

**TITLE:**  
**Reducing childhood overweight and obesity:**  
**Can the target be reached by 2025?**

Paper 1053  
Additional Information  
Parameter Estimates and Data Sources

## Additional file A: Parameter estimates and data sources

Variable	Values	Sources used
<b>Advertising Sponsorship &amp; Promotion</b>		
INIT Effective_Reduction_in_Junk_Food_Ad[Media]	0	Boswell et al 2016. Food cue reactivity and craving predict eating and weight gain: a meta-analytic review. <i>Obesity Reviews</i> . 17: 159–177
Age_Specific_Junk_Food_Energy_Reduction[Age_0_up_to_2]	0.25	
Age_Specific_Junk_Food_Energy_Reduction[Age_2_up_to_5]	1	Boyland E, et al 2016. Advertising as a cue to consume: a systematic review and meta-analysis of the effects of acute exposure to unhealthy food and non-alcoholic beverage advertising on intake in children and adults. <i>American Journal of Clinical Nutrition</i> . 103(2): 519-533
Age_Specific_Junk_Food_Energy_Reduction[Age_5_up_to_12]	1	
Age_Specific_Junk_Food_Energy_Reduction[Age_12_up_to_17]	1	
Age_Specific_Junk_Food_Energy_Reduction[Age_17_up_to_45]	1	World Health Organization 2010. Set of recommendations on the marketing of foods and non-alcoholic beverages to children. Geneva, Switzerland.
Ave_Intake_kJ	8000	Chambers SA, Freeman R, Anderson AS, MacGillivray S 2015. Reducing the volume, exposure and negative impacts of advertising for foods high in fat, sugar and salt to children: A systematic review of the evidence from statutory and self-regulatory actions and educational measures. <i>Prev Med</i> . Jun;75:32-43. doi: 10.1016/j.ypmed.2015.02.011
Base_Replacement_energy_consumption_%	47	
Decrease_in_EDNP_Advertising_%.in_Govt_controlled_space[TV]	50	Dhar T, Baylis K, 2011. Fast food consumption and the ban on advertising targeting children: the Quebec experience. <i>Journal of Marketing Research</i> . 48: 799–813
Decrease_in_EDNP_Advertising_%.in_Govt_controlled_space[Outdoor]	100	
Decrease_in_EDNP_Advertising_%.in_Govt_controlled_space[Print]	50	Norman J, Kelly B, Boyland E & McMahon A 2016. The Impact of Marketing and Advertising on Food Behaviours: Evaluating the Evidence for a Causal Relationship. <i>Curr Nutr Rep</i> . 5(3): 139-149
Decrease_in_EDNP_Advertising_%.in_Govt_controlled_space[OnLine]	25	
Decrease_in_EDNP_Advertising_%.in_Govt_controlled_space[Sponsorship]	33	Kite J, Bellew B, Gale J, Bauman A 2016. The NSW Make Healthy Normal Campaign: Wave 3 Evaluation Report. Prepared for the Centre for Population Health, NSW Ministry of Health. Sydney; Physical Activity Nutrition Obesity Research Group
Decrease_in_EDNP_Advertising_%.in_Govt_controlled_space[POS]	25	
Decrease_in_EDNP_Advertising_%.in_Govt_controlled_space[Movies]	25	Kelly B, Bellew B 2016. Cost benefit of removing unhealthy food advertising from NSW Government owned and leased spaces and sites: a discussion paper. Unpublished paper, provided by The University of Wollongong and The University of Sydney
EDNP_%.of_Food_ads[TV]	100	
EDNP_%.of_Food_ads[Outdoor]	72	Bellew W, Kelly B, King L, et al (2016) A hierarchy of protection from marketing exposures [HOPE]; theoretical framework and estimates of risk protection afforded to children and youth by reducing exposure to unhealthy marketing. Unpublished draft briefing paper provided to model building team.
EDNP_%.of_Food_ads[Print]	72	
EDNP_%.of_Food_ads[OnLine]	72	
EDNP_%.of_Food_ads[Sponsorship]	72	
EDNP_%.of_Food_ads[POS]	72	
EDNP_%.of_Food_ads[Movies]	72	
Feedback_from_Healthy_Food_at_Home_On\Off	1	
Food_Ad_Spend_%.TV]	26.7	
Food_Ad_Spend_%.Outdoor]	5.3	
Food_Ad_Spend_%.Print]	10	
Food_Ad_Spend_%.OnLine]	10	
Food_Ad_Spend_%.Sponsorship]	30	
Food_Ad_Spend_%.POS]	9	
Food_Ad_Spend_%.Movies]	9	
Govt_influence_%.TV]	50	
Govt_influence_%.Outdoor]	45	
Govt_influence_%.Print]	10	
Govt_influence_%.OnLine]	25	
Govt_influence_%.Sponsorship]	30	
Govt_influence_%.POS]	10	

Govt_influence_%[Movies]	10	
Media_On\Off[TV]	1	
Media_On\Off[Outdoor]	1	
Media_On\Off[Print]	1	
Media_On\Off[OnLine]	1	
Media_On\Off[Sponsorship]	1	
Media_On\Off[POS]	1	
Media_On\Off[Movies]	1	
Reduction_in_Unhealthy_Food_due_to_ban_on_TV_ads_%	13	
Sedentary_behaviour_effect_Advertising_feedback_On\Off	1	
Unhealthy_food_%_of_intake	38.5	
Unhealthy_food_ad_restrictions_On_\Off	0	
Years_to_Implement_Ban[Media]	2	
Year_to_Start_Ad_Ban	2017.5	
<b>Ageing Chains</b>		
Initial_%_ow\ob[Age_0_up_to_2]	19.5	NSW Ministry of Health. 2016. SPANS Summary Report (unpublished). North Sydney: NSW Health.
Initial_%_ow\ob[Age_2_up_to_5]	20.7	NSW Department of Planning and Environment 2016. NSW Population Projections. Obtained from Demography Unit, NSW Department of Planning and Environment.
Initial_%_ow\ob[Age_5_up_to_12]	23.9	
Initial_%_ow\ob[Age_12_up_to_17]	22	
Initial_%_ow\ob[Age_17_up_to_45]	50	Homer J, Hirsch G, Milstein B 2007. Chronic illness in a complex health economy: the perils and promises of downstream and upstream reforms. System Dynamics Review. 23(2-3): 313-343
Initial_Population[Age_0_up_to_2]	474241*2/5	
Initial_Population[Age_2_up_to_5]	474241*3/5	Hector D, King L, Hardy L, St George A, Hebden L, Espinel P, Rissel C 2010. Evidence update on obesity prevention across the life-course. A report prepared for NSW Ministry of Health. Obtained 1 November 2016 from <a href="http://sydney.edu.au/medicine/public-health/prevention-research/news/reports/Evidence%20update%20life%20course.pdf">http://sydney.edu.au/medicine/public-health/prevention-research/news/reports/Evidence%20update%20life%20course.pdf</a>
Initial_Population[Age_5_up_to_12]	619263	
Initial_Population[Age_12_up_to_17]	452782	
Initial_Population[Age_17_up_to_45]	2789695	Hadfield R, Lain S, Simpson J et al 2009. Are babies getting bigger? An analysis of birthweight trends in New South Wales, 1990–2005. Med J Aust. 190(6): 312-315.
lt12y	7	
lt17y	5	
lt2_y	2	
lt45_Y	28	
lt5_y	3	
NOM%[Age_0_up_to_2]	2	
NOM%[Age_2_up_to_5]	3	
NOM%[Age_5_up_to_12]	7	
NOM%[Age_12_up_to_17]	9	
NOM%[Age_17_up_to_45]	74	
<b>BAU Aging chain</b>		
Migrant_Children_%_1	5	Zask A, et al 2012. Tooty Fruity Veggie: an obesity prevention intervention evaluation in Australian preschools. Health Promotion Journal of Australia. 23(1)
INIT_BAU_LGA_%	10.5	
BAUannual_change_in_LGA%_1	-0.1	Garrard J 2011. Active travel to school: literature review. Canberra: ACT Department of Health.
lt12y_1	7	
lt17y_1	5	
lt2_y_1	2	Fry, D 2008. NSW Travelsmart Schools Program 2006 - 2007 Summary

It45_Y_1	28	Report.
It5_y_1	3	<a href="http://www.pcal.nsw.gov.au/_data/assets/file/0007/27682/travelsmart.pdf">http://www.pcal.nsw.gov.au/_data/assets/file/0007/27682/travelsmart.pdf</a>  NSW Department of Health 2006. NSW Healthy School Canteen Strategy Evaluation Report 2005. <a href="http://www.healthykids.nsw.gov.au/downloads/file/campaignsprogramms/NSWHealthySchoolCanteenStrategyEvaluationReport2005.pdf">http://www.healthykids.nsw.gov.au/downloads/file/campaignsprogramms/NSWHealthySchoolCanteenStrategyEvaluationReport2005.pdf</a>  Kite J, Bellew B, Gale J, Bauman A 2016. The NSW Make Healthy Normal Campaign: Wave 3 Evaluation Report. Unpublished report, prepared for the Centre for Population Health, NSW Ministry of Health. Sydney; Physical Activity Nutrition Obesity Research Group.
<b>Early Intervention (0-2 years)</b>		
Generic Early Intervention		
INIT High_risk_at_birth_%	10.5	Wen LM, Baur LA, Simpson JM, Xu H, Hayes AJ, Hardy LL, Williams M, Rissel C 2015. Sustainability of Effects of an Early Childhood Obesity Prevention Trial Over Time: A Further 3-Year Follow-up of the Healthy Beginnings Trial. JAMA Pediatr. 169(6): 543-51. doi: 10.1001/jamapediatrics.2015.025
INIT Mothers_Reached_%	25	Hayes A, Lung T, Wen LM, Baur L, Rissel C, Howard K 2014. Economic evaluation of "healthy beginnings" an early childhood intervention to prevent obesity. Obesity (Silver Spring). 22(7): 1709-15. doi: 10.1002/oby.20747
Annual_reduction_in_%_high_risk_at_birth	1	Wen LM, Baur LA, Rissel C, Xu H, Simpson JM 2014. Correlates of body mass index and overweight and obesity of children aged 2 years: findings from the healthy beginnings trial. Obesity (Silver Spring). 22(7): 1723-30. doi: 10.1002/oby.20700
Energy_reduction_%_due_to_early_intervention	10	Wen LM, Baur LA, Simpson JM, Rissel C, Wardle K, Flood VM 2012. Effectiveness of home based early intervention on children's BMI at age 2: randomised controlled trial. BMJ. 26;344:e3732. doi: 10.1136/bmj.e3732.
G02_age_applicability[Age_0_up_to_2]	1	
G02_age_applicability[Age_2_up_to_5]	0	Giugliani ER, Horta BL, Loret de Mola C, Lisboa BO, Victora CG 2015. Effect of breastfeeding promotion interventions on child growth: a systematic review and meta-analysis. Acta Paediatr. 104(467):20-9. doi: 10.1111/apa.13160.
G02_age_applicability[Age_5_up_to_12]	0	
G02_age_applicability[Age_12_up_to_17]	0	
G02_age_applicability[Age_17_up_to_45]	0	
Max_%_mothers_reached	30	Bauman A, Bellew B, Boylan S, Crane M, Foley B, Gill T, King L, Kite J, Mhrshahi S 2016. Obesity Prevention in Children and Young People aged 0-18 Years: a Rapid Evidence Review brokered by the Sax Institute. Full Technical Report. Prepared for the NSW Ministry of Health: Sydney. Physical Activity Nutrition Obesity Research Group
Minimum_%_at_high_risk_of_OwO_at_birth	5	NSW Health 2016. Premier's Priority for Childhood Overweight and Obesity program trajectories. Unpublished report, supplied by NSW Health.
OW\Ob_births_to_OW\Ob_mums_%	50	NSW Health 2016. Program logic models for NSW Health state wide programs. Unpublished documents, supplied by NSW Health.
Time_to_max_early_intervention_effectiveness	5	
<b>Go4Fun – weight reduction intervention</b>		
INIT Go4Fun_Obese_Reduction	0	Peirson et al 2015. Prevention of overweight and obesity in children and youth: a systematic review and meta-analysis CMAJ Open 3(1)
INIT Go4Fun_OwO_reduction	0	Khanal S, Welsby D, Lloyd B, Innes-Hughes C, Lukeis S & Rissel C 2015. Effectiveness of a once per week delivery of a family-based childhood obesity intervention: a cluster RCT. Pediatric Obesity. DOI: doi:10.1111/ijpo.12089
INIT Go4Fun_Reached	7000	
BMI_loss_per_Go4Fun	0.5	Lombard C, Barber E, Bowles K, Clarke R, Collins J, Dordevic A, Huggins C, Palermo C, Truby H 2016. The effectiveness of non-face-to-face family-focused healthy lifestyle programs in reducing childhood overweight and
Go4Fun_Complete_75%of_sessions	60	
Go4Fun_On\Off	0	
Initial_Annual_Go4Fun_enrolments	1600	

Long_Term_BMI_Multiplier	1.5	obesity: an Evidence Check rapid review brokered by the Sax Institute for the NSW Ministry of Health  Henderson L, Lukeis S, O'Hara BJ, McGill B, Innes-Hughes C & Rissel C 2016. Go4Fun®: Evidence and Evaluation Summary (2011–2015). Unpublished report produced by the NSW Ministry of Health.  NSW Health 2016. Premier's Priority for Childhood Overweight and Obesity program trajectories. Unpublished report, supplied by NSW Health.  NSW Health 2016. Program logic models for NSW Health state wide programs. Unpublished documents, supplied by NSW Health.
Obese_%_2015[Age_0_up_to_2]	3	
Obese_%_2015[Age_2_up_to_5]	5	
Obese_%_2015[Age_5_up_to_12]	7.1	
Obese_%_2015[Age_12_up_to_17]	5.8	
Obese_%_2015[Age_17_up_to_45]	15	
Overweight_&_Obese_%_2015[Age_0_up_to_2]	18	
Overweight_&_Obese_%_2015[Age_2_up_to_5]	20	
Overweight_&_Obese_%_2015[Age_5_up_to_12]	22.9	
Overweight_&_Obese_%_2015[Age_12_up_to_17]	27.4	
Overweight_&_Obese_%_2015[Age_17_up_to_45]	50	
Program_status_date	2015.5	
Proportion_of_children_obese_in_target_market_%	75	
Reduction_in_mean_BMI	1	
Sustain_Weight_Loss_%	75	
Target_Go4Fun_new_enrolments_pa	1600	
Years_to_scale_up_to_Go4Fun_target	5	
<b>Healthy Food Environment and Choices</b>		
INIT_Healthy_Food_Affordability	50	
INIT_Healthy_Food_at_Home	60	
INIT_Healthy_Food_Availability_Out_of_Home[Age_0_up_to_2]	50	
INIT_Healthy_Food_Availability_Out_of_Home[Age_2_up_to_5]	50	
INIT_Healthy_Food_Availability_Out_of_Home[Age_5_up_to_12]	50	
INIT_Healthy_Food_Availability_Out_of_Home[Age_12_up_to_17]	50	
INIT_Healthy_Food_Availability_Out_of_Home[Age_17_up_to_45]	50	
Adult_Program_impact_on_0_upto_2s_%	10	
Age_specific_Impact[Age_2_up_to_5]	1	
Age_specific_Impact[Age_5_up_to_12]	1	
Age_specific_Impact[Age_12_up_to_17]	1	
Age_specific_Impact[Age_17_up_to_45]	1	
Awareness_of_Healthy_Food[UA]	15	
Awareness_of_Healthy_Food[AW]	50	
Awareness_of_Healthy_Food[RtE]	75	
Awareness_of_Healthy_Food[Eg]	100	
Awareness_of_Healthy_Food[DisEg]	60	
Healthy_Food_Affordability_Target	75	
Healthy_food_subsidy_required_to_reach_100%_affordability_\$M_pa	200	
Healthy_Food_Availability_Targets_%[Pop]	80	
Max_Energy_Reduction_Healthy_food_%[Pop]	20	

Subsidise_Healthy_Food_On\Off	0	
Time_to_Healthy_Food_at_Home	2	
Time_to_Healthy_Food_Out_of_Home_Yrs	3	
Years_to_Impact_Affordability	4	
<b>Healthy Weight Energy Balance</b>		
INIT Average_kJ_reduced[Pop, Means]	0	(Primary source for energy equation) Schofield WN (1985). Predicting basal metabolic rate, new standards and review of previous work. Hum Nutr Clin Nutr. 39 Suppl 1: 5–41
Average_Height[Age_0_up_to_2]	0.85	
Average_Height[Age_2_up_to_5]	0.98	
Average_Height[Age_5_up_to_12]	1.31	Hall K, Sacks G, Chandramohan D et al 2011. Quantification of the effect of energy imbalance on bodyweight. The Lancet. 378: 826-37
Average_Height[Age_12_up_to_17]	1.64	Hall K, Butte N, Swinburn B, Chow C 2013. Dynamics of childhood growth and obesity: development and validation of a quantitative mathematical model. Lancet Diabetes Endocrinol. 1(2): 97-105
Average_Height[Age_17_up_to_45]	1.7	
Basal_Metabolic_Rate[Age_0_up_to_2]	2350	
Basal_Metabolic_Rate[Age_2_up_to_5]	3400	Kite J, Bellew B, Gale J, Bauman A 2016. The NSW Make Healthy Normal Campaign: Wave 3 Evaluation Report. Prepared for the Centre for Population Health, NSW Ministry of Health. Sydney; Physical Activity Nutrition Obesity Research Group
Basal_Metabolic_Rate[Age_5_up_to_12]	5000	
Basal_Metabolic_Rate[Age_12_up_to_17]	6000	
Basal_Metabolic_Rate[Age_17_up_to_45]	8000	Cole T 2000. Establishing a standard definition for child overweight and obesity worldwide: international survey. BMJ. 320:1240
BaseActivityFactor	1	
Base_Activity_Factor[Age_0_up_to_2]	1.8	
Base_Activity_Factor[Age_2_up_to_5]	1.7	
Base_Activity_Factor[Age_5_up_to_12]	1.5	
Base_Activity_Factor[Age_12_up_to_17]	1.4	
Base_Activity_Factor[Age_17_up_to_45]	1.3	
Choose_initial_Ow\Ob%_pa	0	
Enable_kJ_Expenditure_all	1	
Enable_kJ_Intake_all	1	
Expenditure_adj_time	1	
Initial_Energy_Intakes[Age_0_up_to_2]	5000	
Initial_Energy_Intakes[Age_2_up_to_5]	6500	
Initial_Energy_Intakes[Age_5_up_to_12]	8000	
Initial_Energy_Intakes[Age_12_up_to_17]	9200	
Initial_Energy_Intakes[Age_17_up_to_45]	10000	
init_ow\ob%_pa[Age_0_up_to_2]	5	
init_ow\ob%_pa[Age_2_up_to_5]	1	
init_ow\ob%_pa[Age_5_up_to_12]	0.4	
init_ow\ob%_pa[Age_12_up_to_17]	2	
init_ow\ob%_pa[Age_17_up_to_45]	2	
kJ_excess	100	
Long_Term_Weight_Loss_Calibration	1	
Targeted_at[Pop]	1	
Weight_off_delay	1	
Year_to_start_programs	2016.5	
<b>Mechanisms of Program Engagement &amp; Behaviour Change</b>		
INIT Aware_A	25	Paich M, Peck C, & Valanta J 2011. Pharmaceutical market dynamics and strategic planning: a system dynamics perspective. System Dynamics Review. 27(1): 47–63
INIT Community_Education_and_Information	25	
INIT Disengaged_DisE	0	

INIT Engaged_E	25	<p>Prochaska J, DiClemente C 1982. Transtheoretical therapy: toward a more integrative model of change. <i>Psychotherapy: theory, research and practice</i>. 9(3).</p> <p>Kite J, Bellew B, Gale J, Bauman A 2016. The NSW Make Healthy Normal Campaign: Wave 3 Evaluation Report. Prepared for the Centre for Population Health, NSW Ministry of Health. Sydney; Physical Activity Nutrition Obesity Research Group.</p> <p>O'Hara BJ, Phongsavan P, Venugopal K, et al 2012. Effectiveness of Australia's Get Healthy Information and Coaching Service®: translational research with population wide impact. <i>Preventive medicine</i>, 55(4): 292-298. <a href="http://www.biomedcentral.com/1471-2458/13/175">http://www.biomedcentral.com/1471-2458/13/175</a></p> <p>Fuller, NR, Carter, H, Schofield D, et al 2014. Cost effectiveness of primary care referral to a commercial provider for weight loss treatment, relative to standard care: a modelled lifetime analysis. <i>International Journal of Obesity</i>, 38(8): 1104-1109.</p> <p>Chow, CK, Redfern J, Hillis GS, et al 2015. Effect of lifestyle-focused text messaging on risk factor modification in patients with coronary heart disease: a randomized clinical trial. <i>Jama</i>, 314(12): 1255-1263.</p> <p>Cavill N, Bauman A. 2004. Changing the way people think about health enhancing physical activity: do mass media campaigns have a role? <i>J Sports Sci</i>, 22:771-90</p> <p>McGuire WJ 1984. Public communication as a strategy for inducing health promoting behavioural change. <i>Prev Med</i>, 13:299-319</p> <p>Bauman A, Bowles HR, Huhman M, Heitzler CD, Owen N, Smith BJ, Reger-Nash B 2008. Testing a hierarchy-of-effects model: pathways from awareness to outcomes in the VERB™ campaign 2002-2003. <i>American Journal of Preventive Medicine</i>. 34(6):S249-56.</p>
INIT Ready_to_Engage_RtE	25	
INIT Unaware_UA	25	
Natural_Decay_%_pa	2	
Natural_Progress_to_Engage_%_pa	75	
Social_Marketing_Campaign_Coverage_%	75	
Time_to_accept_need_for_change_Yrs	1	
Time_to_become_aware_Yrs	2	
Time_to_reach_General_Population_Yrs	1	
<b>Parental influence</b>		
Child_age	1	<p>Skouteris H, McCabe M, Swinburn B, Newgreen V, Sacher P, Chadwick P 2011. Parental influence and obesity prevention in pre-schoolers: a systematic review of interventions. <i>Obesity Reviews</i>, 12(5):315-28.</p> <p>Pearson N, Biddle SJ, Gorely T 2009. Family correlates of fruit and vegetable consumption in children and adolescents: a systematic review. <i>Public Health Nutrition</i>. 12(02):267-83.</p> <p><i>Also, expert consensus from workshops that parental influence declines from entry to pre-school, until people become adults, with peer pressure becoming more important in food selection during this time.</i></p>
Median_age[Age_0_up_to_2]	1	
Median_age[Age_2_up_to_5]	3.5	
Median_age[Age_5_up_to_12]	8.5	
Median_age[Age_12_up_to_17]	14.5	
Median_age[Age_17_up_to_45]	20	
Parental_Influence_by_age[Age_17_up_to_45]	1	