*trend*" particularly with "*younger people*", comparing it with the popularity of using the 'carbon



counting'¹⁰ in Sweden when making food choices. Others argued, that knowledge regarding energy content needs to be improved amongst Danes.

It was believed that understanding would progressively build with supporting education, including efforts made to incorporate energy balance, for example, into school curricula/activities. To enhance understanding of MBL information, there was a consensus that reference values were needed;

“you will need a kind of measurement. [...] to get an idea of what your personal energy budget is for a day [...] otherwise you haven't got a clue” (Expert 4)

There was, however, conflicting views regarding the perceived simplicity of MBL information. Most agreed that MBL would be more easily understood if the values were only given in calories and not together with kilojoules (kJ). Generally experts thought that MBL would be very easily understood, while others argued that the addition of energy content to menus would be confusing and there may be some misinterpretation of how to use the values;

“There may be some unconscious processing of the numbers and they may think that ‘more is better’” (Expert 2)

Shopper Internal - Will the profiles of MBL users and other nutrition labelling users be similar? Who is most and least likely to use MBL?

Studies in the USA revealed that the profiles of MBL users and nutrition labelling users were demographically similar. Experts generally agreed that similar patterns would emerge in Denmark where women were consistently mentioned as the most likely users of MBL and adolescents and (older) males the least likely.

Other characteristics used by the experts to define likely MBL users, consistent with nutrition labelling users, included families or mothers with young children, those with higher levels of education and people interested in health or have specific health concerns. There was some hesitation as to whether MBL information would be used by overweight or obese people. Experts acknowledged that some may prefer not to know the energy content of their food to avoid guilt or

¹⁰ Carbon counting (also known as carbon labelling or carbon footprinting) provides consumers with information about the total CO₂ produced in the manufacturing, transportation, and disposal of products that is relevant for environmental concerns and reducing emissions. Up to 25% of an individual's carbon footprint is attributable to diet. Carbon labelling of food is said to have increased climate friendly sales by 20% in a popular Swedish burger chain (76, 77)



associated “*bad feelings*” (Expert 1) while obese people who “*seriously want to lose weight*” (Expert 4) were expected to use MBL when making food choices.

New insights were offered, which verge from established nutrition labelling users, including younger men becoming more body and health conscious, and people, particularly young people, becoming more aware about diet related health issues;

“younger men are very health oriented and they are very keen on how they look” (Expert 4)

“people are becoming more aware about the health consequences of their food intake”
(Expert 2)

Shopper Internal - Will MBL only impact food and beverage items unexpectedly high in energy?

In the USA, expectancy disconfirmation theory was tested in a number of experimental design studies (31, 70) and was also used to explain findings where MBL resulted in the largest decreases in highest calorie menu items (61, 71). Conversely, where consumers’ expectations of the (high) energy content of their food preferences were relatively accurate, MBL had little impact on altering their food choice.

The experts generally agreed that MBL could reasonably be expected to affect sales of the highest calorie items, particularly when customers underestimated the calorie content;

“if a huge burger menu takes up 90% of your daily requirement, you would probably reflect a little bit” (Expert 4)

But the effects of MBL were not expected to be limited to unexpectedly high energy content; it could also be used to simply select the lower calorie option between two preferences. It could also be used for “*calorie accounting*” (Expert 4) where a high calorie choice at one meal may be compensated with lower calorie options at a subsequent meal.

Consistent with expectancy confirmation, preconceptions about fast foods being nutritionally poor and energy dense were considered a barrier for consumers to consider MBL, particularly if dining at these establishments was a rare indulgence.



External - Will meal-deals, value size pricing and other promotions diminish the potential impact of MBL?

In the USA, price is a major determinant of food choice where meal-deals and supersizing encourage consumers to purchase more. It was agreed by the experts that price is also an important determinant of Dane's food choices and it was believed that special offers could diminish the potential impact of MBL in Denmark.

The trend of increasing portion sizes and the heavy promotion of meal-deals, for example, was thought to be more influential on consumers' choices than the POP disclosure of calorie content. It was also expressed concerned that special offers and pricing structures could be used by the food service industry to intentionally jeopardise the initiative, if they thought that MBL could affect profits or if compliance was considered a burden.

Although the financial temptation of 'coin offers' and very cheap food could take priority over some consumers' concern for health, one expert mentioned a recent study (78) which showed that Danes chose healthier options (at fast food outlets) if they were the default option, even if they were more expensive. This study, which resulted in a significant decrease in the total energy ordered when cashiers prompted consumers to purchase healthier options, was thought to be a strong indicator that Danes would respond positively to MBL.

3.4 Anticipated Impact of MBL in Denmark

There was a greater tendency for experts to be optimistic that MBL would be effective in reducing calories, compared to those who were 'sceptical'.

Experts 1 and 3 shared the opinion that MBL has great potential, over time, and that initial consumer response will trigger supply-side changes, thereby enhancing the effects of MBL. Further, they based their presumption of consumer and industry responses on Danish experience with FOP labels;

"We don't see too many people in stores reading the labels of the nutrition stuff. So what we've found to be very effective is to put on nøgleullet (the keyhole symbol) [...] it is very easy to use" (Expert 1)

"we actually think that suppliers will change their recipes. Reformulation, [...] downsizing [...] maybe new products just as we've seen it with nøglehullet (the keyhole symbol) and with the wholegrain logo" (Expert 3)



Expert 4 was confident that MBL would *“help people make better choices”* and over time it would help people become more calorie conscious, which could effectively prevent overweight and obesity. Product innovation and reformulation was considered a likely industry response to MBL, not least driven by competition. What was also considered important is that MBL information has to be, and perceived as, accurate to install consumer trust;

“I think [...] that you can prevent obesity. I mean if you can make that awareness before get people get obese” (Expert 4)

Expert 2 was sceptical, however, that MBL would have any overall positive effects, speculating that energy displays on the menu would only confuse people and that pricing structures would entice people to eat more. He thought that industry response would be restrained by their profit maximising aspirations that favour value size pricing and disfavour reformulation. He also suggested that industry’s voluntary involvement in MBL was more likely addressing corporate social responsibility issues rather than a genuine attempt to improve public health;

“Value size pricing has been increasing and menus are becoming larger” while *“reformulation often means that the products are going to be more expensive”* (Expert 3)



4. Discussion

The next section will consider the results. First, the research questions will be addressed, followed by a more general discussion of the findings, together with their implications.

4.1 First Research Question: Will disclosing energy content on menu boards influence consumers' food choices by reducing energy ordered or consumed?

Based on the literature review, there is a general indication that MBL can produce modest, though meaningful, results by facilitating a decrease in energy consumption. The findings are nevertheless mixed, and lack of consistent or compelling evidence could be attributable to study design. Most of the reviewed studies had substantial methodological shortcomings including, small sample sizes, convenience sampling, cross sectional design, lack of control group, time frame of data collection, use of clinical settings, and use of proxy measures of calorie intake¹¹. Results should therefore be interpreted critically and with some level of caution.

These findings are relatively consistent with two previous systematic reviews. The first, by Harnack & French (64), found that five of six studies provided some evidence that calorie labelling may positively influence food choices, while the remaining study offered no such evidence. The review concluded that *“calorie labelling may have a beneficial effect [...], however, the effect is likely limited in magnitude”* (p.5). The second systematic review, by Swartz, Braxton & Viera, (79), found two of seven studies reported significant decreases in overall calories purchased while another study reported significant decreases, but only in some chains. Conversely, three had no effect and one resulted in some unfavourable differences. Despite concluding that MBL *“calorie menu labeling has no effect or only a modest effect on calorie ordering and consumption”* (p.5) the authors did not dismiss the potential of MBL overtime, speculating that prolonged exposure to the information will have a greater impact.

Similar mixed findings and optimistic conclusions emerged from two other reviews, where the effects of MBL on purchasing behaviour was considered amongst a wider range of MBL implementation issues¹² (35, 80).

¹¹ Energy consumption was most often presumed to be equal to the amount of energy ordered. Few studies measured actual energy consumption

¹² Including reporting on the presence of nutrition and calorie information in-store, awareness of calorie labelling in-store, consumer demand for MBL, consumer attitude to various MBL formats, consumer understanding of MBL information, MBL effects on sales and revenue and self-reported use of MBL



What seems more positive are the results of a Government sponsored process evaluation of MBL implementation in New South Wales (NSW), Australia, conducted in 2013 (eight months after inception). Results indicate that consumers are making healthier choices and there has been a significant decrease in the median kJ intake (52). These results are considered particularly valid since it was conducted in the real world, with a substantial sample size and is void of many of the methodological shortcomings previously mentioned. Further, industry compliance to legislation was achieved more thoroughly and rapidly in NSW, compared to the USA (47, 52, 58), which should provide more reliable results.

Based on evidence available, MBL will most likely influence food choices whereby consumers reduce energy ordered or consumed. This is not to say that every single customer will use the information every single visit. It will most likely affect some people, some of the time.

4.2 Second Research Question: According to Danish experts, what impact will MBL have on Danish consumers, in light of international experience?

Responding to the scenarios, the experts generally believed that MBL would assist consumers making informed and healthier choices. MBL information is expected to be increasingly noticed and understood by consumers over time, though some thought the energy information may be confusing, particularly if it is presented in both kJ and calories. Users of MBL were expected to have similar demographic characteristics as users of nutrition labelling on packaged food, with the exception of young males who are evidently emerging as a health- and body-conscious segment and were considered likely users of MBL. Older men and adolescents were considered least likely to use MBL information. Experts anticipated that pricing incentives may counter MBL effectiveness, but not to the same extent as in the USA. Danish consumers were considered likely to use MBL to reduce calories ordered, if their original selection contains unexpectedly high energy content or if an equally desirable, lower calorie option was available. Most experts believed this consumer reaction would provide industry with a strong motivation for product innovation to reformulate or introduce healthier options.

4.3 General Discussion

The extent to which the above factors will influence MBL use, according to the Danish experts, will be discussed within the adapted version of the 'Conceptual model of FOP label use' (Figure 4). The purpose is to identify key areas to help direct social marketing efforts and consumer research prior to MBL implementation.



4.3.1 Notice

A prerequisite for understanding and using MBL is that consumers must first see the information (72). Labelling can be registered consciously or subconsciously, but the greater amount of attention given to a label positively relates to its reported recognition and use (19).

The experts generally thought that Danes would consciously notice MBL. This could be reasonably expected given their demand for healthier fast food, particularly reduced fat and lower-energy options (42, 81). Further, the 4-Clover recommendations state that energy values on the menu boards must be displayed legibly and appear next to the price at the POP. Since price is an important determinant of food choice (78), the close proximity of calorie information improves the likelihood it will be seen.

This anticipated rise in awareness could reasonably be expected, based on the steady increase of Danish consumers' awareness of the keyhole symbol appearing on packaged food which rose from 57% in 2009, to 93% in 2012 (82, 83) (Figure 5).

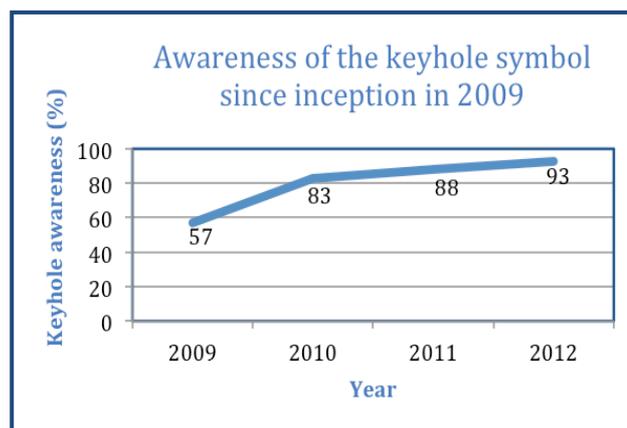


Figure 5: Increased consumer awareness of the keyhole symbol in Denmark since inception in 2009 (Data sources: 82, 83)

Experts mentioned the necessity of information being displayed at the POP. While some energy information is already available to consumers either in-store or on-line, in less prominent formats¹³, strong evidence demonstrates that it is rarely noticed. In one study, for example, only 6 of 4311 customers (0.1%) were observed accessing in-store nutrition information at four major chains prior to MBL (15). The provision of more prominent displays of energy, in the form of MBL,

¹³ Including counter mats, posters, pamphlets, tray liners, food wrappers and web-sites



however, resulted in sharp increase in the number of customers noticing in-store calorie information (15% to 54%) within four weeks of implementation (58).

Some experts thought diners at full-service restaurants were more likely to consider MBL, which was demonstrated by Pulos & Leng (34) in the US, where 71% of patrons noticed. But what may be more relevant is the context in which the food is to be consumed. Six out of ten Danes, for example, are very attentive to eating healthy breakfasts and dinners, but only four out of ten are very aware of eating healthy snacks or lunches (56). Further European consumers are more likely to attend to nutrition information when buying products with a healthier image (84) but consider nutrition information less relevant when buying treats (24). Campaigns supporting MBL implementation may therefore need to communicate the importance of calorie consciousness with regards to lunchtime meals, snacks and 'discretionary' calories.

A Nordic study showed that 76% of Danes thought it was important for nutrition labelling information to be laid out in the same format, while 57% thought it was important that labels appear in the same place (40). Therefore consistency in the presentation and location of the information could accelerate familiarity and understanding of MBL and facilitate comparisons between products, within and between chains (85).

4.3.2 Understanding

If consumers are to properly use MBL for immediate and subsequent food choices, accurate interpretation of the energy information, including the reference value, is necessary. There was a consensus amongst the experts that MBL would be understood by relatively few in the beginning and would be restricted to those who have an interest in health. Lack of knowledge regarding daily energy needs, the notion of energy balance and the meaning of kJ and calories, were considered great barriers by the experts.

According to an extensive pan-European study, consumers understand nutrition labels in the sense that they can rank foods according to healthfulness (86). It is therefore conceivable that Danes will learn to understand MBL and be able to rank items calorically, especially given their 'health consciousness'. Two thirds of Danes desire energy disclosure (55, 78), one half demand healthier fast food options (56, 78) and up to two thirds¹⁴ want healthier choices to be easily identifiable (56). Further, Danes have a relatively good understanding of FOP labelling (56), so it is

¹⁴ One third according to Krøyer & Schou (56) and two thirds according to Volhøj (78)



also conceivable that they can interpret the calorie content of their chosen menu item(s) in the context of a daily calorie allowance.

Denmark will be the first country to use both calories and kJ¹⁵ values on menus. Some experts anticipated this would cause confusion, through adding 'even more numbers' and using the unfamiliar term of 'kilojoules'. Results of a recent survey conducted by Coop (55) indicated that Danes have a poor understanding of energy measures or energy requirements. Calories were used by 60% of respondents, though only 20% knew (within a 4-500 calorie range) the daily calorie requirements for men and women. But fewer than 5% used kJ as a measure of energy and the same low proportion knew (within a 2000 kJ range) the daily kJ requirements for men and women. Similar challenges were faced in Australia where calorie terminology dominated the infrequent use of kJ and there was very low knowledge of daily energy requirements. An intensive education campaign¹⁶, however, significantly increased consumers' understanding of daily kJ needs within six months of implementation (52). Nordic recommendations acknowledge that *"a nutrition label is a tool for delivering information and should be supported by educational and other efforts"* (40). Therefore, similar efforts should be considered in Denmark to ensure improved understanding of both energy measures and the reference values.

Various studies assessing MBL understanding have shown that arranging items on a menu from lowest to highest energy content (37), adding colour schemes to emphasise high (red), medium (amber) and low (green) energy options (74), using a symbol or logo to indicate healthier options (25, 78) and presenting calorie information as exercise equivalents (87) can enhance comprehension. It may be prudent to test various displays of MBL to determine which formats Danes best understand and prefer to use. Results could be useful when deciding on the format in which energy amounts should be displayed (providing they comply with the European Union regulation¹⁷) or when devising social marketing and educational material to support implementation.

According to the Conceptual model of FOP use, understanding of a label is not enough to incite use. Consumers must also like and trust the label. Although not a topic of the interview guide,

¹⁵ As determined by *EU Regulation 1169/2011, Annex XV* (17) both energy measures must be displayed. Australia uses only kJ while the USA and the UK use only calories (the UK initiated MBL before the abovementioned EU regulation came into effect)

¹⁶ Education efforts included a comprehensive website (8700.com.au), interactive calculators for personal daily energy (kJ) intakes, a smartphone application, a Facebook page (8700kJ) and advertising in food courts, on radio, online search marketing, Facebook and mobile phone advertising (52)

¹⁷ According to the *Regulation (EU) No 1169/2011* (17) of the European Parliament and of the Council of 25 October 2011 on the provision of food information to consumers



'preference' was raised to some degree by the experts. If the MBL information is: a) too small, too faint or obscured in some way, b) confusing for consumers or c) exposed by the media as being inaccurate, then consumers' intention to use MBL may be negatively affected. These expressed concerns imply that MBL should be clear and legible, be supported with reference values and that implementation should be accompanied by extensive education and information campaigns, so consumers become familiar with MBL and know how to use it. Further, monitoring the accuracy of stated energy values could help install trust in the system. This could be likened to the public debate and media attention generated by the keyhole symbol appearing on a packet of potato crisps. Some were bewildered that such a product could be labelled as healthy, casting doubt over the credibility of the logo for a time (88).

4.3.3 Shopper Internal – Who is most and least likely to use MBL?

Experts generally agreed that females, families with young children, those with higher levels of education and those with a health interest or concern were the most likely users of MBL. These subgroups correspond to users of nutrition labels on processed foods in Denmark (56).

Food and health are described as female domains, which can make them more attentive to nutrition information (89). Families with children, particularly pre-teenage, seek (25) and pay more attention to (21, 90) nutrition labelling. This may reflect the parental responsibility of caring for a child's health, which gradually decreases as the child gains more independence, including with food choice (37). Increased levels of education relate to an increased capability to process numerical and theoretical information, thereby improving the ability to interpret MBL (89). Those with an interest in healthy eating or have a specific health concern have the motivation to attend to nutrition information (21, 29).

Conversely (older) males, some obese people and adolescents were considered by the experts to be less likely users of MBL.

Males, in general, have consistently been found to be less responsive to nutrition labelling, compared to females (25, 37, 83). They have even been shown to maximise calories ordered, which could reflect a desire for energy dense meals (64), or a perception that low calorie foods taste worse (60, 78). The revelation that younger males were expected to be likely users of MBL, as stated by two experts, could not be substantiated by any published study identified through this



research. However, the recent coining of the term 'metrosexual'¹⁸, used to embrace the new phenomena of younger males who are fashion and body conscious, does provide plausible support to this claim.

With regards to obese people, experts suggested that there are those who want to do something to reduce their weight and those who do not. Literature supports this division, where obese people are sometimes found to be the most responsive to nutrition labelling (66, 71, 92) and at other times are found to have a lower interest in healthy eating (18). Since a major aim of MBL is to reduce obesity, future studies must eventually measure body weight, fat, or obesity levels. As one expert suggested, MBL may be more effective in preventing obesity rather than affecting those who's BMI already exceeds 30. Future studies differentiating between the incidence and prevalence of obesity may capture this potentially positive outcome. Research concerning dietary intake and overweight and obesity are particularly susceptible to social desirability bias (93), therefore studies must be designed to diminish this response bias.

Adolescents are less willing and less able to make healthful choices (37). Classic adolescent mindsets, such as optimistic bias, lead this age group to unrealistically perceive themselves to be invulnerable to adverse health outcomes (94). Immediate gratification and attention to taste, convenience and low cost are often prioritised over health (65, 69), which can cause them to purchase higher amounts of calories (95), especially in the absence of adult input (65). This indicates that adolescents are important targets for education campaigns, but may be difficult to reach.

As suggested by an expert, incorporating energy values into mathematics and home economics curricula could be useful in stimulating childhood interest and understanding to promote healthier eating patterns, which they can continue into adulthood. Social media popular with adolescents, such as Facebook, YouTube, mobile apps or interactive websites, should also be used for campaign efforts to reach and engage this segment who otherwise tend to resist health messages (38).

4.3.4 Shopper Internal – Expectancy (dis)confirmation

Experts believed that MBL may have little affect where consumers already perceived fast food as unhealthy, particularly if they visited these establishments rarely. Conversely, the experts believed

¹⁸ A heterosexual, usually urban male who pays much attention to his personal appearance and enjoys shopping, fashion, and similar interests traditionally associated with women or homosexual men (91)



that MBL effects would be most profound, but not limited to, situations where actual energy values greatly exceed consumers' expectations. Expectancy disconfirmation theory supports such an effect (70) as do a number of studies (35, 37).

The availability of an equally preferable, but lower-energy alternative was also very likely to influence intent to purchase, according to expert opinion. This is supported by international studies (37) and also a recent Danish study where coffee vending machines were labelled with calorie content (96). In this controlled experiment, conducted in Danish blue- and white-collar workplaces, the percentage of high-energy drinks (>30 calories) selected from labelled (4 x intervention) machines significantly decreased over the intervention period compared to an overall increase in the percentage of high-energy drinks selected from the unlabelled (2 x control) machines. The results also showed those choosing coffee from the intervention machines were more than twice as likely to select a low calorie option compared to those selecting coffee from the control machines (OR 2.19 $p < 0.0001$).

Experts also anticipated that consumers could use MBL for 'calorie accounting'; where one high calorie meal could be compensated with a subsequent low calorie meal. This is an important effect, according to Roberto and colleagues (51), who found MBL (together with reference values) reduced participants' calorie consumption later the same day.

Consumer aversion of high calorie menu items would, according to experts, provide industry with the strongest incentive for product innovation to reduce energy content. Such industry response was evidenced by the dramatic increase in the availability of lower-energy or 'diet' options on supermarket shelves, which coincided with the introduction of nutrition labelling on packaged food¹⁹ (97). Similar responses, as a direct consequence of MBL, have already emerged where restaurants have reformulated menu items so they are less caloric (33, 37) or introduced new low-energy products (90). An exploratory analysis of fast food menus before and after MBL implementation in the USA showed that healthier options increased significantly from 13% to 20% at locations with MBL while the control locations remained static at 8% (98). Evidence therefore supports the likelihood of product innovation and reformulation in with regards to offering healthier options in Denmark, in response MBL implementation.

¹⁹ The same study showed nutrition labelling was also responsible for industry to reformulate products or develop new ones with more favourable compositions, such as reducing salt, saturated fatty acids and added sugar and increasing dietary fibre (97)



4.3.5 External – Pricing structures and incentives

The experts concurred that price is very important to many Danes when eating meals outside the home and further agreed that value size pricing, meal-deals and other promotions may be a competing factor influencing consumers' choices. Some experts believed that pricing structures and promotions could be more persuasive than MBL information, which tends to be the case in the USA where price is extremely important to the vast majority of customers (64). Contrastingly, optimistic expert views suggested that the Danes' demand for healthier food, even if it is more expensive, will enable consumers to ignore economic incentives to increase portion sizes or bundle meals.

It is conceivable that Danes will be less inclined to succumb to value size pricing when comparing what motivates fast food choices in the USA compared to Denmark. The main motivator in the USA is taste (97.6%) followed by convenience (91.8%), while price is important to over three-quarters of the population (83.8%) (64). In Denmark, however, convenience is the primary motivator of fast food choice (79%), followed by taste (51%) while price is important to less than one-quarter of the population (23%) (99). Further, the main reason Danes refrain from fast food is because it is considered too unhealthy and particularly high in calories (99).

Expectations, by one expert, that MBL could favourably change purchasing behaviour, despite pricing incentives offered, were based on a recent study in Denmark conducted by Volhøj (78). The results showed that 78% of Danes want a greater range of healthier fast foods, with an emphasis (77%) on low fat options. It also demonstrated that healthier options were chosen almost five times more often, when they were more accessible or otherwise promoted. At the participating McDonald's outlet, 9% chose healthier options when prompted by the intervention cashier, compared to only 2% of customers served at the regular/control cashiers ($p=0.012$). There was a significantly lower proportion of customers who supersized in the absence of cashier prompts (6%), compared to for those receiving regular service that promoted such deals (20%, $p=0.027$). In Volhøj's study (78), the promotion of healthy options and not inviting patrons to supersize resulted in consumers ordering significantly less energy on average (113 calories, $p=0.025$).

Other interventions using choice architecture have found that colour coding menu items to decipher the level of healthiness improved sales of healthy items, and the effects were enhanced when healthy items were more visible and easily accessed (100).



4.4 Main Outcomes and Implications

There are a number of indicators to suggest that MBL could have a more profound effect in reducing calories purchased in Denmark, compared to the moderate and inconsistent effects in the US, as described in the reviewed literature.

Primarily, Danes are expected to notice the information, which is a prerequisite for use. According to the literature available, prominence, clarity and consistency are vital for the information to be noticed. The first two conditions are adequately addressed by the 4-Clover recommendations. Stipulating consistency in the font and positioning²⁰ of the energy value(s) could, however, improve the likelihood of consumers noticing.

Given the Danes' relatively good nutrition literacy, as demonstrated by their understanding of FOP labels and their interest in healthier foods, MBL is likely to be well understood by Danes, enabling them to use the information efficiently. The inclusion of reference values, as recommended by the 4-Clover Alliance, will serve to enhance understanding. It will also be necessary to ensure MBL information is perceived as trustworthy by consumers, to promote understanding and subsequent use. Future evaluations should include questions to help gauge public understanding of energy content of food choices and their perception of the accuracy of the MBL information.

Those deemed least likely to use MBL information have been narrowed to three subgroups. No studies reviewed suggested how to address two of these subgroups; older men and some obese people. One expert suggested, however, that MBL might be more effective in preventing, rather than reducing, obesity and such possible outcomes should be monitored. There are encouraging suggestions from Australia for addressing the remaining subgroup, adolescents who are the most frequent consumers of fast food, through popular social media and novel approaches.

Danes seem less likely to succumb to pricing incentives compared to Americans, given their focus on convenience and taste and demands for healthier fast food options.

Where convenience is the strongest motivator for food selection and healthy choices are the default options, consumers are more likely to make healthier choices (60). Through the literature reviewed, these prerequisites exist in Denmark, which provides an opportunity for MBL to have

²⁰ Stipulating, for example, that the energy value should always be either immediately before or after the price and that it be in the same font as the price



more profound effects than experienced in the USA. It has been shown that; a) Danes desire healthier foods, which are lower in energy b) they respond well to choosing healthier options when they are more accessible or if they are the default options, and c) they prioritise convenience over price when choosing food outside the home. These factors collectively present a largely untapped potential, first identified by Mäkelä, Lillebø & Lammi, (101) whereby providing healthier foods could boost sales and increase client base, and this commercial opportunity should be communicated to industry.

Assessing reductions of calories ordered should not be the only measurement used to evaluate the effectiveness of MBL. Other measurements such as: a) improved consumers understanding of energy consumption b) consumers' enhanced ability to estimate the energy content of meals ordered, c) increased public knowledge of daily energy requirements, d) increased application of calorie substitution to compensate occasional indulgences e) increased consumer demand for lower-calorie options, and f) industry initiatives to reduce energy content through product innovation such as reformulation, reducing portion sizes or using low-calorie default options when bundling, are all equally valid indicators of positive MBL effects in relation to public health.

Measured effects in the Danish population should be interpreted with caution and should not be directly compared with results in the USA. Because consumption of food outside the home is less frequent²¹ and overweight and obesity rates are lower in Denmark²² compared to the USA, the effects on energy purchased and changes in body weight can reasonably be expected to be more subtle in Denmark.

The value of periodical monitoring will be enhanced if it is conducted after full compliance, if it allows time for consumers to understand and apply MBL information when making food choices and if baseline data are available for comparison.

²¹ On average Danes eat out about once a week (78). Around 15% eat out 1-2 times per week, around 70% eat out less than once a week (92). Approximately 49% of Americans eat out at least 3 times a week and 12% eat out more than 7 times a week (92)

²² In Denmark, 46.7% adults are overweight and 13.4% are obese (3). In the USA, 69.2% of adults are overweight and 35.9% are obese (103)



5. Conclusion

The results of this study suggest that the positive effects of MBL experienced in international settings could be even more profound in Denmark. The Danes demand healthier fast foods and their food choices are primarily determined by the appeal of convenience. This study found that such conditions indicate that Danish consumers are more likely to use MBL and choose lower energy options, when they are available, easily identifiable and particularly if they are the default option.

What is important to optimise the potential of MBL in Denmark, according to the findings, is ensuring the information is understood as intended, which will include taking adequate measures to broadcast MBL implementation thoroughly. Media releases, social marketing and publicity campaigns supporting implementation should primarily target adolescents, as they are the most frequent consumers of fast food and least likely to use the information without appropriate persuasion. Such priorities also recognise the importance of preventing obesity pre-adulthood. Given the expressed concerns that pricing incentives may be the most likely impediment to MBL use in Denmark, social marketing efforts may consider focussing on the caloric consequences of larger portion sizes, which promote over-consumption. The initiative must also be monitored or administered to an extent to instil consumer trust in the system.

As consumption of food outside the home increases and the rates of overweight and obesity continue to rise, failure to disclose the energy content at the POP is a particular public health concern. MBL offers to support the objectives of Denmark's *National Action Plan Against Obesity*; namely preventing overweight and obesity; maintaining healthy body weight; and promoting weight loss for those whose BMI exceeds 25 (5). As a part of a multifaceted approach, such action is needed to curb the obesity epidemic, which the World Health Organisation projects will result in 60-70% of all Europeans being overweight by 2030 if the current trend continues (5).

The obesity epidemic indicates that many consumers struggle to make informed food choices. MBL helps make the POP environment more conducive to selecting healthier choices, which is absolutely necessary if consumers are expected to display any degree of personal responsibility.

Food policies have been classified into two broad categories, those that support informed choice through the provision of information or education and those that are capable of changing the market environment or food availability (9). This study found evidence that both categories could potentially be addressed by MBL implementation in Denmark. Given the Danes' demand for



healthier fast food options, it is probable that lower-calorie options become available through favourable product innovation and reformulation as a direct consequence of MBL. The advantage of supply side changes is that they can overcome the risk of increasing health disparities that can arise from knowledge-based interventions (50).

Bound by time and other resource limitations, this was an exploratory study based on literature (relating to both international MBL experience and Danes' attitudes to nutrition labelling) and expert opinion. The results legitimately and unequivocally support that MBL efforts should be pursued, whether it is regulated through a voluntary agreement or national law. While the findings offer some of the first evidence anticipating the potential of MBL in Denmark, they are however limited by the absence of actual consumer research with regards to MBL use among Danes. What this study does provide is direction for further consumer research necessary to optimise MBL use in Denmark.



List of Abbreviations

BMI	Body Mass Index
calories	kilocalories
CDC	Centers for Disease Control and Prevention (United States of America)
CSPI	Centre of Science in the Public Interest
DOH	Department of Health (United Kingdom)
ECDA	European Chronic Disease Alliance
EU	European Union
EUFIC	European Food Information Council
FAO	Food and Agriculture Organisation
FLABEL	Food Labelling to Advance Better Education for Life
FOP	front-of-pack (labelling)
GDA	guideline daily amounts
HECTOR	Eating Out: Habits, Determinants, and Recommendations for Consumers and the European Catering Sector (HECTOR project)
kJ	kilojoules
MBL	menu board labelling
MSF	Ministeriet for Sundhed og Forebyggelse (Danish Ministry of Health)



NBH	National Board of Health (Denmark)
NCD	noncommunicable diseases
NHFA	National Heart Foundation of Australia
NSW	New South Wales (Australia)
POP	point-of-purchase/point-of-selection
PHN&FP	Public Health Nutrition and Food Policy
OECD	Organisation for Economic Co-operation and Development
OR	Odds Ratio
RD	Relative Difference
SES	socio-economic status
UK	United Kingdom
US	United States
USA	United States of America
WASH	World Action on Salt and Health
WHO	World Health Organisation



Definition of Terms

BMI (Body Mass Index) is a measurement used to assess overweight and obesity using an adult's weight (in kilograms) divided by the square of his or her height (in metres). A BMI of 30 or more is classified as obese, while 25 or more is considered overweight (103).

Bundling see 'Meal-deals'

Chain is defined by the respective Acts or voluntary agreements but generally applies to food service outlets/restaurants operating under the same name with around 15 to 20 locations. The range of establishments includes burger houses, cafes, juice or sandwich bars, ice-cream or pizza parlours, service stations, convenience stores, coffee shops, bakeries and full-service restaurants (80).

Kilocalories (abbreviated in this document as 'calories') and kilojoules (kJ) are units of energy from food that is available for the body to metabolise (105). One calorie is equivalent to 4.18 kJ (106). The terms **energy content, calories and kJ** are used interchangeably throughout this document.

Expectancy disconfirmation occurs when someone's expectations are subsequently disconfirmed. According to expectancy disconfirmation theory, purchasing behaviour responds to the level of 'surprise'. Significant underestimation of calories results in negative disconfirmation, which can influence a consumer to avoid a food item, while substantial overestimation of calories results in positive disconfirmation, which provides motivation to choose that food item. **Expectancy confirmation** occurs when expected calorie content is consistent with actual calorie content, and has little influence on changing food choice (31, 61, 70).

Fast food includes convenience and ready-made food and beverage items purchased in quick service (including self-service or counter-service) venues (8), which are typically energy-dense (107).

Based on the HECTOR (Eating Out: Habits, Determinants, and Recommendations for Consumers and the European Catering Sector) project definition, **food eaten outside the home** primarily includes meals, beverages and snacks prepared by food services that are consumed outside the home. But, it can also include meals purchased from food services, which are subsequently eaten at home (e.g. takeaway). The definition tends to place greater emphasis on where or who the food



was prepared by, rather than the location it was eaten, thereby excluding food made in the home and later eaten elsewhere (108).

Various formats of **front-of-pack (FOP) labelling** can consist of a simplified message, a signpost or symbol to summarise the more complex nutrition information found on the back of processed foods (20). They act as interpretational aids to facilitate consumers choosing healthier foods (usually within a food range) and stimulate industry innovation towards healthier products (109).

Meal-deals refers to the **bundling** of pre-selected menu items to create a 'meal', which usually constitutes a main item (such as a burger), a side order (such as french-fries) and a (soft) drink. From a marketing perspective, it encourages people to purchase more and it expedites the food selection and food service process (110).

Menu board labelling (MBL), also known as 'calorie posting' and 'menu labelling', refers to the prominent display of energy values appearing on menu boards, next to the price of standardised food and/or beverage items. A statement as to the recommended daily energy intake for an average adult should accompany it (known as reference values) (36). Throughout this document MBL can also refer to energy values appearing on drive-through menus, hand-held menus or small place cards appearing next to the item on display. Examples of various MBL appear in Figure 6:



Figure 6: Examples of different MBL formats including place cards, handheld menus and menu boards (Source: CSPI, n.d.)

Nutrition labelling traditionally refers to the nutrition facts panel found on the back of processed foods but also encompasses front-of-pack labelling, the ingredients list and nutrition or health claims (19, 24, 111).



Overweight and **obesity** is defined as abnormal or excessive fat accumulation that presents a risk to people's health (104) (also see **BMI**).

Point-of-purchase (POP) refers to the place where food and beverages are ordered, usually at the cash register. **Point-of-selection** refers to the place where food choices are made such as convenience store shelves, cafeteria lines or other food displays (80). For the purpose of simplicity, in this study, 'point-of-purchase' can also refer to 'point-of-selection'.

Processed and **Pre-packaged foods** apply to foods that have undergone some preparation or preserving process and are not considered raw or natural. They are made-up in advance, ready for the consumer, or for catering purposes in various containers and packaging (112).

A Public health awareness campaign is an organised communication activity that is aimed at either the whole population or sub population(s) with the intention of achieving a particular health goal (113).

Reference values provide generic recommended daily energy requirements, such as 'an average adult requires approximately 2000 calories per day'. Figure 7 provides another example. Intended as interpretive guidance to help judge whether calorie content is high or low, reference values can guide consumer understanding by helping put the calorie information in perspective (51, 80).



Reference Value →

Figure 7: Example of reference values (Source: FSA, 2011)

Standardised menu items include food and beverages routinely offered where the ingredient quality and quantity remains consistent throughout the restaurant chain (80).

Social marketing is public health strategy that seeks to influence social behaviours to the benefit of a defined target audience or the general population. It uses commercial marketing approaches, without the commercial profiting aspect (114).



Value size pricing or **Supersizing** provides an economic incentive to purchase more (calories) for relatively less money. Prices are structured so that the price per volume or weight unit is greatest for the smallest size, so buying larger portions is comparatively cheaper (115). As an example, a large portion of french-fries contains 157% more calories, but costs just 67% extra (116).



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Appendix I: Literature Review Summary Table - Measuring the Effects of Providing Energy Information at the Point-of-Purchase

Author(s) (year)	Country	Objective	Design	Participants	Setting(s)	Outcomes & Conclusions	Limitations
Bassett et al. (2008) (Ref. 46)	USA	Characterise customers' fast food purchases relating to their awareness of calorie information prior to NYC's calorie labelling legislation	Cross-sectional survey where up to 50 receipts were collected at each restaurant	7318 adult lunch-time customers provided their receipts of which 7152 responded to the survey questions	167 fast food restaurants from 11 chains (including Subway ¹) in NYC who provided calorie information publicly (either on-site or on-line)	'Seeing' MBL reduced average calories purchased by 52 calories 'Seeing and using' MBL reduced average calories purchased by 99 calories 37% of Subway patrons who noticed calorie labelling, used this information to affect their purchase "overall [...] when fast food chain patrons are provided calorie information prominently prior to purchase, many will see it and use it to reduce their caloric intake" (p. 1459) "[...] even modest reduction in calories (e.g., 50 calories per meal) could significantly reduce population-level caloric intake" (p.1459)	Subway promote themselves as offering 'healthier food choices' which may attract a different profile of customers compared to other fast food chains Convenience sampling where the profile of customers willing to provide receipts and answer survey questions may have been different to those who chose not to participate
Bollinger, Leslie & Sorensen (2010) (Ref. 61)	USA	Measure the effect of the NYC calorie labelling, and investigate the mechanism underlying the measured effect	Sub-study 1² : Analyse and compare all sales transaction data from Starbucks in NYC (intervention) and Boston/Philadelphia (control) for 14 months (3 months prior and 11 months after the calorie labelling regulation was introduced in NYC)	Sub-study 1 : Starbucks' customers generating over 100 million transactions in the complete data set for the study period	Sub-study 1 : 222 Starbucks locations in NYC, 94 locations in Boston and Philadelphia	Calorie labelling decreased the average 'per transaction' calories by 6% (from 247 to 232 calories) There was no significant difference in beverage calorie purchases per transaction in the pre- vs. post-periods Average food calories per transaction decreased by 13.7%; ¼ due to reduced calories per transaction and ¾ due to customers buying fewer food items per transaction	External validity - results from Starbucks may not transfer to other chain fast food restaurant settings Did not measure the effects of MBL on BMI Otherwise this is the strongest of the studies, especially given the very large sample size and 14 months of (complete) data collection of all purchases.

¹ Only Subway offered calorie information near point of purchase at the time of this study

² Some studies consisted of a number of sub-studies. In such cases, relevant sub-studies have been included in the summary table and can be identified by 'Study 1', 'Study 2' or 'Study 3' (as they appear in the original article)



Author(s) (year)	Country	Objective	Design	Participants	Setting(s)	Outcomes & Conclusions	Limitations
Cont... Bollinger, Leslie & Sorensen (2010)			Sub-study 2: Analyse individual purchasing behaviour by observing sales data recorded for 'loyalty' cardholders for 13 months	Sub-study 2: Starbucks' loyalty cardholders who average one or more transactions per week (NYC 7520; Boston/Philadelphia 3772) totalling 1.5 million transactions	Sub-study 2: Analysing individual purchasing behaviour by observing sales data recorded for 'loyalty' cardholders for 13 months	Cardholders who averaged >250 calories per transaction pre-labelling, decreased calories by 26% post-labelling (the greatest effect was seen with high calorie per transaction patrons) Greater decreases in calories per transaction were seen for those cardholders with zip codes of higher levels of education and income Women appeared to be more responsive to MBL than men "Calorie posting should encourage restaurants to innovate and offer low-calorie options..." [There are also] public education benefits from the policy; consumers' exposure to calorie information may make them generally more aware and attentive to the nutritional value of foods they eat" (p.28)	
Burton et al. (2006) (Ref. 31)	USA	Sub-study 2: Examine how the provision of nutrient information affects attitudes and purchase intentions using expectancy-disconfirmation theory	Sub-study 2: Mixed experiment design examining 3 (nutrient information) x 2 (daily value information) x 4 (menu item). Nutrient information included: calories, fat, SFA and sodium levels; calories only; or no information Menu items included: deluxe hamburger with fries, chef's salad, chicken breast with baked potato and turkey sandwich	241 respondents (50% response rate) 97% had graduated from high school 63% female Aged 23-85	Mail survey to participants in a South-Central State	The provision of nutrient information, where calories exceeded customer expectations, had a significant impact on food attitude, purchase intention and choice When calorie content and reference values for average daily energy intake were provided, there was as significant decrease in purchase intention for the burger meal and chef's salad where the actual calories disclosed were much higher than the participants expected "Provision of easily accessible nutrition information in restaurants may provide significant public health benefits by making it easier for consumers to make more healthful food choices" (p.1674)	Small sample size and low response rate Measured purchase intentions rather than behaviour Subjects only had a choice between 4 meals Assumed, rather than measured, participants' "expected" calories for each of the meals



Author(s) (year)	Country	Objective	Design	Participants	Setting(s)	Outcomes & Conclusions	Limitations
Burton, Howlett & Tangari (2009)	USA	Using the expectancy-disconfirmation model, determine how objective calorie estimates, compared to actual calories, influence consumers fast food choices	Sub-study 2: Controlled experiment examining a 2 (menu calorie disclosure: present; or not present) x 3 (consumer expectations: (confirmation; negative disconfirmation; or positive disconfirmation) x 2 (Burger King or Subway) mixed design	Sub-study 2: 363 adults 53% female Median age 47	Web-based consumer panel	Purchase intentions were significantly different when calorie information was disclosed. Positive disconfirmation increased orders of lower calorie meals from 25% to 34% while negative disconfirmation (actual calories are higher than expected) decreased high calorie choices from 36% to 25% Burger King's tender grill salad and Subway's Caesar salad were both overestimated by almost 200 calories Burger King's Whopper with cheese meal and Subway's 12 inch turkey sub with cheese meal were both underestimated by around 30%, 353 and 357 calories respectively "...the relationship between actual and expected nutrition levels drives responses, rather than the disclosure of information <i>per se</i> " (p.258)	Small sample size Measured purchase intentions rather than purchase behaviour Did not provide a reference value for recommended daily average adult calorie intake to support calorie labelling
Chu et al., (2009) (Ref. 62)	USA	Examine changes in meal selection when nutrition labels (including energy, sodium, fat, protein, and carbohydrates) were provided at point-of-selection	Quasi-experimental, single-group, interrupted time-series design examining changes in average energy content of entrées pre-, during- and post-labelling (where labels were removed) according to data collected from electronic sales register records The pre- during- and post-labelling periods were each 2 weeks in duration	Catering largely to college students, the canteen sold between 13,951 and 14,199 entrées in each period	Dining centre in Ohio State University, Columbus, which served food resembling what most chain restaurants offer	The introduction of calorie labelling immediately significantly reduced average energy content of entrées sold (by 12.4 calories; p=0.007) and remained constant during the labelling period. Calories per entrée sold gradually increased again (by 1.5 calories per day; p=0.013) when calorie information was removed again There was a significant decrease in sales for entrées with the highest calorie content between the pre-labelling and labelling periods (P=0.007) "use of nutrition labels reduced the average energy content of entrees purchased without reducing overall sales" (p.2001)	Higher levels of education have been found to be a factor in improving consumers response to nutrition labelling (Bollinger, Leslie & Sorensen 2010) As this study was in a university setting this could have created selection bias by ensuring a more 'responsive' sample



Author(s) (year)	Country	Objective	Design	Participants	Setting(s)	Outcomes & Conclusions	Limitations
Dumanovsky et al. (2011) (Ref. 63)	USA	Assess the impact of calorie menu labelling of fast foods on energy content of individual purchases	Cross-sectional surveys 1 year before and 9 months after NYC's calorie labelling regulation	15,798 adults (7309 pre-regulation and 8489 post-regulation) 1/3 of sample came from high-poverty neighbourhoods	Lunch-time purchases at 168 of New York's 11 most popular fast food chain restaurants, randomly selected	<p>Overall, mean calories purchased did not change between pre- and post-regulation (828 vs. 846 calories; $p=0.22$) 3 chains, which accounted for 42% of the sample however, showed significant reductions³ (McDonald's 829 vs. 786 kcal $p<0.02$; Au Bon Pain 555 vs. 475 kcal, $p<0.001$; KFC 927 vs. 868 kcal, $p<0.001$)</p> <p>Mean energy purchases increased for Subway⁴ 749 vs. 882 kcal ($p<0.001$), while 7 chains experienced no change</p> <p>The 15% who reported using calorie information post-regulation, purchased 106 fewer kcals ($p<0.001$) compared to other customers</p> <p>Those who were more likely to use calorie information, by:</p> <ul style="list-style-type: none"> • Gender: Females (18%) vs. Males (13%) $p<0.001$ • Neighbourhood: Wealthiest (19%) vs. Moderate poverty (17%) vs. poorest (12%) $p<0.001$ • Age: 45+ (16%) vs. 18-24 (11%) $p<0.001$ <p>"There is a positive effect of calorie labelling on energy intake at some major chains, and that use of the information is clearly associated with lower calorie purchases across chains. However, a clear reduction in energy intake across the full sample was not found" (p.5)</p>	<p>Large time gap between data collection periods which encompassed a severe economic downturn</p> <p>Overall reductions in frequency of visits could not be detected</p> <p>Assessed lunch-time meals only and could not detect changes in calories consumed in other meals throughout the day</p> <p>Subway's increase in mean calorie purchases may be partly explained by the introduction and heavy promotion of value-size pricing 'combo meals' coinciding with the labelling regulation (Burton, Howlett & Tangari, 2009)</p>

³ McDonald's offered a broader range of menu items thereby facilitating changes in menu choices in response to MBL, Au Bon Pain launched a low-cal "Portions" menu which offered items under 200 calories at the same time of MBL regulations coming into effect. KFC introduced a grilled chicken option to the existing fried chicken selection at the time of MBL introduction

⁴ Subway introduced meal-deals and value size pricing at the time MBL regulations came into effect, which provided economic incentives for customers to increase total energy value purchased



Author(s) (year)	Country	Objective	Design	Participants	Setting(s)	Outcomes & Conclusions	Limitations
Elbel, Gyamfi & Kersh (2011) (Ref. 65)	USA	Compare fast food choices amongst children and adolescents from low-income communities before and after calorie labelling regulations in NYC (intervention) and Newark (control)	Natural experiment, using matched communities in a 'street intercept' survey to collect receipt data about 2 weeks before and about 4 weeks after mandatory labelling began in NYC	349 subjects up to the age of 17, visiting restaurants alone (31%) or with their parents (69%) Adolescents, 13-17 years of age, made up 54% of the sample 47% were male 66% identified themselves as black, 24 Latino and 11% mixed or White	Lunch-time purchases at 4 of the largest chain restaurants in the 2 cities (McDonald's, Burger King, Wendy's and KFC)	No significant difference in calories purchased pre- and post- labelling NYC pre 643 vs. post 652 (P=0.82); Newark pre 611 vs. post 673 (p=0.37) 16% of NYC adolescents who noticed the calorie labelling, considered this information to make their meal choice No apparent increase in parents' involvement in child's meal selection "MBL had no significant effect on purchasing behaviour [...] for a low-income, racially and ethnically diverse population of parents and adolescents" (p.8)	Short time-frame between data collection periods Small sample size which focussed on lower socio-economic adolescents (2 factors which indicate resistance to calorie labelling is younger age and lower socio-economic status) Didn't measure if MBL had the effect of avoiding or reducing frequency of fast food consumption
Elbel, et al. (2009) (Ref. 58)	USA	Compare fast food choices amongst adults from low-income communities before and after calorie labelling regulations in NYC (intervention) and Newark (control)	Natural experiment using 'street intercept' survey practices to collect receipt data about 2 weeks before and about 4 weeks after mandatory labelling began in NYC	1156 adults from low-income, ethnic origin diverse communities in NYC and Newark	Lunch- and dinner-time purchases at 4 of the largest chain restaurants in the 2 cities (McDonald's, Burger King, Wendy's and KFC)	27.7% of those who saw MBL said this information influenced their food choice though no actual change between calories purchased pre- and post-regulation was detected Regression adjusted calorie content NYC pre 825 (779-870; 95% CI) - post 846 (758-889; 95% CI) Newark pre 823 (802-890; 95% CI) - post 825 (746-906; 95% CI) MBL resulted in 54% more customers noticing calorie information. "This meaningful change [...] could set the stage for a larger influence [...] as time and public policy progress" (p.1117)	Short time-frame between data collection periods Restaurants were not in full compliance of the regulation at the time of collecting post-regulation data Small sample size which focussed on lower socio-economic adults
Finkelstein et al. (2011)	USA	Measure the impact of the King County mandatory menu labelling regulation, including calories appearing on menu and drive-through	Natural experiment collecting transaction data for every menu item sold 11 months prior till 13 months after the regulation became mandatory for menu	-	14 Taco Time quick-service Mexican restaurants (7 control, 7 intervention locations) in the	After MBL introduction, customers purchased 5.7 more calories (p<0.05) in-store and 2.9 more calories (p<0.05) at drive-through counters A difference-in-difference regression analysis found that calories did not reduce per transaction post regulation	Limited to one fast food chain Control group may not have been appropriate given the constant difference between average calories ordered between periods



Author(s) (year)	Country	Objective	Design	Participants	Setting(s)	Outcomes & Conclusions	Limitations
Cont.... Finkelstein et al. (2011)		boards by comparing restaurants within King County (intervention) and non-King County (control)	board labelling (6 months for the drive-through menu board labelling became mandatory)		State of Washington	“In this setting, mandatory menu labelling did not promote healthier food-purchasing behaviour “The results [...] show no significant impact of menu labelling” (p.125)	‘Store-wide data’ did not allow detection of difference between customer sub-groups
Gerend (2009) (Ref. 67)	USA	Evaluate the effects of calorie labelling on college students’ fast food choices and compare the affects between the genders	Experiment where students randomly received a menu card (based on McDonald’s) with or without calorie labelling and made hypothetical orders based on 3 scenarios (a quick dinner; extremely hungry; or not so hungry)	College students aged 17 to 25 years of age 111 males 177 females 65% ate fast food at least once a week	The experiment was conducted in the investigator’s laboratory (College of Medicine, Florida) where 1 to 5 students participated at a time	When calorie information was provided, females chose lower calorie options for both individual food items and complete meals They also ordered significantly fewer (146) calories per meal than females who did not receive the information There was no effect on males’ food choices “... relatively small and inexpensive environmental changes such as providing calorie information at point of purchase could have positive implications for public health” (p.86)	Clinical setting where hypothetical food choices were compared rather than actual food choices Possible respondent bias due to some participants providing socially desirable answers Small sample size
Girz et al. (2011) (Ref. 71)	Canada	Examine the effects of meal choices and amount consumed (between ‘healthy’ and ‘less healthy’ options) when ‘manipulated’ ⁵ calorie information was provided (condition) compared to no calorie information provided (control) Compare the affects	Sub-study 1: Experiment e randomly assigned menus containing just 2 items, a salad or a pasta. Although both dishes contained around 1200 calories, menus were manipulated in the ‘condition’ scenarios Condition 1 - low-calorie salad (600 calories); high-calorie pasta (1200 calories) Condition 2 - high-calorie salad (1200	Sub-study 1: 149 female students (average age 19)	Clinical but ‘restaurant-like’ setting	Sub-study 1: Calorie information affected food selection among restrained eaters, but not unrestrained eaters	Small sample size Limited food choices Clinical setting People ordered and ate their meal alone, which may have altered their choice or the amount eaten than if they were dining with company 8 participants did not notice the calorie information

⁵ Calorie counts appearing on the respective menus were not accurate, but instead were fictitiously increased or decreased for the purpose of the study



Author(s) (year)	Country	Objective	Design	Participants	Setting(s)	Outcomes & Conclusions	Limitations
Cont.... Girz et al. (2011)		between dieters and non-dieters	calories); low-calorie pasta (600 calories); Control – no calorie information Sub-study 2: Further conditions (in addition to those in Study 1): reference values added to the menu which suggested average daily calorie intake - Reduced low calorie options to 400 calories in the 2 condition scenarios - Added a 4 th condition, high-calorie salad (1200 calories); high-calorie pasta (1200 calories)	Sub-study 2: 254 undergraduate students 138 females 116 males mean age between 18 and 19		Sub-study 2: Female dieters in Condition 1 were more likely to choose salad and less likely to choose pasta (p=0.027) None of the 3 Condition scenarios had an effect on unrestrained eaters Dieters ate marginally less than non-dieters in the control scenario Non-dieters ate marginally less when calorie labels were provided together with reference values (p=0.083) Findings supported expectancy disconfirmation theory “The rush to provide calorie information may not prove to be the best approach to fighting the obesity epidemic” (p.6)	
Harnack et al. (2008) (Ref. 59)	USA	Examine the effect of point-of-purchase calorie information with reference values and value size pricing on fast food meal choices	Single-blinded randomised controlled 2 x 2 factorial trial where meals (based on McDonald’s lunch and dinner menu items and sizes) with manipulated calorie information and reference values were, or were not, provided and value size pricing was, or was not, used, to create four different menu conditions Surveys were also conducted on the same participants Food ordered and	594 adults and adolescents (16 years and older) from Minneapolis St. Paul, Minnesota metropolitan area, who regularly ate at fast food restaurants 59% female	Clinical settings (a church basement and hotel conference rooms) where participants chose their respective dinners from 1 of 4 fictitious menus	There was no significant difference (p=0.25) between the 4 menu labelling conditions for the calories consumed or the portion sizes ordered Mean calories ordered: Calorie 874, Price 882, Calorie + Price 842, Control 828 (p=0.62) Mean calories consumed: Calorie 805, Price 813, Calorie + Price 761, Control 739 (p=0.25) Only half of the participants who received calorie information (which was very clearly labelled) actually noticed it, though the average calories consumed by those who noticed and those who didn’t were similar (690 kcal vs. 671 kcal p=0.65)	Clinical setting Limited exposure to the ‘experimental’ conditions, where repeated exposure is often needed before customers become aware and use it Sample seemed to be resistant to nutritional information as only half noticed clearly labelled calorie content on the menus provided and only 58% thought about nutrition when buying fast food



Author(s) (year)	Country	Objective	Design	Participants	Setting(s)	Outcomes & Conclusions	Limitations
Cont.... Harnack et al. (2008)			consumed was recorded			“Providing calorie information for food items on fast food restaurant menus may have little effect on the food choices made by adolescents and adults who regularly eat at these establishments” (p.11)	
Pulos & Leng (2010) (Ref. 34)	USA	Assess the effect of adding nutrition information to menu cards in independent full-service restaurants	Pilot study comparing entrée sales 30 days before and 30 days after nutrition information (calories, fat, sodium and carbohydrates) were added to menus	6 Volunteer restaurants provided itemised sales data of 16,000 entrées sold during the 2 periods totalling 60 days 206 patrons responded to the survey	Lunch- and dinner-time entrée purchases at 6 mid-range, full-service restaurants in Pierce County, Washington	71% of patrons noticed the nutrition information, resulting in 20.4% choosing lower calorie options Those that reduced their calories in the post-labelling period, did so by an average of 75 calories 4 of 6 restaurants saw significant reductions in calories ordered Overall, 33.7% of patrons chose their meals based on at least one of the nutrient values provided where calories were the most influential “Providing nutrition information on menus may encourage a subset of restaurant patrons to significantly alter their food choices” (p.1035)	Small sample sizes of participating restaurants and survey respondents Possible social desirability bias Some entrées recipes were revised after nutritional analysis, though subsequent reductions in calories through this mechanism were not recorded Portion of entrées consumed and ordering of other courses and beverages were not recorded No matched or comparison control group
Roberto et al. (2010) (Ref. 51)	USA	Assess the impact of calorie labelling on food choices and intake (including subsequent meals) and the effects of providing reference values (for recommended average daily caloric intake for adults – 2000 calories) in addition to calorie content of menu items	Single-blinded randomised trial where participants were assigned 1 of 3 menu conditions (without calories; with calories; or with calories and reference value) Subjects participated in focus groups, ordered lunch, ate on-site and then completed questionnaires Actual calories consumed was calculated	303 voluntary adults from New Haven, Connecticut of which 273 participants returned to complete the 24-hour (food) recall	University class room where participants ordered from a menu anonymously based on food items from Au Bon Pain and a local independent restaurant	Those with calorie labels consumed 14% fewer calories. The calories, and calories and reference values conditions consumed 203 and 124 fewer calories Calories consumed by the combined calories conditions (1289 ±656) were significantly less than the no calories condition (1466±724) (p=0.04) The calories and reference values condition consumed an average of 250 less calories in subsequent meals Conditions significantly reduced appetiser and side dish orders (61% ordered in the no calories condition, 50% in the calories and 45% in the	Convenience sampling Participants ordered between 1860 and 2189 calories during the study dinner, (calories consumed were between 1256 and 1459), which are relatively high energy contents for a single meal and may not reflect a ‘normal’ order, perhaps because food was chosen from a menu without prices listed and participants did not pay for the food No menu item exceeded 1500 calories though in the real-



Author(s) (year)	Country	Objective	Design	Participants	Setting(s)	Outcomes & Conclusions	Limitations
Cont.... Roberto et al. (2010)			Participants returned the following day for 24-hour (food) recalls			calories and reference values) No differences between the sexes and 'normal' and > 25 BMI were detected "Chain restaurants should be required to post calorie labels on restaurant menus; however to maximise the effectiveness [...] daily caloric requirements for an average adult [should be included]" (p.317)	world, many surpass 2000 Food was ordered and consumed outside a 'real-world' setting Small sample size
Tandon et al. (2010) (Ref. 68)	USA	Determine if calorie labelling on menus results in lower calorie purchases for children and for adults	Randomised controlled experiment where parents (and children) chose a meal they would 'normally' eat from a McDonald's picture menu with (intervention), or without (control), calorie information	99 children aged between 3 to 6 years of age who regularly ate at McDonald's and their parents	Primary care paediatric clinic in Seattle, Washington	The intervention group ordered an average of 102 less calories for children compared to the control group (P=0.04) There was no difference between the control and intervention groups for calories ordered by the adults. "This study is the first to suggest that labelled menus may lead to significantly lower calorie content in restaurant meals purchased for children" (p.244)	Small sample size Social desirability may be an issue, given the (paediatric) setting Convenience sampling reduces external validity
Tandon et al. (2011) (Ref. 66)	USA	Determine whether calorie labelling on restaurant menus will result in fewer calories purchased by children and their parents	Prospective cohort study comparing family restaurant receipts before and after calorie labelling between Seattle, King County (intervention group with labelling regulations) and San Diego County (control group without labelling regulations)	Parent-child (6 to 11 years of age) pairs 75 in the intervention group 58 in the control group	Recruited families received a \$10 gift card to purchase 'typical' fast food meals from chain restaurants before and after regulations Telephone surveys were also conducted using the same	Noticing calorie information rose significantly from 44% pre-regulation ⁶ to 87% post-regulation, while there was no change in the control group No change in the average amount of calories ordered for children in either group between pre- and post- labelling (intervention 823 vs. 822; control 984 vs. 949) while parents decreased orders by approximately 100 calories in both groups (intervention 823 vs. 720; control 895 vs. 789) Mean calories for overweight parents	Providing the \$10 gift voucher may have influenced (limited) the food/calories purchased (mean price spent pre- was \$10.13 and post-regulation was \$8.93) 5-19% of children and 19-28% of adults did not order a 'typical' meal Small sample size Time frame between data collection may not have allowed time for menu labelling

⁶ Pre-regulation 'noticing' of calorie information may have included in-store information such as pamphlets, posters, tray-liners and food packaging. It could have also been 'noticed' on-line at company websites or from MBL where some restaurants posted such information prior to regulations being enforced.



Author(s) (year)	Country	Objective	Design	Participants	Setting(s)	Outcomes & Conclusions	Limitations
Cont.... Tandon et al. (2011)					participants	(64%) reduced significantly between pre- and post-regulation periods for both intervention and control groups “Findings suggest a positive impact of menu labelling in increasing consumer awareness that did not translate into a lower number of calories purchased” (p.436)	to become effective in changing behaviour Base-line awareness of nutrition was ‘generally high’ among both groups which may account for little change variations between the counties The study did not capture subsequent calorie consumption
Vadiveloo Dixon & Elbel (2011) (Ref. 60)	USA	Re-examine data collected by Elbel, Gyamfi & Kersh (2011) to determine, if MBL had an effect on food purchasing patterns in chain restaurants amongst lower income adults in NYC (intervention) and Newark (control (Revisiting the data collected by Elbel et al. 2009)	Cross-sectional study design Receipt data was collected at the restaurants 4 weeks before and 4 weeks after the regulations were imposed in NYC from willing participants The same sample were also interviewed The study design intentionally collected data from low-income, minority populations	1170 adult customers of McDonald’s, Burger King, Wendy’s and KFC restaurants Pre- labelling 384 NYC 182 Newark Post-labelling 442 NYC 162 Newark	5 restaurants in Newark and 14 restaurants in NYC	Post-labelling 41% of NYC customers noticed calorie information; 14.5% noticed and used the information Those in NYC who noticed and used MBL consumed fast food less often compared to those who did not (4.9 vs. 6.6 meals per week $p<0.05$) No overall favourable differences were measured Those who noticed MBL, regardless of whether they ‘used’ it or not, made ‘healthier’ choices compared to those who did not see MBL After MBL the frequency of eating fast food dinners and snacks differed significantly (NYC 1.09 vs. Newark 1.28 dinners, $p<0.05$; NYC 1.19 vs. Newark 1.22 snacks, $p<0.01$) [MBL] “requires other environmental changes, social marketing, educational campaigns, industry change and behavioural strategies to reach its maximum potential” (p.8)	Cross-sectional design using different samples for pre- and post-labelling periods There was a significant difference between the fast food outlets and the race/ethnicity composition of the participants which makes pre- post regulation and intervention vs. control comparisons difficult Time between data collection periods may have been too short to result in behaviour change Small sample size, especially in the control group 45.5% of customers did not see MBL
Yamamoto et al. (2005) (Ref. 69)	USA	Determine if adolescents will alter their food choices	Participants ordered 2 meals from each modified McDonald’s,	106 adolescents (aged between 11 and 18) recruited from either	Clinical setting	Nutrition labelling caused 31 of 106 participants to change ≥ 1 meal selections; 43 decreased calories and 11	Purchase and consumption ‘intentions’ were measured, not actual behaviour



Author(s) (year)	Country	Objective	Design	Participants	Setting(s)	Outcomes & Conclusions	Limitations
Cont.... Yamamoto et al. (2005)		when fat and calorie information is labelled on menus	Panda Express and Denny's menus; First with no nutrition information and then calorie and fat content information. Participant were asked if nutrition information would change their original orders 'Intended' orders from each of the restaurants were paired (pre- and post-labelling) and compared	school bands or those competing in tennis tournaments		increased Calorie labelling significantly lowered calories ordered at McDonald's and Panda Express (p=0.02 and 0.05 respectively) but not at Denny's 8 out of 27 participants who rated themselves as too fat or overweight reduced the calories they ordered 1 of the 8 participants who rated themselves as 'too skinny', reduced the calories ordered after MBL 20% reduced their calories by 25% [MBL] "should still be encouraged because it resulted in some calorie/fat reduction" (p.402)	Small and convenience sampling Cross-sectional design Clinical setting Unsure if reference values for daily calorie information was provided to support calorie labelling

Abbreviations: BMI: Body mass index, MBL: Menu board labelling, NYC: New York City, SFA: Saturated Fatty Acids, USA: United States of America

