The Pro003 data product

Original number of samples	2,990
Number of samples (per 27.11.2023)	2,983
Number of unique participants	2,971
Biological sample type	Plasma
Participant type(s)	MoBa mothers
Collection timepoint	Gestational week ~17
Case-control selection criteria	None
Biomarker measure(s)	Inflammatory, nutritional, metabolic and thyroid function biomarkers
Original reference article	Kelsey *et al*. 2022
Analytical method(s)	Architect *ci*8200
Related MoBaBIO product(s)	Mab011, Mab012, Mab013, Mab014, Pro004
FHI Project number(s)	PDB1440

The project that generated these data

Norwegian Environmental Biobank, part I: The importance of nutritional status for the effect of heavy metals on the health of mothers and their children (MoBa-ETox)

Project lead: Line Småstuen Haug

This project formed the first part of the establishment of a Norwegian environmental biobank. The overarching goal of the Norwegian environmental biobank is to monitors levels of nutrients, environmental toxicants, and other unwanted substances in the body over time and examine how these substances affect our health. MoBa-ETox aims to obtain knowledge about nutritional and heavy metal status during pregnancy in the Norwegian Mother, Father and Child Cohort Study (MoBa), and to investigate what significance this may have for subsequent health outcomes in mothers and children. There will be a special focus on whether nutritional status can protect against the negative effects of unwanted environmental substances. The project uses biological samples and questionnaire data from the MoBa to analyze the amount of a selection of nutrients, essential elements and heavy metals in existing MoBa samples from the 2nd trimester of pregnancy, describe the results and assess these in relation to established recommendations and acceptable intakes, and investigate the importance of specific nutrients (vitamins and essential elements) and heavy metals for the risk of developing health problems in later life.

Study population

The original Pro003 biomarker data source is based on plasma samples from **2,971 mothers** in MoBa who were pregnant in 2002-2008. Mothers were eligible for inclusion if they had completed questionnaires 1–6, if data were available from the father's questionnaire, if they had available blood and urine samples collected in pregnancy, and if they had genetic data available in MoBa. Mothers were ineligible for inclusion based on exclusion criteria applied for genotyping, which included participants who were not registered in the Medical Birth Registry, plural pregnancies, and pregnancies with children with autism, suspected autism, or symptoms of severe language delay. For a more detailed overview of the participant selection procedure in this study, refer to Caspersen *et al*. 2019.

Available biomarker measures (variable names in bold)

Cholesterol (**fP-Kol**)
25-hydroxyvitamin D (**P-D-25**)*
Ferritin (**P-Ferrit**)
Transferrin (**P-Transf**)
C-reactive protein (**P-hs-CRP**)
Free triiodothyronine (**P-T3-V**)
Free thyroxine (**P-T4-V**)
Thyroid peroxidase antibody (**P-TPOab**)

Thyroid stimulating hormone (**P-TSH**)
Thyroglobulin (**P-TyglAb**)

*This variable is a measurement of the sum of measured 25OHD2 and 25OHD3

Biological sampling and processing

Non-fasting blood samples were collected from mothers at 17-18 weeks' gestation into ethylenediaminetetraacetic acid (EDTA) tubes, centrifuged within 30 minutes, and temporarily placed in a refrigerator at 4 °C. They were shipped from the collecting hospital overnight to MoBa's biobank at the Norwegian Institute of Public Health (NIPH). The samples most often arrived at the biobank within 1–2 days of blood donation, where EDTA plasma were aliquoted onto polypropylene microtiter plates (96-well format, 300 µL per well), sealed with the use of heat-sealing foil sheets, and placed in long-term storage at −80 °C.

For more information on biological sampling, processing and storage, please refer to the original reference articles for NIPH's biobank by Rønningen *et al*. 2006 and Paltiel *et al.* 2014.

Analytical methodology

All of the biomarker measures included in this study were measured from plasma using an **Architect 8200ci integrated analyzer** (Abbott Laboratories, Abbott Park, IL, USA). Plasma cholesterol was measured using the Architect Cholesterol Assay, an enzymatic method. 25-hydroxyvitamin D was measured using the Architect 25-(OH)-D assay. Ferritin was measured using a chemiluminescent microparticle immunoassay (CMIA). C-reactive protein (CRP) was measured using the Multigent CRP Vario (CRPVa) assay. Free triiodothyronine, free thyroxine, thyroid peroxidase antibody, thyroid stimulating hormone and thyroglobulin were analyzed using chemiluminescent microparticle immunoassays (CMIA) for Architect systems. Transferrin was analysed by an immunoturbidimetric procedure (Architect Transferrin assay).

For more detailed information of the methods used in this study, you may refer to the specific methods description documentation developed by the project study group in MoBa-ETox. This will be provided to approved studies in accompaniment of biological datasets.

Measurement units:

Cholesterol (fP-Kol): mmol/L
25-hydroxyvitamin D (P-D-25): nmol/L
Ferritin (P-Ferrit): µg/L
Transferrin (P-Transf): g/L
C-reactive protein (P-hs-CRP): mg/L
Free triiodothyronine (P-T3-V): pmol/L
Free thyroxine (P-T4-V): pmol/L
Thyroid peroxidase antibody (P-TPOab): IU/ml
Thyroid stimulating hormone (P-TSH): mU/L

thyroglobulin (P-TyglAb): IU/ml

Limit of quantification (LOQ):

Cholesterol (fP-Kol): 0.16 mmol/L
25-hydroxyvitamin D (P-D-25): 10 nmol/L
Ferritin (P-Ferrit): 1 µg/L
Transferrin (P-Transf): 0.19 g/L
C-reactive protein (P-hs-CRP): 0.10 mg/L
Free triiodothyronine (P-T3-V): 1.3 pmol/L
Free thyroxine (P-T4-V): 5.1 pmol/L
Thyroid peroxidase antibody (P-TPOab): 3.0 IU/ml
Thyroid stimulating hormone (P-TSH): 0.01 mU/L
Thyroglobulin (P-TyglAb): 1.0 IU/ml

Published articles using Pro003

This section also includes articles related to study design, sampling, and data collection.

- Amberntsson A, Bärebring L, Winkvist A, *et al*. Vitamin D intake and determinants of vitamin D status during pregnancy in The Norwegian Mother, Father and Child Cohort Study. Front Nutr. 2023 Jun 23;10:1111004.
- Kelsey PT, Papadopoulou E, Borge TC, *et al*. Ultra-processed food consumption and associations with biomarkers of nutrition and inflammation in pregnancy: The Norwegian Environmental Biobank. Front Nutr. 2022 Dec 8;9:1052001.
- Amberntsson A, Bärebring L, Winkvist A, *et al*. Maternal vitamin D status in relation to infant BMI growth trajectories up to 2 years of age in two prospective pregnancy cohorts. Obes Sci Pract. 2022 Apr 8;8(5):670-681.
- Caspersen IH, Iglesias-Vázquez L, Abel MH, et al. Iron status in mid-pregnancy and associations with interpregnancy interval, hormonal contraceptives, dietary factors and supplement use. Br J Nutr. 2021 Oct 28;126(8):1270-1280.
- van den Broek S, Lupattelli A, Frank AS, Haug LS, Nordeng H. Thyroid hormone replacement therapy in pregnancy and motor function, communication skills, and behavior of preschool children: The Norwegian Mother, Father, and Child Cohort Study. Pharmacoepidemiol Drug Saf. 2021 Jun;30(6):716-726.
- Frank AS, Lupattelli A, Matteson DS, Meltzer HM, Nordeng H. Thyroid hormone replacement therapy patterns in pregnant women and perinatal outcomes in the offspring. Pharmacoepidemiol Drug Saf. 2020;29:111–121.
- Caspersen IH, Thomsen C, Haug LS, *et al*. Patterns and dietary determinants of essential and toxic elements in blood measured in mid-pregnancy: The Norwegian Environmental Biobank. Sci Total Environ. 2019 Jun 25;671:299-308.
- Abel MH, Korevaar TIM, Erlund I, *et al*. Iodine Intake is Associated with Thyroid Function in Mild to Moderately Iodine Deficient Pregnant Women. Thyroid. 2018 Oct;28(10):1359-1371.

Restrictions for use

None currently known.

Acknowledgements recommended for use

We recommend that any use of these data in analyses that are presented in peer-review publications acknowledges the original articles describing sampling and data collection:

Kelsey PT, Papadopoulou E, Borge TC, *et al*. Ultra-processed food consumption and associations with biomarkers of nutrition and inflammation in pregnancy: The Norwegian Environmental Biobank. Front Nutr. 2022 Dec 8;9:1052001.

Caspersen IH, Thomsen C, Haug LS, et al. Patterns and dietary determinants of essential and toxic elements in blood measured in mid-pregnancy: The Norwegian Environmental Biobank. Sci Total Environ. 2019 Jun 25;671:299-308.

Abel MH, Korevaar TIM, Erlund I, *et al*. Iodine Intake is Associated with Thyroid Function in Mild to Moderately Iodine Deficient Pregnant Women. Thyroid. 2018 Oct;28(10):1359-1371.

Disclaimer

The data in Pro003 that are available for use are provided by MoBa on an *as is* basis as they were received from the generating laboratory and have not been curated or quality controlled prior to release. FHI does not provide any guarantees related to data quality and assurance of the original dataset. We reserve the right to periodically remove samples from the dataset belonging to participants who have retracted their consent to participate in this cohort study, and may alter the contents of the associated documentation accordingly.