Supplemental Table 1. Overview of included studies, study designs, participants (n=20,975), infant body composition measures and main results reported. Full references below.

Author (year) and location	**Study design**	**Included participants**	**Measurement method of body composition**	**Age of body composition measurements in infancy in months**	**Outcomes measured and age in years**	**Results**
Admassu (2018) Ethiopia	Prospective cohort	Healthy, term neonates, >1500g, no congenital malformations, birthed at Jimma hospital, Ethiopia; n= 364	ADP	0 then increments up to 6	ADP (~ 4)	FM at birth was not associated with FFMI at 4 years but was associated with FMI. FM accretion during the first 4 months was not associated with FFMI at the age of 4 years but was associated with FMI. Higher FFM was associated with high FFMI at 4 years but not with FMI. FFM accretion from 0 to 6 months was positively correlated with FFMI at 4 years.
Aris (2017) Singapore	Cross sectional cohort	Infants born to healthy Asian women in two major public hospitals, not taking chemotherapy, psychotropic drugs, or with diabetes 1 diabetes; n= 719	SS, TS, AC	0, 18, 24 (SS and TS); 3, 6, 9, 12, 15, 18, 24 (AC)	Blood pressure (2)	No association between adiposity (AC, TS, or SS) at birth, or velocity of adiposity growth and BP at 48 months.
Brei (2018) Germany	Randomised controlled trial	Infants born to healthy pregnant women; n=208	Skinfolds*, abdominal fat with sonography	0 and 12	BMI, MRI abdomen, skinfolds (3 and 5) Abdominal MRI (5)	Except for high carbohydrate intake, which increased FM accretion and later FM, FM tended to track over time from birth to 5 years.
Buyken (2008) Germany	Cohort study	Healthy, term babies; n= 434	Skinfolds	3 - 6 then five more times throughout infancy	BMI, all four skinfolds (once annually until early adulthood)	Body fat percentage usually tracks over time, except in male infants born to overweight women and breastfed for a long period of time.
Catalano (2009) US	Cross-sectional cohort	Term infants with no congenital anomalies or multifetal gestations; n= 89	SS, TS, DXA, TOBEC, midaxillary, flank, thigh, and calf skinfold, AC	0	BMI, skinfolds, BP, fasting insulin, plasma lipids, fasting glucose, LDL, HDL, leptin, AC, TNF-a, DXA, thigh circumferences, fasting free fatty	No significant difference in FM between non-diabetic and gestational diabetes mellitus offspring and no significant changes in metabolic measures.

					acids, HOMA-IR, activity level, TOBEC (~9)	
Coles (2019) Canada	Cohort study	Healthy infants of healthy pregnant women with + without gestational diabetes attending outpatient obstetrics clinics; n=112 at 3, n= 94 at 5	Skinfolds	12	BMI (3 and 5)	Sum of skinfold thickness was associated with BMI z-score at 5 years (ρ = 0·34, P < 0·0001).
Duncan (2017) USA	Cross-sectional cohort study	Preterm, very-low birth weight infants without congenital anomalies, congenital adrenal hyperplasia, or short bowel syndrome; n= 40	SS, AC	12, 48	BMI, BP, leptin, AC, TNF-a, IL-6, adiponectin, resistin (2 and 3)	SS positively correlated with SS at 3 years, but not at 2 years of age. Adiponectin and resistin were not associated with body composition in infancy. Leptin correlated with SS.
Forsum (2018) Sweden	Cohort study	Healthy, term children recruited from maternity health clinics n= 253	ADP	1, 12 weeks	BMI and ADP (4)	FFM gains between 1 and 12 weeks of age were not associated with FM percent or with FMI at 4 years. FFM gains were associated with BMI at 4 years of age in girls (r=0.32, p=0.0005), but not in boys. Gains in FM in infancy were significantly associated with FM percent and BMI at 4 years in both sexes.
Gasser (1995) Switzerland	Cohort study	Infants born into a Swiss family living in Zurich and born at Cantonal Hospital of Zurich; n = 132	Skinfolds	Increments from 1 to 24	BMI, skinfolds, arm and calf circumference and bi-iliac and bi-humeral width (annually until 9-10, then until growth slowed)	Infant skinfold does not correlate with adult BMI in infants of either sex.
Joglekar (2007) India	Cohort study	Infants to married women living in six villages near Pune; n=698	SS, TS	0, 6, 12, 18, 24	BMI, SS, TS, BP, fasting insulin, plasma lipids, fasting glucose, HDL, DXA, oral glucose tolerance, and MUAC (6 and 7)	Skinfolds at birth were not predictive of body composition at 6 years. Positive associations between the ‘thin-fat’ birth phenotype and both fat and lean mass at 6 years. Thinner SS at birth was associated with higher 120-minute glucose. Larger skinfolds at 6 months and 1 year predicted greater 6-year FM and were unrelated to FFM at 6 years. Larger SS at 1 year were associated with lower HDL.

Karaolis-Danekert 2007) Germany	Cohort study	Term, singleton, healthy neonates with normal birth weight; n= 206	Skinfolds	6, 12, 18, 24	BMI, skinfolds, MUAC (annually until 7)	Normal and rapid growers of body fat percentage decreased in body fat over time. The decrease occurred more slowly in children who grew rapidly, and they appeared to maintain an overall larger percentage BF than did the other children.
Koontz (2014) US	Cohort study	Healthy, term infants recruited from a maternity clinic without congenital abnormalities or medications affecting weight; n=53	TOBEC (or skinfolds)	0, 4, 8, 12	BMI (between 6 and 11)	Rapid FM gain was associated with 8x higher odds of later overweight/obesity.
Krishnaveni (2005) India	Cohort study	Infants born from non-diabetic singleton pregnancies, women recruited when booking consecutively into antenatal clinic; n= 663	SS, TS	Between 0-12	BMI, SS, TS, AC, head circumference and MUAC (4)	Both TS and SS at 4 years were positively correlated with the respective measurements at birth (TS r = 0.14, P = 0.001; SS r = 0.19, P <0.001).
Krishnaveni (2010) India	Cohort study	Infants born from non-diabetic singleton pregnancies, women recruited when booking consecutively into antenatal clinic; n= 663	SS, TS	0	BMI, SS, TS, BP, fasting insulin, triglycerides, total cholestrol, fasting glucose, LDL, HDL, AC, MUAC, bioimpedance (5 to 9.5)	SS at birth is associated with glucose (p=0.04), insulin 120 (p<0.001), BP (p<0.001) and total cholesterol (p=0.04), but not triglycerides (0.4) at 5 to 9.5 years.
Krishnaveni (2015) India	Cohort study	Infants born from non-diabetic singleton pregnancies, women recruited when booking consecutively into antenatal clinic; n= 663	SS, TS	Between 0-12, and 12-24	BMI, SS, TS (2-5 and 5-9.5) Cognitive development, , BP, plasma lipids, LDL, HDL, puberty staging (9.5-13.5)	Higher adiposity at birth was associated with shorter height at 13.5 years. FM at birth, and FM gain during infancy were positively associated with later BMI and skinfold thickness. Greater FFM gain at all ages after birth was associated with higher 13.5-year BMI. No association of FFM or FM in infancy and cardiometabolic risk outcomes or cognitive function.
Lovinsky-Desir (2021) US	Cohort study	Infants born to women whose children had a high risk of developing asthma due to history of asthma, allergic rhinitis, or eczema, recruited	BIA	12, 24	BMI, leptin, TNF-a, adiponectin, BIA, adipokines and inflammatory markers (1, 3, 5, 7, 10) asthma (10), BP (annually 1 to 10), spirometry (3), post	No difference by asthma diagnosis in percentage of body fat trajectories. In multivariable regression models adjusting for potential confounders, no association between any of the trajectories and asthma at age 10 (P>.05 for all models).

		from neighbourhoods with at least 20% of the population below poverty level; n= 609			bronchodilator reversibility (6), methacholine challenge (7 and 10)	
Masukume (2019) Ireland	Cohort study	Infants considered to be low risk of fetal growth restriction, pre-eclampsia, or spontaneous preterm birth; n = 1,305	ADP	0, 2	BMI (2 and 5)	Vaginally delivered infants had lower FM percent and fewer of them were overweight at 5 years. More normal BMI in the group that had lower FM percent. Preterm infants which had significantly different FM percent compared to term infants had different outcomes.
Mihatsch (2021) Spain	Cohort study	Preterm were recruited consecutively to a neonatology department and term infants were recruited randomly from maternity wards Exclusion criteria was congenital disease, chromosomal abnormalities and digestive disorders; n= 128	Skinfold, DXA	6, 12, 18	BMI, skinfolds, fasting insulin, lipids, fasting glucose, LDL, HDL, ferritin, DXA (2 and 3) Cognitive development (2)	From six months, and into the third year of life, gain in weight, length and head circumference, mid arm circumference, adiposity, FFM mass, and bone mineralization in preterm infants are less than in term infants and influenced by nutritional status at discharge.
Pfister (2018) US	Cohort study	Pre-term infants from neonatal intensive care without abnormality affecting growth; n= 34	ADP	Weekly testing	Cognitive development, BP, ADP, and visual evoked potential testing (4)	No significant associations between FM at any age in infancy and P100 latency or processing speed at 4 years. FFM at birth was associated with processing speed (p=0.03) but FFM and gain thereafter was not associated. PPM growth had weak positive association with visual evoked potential (p=0.05). Higher FM, FM percent, and FM gains at 4 months were associated with increased BP at 4 years, but body composition and growth after that was not associated with BP.
Ponsonby (2011) Australia	Cohort study	All infants at high risk of SIDS using a local predictive model between 1988-1995; n= 9,876	SS, TS	0, ~1	HDL, type 1 diabetes (<16)	Skinfolds were not associated with type 1 diabetes.

Quah (2019) Singapore	Cohort study	Infants born to pregnant Asian women; n= 767 BMI, n= 619 skinfold	Skinfolds	0, 18	BMI, skinfolds (5 and 6)	Low intake of sugar-sweetened beverages: - 18 months skinfold= 16.4 - 5 years skinfold= 27.5 High intake - 18 months= 16.4 - 5 years= 29.9
Rolland-Cachera (1987) France	Cohort study	Healthy infants; n= 164 (n= 85 boys, n=79 girls)	SS	0, 6, 12, 18	BMI, SS (every ~6 months then as an adult ~ 21.2)	Earlier adiposity rebound led to higher likelihood of high adult BMI. Early adiposity in infancy is more likely to be associated with adult increased BMI than later adiposity.
Santiago (2021) Brazil	Cohort study	Healthy, term, small-for-gestational-age infants, but not requiring intensive care, or AGA needing breastfeeding support; n= 33	SS, TS	Every 1-3 up until 24	BMI, SS, TS, BP, fasting insulin, LDL, HDL, leptin, AC, neck circumference, arm circumference, triglycerides, total cholesterol, glycemia, insulin (4 and 6)	Differences in skinfold for small for gestational age infants p=0.076 (no difference between skinfolds) Difference in skinfolds between breastfed and non-breastfed babies p=0.005 (difference between breastfed) Outcomes at 4-6 years no significant difference in the following outcomes: ● triglycerides p= 0.921 ● cholestrol p=0.921 ● LDL p=0.795 ● HDL p= 0.399 ● glycaemia p = 0.124 ● HOMER-IR p=0.072 ● BP systolic p=0.064 ● diastolic BP p=0.306
Santos (2016) Netherlands	Cohort study	Infants born between 2002 and 2006 to hospital in Rotterdam; n= 808	Skinfolds	1.5	BMI, BP, fasting insulin, LDL, HDL, triglycerides (6)	Subcutaneous FM and central-to-total subcutaneous FM ratio at 1.5 months or its change were not associated with childhood BP, triglycerides, total cholesterol, HDL or insulin. At 6 years Higher subcutaneous FM at 1.5 months was associated with lower LDL at the age of 6 years. An increase in total subcutaneous FM from 1.5 to 24 months was associated with higher childhood total

Santos (2016) Netherlands	Cohort study	Infants born between 2002 and 2006 to hospital in Rotterdam; n= 808	Skinfolds	1.5, 24	DXA, abdominal ultrasound (6)	Overall, subcutaneous FM at 1.5 months was not associated with BMI or FM at 6 years. However, within boys, there was some evidence (p<0.05) that FM was positively associated with BMI.
Scheurer (2018) US	Cohort study	Full-term and preterm infants born from uncomplicated pregnancies, without any chromosomal or congenital abnormalities; n= 51	ADP	After discharge, ~3.5	BMI, cognitive development, ADP (4)	Early changes in percentage FM were associated with the preterm children's performance on working memory tests at preschool age: greater gains in FM percent were associated with a lower cognitive function scores. Body composition changes in the preterm children were not associated with other cognitive scores.
Totzauer (2018) Europe	Randomised controlled trial	Healthy term infants from uncomplicated singleton pregnancies; n = 650	SS, TS	3 ,6, 12, and 24	BMI, SS, TS (biannually until 6)	Total FM increased 1.5kg from 1 year to 3.8kg at age 6 years when FM percentage remained stable.
Van Beijsterveldt (2021) Netherlands	Cohort study; Sophia Pluto cohort	Healthy, singleton, term infants at several maternity wards in Rotterdam with uncomplicated neonatal period and without severe asphyxia, sepsis or respiratory ventilation; n= 224	ADP, DXA	ADP (3, 6), DXA (6)	DXA (4)	High FM percentage tracked from 3 and 6 months to 4 years, with OR = 4.34 (p=0.002) and OR = 6.54 (p<0.001) respectively. High FMI also tracked from age 3 and 6 months to 4 years with OR= 2.62 (p=0.027) and OR = 5.68 (p=0.001) respectively. High FFMI tracked from age 1, 3 and 6 months to 4 years.
Wibaek (2019) Ethiopia	Cohort study	Term, healthy neonates with birth weight >1,500g, and no congenital malformations; n=571	ADP	0, 6	BP, HbA1c, lipids, triglycerides, HOMA-IR, glucose, C-peptide, anthropometry and ADP (5)	Higher FFM, but not FM, at birth and higher FM and FFM accretion in 0-3 months and 3-6 months were associated with higher FM at 5 years. Higher FM and FFM at birth and accretion from 0–3 months were associated with higher FFM at 5 years. FFM accretion from 3 to 6 months was also associated with FFM at 5 years. FFM at birth and accretion in the periods 0–3 and 3–6 months of age as well as FM accretion in the period 0–3 months were positively associated with height at 5 years. Higher FM at birth and accretion from 0 to 3 months was associated with higher concentrations of total, LDL, HDL and associations were strongest for LDL No association

						between FM and FFM at birth nor their accretion in infancy with other the cardiometabolic markers studied.
Zinkel (2016) US	Cohort study	Infants (grouped into those birthed by mothers of normal BMI and those with BMI 25+) n= 70	TOBEC	0.25 and 2	Total energy expenditure (2), TOBEC (2), DXA (4, 6), BMI and AC (4, 6, 8)	Linear mixed effects models were developed to predict energy expenditure from the potential factors FFM (kg), FM (kg), BMI, BMI z-score, BMI percentile, height, weight (kg), and sex (1=female) for the 75 subjects with at least one total energy expenditure measure. For all models, FFM was the predictor that was most highly correlated with total energy expenditure (R2=0.91, syx= 125 kcal/d).

*Skinfolds: supra-iliac, triceps (TS), supra-scapular (SS), biceps (BS) (unless otherwise stated)
Abbreviations: Abdominal circumference (AC), air displacement plethysmography (ADP), bioelectrical impedance (BIA), blood pressure (BP) body mass index (BMI), dual-energy x-ray absorptiometry (DXA), fat mass (FM), fat-free mass (FFM), interleukin 6 (IL-6), homeostatic model assessment for insulin resistance (HOMA-IR), high density lipoprotein (HDL), low density lipoprotein (LDL), magnetic resonance imaging (MRI), middle-upper arm circumference (MUAC), odds ratio (OR), tumour necrosis factor alpha (TNF-a), total body electrical conductivity (TOBEC)

Additional References:

1. Admassu B, Wells JC, Girma T, et al. Body composition during early infancy and its relation with body composition at 4 years of age in Jimma, an Ethiopian prospective cohort study. Nutrition & Diabetes. 2018;8.
2. Aris IM, Bernard JY, Chen L-W, et al. Postnatal height and adiposity gain, childhood blood pressure and prehypertension risk in an Asian birth cohort. International Journal of Obesity. 2017;41:1011–7.
3. Brei C, Stecher L, Meyer D, et al. Impact of dietary macronutrient intake during early and late gestation on offspring body composition at birth, 1, 3, and 5 years of age. Nutrients. 2018;10:579.
4. Buyken AE, Karaolis-Danckert N, Remer T, et al. Effects of Breastfeeding on Trajectories of Body Fat and BMI throughout Childhood. Obesity 2008;16(2):389–395.
5. Catalano PM, Farrell K, Thomas A, et al. Perinatal risk factors for childhood obesity and metabolic dysregulation. The American Journal of Clinical Nutrition 2009;90(5):1303–1313.
6. Coles N, Retnakaran R, Hanley A, et al. Evaluation of anthropometric measures for assessment of cardiometabolic risk in early childhood. Public Health Nutrition 2020;23(12), 2100–2108.
7. Duncan AF, Frankfurt JA, Heyne RJ, et al. Biomarkers of adiposity are elevated in preterm very-low-birth-weight infants at 1, 2, and 3 y of age. Pediatric Research 217l;81(5):780–786.
8. Forsum E, Eriksson B, Flinke E, et al. Fat and fat-free mass of healthy Swedish children show tracking during early life, but there are differences. Acta Paediatrica 2019;108(9):1704–1708.

9. Gasser T, Ziegler P, Seifert B, et al. Prediction of adult skinfolds and body mass from infancy through adolescence. Annals of Human Biology 1995;22(3):217–233.
10. Joglekar C. Newborn size, and childhood growth, and cardiovascular disease risk factors at the age of 6 years; The Pune Maternal Nutrition Study. International Journal of Obesity 2007;31(10): 1534–1544.
11. Karaolis-Danckert N, Buyken AE, Bolzenius K, et al. Rapid growth among term children whose birth weight was appropriate for gestational age has a longer lasting effect on body fat percentage than on body mass index. The American Journal of Clinical Nutrition 2006;84(6):1449–1455.
12. Koontz MB, Gunzler DD, Presley L., et al. Longitudinal changes in infant body composition: association with childhood obesity. Pediatric Obesity 2014;9(6):e141–e144.
13. Krishnaveni GV, Hill JC, Veena SR, et al. Truncal Adiposity is Present at Birth and in Early Childhood in South Indian Children. Indian Paediatrics 2005:42(6):527-38.
14. Krishnaveni GV, Veena SR, Srinivasan K, et al. Linear Growth and Fat and Lean Tissue Gain during Childhood: Associations with Cardiometabolic and Cognitive Outcomes in Adolescent Indian Children. PLOS ONE 2015;10(11):e0143231.
15. Krishnaveni GV. Adiposity, insulin resistance and cardiovascular risk factors in 9–10-year-old Indian children: relationships with birth size and postnatal growth. J Dev Orig Health Dis 2010;1(6):403–411.
16. Lovinsky-Desir S, Lussier SJ, Calatroni A, et al. Trajectories of adiposity indicators and association with asthma and lung function in urban minority children. Journal of Allergy and Clinical Immunology 2021;148(5):1219-1226.e7.
17. Masukume G, McCarthy FP, Baker PN, et al. Association between caesarean section delivery and obesity in childhood: a longitudinal cohort study in Ireland. BMJ Open 2019; 15;9(3):e025051.
18. Mihatsch W, Martín ID, Barrios-Sabador V, et al. Bone Mineral Density, Body Composition, and Metabolic Health of Very Low Birth Weight Infants Fed in Hospital Following Current Macronutrient Recommendations during the First 3 Years of Life. Nutrients 2021;13(3):1005.
19. Pfister KM, Zhang L, Miller NC et al. Early body composition changes are associated with neurodevelopmental and metabolic outcomes at 4 years of age in very preterm infants. Pediatric Research 2018. 84(5):713–718.
20. Ponsonby, A.-L., Pezic, A., Cochrane, J., et al. Infant anthropometry, early life infection, and subsequent risk of type 1 diabetes mellitus: a prospective birth cohort study. Pediatric Diabetes 2011;12(4pt1):313–321.
21. Quah PL, Kleijweg J, Chang YY, et al. Association of sugar-sweetened beverage intake at 18 months and 5 years of age with adiposity outcomes at 6 years of age: the Singapore GUSTO mother–offspring cohort. British Journal of Nutrition 2019;122:1303–1312.
22. Rolland-Cachera M-F, Deheeger M, Guilloud-Bataille M, et al. Tracking the development of adiposity from one month of age to adulthood. Annals of Human Biology 1987;14(3):219–229.

23. Santiago ACT, Cunha LPM, Costa ML, et al. Cardiometabolic evaluation of small for gestational age children: protective effect of breast milk. Nutr Hosp 2021;38(1):36-42.
24. Santos S, Gaillard R, Oliveira A, et al. Associations of infant subcutaneous fat mass with total and abdominal fat mass at school-age. The Generation R Study. Paediatric and perinatal epidemiology 2016;30(5):511–520.
25. Santos S, Gaillard R, Oliveira A, et al. Subcutaneous fat mass in infancy and cardiovascular risk factors at school-age: The generation R study. Obesity 2016;24(2):424–429.
26. Scheurer JM, Zhang L, Plummer EA, et al. Body Composition Changes from Infancy to 4 Years and Associations with Early Childhood Cognition in Preterm and Full-Term Children. Neonatology 2018;114(2):169–176.
27. Totzauer M, Luque V, Escribano J, et al. Association of sugar-sweetened beverage intake at 18 months and 5 years of age with adiposity outcomes at 6 years of age: the Singapore GUSTO mother–offspring cohort. 2019;122, 1303–1312.
28. Van Beijstervelft IALP, Fluiter KS, Breij LM, et al. Fat mass and fat-free mass track from infancy to childhood: New insights in body composition programming in early life. Obesity 2021;29(11):1899-1906.
29. Wibaek R, Vistisen D, Girma T, et al. Associations of fat mass and fat-free mass accretion in infancy with body composition and cardiometabolic risk markers at 5 years: The Ethiopian iABC birth cohort study. PLoS Med 2019;16(8): e1002888.
30. Zinkel SRJ, Berkowitz RI, Stunkard AJ, et al. High energy expenditure is not protective against increased adiposity in children. Pediatric Obesity 2016;11(6): 528–534.