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Abstract

Canteen Takeaway is a novel concept, which entails workplace canteens to utilise existing production capacity to supply packaged meals for employees to bring home. The concept has a potential to raise the average nutritional quality of employees' diets. The purpose of the study is to assess the economic net gains for users, and for society as a whole, of promoting healthy canteen takeaway meals, using Danish workplaces as an example. The analytical framework for the study combines direct cost analyses, users' willingness to pay estimated through a choice experiment and cost-of-illness methods to assess the net society costs and benefits associated with an extended use of canteen takeaway meals as a health promotion strategy. The results show that employees have a positive willingness to pay for health attributes in canteen takeaway meals, but with a minority having a highly negative willingness to pay for the canteen takeaway concept. The potential health effects of a healthy canteen takeaway programme are estimated to be positive, but modest in magnitude. The estimated costs of providing healthy canteen takeaway meals exceed the sum of average direct and indirect benefits. In conclusion, healthy CTA programmes seems to be an economically sustainable intervention at some workplaces, though the analysis does not fully support a full-scale implementation of healthy CTA programmes at Danish workplaces from a welfare economic perspective.

Keywords: Cost-benefit analysis, Daly, Choice Experiment, Canteen take-away meals, Health.
JEL Classification: D12, D61, I18

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1. Introduction

The prevalence of obesity and its associated chronic diseases is increasing among adults in many countries (WHO 2000). Unhealthy lifestyle patterns, including poor dietary habits and a lack of physical activity, are considered to be among the major reasons for this development. For adults in Denmark, the average daily intake of fruit and vegetables is below the recommended level, whereas the average daily intake of fat is in the upper end of the recommended intake of 25-35 E% (Pedersen et al. 2010). [1] Citizens in lower socio-economic groups appear to face the largest diet-related health threats in these respects (Kjøller et al. 2007; Robertsen et al. 2007), which suggests that factors in the environment play an important role in nutritional behaviour (Ball et al. 2006). Therefore, health promoting strategies based on environmental and policy changes, which aim to make it easier to undertake healthy choices, seem to be especially needed for these groups. In this paper we will study the benefits and costs of a new intervention at the work place: *healthy canteen takeaway*.

Reviews by Boisard et al. (2002) and Fagan (2005) highlight a number of aspects of current arrangements regarding working hours in the European Union. In spite of increased flexibility in such arrangements, there is a lack of compatibility between long working-hours and family commitments, and employees find it difficult to find an appropriate balance between work and family life and face problems with stress. For example, almost 9 per cent of the adult Danish population was estimated to be affected by stress in their everyday life in 2005 – an increase of about 50 per cent since 1987 (Kjøller et al. 2007).[2]

This combination of current life-style challenges points at the workplace as a suitable arena for new interventions to improve the health status and quality of life for a substantial share of the population. Solutions that can contribute to improved dietary behaviour, while at the same time contributing to relieving the pressure on individuals to find an appropriate balance between workplace and family life responsibilities, are key factors in solving these challenges.

One relatively novel approach to ease the everyday life of employees, while intervening in their dietary patterns, is the concept of healthy canteen takeaway (CTA). The healthy CTA concept entails workplace canteens utilising existing production capacity to supply wholesome meals that are packaged and sold to employees. Intervening at this level of the workplace environment will not only have the potential to improve the health and well-being of the individual employee, but also the health of the employee's family, which is an additional advantage compared to interventions that just aim to improve the dietary habits of the employees, for example via interventions in the workplace canteen at lunch. The idea behind wholesome CTA is that it should contain more vegetables and less fat than the dishes consumed by the average Dane for dinner.

In addition, the opportunity to bring ready-to-eat or ready-to-heat meals home from work may ease the daily stress related to shopping, cooking etc experienced by employees. Meals prepared by

[1] For adults in Denmark, the average daily intake of fruit and vegetables amounts to 445 grams (s.d. 230 g) whereas the officially recommended daily intake is 600 g/day. The average daily intake of fat is 35 E% (s.d. 5.6 E%).
[2] The European Foundation for the Improvement of Living and Working Conditions (2007) also found an increasing trend in work-related stress factors in several European countries, although the stress level seems to have stabilised during the recent years.

professionals may also possess a higher culinary quality and variation compared to home cooking, and hence be a more attractive - and healthy - alternative to other products with comparable convenience properties, such as fast food. Hence, healthy CTA meals in particular may be a concept that could contribute to the simultaneous solution of the nutritional and work-life balance-related challenges. For some groups of individuals, however, the CTA concept may appear less appealing, for example, if a takeaway meal is not considered 'a proper dinner' (Murcott 1982;1983; Moisio et al. 2004).

The objective of the present study is to assess the economic net gains of healthy CTA for employees and for society as a whole in a cost-benefit analysis (CBA) framework. In the CBA, willingness to pay results from a choice experiment (CE) are combined with direct cost analysis and cost-of-illness estimates, respectively. Thus, we investigate whether promotion of the healthy CTA concept is desirable from a welfare economic point of view.

Cost-benefit and cost-effectiveness related to worksite health promotion initiatives have been the objective of a number of previous studies, addressing e.g. diet-physical activity-weight loss (Perlmutter et al. 1997; Kouris-Blazos & Wahlquist 2007) as well as multiple health risk targets, such as smoking, alcohol, stress etc. (Aldana 2001; Soler et al. 2010; Aldana et al 2005; Bertera 1990). While studies of worksite initiatives addressing multiple health risks simultaneously have indicated favourable benefit-cost ratios due to reduced absenteeism and higher productivity, the body of literature containing cost-benefit assessments of pure dietary interventions at worksites is very limited. However, studies by Kouris-Blazos & Wahlquist (2007) and Gates (2008) show a positive relationship between overweight and absenteeism, thus suggesting a potential economic benefit from interventions aiming at reducing overweight via diet and physical activity. To the authors' knowledge, no previous study addresses cost-benefit relationships with regard to healthy CTA.

The paper is organised as follows. Section 2 provides a description of the methodology and data used in the study. Section 3 presents and discusses the results of the analysis, and finally, section 4 draws some conclusions.

2. Methodology and data

The analytical framework for this study combines users' willingness to pay (WTP) estimates through the use of the choice experiment method, cost-of-illness estimates and direct cost analyses to assess the net societal costs and benefits associated with an extended use of CTA meals as a health promotion strategy. Costs and benefits are considered to occur in three domains: the employee's private domain, the employer's domain and the remaining societal domain, cf. the analytical framework in figure 1.

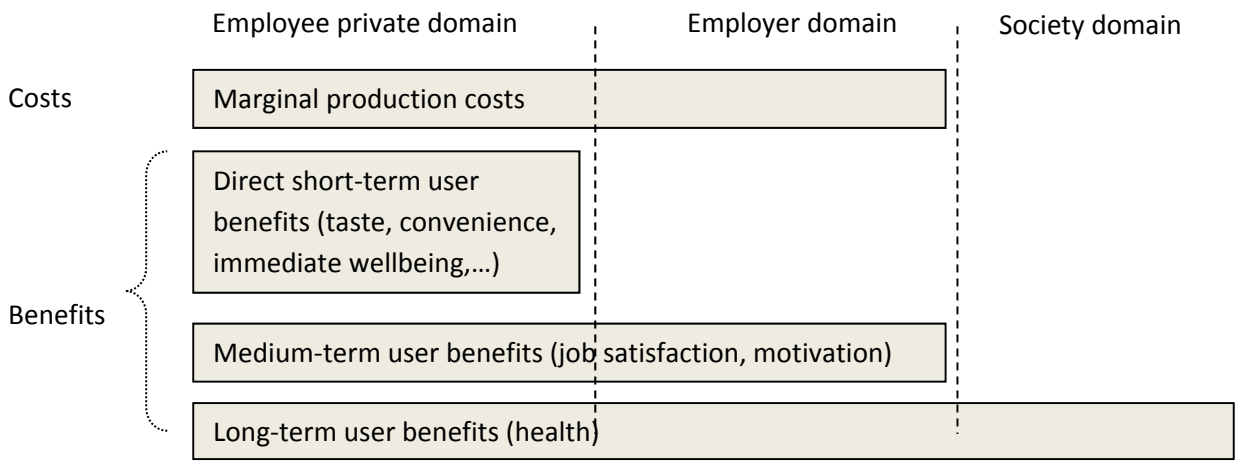

Figure 1. Analytical framework

Below, each element, in terms of users' WTP, external benefits and direct costs, which are to contribute to the cost-benefit analysis is presented, along with a description of the data foundation for each element.

2.1 Users' Willingness to pay as a measure of user benefits

Direct short-term user benefits for employees include convenience, gastronomic exploration, and immediate well-being. Regarding the extent that employees obtain immediate utility from these direct benefits, it is presupposed that this additional utility will be reflected in the employees' WTP for the meals. Furthermore, employees may obtain more indirect medium- or long-run benefits from the CTA meals. For example, a good CTA programme may improve an employee's work-life balance, thus reducing stress levels, and may also have a function in strengthening the social cohesion at the workplace. Such effects may improve job satisfaction, which may also, to some extent, be reflected in the willingness of employees to pay for the meals.

If the provision of nutritious CTA meals replaces less nutritious meals (e.g. meals from fast food outlets), a long-run beneficial health effect may be obtained among the employees, as well as in their respective households. This in turn may lead to a higher quality of life (to the benefit of the employees), but also to a lower future risk of disease-induced income losses, for example represented by the difference between market wage and early retirement payments. And as mentioned above, the option of purchasing takeaway meals from the workplace canteen may relieve some of the stress at the end of the working day – and some of the associated health risks, because it saves shopping and cooking time. To the extent that the employees are economically rational and have full knowledge about the future health consequences of their current food consumption decisions, these indirect benefits for the users will also be reflected in their WTP.

Choice experiment data

To elicit the WTP for the different attributes of a meal, we have carried out a choice experiment (CE). The CE method is particularly suited for eliciting consumer preferences for specific characteristics of a given good (Adamowicz et al. 1998), which is why it was considered appropriate in the specific setting. In the experiment, respondents were asked to choose between two meals, which represented different combinations of the attributes: fat content (represented by different types of meat and sauce), amount of vegetables, convenience (represented by CTA), and price. The attributes for the meals were chosen to be as neutral as possible to avoid the possibility that some people dislike a particular type of dish.

In the choice experiment, the amount of vegetables in a meal is either 75 grams or 200 grams. 75 grams per portion corresponds to an estimated average amount of vegetables in a supper meal consumed by Danish households (Danish Food Agency 1998), while 200 grams of vegetables per serving would bring the average intake close to the recommended daily intake. The attribute regarding fat (generally considered as unhealthy when consumed in too large quantities) in meat and sauce has also two levels; low-fat meat with 5 percent fat, or meat with 15 percent fat. The design of the choice experiment thus gives the respondent a possibility to reveal his/her WTP for an increase in the intake of healthy nutrients (represented by vegetable content), or a decrease in the intake of unhealthy nutrients (represented by fat content). The convenience attribute has two levels; Canteen Takeaway, or home-cooked. The price attribute for CTA has 7 levels (25, 30, 40, 50, 55, 65, and 75 DKK, corresponding to between 3.30€ and 10€)[3], and the price attribute for a home-cooked meal has 4 levels (20, 30, 40, 50 DKK, corresponding to between 2.68€ and 6.70€)[4].

The choice set also contains a third alternative, an opt-out alternative (Haaijer et al. 2001; Kontoleon & Yabe 2003), which is labelled "none of these." Each choice set also provided a description of what low-fat meat and high-fat meat could be and the amount of vegetables that corresponds to 75 grams, see Appendix A1. A fractional-factorial design was used with 32 choice sets (generated in SAS (Kuhfeld 2004)) divided into 8 blocks, and with each respondent receiving 4 choice sets. We applied a foldover design (Huber & Zwerina 1996) for the two level attributes.

The survey was conducted as an internet survey during February 2008. The sample was obtained from Nielsen's online database (Nielsen 2010), with an age distribution of the respondents of between 18 and 65 years. The questionnaire was sent out to 9,918 respondents, of whom 4,550 answered the questionnaire after two reminders, resulting in a response rate of 45.9 percent - for further details of the design and the survey in general, see Nordström (2011). Respondents for whom CTA was irrelevant (students, farmers, self-employed) were excluded from the further analysis, which resulted in a sample of 3,657 respondents. 50.5% of the respondents were males, the average age was 46.2 years (S.D. 10.63), average number of children per household was 0.7 (S.D. 2.1), and the average annual household income before tax was 75,000€ (S.D. 33,000€). Based on these figures, the sample of respondents is considered to be representative for the population of employees at Danish workplaces.

[3] Each price appears 4 times in the 32 choice occasions, except the price 50 DKK that appears eight times.
[4] Each price appears eight times in the 32 choice occasions

Method of analysis

In the analysis of the CE data we follow the standard underlying theory of choice experiments which is based on Lancaster's consumer theory (Lancaster 1966) and random utility theory (Luce 1959; McFadden 1974), where the utility U_{ij} that individual *i* achieves from good *j* is the sum of the utilities obtained from each of the *K* characteristics s_{kij}. Assuming linearity in the valuation of attributes, the random parameter logit model represents the utility U_{ij} as follows:

$$U_{ij} = \beta_{ASCi} ASC_i + \beta_{1i} s_{1ij} + \beta_{2i} s_{2ij} + \cdots + \beta_{4i} s_{4ij} + \varepsilon_{ij} \quad (1)$$

where ASC is an alternative-specific constant for the status quo alternative (Meyerhoff & Liebe 2009; Goett et al. 2000; Revelt & Train 1998). The parameter β_{ki} represents the weight by which attribute *k* is valued by individual *i,* and we assume that the error terms ε_{ij} are independent Gumbel distributed. Moreover, we allow for heterogeneity in the sample by assuming that the coefficients of all non-price attributes are normally distributed, with the exception of the CTA attribute that is assumed to follow a discrete mixture distribution, thereby allowing consumers to place positive, as well as negative, values on the non-price attributes. The price coefficient is being held fixed because such an assumption allows straight forward calculations of the distribution of WTP. For the CTA attribute we apply a more flexible distribution (see e.g. Wedel et al. 1999; Hess et al. 2007). The reason for doing so is that under a RPL specification the results for this specific attribute, showed an unexpected negative sign of the main effect along with a large degree of heterogeneity (mean = -0.16 and s.d. = 0.71), suggesting that a significant share of the respondents also derive positive utility from this attribute[5]. More specifically, this potentially could imply that the sample would be divided up into groups/segments – some being against the attribute Canteen takeaway and others being for the attribute. By applying Discrete Mixture (DM) distribution we can avoid the issue of predefined statistical distributions as in the mixed logit case, but some may argue that the DM model is less flexible than the mixed logit model, since the number of possible values for the taste coefficients is finite (this issue should though be expected to decrease as the number of points used increases). Following Hess et al. (2007), in the DM setting, we divide the β's into two sets of parameters, one set, $\bar{\beta}$, which represents the deterministic part of β, which we treat either as fixed or as continuous distributed parameters and $\hat{\beta}$, which is a set of *N* random parameters, all discrete distributed. The latter set of parameters, $\hat{\beta}$, have m_n mass points, $\hat{\beta}_n^l, l = 1, \dots, m_n$ and an associated probability of π_n^l. Moreover the following two constraints are imposed on the probability π_n^l :

$$0 \leq \pi_n^l \leq 1, n = 1, \dots., N; l = 1, \dots, m_n \quad (2)$$

and

$$\sum_{l=1}^{m_n} \pi_n^l = 1, \; n = 1, \dots., N \quad (3)$$

[5] These results are available from the authors upon request.

In the present case we allow the coefficient of canteen takeaway to follow a discrete distribution with two mass points, thus the coefficient takes two different values: $\hat{\beta}_{CTA}^{positive}$ (Canteen takeaway - positive) with a probability of $\pi_{CTA}^{positive}$, and $\hat{\beta}_{CTA}^{negative}$ (Canteen takeaway - negative) with a probability of $\pi_{CTA}^{negative}$.

Since the utility function is linear in price, the marginal WTP (MWTP) for the attribute is the ratio between the parameter of the attribute and the price parameter, such that:

$$\text{MWTP} = -\frac{\text{Attribute parameter}}{\text{Price parameter}} \tag{4}$$

The model is estimated with simulated maximum likelihood using 300 Halton draws in the simulation process (Train 2003).

User benefit measures

In theory, the linear utility function means that we can obtain the value of the whole as the sum of the value of the attributes for a given alternative. This suggests that the expected mean benefit from an improvement is calculated as the difference between the sum of WTP for the attributes in the intervention state and the sum of WTP for the attributes in the initial state (Hanemann 1999). In a choice experiment in which a single before and after option is to be evaluated, the expected mean WTP is simply given as:

$$E(WTP_i) = \frac{1}{-\beta_{\$}}\left(V_i^1 - V_i^0\right), \tag{5}$$

where $V_i = \beta_{ASCi} ASC_i + \beta_{1i} s_{1ij} + \beta_{2i} s_{2ij} + \cdots + \beta_{4i} s_{4ij}$. This expression represents the 'state of the world' (Lancsar & Savage 2004) user benefit in the forced-choice case where there is only one alternative in the status-quo (or pre-intervention) choice set and only one alternative in the post-intervention choice set (so the status-quo product is not available in the post-intervention state).

In the case of multiple alternatives, where more than one combination of attributes is present in the market and the individual has the opportunity to choose between these different combinations, the estimation of the employee-level benefit for the logit model in equation (1) also follows the log-sum method (Hanemann 1999; Lancsar & Savage 2004):

$$E(WTP_i) = \frac{1}{-\beta_{\$}}\left(\ln\left(\sum_{j=1}^{J^1} e^{V_{ij}^1}\right) - \ln\left(\sum_{j=1}^{J^0} e^{V_{ij}^0}\right)\right) \tag{6}$$

In the present paper, we estimate the MWTP, 'the state of the world' expected benefit and the multi-attribute expected benefit. In the latter case we estimate the expected benefit in 4 different

scenarios, all characterised by going from home cooked meals to CTA. In addition, we allow the users to act in a market in which not only the scenario of going from home cooked meals to takeaway meals exists ('state of the world'), but in which three alternatives to the home cooked meals (in different variants) are preserved ('multiple alternatives'). The 4 different scenarios examined in the paper are illustrated in Appendix A2.

2.2 Estimation of external benefits

In addition to direct and indirect net benefits for the users of healthy CTA meals, some positive external benefits may be considered, especially if the CTA leads to long-term health improvements. Such health-related positive externalities may include improved productivity in terms of reduced absenteeism, or presenteeism (i.e. being present at work, but not fully productive), to the long-term benefit of employers (to the extent wage rate differences do not fully reflect productivity differences), and they are therefore not incorporated in the employees' WTP. In addition, improved job satisfaction may also yield short and medium-term benefits for the employer, e.g. in terms of reduced sick leave and absenteeism, reduced labour turnover, greater flexibility at work etc., which may also have positive economic consequences. For the public sector and the taxpayers, a healthy CTA programme may lead to benefits in terms of savings on tax-financed health care costs and early retirement payments.

Assuming that the population of employees at workplaces with a potential for introducing healthy CTA exhibits dietary patterns similar to the population in general (Pedersen et al. 2010), and that these are normally distributed, 49% have an intake of fruits or vegetables in the range 300-600 g/day, and 26% have an average intake at less than 300 g/day. Similarly, for 17% of the adults, fat intake exceeded 40% of total energy intake, and for 30%, fat intake represented 35-40% of the total daily energy intake.

Several epidemiological studies have examined a low intake of fruit and vegetables as a risk factor for a range of diseases, including cardiovascular diseases, some types of cancer etc. (Lock et al. 2004: Terry et al. 2001), whilst some epidemiological studies have addressed fat intake as a risk factor for these diseases (Boyd et al. 2003; Zhang et al. 1999; Osler et al. 2000). Based on these studies, relative risks (RR) for ischaemic heart disease, stroke, gastric cancer, colorectal cancer, breast cancer and lung cancer – some of the most prevalent diseases in Denmark, which contribute significantly to the total disease burden (WHO 2005) - have been estimated (It should be noted that recent studies have indicated that the quality of fats (e.g. share of saturated versus poly-unsaturated fats) - rather than the quantity – is important for the risk of ischaemic heart disease (Erkkilä et al. 2008), but as the low-fat attribute in this study is closely related to saturated fat content in meat and sauce, we consider meals with low fat content to be a reasonable proxy for low content of low-quality fats). The RR's represent ratios of probabilities for contracting the disease for exposed, versus non-exposed individuals. The RR estimates are given in table 1.

Table 1. Relative risk of selected diseases

	Intake of dietary fats		Intake of fruit and vegetables	
			Medium,	Low
	35-40%	>40%	300-600g/day	<300 g/day
Ischaemic heart disease	1.05	1.09	1.23	1.69
Stroke			1.13	1.36
Gastric cancer			1.13	1.36
Colorectal cancer			1.17	1.37
Lung cancer			1.09	1.23
Breast cancer	1.08	1.17	1.14	1.30

Source: Based on Lock *et al*., (2004), Terry *et al*.,(2001), Boyd *et al*. (2003), Zhang *et al*. (1999), Osler *et al*. (2000)

Given the RR estimates and the share of employees exposed to selected health risks before and after the introduction of low-fat CTA with a high content of fruit and vegetables, the expected long-term health effect (as far as the selected diseases are concerned) can be estimated in terms of the impact fraction (IF) (Morgenstern & Bursic 1982):

$$IF = \frac{(S_b - S_a) + RR \cdot (S_a - S_b)}{(1 - S_b) + RR \cdot S_b} \qquad (7)$$

where S_b and S_a represent the share of individuals exposed to the considered risk factor before and after the change, respectively. The impact fraction represents the relative change in disease burden (for instance measured in disability-adjusted life years – DALY (WHO 2010)) as a consequence of a change in risk factor exposure, given by the difference $S_a - S_b$.

Although an assessment of the economic value of a health effect is a controversial issue, several attempts have been made in the literature (see Kuchler (2001) for a number of contributions on this issue). One approach is to assess an economic value of one DALY corresponding to one average annual salary, reflecting the potential loss of labour-determined value-added due to illness or death). This figure is approximately 60.000€ in Denmark (Statistics Denmark 2010). Another approach is to estimate the average health care costs associated with the respective diseases. Other approaches attempt to measure the economic value in terms of individuals' utility losses, for example WTP for reduced health risk. The fact that the above WTP methodology potentially takes into account the individuals' subjective valuation of health gains, to the extent that these health gains affect their utility directly, should be borne in mind. Hence, individuals' expected reduction in disease-caused net income losses are, in principle, accounted for in the WTP study. However, due to externality effects (such as productivity losses not compensated by a wage reduction, public income transfers or health spendings), health gains still involve a social economic benefit that needs to be accounted for. As the considered external economic effects are expected to be highly correlated with the number of DALYs, we use these DALYs as the outcome variable for health effects and convert them into economic terms using standardized coefficients for the economic impact. Assuming that

public income transfers can be represented by early retirement payments (about 25.000 €/year) and that average health care costs amount to about 30.000€ per DALY, total annual external benefits amount to almost 55.000 € per DALY. But, as these long-term benefits occur with a time lag, there is a need to discount them to a present value to make them comparable with short-term costs and benefits. For this reason, it is assumed that the benefits occur with a 10 year time lag, and that a 3% discount rate is used, which implies that the present value of the external net benefits amounts to about 45.000 €/DALY.

It should be noted that this calculation rests on the assumption that wage rate differences mirror differences in productivity. If this is not the case (e.g. that wage differences are smaller than productivity differences), employees potentially disabled due to poor nutrition may be over-compensated in cases of illness, thus imposing an economic loss on the employers. This in turn implies that the estimated employee WTP for improved health does not fully capture the potential productivity gains, and hence the value of external benefits may have been under-estimated. In the Danish setting, where wages are determined by centralized negotiations to a large extent, this is likely to be the case, although the degree of under-estimation is difficult to determine.

2.3 Estimation of direct costs

Costs related to CTA include the direct costs of ingredients, packaging, labour, investments and energy associated with the production of the meals. CTA meals are assumed to replace other meals (home-cooked, or meals from restaurants or other take-away sources), but as well-established markets for such meals exist, it is assumed that the WTP for such meals corresponds to the respective market prices. The cost for the ingredients in a home-cooked meal is assumed to correspond to the cost of ingredients in the CTA meals.

As the production of takeaway meals from workplace canteens most often can be considered as an integrated activity within the normal production of canteen meals, the costs associated with takeaway production are considered from a marginal perspective, implying that the production of takeaway meals can draw on existing (e.g. kitchen) capacity, thus lowering the need for additional investments and/or labour. Hence, the cost assessment basically includes the cost of additional ingredients and packaging, additional labour costs to some extent, and additional capital costs to a limited extent (with investments in cooling and packaging capacity as a possible exception).

From a data perspective, the fact that the production of CTA meals is integrated with ’ordinary’ canteen operations poses a challenge to the cost assessment related to this additional activity, because canteen operators do not (normally) keep separate records of these different activities. In order to overcome this problem, we have conducted a questionnaire survey among Danish canteen operators to obtain information about different types of costs associated with their implementation and operation of CTA, as well as background information about staff size, and the number and type of daily users. In particular, the questionnaire contained questions about different cost items:

- Ingredients (including the takeaway activity’s estimated share of total ingredient cost)
- Packaging

- Additional labor hours due to takeaway production
- Investment in additional facilities (cooling/freezing, packaging, etc.)

The questionnaires were distributed to approximately 100 canteen operators (the majority within the FazerAmica® canteen operators' company) between November 2009 and January 2010. In total, 16 questionnaires were filled out and returned, and these constitute the basic empirical material for the cost estimations. Due to the low number of observations, the statistical robustness of these results is deemed to be limited. By nature, the collected cost data only represent costs in canteens that are actually running takeaway programmes, which may involve a selection bias, excluding canteens where the introduction and operation of CTA would be more costly. In order to address this issue, we conduct supplementary budgetary calculations for alternative settings and conditions.

3 Results and discussion

The results of each element (WTP estimates, external benefits and costs) are presented in the subsections below, followed by a final subsection merging the results together in a CBA.

3.1 User benefit results

Table 2 presents the estimation results from the discrete mixture and random parameter logit model described above. As can be seen from the table, all the main effects are statistically significant. Both coefficients in the discrete mixture of the Canteen takeaway attribute are significant as well as two out of three estimated standard deviations, which suggests heterogeneous preferences in the sample. The results only reveal an insignificant standard deviation for the attribute vegetables. The model suggests that low fat meat and an increase in the amount of vegetables in a dish have a positive influence on the respondent's utility, whereas the discrete mixture of the attribute 'Canteen takeaway' shows the existence of two segments of consumers. One segment representing 24% of the respondents, who have strong negative preferences for the Canteen takeaway attribute and another segment representing the majority of the respondents (76%), who are in favour of such an intervention, thus showing positive preferences compared to a 'home cooked meal'. One interpretation of those respondents being against Canteen takeaway may lie in a perception among those respondents that takeaway meals do not constitute a 'proper dinner' (Murcott 1982;1983) or it may represent respondents who have bad experiences with workplace canteens. The alternative specific constant (ASC) for the status quo alternative shows that respondents associate negative utility with the third alternative *per se* – the opt-out alternative 'none-of these', which suggests the absence of a status quo bias. Furthermore, the log-likelihood ratio index (LRI) indicates that the model provides a good fit to the data with a value at 0.19 (Louviere et al. 2000).

Table 2: Main effect random parameter logit model and marginal WTP estimates.

	Coefficient	Standard Error	P-value	MWTP
ASC	3.680	0.139	0.000	
Low fat meat	0.196	0.023	0.000	3.95
200 g vegestables	0.088	0.020	0.000	1.77
Canteen Take-Away - positive	0.251	0.070	0.000	5.06
$\pi_{CTA}^{positive}$	0.757	0.057	0.000	
Canteen Take-Away - negative	-1.640	0.322	0.000	-33.05
$\pi_{CTA}^{negative}$	0.243	0.057	0.000	
Cost	-0.007	0.001	0.000	
Standard Deviation				
ASC	*3.830*	*0.136*	*0.000*	
Low fat meat	*0.228*	*0.084*	*0.010*	
200 g vegestables	*0.121*	*0.094*	*0.200*	
LL	-12972			
LRI	0.192			

Note: The MWTP estimates have been transferred into Euros. ASC is the alternative specific constant for the third alternative, i.e., the opt-out alternative. LRI refers to the Likelihood Ratio Index presented by Louviere et al. (2000).

Table 2 also includes the estimates for the respondents' marginal WTP. The estimates are the marginal rates of substitution (MRS) between price and the meal attributes, as shown in equation (4). These estimates suggest, as stated above with respect to the utility, that respondents have positive MWTP for the two attributes 'low fat meat' and '200g vegetables,' relative to 'meat' and '75g vegetables' at 3.95€ and 1.77€, respectively. With respect to the attribute 'Canteen takeaway,' the results show, as argued above, that 24% of the respondents are very much against such intervention, with a mean negative MWTP at -33.05€. More interestingly, 76% of the respondents show a positive WTP for the attribute, with a mean MWTP estimate of 5.06€.

By using these estimates, we also estimate the total benefit for the employees according to equation (5) for the 'state of the world' measure and according to equation (6) for the multiple combinations scenarios (See table A2 in the appendix). Since 24% of the respondents show that they would not purchase canteen takeaway meals, the following analysis is only conducted using the estimates for the segment of respondents showing positive preferences for such intervention. The results are presented in Table 3.

Table 3: Welfare measures (in Euros) per CTA meal for the 4 scenarios – using the 'state of the world' and the 'multiple alternatives' approach.

	State of the World		Multiple alternatives	
Scenario (attribute)	WTP	Standard Error	WTP	Standard Error
Scenario 1 (CTA)	4.82	1.45	1.15	0.37
Scenario 2 (CTA+low fat meat)	8.58	1.76	2.20	0.49
Scenario 3 (CTA+200g vegetables)	6.51	1.64	1.60	0.45
Scenario 4 (CTA+low fat meat + 200g vegetables)	10.27	1.98	2.73	0.57

Standard errors are estimated using the Krinsky-Robb method (Krinsky & Robb 1986) with 2000 Halton draws. The initial state corresponds to a home-cooked meal with 75g vegetables and meat.

As can be seen from table 3, the estimated user benefit measures in scenario 1 and 4 are all statistically significantly different from zero. The results also reveal that, in general, the 'multiple alternatives' approach produces estimates that are about a quarter of the 'state of the world' estimates. This result is in line with previous findings (e.g. Lancsar & Savage 2004). Thus, the choice of benefit measure strongly influences the benefit value. If the 'state of the world' approach is mistakenly applied in a multiple alternative setting, it can result in biased benefit estimates.

Furthermore, the results suggest that all of the scenarios provide a positive welfare gain, with scenario 1 providing the smallest gain, followed by scenario 3 and scenario 2, and finally with scenario 4: the case of going from a home cooked meal with meat and 75g of vegetables to a CTA meal with low fat meat and 200g of vegetables, as the scenario with the largest gain.

3.2 External benefit results

Based on the epidemiology-based methodology and combined with assumptions regarding the influence of CTA on the users' food intake, it is possible to estimate the potential long-term health benefits of the CTA meals. In particular, it is assumed that the dietary variables mentioned in the introduction are normally distributed, and, in order to ensure consistency with the WTP results, that the CTA meals increase the intake of fruit and vegetables by 125 g on days when such meals are consumed, and lower the share of energy derived from fat by about one percentage point on a whole-day basis, which is in line with the attributes underlying scenario 4 in the above CE. Hence, on days when CTA meals are consumed, the proportion of employees with medium and high exposure to health risks related to a low intake of fruit/vegetables and a high intake of fat, are reduced.

Two alternative scenarios are considered: a scenario, in which employees consume one healthy CTA supper meal every working week (45 working weeks per year), and another scenario in which employees consume CTA meals every working day (i.e. 5 days per week for 45 weeks per year).The fraction of employees exposed to high or medium risk should be affected more in the second scenario than in the first.

In table 4, the potential health impacts of these assumptions have been estimated. One weekly healthy CTA meal has the potential to reduce the disease burden of ischaemic heart diseases by almost 6 DALY's per 100.000 inhabitants, a reduction of almost 0.7%, whereas 5 weekly healthy CTA meals may have the potential to reduce the disease burden of ischaemic heart disease by 28.2 DALY per 100.000 inhabitants – more than 3% of the disease burden. In total, 1 CTA meal per week results in a reduction of 10.5 DALY per 100,000 inhabitants while 5 CTA meals per week may reduce the disease burden of the six health problems considered in table 1 by 52 DALY per 100,000 inhabitants.

Table 4. Effects of healthy Canteen Takeaway on disease burden

	Disease burden	Reduced disease burden, DALY/100,000			
	DALY/ 100.000 inhab. Basis	CTA with high vegetables and low-fat meat and sauce		CTA with high veg.	CTA with low-fat meat/sauce
		1 CTA/week	5 CTA/week	5 CTA/week	5 CTA/week
Ischaemic heart disease	860	5.7	28.2	19.2	8.9
Stroke	660	1.6	8.3	8.3	0.0
Gastric cancer	58	0.1	0.7	0.7	0.0
Colorectal cancer	331	0.8	4.0	4.0	0.0
Lung cancer	484	0.8	3.9	3.9	0.0
Breast cancer	256	1.5	7.2	2.6	4.6
Total		10.5	52.3	38.7	13.5
Economic value pr. capita		4.8	23.7	17.6	6.1
Economic value pr. CTA meal		0.106	0.105	0.078	0.027

As mentioned previously, the present value of external benefits (total health benefits net of the direct value to the individual, as reflected in the WTP) associated with a healthy CTA (high content of vegetables and low-fat meat and sauce) amounts to about 45,000 €/DALY. With 10.5 DALY's saved per 100,000 inhabitants with one weekly CTA-meal, this equals 10.5*45,000/100,000 = 4.8 €/inhabitant. Distributed over 45 working weeks, this corresponds to 0.106 € per CTA meal. If CTA meals are consumed every working day, the estimated value of external benefits amounts to 23.7 €/inhabitant, corresponding 0.105 € per CTA meal (the slightly lower value being an implication of a decreasing marginal health effect).

In the two right-most columns of the table, the partial health effects of high vegetable and low-fat meat and sauce content, respectively, are quantified. A high content of vegetables has a potential health effect, which is more than double the aggregate health effect of a relatively low fat content in meat and sauce in the CTA meals.

It should be noted that these health-related externality benefits only relate to the above-mentioned six serious diseases. A number of other diseases may also be linked to an unhealthy diet containing too much fat and not enough vegetables, including chronic diseases such as other forms of cancer, diabetes, diverticulosis/diverticulitis, gall stones, etc. Furthermore, more temporary conditions such as a lack of energy or concentration, reduced well-being and stress may also be linked to a poor diet and these may also lead to increased absenteeism or presenteeism at workplaces with the associated economic burden for the health sector. Hence, the calculated health-related benefits are likely to represent a lower-end estimate of the total health benefits from healthy CTA meals.

Furthermore, the convenience aspect may save time after work otherwise spent on shopping and cooking, which may reduce the need for employees to leave work at a set time, thereby facilitating the completion of the daily workload. Although this is an employer benefit that is difficult to quantify, it may contribute to the total externality benefits. And as mentioned earlier, if wage differences do not fully reflect productivity differences, employers may also benefit from productivity gains due to a lower disease burden than has been applied in these calculations.

3.3 Direct cost results

The results from the 16 questionnaires supplied to the canteen operators are examined below with respect to labour, working procedures and additional investments supplemented by cost estimates of increasing the nutritional quality of the meals. Two of the canteens which completed the questionnaire reported a moderate increase in labour, four canteens reported changes in working procedures due to the takeaway activities, and the remaining canteen operators did not report changes in labour use. We assume that changes in working procedures due to the introduction of the takeaway concept involve an increased workload of 2 hours per month per staff member, which is included in the subsequent analysis.

Based on the questionnaire data, marginal unit costs for ingredients and labour were estimated by means of linear regression analysis, which showed a marginal ingredient cost of 2.50€ and 0.008 additional working hours, which corresponds to a labour cost of 0.28€ per CTA serving, assuming an average labour cost of 35€ per working hour. However, it should be noted that this average stems from additional labour at 6 canteens (including assumed work load increases associated with changed working procedures). The remaining 10 canteens did not report increased labour costs due to the takeaway activities, and consequently a zero change in work load was assumed for these canteens.

Six of the surveyed canteens reported additional investments of, on average, 700€ due to the introduction of CTA meals, which equates 250€ on average for all the participating canteens. As six observations were too few for meaningful statistical analysis, we assume an average investment of 250€ per canteen, which corresponds to a monthly capital cost of 3€ per canteen (assuming a 3% discount rate and a 10 year investment horizon), which corresponds to 0.015 € per takeaway meal if the canteen supplies 200 meals per month. The average costs of packaging were calculated as 0.70€ per takeaway meal. If we assume that the cost of ingredients per CTA meal is the same as a home-cooked meal, the cost difference between a CTA and a home-cooked meal is 1.06€.

The cost items are presented in table 5 and the total marginal cost of the takeaway activities is estimated to 3.53€ per meal. It should also be noted that due to the relatively low number of observations in the cost questionnaire, firm conclusions on the costs based on this figure should be drawn with some care. Furthermore, as this figure is based on the reported costs, which may be subject to selection bias, the figure is expected to represent a lower-end estimate, if a more wide-scale implementation of CTA meals were to be considered.

In order to compensate for the low number of empirical observations, as well as the potential selection bias in the data, we supplement the above analysis of the collected data with calculations based on alternative assumptions regarding meal concept and the utilisation of existing capacity. In table 5, such calculations are presented in 5 different settings for a canteen serving 200 takeaway meals per month. These settings can be considered as alternatives to the one presented in the questionnaire.

Table 5. Sensitivity of CTA production costs (for 200 CTA servings per month), €/month

	Basis	Lean meat	More vegetables	Additional labour	Additional investments	All factors
Ingredients	505	606	527	505	505	598
Packaging	142	142	142	142	142	142
Labour costs	56	56	56	1,048	56	1,048
Capital costs	3	3	3	3	22	22
Total costs	706	807	729	1,698	725	1,810
Cost (in €) per CTA serving	3.53	4.04	3.64	8.49	3.63	9.05

Increasing the nutritional quality of the meals might be one way to change the meal concept, either by using lean meat in the dishes, rather than meat with an average fat content, or by increasing the proportion of fruit and vegetables. As lean meat tends to be more costly than average meat, a shift towards leaner meat (at an unchanged total quantity) increases the average cost by around 0.50€ per serving, whereas an increased proportion of vegetables (assuming an unchanged total energy content) entails a relatively low additional cost (around 0.10€ per serving at current relative food prices estimated on the basis of household purchase data from GfK Denmark). The questionnaire data does not indicate the nutritional quality of the CTA meals. These calculations are in line with findings from other studies regarding e.g. school lunch programmes, which also find that nutritious meals need not be significantly more costly to produce (Mitchell et al. 2008; Wagner et al. 2007). If current CTA meals are already healthy regarding vegetables and fat content, the additional cost estimates resulting from increasing the nutritional quality may represent an upper-end estimate of the true extra costs.

The canteens that responded to the survey have already introduced takeaway programmes and the sample may not, therefore, be representative of all workplace canteens in Denmark, as the takeaway programmes may have been introduced due to excess capacity (staff or equipment). If we assume that more canteens adopt takeaway programmes, some would possibly need to increase labour or undertake additional investments (presumably mainly in cooling and packaging capacity).

Based on the information on total labour use and the total number of canteen meal servings, it is estimated that an average regular canteen serving requires 0.16 man-hours. Assuming a similar labour effort per takeaway serving, this would increase the monthly labour cost by more than 1,000 € in a canteen producing 200 monthly takeaway servings, which is a substantial increase, compared with the cost estimates based on current CTA operators. If the canteens do not possess sufficient cooling and packaging capacity, investments in the region of 2,200 €, which corresponds to an additional monthly cost of almost 20€, may be needed (Gastropolis24 2010). In sum, if nutritious takeaway meals are to be supplied from canteens without current excess kitchen or staff capacity, the cost per meal would amount to around 9 €, i.e. almost triple the average unit cost estimated from the data – or about 6.5€ more than a home-cooked meal. The availability of spare labour capacity in particular is crucial for the costs.

The costs have been evaluated for canteens providing 200 takeaway servings per month. Some of the elements may depend on the scale of operation. For example, the potential for utilising labour and capital cost-effectively can be assumed to be greater in large-scale, rather than small-scale production, whereas the unit cost of ingredients and packaging is more likely to be independent of scale. Calculations similar to those in the right-hand column of table 5, have been carried out for different scales ranging from 50-2,000 servings per month (not presented), which show some economies of scale, in particular for the production of less than 200 servings per month. As labour costs constitute a crucial factor in the cost calculation, one crucial element in this scale pattern is the flexibility in the amount of staff employed in canteen operations.

3.4 Comparison of costs and benefits

In this section, the direct and indirect employee benefits and external benefits are compared with the costs of providing CTA meals to employees at the workplace for four alternative scenarios representing the possible combinations of high/low fat meat and sauce, and a high/low content of vegetables. The results are summarised in table 6 below.

Table 6. Costs and benefits of healthy CTA, €/serving

	CTA	CTA, low-fat meat/sauce	CTA, high vegetable	CTA, high vegetable, low-fat meat/sauce
Employee private benefits (WTP)	1.15	2.20	1.60	2.73
External health benefits	0	0.03	0.08	0.11
Production costs	1.01	1.51	1.12	1.62
Total net benefit	0.14	0.72	0.56	1.22

As the results show the first scenario which offers a CTA meal without additional health benefits yields an average net benefit of 0.14€/serving. The highest welfare estimate, based on the marginal WTP calculations, is achieved when switching from a home cooked meal with meat and 75g of

vegetables to a CTA meal with low fat meat and 200g of vegetables. This scenario provides direct and indirect benefits for the employees corresponding to 2.73€ per CTA meal. Adding the external benefits of 0.11€ per CTA meal results in a total benefit of 2.84€ per CTA meal. Comparing these benefits with the production costs of 1.62€/meal (assuming that there is no need for additional labour or investments), the net result becomes 1.22€ per CTA meal. All the scenarios put forth suggest that the CTA concept provides positive net benefits from a welfare economic point of view. If the benefits to society are to be maximized, the CTA intervention should include both low fat meat/sauce and a large amount of vegetables. However, this result is relatively sensitive to the assumption of spare labour capacity. If instead further labour costs are necessary, the conclusion may be less favourable to CTA.

The estimated external health benefits are positive, but relatively small in economic terms compared to the estimated costs and private benefits associated with the health attributes of CTA meals. Nevertheless, such health attributes appear to be important for the economic viability of CTA meals, because they contribute positively to the users' perceived benefits of the CTA meals. Additionally, a CTA programme may increase job satisfaction, which can have beneficial effects on productivity – benefit has not been included in the present analysis.

4 Conclusion

This study has evaluated the benefits and costs of healthy canteen takeaway (CTA) meals at workplaces as an intervention strategy to improve employees' dietary habits and their work-life balance. The study combines willingness to pay (WTP) analyses based on choice experiments, DALY assessments based on epidemiological literature and cost estimates based on a survey among Danish workplace canteen operators.

The results of the analyses show that employees have a positive WTP for health attributes in CTA meals, as well as for the concept of CTA, although a relatively large minority (24%) of the respondents did have a negative WTP for the CTA meals. The potential health effects of a healthy CTA programme are estimated to be positive, albeit modest in scale. Provided that CTA meals can be supplied without additional labour costs (i.e. assuming that canteen operators possess excess labour capacity), the benefits of a healthy takeaway programme will exceed the costs for a large majority (around 76%) of employees.

In conclusion, healthy CTA programmes seem to be an economically sustainable intervention at some workplaces, though the analysis does not fully support a full-scale implementation of healthy CTA programmes at Danish workplaces from a welfare economic perspective. There are two main reasons why healthy CTA meals are only economically sustainable at some workplaces. On the one hand, only a segment (although large) of the Danish employees (respondents) exhibit a WTP for such takeaway meals that is sufficiently high to cover the additional costs of providing such meals, whilst on the other hand, it is crucial for the economic sustainability that the supply of CTA meals can be undertaken without significant additional labour costs.

A number of further aspects should also be taken into consideration when evaluating the findings of this study. The estimation of employees' private benefits from healthy CTA is based on the current

preferences of a representative sample of employees at Danish workplaces, of which the vast majority did not have a CTA programme. It is likely that individual preferences for CTA meals may be affected by the presence of such programmes – positively or negatively. Such 'dynamic' effects have not been incorporated in the present study.

Finally, it should be noted that the combination of results from three different analytical approaches involves some methodological challenges. Every effort has been made to overcome these challenges in order, for example, to ensure consistency and to avoid double-counting. Nevertheless, the elements of the analysis are based on different populations and methods, which introduce some uncertainty into the combined results.

Appendix A1. Choice set example.
In the meals, the meat can be low-fat meat (e.g. minced beef steak with 5 percent fat, or chicken filet) or meat (e.g. minced beef-steak with 15 percent fat or breadcrumb chicken with skin). A medium-sized carrot and a medium-sized tomato weigh about 75g.

Meal A	**Meal B**	**Meal C**
Low-fat meat and sauce with rice	Meat and sauce with rice	
Vegetables	Vegetables	
75 grams	200 grams	None of these
Home cooking	Canteen Take Away	
Preparation: purchase and cooking	Preparation: only requires heating	
Price (DKK) 30	Price (DKK) 40	

In Danish, the dish 'hakkebøffer' was used to represent the type of meat. The ingredients for 'hakkebøffer' are lean ground beef, butter, salt and pepper.

Appendix A 2: Overview of the different scenarios in the initial states and the new states for the meal alternatives.

Initial State	Alternative 1	Alternative 2	Alternative 3	Alternative 4
	Meat 75 g vegetables home cooking	Low-fat meat 75 g vegetables home cooking	Meat 200 g vegetables home cooking	Low-fat meat 200 g vegetables home cooking
New State				
Scenario 1	Meat 75 g vegetables Canteen Take away	No Change	No Change	No Change
Scenario 2	Low-fat meat 75 g vegetables Canteen Take away	No Change	No Change	No Change
Scenario 3	Meat 200 g vegetables Canteen Take away	No Change	No Change	No Change
Scenario 4	Low-fat meat 200 g vegetables Canteen Take away	No Change	No Change	No Change

References

Adamowicz, W. L., Louviere, J., and Swait, J. (1998). Introduction to attribute-based stated choice methods. NOAA - National Oceanic and Atmospheric Administration , 1-44. 1-1-1998. Washington, USA, NOAA - National Oceanic and Atmospheric Administration. 14-9-0004.

Aldana S.G. (2001). Financial Impact of Health Promotion Programs: A Comprehensive Review of the Literature, *Am J Health Promot*, vol. 15(5), 296-320

Aldana S.G., Merrill R.M., Price K, Hardy A. & Hager R. (2005). Financial impact of a comprehensive multisite workplace health promotion program, *Prev Med,* vol. 40, 131-137

Ball K., Timperio A.F. & Crawford D (2006) Understanding environmental influences on nutrition and physical activity behaviours: where should we look and what should we count? *Int J Behav Nutr Phys Act*, 3:33

Bertera R.L. (1990). The Effects of Workplace Health Promotion on Absenteeism And Employment Costs in a Large Industrial Population, *Am J Public Health*, vol. 80(9), 1101-05

Boisard P., Cartron D., Gollac M. & Valeyre (2002) Time constraints at work and health risks in Europe, European Foundation for the Improvement of Living and Working Conditions (http://www.eurofound.europa.eu/pubdocs/2002/11/en/1/ef0211en.pdf)

Boyd N.F., Stone J., Vogt K.N., Connelly B.S., Martin L.J. & Minkin S., (2003) Dietary fat and breast cancer risk revisited: a meta-analysis of the published literature, *Brit J Cancer*, vol. 89, pp. 1672-1685

Danish Food agency (1998) Danskernes kostvaner 1995 (Danes' dietary habits 1995), (http://www.foedevarestyrelsen.dk/fdir/publications/2000006/kap5.asp, accessed, August 2008)

Erkkilä A., Mello V.D.F. d, Risérus U. & Laaksonen D.E. (2008) Review: Dietary fatty acids and cardiovascular disease: An epidemiological approach, *Progr Lipid Res*, vol. 47, pp. 172-187

European Foundation for the Improvement of Living and Working Conditions (2007) Work-related stress (http://www.eurofound.europa.eu/ewco/reports/TN0502TR01/TN0502TR01.pdf)

Fagan C. (2005) Working-time preferences and work-life balance in the EU: some policy consideration for enhancing the quality of life, European Foundation for the Improvement of Living and Working Conditions (http://www.eurofound.europa.eu/publications/htmlfiles/ef0342.htm).

Gastropolis24 (2010). http://www.gastropolis24.dk

Gates D.M., Succop P, Brehm B.J., Gillespie G.L. & Sommers B.D. (2008). Obesity and presenteeism: the impact of body mass index on workplace productivity, *J Occup Environ Med*, vol. 50(1), 39-45

Goett, A., Hudson, K. & Train, K. (2000). Consumers' choice among retail energy suppliers: The willingness-to-pay for service attributes., *The Energy Journal*, vol. 21, pp. 1-28.

Haaijer, R., Kamakura, W., and Wedel, M. (2001). The "no-choice" alternative in conjoint choice experiments. *International Journal of Market Research* 43(1):93-106.

Hanemann, M. (1999). Welfare analysis with discrete choice models. In J. A. Herriges and C. Kling (eds.), *Valuing Recreation and the Environment*. Cheltenham: Edward Elgar, 33-64.

Hess, S., Bierlaire, M., and Polak, J. W. (2007). A systematic comparison of continuous and discrete mixture models. *European Transport* 37:35-61.

Huber, J. and Zwerina, K. (1996). The Importance of Utility Balance in Efficient Choice Designs. *Journal of Marketing Research* 33:307-317.

Kjøller M., Juel K. & Kamper-Jørgensen F. (ed.) (2007) Folkesundhedsrapporten Danmark 2007 (Public Health Report 2007). Danish Institute of Public Health

Kontoleon, A. & Yabe, M. (2003). Assessing the Impacts of Alternative 'Opt-out' Formats in Choice Experiment Studies: Consumer Preferences for Genetically Modified Content and Production Information in Food, *J Agric Policy Res*, vol. 5, pp. 1-43.

Kouris-Blazos A & Wahlqvist M. (2007). Health economics of weight management: evidence and cost, *Asia Pac J Clin Nutr*, vol. 16 (suppl), 329-338

Krinsky, I. and Robb, A. L. (1986). On Approximating the Statistical Properties of Elasticities. *The Review of Economics and Statistics* 68(4):715-719

Kuchler F. (ed.) (2001) Valuing the Health Benefits of Food Safety: A Proceedings, United States Department of Agriculture, Miscellaneous Publication, Number 1570 (http://www.ers.usda.gov/Publications/MP1570/ - accessed October 6, 2010)

Kuhfeld, W. (2004). *Marketing Research Methods in SAS. Experimental Design, Choice, Conjoint and Graphical Techniques*, [online]. SAS Institute Inc. (http://support.sas.com/techsup/technote/ts694.pdf).

Lancaster, K. J. (1966). A New Approach to Consumer Theory, *The Journal of Political Economy*, vol. 74 , no. 2, pp. 132-157.

Lancsar, E. and Savage, E. (2004). Deriving welfare measures from discrete choice experiments: inconsistency between current methods and random utility and welfare theory. *Health Economics Letters* 13:901-907.

Lock K., Pomerleau J., Causer L., McKee M. (2004) Low fruit and vegetable consumption, in Ezzati M., Lopez A.D., Rodgers A., Murray C.J.L. (eds) Comparative Quantification of Health Risks. Global and Regional Burden of Disease Attributable to Selected Major Risk Factors, vol. 2, WHO

Louviere, J., Hensher, D. A., and Swait, J. (2000). *Stated Choice Methods. Analysis and Applications*. Cambridge, UK: University Press.

Luce, R. D. (1959). *Individual choice behaviour*. New York: Wiley.

McFadden, D. (1974). Conditional Logit Analysis of Qualitative Choice Behavior. In P. Zarembka (ed.), *Frontiers in Econometrics*. New York: Academic, 105-142.

Meyerhoff, J. and Liebe, U. (2009). Status Quo Effect in Choice Experiments: Empirical Evidence on Attitudes and Choice Task Complexity. *Land Economics* 85(3):515-528.

Mitchell D., Shannon B.M., McKenzie J., Smicklas-Wright H., Miller B.M. & Tershakovec A.M. (2008) Lower Fat Diets for Children Did Not Increase Food Costs, *J Nutr Educ*, doi: 10.1016/S0022-3182(00)70526-7

Moisio, R, Arnould E.J,, Price, L.L. (2004). Between mothers and markets. Constructing family identity through home-made food. *Journal of Consumer culture*, 4(3): 361-384

Morgenstern H. & Bursic E.S. (1982) A method for using epidemiologic data to estimate the potential impact of an intervention on the health status of a target population, *J Comm Health*, vol. 7(4), pp. 292-309

Murcott, A. (1982) On the social significance of the "cooked dinner" in South Wales. *Social Science Information,* 21, 677-696

Murcott, A. (1983), "It's a pleasure to cook for him": Food, Mealtimes and Gender in some South Wales Households, In The Public and the Private, E. Gamarnikow et al., eds., Heinemann Educational Books, pp. 78-90.

Nielsen (2010) A.C. Nielsen Danmark website: http://dk.nielsen.com/products/crs_hs_choice.shtml, accessed October 6, 2010

Nordström, J. (2011), Valuation of health inputs and convenience in new products, mimeo University of Copenhagen.

Osler M., Godtfredsen J., Grønbæk M., Marckmann P. & Overvad K (2000) En kvantitativ vurdering af kostens betydning for dødeligheden af hjertesygdomme i Danmark, Beregning af ætiologisk fraktion, Ernæringsrådet, 2000

Pedersen A.N., Fagt S., Groth M.V., Christensen T., Biltoft-Jensen A., Matthiesen J., Andersen N.L., Kørup K., Hartkopp H., Ygil K.H., Hinsch H-J., Saxholt E. & Trolle E. (2010) Danskernes kostvaner 2003-2008 – Hovedresultater, Rapport, DTU Fødevareinstituttet

Perlmutter C.A., Canter D.D., Gregoire M.B. (1997). Profitability and Acceptability of Fat- and Sodium-Modified Hot Entrees in a Worksite Cafeteria, *J Am Diet Assoc*, vol. 97 (4), 391-395

Revelt, D. & Train, K. (1998). Mixed Logit with Repeated Choices: Households' Choice of 495 Appliance Efficiency Level, *Review of Econometrics and Statistics*, vol. 80, no. 4.

Robertson, A., Lobstein, T., & Knai, C. (2007). Obesity and socio-economic groups in Europe: Evidence review and implications for action. SANCO/05/C4-NUTRITION-03, funded by the European Commission.

Soler R.E., Leeks K.D., Razi S., Hopkins D.P., Griffith M., Aten A., Chattopadhyay S.K., Smith S.C., Habarta N., Goetzel R.Z., Pronk N.P., Richling D.E., Bauer D.R., Buchanan L.R., Florence C.S., Koonin L., MacLean D., Rosenthal A., Matson Koffman D., Grizzell J.V., Walker A.M. (2010). The Task Force on Community Preventive Services. A Systematic Review of Selected Interventions for Worksite Health Promotion: The Assessment of Health Risks with Feedback, *Am J Prev Med*, vol. 38 (2, suppl 1), pp. S237-S262

Statistics Denmark (2010), Statistikbanken (www.statistikbanken.dk)

Terry P., Giovannucci, Michels K.B., Bergkvist L., Hansen H., Holmberg L. & Wolk A. (2001) Fruit, vegetable, dietary fiber and risk of colorectal cancer, *J Nat Cancer Inst*, vol. 93(7), pp. 525-533

Train, K. (2003). *Discrete Choice Methods with Simulation*. Cambridge: Cambridge University Press.

Wagner B., Senauer B. & Runge C.F. (2007) An Empirical Analysis of and Policy Recommendations to Improve the Nutritional Quality of School Meals, *Rev Agric Ec*, vol. 29 (4), pp. 672-688

Wedel, M., Kamakura, W., Arora, N., Bemmaor, A., Chiang, J., Elrod, T., Johnson, R., Lenk, P., Neslin, S., and Poulsen, C. S. (1999). Discrete and Continuous Representations of Unobserved Heterogeneity in Choice Modeling. *Marketing Letters* 10(3):2

WHO (2000) Obesity: preventing and managing the global epidemic -report of a WHO Consultation, WHO Technical Report Series 894

WHO (2005) Public Health Action for healthier children and populations, Copenhagen, Regional Office for Europe

WHO (2010) Metrics: Disability-Adjusted Life Year (DALY) – Quantifying the Burden of Disease from mortality and morbidity (http://www.who.int/healthinfo/global_burden_disease/metrics_daly/en/index.html), accessed October 6, 2010

Zhang S., Hunter D.J., Forman M.R., Rosner B.A., Speizer F.E., Colditz G.A., Manson J.E., Hankinson S.E. & Willett W.C. (1999) Dietary Carotenoids and Vitamins A, C and E and Risk of Breast Cancer, *J Nat Cancer Inst*, vol. 91(6), pp. 547-556