BIOGRAPHICAL SKETCH

Provide the following information for the Senior/key personnel and other significant contributors.
Follow this format for each person. DO NOT EXCEED FIVE PAGES.

NAME: Chattopadhyay, Ishanu

eRA COMMONS USER NAME (credential, e.g., agency login): ishanu

POSITION TITLE: Assistant Professor

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.)*

INSTITUTION AND LOCATION	DEGREE (if applicable)	END DATE MM/YYYY	FIELD OF STUDY
The Pennsylvania State University, State College, PA	MS	08/2004	Mechanical Engineering
The Pennsylvania State University, State College, PA	MA	08/2005	Mathematics
The Pennsylvania State University, State College, PA	PHD	08/2006	Mechanical Engineering
The Pennsylvania State Univesity, State College, PA	Postdoctoral Fellow	08/2010	Computer Science
Cornell University, Ithaca, NY	Postdoctoral Fellow	08/2013	Computer Science

A. Personal Statement

Professor Ishanu Chattopadhyay research focuses on large-scale data analysis, machine learning, and automated model discovery with minimal human intervention. Leading the laboratory for Zero Knowledge Discovery, Dr. Chattopadhyay is interested in unraveling complex phenomena in biology, medicine, clinical decision-making, epidemiology of complex diseases and their screening and diagnosis, by leveraging and developing algorithms for sophisticated pattern recognition and discovery. More broadly, the laboratory focuses on the design and deployment of new learning algorithms, and new extensions to existing techniques trying to understand what is theoretically possible, what can be achieved in practice, and, more generally, what are the hard limits of the data science revolution. Dr. Chattopadhyay's work resides at the cusp of several disciplines - artificial intelligence, statistical theory, formal languages, dynamical systems, and machine learning; formulating tools that work where subject matter expertise is scant; hopefully answering questions that we have not yet thought to ask.

1. Huang Y, Rotaru V, Chattopadhyay I. Sequence likelihood divergence for fast time series comparison. Knowledge and Information Systems. 2023 March 16; :-. Available from: https://link.springer.com/10.1007/s10115-023-01855-0 DOI: 10.1007/s10115-023-01855-0
2. Onishchenko D, Marlowe R, Ngufor C, Faust L, Limper A, Hunninghake G, Martinez F, Chattopadhyay I. Screening for idiopathic pulmonary fibrosis using comorbidity signatures in electronic health records. Nature Medicine. 2022 September 29; 28(10):2107-2116. Available from: https://www.nature.com/articles/s41591-022-02010-y DOI: 10.1038/s41591-022-02010-y
3. Rotaru V, Huang Y, Li T, Evans J, Chattopadhyay I. Event-level prediction of urban crime reveals a signature of enforcement bias in US cities. Nature Human Behaviour. 2022 June 30; 6(8):1056-1068. Available from: https://www.nature.com/articles/s41562-022-01372-0 DOI: 10.1038/s41562-022-01372-0
4. Onishchenko D, Huang Y, van Horne J, Smith P, Msall M, Chattopadhyay I. Reduced false positives in autism screening via digital biomarkers inferred from deep comorbidity patterns. Science Advances. 2021 October 08; 7(41):-. Available from:

https://www.science.org/doi/10.1126/sciadv.abf0354 DOI: 10.1126/sciadv.abf0354

B. Positions, Scientific Appointments and Honors

Positions and Scientific Appointments

2016 - Assistant Professor, University Of Chicago, Chicago, IL
2014 - 2016 Research Scientist, Computation Institute, University of Chicago, Chicago, IL

Honors

2020 - 2022 Young Faculty Award 2020, Defense Advanced Research Projects Agency

C. Contribution to Science

1. Analyzing complex dependencies in biosystems, and massive databases of health records is a daunting computational challenge of scale. Chattopadhyay's work in this direction proceeds with the introduction a new class of non-parametric non-linear zero-knowledge pattern inference algorithms. Classically, modeling proceeds by fixing a structure or a parameterized family, and tuning parameters against the data at hand. Data-driven nonparametric approaches with access to massive databases now allow us to explore unsupervised modeling, that make very few prior assumptions. In addition to eliminating structural biases, unsupervised inference have the potential for true pattern discovery, and finding novel and highly precise screening and diagnosis tools, that may be deployed with little additional resource demand.

    a. Onishchenko D, Marlowe R, Ngufor C, Faust L, Limper A, Hunninghake G, Martinez F, Chattopadhyay I. Screening for idiopathic pulmonary fibrosis using comorbidity signatures in electronic health records. Nature Medicine. 2022 September 29; 28(10):2107-2116. Available from: https://www.nature.com/articles/s41591-022-02010-y DOI: 10.1038/s41591-022-02010-y
    b. Onishchenko D, Rubin D, van Horne J, Ward R, Chattopadhyay I. Cardiac Comorbidity Risk Score: Zero-Burden Machine Learning to Improve Prediction of Postoperative Major Adverse Cardiac Events in Hip and Knee Arthroplasty. Journal of the American Heart Association. 2022 August 02; 11(15):-. Available from: https://www.ahajournals.org/doi/10.1161/JAHA.121.023745 DOI: 10.1161/JAHA.121.023745
    c. Onishchenko D, Huang Y, van Horne J, Smith PJ, Msall ME, Chattopadhyay I. Reduced false positives in autism screening via digital biomarkers inferred from deep comorbidity patterns. Sci Adv. 2021 Oct 8;7(41):eabf0354. PubMed Central PMCID: PMC8494294.
    d. Jia G, Li Y, Zhang H, Chattopadhyay I, Boeck Jensen A, Blair DR, Davis L, Robinson PN, Dahlén T, Brunak S, Benson M, Edgren G, Cox NJ, Gao X, Rzhetsky A. Estimating heritability and genetic correlations from large health datasets in the absence of genetic data. Nat Commun. 2019 Dec 3;10(1):5508. PubMed Central PMCID: PMC6890770.

2. Dr. Chattopadhyay's work on the inverse Gillespie algorithm iGillespie and GenESeSS provide two complementary approaches to de novo modeling in biosystems. In the former we can back out complex regulatory circuits, at various abstraction levels from single cell expression data, and in the latter we can infer generative stochastic models from discrete time series. Dr. Chattopadhyay's other key contribution is the Data Smashing algorithm. Most "data mining" algorithms today rely on a human expert to specify what "features" of the data are relevant. Relying on experts is error prone, and unlikely to keep pace with the growing complexity of biomedical data. Data Smashing provides a universal way to circumvent the reliance on human experts, quantifying the similarity between data streams without prior knowledge of where they were generated, how they are encoded, and what they represent; in essence creating a universal quantification of similarity, in the same sense that Kolmogorov complexity is a universal quantification of complexity. Data Smashing allows detection of subtle changes in the underlying stochastic dynamics driving biochemical processes, and provide

crucial building blocks for personalized precision medicine: applications range from isolating cohorts of patients that respond similarly to specific therapies, to detecting abnormal cardiac rhythms, to identifying distinct classes of epileptic pathologies from EEG recordings, to classifying individual microbiomes.

a. Rotaru V, Huang Y, Li T, Evans J, Chattopadhyay I. Event-level prediction of urban crime reveals a signature of enforcement bias in US cities. Nature Human Behaviour. 2022 June 30; 6(8):1056-1068. Available from: https://www.nature.com/articles/s41562-022-01372-0 DOI: 10.1038/s41562-022-01372-0
b. Chattopadhyay I, Lipson H. Data smashing: uncovering lurking order in data. Journal of The Royal Society Interface. 2014 December 06; 11(101):20140826-. Available from: https://royalsocietypublishing.org/doi/10.1098/rsif.2014.0826 DOI: 10.1098/rsif.2014.0826
c. Chattopadhyay I. Scalable ϵ-Optimal Decision-Making and Stochastic Routing in Large Networks via Distributed Supervision of Probabilistic Automata. SIAM Journal on Control and Optimization. 2014 January; 52(4):2512-2547. Available from: http://epubs.siam.org/doi/10.1137/110857507 DOI: 10.1137/110857507
d. Chattopadhyay I, Kuchina A, Suel G, Lipson H. Inverse Gillespie for inferring stochastic reaction mechanisms from intermittent samples. Proceedings of the National Academy of Sciences. 2013 July 22; 110(32):12990-12995. Available from: http://www.pnas.org/cgi/doi/10.1073/pnas.1214559110 DOI: 10.1073/pnas.1214559110

3. Algorithmic Analysis of Genomic Viral Genome Databases at scale to predict sequence divergence and emergence of novel pathogens: As we begin to recover from the COVID-19 pandemic, a key question is if we can avert such disasters in future. Current surveillance protocols generally focus on qualitative impact assessments of viral diversity These efforts are primarily aimed at ecosystem and human impact monitoring, and do not help to precisely quantify emergence. Dr. Chattopadhyay's recent and ongoing work aims to address this gap in knowledge by designing new scalable algorithms that carry out pattern discovery in sequence databases, with the objective of predicting spillover and species jumps before they happen. A new metric for comparing biologically meaningful genomic differences, the q-distance, precisely quantifies the probability of spontaneous jump by random chance. Learning from patterns of mutations from large sequence databases, the q-distance adapts to the specific organism, the background population, and realistic selection pressures; demonstrably improving inference of ancestral relationships and future trajectories. As important application, Dr. Chattopadhyay's work shows that the q-distance predicts future strains for seasonal Influenza, outperforming World Health Organization (WHO) recommended flu-shot composition almost consistently over two decades.

a. Chattopadhyay,Ishanu,, Sizemore,Nicholas,, Oliphant,Kaitlyn,, Martin,Camilia,, Claud,Erika,. A Digital Twin of the Infant Microbiome to Predict Neurodevelopmental Deficits. [Preprint]. 2023 January 05. DOI: 10.21203/rs.3.rs-2406518/v1
b. Chattopadhyay,Ishanu,, Wu,Kevin,, Li,Jin,, Esser-Kahn,Aaron,. Emergenet: Fast Scalable Pandemic Risk Assessment of Influenza A Strains Circulating In Non-human Hosts. [Preprint]. 2022 December 23. DOI: 10.21203/rs.3.rs-2336091/v1
c. Huang Y, Chattopadhyay I. Universal risk phenotype of US counties for flu-like transmission to improve county-specific COVID-19 incidence forecasts. PLOS Computational Biology. 2021 October 14; 17(10):e1009363-. Available from: https://dx.plos.org/10.1371/journal.pcbi.1009363 DOI: 10.1371/journal.pcbi.1009363
d. Chattopadhyay I, Kiciman E, Elliott JW, Shaman JL, Rzhetsky A. Conjunction of factors triggering waves of seasonal influenza. Elife. 2018 Feb 27;7 PubMed Central PMCID: PMC5864297.

Complete List of Published Work in My Bibliography:
https://www.ncbi.nlm.nih.gov/myncbi/ishanu.chattopadhyay.2/bibliography/public/

BIOGRAPHICAL SKETCH

Provide the following information for the Senior/key personnel and other significant contributors.
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NAME: Michael E. Msall, MD

eRA COMMONS USER NAME (credential, e.g., agency login): MMSALL

POSITION TITLE: Professor of Pediatrics, Chief of Developmental and Behavioral Pediatrics

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.)*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	Completion Date MM/YYYY	FIELD OF STUDY
Northwestern University, Evanston, IL	B.A.	06/1973	Mathematics
Northwestern University Medical School, Chicago, IL	M.D.	06/1979	Medicine
Univ. of Maryland Medical School, Baltimore, MD	Internship	06/1980	Pediatrics
Brown University Medical School. Providence, RI	Residency	06/1982	Pediatrics
Kennedy Krieger Institute, Johns Hopkins University, Baltimore, MD	Postdoc Fellow	06/1984	Neurodevelopment
Johns Hopkins Hospital, Baltimore, MD	Research Fellow	06/1985	Developmental Genetics

A. Personal Statement I am pleased to confirm my wholehearted support for Dr. Chattopadhyay's PA-18-399 NIH R03 project entitled "**Universal Early Screening For Autism Risk using Comorbidity Pattern Discovery in Past Medical Encounters".** During the past 35 years, I have been involved in understanding the complexity of early child developmental trajectories after translational technologies, whether genetic, pulmonary, cardiac, oncological, or neurosensory. With interdisciplinary colleagues, I developed a pediatric functional independence measure (WeeFIM™**)** that was used for 3-7 year outcomes in four NIH Multicenter RCT Studies: NEI Cryosurgery for Retinopathy of Prematurity where 1 in 12 children had an autism spectrum disorder (PMID: 11061766), NICHD Fetal Surgery for Myelomeningocele (PMID:21327591), NICHD CoolCap trial for neonatal encephalopathy (PMID:22258133) and NCI Induction Chemotherapy and Conformal Radiation Therapy for Very Young Children With Nonmetastatic Medulloblastoma(PMCID: PMC3434977). More recently I developed the Warner Initial Development Evaluation of Adaptive and Functional Skills (WIDEA-FS) which tracks emerging motor, communicative and adaptive competencies in the first two years of life. My current collaborative projects include tracking early childhood health and developmental trajectories after critical neonatal illness (Andrews, Liley, Wu); 18 year outcomes of extremely low gestational age (ELGAN) preterm survivors with respect to health and development in settings of inflammatory biomarkers and placenta epigenetics(O'Shea); In this cohort we found that 1 in 4 experienced intellectual disability and 1 in 10 children met criteria for an Autism Spectrum Disorder. I am also involved in the 30 year physical, behavioral, and social health outcomes after neonatal intensive care linked to biomarkers of stress and allostatic load (Sullivan); the spectrum of neurodevelopmental disorders among children, adolescents, and adults with Monogenic Diabetes (Greeley), the influence of the microbiome on developmental trajectories of preterm survivors in the first 5 years of life (Claud), and as part of MCHB Life Course Intervention Research Netwok (Halfon) and Illinois LEND(Acharya) to improve life course outcomes for individuals with prematurity, autism, intellectual disability, and cerebral palsy. I welcome working with you and your team as we examine valid ADOS diagnostic assessments using appropriate developmental observations of young children<3 years of age after positive screening for autism with the MCHAT-R. Importantly we will also link children who screen positive to developmental, educational and community support resources. I also welcome disseminating our findings at national meetings and in peer-reviewed publications.

1.Nanclares-Nogués V, Lin E, Rolland C, Cupoli JM, Msall ME. Enhancing multidisciplinary community supports for minority preschool children with autistic spectrum disorders: Promoting family centered and evidence based practices. Int Pub Health J. 2010; 2(1-special issue):69-82..
2.Luyster RJ, Kuban KC, O'Shea TM, Paneth N, Allred EN, Leviton A; ELGAN Study investigators (includes Msall, ME). The Modified Checklist for Autism in Toddlers in extremely low gestational age newborns: individual items associated with motor, cognitive,vision and hearing limitations. Paediatr Perinat Epidemiol. 2011;25(4):366-76. PMID: 21649679
3.Joseph RM, Korzeniewski SJ, Allred EN, O'Shea TM, Heeren T, Frazier JA, Ware J, Hirtz D, Leviton A, Kuban K; ELGAN Study Investigators (includes Msall ME). Extremely low gestational age and very low birthweight for gestational age are risk factors for autism spectrum disorder in a large cohort study of 10-year-old children born at 23-27 weeks' gestation.Am J Obstet Gynecol. 2017;216(3):304.e1-304.e16. PMID:2784719
4.Berg KL, Acharya K, Shiu CS, Msall ME. Delayed Diagnosis and Treatment Among Children with Autism Who Experience Adversity.J Autism Dev Disord. 2018;48(1):45-54. PMID:2886484
Rationale of the 4 Publications: #1 Describes an approach for linking vulnerable families of preschoolers to early detection and evidence based interventions. #2 Describes how MCHAT used in high risk neonatal followup programs is not specific for autism. #3Describes antecedents of an autism spectrum disorder where prevalence rates were 15% at 23-24 weeks, 6.5% at 25-26 weeks, and 3.4% at 27 weeks gestational age #4 Examines gaps in early detection of autism among children experiencing adversity.

B. Positions, Professional Memberships, Boards and Honors

07/1985-06/1991 Assistant Professor of Pediatrics, Physical Medicine and Rehabilitation, State University of New York at Buffalo, School of Medicine, Buffalo, New York
07/1991-06/1996 Associate Professor of Pediatrics, Physical Medicine and Rehabilitation, State University of New York at Buffalo, School of Medicine, Buffalo, New York
07/1996-09/2003 Professor of Pediatrics and Human Development, Brown University Medical School, and Director, Child Development Center, Hasbro Children's Hospital and Rhode Island Hospital, Brown University, Providence, Rhode Island
10/2003-present Professor of Pediatrics, Section Chief, Developmental and Behavioral Pediatrics; Co-Director Joseph P Kennedy Research Center on Intellectual and Developmental Disabilities; Member, Center for Human Potential & Public Policy, Harris School of Public Policy; Affiliated Faculty, Center for Health & Social Sciences (CHeSS). The University of Chicago

Board Certifications, Medical Licensure

1984 American Board of Pediatrics, Diplomate, Number 31194 (November 11, 1984)
2001 – 2021 American Board of Pediatrics and American Board of Psychiatry and Neurology, Diplomate in Neurodevelopmental Disabilities, Number 94 (April 3, 2001-2012); Recertified May 18, 2011-2021.
2003 – 2022 American Board of Pediatrics, Subspecialty Certification in Developmental and Behavioral Pediatrics (March 6, 2003-2012). Recertified September 25, 2012-2022.
2003-2020 State of Illinois Medical License, Number 036-110199

Professional Memberships

American Academy of Cerebral Palsy and Developmental Medicine, Fellow, December 1, 1985;
Treatment Outcomes Committee Member 1998-2014;
Strategic Planning Committee, Complex Care Coordination Committee 2014-2017
Cerebral Palsy Common Data Elements. Workgroup on Neurocognitive,Social and Emotional Assessments 2014-2017.
Complex Care Coordination Committee Work Group 2016-present
American Pediatric Society (elected), 1997-present
Child Neurology Society (elected), 2006-present
International Child Neurology Society (elected), 2006-present
Society for Pediatric Research (elected), 1993-present

Honors

1985 Sir James Carreras International Variety Club Award for Physician Leadership in Neurodevelopmental Disabilities (AACPDM)
2000 Governor's Award, Rhode Island Early Intervention Coordinating Committee
2001 Rhode Island Human Services Feather Award, CEDARR Initiative

2003 Certificate of Recognition: Advocacy for Children with Special Needs -R.I. Department of Health
2010 Kristine Sandberg Knisely Lectureship Award. Hospital of the University of Pennsylvania
2012 Pathways Pioneer Award for Leadership in Clinical Care Research and Advocacy for Children at Risk of Neurodevelopmental Disability.)
2013 March of Dimes 16th Annual Jonas Salk Health Leadership Award for Research
2016 Mentor Award, American Academy of Cerebral Palsy and Developmental Medicine
2020 **Jane Sweeney Award of the American Academy of Physical Therapy** for Enablement Counseling for Children with Cerebral Palsy to optimize child health, neuroplasticity, functioning, and participation.

C. Contributions to Science

During my pediatric residency, I was able to experience how advances in translational medicine increased the survival of children with life threatening and physiological destabilizing conditions. However, I asked the question: How do these children fare with respect to their long-term physical, developmental and behavioral health outcomes?. I undertook fellowship training at John Hopkins Hospital Kennedy Institute (now Kennedy Krieger) and was able to experience interdisciplinary training in developmental neurology, genetics, child development and rehabilitation. This training led me to understand that three interrelated themes would be necessary for improving health developmental and behavioral functioning and community participation for children, adolescents and young adults at risk for, or experiencing, neurodevelopmental disabilities.

Theme 1: ***To understand what factors increase survival and decrease neurodisability in mobility, communication, self-care, social, and cognitive skills after neonatal technologies***

Between 1983 and 1986 neonatologists investigated the role of exogenous surfactant replacement in the management of children born extremely preterm (<28 weeks gestation) and extremely low birth weight (<1000 Grams). This intervention dramatically increased survival and is one of the top 10 pediatric scientific advances of the past 50 years. I was able to examine the spectrum of neurodevelopmental disability in survivors at 5 years; I developed a scale of measuring children's functioning (the Wee-FIM) and proposed that the concept of kindergarten readiness could help inform long term aspects of children's physical, developmental, and social competencies. In addition knowing the supports that children required for educational success could help in the discovery of developmental processes that underlie long-term adolescent and adult health, educational and vocational disability. This resulted in a series of 51 papers by me and 20 model outcome studies by others involving children who were extremely preterm who were born in Australia, Canada, UK, France, and Scandinavia. In addition this framework has helped inform lifecourse physical, behavioral and social health outcomes of a Rhode Island preterm cohort who have been followed to age 23 years.

a. Msall ME, Buck GM, Rogers BT Catanzaro, NL. Kindergarten readiness after extreme prematurity. Am J Dis Child. 1992; 146:1371-1375. (PMID: 1384309)
b. Msall ME, Phelps DL, DiGaudio KM, Dobson V, Tung B, McClead RE, Quinn GE,Reynolds JD, Hardy RJ, Palmer Severity of neonatal retinopathy of prematurity is predictive of neurodevelopmental functional outcome at age 5.5 years. Behalf of the Cryotherapy for Retinopathy of Prematurity Cooperative Group. Pediatrics. 2000;106(5):998-1005. PMID: 11061766.
c. Sullivan MC1, Msall ME, Miller RJ 17-year outcome of preterm infants with diverse neonatal morbidities: Part 1--Impact on physical, neurological, and psychological health status. JSpec Pediatr Nurs 2012;17:226-41. PMCID: PMC3385002.
d. Sullivan MC, Winchester SB, Msall ME. Prematurity and cardiovascular risk at early adulthood. Child Care Health Dev. 2018 Sep 21. doi: 10.1111/cch.12616.PubMed PMID: 30239014.

Theme 2: ***To advance measures of children's functioning in basic activities.***

In order to understand the impact of disability on daily activities, I developed the Wee FIM, the pediatric Functional Independence Measure for ages 2.5 - 6 Years, the Warner Initial Developmental Evaluation of Functional and Adaptive Skills for children ages birth to 2.5 years, and the Child Health Impairment-Functioning, Participation, and Participation (CHI-FPS) Checklist for children 7-18 years. These instruments were respectively normed on over 1500 neurotypical children and over 1500 children with disabilities. These tools were also validated against specific standardized motor, communicative, developmental, psychological, and educational achievement tests. This resulted in 35 publications. I have highlighted four below. In addition there are also 147 PubMed citations using the WeeFIM in children with cerebral palsy, spina bifida, genetic disabilities, and traumatic injuries.

a. Hogan DP, Rogers ML, Msall ME. Functional limitations and key indicators of well-being in children with disability. Arch Pediatr Adolesc Med. 2000;154(10):1042-8.PMID: 11030857

b. Msall M, Avery R, Tremont MR, Lima JC, Rogers M, Hogan DP. Functional disability and school activity limitations in 41,300 school-age children: Relationship to medical impairments. Pediatrics. 2003; 111(3):548-553. (PMC165589)
c. Ottenbacher KJ,Msall ME, Lyon N, Duffy LC,Ziviani J, Granger CV, Braun S,Feidler RC. The WeeFIM instrument: its utility in detecting change in children with developmental disabilities. Arch Phys Med Rehabil. 2000;81(10):1317-26. PMID: 11030496.
d. Msall ME, Avery RC, Msall ER, Hogan DP. Distressed neighborhoods and child disability rates: analyses of 157,000 school-age children. Dev Med Child Neurol. 2007;49(11):814-7.PMID: 17979858.

Theme 3: ***To understand, in high risk populations the importance of indicators of child health, development, and cognitive functioning and family well-being.***

These are highlighted by the following 4 studies In addition over 136 PubMed citations have attempted to use indicators of neurodevelopment and cognitive functioning in order to understand the impact of child disability on health, education and family life.

a. Gollenberg AL, Lynch CD, Jackson LW, McGuinness BM, Msall ME. Concurrent validity of the parent-completed Ages and Stages Questionnaires with the Bayley Scales of Infant Development II in a population-based study Child: Care Health and Development. 2010; 36(4):485-490. (PMID: 20030657
b. Patrianakos-Hoobler AI, Msall ME, Huo D, Marks JD, Plesha-Troyke S, Schreiber MD. Predicting school readiness from neurodevelopmental assessments at age 2 years after respiratory distress syndrome in infants born preterm. Dev Med Child Neurol. 2010;52(4):379-85. PMCID: PMC289279
c. Sriram S, Schreiber MD , Msall ME ,Kuban KCK, Joseph RM, O' Shea, MT Allred EN and Leviton, A for the ELGAN Study Investigators. Cognitive Development and Quality of Life Associated with BPD in 10-Year-Olds Born Preterm. Pediatrics 2018 Jun;141(6). pii: e20172719. doi: 10.1542/peds.2017-2719. Epub 2018 May 17.PMID:29773664
d. Logan JW, Allred EN, Msall ME, Joseph RM, Michael O'Shea TT, Heeren T, Leviton A, Kuban KCK; ELGAN Study Investigators. Neurocognitive function of 10-year-old multiples born less than 28 weeks of gestational age. J Perinatol. 2018 Nov 21.doi: 10.1038/s41372-018-0273-x. [Epub ahead of print] PubMed PMID: 30464222.

Partial list of 131 of Dr. Msall's peer-reviewed publications 2002-current:

Display the 131 citations in PubMed

D. RESEARCH SUPPORT

Ongoing

HRSA/MCHB T73 MC11047 Acharya (UIC) & Sobotka (UChicago) 09/01/08 – 06/30/21
Leadership Education in Neurodevelopmental and Related Disorders Training Program (LEND) Dr. Msall is the Pediatric Discipline Coordinator with emphasis on life course outcomes of children, adolescents, and adults with cerebral palsy, intellectual disability, genetic disability and autistic spectrum disorders.
Role: Pediatric Discipline Coordinator

NIH/NICHD R01 HD098095-01A1 White-Traut (MCW) & Msall (UChicago) 04/15/20—03/31/22
Implementation of an Evidence-Based Parentally Administered Intervention for Preterm Infants This research tests whether this well-established **H-HOPE intervention can be implemented with support and sustained independently for 6 months**. During the infant's NICU stay, nursing staff teach parents about their infant and how to administer the developmental interventions. Role: PI for UChicago subaward

NIH/NIEHS R01 ES031615 (Olopade) 07/01/20 – 03/31/25
Impact of household air pollution (HAP) in-utero through early childhood on neurocognitive development from infancy to 8 years (HAPCOG Study)
Studies neurodevelopmental outcomes for children over the first 8 years of life, comparing prenatal and early life exposure to household air pollution and examination of maternal cognition, psychosocial stress and quality of home environment and how they influence developmental outcomes for children. Role: Co-investigator

NIH/NICHD UG3OD023348 (O'Shea/Msall, Hunter) 09/21/16 – 08/31/23
ELGAN 3: Environment, Epigenetics, Neurodevelopment & Health of Extremely Preterm Children The study includes 889 survivors of extremely low gestational age newborns (ELGANS, <28wks gestation) prospectively followed to age 18 years evaluating the relationship between early biomarkers (placental characteristics and blood proteins), inflammation, and physical and behavioral health outcomes. Role: PI UChicago Site and Co-PI for overall study.

NIH/NINDS U01 NS092764 NINDS (Wu/Juul) 09/30/16 – 06/30/21
***High-dose Erythropoietin for Asphyxia and Encephalopathy* (HEAL)**
Hypothesis: Epo given to cooled infants with moderate/severe HIE reduces the combined primary outcome of death or neurodevelopmental impairments from 49%to 33%. Role:Co-investigator

CP01 Pilot (Peyton and Msall) 07/01/18 - 06/30/21
NIDR-Ability Labs:
Use of Baby Moves for the early detection of Children at highest risk for Cerebral Palsy.
This study of 300 high risk preterm infants from UChicago, Northwestern, University of Illinois at Chicago and Loyola University Chicago uses a video app at 12-16 weeks corrected age with centralized readers linked to neuromotor assessments to determine which children are at highest risk for cerebral palsy. Role: Co-PI

Cerebral Palsy Research Foundation (Msall) 01/01/16 – 12/31/21 Travel only
Enablement Counseling Practices for Children at Highest Risk for Cerebral Palsy: Promoting Parent-Professional Learning Activities During Daily Routines
This award supports Dr. Msall's travel to Sydney, Melbourne, Brisbane and Perth Australia for 2-4 weeks each year to observe interdisciplinary counseling practices. Aims: 1) to provide positive information and individualized supports for families of children at highest risk for CP using enablement counseling and 2) Create standardized observations using home videos of play and feeding to promote activity-based learning.

Cerebral Palsy Alliance Research Found. (Davis) 03/01/18 – 02/28/22
Successfully negotiating life challenges: Learnings from adults with cerebral palsy
Study goals: (a) how people with cerebral palsy have successfully negotiated major challenges of adulthood, (b) what factors contributed to successful outcomes, (c) what supports were needed\useful in achieving these outcomes, and (d) how stories of success differ from less favorable outcomes. Role: Co-Investigator, receiving travel funds for trip to Australia. Travel Only

NIH/NICHD-NHLBI NCT01353313 (DeMauro PI) 07/01/17 – 06/30/21
NRN Hydrocortisone for BPD Trial Bronchopulmonary dysplasia (BPD) affects up to half of extremely preterm infants, and is associated with adverse respiratory, developmental, educational, and health economic outcomes. his proposed "tracking" study is an observational follow-up study of the 3-4-year medical status and 5 year pulmonary and cognitive outcomes. Role: Consultant

R01 NR018147-01 NIH/NINR (Sullivan/Msall) 02/01/19 – 01/31/24
Allostatic Load & Epigenetic Mechanisms in Lifecourse Trajectories of Premature Infants at Age 30
The Wave 10 Cohort at age 30 years will examine cumulative impact of medical and socioeconomic risk and protection , and stress biomarkers on adult outcomes of physical and psychological health, adaptive function, executive function, work and social competence. .
Role Site PI and Project leader of neurodevelopment and behavior health outcomes

Thrasher Research Fund (Mulkey/Msall/Peyton) 12/01/19 – 11/30/22
Developmental Outcome after in Utero ZIKV Exposure in Children without Congenital Zika Syndrome
Goal: Determine if ZIKV-exposed children without CSZ have lower multi-domain developmental assessment scores in motor, cognitive, communicative, and executive function skills at 3 and 4 years of age, compared to non-ZIKV exposed controls. Role: Co-I and site PI for the UChicago component of the award.

NIH R01 HD102445 (Mulkey/Msall) 09/10/20 – 06/30/25
Childhood Outcome after In Utero ZIKV Exposure
Utilizing behavioral and neuroimaging techniques to examine neurodevelopmental outcomes in school-aged children who were prenatally exposed to ZIKV but who did not develop congenital Zika Syndrome with the goal of characterizing the spectrum of neurologic outcomes to provide an evidence-base for future treatment guidelines. Co-Investigator, and leader of UChicago component of the award.

Completed (past three years)
NIH/NICHD UG3OD023281 (Claud/Gilbert) 09/30/16 – 09/01/19
The Microbiome as a Potential Mediator of Socio-economic Disparities in Preterm Infant Neurodevelopmental Trajectories from NICU Discharge to School Age is part of the NICHD Environmental Influences on Child Health Outcomes(ECHO) Consortium The goal of this proposal is to demonstrate that microbiome development influences health and neurodevelopmental outcomes at age 2 and 5 Years among high risk preterm infants. Furthermore, we will identify environmental factors associated with SES that influence the microbiome. Role: Co-Investigator

BIOGRAPHICAL SKETCH

Provide the following information for the Senior/key personnel and other significant contributors.
Follow this format for each person. **DO NOT EXCEED FIVE PAGES.**

NAME: Peter J. Smith, M.D., M.A

eRA COMMONS USER NAME (credential, e.g., agency login): pjsmith

POSITION TITLE: Associate Professor, Pediatrics

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.)*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	Completion Date MM/YYYY	FIELD OF STUDY
University of Notre Dame, Notre Dame, IN	B.A	1990	Theology and Pre-Medicine
University of Edinburgh, Scotland	Rotary Scholarship	1991	Postgraduate Studies
Duke University, Durham, NC	M.D.	1995	Medicine
General Pediatrics, Washington University, St. Louis, MO	Residency	1998	General Pediatrics
Harvard Medical School & Children's Hospital, Boston, MA	Fellowship	2000	Neurodevelopmental Disabilities
Harvard Medical School & Children's Hospital, Boston, MA	Fellowship	2002	Developmental-Behavioral Pediatrics
Boston College, Boston, MA	M.A	2002	Theology

A. Personal Statement

As a clinician, educator, and scholar, my work has primarily focused upon the most vulnerable populations: children with disabilities, children with medical complexity, children with behavioral-mental health disorders, as well as the systems that support these children (and their families). In addition, I have developed educational programs for physicians (residents, fellows, practicing clincians), medical students, and nurse practicioners. I have collaborated extensively, both locally and at distance (including internationally), and across disciplines.

B. Positions

2001-2002 Instructor, Department of Pediatrics, Harvard University,
2002-2012 Assistant Professor, Department of Pediatrics, The University of Chicago,
2002-present Member, MacLean Center for Clinical Medical Ethics
2002-2003 Member, Section of General Pediatrics
2003-present Member, Section of Developmental and Behavioral Pediatrics
2012-present Associate Professor, Department of Pediatrics, Section of Developmental and Behavioral Pediatrics, The University of Chicago

C. Research Support

Ongoing Research Support:

1. HRSA. T73 MC11047 Overall PI: K. Acharya (UIC). My role: Ethics Consultant. Illinois Leadership for Children with Neurodevelopmental and Related Disabilities (IL LEND), Sub-award to University of Chicago Annual Total Direct Costs $50,000. Project Period 09/01/16 – 08/31/212. 1% Effort.
2. Coleman Foundation. My role: Co-PI. Coleman Foundation Training Program in Developmental & Behavioral Pediatrics (DBP) for Advance Practice Registered Nurses (APRN's) at Almost Home Kids. Total grant $425,000. Project period 09/01/18-08/31/21.

3. The Oberweiler Foundation. My role: Co-PI. Keith Veselik, M.D. Medical Education Program at Almost Home Kids. Total grant $75,000. Project period 11/01/18-10/31/21

Completed Research Support:

1. CDC P30 CD000147. PI: D Meltzer. My Role: PI of pilot project funded through this primary grant for the Chicago Center of Excellence in Health Promotion Economics (CCEHPE) at the University of Chicago. Developing an Instrumental Variables Approach for Generating Causal Inferences of Breast Feeding's Impact on Infant Development, Total Direct Costs $23,687, 3% Effort. Project Period: 01/01/08 – 06/30/09.
2. HRSA/AAP H02 MC02609. PI: P. Smith. Illinois Medical Home Project. Direct Costs: $20,000, 5% Effort. Project Period 09/01/07-06/30/11
3. FACCTS (France and Chicago Collaborating in the Sciences) (Smith & Stutz) Efficacy Assessment of Folinic Acid and Thyroid Hormone Systemic Treatment on the Psychomotor Development of Young Children with Down syndrome. $10,000, 0% effort. Project Period 01/31/13-06/30/13.
4. IJL (Institut Jérôme Lejeune). Efficacy Assessment of Folinic Acid and Thyroid Hormone Systemic Treatment on the Psychomotor Development of Young Children with Down syndrome. $85,939, 3% Effort. Project Period 07/01/13 - 08/31/14.
5. HRSA. T73 MC11047 Overall PI: K. Acharya (UIC). My role: Pediatrics Coordinator. Illinois Leadership for Children with Neurodevelopmental and Related Disabilities (IL LEND), Sub-award to University of Chicago Annual Total Direct Costs $50,000. Project Period 09/01/08 – 08/31/16. 2% Effort.

Peer-reviewed publications in the primary literature, exclusive of abstracts:

1. Smith PJ, Morris A, Reller B. 2003. Predicting Urine Culture Results by Dipstick Testing and Phase Contrast Microscopy. *Pathology* 35:161-165. http://www.swetswise.com.proxy.uchicago.edu/eAccess/viewFulltext.do?articleID=155854556
2. Smith PJ, Mahowald MM. 2007. Review of Choosing Children: The Ethical Dilemmas of Genetic Intervention. Perspectives in Biology and Medicine 50(3):471-474. http://muse.jhu.edu/journals/perspectives_in_biology_and_medicine/v050/50.3smith.html
3. Bauer SC, Smith PJ, Chien AT, Berry AD, Msall ME. 2009. Educating Pediatric Residents About Developmental and Social-Emotional Health. *Infants & Young Children* 22(4):309-320. http://journals.lww.com/iycjournal/Fulltext/2009/10000/Educating_Pediatric_Residents_About_Developmental.7.aspx
4. Walsh-Lang C, Smith PJ, Friedman Ross L. 2009. Ethics and Professionalism in the Pediatrics Curriculum: A Survey of Pediatric Program Directors. *Pediatrics* 124(4): 1143-51. http://pediatrics.aappublications.org/content/124/4/1143.full
5. Leewenburgh-Pronk,WG, Smith, PJ, vanVught AJ, Lantos, JD, Tibboel, D, deHoog, M, Buysse, C. 2012. Ethics Rounds: A Baby with Meningococcemia and Septic Shock. *Pediatrics* 130(1): 134-38. http://pediatrics.aappublications.org/content/130/1/134.full.pdf+html
6. Tian, W, Smith, PJ, Msall, M. 2015. An Emerging Problem Due to Prior Successes: A Case Report of a Medically Complex Child in Need of a Comprehensive Medical Home. *Pediatric Annals* 44(1): 36-39. http://www.healio.com/pediatrics/journals/pedann/2015-1-44-1/%7B00788dc1-ec5f-4909-849d-3a4e5768dc60%7D/medically-complex-children-and-early-intervention-for-comprehensive-medical-care-at-home
7. Kuo DZ, Houtrow AJ, AAP Council on Children with Disabilities. Recognition and Management of Medical Complexity. *Pediatrics*. 2016; 138(6): e20163021 http://pediatrics.aappublications.org/content/early/2016/11/17/peds.2016-3021
8. Friedman SL, Norwood KW, AAP Council on Children with Disabilities. Out-of-home Placement for Children and Adolescents with Disabilities – Addendum: Care Options for Children and Adolescents With Disabilities and Medical Complexity. *Pediatrics*. 2016; 138(6): e20163216. http://pediatrics.aappublications.org/content/early/2016/11/24/peds.2016-3216
9. Cohen GJ, Weitzman CC. AAP Committee on Psychosocial Aspects of Child and Family Health, AAP Section on Developmental and Behavioral Pediatrics. Helping Children and Families Deal with Divorce and Separation. *Pediatrics*. 2016; 138(6): e20163020. http://pediatrics.aappublications.org/content/138/6/e20163020

10. Gleason MM, Goldson M, Yogman MW. AAP Council on Early Childhood, AAP Committee on Psychosocial Aspects of Child and Family Health, AAP Section on Developmental and Behavioral Pediatrics. Addressing Early Childhood Emotional and Behavioral Problems. *Pediatrics*. 2016; 138(6); e20163023. http://pediatrics.aappublications.org/content/138/6/e20163023
11. Glassgow AE, Martin MA, Caskey R, Gerges M, Johnson M, Marko M, Perry-Bell K, Risser HJ, Smith PJ, & Van Voorhees B. An Innovative Health Care Delivery Model for Children with Medical Complexity. *Journal of Child Health Care*; Vol 21, Issue 3, pp. 263 – 272 First published date: June-05-2017; 10.1177/1367493517712063
12. Adams RC, Levy SE. AAP Council On Children With Disabilities. Shared Decision-Making and Children with Disabilities: Pathways to Consensus. *Pediatrics*. 2017. 139(6): e20170956.
13. Hauer J, Houtrow AJ, AAP Section on Hospice and Palliative Medicine, Council On Children With Disabilities. Pain Assessment and Treatment in Children With Significant Impairment of the Central Nervous System. *Pediatrics*. 2017; 139(6): e20171002
14. Renee M. Turchi, Vincent C. Smith, Committee on Substance Use and Prevention and the Council on Children with Disabilities, The Role of Integrated Care in a Medical Home for Patients With a Fetal Alcohol Spectrum Disorder. *Pediatrics* 2018;142; 10.1542/peds.2018-2333
15. Mattson G, Kuo DZ, AAP Committee on Psychosocial Aspects of Child and Family Health, AAP Council on Children with Disabilities. Psychosocial Factors in Children and Youth With Special Health Care Needs and Their Families. *Pediatrics*. 2019;143(1):e20183171
16. Houtrow A, Murphy N, AAP Council on Children With Disabilities. Prescribing Physical, Occupational, and Speech Therapy Services for Children With Disabilities. *Pediatrics.* 2019; 143(4):e20190285
17. Hyman SL, Levy SE, Myers SM, AAP Council on Children With Disabilities, AAP Section on Developmental and Behavioral Pediatrics. Identification, Evaluation, and Management of Children With Autism Spectrum Disorder. *Pediatrics*. 2020;145(1): e20193447
18. Statter MB, Noritz G, and Committee on Bioethics, & Council On Children with Disabilities. Children With Intellectual and Developmental Disabilities as Organ Transplantation Recipients. *Pediatrics.* Volume 145, number 5, May 2020: e20200625; DOI: https://doi.org/10.1542/peds.2020-0625
19. Poumeaud F, Mircher C, Smith PJ, Faye PA, Sturtz FG. Deciphering the links between psychological stress, depression, and neurocognitive decline in patients with Down syndrome. *Neurobiology of Stress*. Volume 14, 2021,100305, ISSN 2352-2895, https://doi.org/10.1016/j.ynstr.2021.100305

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NAME: James Mitchell

eRA COMMONS USER NAME (credential, e.g., agency login): JMITCHELL5

POSITION TITLE: Associate Professor of Pediatrics

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.)*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	Completion Date MM/YYYY	FIELD OF STUDY
Northwestern University, Evanston, IL	BA	06/1979	Biology
Rush Medical College, Chicago, IL	MD	06/1983	Medicine
The University of Chicago, Chicago, IL	Residency	06/1986	Pediatrics
The University of Chicago, Chicago, IL	Chief Resident	06/1987	Pediatrics

A. Personal Statement

The proposed study is a prospective real-time trial of a previously created predictive algorithm in a general pediatrics clinic. The goal is to develop and validate the efficacy of machine-inferred digital biomarkers for autism, mined automatically from the Electronic Health Record databases. In abroad range of clinical settings with physicians from the Section of Academic Pediatrics, children will be screened who will then receive immediate diagnostic evaluations. These performance sites will be within the Department of Pediatrics at the Comer Children's Hospital and at its many affiliated community clinics. These sites provide a demographic diversity of patients, and each provider brings a wealth of experience in real-world practice application. I am the Medical Director for the Ambulatory setting and my focus is on implementation science. I develop and execute the strategies required to affect practice or behavioral change in the ambulatory setting. There are numerous guidelines for pediatric practice, both for illness and for wellness visits. The challenges are disseminating the information among relevant stakeholders, improving their understanding of the guidelines, then operationalizing the new task in a manner that is logical, and is easy to incorporate in practice. When looking to affect long-term change, I also identify metrics and measurements that will allow members of the care-team to sustain the desired goals. For most of the practice changes accomplished, I have engaged not only physicians, but also nurse practitioners, medical assistants, billing staff, Information technology members and relevant administrative leaders. I also emphasize a practical awareness of finite resources, and thinking creatively with technology as well as the value of some "lo-tech" solutions.

Under my leadership, we have launched projects increasing patient access for acutely ill children, increased our Human Papilloma Virus (HPV) completion rates from (6%) to (65%), and we now assure that the vast majority of our patients are appropriately screened for autism, development, hearing, vision, maternal depression and adolescent depression. With the deployment of each screening process, we identified workflows and improved the ease of practice for providers. This aspect of care is often overlooked as more tasks are assigned in the electronic medical record, but it critical in gaining provider "buy-in" and in sustaining change.

Our culture of collaborative excellence exemplifies the attitudes and skills that future leaders must have to be effective in transforming health care, especially in an underserved setting. When our new processes are

executed within the setting of Comer clinics, we are quickly able to discover if our plans really have broad applicability.

B. Positions and Honors

1987-1988	Clinical Instructor, Pediatrics, University of Chicago, Chicago, IL
1988-1989	Instructor of Clinical Pediatrics, University of Chicago, Chicago, IL
1989-2010	Assistant Prof. of Clinical Pediatrics, University of Chicago, Chicago, IL
1989-current	Cook County Physicians Association- Secretary 1990-1991
1990	Fellow, American Academy of Pediatrics
2008-current	American Academy of Pediatrics, Council on Community Pediatrics
2010-present	Associate Professor of Pediatrics, University of Chicago, Chicago, IL
2014-current	American Academy of Pediatrics, Council on Foster Care, Adoption and Kinship Care
2018	Fellow, Institute of Medicine of Chicago

C. Contributions to Science

Works that are publically available (includes: websites, interviews, publications in the popular press, testimony, computer programs, etc.):

Foster Care System in Illinois. Much of Dr. Mitchell's scholarly work has centered around the foster care system and identifying opportunities to optimize health care for this population. At any given time there are approximately 450,000 children in foster care in the United States. Illinois has 15,000 of these children and 5000 foster children reside in Cook County were he is responsible for managing the health care system for this population. The majority of physicians managing youth in foster care have had no additional training for this population. Although recognition of child abuse is incorporated into pediatric residency training, identification of the changes required for children in foster care is not generally addressed in US pediatric residency programs. Seventy (70%) of Illinois children in foster care are not victims of child abuse, but rather victims of various forms of neglect, therefore abuse recognition alone does not prepare future pediatricians for the children they will encounter living in foster care.

His most recent project with foster care is the HealthWorks Medical Home Transition Program (MHTP), which launched as a pilot in January 2018. The premise of the MHTP program is that while we understand every child needs a medical home, and especially those in foster care, there are nuances of foster care greatly influence the timing and effectiveness of initiating a medical home for these children. I am not aware of any similar program in the United States. He created a suite of four new transitional forms for children in foster care. The forms are single-page, standardized sign-outs which capture brief, significant comments between foster parents, primary care physicians, mental health providers and educational providers. DCFS has reviewed and approved these forms which are being piloted in Cook County.

Unfortunately, these items are not accessible for public use.

D. Research Support

None