

# The costs of obesity prevention and treatment

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## Introduction

It is well known that childhood and adult obesity impose significant costs to the health service and wider society (Serdula et al., 1993) and there is growing recognition that targeted treatment and prevention programmes should be from a wide-system perspective and therefore include delivery in non-health care settings such as schools, community venues and workplace settings. However, it is not clear how economic evaluations should be designed to evaluate these interventions, in particular how the non-health care costs should be captured. A recent review identified that there have been few economic evaluations of obesity interventions reported and a wide range of methods applied for collecting and reporting cost information (Zanganeh et al., 2019). Furthermore, only four out of 39 evaluations were conducted in a UK setting.

## Methods

In this short paper we synthesize cost information from three recent evaluations of interventions designed to either treat or prevent obesity in non-health care settings. The purpose is to describe the methods used to capture the cost information associated with complex interventions using a 'bottom-up' methodology, and to highlight the proportional contribution of each element of cost across the three case studies.

Case study 1 is the WAVES study. This was a multi-centre cluster randomized controlled trial (RCT) conducted to estimate the effect of an obesity prevention intervention in which primary schools were either randomised to the intervention arm (n=24 schools; 622 children) or to continue with ongoing health-related activities (the control arm, n=26 schools; 735 children). Full details of the trial design, intervention development and the RCT results (Adab et al., 2015; Adab et al., 2018), and full cost-effectiveness analysis (Canaway et al., 2019) are reported elsewhere. Briefly the intervention comprised four components focused on changing dietary and physical activity behaviours: cooking workshops; signposting to local opportunities to be physically active; 'Villa Vitality' (an external package provided by a sporting institution to promote physical activity and healthy eating); and daily structured physical activity sessions delivered within the school day.

Case study 2 is the CHANGE study. A feasibility study was conducted to adapt an existing children's weight management programme to meet the needs of culturally diverse populations in which families were allocated to either the 'intervention' programme (375 families) or the comparator programme (161 families). Full details of the study design and results are available (Pallan et al., 2018). The intervention was an enhanced culturally adapted programme delivered to families in a community setting over six weeks. The comparator was the standard weight management programme delivered over the same time period.

Case study 3 is the HDHK study - Healthy Dads, Healthy Kids UK. This was a feasibility RCT in which fathers of primary school aged children identified as having a BMI  $\geq 25\text{kg/m}^2$  were randomly allocated to either the intervention arm which comprised nine weekly healthy lifestyle group sessions involving the father and child or the control arm in which each family received a voucher for one visit to a local leisure centre. Within the study, three different modes of delivery for the intervention were explored: 1. Local Authority-delivered; 2. Private Coaching Organization-delivered; 3. Leisure Centre-delivered. Further details of the study are reported (Jolly et al., waiting to publish).

For all three studies, data on resource use were identified and measured by the trial team. All resource use capture tools were embedded within the trial data collection forms. Each study adopted a 'bottom-up' costing approach whereby the intervention components were 'itemised' and resource use collected alongside. For the WAVES study, this was a multi-component intervention comprising workshops delivered at school at which all materials and food items were recorded, and staff time logged using school self-completion logbooks. Similarly, time and materials relating to the daily physical activity sessions in school were recorded by the staff

in logbooks. One component was provided by an external sporting institution and therefore purchased at a fixed cost, and the time spent by research staff updating information sheets to signpost families to local physical activity opportunities was recorded using an electronic log.

The HDHK and the CHANGE studies were both feasibility trials and the economic evaluation therefore focused on the feasibility of cost data collection. For both interventions, the resource use captured included the costs of the intervention materials (handbooks and logbooks), room hire, intervention promotion, travel costs and staff time for delivery and training. All studies focused on measuring only the costs that differed between the 'usual care' and the intervention, therefore capturing only the incremental cost differences.

Unit costs for staff time were then applied to the resource use using external sources. For all studies, a societal perspective was adopted and costs were summed and averaged for each participant or family unit and the mean difference in costs between the two arms of the study estimated.

## Results and discussion

The resources identified for each of the obesity interventions and their costs are outlined in the table overleaf.

The costs presented here are the average costs per participant for a range of obesity prevention and treatment interventions. They are constructed from findings from three research studies based in the West Midlands, England. The costs provide an indication of the resource use requirements to deliver weight prevention and management activities in different settings.

Looking at the per participant costs, these do not appear to be expensive interventions. The six week CHANGE programme cost around £40 per participant, and WAVES cost £165 per child. HDHK costs are between £125 and £300 per family. In times of very limited budgets it can be difficult to find the resources to implement new services, or to put in place services that cost more than the existing one. However, if such interventions are more effective (that is, participants can make sufficient and lasting changes to their weight and lifestyle) than the comparator, this could have an impact on costs to the health service and wider society both today and in the future (Serdula et al., 1993). To set these costs into perspective, for the same year (2017/18) we know that just one GP appointment costs £37.40, an elective in patient stay costs around £3,756 and a paediatric outpatient appointment costs £185.

Intervention fidelity is, of course, important: to obtain the same effect were the interventions to be rolled-out, they should be delivered adhering to the same methods as within the trial. However, our detailed 'bottom-up' estimates of the resources used to deliver the interventions has allowed us to identify some components, such as choice of venue, timing of sessions, or delivery organisation, that may help keep the costs within budget.

**Mean resource use and costs associated with the obesity interventions (2017/18 prices)**

Resource item	Unit cost (£)	Resource use	Intervention (£)	Comparator (£)
<b>The CHANGE Intervention</b>				
<b>Initial training/set up costs</b>				
Training of 2 main facilitators (2 sessions: 1 x 2.5 hours + 1 x 1.5 hours)	10.80 <sup>a</sup>	8 hours	86.40	
Training of 1 assistant (2 sessions: 1 x 2.5 hours + 1 x 1.5 hours)	10.80 <sup>b</sup>	4 hours	43.20	
Display boards	395.00 <sup>c</sup>	2	790.00	
Card game	18.93 <sup>c</sup>	1	18.93	
Floor mat	39.00 <sup>a</sup>	1		39.00
Photocard	6.00 <sup>a</sup>	1		6.00
Stomach model	60.00 <sup>a</sup>	1		60.00
Fat model	73.00 <sup>a</sup>	1		73.00
<b>Subtotal set up/training costs</b>			<b>938.53</b>	<b>178.00</b>
<b>Delivery costs (identified as different between comparator and intervention arm)</b>				
Folders (1 per participant)	4	169 participants (intervention arm)	676	Free
Inserts for the cover of the folder	0.45	169 participants (intervention arm)	76.05	
Folder dividers	1.23	169 participants (intervention arm)	207.87	
Food labelling sheets	0.27	169 participants (intervention arm)	45.63	
Certificates	0.72	169 participants (intervention arm)	121.68	
Single-sided worksheets (11 per participant)	0.10	169 participants (intervention arm)	185.90	
Double-sided worksheets (colour) (6 per participant)	0.20	169 participants (intervention arm)	202.80	
Double-sided worksheets (black and white) (100 per participant)	0.04	74 participants (100 per participant)		296.00
Healthy portion plates (1 per participant in control arm)	1.88	74 participants (control arm)		139.12
BMI charts	0.55	169 participants (intervention arm), 74 participants (control arm)	92.95	40.70
<b>Staffing (additional staffing costs for intervention compared to comparator)</b>				
Assistant	10.80 (hour)	Intervention (5 weeks for 2.5 hours) Comparator (3 weeks for 2 hours)	135	64.80
Venue hire	580 (average weekend rate)	Intervention (7 weekend sessions) Comparator (1 weekend session)	4060	580
<b>Total cost (including training/set up costs)</b>			<b>6742.41</b>	<b>1298.62</b>
<b>Total average cost per session (including training/set up costs)</b>			<b>421.40</b>	<b>162.33</b>
<b>Total average cost per participant (including training/set up costs)</b>			<b>39.90</b>	<b>17.54</b>
<b>HDHK intervention (3 modes of delivery)</b>				
<b>Local Authority delivered:</b>				
<b>Set up/training costs</b>				
Room hire for training	40 (per day)	2 days	80	
Training the health trainers	1000 (per day)	2 days training (for 9 trainers)	2000	
Training the sports coach	250 (per day)	1 day training(for 1 sports coach)	250	
<b>Subtotal set up/training costs</b>			<b>2330</b>	
<b>Equipment (per family pack)</b>				
t-shirts	3.30	(assume 4 per family)		

Resource item	Unit cost	Resource use	Intervention (£)	Comparator (£)
pedometers	16.50	1		None
stickers	0.50	1 pack		"
handbook for dad	8.40	1		"
handbook for child	2.50	1		"
handbook for mum	4.25	1		"
logbook	4.60	1		"
play cared	1.85	1		"
spinner	0.50	1		"
<b>Subtotal (per family pack)</b>	<b>52.30</b>	<b>1</b>		
<b>Subtotal for the whole intervention (15 x family packs)</b>		<b>15 family packs</b>	<b>785</b>	
Room hire	0	Provided free of charge	0	"
Preparation time for 2 x health trainers (1 hour per weekly session for 9 weeks)	18 (per hour) <sup>d</sup>	1 hour per weekly session for 9 weeks	324	"
Delivery time for 2 x health trainers (1.5 hours per weekly session for 9 weeks)	18 (hour)	1.5 hour per weekly session for 9 weeks	486	"
Delivery time for 1 x sports coach	50 (hour)	1 hour per week for 9 weeks	450	"
Delivery time for grade 6 researcher	15 (hour) <sup>e</sup>		203	"
<b>Total cost (excluding training)</b>			<b>2248</b>	
<b>Total cost (including training)</b>			<b>4578</b>	
<b>Total average cost per session (including training)</b>			<b>508</b>	
<b>Total average cost per family (including training/set up costs)</b>			<b>305</b>	"
<b>Coaching organization delivered:</b>				
Whole package including training and delivery	3444 <sup>f</sup>		3444	"
Room hire (per week)	40		360	"
<b>Total cost (including training)</b>			<b>3804</b>	
<b>Total average cost per session (including training)</b>			<b>422</b>	
<b>Total average cost per family (including training/set up costs)</b>			<b>254</b>	
<b>Leisure centre delivered</b>				
Whole package including training and delivery	1530 <sup>f</sup>		1530	"
Room hire (per week)	40		360	"
<b>Total cost (including training)</b>			<b>1890</b>	
<b>Total average cost per session (including training)</b>			<b>210</b>	
<b>Total average cost per family (including training/set up costs)</b>			<b>126</b>	
<b>WAVES intervention</b>			<b>Intervention mean cost per school class</b>	
Signposting	Please see Canaway et al, 2019 for full details	Published cost items are in 2013/14 prices.	140	"
Villa vitality package		Here they are inflated to 2017/18 prices	3027	"
Cooking classes and workshops		Using PSS annual percentage increases for	289	"
Purchasing/packing/printing materials		Local Authority services.	128	"
Cooking materials			43	"
Delivery of materials			123	"
Physical activity sessions at school (staff time)			1132	"
<b>Total average cost per class</b>			<b>4884</b>	
<b>Total average cost per child (assuming 30 children in a class)</b>			<b>163</b>	

<sup>a</sup>Costs provided by the weight management service staff (BCHCT), <sup>b</sup> Band 4, NHS Agenda for Change Pay 2016/17 <sup>c</sup> Costs provided by research team <sup>d</sup> Source: <https://www.youthemployment.org.uk/careers-hub-job-role/health-trainer/> (accessed 6 December 2019) <sup>e</sup> Source: University of Birmingham salary payscales: <https://www.birmingham.ac.uk/staff/jobs/pay.aspx> <sup>f</sup> Amount charged by external organization.

## References

- Adab, P., Pallan, M., Lancashire, E., Hemming, K., Frew, E., Barrett, T., Bhopal, R., Cade, J., Canaway, A., Clarke, J., Daley, A., Deeks, J., Duda, J., Ekeland, U., Gill, P., Griffin, T., McGee, E., Hurley, K., Martin, J., Parry, J., Passmore, S. & Cheng, K. (2018). Effectiveness of a childhood obesity prevention programme delivered through schools, targeting 6 and 7 year olds: cluster randomised controlled trial (WAVES study), *British Medical Journal*, 360, 211.
- Adab, P., Pallan, M., Lancashire, E., Hemming, K., Frew, E., Griffin, T., Barrett, T., Bhopal, R., Cade, J., Daley, A., Deeks, J., Duda, J., Ekeland, U., Gill, P., McGee, E., Parry, J., Passmore, S. & Cheng, K. (2015). A cluster-randomised controlled trial to assess the effectiveness and cost-effectiveness of a childhood obesity prevention programme delivered through schools, targeting 6-7 year old children: the WAVES study protocol, *BMC Public Health*, 15, 488.
- Canaway, A., Frew, E., Lancashire, E., Pallan, M., Hemming, K. & Adab, P. (2019). Economic evaluation of a childhood obesity prevention programme for children: Results from the WAVES cluster randomised controlled trial conducted in schools, *PLOS One*, 14, 7, e0219500.
- Jolly, K., Jones, L., Sidhu, M., Pallan, M., Young, M., Roalfe, A., Burgess, A., Daley, A., Collins, C., Frew, E., Adab, P. and Morgan, P. (waiting to publish). Health Dads, Healthy Kids UK: a cultural adaptation and feasibility study of a weight management programme for fathers of younger children, *Public Health Research*, 14, 185, 13. National Institute for Health Research.
- Pallan, M., Hurley, K., Griffin, T., Lancashire, E., Blissett, J., Frew, E., Gill, P., Hemming, K., Jackson, L., Jolly, K., McGee, E., Parry, J., Thompson J. & Adab, P. (2018). A cluster-randomised feasibility trial of a children's weight management programme: the Child weight mANaGement for Ethnically diverse communities (CHANGE) study, *Pilot and Feasibility Studies*, 4, 175.
- Serdula, M., Ivery, K., Coates, R., Freedman, D., Williamson, D. and Byers, T. (1993). Do Obese Children Become Obese Adults? A Review of the Literature, *Preventive Medicine*, 22, 2, 167-177.
- Zanganeh, M., Adab, P., Bai, L. and Frew, E. (2019). A systematic review of methods, study quality, and results of economic evaluation for childhood and adolescent obesity intervention. *Internal Journal of Environmental Research and Public Health*, 16, 3, 485.