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Centro de Integração de Dados e Conhecimentos para Saúde

Ministério da Saúde
FIOCRUZ
Fundação Oswaldo Cruz
Instituto Gonçalo Moniz

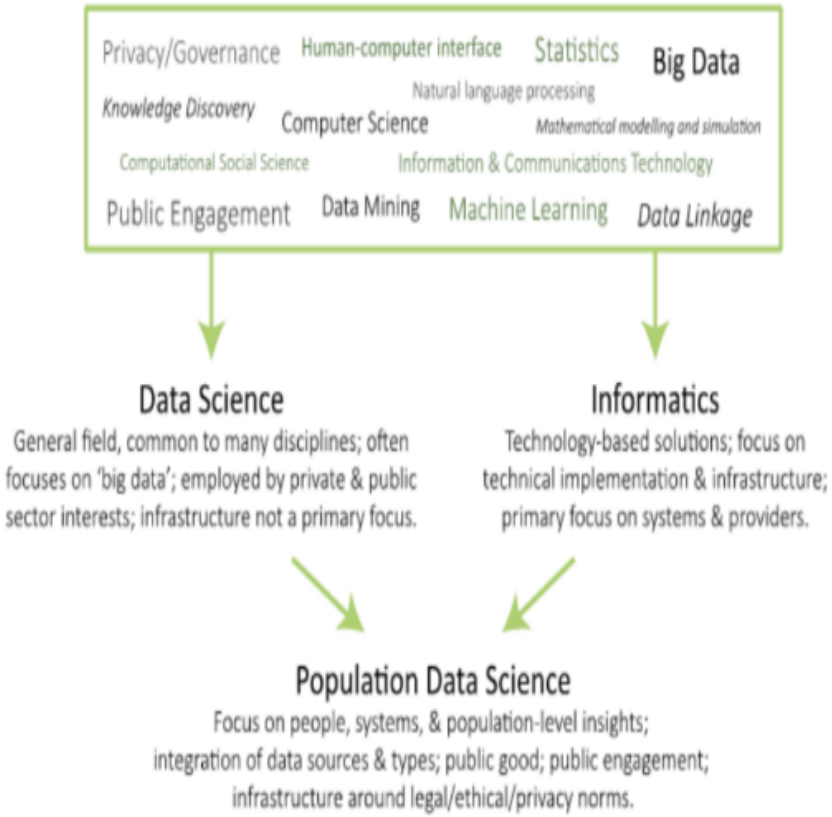
Population-based epidemiology in the era of data science and routine health data:

Experiences from Brazil

Mauricio L Barreto

WCE
WORLD CONGRESS OF EPIDEMIOLOGY 2024

Population Data Science



This multidisciplinary science aims to promote technological advancements, and discover new ways of analyzing data and methods of public engagement.

- **Population Data Science** is characterized by four aspects:

i) It is valuable and in the public's interest, as it uses data in a positive manner to benefit citizens and society;

ii) Data from different sources are integrated and analyzed;

iii) Results are analyzed from a populational perspective;

iv) Technical infrastructure should be developed, and policies should be elaborated in conformity with regional ethical and legal standards to support scientific research, while preserving the privacy of data subjects.

McGrail et al., 2018. A Position Statement on Population Data Science: The Science of Data about People.

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What challenges might an initiative using linked data to support research in Brazil face?

Brazil's Unified Health System - SUS

- That largest Latin American country (8.5 million Km^2)
- Population of ~215 million inhabitants

Universal access to health care services for the entire Brazilian population, and universal health coverage across Brazil is provided through the Brazilian Unified Health System (SUS).

LGPD, Academic Research and Public Health Research

Presidência da República
Secretaria-Geral
Subchefia para Assuntos Jurídicos

LEI Nº 13.709, DE 14 DE AGOSTO DE 2018.

Texto compilado

Mensagem de veto

Vigência

~~Dispõe sobre a proteção de dados pessoais e altera a Lei nº 12.965, de 23 de abril de 2014 (Marco Civil da Internet).~~

Lei Geral de Proteção de Dados Pessoais (LGPD) (Redação dada pela Lei nº 13.853, de 2019) Vigência

O PRESIDENTE DA REPÚBLICA Faço saber que o Congresso Nacional decreta e eu sanciono a seguinte Lei:

CAPÍTULO I
DISPOSIÇÕES PRELIMINARES

Art. 1º Esta Lei dispõe sobre o tratamento de dados pessoais, inclusive nos meios digitais, por pessoa natural ou por pessoa jurídica de direito público ou privado, com o objetivo de proteger os direitos fundamentais de liberdade e de privacidade e o livre desenvolvimento da personalidade da pessoa natural.

Parágrafo único. As normas gerais contidas nesta Lei são de interesse nacional e devem ser observadas pela União, Estados, Distrito Federal e Municípios. (Incluído pela Lei nº 13.853, de 2019) Vigência

Art. 2º A disciplina da proteção de dados pessoais tem como fundamentos:

I - o respeito à privacidade;

II - a autodeterminação informativa;

III - a liberdade de expressão, de informação, de comunicação e de opinião;

IV - a inviolabilidade da intimidade, da honra e da imagem;

V - o desenvolvimento econômico e tecnológico e a inovação;

VI - a livre iniciativa, a livre concorrência e a defesa do consumidor; e

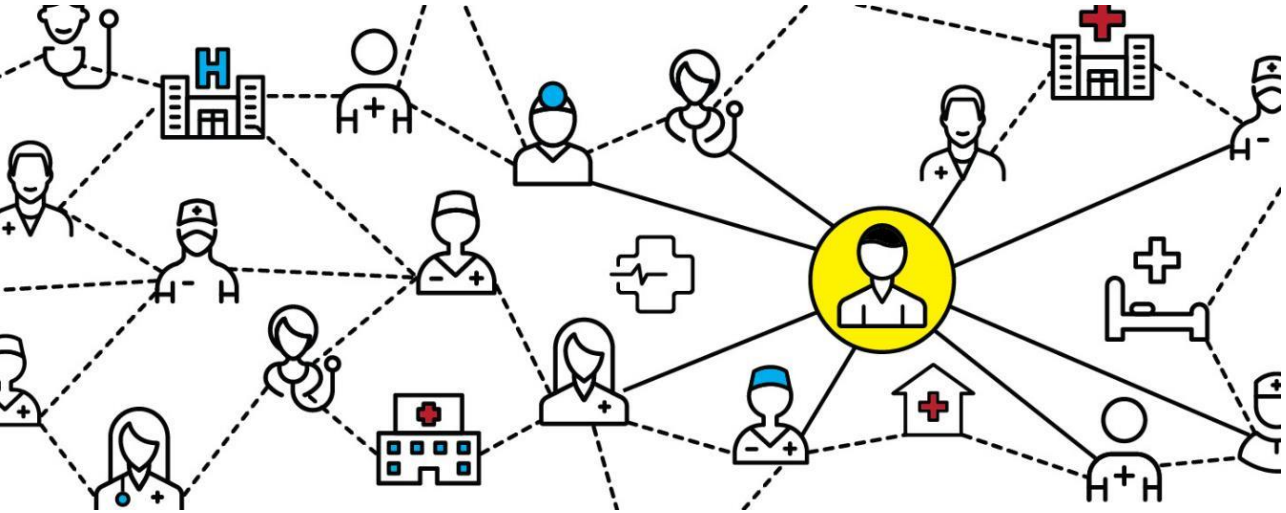
VII - os direitos humanos, o livre desenvolvimento da personalidade, a dignidade e o exercício da cidadania pelas pessoas naturais.

Art. 3º Esta Lei aplica-se a qualquer operação de tratamento realizada por pessoa natural ou por pessoa jurídica de direito público ou privado, independentemente do meio, do país de sua sede ou do país onde estejam localizados os dados, desde que:

I - a operação de tratamento seja realizada no território nacional;

- Scientific research and public health are considered specific contexts for processing personal data under the LGPD, provided that <u>recommendations and safeguards established by the law are followed in conformity with specific regulations **for each sector** </u>(Articles 4º, 7º, 11 e 13).

Fragmentation



Brazil Data Ecosystem

Social and Health Policies

- Cadastro Único
- Programa Bolsa Família voltou!
- 1 milhão de cisternas
- Minha casa, minha vida está de volta
- Saúde da Família
- PMAQ – Programa de Melhoria do Acesso e da Qualidade

Health Outcomes

- SIM
- SINASC
- SIH – Sistema de Informação Hospitalar
- SINAN – Sistema de Informação de Agravos de Notificação
- SISVAN
- SIAB – Sistema de Informação de Atenção Básica

cidacs – Centro de Integração de Dados e Conhecimentos para Saúde

Ministério da Saúde – FIOCRUZ – Fundação Oswaldo Cruz – Instituto Gonçalo Moniz

Many challenges to connecting these data “silos”

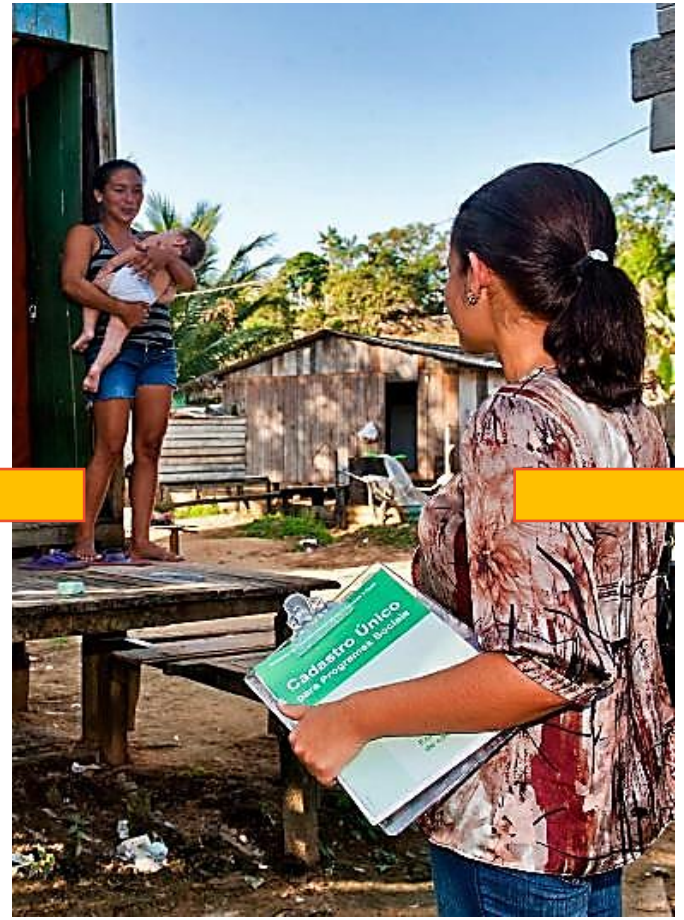
- ✓ Data heterogeneity (accuracy, format);
- ✓ Data fragmentation (multiple databases, multiple owners/ stakeholders);
- ✓ Data availability (protection for commercial or cultural reasons, or related to personal privacy);
- ✓ Data handling (data management, data access, data quality, data querying, data sharing);
- ✓ Data privacy and integrity (prevention of corruption and hacking);
- ✓ Data conceptualisation (ontologies).

Why was CIDACS created?

CIDACS was created in December 2016 in the city of Salvador (Bahia-Brazil) with the objective of conducting interdisciplinary research on population health determinants using integrated Brazilian (national) datasets to generate scientific knowledge and provide evidence to support public policymaking.

Unified Registry for Social Programmes (CadUnico)

Individual level variables
✓ Age (at time of application)
✓ Sex
✓ Marital status
✓ Relationship to the person responsible for the household
✓ Race/Ethnicity
✓ Literacy status
✓ Level of education
✓ Employment status
✓ Household income (monthly)
✓ Individual income (monthly)
✓ Indigenous, *quilombola*, and other traditional population groups
✓ Experiencing homelessness?
✓ Place of birth



Family level variables
✓ Municipality of family residence
✓ Region of family residence
✓ Location of family residence
✓ Housing and flooring material
✓ Household type
✓ Household water supply
✓ Sewage disposal system
✓ Electricity
✓ Waste collection
✓ Sidewalks around household
✓ Number of individuals in the household
✓ Number of rooms in the household

Data source	Data type	Approximate coverage	Examples of relevant variables
SINASC	Live birth records in Brazil	97% of live births	Newborn characteristics (sex, Apgar scores, birth weight, ICD-10 coded congenital malformation), maternal characteristics (name, age, marital status, education, race/ethnicity, place of residence), paternal characteristics (name, age), perinatal information (reproductive history: parity, abortions, stillbirths, gestational duration, delivery mode, number of fetuses, antenatal care attendance), location of birth
CadUnico	Social records from over 130 million individuals aged ≥16 years whose families applied for social assistance in Brazil	>50% of population	Location of residence (municipality, region, urban or rural), living conditions (housing, water sources, electricity, sewage, waste, household density), socioeconomic characteristics (education, employment, income), demographics (age, sex, race/ethnicity), social protection program participation and conditionalities
SINAN	Records of communicable diseases of interest in the country	----	It is disease specific. Onset of symptoms, date of birth, patient name, sex, address, laboratory confirmation, symptoms and treatment
SIH-SUS	Hospitalisation admission records	75% of hospitalisations in the Brazilian National Health System	Cause of hospitalisation (ICD-10 code), duration, costs, and date of hospitalisation, type of hospital
SIM	Death records in Brazil	75-95% of Brazilian deaths, with some geographic heterogeneity	Cause of death (ICD-10 code), characteristics of the deceased (dates of birth and death, name, name of parents, sex, race/ethnicity, birth weight for infants), place of death, characteristics of mother of deceased children (maternal name, age, marital status, education, occupation, race/ethnicity, number of births, place of residence, length of gestation, number of previous stillbirths or abortions, type of delivery)
SISVAN	Anthropometric and food consumption records	30% of children <5 years attending primary care in the Brazilian National Health System, with heterogeneity across populations	Date of birth, age, sex, race/ethnicity, anthropometrics, breastfeeding, complementary feeding, consumption of healthy and unhealthy foods

cidacsRL

a novel iterative deterministic record linkage algorithm based on a combination of indexing search and scoring algorithms (provided by Elasticsearch) [...] for huge datasets, with higher accuracy, improved scalability, and substantially shorter execution time compared to other existing linkage tools.

BMC Medical Informatics and Decision Making

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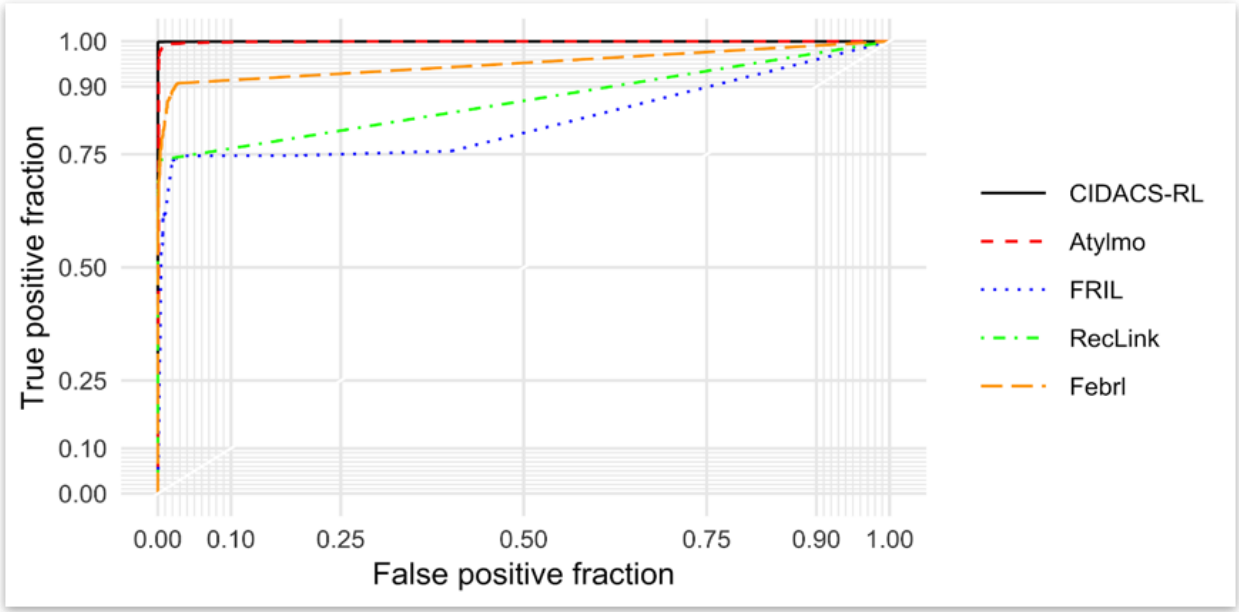
Research article | Open access | Published: 09 November 2020

CIDACS-RL: a novel indexing search and scoring-based record linkage system for huge datasets with high accuracy and scalability

George C. G. Barbosa, M. Sanni Ali, Bruno Araujo, Sandra Reis, Samila Sena, Maria Y. T. Ichihara, Julia Pescarini, Rosemeire L. Fiaccone, Leila D. Amorim, Robespierre Pita, Marcos E. Barreto, Liam Smeeth & Mauricio L. Barreto

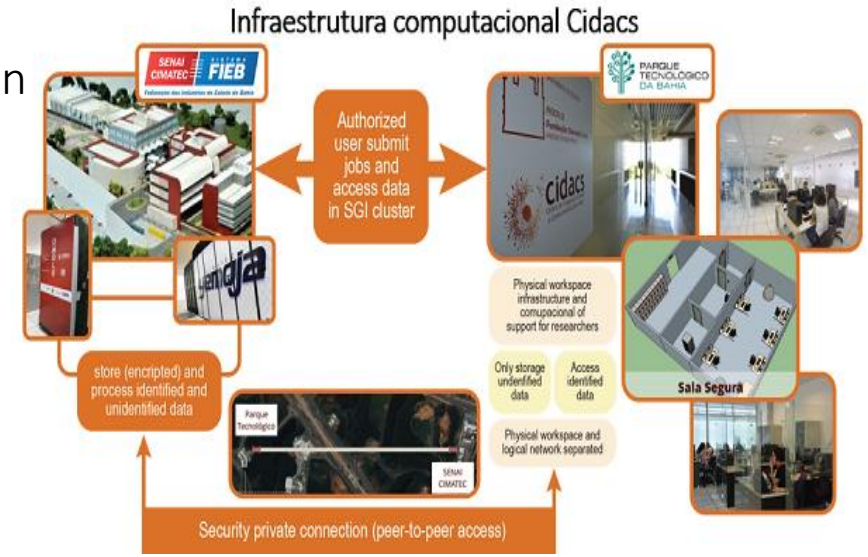
BMC Medical Informatics and Decision Making **20**, Article number: 289 (2020) | Cite this article

3525 Accesses | **34** Citations | **1** Altmetric | Metrics

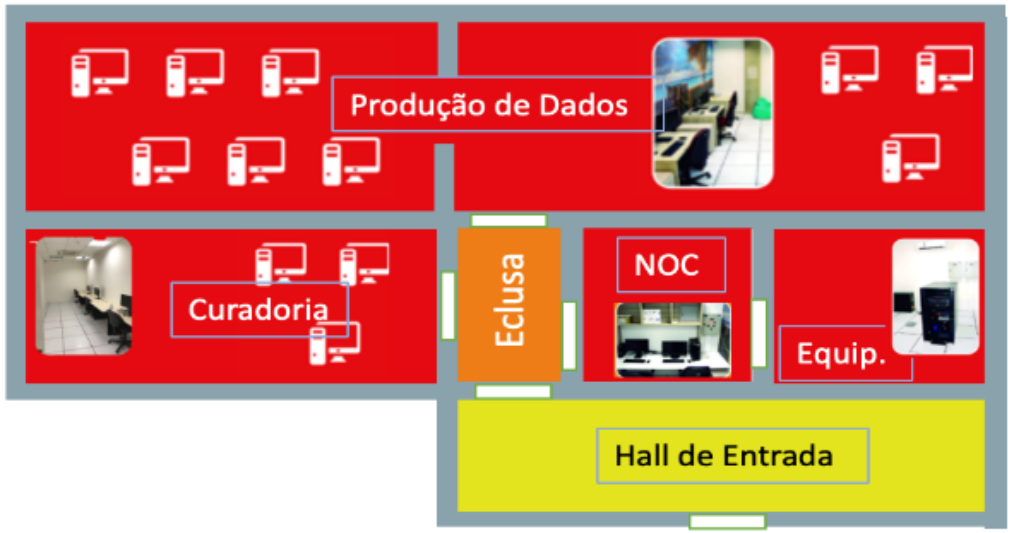


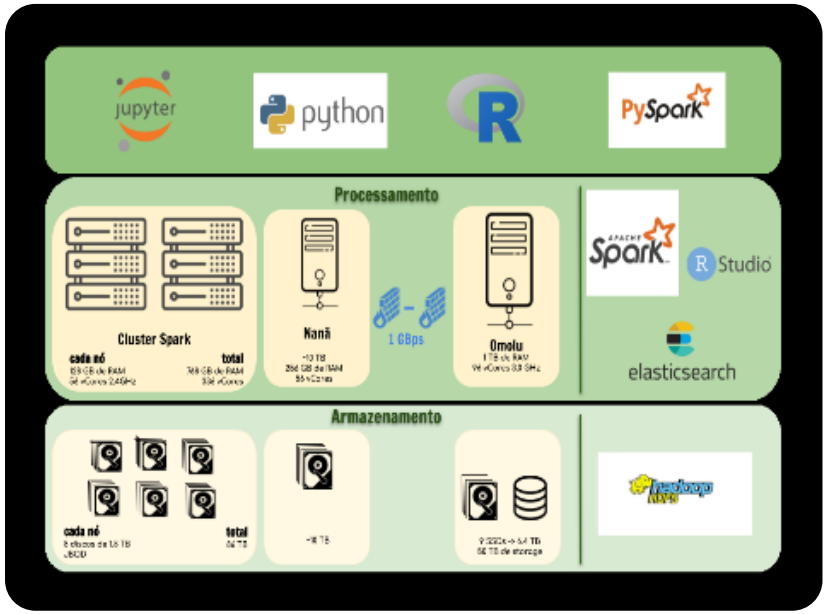
cidacsRL

Computational resources on Data platform



Safety room for data integration





Datacenter Container

The centre employs a complex data management system incorporating information security, ethical principles, and privacy protection.

International Journal of Population Data Science (2019) 4:2:04

International Journal of Population Data Science

Journal Website: www.ijpds.org

The Centre for Data and Knowledge Integration for Health (CIDACS): Linking Health and Social Data in Brazil

Barreto, ML[1,2*], Ichihara, MY[1,2], Almeida, BA[1], Barreto, ME[1,3], Cabral, L[1], Fiaccone, RL[1,4], Carreiro, RP[1], Teles, CAS[1], Pitta, R[1], Penna, GO[1,5,6], Barral-Netto, M[1], Ali, MS[1,7,8], Barbosa, G[1], Denaxas, S[9], Rodrigues, LC[1,8], and Smeeth, L[1,8]

Submission History
Submitted: 31/08/2019
Accepted: 21/08/2019
Published: 20/11/2019

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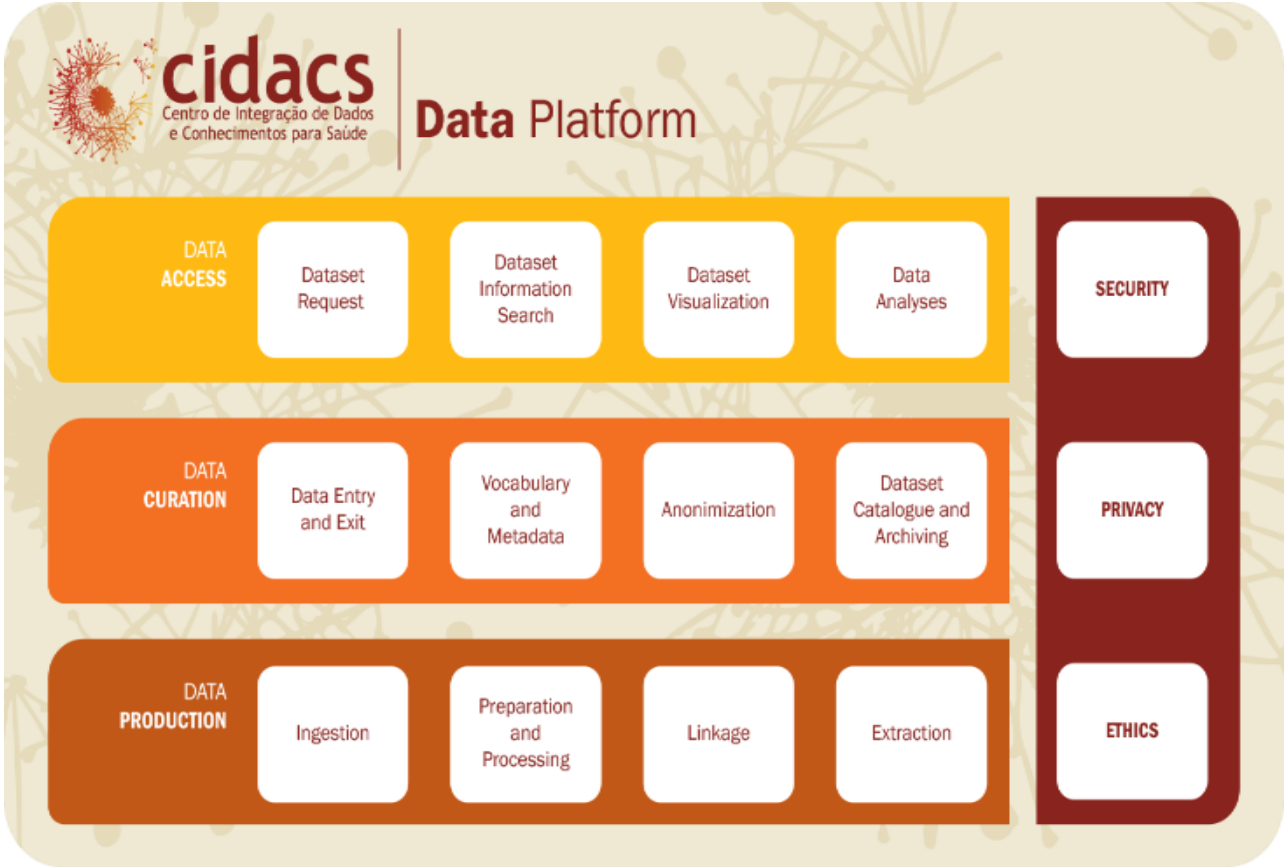
Abstract

The Centre for Data and Knowledge Integration for Health (CIDACS) was created in 2016 in Salvador, Bahia-Brazil with the objective of integrating data and knowledge aiming to answer scientific questions related to the health of the Brazilian population. This article details our experiences in the establishment and operations of CIDACS, as well as efforts made to obtain high-quality linked data while adhering to security, ethical use and privacy issues. Every effort has been made to conduct operations while implementing appropriate structures, procedures, processes and controls over the original and integrated databases in order to provide adequate datasets to answer relevant research questions. Looking forward, CIDACS is expected to be an important resource for researchers and policymakers interested in enhancing the evidence base pertaining to different aspects of health, in particular when investigating, from a nation-wide perspective, the role of social determinants of health and the effects of social and environmental policies on different health outcomes.



Available at: https://doi.org/10.23889/ijpds.v4i2.1140

Data management, data governance, data ethics

International Journal of Population Data Science (2024) 9:1:06

International Journal of Population Data Science

Journal Website: www.ijpds.org

CIDACS' efforts towards an inclusive and dialogic data governance in Brazil: a focused literature review

Bethânia de A. Almeida[1,*], Roberto P. Carreiro[1], Maíra L. de Souza[1], and Mauricio L. Barreto[1]

Submission History
Submitted: 29/04/2023
Accepted: 20/02/2024
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Abstract

The Centre for Data and Knowledge Integration for Health's (CIDACS) data governance efforts have primarily focused on legal, technical and operational procedures to provide high-quality linked administrative data for investigations on social determinants of health and the impact of social protection policies in low-income and vulnerable populations throughout Brazil. The Centre is moving towards an updated data governance model that incorporates the participation of, and consultation and dialogue with, data stakeholders, including groups covered by our linked data. To this end, this paper presents our procedures and challenges, outlining relevant considerations based on a focused literature review that aims to support the inclusion of societal participation in our revised data governance approach, which should be considered an ongoing process.

Keywords
data governance; administrative data linkage; data subjects rights as groups and communities

- Research analysis is focused on a population perspective; however, ethical and legal standards, as well as the preservation of privacy, target individuals.

- Our data governance approach has started to address questions related to data ethics, as well as the rights of groups as data subjects.

Available at: https://doi.org/10.23889/ijpds.v9i1.2163

100 Million Brazilians Cohort

IEA International Epidemiological Association

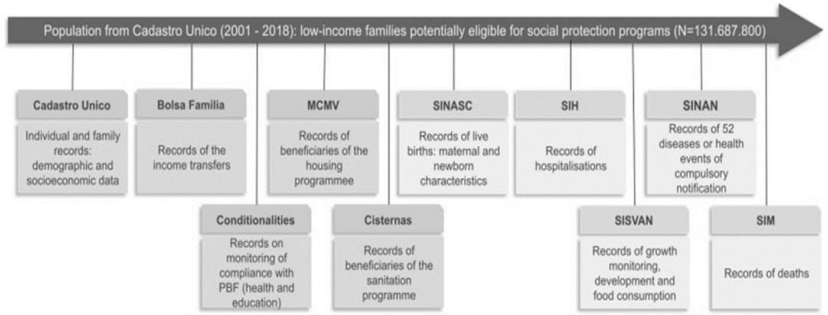
International Journal of Epidemiology, 2022, e27–e38
https://doi.org/10.1093/ije/dyab213
Advance Access Publication Date: 18 December 2021
Cohort Profile

OXFORD

Cohort Profile

Cohort Profile: The 100 Million Brazilian Cohort

Coorte de 100 milhões de brasileiros



Coorte de Nascimentos

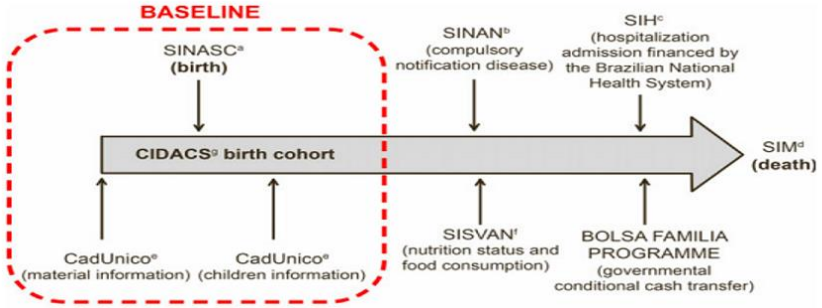
Available at: https://doi.org/10.1093/ije/dyab213

CIDACS' Birth Cohort

IEA

Cohort Profile

Cohort Profile: Centro de Integração de Dados e Conhecimentos para Saúde (CIDACS) Birth Cohort



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FIOCRUZ Fundação Oswaldo Cruz Instituto Gonçalo Moniz

The 100 Million Brazilians cohort and CIDACS' Birth cohort support research initiatives in a variety of areas related to public health.

Strategic research agenda

- Social and Environmental Determinants of Health and Health Inequalities
- Assessment of the Impact of Social Policies on Health
- Assessment of the Impact of Health Programs and Interventions
- Digital Surveillance and Public Health Emergencies
- Data Governance, Science and Society
- Knowledge Dissemination and Societal Engagement

TO EVALUATE THE IMPACT OF POVERTY REDUCTION POLICIES ON HEALTH

JAMA Network Open

Original Investigation | Health Policy

Participation in Conditional Cash Transfer Program During Pregnancy and Birth Weight–Related Outcomes

Ila R. Falcão, PhD; Rita de Cássia Ribeiro-Silva, PhD; Rosemeire L. Fiaccone, PhD; Flávia Jôse Oliveira Alves, PhD; Aline dos Santos Rocha, PhD; Naiá Ortelan, PhD; Natanael J. Silva, MSc; Poliana Rebouças, PhD; Elzo Pereira Pinto Júnior, PhD; Marcia Furquim de Almeida, PhD; Enny S. Paixao, PhD; Júlia M. Pescarini, PhD; Laura C. Rodrigues, PhD; Maria Yury Ichihara, PhD; Mauricio L. Barreto, PhD

American Journal of Epidemiology

Vol. 00, No. 00
DOI: 10.1093/aje/kwaa127
Advance Access publication:

Original Contribution

Conditional Cash Transfer Program and Leprosy Incidence: Analysis of 12.9 Million Families From the 100 Million Brazilian Cohort

PLOS MEDICINE

RESEARCH ARTICLE

Conditional cash transfer program and child mortality: A cross-sectional analysis nested within the 100 Million Brazilian Cohort

Dandara Ramos[1,2]*, Nívea B. da Silva[1,3], Maria Yury Ichihara[1,2], Rosemeire L. Fiaccone[1,3], Daniela Almeida[1,4], Samila Sena[1], Poliana Rebouças[1,2], Elzo Pereira Pinto Júnior[1], Enny S. Paixão[1,5], Sanni Ali[1,5], Laura C. Rodrigues[1,5], Maurício L. Barreto[1,2]

nature communications

Article

https://doi.org/10.1038/s41467-024-44975-z

Income determines the impact of cash transfers on HIV/AIDS: cohort study of 22.7 million Brazilians

Received: 4 September 2023
Accepted: 10 January 2024
Published online: 12 February 2024
Check for updates

Andréa F. Silva[1,2], Inês Dourado[1], Iracema Lua[1,2], Gabriela S. Jesus[1,3], Nathalia S. Guimarães[1], Gabriel A. S. Morais[1], Rodrigo V. R. Anderle[1], Julia M. Pescarini[2], Daiane B. Machado[2,4], Carlos A. S. T. Santos[2], Maria Y. Ichihara[2], Mauricio L. Barreto[1,2], Laio Magno[1,5], Luis E. Souza[1], James Macinko[6] & Davide Rasella[1,2,7]

PLOS MEDICINE

RESEARCH ARTICLE

Relationship between the Bolsa Família national cash transfer programme and suicide incidence in Brazil: A quasi-experimental study

Daiane Borges Machado[1,2]*, Elizabeth Williamson[3], Julia M. Pescarini[1,3], Flavia J. O. Alves[1], Luís F. S. Castro-de-Araujo[1,4], Maria Yury Ichihara[1], Laura C. Rodrigues[1,3], Ricardo Araya[5], Vikram Patel[2,6], Maurício L. Barreto[1,7]

JAMA Network Open

Original Investigation | Public Health

Association of Conditional Cash Transfers With Maternal Mortality Using the 100 Million Brazilian Cohort

Flávia Jôse O. Alves, PhD; Dandara Ramos, PhD; Enny S. Paixão, PhD; Ila R. Falcão, PhD; Rita de Cássia Ribeiro-Silva, PhD; Rosemeire Fiaccone, PhD; Davide Rasella, PhD; Camila Teixeira, PhD; Daiane Borges Machado, PhD; Aline Rocha, PhD; Marcia F. de Almeida, PhD; Emanuelle F. Goes, PhD; Laura C. Rodrigues, PhD; Maria Yury Ichihara, PhD; Estela M. L. Aquino, PhD; Maurício L. Barreto, PhD

Program (BFP) Impact on Child Mortality

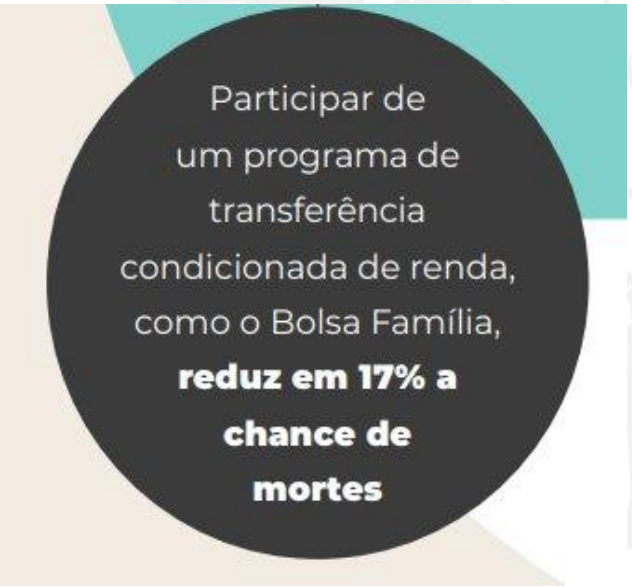
PLOS MEDICINE

RESEARCH ARTICLE

Conditional cash transfer program and child mortality: A cross-sectional analysis nested within the 100 Million Brazilian Cohort

Dandara Ramos[1,2]*, Nívea B. da Silva[1,3], Maria Yury Ichihara[1,2], Rosemeire L. Fiaccone[1,3], Daniela Almeida[1,4], Samila Sena[1], Poliana Rebouças[1,2], Elzo Pereira Pinto Júnior[1], Enny S. Paixão[1,5], Sanni Ali[1,5], Laura C. Rodrigues[1,5], Maurício L. Barreto[1,2]

IMPACT OF BFP ON UNDER-5 MORTALITY OVERALL = -17%



BFP

This study also observed heterogeneities in BFP effect among several subgroups

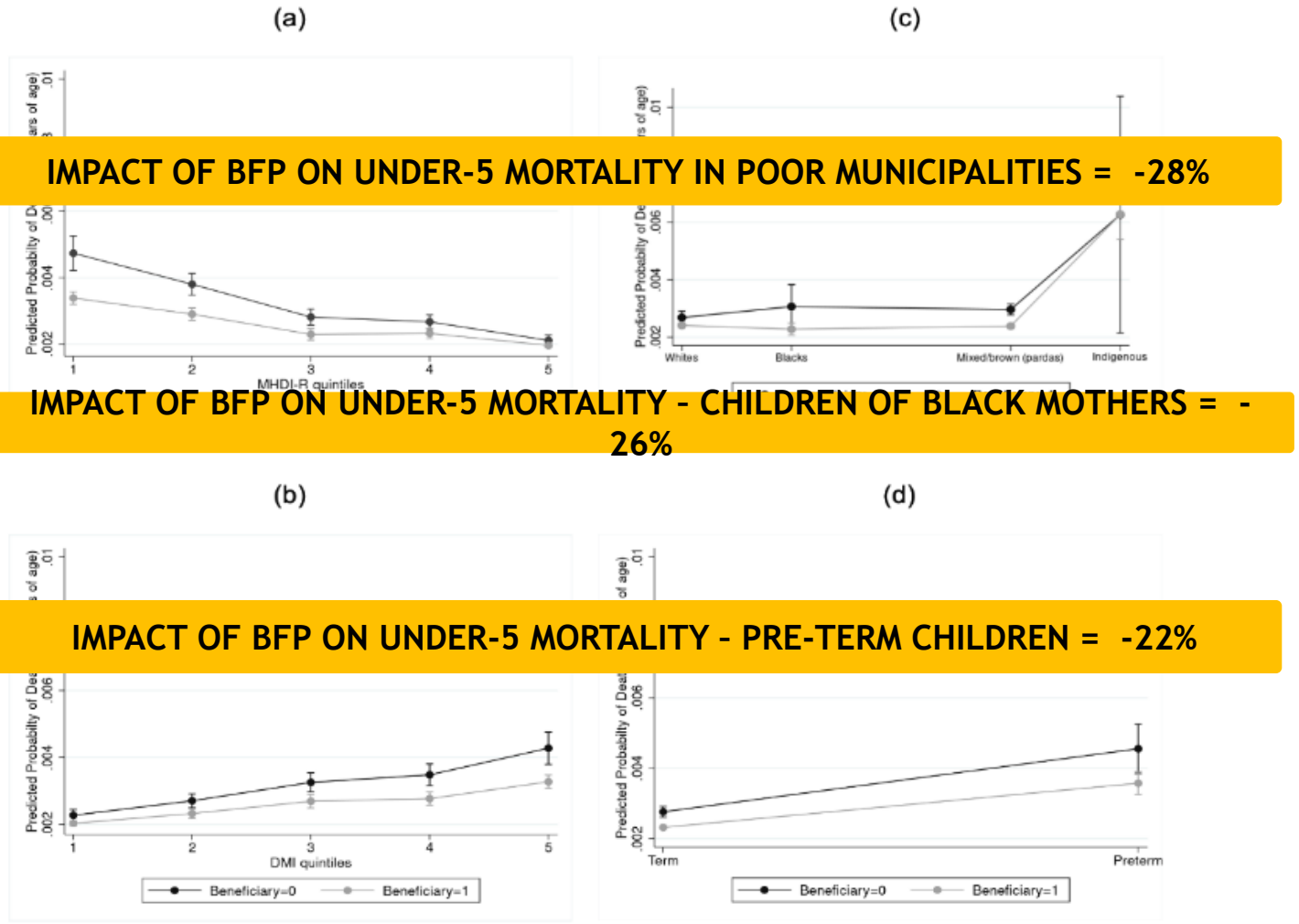
Association was stronger for:

- (a) children living in municipalities in the lowest income quintile (1st quintile of municipal income: wOR= 0.72; 95% CI: 0.62 to 0.82)
- (b) municipalities with better BFP management (5th quintile of the Decentralized management index: wOR= 0.76; 95% CI: 0.66 to 0.88)
- (c) children of Black mothers (wOR =0.74; 95% CI: 0.57 to 0.97);
- (d) preterm children (wOR =0.78; 95% CI: 0.68 to 0.90);

IMPACT OF BFP ON UNDER-5 MORTALITY IN POOR MUNICIPALITIES = -28%

IMPACT OF BFP ON UNDER-5 MORTALITY - CHILDREN OF BLACK MOTHERS = -26%

IMPACT OF BFP ON UNDER-5 MORTALITY - PRE-TERM CHILDREN = -22%



TO INVESTIGATE LOW-FREQUENCY BUT RELEVANT HEALTH EVENTS

The Lancet Regional Health - Americas 3 (2021) 100045

Contents lists available at ScienceDirect

The Lancet Regional Health - Americas

journal homepage: www.elsevier.com/locate/lana

Research paper

Risk of mortality for small newborns in Brazil, 2011-2018: A national birth cohort study of 17.6 million records from routine register-based linked data

Enny S. Paixao, Ph.D [1,2,*], Hannah Blencowe, MD, Ph.
Eric O. Ohuma, Ph.D [2], Aline dos Santos Rocha [1,3], Flá
Maria da Conceição N. Costa, MD, Ph.D [1,4], Lorena Su

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Mortality from Congenital Zika Syndrome — Nationwide Cohort Study in Brazil

Enny S. Paixão, Ph.D., Luciana L. Cardim, Ph.D., Maria C.N. Costa, M.D., Ph.D., Elizabeth B. Brickley, Ph.D., Rita C.O. de Carvalho-Sauer, M.Sc., Eduardo H. Carmo, M.D., Ph.D., Roberto F.S. Andrade, Ph.D., Moreno S. Rodrigues, Ph.D., Rafael V. Veiga, Ph.D., Larissa C. Costa, Ph.D., Cynthia A. Moore, M.D., Ph.D., Giovanny V.A. França, Ph.D.,

Incidence and risk factors of tuberculosis among 420 854 household contacts of patients with tuberculosis in the 100 Million Brazilian Cohort (2004–18): a cohort study

o S S Teixeira, Maria Yury Ichihara, Davide Rasella, Joilda S Nery, Samila O L Sena, Elizabeth B Brickley, ro N Sanchez*, Julia M Pescarini*

LANCET
tious Diseases

Risk of death following chikungunya virus disease in the 100 Million Brazilian Cohort, 2015–18: a matched cohort study and self-controlled case series

Thiago Cerqueira-Silva, Julia M Pescarini, Luciana L Cardim, Clémence Leyrat, Heather Whitaker, Carlos Alexandre Antunes de Brito, Elizabeth B Brickley, Manoel Barral-Netto, Maurício L Barreto, Maria G Teixeira, Viviane S Boaventura, Enny S Paixão

Lancet Infect Dis 2024; 24: 504–13
Published Online February 8, 2024
https://doi.org/10.1016/S1473-3099(23)00739-9

Summary

Background Chikungunya virus outbreaks have been associated with excess deaths at the ecological level. Previous studies have assessed the risk factors for severe versus mild chikungunya virus disease. However, the risk of death following chikungunya virus disease compared with the risk of death in individuals without the disease remains unexplored. We aimed to investigate the risk of death in the 2 years following chikungunya virus disease.

JAMA Dermatology | Original Investigation

Incidence of and Factors Associated With L Among Household Contacts of Patients Wi

Camila Silveira Silva Teixeira, MsC; Júlia Moreira Pescarini, PhD; Flávia Jôse Oliveira Alves; Joilda Silva Nery, PhD; Mauro Niskier Sanchez, PhD; Carlos Teles, PhD; Maria Yury Travas; Anna Ramond, PhD; Liam Smeeth, PhD; Maria Lucia Fernandes Penna, PhD; Laura Cunh; Elizabeth B. Brickley, PhD; Gerson Oliveira Penna, PhD; Maurício Lima Barreto, PhD;

Figure 2. Cumulative Incidence of Subsequent Leprosy Cases Among Households of Patients With Leprosy

Received: 31 August 2021 | Revised: 4 November 2021 | Accepted: 11 November 2021 | First published online: 13 December 2021
DOI: 10.1002/ijgo.14053

CLINICAL ARTICLE

Obstetrics

Recurrence of preterm births: A population-based linkage with 3.5 million live births from the CIDACS Birth Cohort

Aline S. Rocha [1,2] | Rita de Cássia Ribeiro-Silva [1,2] | Enny S. Paixao [2,3] | Ila R. Falcão [1,2] | Flavia Jôse. O. Alves [2,4] | Naiá Ortelan [2] | Marcia F. de Almeida [5] | Rosemeire L. Fiaccone [2,6] | Laura C. Rodrigues [3] | Maria Yury Ichihara [2] | Mauricio L. Barreto [2,4]

LE

Causes of death in children with congenital Zika syndrome in Brazil, 2015 to 2018: A nationwide record linkage study

Maria da Conceição N. Costa [1,2✉], Luciana Lobato Cardim [1✉], Cynthia A. Moore [3], Eliene dos Santos de Jesus [2,4], Rita Carvalho-Sauer [2,5], Mauricio L. Barreto [1,2], Laura C. Rodrigues [1,6], Liam Smeeth [6], Lavínia Schuler-Faccini [7], Elizabeth B. Brickley [6], Wanderson K. Oliveira [8], Eduardo Hage Carmo [1,9], Julia Moreira Pescarini [1,6], Roberto F. S. Andrade [1,10], Moreno M. S. Rodrigues [1], Rafael V. Veiga [1], Larissa C. Costa [1], Giovanny V. A. França [9], Maria Gloria Teixeira [1,2‡], Enny S. Paixão [1,6‡*]

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DATA TO INVESTIGATE RARE BUT RELEVANT HEALTH EVENTS

Large sample sizes allow several analytical advantages, such as the analysis of rare events that are not possible in studies that rely on small sample size.

11.5 million live births, of which, **3,308** babies born with confirmed or probable CZS.

Babies born with CZS were at **>11x greater risk** of death during first three years of life than those born without.

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Mortality from Congenital Zika Syndrome — Nationwide Cohort Study in Brazil

Enny S. Paixão, Ph.D., Luciana L. Cardim, Ph.D., Maria C.N. Costa, M.D., Ph.D., Elizabeth B. Brickley, Ph.D., Rita C.O. de Carvalho-Sauer, M.Sc., Eduardo H. Cunha, M.D., Ph.D., Roberto F.S. Andrade, Ph.D., Moreno S. Rodrigues, Ph.D., Rafael V. Veiga, Ph.D., Larissa C. Costa, Ph.D., Cynthia A. Moore, M.D., Ph.D., Giovanny V.A. França, Ph.D., Liam Smeeth, M.D., Ph.D., Laura C. Rodrigues, M.D., Ph.D., Maurício L. Barreto, M.D., Ph.D., and Maria G. Teixeira, M.D., Ph.D.

ABSTRACT

BACKGROUND

Prenatal exposure to Zika virus has potential teratogenic effects, with a wide spectrum of clinical presentation referred to as congenital Zika syndrome. Data on survival among children with congenital Zika syndrome are limited.

METHODS

In this population-based cohort study, we used linked, routinely collected data in Brazil, from January 2015 through December 2018, to estimate mortality among live-born children with congenital Zika syndrome as compared with those without the syndrome. Kaplan–Meier curves and survival models were assessed with adjustment for confounding and with stratification according to gestational age, birth weight, and status of being small for gestational age.

RESULTS

A total of 11,481,215 live-born children were followed to 36 months of age. The mortality rate was 52.6 deaths (95% confidence interval [CI], 47.6 to 58.0) per 1000 person-years among live-born children with congenital Zika syndrome, as compared with 5.6 deaths (95% CI, 5.6 to 5.7) per 1000 person-years among those without the syndrome. The mortality rate ratio among live-born children with congenital Zika syndrome, as compared with those without the syndrome, was 11.3 (95% CI, 10.2 to 12.4). Among infants born before 32 weeks of gestation or with a birth weight of less than 1500 g, the risks of death were similar regardless of congenital Zika syndrome status. Among infants born at term, those with congenital Zika syndrome were 14.3 times (95% CI, 12.4 to 16.4) as likely to die as those without the syndrome (mortality rate, 38.4 vs. 2.7 deaths per 1000 person-years). Among infants with a birth weight of 2500 g or greater, those with congenital Zika syndrome were 12.9 times (95% CI, 10.9 to 15.3) as likely to die as those without the syndrome (mortality rate, 32.6 vs. 2.5 deaths per 1000 person-years). The burden of congenital anomalies, diseases of the nervous system, and infectious diseases as recorded causes of deaths was higher among live-born children with congenital Zika syndrome than among those without the syndrome.

CONCLUSIONS

The risk of death was higher among live-born children with congenital Zika syndrome than among those without the syndrome and persisted throughout the first 3 years of life. (Funded by the Ministry of Health of Brazil and others.)

From the London School of Hygiene and Tropical Medicine, London (E.S.P., E.B.B., L.S., L.C.R.); the Center of Data and Knowledge Integration for Health, Gonçalo Moniz Institute, Oswaldo Cruz Foundation (E.S.P., L.L.C., M.C.N.C., E.H.C., R.F.S.A., M.S.R., R.V.V., L.C.C., L.C.R., M.L.B., M.G.T.), and Instituto de Saúde Coletiva, Federal University of Bahia (M.C.N.C., M.L.B., M.G.T.), Salvador, the East Regional Health Center of the State Health Secretariat of Bahia, Santo Antônio de Jesus (R.C.O.C.-S.), and the Secretariat of Health Surveillance, Ministry of Health, Brasília (G.V.A.F.) — all in Brazil; and the Division of Birth Defects and Infant Disorders, National Center on Birth Defects and Developmental Disabilities, Centers for Disease Control and Prevention, Atlanta (C.A.M.). Dr. Paixão can be contacted at enny.cruz@lshtm.ac.uk or at the London School of Hygiene and Tropical Medicine, Keppel St., London WC1E 7HT, United Kingdom.

Drs. Paixão and Cardim and Drs. Barreto and Teixeira contributed equally to this article.

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TO INVESTIGATE HEALTH INEQUALITIES

Ethno-racial inequalities on adverse birth and neonatal outcomes: a nationwide, retrospective cohort study of 21 million Brazilian newborns

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Ethnoracial inequalities and child mortality in Brazil: a nationwide longitudinal study of 19 million newborn babies

Poliana Rebouças, PhD • Emanuelle Goes, PhD • Julia Pescarini, PhD • Dandara Ramos, PhD • Maria Yury Ichihara, PhD • Samila Sena, MSc • Rafael Veiga, PhD • Laura C Rodrigues, PhD • Prof Maurício L Barreto, MD PhD • Enny S Paixão, PhD • Show less

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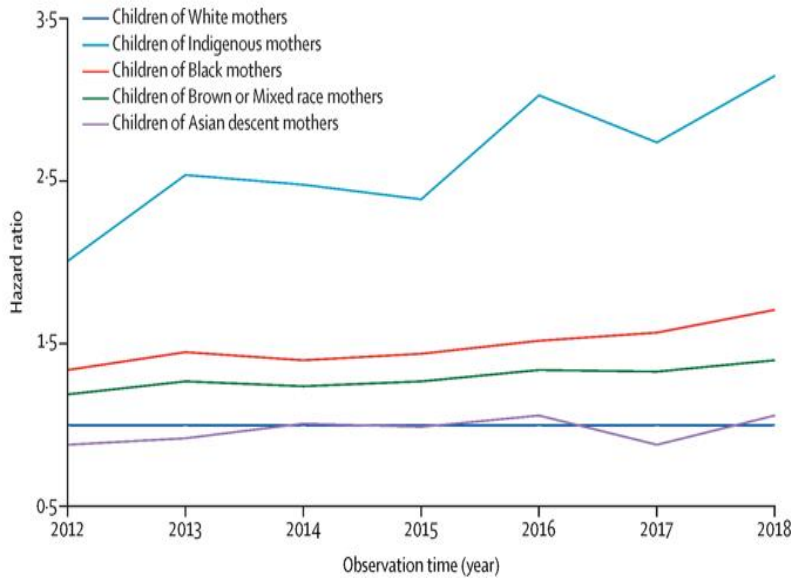

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The intersection of race/ethnicity and socioeconomic status: inequalities in breast and cervical cancer mortality in 20,665,005 adult women from the 100 Million Brazilian Cohort

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Articles
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Maternal and congenital syphilis attributable to ethnoracial inequalities: a national record-linkage longitudinal study of 15 million births in Brazil

Enny S Paixao*, Andréa J F Ferreira*, Julia M Pescarini, Kerry L M Wong, Emanuelle Goes, Rosemeire Fiaccone, Guilherme Lopes de Oliveira, Poliana Rebouças, Andrey Moreira Cardoso, Liam Smeeth, Maurício L Barreto, Laura C Rodrigues†, Maria Yury Ichihara†

Summary

Background This study estimated ethnoracial inequalities in maternal and congenital syphilis in Brazil, understanding race as a relational category product of a sociopolitical construct that functions as an essential tool of racism and its manifestations.

Methods We linked routinely collected data from Jan 1, 2012 to Dec 31, 2017 to conduct a population-based study in Brazil. We estimated the attributable fraction of race (skin colour) for the entire population and specific subgroups compared with White women using adjusted logistic regression. We also obtained the attributable fraction of the intersection between two social markers (race and education) and compared it with White women with more than 12 years of education as the baseline.

Findings Of 15 810 488 birth records, 144 564 had maternal syphilis and 79 580 had congenital syphilis. If all women had the same baseline risk as White women, 35% (95% CI 34·89–36·10) of all maternal syphilis and 41% (40·49–42·09) of all congenital syphilis would have been prevented. Compared with other ethnoracial categories,

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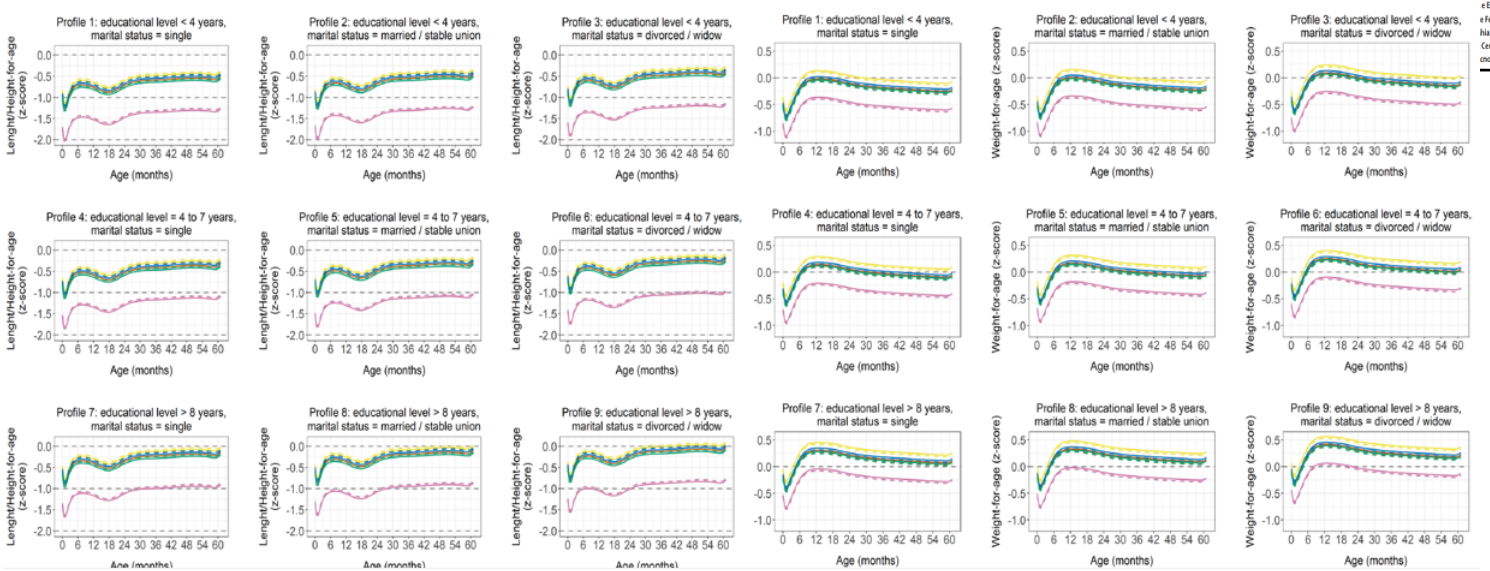
BMC Pediatrics

RESEARCH Open Access

Ethnoracial disparities in childhood growth trajectories in Brazil: a longitudinal nationwide study of four million children

Helena Benes Matos da Silva[1,2*†], Rita de Cássia Ribeiro-Silva[1,2], Juliana Freitas de Mello e Silva[2†], Irina Chis Ster[3], Poliana Rebouças[2], Emanuelle Goes[2], Maria Yury Ichihara[2], Andréa Ferreira[2,4], Julia M. Pescarini[5], Rosemeire Leovigildo Fiaccone[6], Enny S. Paixão[2] and Maurício L. Barreto[2]



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Children born to indigenous mothers were on average 3.3 cm (95% CI: −3.36, −3.27) shorter than their white counterparts.

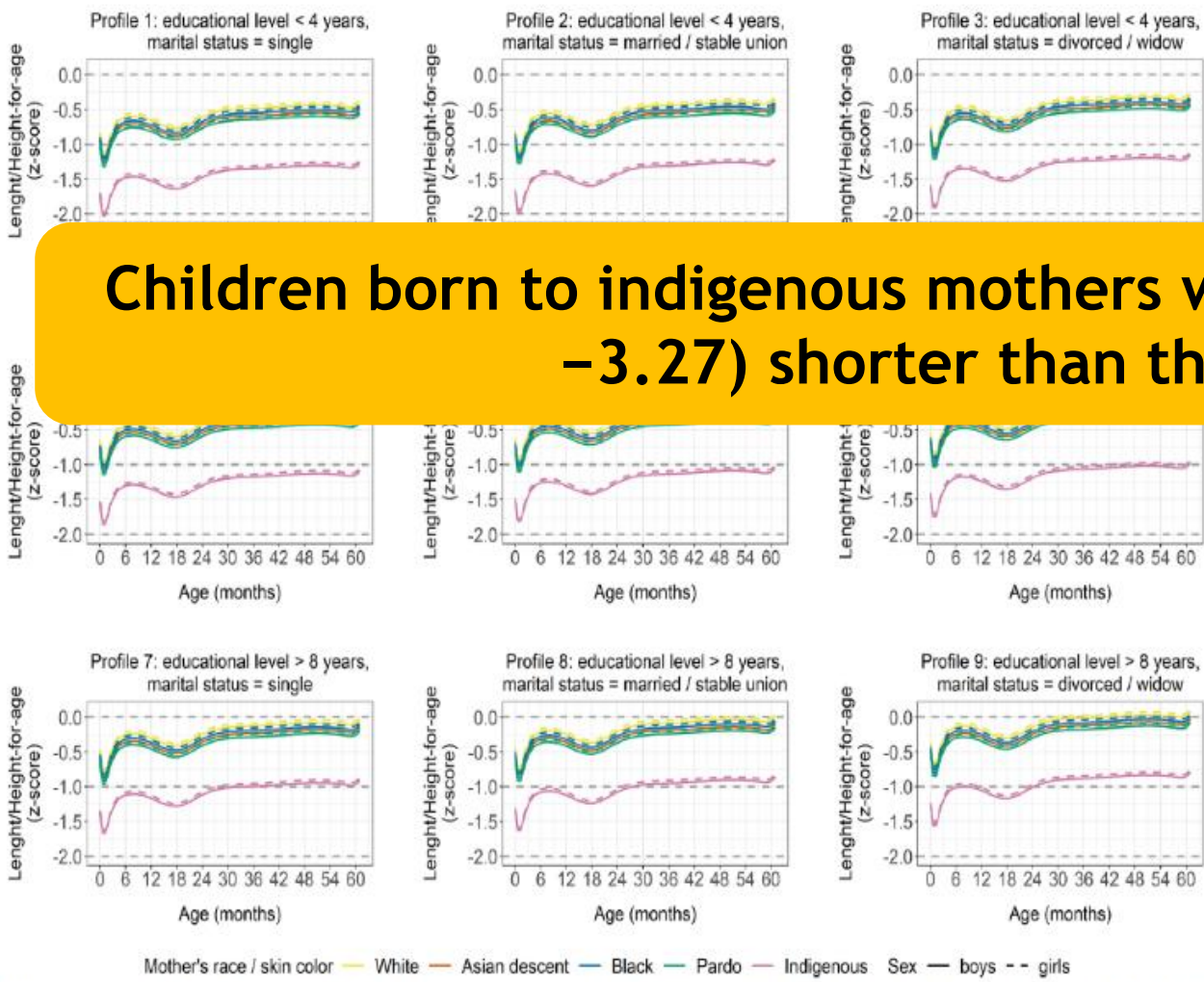
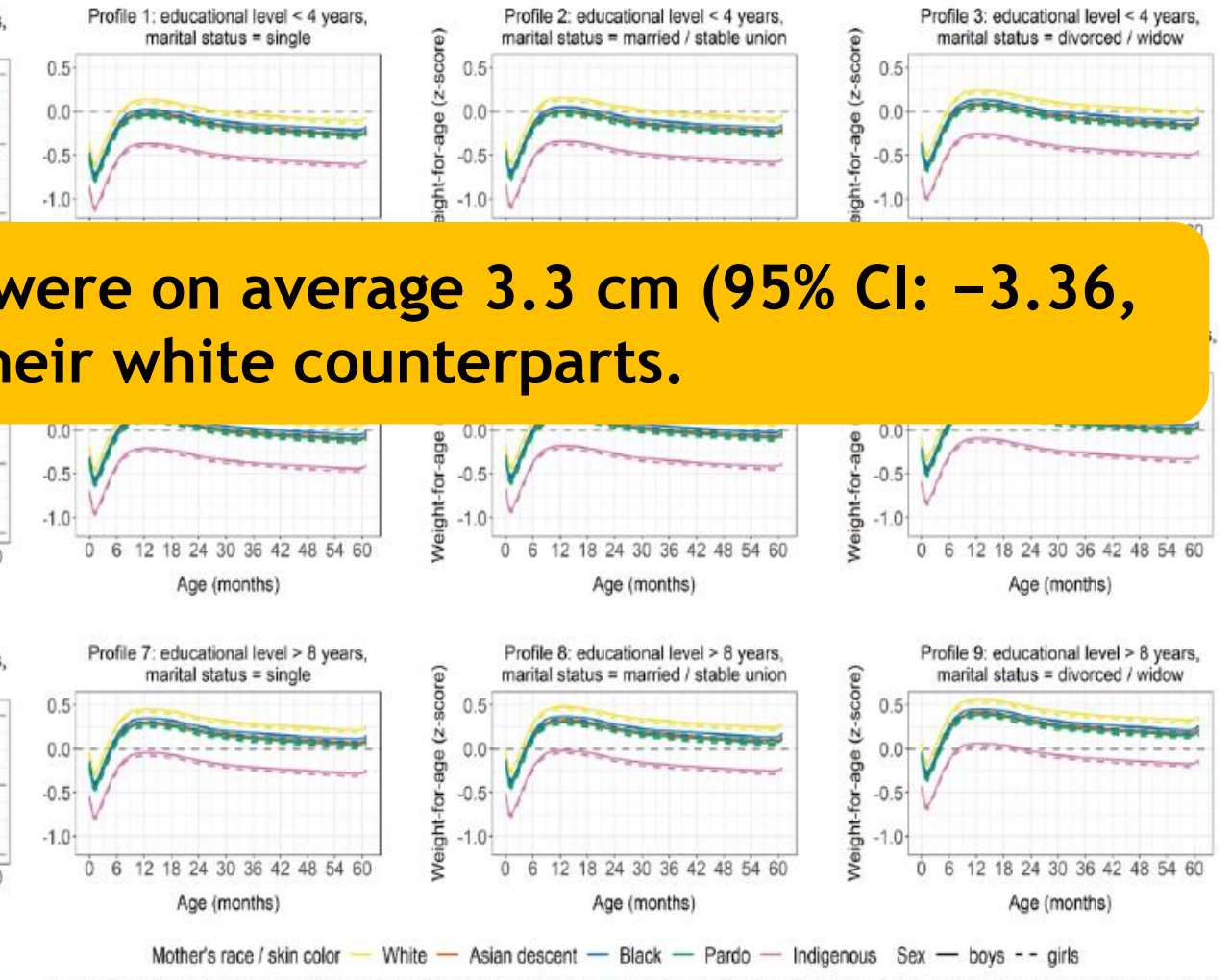


Fig. 5 Estimated mean curves for length/height-for-age z-scores, according to mother's age, educational level, and marital status. Brazil, 2008–2017



4 Estimated mean curves for weight-for-age z-scores model, according to mother's age, educational level, and marital status. Brazil, 2008–2017

Platform to study environmental and climate effects on health

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Plataforma de Dados Climáticos, Ambientais e de Saúde

Objective 3. Expand and update the *100 Million Brazilian* and *CIDACS Birth Cohorts* and develop the *CIDACS Climate and Environmental Platform*

- Extend and expand the geocoding of data in the *100 Million Brazilian* and *CIDACS Birth Cohorts*
- Update the the *100 Million Brazilian* and *CIDACS Birth Cohorts* to include new data up to 2023.
- Develop a fully functional *CIDACS Climate and Environmental Platform*
  - Hydrometeorological, reanalysis, and satellite imagery data

Plataforma de dados climáticos ambientais no CIDACS: Exemplos

Dados medidos in situ pelo INMET	Modelo de Reanálise ERA 5 LAND	Modelo de Reanálise VAN DONKELLAR	MAPBIOMAS
Período: 2000-presente (diário). Download: município e UF. Variáveis: • Temperatura: max - min- média - ponto orvalho • Precipitação Total • Vel e direção do vento • Pressão à Superfície • Umidade Relativa	Período: 2000-presente (diário). Download: município e UF. Variáveis: • Temperatura: max - min- média - ponto orvalho • Precipitação Total • Comp do vento: u e v • Pressão à Superfície • Umidade Relativa	Período: 2000-presente (mensal). Download: município e UF. Modelo: V5GL01.HybridPM25 Variável: • PM2.5 • NO2	Período: 2000-presente (mensal/anual). Download: município e UF. Variáveis: Uso e ocupação do solo Cicatriz de fogo Cobertura de água

Agnes Soares, coordenadora geral de Vigilância em Saúde Ambiental do Ministério da Saúde

cidacs Centro de Integração de Dados e Conhecimentos para Saúde
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Final considerations

- CIDACS' central mission entails generating scientific knowledge and providing evidence to support public policymaking to tackle health inequalities and other major challenges the Brazilian population faces.

- CIDACS has faced and overcome many challenges in producing scientific knowledge and evidence using integrated data.

- Overcoming these challenges requires the collective efforts of an interdisciplinary team and the development of in-house solutions, including customized data infrastructure, linkage algorithms, data acquisition processes, and analytical strategies.

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Obrigado!
Thank you!

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