13th World Congress DOHaD
a bridge towards One Health
September 7–10 2025
Buenos Aires · Argentina

SATELLITE SYMPOSIUM
LIFECYCLE COHORT STUDIES

13th World Congress on Developmental Origins of Health and Disease (DOHaD)

September 4 and 5th, 2025
São Paulo, Brazil

Lifecycle COHORT studies

USP CAPES FAPESP CNPq

Lifecycle cohort studies. Satellite Symposium of the 13th World Congress on Developmental Origins of Health and Disease (DOHaD)

Local: Anfiteatro João Yunes, School of Public Health, University of São Paulo (USP).

Av. Dr. Arnaldo 715, Cerqueira César, São Paulo – SP

Period: September 4-5, 2025

Lifecycle Cohort Studies. Satellite Symposium of the 13th World Congress on Developmental Origins of Health and Disease (DOHaD)

Faculdade de Saúde Pública, Universidade de São Paulo, September 4-5, 2025

This symposium is a satellite event of the **13th World Congress on Developmental Origins of Health and Disease (DOHaD)** (https://www.dohad2025.com.ar/), Buenos Aires.

Our purpose here is to bring together experiences from cohort studies carried out in different settings, highlighting key advances and challenges in this research area. We expect to foster international collaboration networks.

As lifecycle cohort studies continue to expand across the globe, they offer opportunities to understand the dynamic interplay of biological, social, and environmental factors over time. We hope that this meeting could be used as a platform for researchers and policymakers to share insights, methodologies, and innovations that can enhance the impact and relevance of cohort research across diverse populations.

By facilitating cross-cohort comparisons, harmonization efforts, and knowledge exchange, we aim to improve the global resources for longitudinal research with high quality data, promoting scientific evidence for more equitable societies across the life course.

Organizing Local Committee:

- **Marly Augusto Cardoso** – Department of Nutrition, School of Public Health (FSP), USP.
- **Bárbara H. Lourenço** – Department of Nutrition, FSP, USP.
- **Liania Alves Luzia** – Laboratory Specialist, Department of Nutrition, FSP, USP.
- **Graduate Students** from FSP/USP, School of Medicine/USP & MINA-Brazil Study Researchers:

- Isabel Giacomini
  - Ana Carolina Hovadick
  - Ana Raquel Ernesto Manuel Gotine
  - Bianca de Melo Guedes
  - Gabriella Machado de Souza

- Joanna Manzano Strabeli Ricci
- Karla Gabrielle Sales Fernandes
- Lucas Damasio Faggiani
- Mariana Ting
- Nathalia Silva
- Tamiris Ramos Silva

Scientific Committee

- **Marly A. Cardoso** – Department of Nutrition, FSP, USP.
- **Antonio Marcus de A. Paes** – Department of Physiological Sciences, Center for Biomedical and Health Sciences (CCBS), Federal University of Maranhão (UFMA). President of DOHaD Brazil Association.
- **Alessandra C. Goulart** – Department of Epidemiology, FSP, USP.
- **Alícia Matijasevich** – Department of Preventive Medicine, School of Medicine, USP.
- **Antonio Augusto Moura da Silva** – Department of Public Health, CCBS, UFMA.
- **Bárbara H. Lourenço** – Department of Nutrition, FSP, USP.
- **Bernardo Lessa Horta** – Department of Social Medicine, School of Medicine, Federal University of Pelotas (UFPel). Graduate Program in Epidemiology, UFPel.
- **Cecília Cláudia Costa Ribeiro** – Department of Dentistry, CCBS, UFMA.
- **Fabíola Suano** – Department of Pediatrics, Paulista School of Medicine, UNIFESP.
- **Isabel Giacomini** – PhD candidate, Department of Nutrition, FSP, USP
- **Simone Karam** – School of Medicine, Federal University of Rio Grande (FURG).
- **Teresa Gontijo de Castro** – Senior Research Fellow, Department of Nutrition & Dietetics, University of Auckland, New Zealand / Waipapa Taumata Rau, Aotearoa.

SATELLITE SYMPOSIUM - LIFECYCLE COHORT STUDIES
13th WORLD CONGRESS ON DEVELOPMENTAL ORIGINS OF HEALTH AND DISEASE (DOHAD)

THURSDAY 04 SEPTEMBER

8:30 - 9:00 am **Reception**

9:00 - 9:15 am **Welcome remarks**
Marly Cardoso (School of Public Health, SPH/USP), José Leopoldo Ferreira Antunes (Dean, SPH/USP), Antonio Marcus de A. Paes (President of DOHaD Brazil Association)

9:15 - 10:45 am **Opening Lecture**
A maternal-child cohort using electronic health records.
Lucilla Poston, President of International Society for DOHaD; Professor of Maternal and Fetal Health, School of Life Course and Population Sciences, King's College London, UK.
Session chair: Fabiola Suano (School of Medicine, UNIFESP)

10:45 - 11:15 am Coffee break

11:15 – 11:45 am **Challenges in Mounting the ECHO Cohort**
Matthew W. Gillman, Program Director, Environmental Influences on Child Health Outcomes (ECHO), Program Office, National Institutes of Health, USA.
Session chair: Antonio Marcus de A. Paes (Federal University of Maranhão)

11:45 – 11:55 pm Questions/comments

11:55 - 1:10 pm **Oral communications:**
Moderators: Cecília Cláudia Costa Ribeiro (Federal University of Maranhão) and Teresa Gontijo de Castro (University of Auckland, New Zealand)

- Giovana Nigri Cursino: Sociodemographic factors are associated with gestational weight gain trajectories: Results from the Brazilian Maternal and Child Nutrition Consortium
- Caroline Zani Rodrigues: Intergenerational malnutrition profiles in the Brazilian Amazon: characterization and predictors in the first 2 years of life
- Andreia Machado Miranda: Social inequalities in leisure-time and transport-related physical activity through the lens of intersectionality: Evidence from a 10-Year Longitudinal Study in Brazil
- Nara Brito: Prevalence and Associated Factors of Suicidal Ideation in Adolescents at Age 18: 2004 Pelotas Birth Cohort
- Nathalia de Oliveira Silva: Multimorbidity in Childhood and Adolescence and Its Association with Socioemotional Skills in Early Adulthood: A Study Based on the 2004 Pelotas Birth Cohort

1:10 - 2:30 pm Lunch at SPH/USP cafeteria
** Please bring your badge with you.*

SATELLITE SYMPOSIUM - LIFECYCLE COHORT STUDIES
13th WORLD CONGRESS ON DEVELOPMENTAL ORIGINS OF HEALTH AND DISEASE (DOHAD)

THURSDAY 04 SEPTEMBER

2:30 - 3:15 pm **Diversity of study designs and innovative strategies for follow-up**
Moderator: Fabíola Suano (School of Medicine, UNIFESP)
- Methodological challenges in collaborative research – insights and findings from the COHORTS initiative. Aryeh D Stein (Emory University, USA)
- Follow-up strategies in the MINA-Brazil birth cohort. Barbara Lourenço (SPH/USP)

3:15 – 3:30 Questions/comments

3:30 – 3:45 Short break

3:45 – 5:00 pm **Oral communications:**
Moderators: Simone Karam (School of Medicine, Federal University of Rio Grande, Brazil) and Antônio Augusto Moura da Silva (Federal University of Maranhão)
- Carmen Ildes Rodrigues Fróes Asmus: Childhood and Environmental Pollutants Project (PIPA's Project)
- Nathália Teixeira de Oliveira: Association between the occurrence of heat waves and breastfeeding practices throughout the year 2019 among children registered in the Brazilian Food and Nutrition Surveillance System: Preliminary results
- Rafaela Vitória Pereira Sá: Prenatal conditions as predictors of Asthma and Allergy Traits at Two Years of Age: a machine learning approach from the BRISA Cohort
- Fernanda Lima Soares: Tissue-Specific Expression-Based Polygenic Risk Scores and Methylation Score in Interaction with Birth Weight Associate to Childhood BMI: A Multi-Cohort Study
- Silas Alves: Mapping Health Risks in the First 1,000 Days: Complex Networks of Maternal Factors, Birth Outcomes, and NCDs in Childhood

6:00 - 10:00 pm Social gathering with live forro music
Canto Madalena: Medeiros de Albuquerque street 471 - Vila Madalena, São Paulo – SP (https://www.tripadvisor.com/Restaurant_Review-g303631-d2619596-Reviews-Canto_da_Madalena-Sao_Paulo_State_of_Sao_Paulo.html)

** Please bring your badge with you.*

SATELLITE SYMPOSIUM - LIFECYCLE COHORT STUDIES
13th WORLD CONGRESS ON DEVELOPMENTAL ORIGINS OF HEALTH AND DISEASE (DOHAD)

FRIDAY 05 SEPTEMBER

9:00 - 10:10 am	**Methodological challenges** Moderator: Alícia Matijasevich (School of Medicine, SM/USP) - Approaches to handle bias in cohort studies, and increase causal inference. Bernardo L. Horta (Federal University of Pelotas, Brazil) - Modeling age-specific child growth effects on later health and human capital outcomes. Linda S. Adair (University of North Carolina, USA)
10:10 - 10:30 am	Questions/comments
10:30 - 11:00 am	Coffee break
11:00 - 11:40 am	**Data collection and pooling data issues** Moderator: Alessandra Goulart (SPH, USP) - Data collection in a birth cohort spanning childhood to adulthood - The Trondheim Early Secure Study (TESS). Silje Steinsbekk (Norwegian University of Science and Technology, Norway) - Approaches to ethnic and socio-cultural diversity: contributions from Growing up in New Zealand (GUINZ) cohort. Teresa Gontijo de Castro (University of Auckland, New Zealand/ Waipapa Taumata Rau, Aotearoa).
11:40 - 11:55 pm	Questions/comments
11:55 - 1:10 pm	**Oral communications:** Moderators: Alícia Matijasevich (SM/USP), Bárbara H. Lourenço (SPH/USP) - Bruna Lazzeri: Harmonisation of data on fruit and vegetable intakes in pregnant women in the Brazilian Maternal and Child Nutrition Consortium: the association of dietary intake with birth outcomes - Gabriela Torres Silva: Determinants of human milk volume trajectories in the postpartum period: Findings from the Brazilian site of the MILQ cohort - Luisa Bittencourt de Aquino Fernandes Dias: Shared Risk, Shared Habits: Dietary Patterns in Mothers with a history of gestational diabetes and overt diabetes and Their Children - Erin A Hudson: Early Life Exposures, Ultra-Processed Food, and Insulin/Glucose Dynamics in Children Exposed to GDM: Preliminary Findings - Angelica Beate Winter Boldt: (Epi)genetic markers for metabolic syndrome, fat percentage and obesity in south Brazilian Mennonites
1:15 – 2:30 pm	Lunch at SPH/USP cafeteria (*Please bring your badge with you)*
2:30- 4:00 pm	**Cohort studies and DOHaD: building a sustainable future through early life insights** All invited speakers. Round table moderator: Bernardo Horta
4:00 pm	**Closing remarks** - Marly Cardoso (School of Public Health, USP)

See you at the *Second Satellite Symposium of the 14th World Congress DOHaD in Japan, 2027!*

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ABSTRACTS OF LECTURES

Lifecycle COHORT studies

A Maternal-Child Cohort using Electronic Health Records

L Poston, LA Magee, S-M Latt, T Dasgupta, elixir-Born in South London Partnership; Department of Women and Children's Health, School of Life Course and Population Sciences, King's College London, UK.

Conventional birth cohorts make substantial contributions to DOHaD life course research. With advances in data acquisition and linkage, birth cohorts using routine electronic health records (EHR) are increasingly employed to provide population level data for life course research, and offer advantages and some disadvantages over traditional cohorts. In the UK these linkages are a relatively novel approach to life course research.

Everyone in the UK has a unique National Health Service number facilitating linkage of health care and other administrative records from a wide variety of databases. In 2018 we began a new maternal child data linkage to bring together antenatal, neonatal, child health and developmental outcomes in an inner-city highly diverse population of London. Uniquely to the UK, the linkage includes maternal and child mental health data. There have been many challenges through governance requirements and data acquisition, but opportunities too.

With > 70,000 pregnancies in the database we are engaged in a portfolio of studies addressing exposures in maternal and early life, and follow up of infants and children. We have studied the consequences of the COVID pandemic for mother and child, and are working with Government to evaluate impacts of population health interventions. We are also addressing the impact of inequalities on physical and mental health outcomes.

All EHR birth cohorts in the UK have formed a partnership, MIREDA (Mother and Infant Research Electronic Data Analysis) led by the University of Swansea, Wales. MIREDA recently completed development of a common data model using OMOP (The Observational Medical Outcomes Partnership) to standardize the structure and content of UK maternity data, to enable efficient analyses. With the first stage complete, this offers a national resource for federated analysis of pregnancy outcomes in the UK, at a greater depth than available through national maternity datasets.

Funded by the Medical Research Council UKRI.

- Carson LE et al. Cohort profile: the eLIXIR Partnership-a maternity-child data linkage for life course research in South London, UK. BMJ Open. 2020 Oct 6;10(10):e039583. doi: 10.1136/bmjopen-2020-039583.
- Seaborne M et al, Mother and Infant Research Electronic Data Analysis (MIREDA): A protocol for creating a common data model for federated analysis of UK birth

cohorts and the life course. Int J Popul Data Sci. 2024 Sep 12;9(2):2406. doi: 10.23889/ijpds.v9i2.2406.

- McGreevy A et al. The impact of the COVID-19 pandemic on maternal healthcare costs: a time series analysis of pregnancies of multi-ethnic mothers in South London, United Kingdom. BMC Med. 2025 Jul 1;23(1):375..

Challenges in Mounting the ECHO Cohort

Matthew W. Gillman, MD, SM
Director, US NIH Environmental influences on Child Health Outcomes (ECHO) Program
Life Course Cohorts Symposium, Sao Paulo, Brazil

The Environmental influences on Child Health Outcomes (ECHO) Cohort, supported by the US National Institutes of Health and begun in 2016, now has longitudinal data on close to 150,000 children and their family members. Several challenges have accompanied the creation of the Cohort. In its initial 7 years it comprised extant and new data and specimens from approximately 70 pre-existing, ongoing longitudinal maternal-child studies. While providing an opportunity for early productivity, data harmonization was a key challenge because the individual studies had different inclusion criteria, data collection schedules and instruments. Now in its second 7-year funding cycle, the ECHO Cohort benefits from a single standardized data and specimen collection protocol, a single institutional review board for ethics oversight, central data capture, and more efficient representative governance.

A related challenge was having 100s of investigators working collaboratively so that the whole is greater than the sum of the parts. Relentless focus on ECHO's mission to enhance the health of children for generations to come as well as instituting cross-cutting themes of solution-oriented research, the science of team science, and developing the next generation of researchers helped facilitate an interdisciplinary approach.

An aspiration from the inception of the ECHO program was to address pre-conceptional origins of child health. But recruiting a large enough general population sample to yield a reasonable number of first pregnancies was infeasible. ECHO's solution has been to recruit in the interpregnancy interval, which represents the preconception period for any "second" pregnancies that occur during the ECHO funding period. The ECHO Cohort has also started to recruit partners of these women, with the goal of collecting data and specimens from them before the next pregnancy starts.

Maximizing the health impact of the ECHO Cohort is a long-term goal. While ECHO values any rigorous scientific contributions, the program puts an emphasis on solution-oriented research, i.e., "so-what" questions whose answers can inform public health programs, clinical practice, and policies. To illustrate this principle, ECHO is holding its first annual Science to Action Symposium on 15 September 2025, which brings together policymakers, practitioners, participants, media, and scientists to move the needle on child health. All are welcome to attend, virtually or in person in Bethesda, MD, USA. https://cvent.me/8229Py

Another way to increase the impact of ECHO research is for the broad scientific community to use the data and specimens that participants have generously contributed. One route, via a Data Use Agreement, is by accessing de-identified data on

the Data and Specimen Hub of the NIH/NICHD https://echochildren.org/dash/. For researchers also interested in obtaining a limited set of personal identifiers, e.g., dates and addresses, +/- biospecimens, ECHO has recently instituted an ancillary studies process, which involves a process with several steps to ensure data and specimen stewardship https://echochildren.org/echo-ancillary-studies/.

For more information about the ECHO Program:

- Email NIHKidsandEnvironment@od.nih.gov
- Visit the website www.echochildren.org
- Sign up for the newsletter lp.constantcontactpages.com/su/CAHfEfJ/echo

Session on Diversity of study designs and innovative strategies for follow-up
COHORTS: Consortium of Health-Orientated Research in Transitional Societies

Aryeh D Stein
Emory University

COHORTS, the Consortium on Health-Orientated Research in Transitional Settings, is an example of data pooling. COHORTS is a research collaboration among the investigators of birth cohort studies in five countries (Brazil, Guatemala, India, Philippines, and South Africa). Originally convened in the context of the 2008 Lancet Series on Maternal and Child Nutrition, inclusion criteria included a low- or middle-income setting, at least 1000 individuals under follow-up since birth, and follow-up at least through adolescence. The oldest cohorts were born 1969-1972 (India) and 1969-1977 (Guatemala), and the youngest of the original five cohorts was born in 1990 (South Africa). Subsequently, the 1993 Pelotas birth cohort was incorporated. All cohorts provide deidentified data, which are then harmonized to allow multi-site analysis.

Through examples of COHORTS publications, the presentation will focus on the process of data harmonization, considerations in engaging in pooled analyses, lessons learned from the harmonization process, and suggestions for future collaborations to consider.

A key feature of COHORTS has been the need to harmonize data that were collected in independent cohorts, without the benefit of prior planning and coordination. Each participating cohort has been responsible for its own design, cadency of field work, range of data to be collected at each wave, and data maintenance. Thus, the first stage of the collaboration included exploration of common elements. It became clear that common ages of cohort participants in childhood were birth, 6 mo, and 24 mo. All but one of the cohorts had a wave of field work at age 5 yr, with the final cohort having a wave at age 8.5y. The COHORTS investigators therefore made a decision that analyses of childhood would refer to this age as ‘mid-childhood’ to preserve the range of ages.

A second area of harmonization was concerned with the distinction between the underlying construct intended to be studied and the measure used to collect the data. For example, glucose was measured in all cohorts at least once in adulthood, but each cohort measured it differently. The COOHORTS investigators reasoned that if the underlying relationships between early life circumstances and glucose metabolism were real, they would be apparent regardless of the specific methodology used in each study. Indeed, it has been clear that this assumption holds. Across several adult characteristics (glucose, blood pressure, IQ, and others), the consistency of observations is remarkable. Such consistency adds to the robustness of the findings of the collaboration.

Follow-up strategies in the MINA-Brazil birth cohort

Bárbara Hatzlhoffer Lourenço
Department of Nutrition, School of Public Health, University of São Paulo, Brazil

This presentation will outline the main features of the Maternal and Child Health and Nutrition in Acre, Brazil (MINA-Brazil) study. Topics will include the study's main objectives, design, area, participants, and follow-up assessments from 2015 to 2025. A brief overview of the study measurements will be provided and key strategies for follow-up will be discussed. The MINA-Brazil study is a longitudinal, prospective population-based birth cohort established in the city of Cruzeiro do Sul, in the Brazilian Amazon area. Focusing primarily on the first 1,000 days from pregnancy through early childhood, the study aims to examine how early environmental and maternal exposures influence child growth and development, by integrating epidemiological, clinical, and biological data in a malaria-endemic area. Participants were enrolled at delivery between July 2015 and June 2016 (n=1,246 mother–baby pairs). Of those included in the MINA-Brazil birth cohort, 545 women (approximately 43.7%) were recruited during pregnancy, with up to 20 gestational weeks, between February 2015 and January 2016. Assessments occurred during pregnancy (at 20 and 28 weeks), at delivery, and at 30-90 days, 6 months, 1 year, 2 years, 5 years, and 9 years of age. Data were collected on household and sociodemographic characteristics, obstetric history, antenatal care, maternal and child health, diet and supplementation at multiple time points. Maternal blood samples during pregnancy and child blood and stool samples at 1 and 2 years were obtained for the analysis of biochemical markers (e.g., hemoglobin, ferritin, vitamin levels, inflammatory markers) and gut microbiota. Anthropometric measurements included child weight, length/height, and head and waist circumferences. Neurodevelopmental screening using the Denver II test was carried out at 1 and 2 years, and child behavioral problems were assessed at 5 years. During the 9-year follow-up, the children's body composition, blood pressure, sexual maturation, diet, physical activity, sleep patterns, problematic screen use, and social interactions were evaluated, and fasting blood samples were collected. Different follow-up strategies have been implemented to optimize participant retention over the years. At baseline, partnerships were established with the state and municipal health departments for participant screening at primary healthcare centers and the reference maternity hospital. During follow-up, innovative communication initiatives included telephone calls by trained interviewers to reach participants or their relatives, text and WhatsApp messaging, and the creation of a social media community. Home visits were conducted with the help of a trained local post office worker to verify reported addresses. The 9-year assessment planning was based on integrating MINA-Brazil datasets with the Brazilian Ministry of Education's School Census, as well as local partnerships with the state and municipal

education secretariats to carry out school-based evaluations. Although the geographic location and complex logistics of a resource-limited setting present unique participant retention challenges, the MINA-Brazil study addresses a critical data gap by providing high-quality prospective data for multidimensional analyses in a life-cycle perspective in the Amazon region.

Intergenerational and transgenerational effects of pregnancy and perinatal exposures on child health

Eduardo Villamor
University of Michigan, United States

Environmental exposures can affect health outcomes through more than one generation via non-DNA sequence-based inheritance; yet, evidence from epidemiologic studies is scant and fraught with obstacles to ascertain causation. I will describe recent studies on the inter- and transgenerational roles of pregnancy and perinatal exposures on distal offspring health outcome.

Maternal obesity increases risk of infant mortality. Because obesity is highly inheritable, grandmaternal obesity could also play a role. However, it is unknown whether grandmaternal obesity is related to grandoffspring infant mortality risk. We investigated the associations of grandmaternal early pregnancy body mass index [BMI (in kg/m2)] and grandoffspring infant mortality risk. Using Swedish nationwide registers, we estimated infant mortality hazard ratios (HRs) by levels of maternal grandmaternal early pregnancy BMI among 315,461 singleton live-born grandoffspring. We examined whether the association was mediated through maternal body size. In a subset of 164,095 grandsoffspring we evaluated the role of paternal grandmaternal BMI. To explore whether factors shared within families explained these associations, we studied the relations of maternal or paternal full sisters' BMI and infant mortality. Maternal grandmaternal overweight or obesity (BMI 25.0) was associated with increased grandoffspring infant mortality risk. Compared with the population median BMI (21.7), estimated adjusted hazard ratios [HRs (95% confidence interval [CI])] of grandoffspring mortality for BMI 25.0 and 30.0 were, respectively, 1.60 (1.14, 2.23) and 1.61 (1.13, 2.27). Maternal high birth weight-for-gestational age and early pregnancy obesity (BMI 30.0) were also associated with increased infant mortality risk. The association between maternal grandmaternal overweight or obesity and grandoffspring infant mortality was mostly (62%) mediated through maternal overweight or obesity. Maternal sisters' BMI was unrelated to infant mortality. Paternal grandmaternal obesity was associated with increased infant mortality risk (HR [95% CI] for BMI 30.0 compared with 21.7: 1.65 [1.02, 2.67]); associations with paternal sisters' BMI were not statistically significant. Maternal grandmaternal overweight or obesity is associated with increased risk of grandoffspring infant mortality; factors shared within families may not play a major role. The association is mediated through the maternal early pregnancy BMI. Whether the association with paternal grandmaternal BMI is explained by shared familial factors warrants future confirmations, and key challenges and approaches to enhance causal inference in this field.

Approaches to handle bias in cohort studies, and increase causal Inference

Bernardo L. Horta
Federal University of Pelotas

In observational studies, exposures are not randomly assigned to the study participants, as in randomized controlled trials. For this reason, these studies are susceptible to selection bias, confounding and other bias that may limit the capacity of these studies in inferring causality. On the other hand, there are some strategies that can be used to improve causal inference in observational studies. In the presentation, we will discuss the following approaches that can be used to improve causal inference, such: Inverse probability weighting, negative control, mendelian randomization, and sensitivity analysis.

I will present findings from the 1982 Pelotas birth cohort study, focusing on approaches used to explore the likelihood that the observed associations were due to bias. The 1982 Pelotas birth cohort is a population-based study. In 1982, the perinatal study identified all hospital births in Pelotas, a southern Brazilian city, and those livebirths whose families lived in the urban area of the city were enrolled in the study. The whole cohort or a subsample have been followed up at 1, 2, 4, 13,15, 18, 19, 23, 30 and 40 years of age. The most recent follow-up of the cohort interviewed 3087 subjects, at a mean age of 40.5 years, showing that is possible to recruit a population-based birth cohort and achieve high follow-up rates into adulthood in a middle-income setting.

Concerning mendelian randomization, we investigated the association of milk intake with obesity and BP using genetically-defined lactase persistence (LP) based on the rs4988235 polymorphism in a Mendelian randomization design in the 1982 Pelotas (Southern Brazil) Birth Cohort. These results were combined with published reports identified through a systematic review using meta-analysis. In conventional observational analysis, each 1-dl/day increase in milk intake was associated with -0.26 (95% CI: -0.33; -0.19) kg/m^2 in BMI and -0.31 (95% CI: -0.46; -0.16) and -0.35 (95% CI: -0.46; -0.23) mmHg in systolic and diastolic BP, respectively. These results were not corroborated when analysing LP status, but confidence intervals were large. In random effects meta-analysis, LP individuals presented higher BMI [0.17 (95% CI: 0.07; 0.27) kg/m^2] and higher odds of overweight-obesity [1.09 (95% CI: 1.02; 1.17)]. There were no reliable associations for BP. Suggesting, that LP is positively associated with obesity, suggesting that the negative association of milk intake with obesity is likely due to limitations of conventional observational studies. Our findings also do not support that increased milk intake leads to lower BP.

Modeling age-specific child growth effects on later health and human capital outcomes

Linda S. Adair
University of North Carolina, United States

Longitudinal analyses of child growth are critical for understanding the overall trajectory of growth as well as age or stage-specific patterns of growth that may be related to later health outcomes. A challenge for the identification of such stages is the high degree of correlation among repeated measures of growth. The Consortium for Health Orientated Research in Transitional Societies (COHORTS) team effectively used "conditional" growth measures to show the relative importance of growth in infancy vs mid-childhood, vs adolescence for adult cardiometabolic risk factors and attained schooling. Conditional variables are standardized residuals obtained from regressing current size measures on all previous size measures. They thus represent a child's deviation from expected size based on the growth pattern in the study cohort, and can be interpreted as representing faster or slower relative weight gain or linear growth in each specific interval for which data are available. Since the interval-specific conditional variables uncorrelated, they can be used together in regression models to identify the growth intervals that are the best predictors of later health outcomes. A second approach to take advantage of cohort data is the use of growth trajectories to capture the overall pattern of child growth that may predict later adult outcomes.

Data from the Cebu Longitudinal Health and Nutrition Survey (CLHNS) will be used to illustrate how age-specific linear growth and relative weight gain during infancy, childhood, and adolescence predict adult body composition, blood pressure and attained schooling as a measure of human capital. The presentation will compare the inferences gained from use of conditional variables and latent class growth curves as predictors of health outcomes at from early (age 21) to mid-adulthood (age 40).

Setting the Stage for Good Health: The Impact of Sleep, Activity, and Eating Behaviors in Childhood

Silje Steinsbekk, PhD, clinical child, and adolescent psychologist
Professor of clinical child, and adolescent psychology, Dept. of Psychology, Norwegian University of Science and Technology. A 2022 Fulbright scholar at UC Berkeley, USA.

Data collection in a birth cohort spanning childhood to adulthood - The Trondheim Early Secure Study (TESS)
Prof./Co-PI Silje Steinsbekk

The Trondheim Early Secure Study (TESS) is a birth-cohort study focusing on mental health, psychosocial development (e.g., self-esteem, emotion regulation), and health behavior (e.g., physical activity, eating, sleep). TESS aims to determine the prevalence and course of common mental disorders, and to detail potential etiological factors and outcomes; to describe children's and adolescents' typical development as well as determinants of individual differences in important aspects of functioning and health, such as social and academic competence, social relationships, self-concept, behavioral and emotional regulation, sexuality, cognition, physical activity, eating and sleep. As participants grow older, new aspects of development are captured by the study, such as sexual health, Internet gaming and social media use, - yet again the aim is to reveal antecedents and outcomes. Our research has resulted in close to 100 international peer-reviewed publications in highly ranked journals TESS - NTNU.

The TESS (analytical sample: *n*≈1,092) has followed the 2003 and 2004 birth cohorts in Trondheim and their parents with biennial assessments since the children were 4 years old (2007/2008). In total, 3,358 parents (97% response rate) attended the regular health checkup for 4-year-olds where the well-child-clinic health nurse obtained consent to participate (*n*=2,475 consented; 82.1% of eligible). Of the 1,250 parents who were invited to participate, we enrolled and interviewed 1007 (80.6%) at the first wave (T1) (50.9% girls). One parent and the child/adolescent have completed tests, interviews, questionnaires, and observations at NTNU—over a period of 4-5 hours --at ages 6 (T2: *n*=802), 8 (T3: *n*=704), 10 (T4: *n*=703), 12 (T5: *n*=666), 14 (T6: *n*=636), 16 (T7: *n*=666), and 18 years (T8: *n*=. The 9th data collection (age 20) is ongoing (completed April 2025) and will be followed by a 10th wave (22 years, May. -25 to Oct.-26). Information has also been obtained from the other parent and teachers at all time points, and participants have consented to combine data with official registers. Participants that have relocated are reimbursed for their travel and accommodation expenses. From T9 (age 18) onwards, only participants are included (i.e., no parents, teachers), which makes the data collection less resource demanding. Digital alternatives will be offered to those who cannot attend physically in Trondheim.

TESS has been running successfully for nearly 17 years, with limited selective

attrition. In the keynote I will address presumed reasons for this relatively low attrition and describe which steps we have taken to uphold and potentially increase statistical power. Regarding the latter, from age 16 onwards, we have reinvited those who dropped out at the early waves when parents were the ones deciding to attend or not. According to Norwegian law, participants can give their own consent from age 16. I will describe which procedures we used and how this re-recruitment has affected our study.

In addition to the risk of drop-out, longitudinal studies also face challenges related to the increasing age of their participants which comes with a need for new and age-adapted measures, and the importance of addressing new aspects of development (e.g., gaming, social media use, bullying). On the other hand, to take maximum advantage of the longitudinal design, such changes should be as small as possible. Further, more attention has recently been drawn to measurement invariance, which might be difficult to achieve in prospective studies stretching from childhood to emerging adulthood, which is also something I will comment on in my lecture.

Approaches to ethnic and socio-cultural diversity: Contributions from the Growing up in New Zealand cohort

Teresa Gontijo de Castro[1] & Clare Wall[1]
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The first part of this presentation will provide a brief overview of the demography, diversity and health in *Aotearoa* New Zealand. We will explain what is the Treaty of Waitangi (*Te Tiriti o Waitangi*) and how this legal agreement signed in 1840 between the English Crown and *Māori Rangatira* influences all aspects of life in New Zealand, including research. We will illustrate the health challenges and inequities in the country using the example of child nutrition. We will also explain the meaning of Vision *Mātauranga*, *Hauora Māori* and *Māori* data sovereignty and how they are applied to research in New Zealand. In the second part of the presentation, we will describe the characteristics of the *Growing up in New Zealand* cohort, the relevance of its findings for shaping national policies and how the study ensures that the Treaty obligations are met within data collection, storage, analyses and findings interpretation.

Growing Up in New Zealand is the largest longitudinal study on child development in New Zealand and its primary goal is to understand what supports healthy development and well-being for children. The study began in 2009 and was designed to understand the lives of New Zealand children and families from before birth through to young adulthood. It initially recruited over 6,800 children, representing approximately 7,000 families, from the Auckland, Counties Manukau, and Waikato regions. Key phases of data collection have taken place at the antenatal stage, 9 months, 2 years, 4.5 years, 6 years, 8 years, and 12 years and will be continued through teenage years. *Growing up in New Zealand* offers valuable insights into the social, economic, cultural, and environmental factors that shape childhood in New Zealand and provides data that helps inform government policies and community programmes. Examples include its provision of the first nationally generalizable information on feeding practices and diet quality among under-5-year-olds which were (are) used in the revision of national food and nutrition guidelines. Findings on the high prevalence of insufficient use of folic acid during pregnancy have contributed to the pool of evidence for implementing the first mandatory food fortification legislation in NZ that bread making flours are to be fortified with folic acid (effective from Aug 2023).

The cohort reflects the country's diverse population, including Māori, Pacific, Asian, and European families. The study emphasises cultural relevance, particularly in understanding the experiences of Māori and Pacific children in New Zealand. It seeks to include perspectives on *Te Ao Māori* (the Māori worldview) and the values of different communities. This helps to ensure that the data is not only comprehensive but also respectful and reflective of New Zealand’s cultural diversity. The study`s management

and governance groups ensure that data collection, storage, analysis and use of Māori knowledge is consistent with Māori goals and aspirations and with the *Kaitiaki* (guardianship) principles on which the study was founded. The study process that is in place also ensures that data collection, storage, analysis and use of Pasifika knowledge is compatible with Pasifika development goals and aspirations. We will complete the presentation illustrating a couple of examples of nutrition research development in partnership with ethnic expert researchers.

Contributions from birth cohorts in São Luis, northeast Brazil

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In São Luís city two birth cohorts are being followed: the 1997/98 cohort and the BRISA cohort from 2010. The 1997/98 cohort began with 2,493 individuals and was re-evaluated in 2004 (673 children at age 7) and again in 2014/2015 (2,515 adolescents at age 18). The prenatal BRISA cohort was initiated in 2009 with 1,447 mothers, assessed at birth with 1,381 participants, and again at 2 years (1,151 children) and in 2022/2023 at 12 years (700 participants). The population-based BRISA cohort started in 2010 with 5,166 participants, re-evaluated at 2 years with 3,308 participants, and again in 2022/2023 at 12 years (1,665 participants). Comparing data between the two birth cohorts from 1997/98 to 2010: infant mortality decreased from 28.5 per 1,000 to 12.8 per 1,000, and neonatal, perinatal, and stillbirth mortality rates also showed significant reductions. The prevalence of smoking during pregnancy was very low in 1997/98 (6%) and remained low (4.1%) in 2010. From ages 7/9 to 18/19, the prevalence of overweight in the 1997/98 cohort more than tripled from 5.4% to 17.2%.

Below are several conclusions from published articles using data from these cohorts:

- Adolescents with less than 6 hours of sleep per day have systolic blood pressure 2.90 mmHg higher compared to those who sleep 6 hours or more.
- Adolescents with less than 6 hours of sleep per day have LDL-c 3.33 mg/dL lower than those with 6 or more hours of sleep.
- Longer sleep duration was associated with lower muscle mass index in adolescents.
- There was a significant association between body dissatisfaction, overweight among adolescents, and depressive symptoms.
- Poor sleep quality was associated with lower consumption of whole or minimally processed foods, higher consumption of ultra-processed foods, and greater added sugar intake.
- Consumption of ultra-processed foods was linked to a lower muscle mass index measured by dual-energy X-ray absorptiometry.
- Adolescents with normal weight obesity (normal BMI but elevated body fat percentage) had higher average serum cholesterol and LDL cholesterol than those with overweight (altered BMI but normal body fat percentage) or obesity (altered BMI and altered body fat percentage).
- The prevalence of excessive daytime sleepiness among adolescents was 37%, associated with high alcohol consumption, major depressive episodes, and socioeconomic classes A, B, and C.

- Use of addictive substances (cigarettes, alcohol, and illegal drugs) and added sugars was linked to depression and suicide risk in adolescents.
- The provision of sugar-sweetened beverages seems to contribute to an increased risk of asthma measured by a latent variable (asthma traits in childhood) in the first two years of life.
- Greater detriments in the mother-child relationship (bonding) were associated with depression during pregnancy and postpartum, lower social support, unfavorable socioeconomic situations, and living without a partner.
- Prevalence of violence during pregnancy: psychological 47%, physical 12%. Moderate depressive symptoms during pregnancy 20%, severe 27%.

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ORAL PRESENTATIONS ABSTRACTS

Lifecycle COHORT studies

Sociodemographic factors are associated with gestational weight gain trajectories: Results from the Brazilian Maternal and Child Nutrition Consortium

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Background/objectives: Different weight gain trajectories can lead to variation in total gestational weight gain (GWG) and adverse maternal and child health outcomes. This study aimed to identify GWG trajectories according to the z-score of the Brazilian GWG chart and the association of sociodemographic factors with these trajectories. **Methods**: Data from 10 cohorts conducted in Brazil between 1990-2018 with women aged 18-49 were used (10,643 women/55,441 GWG observations). The variables comprised pre-pregnancy weight (kg), height (cm), pre-pregnancy BMI (kg/m^2), cumulative GWG (weight measured at each visit minus the self-reported pre-pregnancy weight; kg), gestational age (weeks), maternal race/ethnicity, age, and education. GWG trajectories were identified using latent class growth modeling, and their associations with sociodemographic variables were analyzed using multinomial logistic regression (reporting the RRR). **Results**: We identified four GWG trajectories: 1) “Decreasing” (18.5%; n=1,970): high GWG early in pregnancy followed by a decline; 2) “Stable increasing” (24.7%; n=2,631): stable increase in GWG throughout pregnancy (reference category); 3) “Stable decreasing” (41.6%; n=4,432): consistent decline; 4) “Increasing” (15.1%; n=1,610): high GWG across pregnancy. Black women had a higher risk of belonging to the “Decreasing” (RRR=1.18; 95%CI: 1.12-1.68; p=0.002) and “Stable decreasing” (RRR=1.31; 95%CI: 1.11-1.56; p< 0.001) trajectories. Women with <8 years of education were more likely to belong to the “Decreasing” trajectory (RRR=1.37; 95%CI: 1.19-1.57; p<0.001) and had a lower risk of being in the “Increasing” (RRR=0.60; 95%CI: 0.51- 0.70; p<0.001) trajectory. Women aged ≤25 years were less likely to belong to the “Decreasing” (RRR=0.70; 95%CI: 0.62-0.79; p<0.001) and “Stable decreasing” (RRR=0.73; 95%CI: 0.66-0.81; p<0.001) trajectories but had a higher risk of being in the “Increasing” trajectory (RRR=1.34; 95%CI: 1.17-1.53; p<0.001), while women aged ≥35 years had a higher likelihood of belonging to the “Decreasing” (RRR=1.73; 95%CI: 1.41- 2.14; p<0.001) and “Stable decreasing” (RRR=1.40; 95%CI: 1.16-1.69; p<0.001) trajectories, and a lower risk of being in the “Increasing” trajectory (RRR=0.69; 95%CI: 0.51-0.93;

p=0.015). **Conclusion**: These results indicate that maternal race/ethnicity, age, and education are directly associated with cumulative GWG trajectories, highlighting the need for adequate prenatal care and continuous GWG monitoring.

Funding: CAPES, FAPERJ, and CNPq.

Intergenerational malnutrition profiles in the Brazilian Amazon: characterization and predictors in the first 2 years of life

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Background/objectives: Intergenerational malnutrition can lead to lifelong health problems, yet longitudinal evidence combining anthropometric and biochemical indicators is scarce. This study aimed to identify latent malnutrition profiles in the mother-child dyad up to 2 years of age, and investigate its predictors. **Methods:** This analysis is part of the Maternal and Child Health and Nutrition in Acre, Brazil (MINA-Brazil Study), a population-based birth cohort in the Amazon region. At birth and the 1- and 2-year follow-ups, data were collected on sociodemographic, health and lifestyle characteristics. Nutritional status of mothers and children was assessed using maternal BMI and WHO growth standards (height-for-age [HAZ] and BMI-for-age [BAZ] Z-scores). Child blood samples were used to measure hemoglobin, ferritin, and vitamin A concentrations. Latent profile analysis identified malnutrition profiles during the first 2 years of life, using BIC and SABIC model fit indices in addition to entropy. Multinomial regression analysis identified the predictors of the malnutrition latent profiles. **Results:** According to the model fit indices, three mother-child latent malnutrition profiles were identified: 1) “iron deficient child” (n=48; 5%), mean hemoglobin concentration: 10.3 g/dL (95%CI: 9.3; 11.3), mean ferritin: 5.7 µg/L (95%CI: 3.8; 8.6); 2) “adequate pair” (n=837; 86%) with all mean nutritional status parameters according to the expected cutoffs; 3) “higher maternal BMI and child BAZ” (n=86; 9%), mean maternal BMI: 28.7 kg/m2 (95%CI: 26.6; 30.8), mean BAZ: 1.95 Zscores (95%CI:1.43; 2.48). The chance of belonging to the “iron deficient child” profile decreased by 72% for each one-point increase in household wealth index (OR=0.28; 95%CI: 0.14; 0.53) and by 69% for each additional year of maternal schooling (OR=0.31; 95%CI: 0.13; 0.75). Conversely, the chance of belonging to the “higher maternal BMI and child BAZ” profile increased by 28% (95%CI: 1.16; 1.42) for each kilogram in maternal pre-pregnancy BMI, and 98% (95%CI: 1.37; 2.85) for each 1 Z-score increase in child’s birth weight. **Conclusion:** Distinct mother–

child nutritional profiles emerged, predicted by household wealth, maternal schooling, pre-pregnancy BMI, and birth weight Zscores.

Funding: This work is part of the MINA-Brazil Study, supported by the São Paulo Research Foundation – FAPESP (grants #2016/00270-6 and #2022/03136-0). Rodrigues received scholarships from FAPESP (#2022/13550-8 and #2023/17875-1). Funding agencies had no role in study design, analysis, or writing.

Social inequalities in leisure-time and transport-related physical activity through the lens of intersectionality: Evidence from a 10-Year Longitudinal Study in Brazil

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Background/Objectives: Social factors shape health behaviors and drive persistent inequalities, particularly in the Global South. Few studies have examined how intersecting social identities jointly influence physical activity in low- and middle-income countries. This study aimed to explore social inequalities in leisure-time (LTPA) and transport physical activity (TRPA) through the lens of intersectionality among individuals living in Sào Paulo, Brazil. **Methods:** Longitudinal data from 978 participants of the "Health Survey of Säo Paulo: Physical Activity and Environment" cohort were analyzed across three waves: 2014/15, 2020/21, and 2023/24. Physical activity was assessed using the long-form IPAQ. To capture intersectional social disadvantage, a Multiple Jeopardy Index was constructed by combining sex, race/skin color, and educational level, with scores ranging from 0 (lower vulnerability) to 4 (higher vulnerability). Prevalence of LTPA and TRPA was calculated by Jeopardy category across waves. Associations were estimated via multilevel Poisson models accounting for repeated measures nested within observations, individuals and census tracts. **Results:** Persistent inequalities in LTPA were observed. Individuals with highest vulnerability (female, non-White, low education) consistently reported lower LTPA. In fully adjusted models, Jeopardy categories 3 and 4 showed lower LTPA prevalence than the reference group (category 0: male, White, high education), with prevalence ratios of 0.72 (95% CI: 0.57-0.91) and 0.62 (95% CI: 0.49-0.80), respectively. A clear inverse gradient and significant dose-response trend was observed ($p<0.001$). No significant associations were found between the Jeopardy Index and TRPA. **Conclusion:** Intersections of sex, race/skin color, and education significantly shape LTPA in Brazil, underscoring how overlapping disadvantages affect health behaviors. Public policies should prioritize structurally disadvantaged groups through inclusive, sustained opportunities for leisure-time activity.

Keywords: Social inequalities; physical activity; intersectionality.

Funding: The “Health Survey of Säo Paulo: Physical Activity and Environment” was supported by the Sào Paulo Research Foundation (FAPESP), Brazil (grant number: 2017/17049-3). AMM received a research fellowship from the BRIDGE project, funded by the University of Birmingham and the University of Illinois.

Prevalence and Associated Factors of Suicidal Ideation in Adolescents at Age 18: 2004 Pelotas Birth Cohort

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Introduction: Suicidal ideation is part of the spectrum of suicidal behaviors and reflects significant psychological distress, requiring specialized mental health care (Harmer, 2024; Nock, 2008; De Leo, 2021). It refers to the presence of recurrent thoughts about one's own death, which may vary in intensity and frequency (De Leo, 2021). This phenomenon arises from complex interactions among biopsychosocial, socioeconomic, and interpersonal relationship factors (Tintori, 2023; Van Orden, 2010). Global lifetime prevalence of suicidal ideation is estimated to range from 10% to 14% (Van Meter, 2023; Lee, 2010; Jordans, 2018; Pengpid, 2020). Among adolescents, particularly those in socially vulnerable contexts and with insufficient psychosocial support, these rates tend to be higher, contributing to worsening mental health outcomes and reduced quality of life. This study is grounded on two main premises: the importance of investigating this issue in low-and middle-income country contexts, and the potential to contribute to mental health problem prevention and to the promotion of socioemotional development from the earliest stages of life. **Objective:** We sought to investigate the prevalence, distribution, and risk factors associated with suicidal ideation among 18-year-old participants of the 2004 Pelotas Birth Cohort. **Methods:** The Mental Health Questionnaire applied during the 18-year follow-up provided the outcome variable, derived from the item *"I think about killing myself"*, analyzed as a binary categorical variable. Multiple exposure variables were considered, spanning from the perinatal period to age 18. **Results:** In the study population, the prevalence of suicidal ideation was 6.96% (95% CI: 6.01–7.90), with significant associations found for female sex, non-cisgender, sleep quality, homosexuality, non-white maternal skin color, presence of maternal depressive symptoms during the adolescent's teenage years, occurrence of stressful events in childhood, and adversities in intrafamilial relationships over the life course. The study results indicate that individuals who experience greater adversity related to social discrimination, as well as stressful events, threats, and low family support from the prenatal period to age of 18, are more likely to develop suicidal ideation at the age of 18. **Conclusion:** The analysis of factors associated with suicidal ideation in adolescence strengthens the evidence base

and informs the development of preventive strategies, while guiding the improvement of intersectoral actions targeting youth.

Keywords: Suicidal Ideation. Self-Injurious Behavior. Birth Cohort. Mental Health. Adolescence.

Multimorbidity in Childhood and Adolescence and Its Association with Socioemotional Skills in Early Adulthood: A Study Based on the 2004 Pelotas Birth Cohort

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Introduction: In recent decades, deaths from communicable diseases have declined, while chronic non-communicable diseases (NCDs) have become the leading causes of death, affecting not only older adults but also younger populations. Multimorbidity refers to the coexistence of two or more chronic physical and/or mental health conditions in an individual, with none considered primary. This condition is associated with reduced quality of life and may interfere with the psychological and social development of young people, posing challenges to the acquisition of socioemotional skills. **Objective:** To identify the presence of physical and mental multimorbidity at ages 6, 11, and 15 among participants of the 2004 Pelotas Birth Cohort and its association with socioemotional skills at age 18. **Methods:** This study analyzed data from the 2004 Pelotas Birth Cohort, which included all live births in that year. Outcomes at age 18 included locus of control, self-control, emotional regulation, and peer relationships. Adjusted models included sociodemographic and perinatal variables. **Results:** The prevalence of multimorbidity was 15.4% at age 6, 31.8% at age 11, and 14.4% at age 15. Adjusted models showed consistent associations between multimorbidity and poorer socioemotional outcomes at age 18, especially in emotional regulation and peer relationships. Multimorbidity at ages 6 and 11 was significantly associated with a more external locus of control ($\beta = 0.228$; $p = 0.009$ and $\beta = 0.205$; $p = 0.003$), lower self-control ($\beta = -0.280$; $p = 0.029$ and $\beta = -0.279$; $p = 0.006$), worse emotional regulation ($\beta = -1.028$; $p < 0.001$ and $\beta = -0.771$; $p < 0.001$) and increased odds of peer relationship difficulties (OR = 1.37 at age 6 and OR = 1.47 at age 11). Persistent multimorbidity between ages 6 and 11 showed stronger negative effects, suggesting cumulative developmental impacts. **Conclusion:** Early and persistent multimorbidity in childhood and adolescence is associated with worse socioemotional outcomes at age 18. Stronger associations were observed for exposures at younger ages (6 and 11), particularly affecting emotional regulation and peer relationships. These findings reinforce the need for early detection and ongoing interventions.

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Childhood and Environmental Pollutants Project (PIPA's Project)

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Background/Objectives: The Childhood and Environmental Pollutants Project (PIPA's Project) is a birth cohort study investigating the effects of multiple urban pollutants—such as metals, pesticides, and plasticizers—on maternal and child health from pregnancy to age four. It has been conducted at the Maternity Hospital of the Federal University of Rio de Janeiro (UFRJ MH), Brazil, since 2021. This paper discusses the relationship between maternal socio-environmental conditions and the concentrations of metals (lead, arsenic, and mercury) in newborns' umbilical cord blood. **Methods**: The study population consisted of a convenience sample of all babies born at the UFRJ MH from July 2021 to June 2022 (12 months), to pregnant women aged 16 or older living in Rio de Janeiro. Data on demographic, socio-economic, lifestyle, work, and housing variables were collected. Concentrations of lead (Pb), mercury (Hg), and arsenic (As) were analyzed in umbilical cord blood using inductively coupled plasma-mass spectrometry (ICP-MS). **Results:** There were 844 (93%) eligible births, with 778 (94%) cord blood samples collected. The detection rates for Pb, Hg, and As were 99% (742), 94% (708), and 61% (450), respectively. The total green area percentage (PAGT) of urban residence zones was a primary socio-environmental determinant associated with high metal exposure (≥ median). Newborns living in city zones (Central and North) with lower PAGT had at least one metal (p=0.026) above the median cord blood concentration. The prevalence of newborns with ≥ median Pb concentration was 26% higher in the Central zone (PR: 263; CI: 053–515) and 23% higher in the North zone (PR: 236; CI: 072–425) compared to the South zone. **Conclusion:** The study provides evidence that the lower availability of urban green spaces in residential zones is associated with greater environmental exposure to pollutants (metals) during pregnancy.

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Association between the occurrence of heat waves and breastfeeding practices throughout the year 2019 among children registered in the Brazilian Food and Nutrition Surveillance System: Preliminary results

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Background: Exclusive breastfeeding (EBF) is recommended until six months of age; however, extreme environmental factors, such as heat waves, may interfere with breastfeeding patterns. **Objective:** To investigate the association between the occurrence of heat waves and the prevalence of breastfeeding practices among Brazilian children under six months of age. **Methods:** This is a longitudinal study with repeated measures per child, ranging from a minimum of 1 to a maximum of 6, with a mean of 1.4 measurements during the year 2019. Using the Brazilian Food and Nutrition Surveillance System (SISVAN) microdata on dietary intake, including children aged 0-5 months with records from 2019. Breastfeeding practices were classified as EBF, predominant breastfeeding, mixed breastfeeding, complementary breastfeeding, and no breastfeeding. Meteorological municipality data were obtained from the National Institute of Meteorology. A heat wave was defined using daily mean temperature data for each municipality. The 90th percentile of temperature was calculated for each city to establish a location-specific threshold for identifying the hottest days. Days with mean temperatures exceeding this threshold were classified as "hot days." A heat wave was then defined as the occurrence of three or more consecutive hot days. During the months for which child measurements were available, a total of 1,361 heat waves were identified. Data from one Brazilian municipality from each macro-region were analyzed. These cities were selected based on the highest coverage of children registered in SISVAN in each region (Palmas, Fortaleza, Montes Claros, Porto Alegre, and Campo Grande). A logistic mixed-effects regression model was used, with random intercept. Based on the coefficient odds ratios (OR) and 95% confidence intervals were calculated. **Results:** The sample comprised data from 3,372 unique children, totaling 4,643 observations. Exposure

to heat waves was not significantly associated with predominant, mixed, or complementary breastfeeding categories. However, exposure to heat waves was significantly associated with a reduced likelihood of no breastfeeding (coefficient = -0.32; OR = 0.73; p = 0.038), suggesting that, during heat waves, the absence of breastfeeding was less frequent. **Conclusion:** Exposure to heat waves was associated with a lower likelihood of absence from breastfeeding. These results suggest that the effects of heat waves are complex and highlight the need for further studies to better understand this relationship.

Funding: Coordination for the Improvement of Higher Education Personnel

Prenatal conditions as predictors of Asthma and Allergy Traits at Two Years of Age: a machine learning approach from the BRISA Cohort

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Background/objectives: Asthma and allergies are interconnected conditions and highly prevalent in early childhood and represent a growing public health concern due to their impact on quality of life. This study applied a supervised machine-learning model to early-life variables in the BRISA cohort to identify prenatal predictors of asthma and allergy traits at two years of age. **Methods:** Data from the 1447 mother-child BRISA prenatal cohort in São Luis were used from pregnancy through the first two years of life. Asthma traits were defined either by a medical diagnosis or wheezing episodes, and Allergic traits were defined as the presence of a medical diagnosis of dermatitis, rhinitis, food allergies, or eosinophil counts ≥300 in the second year of life. Predictors were selected based on the literature and included maternal characteristics during pregnancy, birth-related variables, and early-life exposures. A Support Vector Machine algorithm was applied, and model performance was assessed using cross-validation and metrics such as accuracy, sensitivity, and specificity. To enhance model interpretability, SHapley Additive exPlanations (SHAP) values were calculated. All participants provided written consent (Ethics Committee #4771/2008-30). **Results:** The prevalence rates of asthma and allergy traits were 30.6% and 53.5%, respectively. Model accuracy was 58.6% (CI95% 55.7;61.5) for asthma and 55.3% (CI95% 52.4; 58.2%) for allergies. Sensitivities were 51.8% and 50.9%, respectively, and specificities were 61.8% and 60.4%. SHAP value analysis identified common predictors as relevant risk factors for both outcomes, such as weekly consumption of soft drinks, low family income, gestational hypertension, and family history of atopic disease. Others included early food introduction, maternal age, and alcohol consumption during pregnancy. **Conclusion:** Interpretability analyses from our supervised machine learning model reveal that common early-life exposures—many both modifiable and shaped by social determinants—drive the onset of asthma and allergic traits as early as age two. These insights underscore the urgency of integrated preventive strategies that combine

optimized maternal nutrition, comprehensive prenatal care, and upstream socioeconomic interventions to address the onset of these conditions.

Keywords: Prenatal care; Machine Learning; Childhood asthma; Atopy.

Funding: This work was supported by the Brazilian Ministry of Health/DECIT/CNPQ [n. 400759/2024-1] in partnership with the Gates Foundation.

Tissue-Specific Expression-Based Polygenic Risk Scores and Methylation Score in Interaction with Birth Weight Associate to Childhood BMI: A Multi- Cohort Study

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Background/objectives: Poor fetal growth, measured primarily through birth weight, is a common prenatal adversity that triggers neurometabolic alterations, including altered eating behavior and increased obesity risk later in life. However, individual differences exist; not all children exposed to this adversity will develop obesity. **Methods:** We used data from a discovery epigenetic wide association study (EWAS) of adult body mass index (BMI) (Do et al., 2023) to calculate a methylation score in three child cohorts with methylation data: MAVAN (Canada), n = 87, age 6; GUSTO (Singapore), n = 289, ages 6 and 12 months; and BIBO (Netherlands), n = 124, age 6. Using genotype data from these children, we also calculated expression-based polygenic risk scores (ePRS) based on gene expression informed by GTEx data in the nucleus accumbens (NAcc) and white adipose tissue (WAT). We tested whether these ePRSs moderated the association between birth weight and BMI, and whether adding the methylation score improved the models. **Results:** In MAVAN, there was a significant interaction between NAcc ePRS and birth weight on BMI at 6 years, detected with (β = -0.0008, $p < 0.05$) and without the methylation score. In GUSTO, WAT ePRS interacted with birth weight on BMI at 6 (β = -0.0004, $p < 0.05$) and 12 months (β = -0.0002, $p < 0.05$), regardless of methylation score inclusion. No interactions were observed in BIBO. **Conclusion:** Birth weight interacted with distinct tissue-specific ePRSs across populations. Although the ePRSs were derived from the same gene set, their predictive value for BMI in childhood was influenced by

the tissue gene expression weight and population-specific factors such as ethnic background. These findings underscore the need to consider population diversity when evaluating susceptibility to prenatal adversity. Such insights are critical for advancing precision prevention strategies in early metabolic health.

Keywords: functional genomics; ePRS; birth weight; BMI; DOHaD

Funding: CAPES and CNPQ

Mapping Health Risks in the First 1,000 Days: Complex Networks of Maternal Factors, Birth Outcomes, and NCDs in Childhood

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Background: Noncommunicable diseases (NCDs) are the leading global cause of morbidity and mortality, with early-life exposures playing a key role in shaping lifelong trajectories. Preventing NCDs requires action in the earliest stages of life, particularly by addressing maternal risk factors that influence both birth outcomes and child health. This study aimed to investigate how pre-gestational and gestational maternal conditions relate to adverse birth outcomes and early childhood NCDs at age two, using a complex network approach to identify patterns of interconnected risk.

Methods: We analyzed data from the BRISA Prenatal Cohort, comprising 1,383 mother– child pairs from São Luís, Brazil. Maternal exposures, including socioeconomic status, obesity, anemia, hypertension, and consumption of ultra-processed foods and sugar- sweetened beverages, were assessed during pregnancy. Data collection also included clinical dental examinations and self-reported maternal and child health conditions. To investigate the structure of associations between maternal risk factors and child health outcomes, we constructed a complex network using Jaccard similarity coefficients. The analysis focused on adverse birth outcomes such as cesarean delivery, macrosomia, and preterm birth, as well as early-onset NCDs by age two, including obesity, asthma, allergies, and dental caries. Community detection was performed using the Louvain algorithm to identify clusters of interconnected maternal exposures

and child health outcomes. All participants gave written consent (Ethics Committee #1 4771/2008–30). **Results:** Sugary drinks and low income were linked to adverse birth outcomes. Ultra- processed foods, pre-gestational obesity, and diabetes during pregnancy were related to cesarean delivery and macrosomia. Hypertension, maternal age, and periodontitis were tied to preterm birth, which, in turn, was related to early weaning, early exposure to added sugars, and asthma at 2 years of age. Early NCDs at age two (obesity, asthma, allergies, and caries) were strongly linked to maternal consumption of ultra-processed food and sugary drinks, maternal anemia and caries, low income, early sugar exposure at age two, cesarean birth, lack of exclusive breastfeeding, and maternal periodontitis. Three clusters emerged: Community 1, grouped by metabolic risks; Community 2, characterized by social disadvantage and child caries; and Community 3, encompassing behavioral and pregnancy-related risks. Gestational hypertension had the highest betweenness centrality. **Conclusions:** This study underscores the intergenerational persistence of health risks during the first 1000 days and their impact on early NCDs. Understanding how maternal metabolic, behavioral, and socio-economic risks interconnect is crucial for early interventions.

Keywords: Maternal risk factors; Adverse birth outcomes; Early childhood NCDs; Complex network analysis.

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Harmonisation of data on fruit and vegetable intakes in pregnant women in the Brazilian Maternal and Child Nutrition Consortium: the association of dietary intake with birth outcomes

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Background/Objective: To describe the harmonisation of fruit and vegetable consumption data from the Brazilian Maternal and Child Nutrition Consortium (BMCNC) and assess associations with neonatal outcomes. **Method:** This study used data from 11 BMCNC studies, grouped into two databases: food consumption screeners (FCS) and food frequency questionnaires (FFQ). Exposure variables were harmonised into weekly categories (FCS) and daily frequency (FFQ). Distributions were analysed by study and in the combined dataset. Adjusted linear and logistic regression models assessed associations with birth weight, low birth weight (LBW), small for gestational age (SGA), and preterm birth (PTB). **Results:** Harmonisation of FCS resulted in similar consumption distributions across studies. The final dataset included 4,110 pregnant participants, with 1,780 in the FFQ analysis. Differences in daily consumption frequency by FFQ were reduced after excluding outliers. Vegetable consumption (1–4 or ≥5 days/week) was associated with lower unadjusted odds of LBW (OR 0.64–0.66), but there were no associations after adjustment. Each additional daily fruit serving (FFQ) was associated with a 29 g increase in birth weight (95% CI 11–47 g; p = 0.001). No associations were found with LBW, SGA and PTB. **Conclusion:** We have shown that it was feasible to harmonise fruit and vegetable consumption data from 11 studies in BMCNC and found

that higher fruit intake was associated with greater birth weight (FFQ). Our findings support advising pregnant women to consume more than one daily fruit serving.

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Determinants of human milk volume trajectories in the postpartum period: Findings from the Brazilian site of the MILQ cohort

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Background: There is limited evidence on human milk (HM) volume trajectories across lactation and the contribution of maternal and infant determinants, particularly from studies using the deuterium dose-to-mother (DTM) technique. **Objective**: To assess the contribution of maternal sociodemographic, obstetric, and breastfeeding-related factors to variations in human milk volume trajectories from 1 to 8.5 months postpartum. **Methods**: Data from the Brazilian site of the MILQ cohort included 140 healthy mother–infant pairs (304 observations). Maternal and infant saliva samples were analyzed to estimate 24-hour HM volume using the DTM technique at three postpartum intervals: 1–3.49 months, 3.5–5.9 months, and 6–8.5 months. Linear mixed-effects models were applied to evaluate changes in HM volume over time and to assess the role of maternal and infant factors on HM variation. Interaction terms between significant determinants and time (weeks postpartum) were tested to explore how these factors modified HM volume trajectories throughout the study period. **Results**: Longitudinal linear mixed-effects models demonstrated a significant decline in HM volume over time, averaging approximately 4 ml per week (β = -4.3; SE = 1.29; p < 0.001). Among primiparous women, HM volume decreased 5 ml per week more steeply than in multiparous women (β*interaction*= - 5.17; 95% CI: -10.43; 0.09; SE= 2.67; p = 0.055). Women breastfeeding >13 times/day maintained an additional 9.97 ml per week compared to those breastfeeding <13 times/day (β*interaction* = 9.97; 95%

CI: 5.02; 14.91; SE = 2.51; p < 0.001). Non-exclusively breastfeeding mothers experienced a faster decline in HM volume, approximately 11 ml per week, relative to those exclusively breastfeeding (β*interaction* = -11.16; 95% CI: -22.21; -10.00; SE = 2.88; p < 0.001). **Conclusions**: Parity, breastfeeding frequency, and breastfeeding status were identified as key modifiers of HM volume trajectories over time. These findings highlight the importance of supporting breastfeeding practices as a critical component of maternal and child health strategies.

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Shared Risk, Shared Habits: Dietary Patterns in Mothers with a history of gestational diabetes and overt diabetes and Their Children

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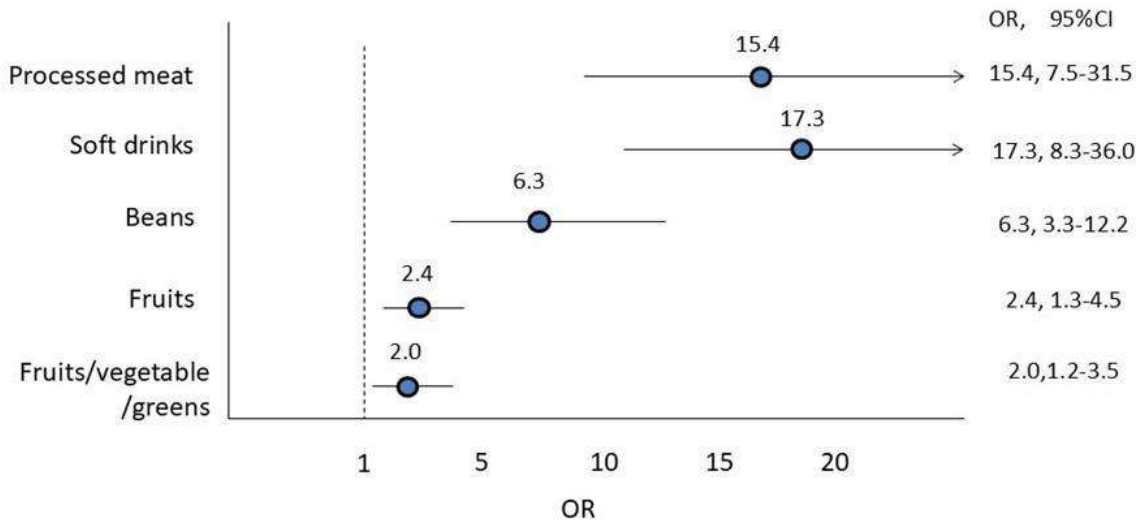
Introduction: Evidence suggests that eating patterns in childhood are influenced by family dietary habits and tend to persist throughout life. This is an important matter mainly in high cardiometabolic risk individuals such as women with diabetes in pregnancy and their offspring. **Objective:** To assess the association between maternal dietary intake in women with history of gestational diabetes (GDM) or overt diabetes and the dietary habits of their children. **Methods:** A retrospective cohort study enrolling 222 women with GDM or overt diabetes followed in prenatal care service, who were recalled along with their children for revaluation of clinical and nutritional status 2 to 14 years after birth. Dietary intake was assessed using a questionnaire adapted from SISVAN (Brazilian Food and Nutrition Surveillance System). **Results:** Current evaluation showed that women were 40.9(6.3) years old and had 55% of obesity and 54.5% of metabolic syndrome. Children were 6.2(2.9) years, being 54% female, 19.4% with obesity and 11.7% with metabolic syndrome. Children of mothers who reported eating meals in front of screens showed a higher prevalence of the same behavior (84.3% *vs.* 34.0%; p<0.001) compared to those who did not have this habit; these children were about 10 times more likely to adopt the same behavior (OR10.8; 95%CI 5.5–21.0), independent of sex, age, or BMI. We observed higher frequencies of children's intake in the previous day of processed meats (65.7 *vs.* 11.7%; p<0.001), soft drinks (85.2 *vs.*

29.8%; p<0.001), fruits (72.5 *vs.* 58.2%; p=0.037), beans (81.5 *vs.* 42.2%; p<0.001) and fruits/vegetables/greens (62.4 *vs.* 44.9%; p=0.010) in the group of mothers who had the same habit. Children were 17 times more likely to consume soft drinks (OR 17.3; 95% CI: 8.3–36.0), 15 times more likely to consume processed meats (OR 15.4; 95% CI: 7.5–31.5), 6.3 times more likely to eat beans (OR 6.3; 95% CI: 3.3–12.2), 2.4 times more likely to consume fruits (OR 2.4; 95% CI: 1.3–4.5), and twice as likely to eat fruits/vegetables/greens (OR 2.0; 95% CI: 1.2–3.5) when their mothers had the same dietary habits, independent of the child's age, sex, or BMI. **Conclusion:** Maternal consumption of both healthy and unhealthy foods significantly increased the likelihood of similar behaviors in children, independent of child's age, sex, and BMI. Given that mothers with a history of GDM and overt diabetes and their children are at increased cardiometabolic risk, these findings highlight the importance of family-based nutrition education strategies.

Figure 1. Association between offspring (dependent variable) and maternal (independent variable) dietary intake, adjusted for offspring's sex, age and current BMI.



Logistic regression used; OR, Odds Ratio; 95%CI, Confidence Interval

Key words: gestational diabetes, childhood, dietary intake, cardiometabolic risk, cycle of life

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Early Life Exposures, Ultra-Processed Food, and Insulin/Glucose Dynamics in Children Exposed to GDM: Preliminary Findings

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Background/Objectives: Children exposed to gestational diabetes mellitus (GDM) in utero face elevated cardiometabolic risk later in life. Longer breastfeeding duration is linked to several favorable childhood health outcomes, but evidence of its influence on glucose and insulin dynamics is limited. Protective effects may involve reduced early exposure to sweetened beverages and ultra-processed foods (UPFs), which could shape dietary habits. High UPF intake is linked to poor metabolic health, but whether UPF intake directly disrupts insulin/glucose dynamics in youth remains unclear. This preliminary analysis examined associations between breastfeeding duration and UPF

intake at 12-14 years of age from the SWIFT-Youth cohort, and between UPF intake in this early adolescent cohort and glucose/insulin dynamics. **Methods:** SWIFT is a longitudinal prospective multi-ethnic cohort study of women with GDM and their children (follow up 2008-2025). Maternal GDM diagnosis and treatment, and perinatal outcomes were obtained from electronic health records. Breastfeeding and complementary feeding data were collected from birth to 12 months via monthly mailed surveys, phone interviews, and research visits. At research visits ~12–14 years of age, SWIFT youth completed an oral glucose tolerance test (fasting, 30-min, and 2-h plasma glucose and insulin) along with anthropometric and other assessments and three 24-hour dietary recalls. HOMA-IR and the Matsuda Index were calculated. UPF intake was computed using NOVA classification. This analysis included participants with ≥2 recalls and at least 2 timepoints from OGTT. Linear regression models estimated cross-sectional and longitudinal associations. **Results:** This preliminary analysis included 255 participants (13.4 ± 1.0 years old, 49% male, 39% Asian, 37% Hispanic, 13% White, 9% Black). Mean fasting glucose was 98.1 ± 6.9 mg/dL and fasting insulin was 11.8 ± 8.4 µU/mL. UPFs comprised 54.3% (±17.7) of daily energy and 13.2% (±16.9) of daily grams. In unadjusted analyses, UPF intake was not associated with fasting glucose or insulin, HOMA-IR, or Matsuda Index. Breastfeeding duration (months) in infancy was inversely associated with UPF (%kcal) ($\beta = -0.32$, $p = 0.037$) and UPF (%grams) ($\beta = -0.32$, $p = 0.030$) at 12-14 years but not glucose or insulin metrics. **Conclusions:** To our knowledge, this is the first study to show that longer breastfeeding duration is associated with lower UPF intake in early adolescence. These are early-stage findings, and this analysis is ongoing. Next steps will incorporate key covariates such as pubertal stage, physical activity, and maternal GDM severity. We will also classify UPF intake and metabolic health outcomes using established clinical cut points and Poisson regression will estimate relative risks. These analyses will assess whether adolescent UPF intake relates to glucose/insulin dynamics in GDM-exposed youth and how early-life exposures shape these patterns to guide risk-reduction strategies.

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(Epi)genetic markers for metabolic syndrome, fat percentage and obesity in south Brazilian Mennonites

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Mennonites are an Anabaptist European population presenting 500 years genetic and cultural isolation, which passed through at least 3 demographic bottleneck events, reducing their genetic diversity. The last bottleneck caused the death of most children and adolescents between 13 and 18 years of age, in the Ukraine. Roughly 1% of the original Mennonite population emigrated to South Brazil. Through historical and genealogical records, we estimated that 46% of the South Brazilian Mennonites (SBM) came from different locations in the Ukraine and that the effective size of the population in the 1940s was of around 75 couples, mostly coming from different colonies in Russia. Based on 325 SBM exomes (Illumna HiSeq), we confirmed low consanguinity but a clear founder effect for 96% of 23 pathogenic variants, separating SBM from the original European populations. To identify (epi)genetic markers for polygenic disorders as metabolic syndrome (MetS), we extensively interviewed 762 SBM from three settlements between 2016-2023 (updating information now in 2025, as we return pharmacogenetic results), and compared the results to non-Mennonite individuals from 5 towns in Paraná state (PR, n=1346). We further compared 63 SBM with vs. 127 exomes without MetS and genotyped candidate variants in regulatory regions with mass spectrometry (iPLEX). We also evaluated DNA methylation of the *NR3C1* and *FKBP5* genes, encoding the glucocorticoid receptor and its regulator,

respectively, in white blood cells of up to 66 with and 141 individuals without MetS. MetS prevalence was 35.8%, not differing from the prevalence we found in PR. Among independent MetS risk factors, we found lower maternal warmth in infancy (OR=1.59, P=0.019), a result also confirmed in PR. Thirty-nine variants of 34 genes were associated with MetS (p<0.02), 41% create/disrupt CpG sites and 12 were associated with visceral adipose and/or cardiovascular tissue expression, but we found no methylation differences in the *NR3C1* and *FKBP5* genes within white blood cells. We also collected body fat percentage (BF%) from 189 participants, and compared control (n=99), obese (OB) (n=111) and overweight (OW) (n=42) groups. Age (beta=0.16; pcorr=2.10-5) and sex (beta=-2.4; pcorr=0.049) are related to BF%, while the education level (OR=0.73; pcorr=4.10-4) and eating habits such as removing fat from meat (OR=1.51; pcorr=6.10-04) were associated with OB development. The rare variant tests (SKAT-O, SKAT-C and Burden-C) were performed for protein coding and lncRNA genes, resulting in 13 associated genes. Among them, taste 2 receptor member 4 (*TAS2R4*) was the only gene simultaneously associated with BF% and OB, encoding a protein whose activation prevents diabetic glomerulonephritis in mice. Based on genealogical records starting from the XVII century for SBM, possible transgenerational epigenetic effects will next be evaluated in the SBM descendants who used different migratory routes to come to Brazil.

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