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Breastfeeding and body composition

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The Priming Concept:

- Exposures in pregnancy and early infancy determine the risk for morbidity in adolescence and adulthood.
- Experimental evidence from animal studies dates back at least 50 years.
- Empirical evidence in humans emerged some 20 years later.



Does breastfeeding (BF) make a difference?

- Human milk:
 - Lower protein content
 - Contains bioactive factors inhibiting adipocyte differentiation in vitro
 - Lower plasma concentration of insulin in breastfed children
- Reduction in the risk of childhood obesity would be biologically plausible.



- Case Control study
 - 639 cases vs. 533 controls
 - Age: 12 – 18 years
- Main results:
 - Significant reduction of the risk for obesity by BF
 - Dose effect by duration of BF

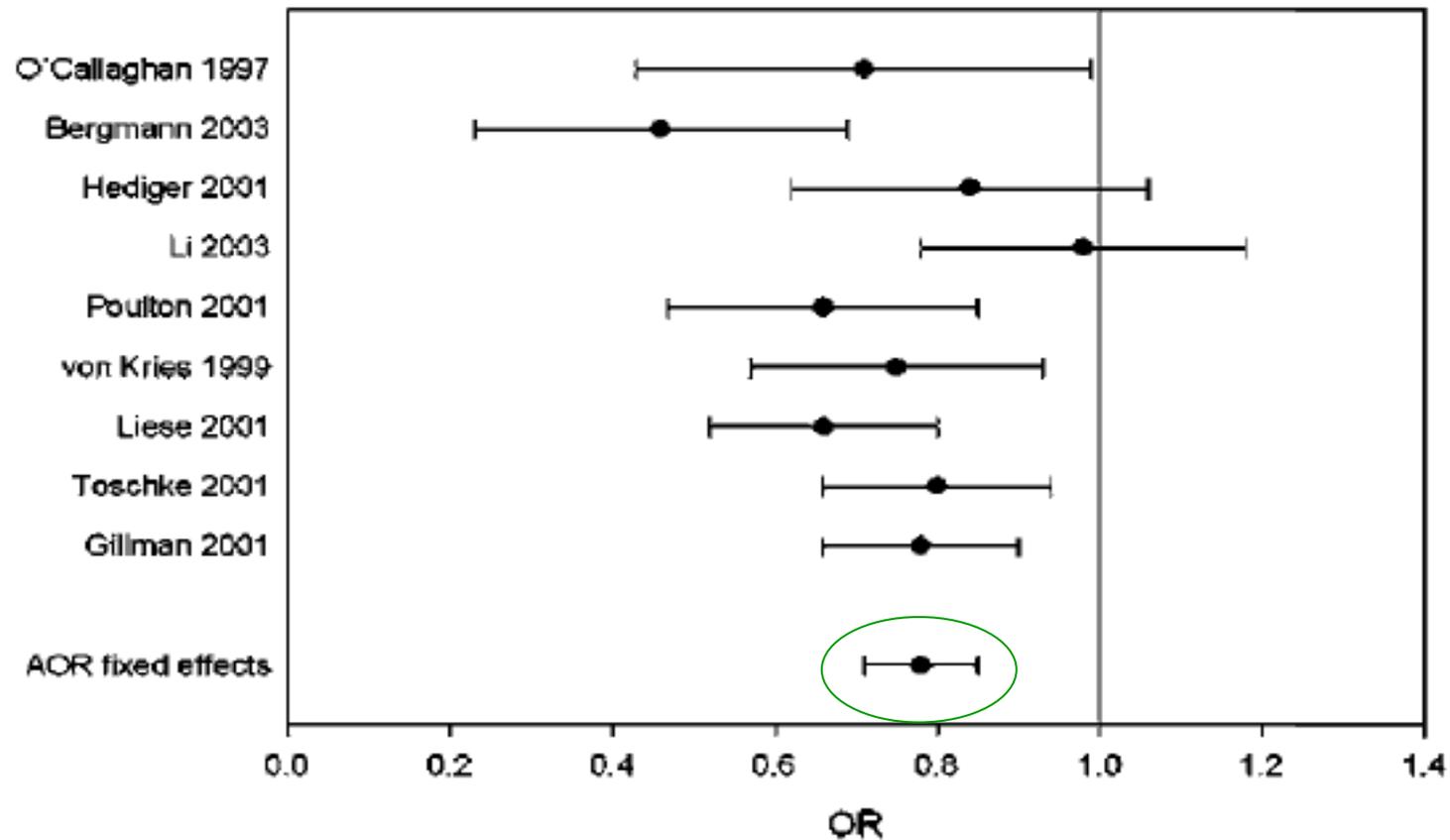


Total: n=9206	Adjusted odds ratio*	
Exclusively breastfed for	Being overweight	Being obese
≤ 2 months (n=2084)	0.89 (0.73 to 1.07)	0.90 (0.65 to 1.24)
3-5 months (n=2052)	0.87 (0.72 to 1.05)	0.65 (0.44 to 0.95)
6-12 months (n=863)	0.67 (0.49 to 0.91)	0.57 (0.33 to 0.99)
>12 months (n=121)	0.43 (0.17 to 1.07)	0.28 (0.04 to 2.04)
Ever breastfed (n=5184)	0.79 (0.68 to 0.93)	0.75 (0.57 to 0.98)

*Odds ratios adjusted for parental education, maternal smoking during pregnancy, low birth weight, own bedroom, and frequent consumption of butter.



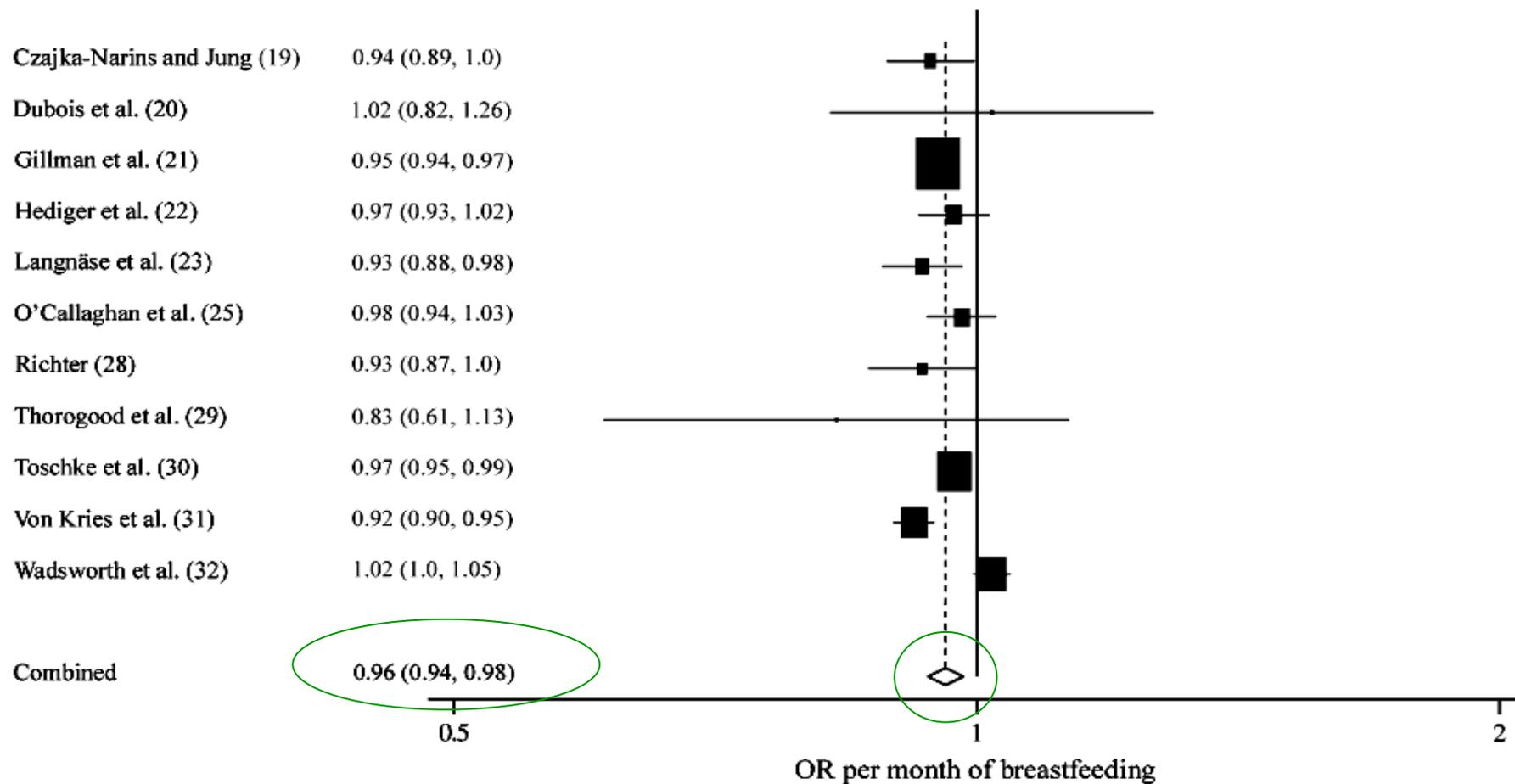
Meta-analysis 1: Adjusted ORs for overweight / obesity



Summary OR: 0.78 [0.71, 0.85]

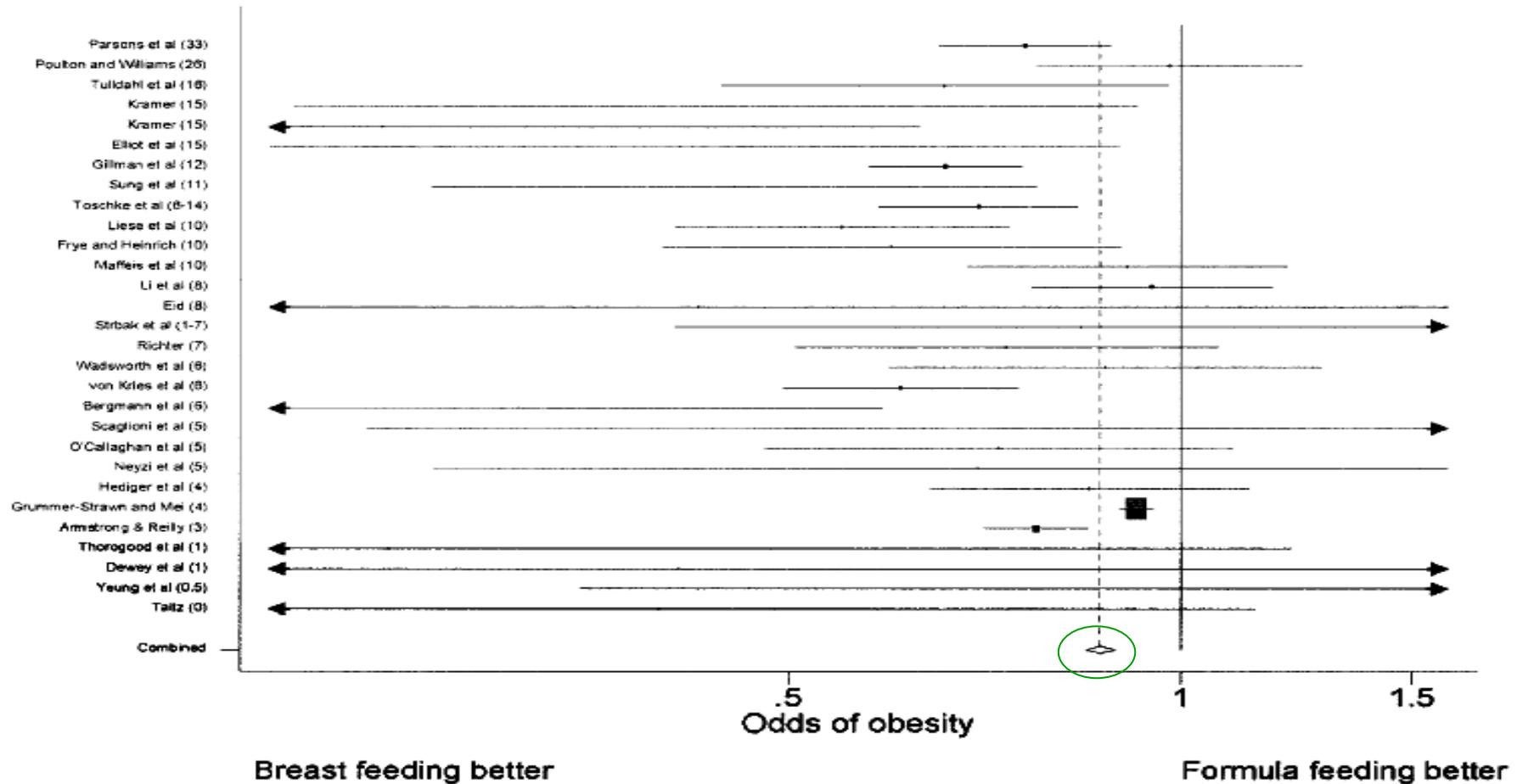


Meta-analysis 2: Dose effects of BF duration





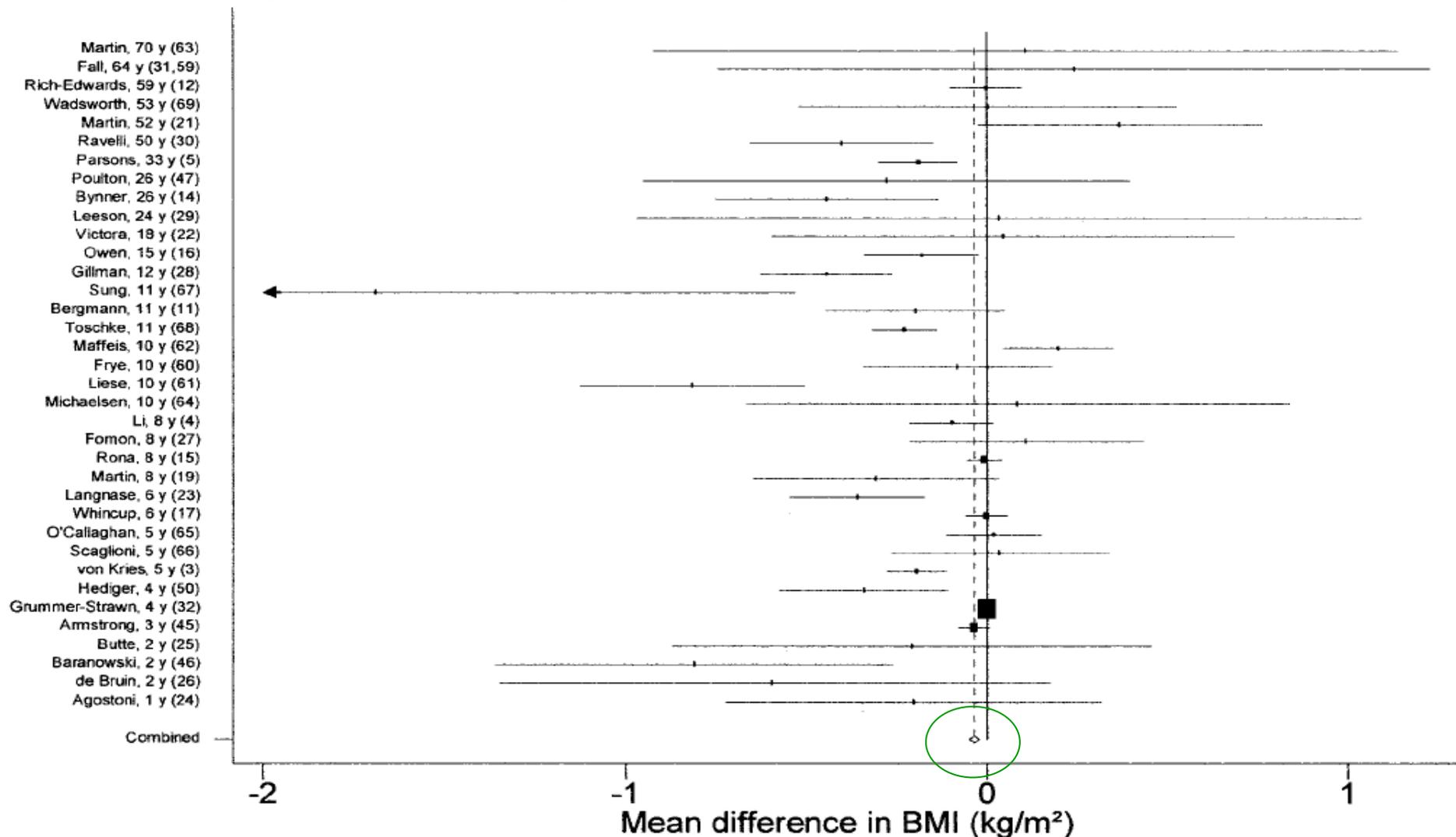
Meta-analysis 3: (Unadjusted) ORs for obesity (age)



Summary OR: 0.87 [0.85, 0.89]



Meta-analysis 4: Unadjusted effects on mean BMI





- Without adjustment (36 studies):
-0.04 (-0.06, -0.03)
 - With adjustment for maternal BMI, SES and maternal smoking (11 studies):
-0.01 (-0.05, 0.03)
- Confounding!



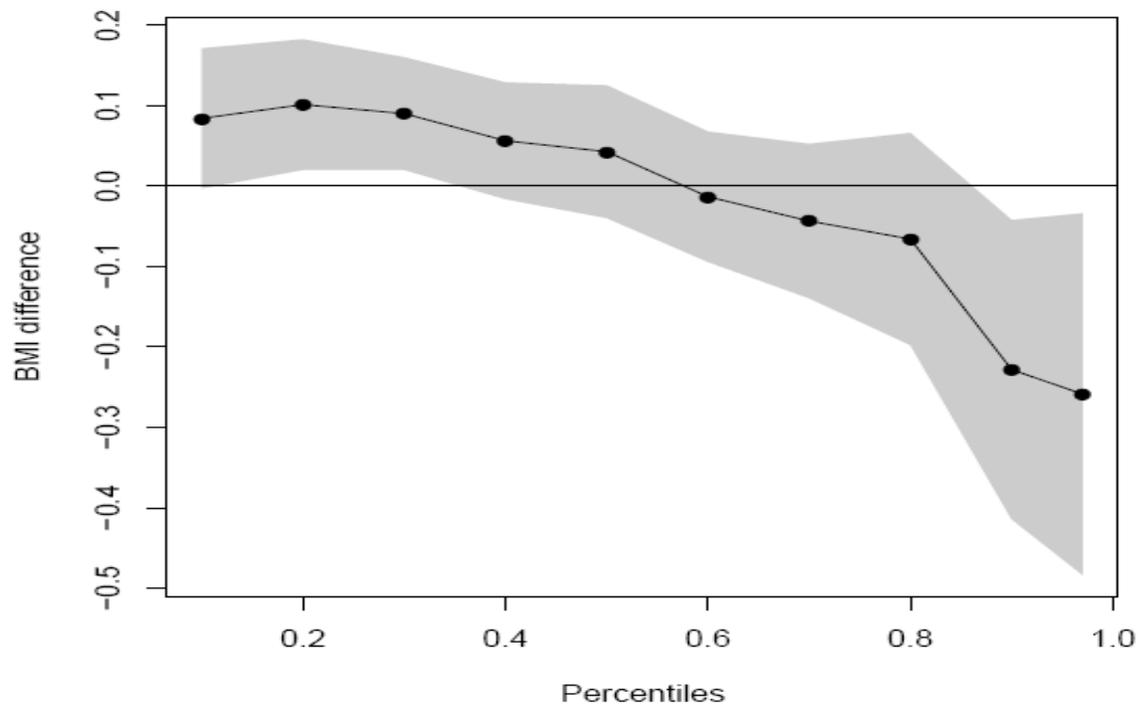
Meta-analyses: Proof of causality?

- Three meta-analyses indicate protective effects regarding overweight / obesity, but could all be wrong:
 - Residual confounding
 - Publication bias
- One meta-analysis is not confirmative
 - But focuses the entire BMI distribution - not overweight or obesity.
 - Might this be the „wrong“ outcome?



Does BF shift the entire BMI distribution or only the upper parts?

- Cross sectional study on 9368 children with BMI assessed at school entry
- BF exposure assessed in a questionnaire
- Quantile regression models applied
 - Adjusted effect of BF on different percentiles (quantiles) of the BMI distribution



- BF shifts the lower and upper tail of the BMI distribution to different directions.
- No effect on mean BMI

Effects were adjusted for sex, age, maternal smoking in pregnancy, TV watching, parents' graduate, maternal BMI and early infant weight gain



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 - PROBIT trial: Randomize BF promotion



Kramer et al., AJCN 2007:

- Cluster randomized trial in Belarus – where breastfeeding rates were low.
- $n = 13889$ children seen in follow-up
- Intervention: BF promotion according to WHO guidelines.
- Explanatory variable: Exposure to BF promotion (promoting increased BF duration)
- Outcomes assessed at 6.5 years



Outcome	Difference in means* (95% CI)
BMI [kg/m ²]	0.1 (-0.2, 0.3)
Waist circumference [cm]	0.3 (-0.8, 1.4)
Hip circumference [cm]	0.6 (-0.3, 1.4)
Waist to hip ratio	0.00 (-0.02, 0.01)
	OR (95% CI)
Overweight	1.1 (0.8, 1.4)
Obesity	1.2 (0.8, 1.6)

*Cluster-adjusted difference for intervention vs. control group



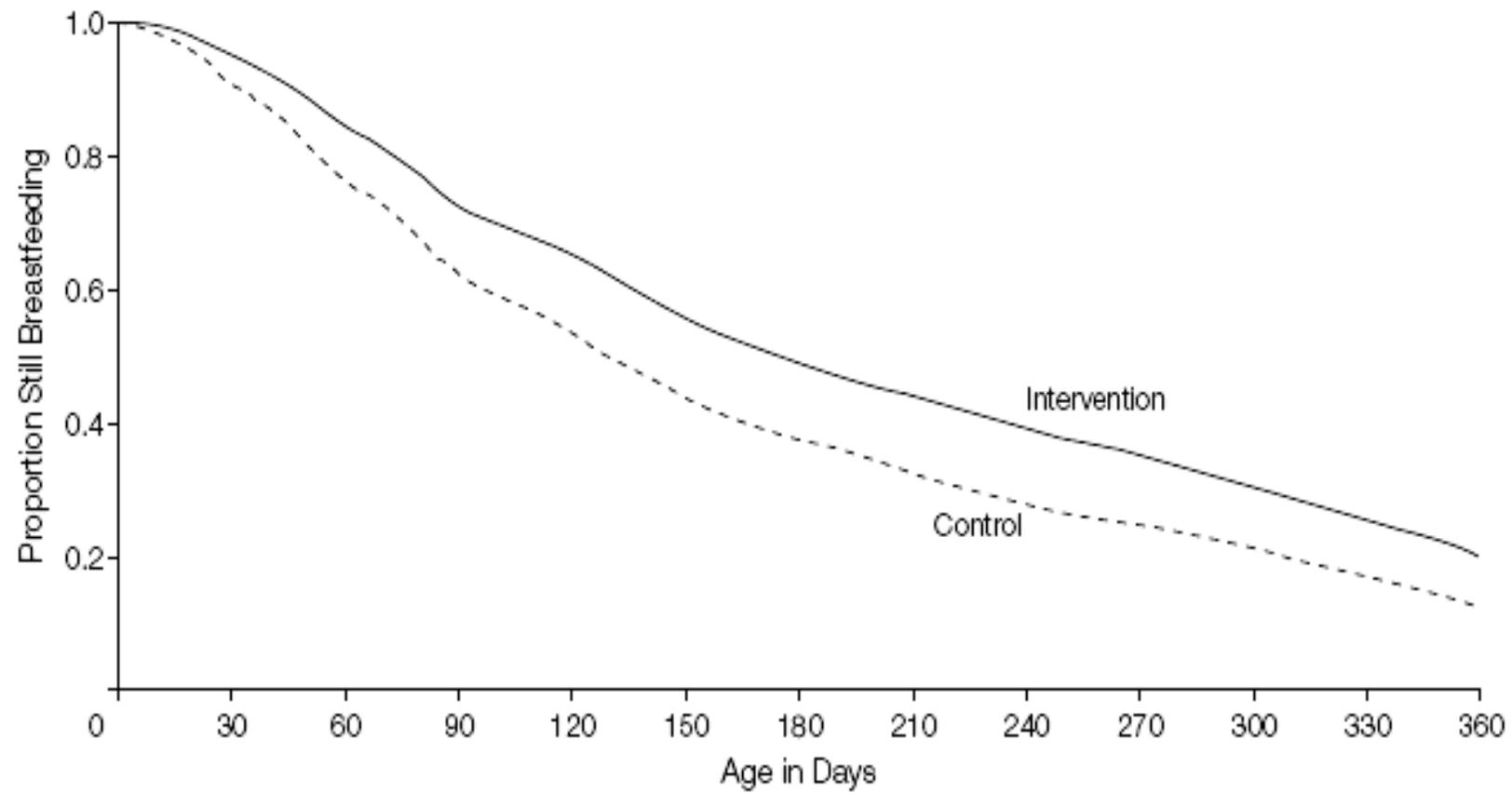
Evidence of no effect of BF?

- If we assume there really **is** an effect of BF, how likely would it be detected?
 - Potential effect on mean BMI: -0.04 kg/m^2 (Owen)



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- Breastfed children in both the intervention group and the control group (at 6 months: 49.7% vs. 36.1 %).





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- $n \approx 7000$ per treatment arm
 - Breastfed children in both the intervention group and the control group (at 6 months: 49.7% vs. 36.1 %).
- Expected difference in mean BMI between groups: -0.005 kg/m^2

- **Statistical power: 4 %**



Power (%) in the PROBIT trial:

Effect size and type	OR for obesity	PROBIT setting ²
		%
Arenz et al (1)		
Crude	0.67	10.9
Adjusted	0.78	7.4
Owen et al (4)		
Crude	0.87	5.8
Adjusted	0.93	5.2
Mean difference in BMI		
Owen et al (3)		
Adjusted	-0.01 ⁴	2.8
Crude	-0.04 ⁴	4.0
Small-scale studies	-0.19 ⁴	16.1



- Priming of body composition by BF is **possible**.
 - But the effect is small (if existent)
 - BF may not affect the BMI distribution equally.
- Potential effect is **difficult to prove**:
 - Meta-analyses of observational studies may be biased.
 - RCTs on breastfeeding are not feasible.
 - BF promotion trials may lack power.

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**Thank you for
your attention!**