

## Appendix 2: Characteristic of studies excluded from meta-regression

|     | Author, Year, Country (Intervention name)          | Study design: Sample size (n) Analysed (An)  | Obesity definition  | Diet D)/ Exercise (E)/D+E: Setting | Format & content  | Adiposity outcome measurement or reasons for exclusion for meta-regression |
|-----|--|--|---|------------------------------------|---|--|
| 1.  | Carraway 2014 <sup>1</sup><br>USA                  | Cohort<br>Total = 52 (subgroup n =33 & families offered FU for 10 months)  | BMI > 95th %ile   | Community                          | 6 x 1 hr nutrition sessions + ad-lib access to a nutritious diet + 7hr/day PA + GT + CBT.   | WC only  |
| 2.  | Croker 2012 <sup>2</sup><br>UK                     | RCT:<br>Total = 72 (63)<br>FBBT= 37 (33)<br>OC =35 (30)  | OW or Ob as per IOTF<br>Mean BMI SDS>3  | D+E<br>Clinic (Hospital)           | Reduce snacking ≤ 2 occasions/day + Balanced diet following 'Eatwell plate and 'Traffic Light system' + Reduce sedentary behaviour + 60 min/day exercise.   | body mass, fat mass, WC &WC-SDS  |
| 3.  | Doughty 2015 <sup>3</sup><br>USA                   | Cohort<br>Total = 12   | BMI ≥ 89th %ile.<br>Requested data from study authors regarding OB/OW– no response. | D+E<br>Academic<br>Institution     | Behavioural counselling + Daily caloric targets + 2 x 1hr/5 days and one 1hr/day physical training) + behavioural counselling.  | WC. body mass  |
| 4.  | Elloumi 2009 <sup>4</sup><br>Tunisia               | RCT<br>Total =21<br>Energy restriction =7<br>Exercise training =7<br>Both =7                                       | BMI > 97th %ile<br>(French standards)   | D+E<br>Academic<br>Institution     | 2-month intervention. 3 groups, R = energy restricted group. E=individualised exercise group. RE= energy restriction + exercise. Individualized dietary advice by dietitian. 500kcal/day deficit (15% protein, 55% CHO, 30% fat). Exercise: 90 mins per day; 4 days per week. Intensity of exercise at heart rate corresponding to lipox <sub>max</sub> | Body mass, fat mass  |
| 5.  | Grulich-Henn, 2011 <sup>5</sup><br>Germany         | Cohort Total = 58  | BMI > 97th %ile<br>(German paed. standards)   | D + E<br>Academic<br>Institution   | 6 x monthly nutritional consultation & CBT + 24 weekly PA programs.   | Body mass only   |
| 6.  | Gunnarsdottir, 2014 <sup>6</sup><br>Iceland        | Cohort Total = 84  | BMI z-score > 2.0 SDS<br>(Swedish growth curve)                                     | D+E<br>Clinic (Hospital)           | Family-based Epstein behavioural intervention.  | Body mass only   |
| 7.  | Holm 2007 <sup>7</sup><br>Denmark                  | Cohort<br>Total enrolled =120; BL =110,<br>post-intervention = 87  | BMI-SDS LMS method<br>(Danish ref pop.)   | D+E<br>Academic<br>Institution     | Restricted low-fat diet (6500-7000 kJ/day) + Mandatory and optional PA.   | number of pps not consistent for BMI-SDS and % body fat                    |
| 8.  | Kalavainen, 2012 <sup>8</sup><br>Finland           | RCT<br>Total = 70<br>routine treatment = 35,<br>group treatment = 35   | Wt-for-ht 115-182%  | D+E<br>Community                   | 2 interventions (Group and routine) - Routine (2 school health care sessions) + Group (10 x 90 min/wk parents and children separate focusing on healthy lifestyle/physical activity session, then next 5 sessions/2 wks + 1 session together)   | Fat mass only  |
| 9.  | Kolsgaard, 2011 <sup>9</sup><br>Norway             | Cohort<br>Total = 230 analysed (n= 307 started)  | BMI > 97.5 %ile for ht according to Norwegian percentiles.                          | D+E<br>Clinic (Hospital)           | ~1hr biannual diet & PA (60 min/day exercise encouraged) counselling session with children & parent/s.  | Body mass, WC  |
| 10. | Kolotourou 2013 <sup>10</sup><br>UK<br><b>MEND</b> | Cohort: Recruited from MEND<br>RCT.<br>Total = 230 analysed<br>Subsample 1 = 71 (6 mth RCT completers – both arms) | BMI ≥ 98 <sup>th</sup> %ile   | D+E:<br>Community                  | Family-based 9-week MEND program (2 x wk group sessions including nutrition education, behaviour modification + fun-based PA) + 12 wk free family swim pass.  | WC only  |

|     |   |   |  |                              |   |   |
|-----|---|---|--|------------------------------|---|---|
|     |   | Subsample 2 = 42 (12 mth RCT completers – IG only)            |  |                              |   |   |
| 11. | Marcano, 2011 <sup>11</sup><br>Venezuela  | Cohort<br>Total = 111   | OW: BMI >90th %ile/BMI z-score > 1.5.<br>OB: BMI >97th %ile/BMI z-score >2             | D+E:<br>Clinic (Hospital)    | Nutrition+PA recommendations + A form to register wkly hours of PA, number of steps taken/day, and hrs/wk spent in sedentary activities + Restrict calorie intake and focus on a balanced diet encouraged.  | Body fat only   |
| 12. | Mager 2015 <sup>12</sup>  | Cohort<br>Total=12 (completed =9)                             | CDC criteria   | D Clinic (but unclear)       | 1 session of education for parents and children and then follow up at 3 months and 6 months afterwards.   | WC only   |
| 13. | Makkes 2016 <sup>13</sup><br>Netherlands  | RCT:<br>Total = 80<br>Short-stay (SS)=40<br>Long-stay (LS)=40 | BMI-SDS ≥3.0 or BMI-SDS ≥2.3 + OB-related comorbidity                                  | D+E:<br>Clinic (Hospital)    | Intensive 12-month lifestyle treatment. In-patient period of either 2 months (short-stay group) or 6 months (long-stay group). Short-stay group: biweekly 2-day return visits for 4 months, then monthly 2-day return visits for 6 months following in-pt period. Long-stay group: monthly 2-day return visits for 6 months following in-pt period.<br>Treatment: Nutrition, physical activity and behaviour change. Required active participation of parents/caregivers. | WC,WC-SDS   |
| 14. | Martos, 2009 <sup>14</sup><br>Spain<br>(Same intervention as Valle Jimenez 2013 <sup>23</sup> but different sample) | Cohort<br>Total = 47  | BMI > 95th %ile on growth curves   | D+E<br>Community             | Moderately OB subjects (Low-calorie diet); Severe/refractory OB subjects (Restriction diet of 25-30%) + Moderate/intense exercise 60 min/day x 5 days/wk encouraged.  | Body mass only  |
| 15. | Obert 2013 <sup>15</sup><br>France  | Cohort<br>Total = 28 (plus 20 healthy lean controls)          | BMI > 97th French %ile   | D+E:<br>Clinic (Hospital)    | Cycle ergometer (9 x 5 mins x 3 times/week: 4 min moderate + 1 min intense) + 2 times/wk moderate exercise for 1st 2 mths   | Body mass, fat mass   |
| 16. | Panagiotopoulos2011 <sup>16</sup><br>Canada   | Cohort<br>Total =119  | OB: BMI ≥ 95th %ile;<br>OW: BMI ≥ 85th %ile and <95th %ile with at least 1 comorbidity | D+E:<br>Clinic (Hospital)    | 10 x consecutive wkly group sessions (6-10 families): 30 min PA + nutrition session + behavioural session.  | Body mass only  |
| 17. | Pozzato <sup>17</sup><br>Verduci 2011 <sup>18</sup><br>Italy  | Cohort:<br>Total = 26   | >30kg/m2 age and sex adjusted Cole <i>et al</i> curve                                  | D+E.<br>Community and Clinic | Normocaloric balanced diet and active lifestyle based on italian guidelines for treatment of childhood obesity  | WC only   |
| 18. | Reinehr, 2004b <sup>19</sup><br>Germany<br>OBELDICKS  | Cohort:<br>Total = 57   | BMI ≥ 97th %ile  | D+E:<br>Clinic (Hospital)    | Obeldicks - Intensive phase 3 mnths (Parents' course 2x/mnth + Behaviour therapy 2x/mnth + Nutritional course 2x/mnth + Exercise therapy 1x/wk) + Establishing phase 3 mnths (Talk rounds for parents 1x/mnth + Psychological therapy + Exercise therapy 1x/wk) + Establishing phase 2 for 3 mnths (Psychological therapy + Exercise therapy 1x/wk) + Establishing phase 3 for 3 mnths (Exercise therapy 1x/wk).  | Body fat only   |
| 19. | Reinehr, 2009 <sup>20</sup><br>Germany<br>OBELDICKS   | Cohort<br>Total = 109 (plus 43 obese controls)                | IOTF criteria: OB  | D+E:<br>Clinic (Hospital)    | Obeldicks (as above)  | WC only   |
| 20. | Rijks 2015 <sup>21</sup><br>Netherlands   | Non-randomised prospective study<br>Total = 172               | IOTF criteria: OW, OB, MO  | D+E:<br>Clinic (Hospital)    | Guidance with focus on nutrition, food habits, PA, sleep, psychological and social aspects.   | WC-SDS only   |
| 21. | Rovira 2013 <sup>22</sup><br>Spain  | Cohort<br>Total = 110   | BMI ≥ 97th %ile  | D+E<br>Clinic (Hospital)     | 12 x monthly visits in 2 phases: motivational and intervention. Focus on promoting healthy eating, encouraging PA & decreasing sedentary behaviour.   | Only reported as 'good responders' and 'poor responders' to |

|     |   |  |   |  |  |  |
|-----|---|--|---|--|--|--|
|     |   |  |   |  |  | intervention so removed from analysis                              |
| 22. | Santomauro 2011 <sup>23</sup><br>Venezuela              | Cohort<br>Total = 36   | BMI > 97 <sup>th</sup> %ile                                     | D+E:<br>Clinic (Hospital)                      | Dietary recommendations + 30 mins daily moderate exercise or 3 x wk moderate exercise + decrease time watching TV/video games.   | Body mass, fat mass  |
| 23. | Schum 2012 <sup>24</sup><br>Germany                     | Cohort:<br>Total = 75<br>HZ=52<br>HO= 21   | BMI-SDS > 2   | E:<br>Community                                | Increase to 2 hrs/day PA + nutritional recommendations based on 'Optimised Mixed Diet for German Children and Adolescents' + close surveillance by physician.  | Fat mass, WC   |
| 24. | Shalitin, 2009 <sup>25</sup>                            | Cohort:<br>Total = 174 randomised<br>E =58 (52)<br>D =58 (55)<br>D+E = 58 (55)       | BMI > 95 <sup>th</sup> %ile for age & gender                    | D+E:<br>Clinic (Hospital)                      | 3-month interventions: Exercise intervention (90 min moderate exercise 3 days/wk); Diet intervention 3 mths (12 x/wk nutritional group meetings with parents + Hypocaloric diet 1200 kcal/day); Diet and exercise intervention 3 mths (90 min training session days/wk + 12 x/wk nutritional group meetings with parents + Hypocaloric diet 1200 kcal/day).                                      | SEs were calculated from a mixed model and not directly comparable |
| 25. | Springer 2015 <sup>26</sup><br>Germany                  | Cohort:<br>Total=39  | BMI > 90 <sup>th</sup> %ile                                     | D+E:<br>Clinic (Hospital)                      | Encouraged to increase exercise by 1-2 hrs/day + Decrease sedentary behaviour to a total of 2 hrs/day or less + Nutrition recommendations + 6 telephone calls from/visits to the physician.  | fat mass, WC & WC-SDS  |
| 26. | Tan-Ting 2011 <sup>27</sup><br>Philippines              | Cohort:<br>Total = 44  | BMI ≥ 95 <sup>th</sup> %ile (CDC)                               | D+E:<br>Clinic (Hospital)                      | Multidisciplinary, individualised, behavioural modification and exercise programme (St Luke's Medical Center Obesity & Weight Management Program)<br>Dietary session (6 sessions over 3 mths) + Restricted diet (1200-1500 Kcal/day) + Physical activity (24 x 1hr sessions over 3 mths + encouraged to do ≥ 30 min of individual exercise) + Behavioural management (4 x sessions over 3 mths). | body mass, fat mass, WC & WC-SDS                                   |
| 27. | Valle Jimenez 2013 <sup>28</sup><br>Spain               | Cohort<br>Total = 50 (plus n=50 non-obese control)                                   | BMI >95 <sup>th</sup> percentile growth curves for Spanish pop. | D+E:<br>Academic Institution/Clinic (Hospital) | Behavioural components, physical exercise and nutritional education. Energy distribution of diet: 25% between breakfast & lunch; 30-35% at lunch; 15% afternoon snack; remainder dinner. Moderate-to-intense PA for 30 mins at least 3 days per wk. Aim that 1 month after the start of tx subjects should be engaging in 60 mins/day moderate-to-intense physical exercise.                     | Body mass only   |
| 28. | Vanhelst 2013 <sup>29</sup><br>France                   | Cohort<br>Total=37   | ND  | D+E:<br>Community                              | 2hr/wk exercise sessions + 2hr/3 months health education session.  | Fat mass, fat free mass  |
| 29. | Vasquez 2013 <sup>30</sup><br>Chile                     | Cohort<br>X-over trial<br>(Group 1 only)<br>Total = 60                               | BMI ≥ 95 <sup>th</sup> %ile CDC                                 | D+E:<br>Academic Institution                   | Group nutrition education sessions x 6 (5 for children; 1 for parents)<br>Psychologist support sessions x 6 (5 for children; 1 for parents)<br>PE 45 mins x3/wk (30 sessions in total)   | Body mass, WC  |
| 30. | Verduci 2015 <sup>31</sup><br>Italy                     | Cohort:<br>Total = 85  | BMI Cole's curve cut-off 30 kg/m <sup>2</sup> at 18 yrs         | D+E:<br>Clinic (Hospital)                      | Normocaloric balanced diet + 60 min/day moderate/vigorous exercise + 1 hr educational session with dietician at recruitment.   | WC only  |
| 31. | Vos, 2011 <sup>32</sup><br>Netherlands                  | RCT<br>Total = 81 (BL: 79 An. 69)<br>I = 41 (BL 40: An. 36)<br>OC=40 (BL 39: An. 33) | Cole <i>et al</i> criteria                                      | D+E:<br>Clinic (Hospital)                      | 12 mths: During first 3 mths (7 x 2.5 hr/2 wks children group meetings + 5 x 2.5 hr/2 wks parent meetings + 1 x 2.5 hr/2 wks child/parent meeting + 2-3 refresher follow-up sessions for total of 2 yrs).<br>Also included exercise however not described except in flow diagram   | WC-SDS only  |
| 32. | Weiss 2009 <sup>33</sup><br>USA<br>Yale<br><b>TEAMS</b> | Cohort:<br>Total = 186   | BMI > 95 <sup>th</sup> %ile (CDC)                               | D+E:<br>Clinic (Hospital)                      | Subjects followed biannually as outpatients + Received nutritional/PA guidance. Levels of adherence to these recommendations was not evaluated or documented   | Body mass only   |

|     |                                      |  |  |                   |   |                |
|-----|--------------------------------------|--|--|-------------------|---|----------------|
| 33. | Weigel 2008 <sup>34</sup><br>Germany | RCT:<br>Total = 73<br>IG = 37<br>OC = 36 | OW BMI > 90 <sup>th</sup> %ile<br>OB BMI > 97 <sup>th</sup> %ile<br>Extremely OB BMI > 99.5 <sup>th</sup> %ile | D+E:<br>Community | Twice wkly 45-60 min sessions on exercise/dietary education/coping strategies.    | Fat mass only  |
| 34. | Wong 2009 <sup>35</sup><br>USA       | Cohort:<br>Total = 21                    | BMI ≥ 95 <sup>th</sup> %ile  | D+E:<br>Community | 6 x 1hr behavioural lessons + 4 x 1hr PA/ nutrition lessons + 1800 kcal/day diet. | body mass only |

**KEY:** %ile = percentile; AmO = Outpatient Ambulatory; An. = analysed; apt. = appointment; BB =Bright Bodies; BFC = Better food choices; BL = baseline; BM = behaviour modification; BMI= body mass index; C = control; CG: control group; CBT = cognitive behavioural therapy; CDC = Centre for Disease Control; CG = control group; CHO = carbohydrate; D = diet; E = exercise; FBBT = family-based behavioural treatment; F = female; FU = follow up; GI = glycaemic index; GT = group therapy; HGI = high glycaemic index; hr = hour; HZ = heterozygous; HO = homozygous; ht = height; I = intervention; IG= intervention group; IOTF = International Obesity Task Force; Inpt. = inpatient; LGI = low glycaemic index; LMS= least-mean-squares; LS = long stay; min= minute; mth = month; MO = morbidly obese; norm. normal; n = number; NAFLD = Non-alcoholic fatty liver disease; ND = not described; NR = not reported; OB = obese; OC = obese control; OW = overweight; paed. = paediatric; PA = physical activity; PE = physical activity; PROT= protein; ppts= participants; RCT = randomised controlled trial; SD = standard deviation; SDS = standard deviation score; SE: standard error; SMP= Structured meal plan; SS= short stay; SMC= structured modified carbohydrate diet; trad. = traditional; Trad. act = traditional activity; tx = treatment; TEAMS = Tracking Endpoints in Adolescent MS; wk = week; WList OC– wait list obese control; WL = weight loss; wt = weight; X-over = crossover; yr = year

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