

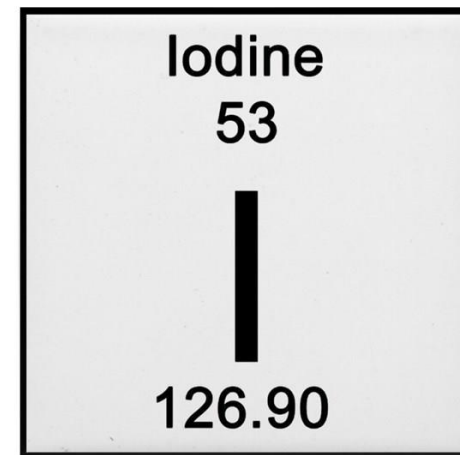
*MAMMAS MAT – EN INTERVENSJONSSTUDIE MED TORSK  
HOS GRAVIDE MED MILD-TIL-MODERAT JODMANGEL*



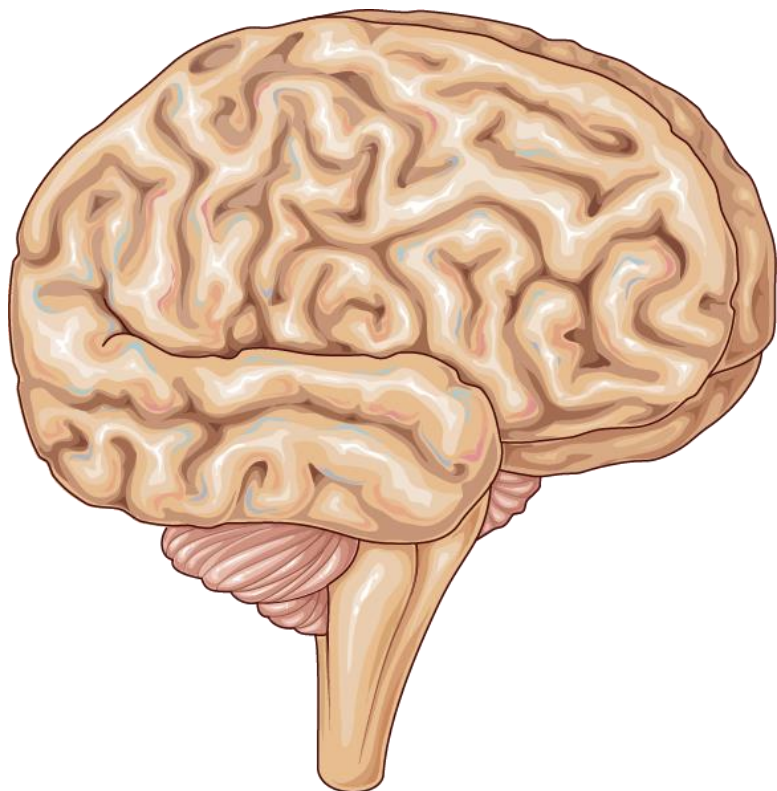
SYNNØVE NÆSS | 1.12.19

# JOD

- Essensielt sporelement gjennom hele livet pga. inkorporeringen i thyroidea-hormonene trijodtyronin (T3) og thyroxin (T4)
- Jodmangel definert som en av de vanligste ernæringsmanglene i verden



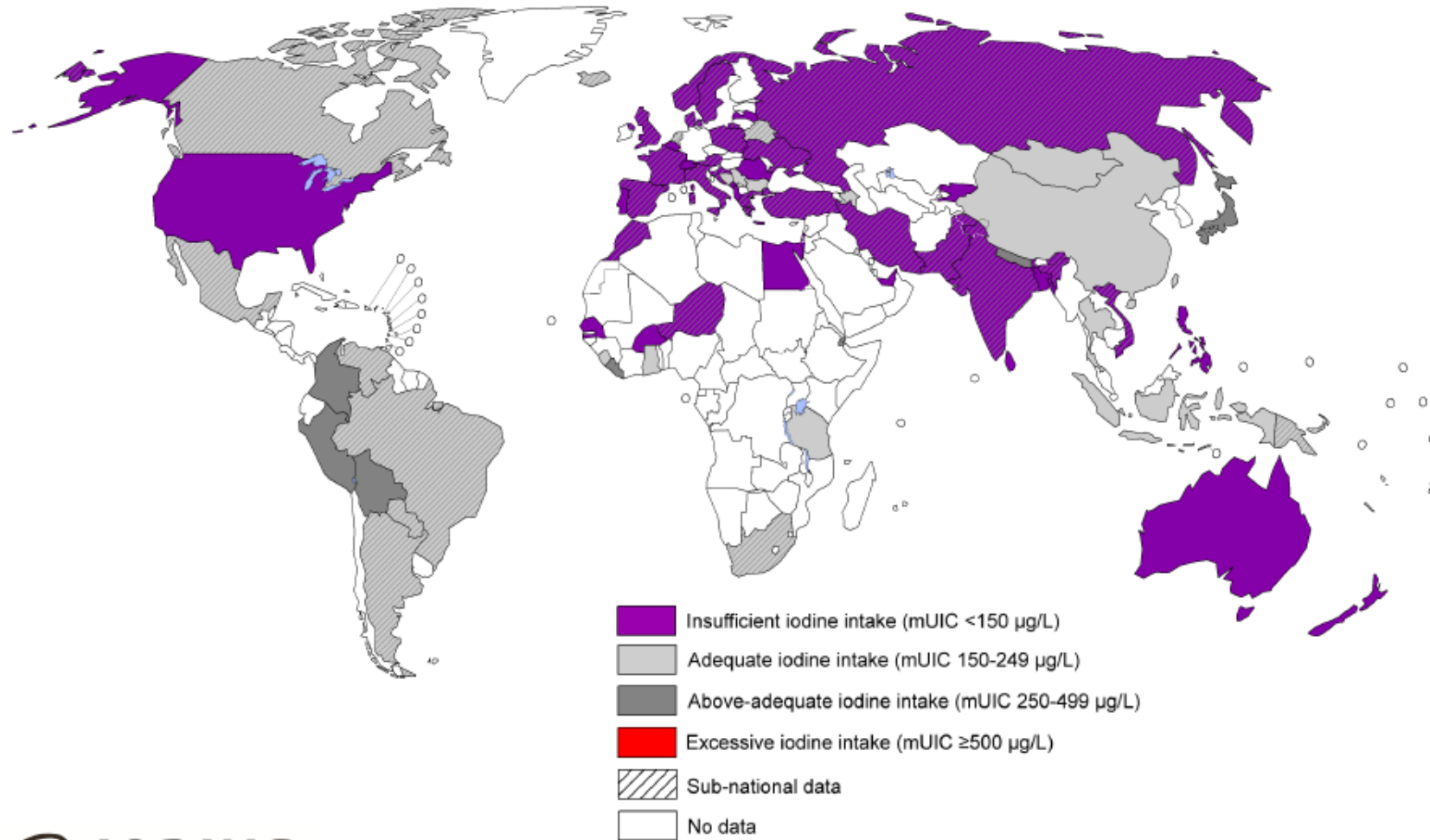
# JODMANGEL



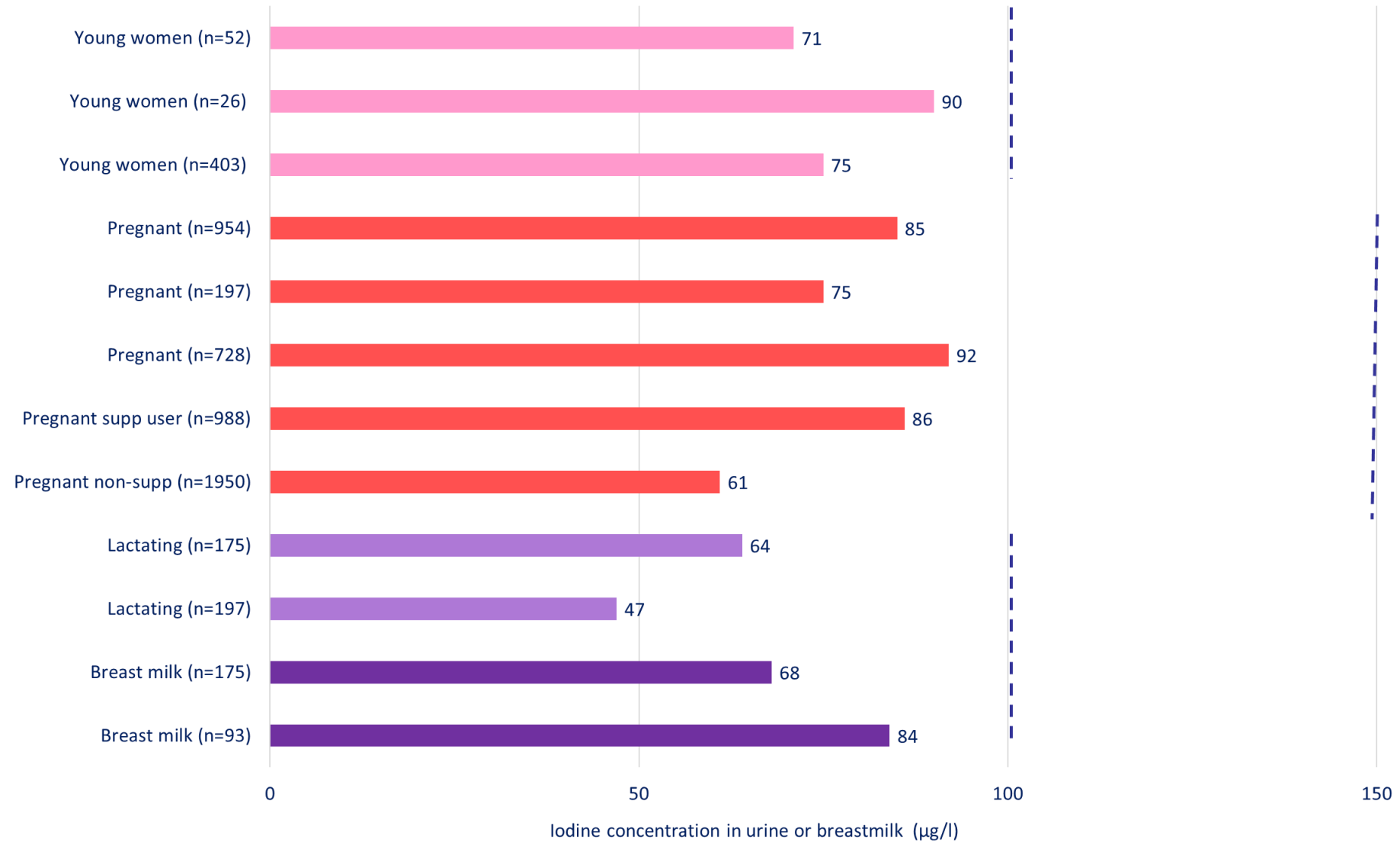
**WHO: «Single most important preventable cause of brain damage»**

## Global Scorecard of Iodine Nutrition 2017

Based on median urinary iodine concentration (mUIC) in pregnant women



# NORWEGIAN STUDIES 2016-2018



# Suboptimal Maternal Iodine Intake is Associated with Neurodevelopmental Delay in Norwegian Mothers and Children

Marianne H Abel,<sup>1,2,4</sup> Ida H Casperse,<sup>1,2,4</sup> Ragnhild E Brandlistuen,<sup>3</sup> Heidi Aas

<sup>1</sup>Department of Research and Development, TINE SA, 0902 Oslo, Norway; <sup>2</sup>Mental and Physical Health, Norwegian Institute of Management, Faculty of Health Sciences, Oslo; <sup>3</sup>Division of Infection Control and Environmental Health, Norwegian Institute of Public Health, 0456 Oslo, Norway; <sup>4</sup>Department of Nutrition, TINE SA, 0902 Oslo, Norway

## Abstract

**Background:** Severe iodine deficiency is associated with adverse outcomes for the child, but the potential consequences of mild-to-moderate iodine deficiency are less clear. **Objective:** We explored the associations between maternal iodine intake and the potential impact of maternal iodine intake on child neurodevelopment. **Methods:** This population-based prospective study included 39,471 mother-child pairs participating in a validated food frequency questionnaire covering the first half of pregnancy from 2002 to 2008. Maternal iodine intake was assessed by urinary iodine concentration in midpregnancy that covered mean intake since the start of pregnancy. We reported child language and motor development at 8 years. **Results:** In 33,047 mother-child pairs, excluding children with language delay ( $P = 0.024$ ), externalizing and internalizing behavior problems, but not gross motor skills or the risk of not attending school ( $P < 0.001$ ), 16% (95% CI: 10%, 21%) of the cases of language delay, 16% (95% CI: 10%, 21%) of the cases of internalizing behavior problems, and 16% (95% CI: 10%, 21%) of the cases of externalizing behavior problems. **Conclusions:** Maternal iodine intake below 150  $\mu\text{g}/\text{day}$  was associated with children reporting symptoms of child language delay, behavioral problems, and externalizing behavior problems. There was no evidence of a protective effect of iodine supplementation on child neurodevelopment.

European Journal of Nutrition  
<https://doi.org/10.1007/s00394-018-1850-7>

## ORIGINAL CONTRIBUTION

# Language delay and poorer school performance at 8 years in the Norwegian Mother and Child Cohort Study with inadequate iodine intake in pregnancy: results from a population-based study

Marianne H. Abel<sup>1,2,3</sup> · Ragnhild E. Brandlistuen<sup>4</sup> · Ida H. Casperse<sup>1</sup> · Helle Margrete Meltzer<sup>1</sup> · Anne Lise Brantsaeter<sup>1</sup>

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## Abstract

**Purpose** Some studies indicate that mild-to-moderate iodine deficiency in pregnancy is associated with neurocognitive development, including previous results from the Norwegian Mother and Child Cohort Study (MoBa) reporting that low iodine intake in pregnancy is associated with language and learning at 8 years. **Methods** The study sample includes 39,471 mother-child pairs participating in a validated food frequency questionnaire covering the first half of pregnancy from 2002 to 2008. Maternal iodine intake was assessed by urinary iodine concentration in midpregnancy that covered mean intake since the start of pregnancy. We reported child language and motor development at 8 years. Multivariable regression was used to explore associations between maternal iodine intake and child outcomes. **Results** Maternal iodine intake from food less than  $\sim 150 \mu\text{g}/\text{day}$  was associated with children reporting symptoms of language delay ( $p = 0.013$ ), reading skills ( $p$ -overall = 0.019), and writing skills ( $p$ -overall = 0.001), and increased likelihood of the child receiving special educational services ( $p < 0.001$ ). Although significant, differences were general. **Conclusions** Low habitual iodine intake in pregnant women, i.e., lower than 150  $\mu\text{g}/\text{day}$ , was associated with children reporting poorer child language, school performance, and increased use of special educational services. We found no indications of benefits or harm of iodine supplementation. Initiating use in pregnancy might be too late.

**Keywords** Iodine · Pregnancy · Dietary supplements · Neurodevelopment · MoBa

## Article

# Maternal Iodine Status is Associated with Offspring Language Skills in Infancy and Toddlerhood

Maria Wik Markhus<sup>1,\*</sup> · Lisbeth Dahl<sup>1</sup> · Vibeke Moe<sup>2</sup> · Marianne Hope Abel<sup>3,4</sup> · Anne Lise Brantsaeter<sup>3</sup> · Jannike Øyen<sup>1</sup> · Helle Margrete Meltzer<sup>3</sup> · Kjell Morten Stormark<sup>5</sup> · Ingvild Eide Graff<sup>1</sup> · Lars Smith<sup>2</sup> and Marian Kjellevold<sup>1</sup>

- <sup>1</sup> Institute of Marine Research, P.O. box 1870 Nordnes, 5817 Bergen, Norway; lisbeth.dahl@hi.no (L.D.); jannike.oyen@hi.no (J.Ø.); ingr@norceresearch.no (I.E.G.); marian.kjellevold@hi.no (M.K.)  
<sup>2</sup> Department of Psychology, University of Oslo, 0316 Oslo, Norway; vibeke.moe@psykologi.uio.no (V.M.); lrsmith@gmail.com (L.S.)  
<sup>3</sup> Division of Infection Control and Environmental Health, Norwegian Institute of Public Health, 0456 Oslo, Norway; mariannehope.abel@fhi.no (M.H.A.); annelise.brantsaeter@fhi.no; (A.L.B.); helle.meltzer@fhi.no (H.M.M.)  
<sup>4</sup> Department of Nutrition, TINE SA, 0902 Oslo, Norway  
<sup>5</sup> Regional Centre for Child and Youth Mental Health and Child Welfare, Uni Research Health, Uni Research, P.O. box 7810, 5020 Bergen, Norway. kjst@norceresearch.no  
\* Correspondence: maria.wik.markhus@hi.no; Tel.: +47-92-457-469

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**Abstract:** Inadequate iodine status affects the synthesis of the thyroid hormones and may impair brain development in fetal life. The aim of this study was to explore the association between maternal iodine status in pregnancy measured by urinary iodine concentration (UIC) and child neurodevelopment at age 6, 12 and 18 months in a population-based cohort. In total, 1036 families from nine locations in Norway were enrolled in the little in Norway cohort. The present study includes  $n = 851$  mother-child pairs with singleton pregnancies, no use of thyroid medication in pregnancy, no severe genetic disorder, data on exposure (UIC) in pregnancy and developmental outcomes (Bayley Scales of Infant and Toddler Development, third edition). Data collection also included general information from questionnaires. We examined associations between UIC (and use of iodine-containing supplements) and repeated measures of developmental outcomes using multivariable mixed models. The median UIC in pregnancy was 78  $\mu\text{g}/\text{L}$  (IQR 46–130), classified as insufficient iodine intake according to the WHO. Eighteen percent reported use of iodine-containing multisupplements. A UIC below  $\sim 100$  was associated with reduced receptive ( $p = 0.025$ ) and expressive language skills ( $p = 0.002$ ), but not with reduced cognitive or fine- and gross motor skills. Maternal use of iodine-containing supplements was associated with lower gross motor skills ( $b = -0.18$ , 95% CI =  $-0.33, -0.03$ ,  $p = 0.02$ ), but not with the other outcome measures. In conclusion, an insufficient iodine intake in pregnancy, reflected in a UIC below  $\sim 100 \mu\text{g}/\text{L}$ , was associated with lower infant language skills up to 18 months. The use of iodine-containing supplements was not associated with beneficial effects.

**Keywords:** Bayley; cohort; pregnancy; iodine status; iodine supplementation; infants; ICP-MS; mild to moderate iodine deficiency; neurodevelopment; urinary iodine concentration

# JODKILDER I DET NORSKE KOSTHOLDET



# Mammas mat

Er du gravid og venter ditt første barn?

Invitasjon til å delta i et forskningsprosjekt



# Mammas mat

Er du gravid og venter ditt første barn?

Invitasjon til å delta i et forskningsprosjekt





# STUDIEDESIGN

- Design
  - To-armet ikke-blindet randomisert kontrollert intervensjonsstudie (RCT)
- Primær utfallsmål: Mors jodstatus (UIC: seks spot urinprøver)
- Sekundær utfallsmål: Barnets utvikling (Bayley-III)



# STUDIEPOPULASJON

- Gravide kvinner i Bergens-området
- Inklusjonskriterier
  - Førstegangsggraviditet
  - $\leq$  svangerskapsuke 19
  - Et-barnsgraviditet
  - Snakke og forstå norsk (pga. spørreskjema og tester)
- Eksklusjonskriterier:
  - Fiskeallergi
  - Sykdommer som påvirker jodstatus (hypo- og hypertyroidisme, Graves sykdom, tyreoditt)



# DATAINNSAMLING - INTERVENSJON

Kontroll-gruppe n= 65



Svangerskap

FØLGER SITT VANLIGE KOSTHOLD

9-16

18

19

Rekruttering

Baseline

Randomisering

36

Post-testing

Fødsel

Intervensjons-gruppe n= 68



Svangerskap

2 x 200 GRAM TORSK UKENTLIG I 16 UKER

9-16

18

19

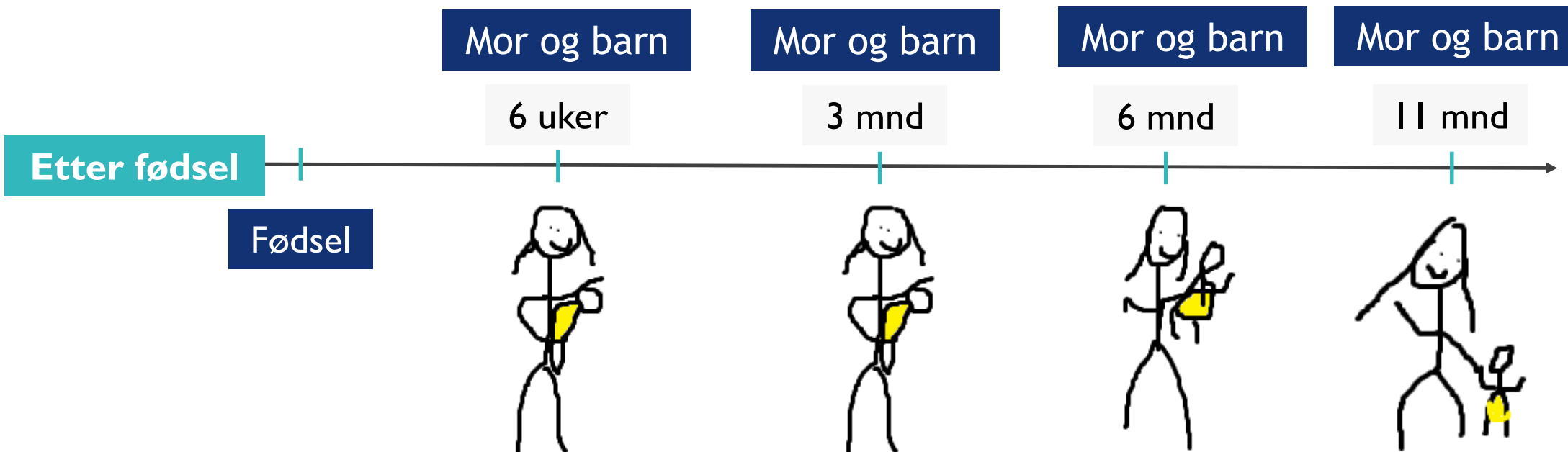
20

36

Fødsel



# DATAINNSAMLING – OPPFØLGING



STUDY PROTOCOL

Open Access

Effects of cod intake in pregnancy on



TIMEPOINT	Recruitment	Enrolment / Allocation					Post-allocation							
	GW <18	PREGNANCY					INFANCY							
		GW 18	GW 19	GW 20	GW 36	6 weeks	3 months	6 months	11 months					
						M	I	M	I	M	I	M	I	
<b>ENROLMENT</b>														
Eligibility screen	X													
Informed consent		X												
Instructions		X												
Allocation			X											
<b>INTERVENTIONS</b>														
Intervention				↔										
Control														
<b>BIOLOGICAL DATA</b>														
U-iodine concentration		X*			X*			X	X	X	X		X	
U-creatinine concentration		X*			X*			X	X	X	X		X	
S-Thyroid stimulating		X			X			X	X	X	X			
S-Free T4 status		X			X			X	X	X	X			
S-Free T3 status		X			X			X	X	X	X			
RBC-FA status		X			X			X	X	X	X			
S-Iron status		X			X			X	X	X	X			
S-Vitamin B <sub>12</sub> status		X			X			X	X	X	X			
Breastmilk-iodine status							X	X						
Breastmilk-FA status							X	X						
H-Mercury status		X			X		X			X	X		X	
<b>QUESTIONNAIRE†</b>														
Food Diary		X*			X*									
FFQ		X			X			X	X	X	X	X	X	
24-hour recall								X		X				
ASQ-3								X		X			X	
ASQ:SE								X		X			X	
BISQ								X		X			X	
EPDS		X			X			X		X		X		
HADS		X			X			X		X		X		
SCOFF‡		X			X			X		X		X		
<b>ASSESSMENT</b>														
Bayley-III													X	

**Fig. 1** Overview of study schedule and main activities. \*Six consecutive days between GW 18 and GW 19 and between GW 35 and GW 36 (last days of intervention meal). †Questionnaire includes: participant characteristics; self-reported maternal mental health; and parent-reported infant mental health. Abbreviations: GW, gestational week; M, mother; I, infant; U, urine; S, serum; T4, thyroxine; T3, triiodothyronine; RBC, red blood cells; FA, fatty acids; H, hair; FFQ, Food Frequency Questionnaire; ASQ-3, The Ages and Stages Questionnaire; ASQ:SE, The Ages and Stages Questionnaire: Social Emotional; BISQ, Brief Infant Sleep Questionnaire; EPDS, The Edinburgh Postnatal Depression Scale; HADS, The Hospital Anxiety and Depression Scale. ‡Screening tool for eating disorders



# BIOLOGISKE PRØVER

- Blodprøver
  - T3,T4,TSH
  - Jern
  - B12
  - Fettsyrer
  - Vitamin D
- Urinprøver
  - Jod
  - Kreatinin
- Morsmelk
  - Jod
  - Fettsyrer
  - Vitamin D
- Hårprøver
  - Kvikksølv



## RESEARCH

## Open Access



# Validation and reproducibility of a new iodine specific food frequency questionnaire for assessing iodine intake in Norwegian pregnant women

Synnøve Næss<sup>†\*</sup>, Inger Aakre<sup>†</sup>, Marian Kjellevoid, Lisbeth Dahl, Ive Nerhus, Lisa Kolden Midtbø and Maria Wik Markhus

## Abstract

**Background:** Iodized salt is not mandatory in Norway, and the permitted level of iodine in table salt is low (5 µg/g). Thus, milk and dairy products, fish and eggs are the main dietary sources of iodine in Norway. Mild-to-moderate iodine deficiency in pregnant women has been described in several European countries, including Norway. There are few validated tools available to assess iodine intake in an efficient manner. The aim of the current study was to assess the validity and reproducibility of a new iodine-specific food frequency questionnaire (I-FFQ) in Norwegian pregnant women.

**Methods:** An I-FFQ consisting of a total of 60 food items and the use of supplements was developed to assess iodine intake and was administrated to 137 pregnant women at gestational week 18–19. Reference methods were a structured 6-days iodine specific food diary, urinary iodine concentration (UIC) (pooled sample of spot UIC from six consecutive days), and thyroid function tests. Correlation analyses, Cohen's weighted kappa, Bland-Altman plots, and linear regression analyses were used to assess validity. Reproducibility of the I-FFQ was assessed in a subgroup ( $n = 47$ ) at gestational week 35–36.

**Results:** There was a strong correlation between estimated iodine intake from the I-FFQ and food diary ( $r = 0.62$ ,  $P < 0.001$ ) and an acceptable correlation between the I-FFQ and UIC ( $r = 0.21$ ,  $P = 0.018$ ). There was no significant association between the I-FFQ and thyroid function tests. The I-FFQ estimated higher iodine intake compared to the food diary with a mean absolute difference 33 µg/day. The limits of agreement from the Bland-Altman plots were large, however few participants fell outside the limits of agreement (5.2–6.5%). There was no difference between the estimated iodine intake from the I-FFQ assessed at gestational week 18–19, and gestational week 35–36 ( $P = 0.866$ ), and there was a strong correlation between the two time points ( $r = 0.63$ ,  $P < 0.001$ ).

**Conclusion:** In summary, this study suggests that the I-FFQ can be used as a valid tool to estimate and rank iodine intake among Norwegian pregnant women. We further suggest that this I-FFQ may also be valid in other populations with similarly dietary patterns and where salt is not iodized.

**Trial registration:** The study is registered in [ClinicalTrials.gov](https://www.clinicaltrials.gov) (NCT02610959).

**Keywords:** Iodine, FFQ, Validation, Pregnancy, Dietary assessment



# KARTLEGGING AV UTVIKLING - ASQ

- 3 mnd
- 6 mnd



## Ages & Stages Questionnaires®

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Child Monitoring System  
THIRD EDITION

Jane Squires & Diane Bricker  
with assistance from  
Elizabeth Twombly, Robert Nickel, Jantina Clifford,  
LaWanda Potter, Rob Hoselton, Linda Mounts, & Jane Farrell





# KARTLEGGING AV UTVIKLING – BAYLEY III

- 11 mnd



**Bayley**  
Scales of Infant and  
Toddler Development™  
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# STATUS MAMMAS MAT

- Datainnsamling ferdig høst 2018
- Hovedmanus ferdig og skal sendes inn før jul
- Flere artikler underveis



MAMMAS MAT:

TO BE CONTINUED..



# SAMARBEIDSPARTNERE

## Vitenskapelig

- HI: Maria Wik Markhus, Lisbeth Dahl, Marian Kjellevoid, Synnøve Næss, Inger Aakre, Lisa Kolden Midtbø, Ive Nerhus
- NORCE: Ingrid Kvestad og Mari Hysing

## Rekruttering

- Seksjon for fostermedisin og ultralyd, Kvinneklinikken, Helse Bergen, Haukeland Universitetssjukehus

## Finansiering

- Fiskeri og havbruksnæringens forskningsfond – FHF
- Nærings- og fiskeridepartementet (HI)



TAKK FOR MEG! SPØRSMÅL?

