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Authors	Fitzgerald, Sarah;Murphy, Aileen;Kirby, Ann;Geaney, Fiona;Perry, Ivan J.
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Cost-effectiveness of a complex workplace dietary intervention: an economic evaluation of the Food Choice at Work study

Sarah Fitzgerald,[1] Aileen Murphy,[2] Ann Kirby,[2] Fiona Geaney,[1] Ivan J Perry[1]

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[1]School of Public Health, University College Cork, Cork, Ireland
[2]Department of Economics, Cork University Business School, Aras na Laoi (Lee House), University College Cork, Cork, Ireland

Correspondence to
Dr. Sarah Fitzgerald;
sarahfitzgerald@ucc.ie

ABSTRACT

Objective To evaluate the costs, benefits and cost-effectiveness of complex workplace dietary interventions, involving nutrition education and system-level dietary modification, from the perspective of healthcare providers and employers.

Design Single-study economic evaluation of a cluster-controlled trial (Food Choice at Work (FCW) study) with 1-year follow-up.

Setting Four multinational manufacturing workplaces in Cork, Ireland.

Participants 517 randomly selected employees (18–65 years) from four workplaces.

Interventions Cost data were obtained from the FCW study. Nutrition education included individual nutrition consultations, nutrition information (traffic light menu labelling, posters, leaflets and emails) and presentations. System-level dietary modification included menu modification (restriction of fat, sugar and salt), increase in fibre, fruit discounts, strategic positioning of healthier alternatives and portion size control. The combined intervention included nutrition education and system-level dietary modification. No intervention was implemented in the control.

Outcomes The primary outcome was an improvement in health-related quality of life, measured using the EuroQoL 5 Dimensions 5 Levels questionnaire. The secondary outcome measure was reduction in absenteeism, which is measured in monetary amounts. Probabilistic sensitivity analysis (Monte Carlo simulation) assessed parameter uncertainty.

Results The system-level intervention dominated the education and combined interventions. When compared with the control, the incremental cost-effectiveness ratio (€101.37/quality-adjusted life-year) is less than the nationally accepted ceiling ratio, so the system-level intervention can be considered cost-effective. The cost-effectiveness acceptability curve indicates there is some decision uncertainty surrounding this, arising from uncertainty surrounding the differences in effectiveness. These results are reiterated when the secondary outcome measure is considered in a cost–benefit analysis, whereby the system-level intervention yields the highest net benefit (€56.56 per employee).

Conclusions System-level dietary modification alone offers the most value per improving employee health-related quality of life and generating net benefit for employers by reducing absenteeism. While system-level dietary modification strategies are potentially sustainable obesity prevention interventions, future research should include long-term outcomes to determine if improvements in outcomes persist.

Trial registration number ISRCTN35108237; Post-results.

Strengths and limitations of this study

- This is the first study to comprehensively integrate health effectiveness evidence with the economic costs of implementing and delivering workplace dietary interventions.
- The inclusion of a cost–benefit analysis which monetised absenteeism, facilitated the translation of trial outcomes into realisable benefits for businesses.
- The main limitation of this study is that it did not include long-term outcomes. Therefore, the potential for costs to be offset in the future is unknown.

INTRODUCTION

The increasing prevalence of diet-related disease is a major contributor to global morbidity and mortality and also to escalating healthcare spending.[1 2] Calorie excess and dietary intakes of fat (saturated and trans fats), sugar and salt play a critical role in the development of many chronic diet-related diseases, including obesity, cardiovascular disease stroke and type 2 diabetes.[3] In an effort to ease the health and economic burden of chronic diet-related disease, the workplace has been identified as a priority setting to positively influence individuals' dietary behaviours with individuals now spending up to two-thirds of their waking hours at work.[3 4] Owing to limited evidence on the effectiveness of workplace dietary interventions and the need to integrate health effectiveness evidence with economic costs, an investigation of their cost-effectiveness is needed.[5–8]

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When estimating the cost-effectiveness of a workplace intervention, it is imperative that consideration is given to clinical and quality of life measures, and towards measuring the impact of the intervention on absenteeism. Employers bear the financial burden of diet-related diseases through workplace absenteeism which incurs both direct and indirect costs.[9–14] Direct costs include sick pay schemes, medical referrals and the cost associated with replacing absent employees and indirect costs consist primarily of losses incurred through absenteeism which in turn leads to reduced productivity.[15] In the UK alone, workplace absenteeism is estimated to cost £29 billion annually with a reported 131 million days lost to absenteeism in 2013.[16] In an effort to halt these mounting costs, many employers are investing in workplace health promotion programmes; however, evidence on the cost-effectiveness of these programmes is limited.[17 18] Furthermore, recent research has revealed that when investing in workplace health promotion, employers are also driven by altruistic motives and feel responsible for enabling the health of their employees.[19 20] Employers feel responsible for creating a healthy workplace environment that will meet their employees' growing expectations, which will help employee attract and retain employees.[19 20] Similarly, employers have become increasingly concerned with portraying a positive company image to industry and to their employees and perceive the implementation of workplace health interventions as a means of achieving this image.[19 21]

The Food Choice at Work (FCW) study was a cluster-controlled trial of complex workplace dietary interventions.[22] The novel trial assessed the comparative effectiveness of a system-level dietary modification intervention and a nutrition education intervention both alone and in combination versus a control workplace. The findings demonstrate that a well-structured, complex workplace dietary intervention, combining nutrition education and system-level dietary modification, reduces employee's dietary intakes of salt and saturated fat, improves employees' nutrition knowledge and decreases their body mass index.[5] Thus, combining nutrition education and system-level dietary modification is an effective approach for promoting a healthy diet and weight loss at work. This study employed standard economic evaluation methodology and evidence from the FCW trial to assess the cost-effectiveness of complex workplace dietary interventions. Cost-effectiveness of this complex workplace dietary intervention was assessed from two different perspectives: (1) the health system perspective in terms of quality-adjusted life-years (QALYs), that is, a cost–utility analysis and (2) an employer's perspective in terms of monetary benefit, that is, a cost–benefit analysis.

METHODS

This analysis follows the standard methodology of cost-effectiveness analysis and builds on previous analysis of workplace interventions to reduce absenteeism in the workplace.[5 23] The methods and data used are explained with a more detailed description of modelling assumptions given.

Interventions

Full details of the FCW study have been described elsewhere.[5 22] Briefly, a cluster controlled trial was conducted in four large manufacturing workplaces in Cork, Ireland for a 9-month time period. Workplaces were allocated to receive one of the following: nutrition education alone (education) (n=226); system-level dietary modification alone (system-level) (n=113); combined intervention (combined) (n=400) or no intervention (control) (n=111). The number of employees recruited per workplace was proportionate to company size.[5] The nutrition education intervention was provided using individual nutrition consultations, group presentations and detailed nutrition education (traffic light menu labelling, posters, leaflets and e-mails). In the system-level intervention, dietary modification elements were implemented which included menu modification (restriction of fat, sugar and salt), an increase in fibre, fruit and vegetables, price discounts on fruit, strategic positioning of healthier alternatives and portion size control. The combined intervention included received all elements of the education and system-level interventions and no intervention was implemented in the control.[5] Table 1 contains a detailed description of the multicomponent intervention elements.

Economic evaluation

This economic evaluation was primarily informed by national guidelines.[24] Given the nature and scope of the intervention, a health service provider and employer's perspective was taken. A cost–utility analysis measured the cost-effectiveness of the interventions in terms of QALYs and a cost–benefit analysis was employed, whereby the monetary value of absenteeism was used to estimate the net benefit of each intervention relative to the control.

Costs

A cost analysis of the FCW trial has been described elsewhere.[25] In summary, a bottom-up approach using micro-costing was employed, whereby intervention costs were disaggregated from the employer's perspective. The FCW research team involved in the development and implementation of the interventions were consulted to identify, measure and value the resources consumed under each intervention. The costs were classified into three different phases, representing setup costs, maintenance costs and physical assessment costs. Five cost categories were identified for each phase: (1) nutritionist costs; (2) catering costs; (3) management costs; (4) employee costs and (5) printing and material costs. Following identification of the resources consumed in each intervention, the unit costs of the resources were multiplied by the quantities used. Costs were valued in monetary terms using standard techniques in line with national guidelines.[23 24]

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Table 1 Description of the intervention elements

Intervention	Description of elements
Nutrition education	Group presentations: Monthly nutrition sessions (30 min per session) were delivered in the workplace by the FCW nutritionist. Topics included portion control, food labelling and general healthy eating guidelines. Sessions were repeated to ensure they were accessible to employees on different shift cycles. Individual nutrition consultations: Participants received one-to-one dietary counselling with the FCW nutritionist. Consultations were tailored for each participant based on their lifestyle, physical assessment results and dietary recall assessments. The nutritionist provided advice on how to follow a healthy diet, reach/maintain a healthy body weight and achieve healthy resting blood pressure. Participants also received a healthy eating booklet and a personalised measurement card. Detailed nutrition information: Detailed nutrition information was prepared by the FCW nutritionist and displayed in the workplace throughout the intervention. The information included posters, leaflets, e-mails and daily calorie menu labelling with a unique traffic light coding system. A healthy eating chat table was also provided twice a month during break times to provide employees with an opportunity to ask the nutritionist about healthy eating.
Environmental dietary modification	Menu modification: Fat, saturated fat, sugar and salt were restricted. Stock and bouillon were replaced with low-salt stock options. Salt was replaced with fresh herbs, spices and garlic for additional flavour. High-salt savoury options, high-salt products and processed meats were reduced and replaced where possible with low-salt options. Full-fat dairy products were replaced with low-fat options where possible. Cream and cheese were not used as a garnish on meals and the amount of cheddar in all meals was reduced. Cooking methods using oil (deep-fat frying) were limited and replaced with boiling, poaching, grilling, baking and steaming where possible. Plant oils were introduced for cooking. Sauces and accompaniments were not added to any meal unless requested by the employee. Chips and French fries were removed from the menus 2 days a week and were replaced with different potato options such as baked potatoes. Soft carbonated drinks were restricted and replaced with water, milk and unsweetened options. Increase in fibre and availability of fruit and vegetables: White pasta, rice and bread were replaced with wholegrain alternatives. Fruit and vegetables were added to rice, pasta, soup and meat dishes. Fresh whole fruit was made available throughout the day and a buffet-style fresh salad bar was available to accompany any dish on a daily basis. Price discounts: Portions of whole fresh fruit were offered at discount prices on a daily basis within the confines of the pre-existing catering contract. Strategic positioning of food: Healthier alternatives were strategically positioned throughout the workplace canteen. Healthy snacks, such as fresh fruit, dried nuts, seeds, brown sandwiches and brown soda bread were positioned at eye level at the entrance of the canteen and in the vending machines. Free-flowing salt and sugar were removed from tables and replaced with sachets. Portion size control: Standard serving tools were used to control portion size at mealtimes. Catering staff received training from the FCW nutritionist regarding strict portion size control.

FCW, Food Choice at Work.

A detailed exposition of the costs and approaches used to estimate and value resources are fully described elsewhere.[25] Table 2 contains a breakdown of the total cost of the FCW interventions over 12 months. Total costs were standardised for a cohort of 517 employees per workplace, which reflected the number of employees that completed the trial. Standardising costs for a 12-month period and for a cohort of 517 employees per workplace will increase the comparability of findings for employers. In addition, having the same sample size per workplace will allow employers to use the costs as a benchmark for similarly sized workplaces. Total costs were highest in the combined intervention (€52 940), followed by the education intervention (€50 216) and the system-level intervention (€25 345). In the control, physical assessment costs (monitoring of employees) accounted for 100% of costs (€22 201). All resource quantities and costs were estimated and reported in 2016 € (Ireland). Discounting was not undertaken due to the 1-year time horizon.

Outcomes

The primary outcome measure was an improvement in QALYs from baseline to 7–9-month follow-up. To measure health-related quality of life (HRQoL) the EuroQoL 5 Dimensions 5 Levels questionnaire was employed, as per national guidelines.[24] As data were only available for 7–9 months, HRQoL was extrapolated from 9 to 12 months to obtain HRQoL for a 1-year period, with the assumption that HRQoL remained constant for 12 months. In the absence of value set for Ireland, the UK cross-walk value set was employed to estimate QALYs.[26]

The secondary outcome measure was the net benefit of the interventions in terms of reducing absenteeism. Annual absence data for a year prior to and a year postintervention implementation were obtained from the human resources department of each workplace. The monetary value of absenteeism was employed to report the net benefit of the interventions compared with the control. Reductions in absenteeism were valued using

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Table 2 Costs of implementing and delivering the interventions for 12 months

	Control costs (€)	Education costs (€)	System-level costs (€)	Combined costs (€)
Setup costs				
Nutritionist	–	600	2494	3225
Catering costs	–	41	490	490
Management stakeholder costs	–	103	103	103
Printing and materials	–	1019	85	1019
Employee time	–	53	53	53
Subtotal	–	1816	3225	4890
Maintaining costs				
Nutritionist	–	12985	350	12635
Catering costs	–	1573	–	1573
Management stakeholders costs	–	205	205	205
Printing and materials	–	282	–	282
Employee time	–	8241	–	8241
Subtotal	–	23286	555	22936
Physical assessments				
Nutritionist	14224	14333	13659	14333
Employee time	7977	10781	7906	10781
Subtotal	22201	25114	21565	25114
Total cost of intervention	22201	50216	25345	52940
Cost per employee (n=517) per year	42.94	97.13	49.02	102.40
Total cost of intervention (excluding physical assessments)	0	25102	3780	27826
Cost per employee (n=517) per year (excluding physical assessments)	0	48.55	7.31	53.82

national estimates of the national average daily cost of absenteeism (€144.48).[27] Complete follow-up data were available for a total of 517 employees from the four workplaces, sociodemographic, health and lifestyle characteristics of employees who completed the trial and are presented in table 3.[5]

Assessing cost-effectiveness and investigating uncertainty

Incremental cost-effectiveness ratios (ICERs) and net benefit were employed to assess the cost-effectiveness of each intervention using the primary and secondary outcomes for a cost–utility analysis and cost–benefit analysis, respectively.[24 28] A probabilistic sensitivity analysis, using Monte Carlo simulation was performed to assess parameter uncertainty. Probability distributions were assigned to individual model parameters. As the cost data were non-negative, continuous data, they assumed gamma distributions and the outcomes assumed normal probability distributions.[29] The Monte Carlo simulation propagated uncertainty throughout the model and provided 10000 different values for expected costs and expected outcomes associated with each intervention and the control. The average of the expected costs and effects were used to estimate net benefit and ICERs in the probabilistic model. These ICERs were plotted onto incremental cost-effectiveness planes, with the costs plotted in the north–south axis and the effects plotted on the east–west axis. A cost-effectiveness acceptability curve summarised decision uncertainty by graphically demonstrating the probability of an intervention being cost-effective compared with the control using a range of ceiling ratios (€0 to €100 000/QALY).[30 31]

RESULTS

Cost–utility analysis

With regards to intervention costs per employee, the lowest cost per employee was observed in the control (€42.94), followed by the system-level intervention (€49.02), the education intervention (€97.13) and the combined intervention (€102.40). Meanwhile, each of the interventions delivered QALY improvements, the largest improvement was observed in the system-level intervention (+0.05 QALYs), followed by the education intervention (+0.03 QALYs), the combined intervention (+0.01 QALYs); while the control resulted in deterioration (−0.01 QALYs) (table 4).

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Table 3 Sociodemographic, health and lifestyle characteristics of employees who completed the trial

	Total n=517 N (%)	Control n=67 N (%)	Education n=107 N (%)	System level n=71 N (%)	Combined n=272 N (%)
Sociodemographic					
Age group (years)					
18–29	44 (8.5)	11 (16.4)	13 (12.1)	7 (9.9)	13 (4.8)
30–44	331 (64.0)	34 (50.7)	67 (62.6)	33 (46.5)	197 (72.4)
45–65	142 (27.5)	22 (32.8)	27 (25.2)	31 (43.7)	62 (22.8)
Gender					
Male	393 (76.0)	42 (62.7)	81 (75.7)	43 (60.6)	227 (83.5)
Female	124 (24.0)	25 (37.3)	26 (24.3)	28 (39.4)	45 (16.5)
Educational level					
None/primary/secondary	99 (19.1)	24 (35.8)	24 (22.4)	32 (45.1)	19 (7.0)
Tertiary	418 (80.9)	43 (64.2)	83 (77.6)	39 (54.9)	253 (93.0)
Marital status					
Married/cohabiting	375 (72.5)	46 (68.7)	74 (69.2)	50 (70.4)	205 (75.4)
Separated/divorced/widowed	17 (3.3)	5 (7.5)	3 (2.8)	2 (2.8)	7 (2.6)
Single/never married	125 (24.2)	16 (23.9)	30 (28.0)	19 (26.8)	60 (22.1)
Job position					
Manager/supervisor	114 (22.1)	17 (25.4)	27 (25.2)	14 (19.7)	56 (20.6)
Non-manager/non-supervisor	403 (77.9)	50 (74.6)	80 (74.8)	57 (80.3)	216 (79.4)
Health					
Body mass index (kg/m^2)					
Normal weight	147 (28.4)	17 (25.4)	34 (31.8)	18 (25.4)	78 (28.7)
Overweight	254 (49.1)	33 (49.3)	48 (44.9)	34 (47.9)	139 (51.1)
Obese	116 (22.4)	17 (25.4)	25 (23.4)	19 (26.8)	55 (20.2)
Lifestyle					
Smoking status					
Never smoked	285 (55.1)	37 (55.2)	56 (52.3)	34 (47.9)	157 (57.7)
Former smoker	161 (31.1)	24 (34.3)	30 (28.0)	26 (36.6)	82 (30.1)
Current smoker	71 (13.7)	6 (9.0)	21 (19.6)	11 (15.5)	33 (12.1)
Physical activity					
Low	228 (44.1)	53 (79.1)	50 (46.7)	38 (53.5)	87 (32.0)
Moderate	136 (26.3)	9 (13.4)	30 (28.0)	18 (25.4)	79 (29.0)
High	153 (29.6)	5 (7.5)	27 (25.2)	15 (21.1)	106 (39.0)

Comparing the costs and QALY improvements, it is evident that the system-level intervention dominates both the education intervention and the combined intervention, as it delivers greater benefit at a lower cost. While compared with the control, the system-level intervention delivers more benefit but at a greater cost, positioning it in the northeastern quadrant on a cost-effectiveness plane. The ICER of the system-level intervention compared with control, €101.37/QALY, is well below what is considered cost-effective nationally (€45 000/QALY). However, the incremental cost-effectiveness plane (figure 1) demonstrates there is considerable uncertainty surrounding the existence and extent of differences in effectiveness between the system-level intervention and the control (95% range produced in the probabilistic sensitivity analysis produced a 95% range of −0.49 to +0.60.) This translates into decision uncertainty, presented on the cost-effectiveness acceptability curve (figure 2), with 58% probability of the system-level intervention being cost-effective compared with control. As the ceiling ratio increases beyond €100/QALY, the probability of the system-level intervention being cost-effective increases while it falls for the control.

Cost–benefit analysis

As discussed above the secondary outcome measure for the study was absenteeism which is employed in a

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Table 4 Change in effectiveness in outcomes from baseline 1-year follow-up

		Cost–utility analysis		Cost–benefit analysis		
	Costs (€)	QALYs (SD)	ICER	Absenteeism (SD)	Absenteeism (€)*	Net benefit†
Control	42.94	−0.01 (0.11)		+0.34 (5.38)	49.12	−92.06
Probabilistic	42.91	−0.01 (0.19)		+0.36 (5.40)		
System level	49.02	+0.05 (0.11)	€101.37/QALY‡	−0.71 (3.67)	−102.58	53.56
Probabilistic	48.99	+0.06 (0.19)	€100.76/QALY	−0.76 (3.66)		
95th percentile range			(€35.84–€147.93)			
Education	97.13	+0.03 (0.12)	Dominated by system level	−0.36 (4.67)	−52.01	−45.12
Probabilistic	97.06	+0.03 (0.14)		−0.35 (4.63)		
Combined	102.40	+0.01 (0.09)	Dominated by system level	−0.78 (5.43)	−112.69	10.29
Probabilistic	102.33	+0.01 (0.14)		−0.79 (5.46)		

*Cost per absent day €144.48.[27]
†Net benefit=benefits (€)—costs (€).
‡System-level versus control: (incremental costs/incremental QALYs).
ICER, Incremental cost-effectiveness ratio; QALYs, quality-adjusted life-years.

cost–benefit analysis to assess cost-effectiveness from an employer's perspective. As outlined above the lowest cost per employee was observed in the control (€42.94), followed by the system-level intervention (€49.02), the education intervention (€97.13) and the combined intervention (€102.40). Similar to the QALY estimates, each of the interventions improved absenteeism; the largest improvement was observed in the combined intervention (−0.78 days), followed by the system-level intervention (−0.71) and the education intervention (−0.36 days), while the control resulted in increased absenteeism (+0.34 days) (table 4). The reduction in absenteeism is expressed in monetary amounts using the national daily cost of absenteeism per employee of €144.48. The control and nutrition education interventions had negative net benefits, that is, the costs of the intervention

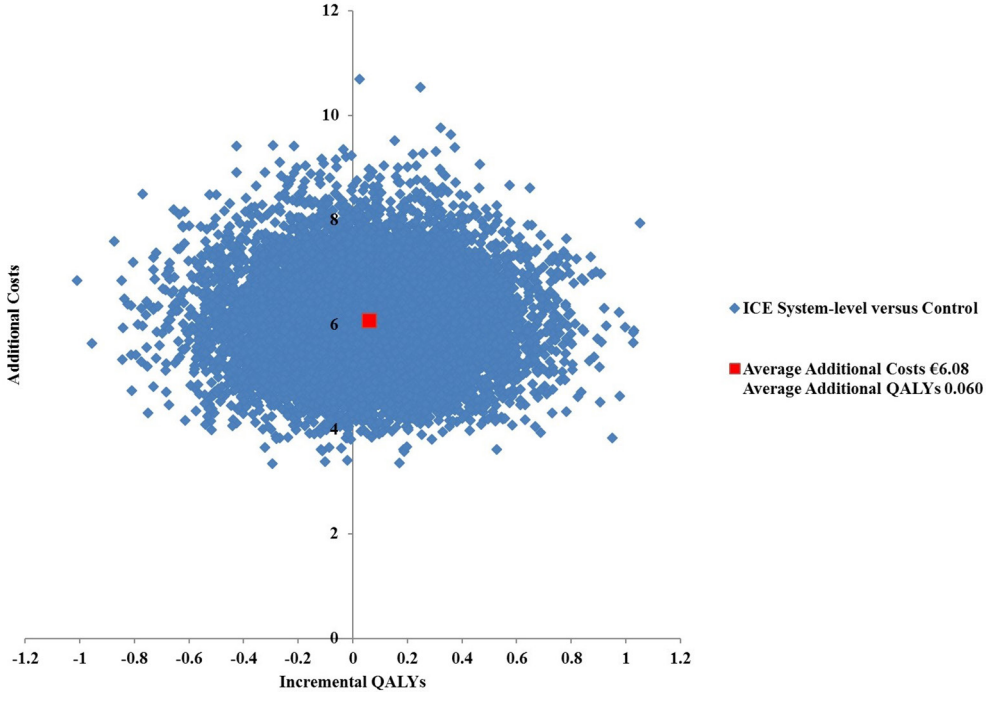


Figure 1 Incremental cost-effectiveness plane of the system-level intervention compared with the control. The system-level intervention delivers more benefit (additional QALYs) but at a greater cost, positioning the ICER in the northeastern quadrant on the cost-effectiveness plane. The plane illustrates the uncertainty surrounding the existence and extent of differences in effectiveness between the system-level intervention and the control (95% range produced in the probabilistic sensitivity analysis produced a 95% range of −0.49 to +0.60.). ICE, incremental cost-effectiveness; ICER, incremental cost-effectiveness ratio; QALYs, quality-adjusted life-years.

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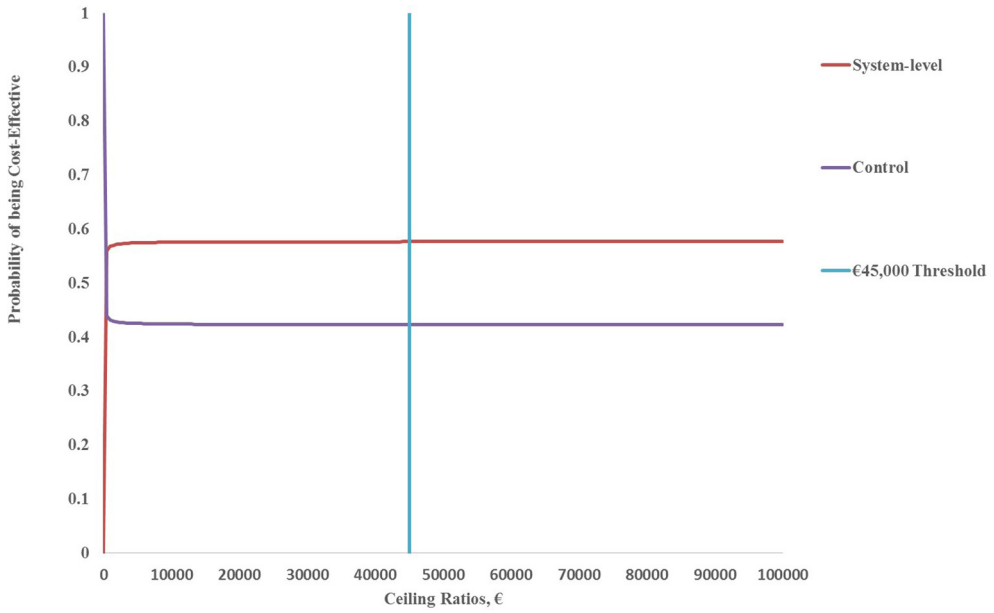


Figure 2 Cost-effectiveness acceptability curve of the system-level intervention compared with the control. At a ceiling ratio of €45 000/QALY, the system-level intervention has a 58% probability of being cost-effective when compared with the control. QALY, quality-adjusted life-year.

outweighed the benefits of reduced absenteeism. The system-level and combined interventions had positive net benefits, that is, the savings gained from reduced absenteeism were greater than the costs of the intervention. The system-level intervention had the highest net benefit, €53.56 per employee, and therefore dominates the other interventions. These results are consistent with those in the cost–utility analysis which measured outcomes in terms of QALYs.

DISCUSSION

This study sought to determine the cost-effectiveness of a complex workplace dietary intervention, which included nutrition education and system-level dietary modification elements both alone and in combination versus a control workplace. The system-level intervention dominated the education and combined interventions as it delivered greater benefit (QALYs) at lower costs. Compared with the control, the system-level intervention also delivered greater QALYs at an additional cost. The low ICER suggests the intervention is cost-effective, nevertheless, there is considerable uncertainty surrounding the difference in effects. The cost-effectiveness of the system-level intervention was reiterated when considering the secondary outcome measure (absenteeism measured in euros in a cost–benefit analysis) as it delivered highest net benefit.

The main strength of this economic evaluation is that it is one of the first studies to comprehensively integrate health effectiveness evidence with the economic costs of implementing and delivering workplace dietary interventions. The findings from the economic evaluation complement the findings from the FCW cluster controlled trial that suggests workplace dietary interventions can potentially improve employee health.[5–8] Moreover, the study provides employers, public health policy-makers, national and international catering stakeholders and industry with robust cost-effectiveness evidence on workplace dietary interventions. The inclusion of a cost–benefit analysis is an additional significant strength of this novel study. The Medical Research Council advocate that if an intervention is proven to be effective as improving health behaviours of employees, it is more likely that the intervention will be implemented at scale if the outcomes are presented in a way that is of relevance to those who are bearing the costs of the intervention.[32] Therefore, in instances where interventions are funded by private industry, it is imperative that the monetary net benefits are of relevance to the business. In this study, monetising absenteeism facilitated the translation of the FCW trial outcomes into realisable and tangible benefits for businesses. Although each intervention reported a positive net benefit, it should be noted that these results are reliant on the monetary estimate for absenteeism that was used. The daily estimate that was used was obtained from the Irish Business and Employers Confederation (IBEC) and adjusted for inflation (€144.48), as no other suitable estimate within the Irish context is currently available.[27]

The study captures the high initial cost of intervention implementation without incorporating long-term outcomes. Future research, which would include collecting data on long-term outcomes, may also quantify further health and monetary benefits that were not captured in this economic evaluation. For instance, improving employees' dietary behaviours is likely to affect the dietary behaviours of their families and also possibly their wider communities, generating positive externalities. Furthermore, it is possible that the cost of sickness

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has been underestimated as this study did not measure presenteeism. Presenteeism has been defined as being present at work despite being ill and it is estimated that productivity losses due to presenteeism are significantly higher than losses incurred from absenteeism.[33 34] A 2016 Global Corporate Challenge report, estimated that in the USA, employees were absent from work for an average of 4 days per year, while they were unproductive at work for 57.5 days per year.[35] The report further estimated that absenteeism costs US employers US$150 billion annually while presenteeism costs were estimated at US$1500 billion annually.[35] To estimate the true cost of sickness, future research should include measures for both absenteeism and presenteeism. It should also be noted that the cost–benefit analysis might be capturing time preference as employers may place greater value on short-term costs and benefits of reducing absenteeism rather than those occurring in the future (improving employee health). As this study did not include long-term outcomes, which is its main limitation, the potential for costs to be offset in the future is unknown. Furthermore, the inclusion of atypical multinational manufacturing workplaces along with the small sample size, may potentially limit the generalisability of the findings. Additionally, the potential presence of participation bias must be acknowledged. Despite employees being randomly selected to participate in the study, bias cannot be ruled out as healthy employees may have been more likely to participate in the study when compared with unhealthier employees.

From a public health policy perspective, there is a definite need for pragmatism in the assessment of low-risk interventions, such as those addressed in this study, in tackling societal challenges of obesity and poor dietary behaviours.[13] As any single obesity prevention intervention is likely to have only a small impact at the aggregated level, there is a need to implement multiple low-agency interventions that do not require individuals to consciously engage with any intervention element of change their behaviour.[36] This study suggests that despite the use of a short time frame, system-level dietary modification interventions can potentially offer the best value in terms of improving employee health and generating monetary benefit for employers through reducing absenteeism.

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