

Getting Started Workshop: The Fragile Families Challenge

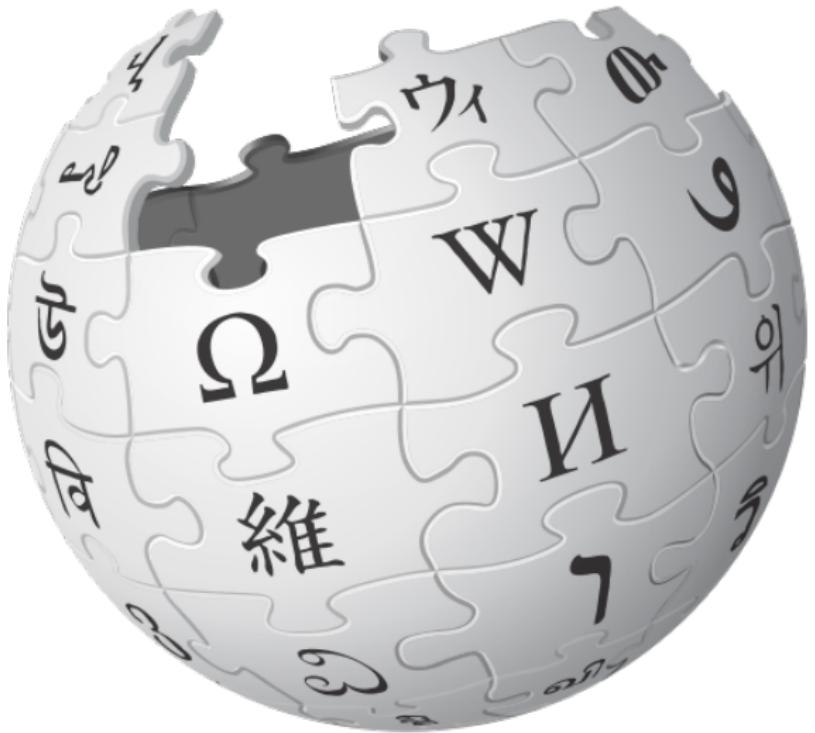
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Initial sequencing and analysis of the human genome

International Human Genome Sequencing Consortium*

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Combined Measurement of the Higgs Boson Mass in pp Collisions at $\sqrt{s} = 7$ and 8 TeV with the ATLAS and CMS Experiments

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- Conference for Computing in High-Energy and Nuclear Physics (CHeP03), 2003, CHeP-2003-MOLT007, arXiv: physics/0306116.
- [28] L. Moneta, K. Belasco, K.S. Cranmer, A. Lazzaro, D. Piparo, G. Schott, W. Verkerke, and M. Wolf, The ROOSTAT Project, in Proceedings of the 13th International Workshop on Advanced Computing and Analysis Techniques in Physics Research (ACAT2010) (SISSA, 2010), Phys. Sci., ACAT2010 (2010) 057 [arXiv:1009.1003].
- [29] K. Cranmer, O. Lewis, L. Moneta, A. Shihab, and W. Verkerke (ROOT), "HISTFACTORY: A tool for creating statistical models for use with ROOFIT and ROOSTAT," Tech. Rep. CERN-OPEN-2012-016, 2012 (http://cds.cern.ch/record/1456844).
- [30] ATLAS Collaboration, Electron and photon energy calibration with the ATLAS detector using LHC Run 1 data, Eur. Phys. J. C **74**, 3071 (2014).
- [31] ATLAS Collaboration, Measurement of the muon reconstruction performance of the ATLAS detector using 2011 and 2012 LHC proton-proton collision data, Eur. Phys. J. C **74**, 3130 (2014).
- [32] CMS Collaboration, Performance of CMS muon reconstruction in pp collision events at $\sqrt{s} = 7$ TeV, J. Instrum. **7**, P10002 (2012).
- [33] CMS Collaboration, Performance of electron reconstruction and selection with the CMS detector in proton-proton collisions at $\sqrt{s} = 8$ TeV, arXiv:1502.02701 [J. Instrum. to be published].
- [34] CMS Collaboration, Performance of photon reconstruction and identification with the CMS detector in proton-proton collisions at $\sqrt{s} = 8$ TeV, arXiv:1502.02702.
- [35] P.D. Dauncey, M. McKenzie, N. Waddington, and G.J. Davies, Handling uncertainty in background shapes: The discrete profiling method, J. Instrum. **10**, P04015 (2015).
- [36] ALEPH, DELPHI, L3, OPAL, SLD Collaborations, LEP Electroweak Working Group, and SLD Electroweak and Heavy Flavour Groups, Precision electroweak measurements on the Z resonance, Phys. Rep. **427**, 257 (2006).
- [37] ATLAS Collaboration, Observation and measurement of Higgs boson decays to WW^* with the ATLAS detector, arXiv:1412.2641 [Phys. Rev. D (to be published)].
- [38] ATLAS Collaboration, Evidence for the Higgs-boson Yukawa coupling to tau leptons with the ATLAS detector, J. High Energy Phys. 04 (2015) 117.
- [39] CMS Collaboration, Measurement of Higgs boson production and properties in the WW decay channel with leptonic final states, J. High Energy Phys. 01 (2014) 096.
- [40] CMS Collaboration, Evidence for the 125 GeV Higgs boson decaying to a pair of τ leptons, J. High Energy Phys. 05 (2014) 104.

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 D. E. Ferreira de Lima,^{53,t} A. Ferreir,^{167,t} D. Ferreira,^{49,t} C. Ferretti,^{89,t} A. Ferretto Parodi,^{30a,30b,t} M. Fiascaris,^{31,t}
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Fragile Families Challenge

Fragile Families Challenge

A scientific mass collaboration combining

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- ▶ predictive modeling,

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- ▶ predictive modeling,
- ▶ causal inference,

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- ▶ predictive modeling,
- ▶ causal inference,
- ▶ and qualitative interviews

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A scientific mass collaboration combining

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- ▶ causal inference,
- ▶ and qualitative interviews

to improve the lives of disadvantaged children in the US.

FF Fragile Families

& Child Wellbeing Study
PRINCETON | COLUMBIA



- ▶ Birth cohort panel study
- ▶ ≈ 5,000 children born in 20 U.S. cities
- ▶ Oversample of non-marital births
- ▶ Followed from birth through age 15

Key research question: What can be done to improve the life chances of disadvantaged children?

Hundreds of papers and dozens of dissertations

<http://crcw.princeton.edu/publications/publications.asp>

Published Articles

Authors	Date	Title / Link
Brianne Pragg, Chris Knoester	Forthcoming	"Parental Leave Use Among Disadvantaged Fathers" <i>Journal of Family Issues</i> .
Jessica Hardie, Kristin Turney	Forthcoming	"The Intergenerational Consequences of Parental Health Limitations" <i>Journal of Marriage and Family</i> .
Robin Hognas, Heidi Williams	Forthcoming	"Maternal Kinship Involvement and Father Identity in Fragile Families" <i>Journal of Family and Economic Issues</i> .
Manuel Jiménez, Roy Wade, Ofira Schwartz-Soicher, Yong Lin, Nancy Reichman	Forthcoming	"Adverse Childhood Experiences and ADHD Diagnosis at Age 9 in a National Urban Sample" <i>Academic Pediatrics</i> .
Samara Gunter	Forthcoming	"Dynamics of Urban Informal Labor Supply in the United States" <i>Social Science Quarterly</i> .
Juan Shao-Chiu, Heather Washington, Megan Kurlychek	Forthcoming	"Breaking the Intergenerational Cycle: Partner violence, child-parent attachment, and children's aggressive behaviors" <i>Journal of Interpersonal Violence</i> .
Youngmin Yi, Kristin Turney, Christopher Wildeman	Forthcoming	"Mental Health Among Jail and Prison Inmates" <i>American Journal of Men's Health</i> .
Michael McFarland, Sara McLanahan, Bridget Goosby, Nancy Reichman	Forthcoming	"Grandparents' Education and Infant Health: Pathways Across Generations" <i>Journal of Marriage and Family</i> .
Christian King	Forthcoming	"Food Insecurity and Housing Instability in Vulnerable Families" <i>Review of Economics of the Household</i> .
Wan-Yi Chen, Yookyong Lee	Forthcoming	"The Impact of Community Violence, Personal Victimization, and Paternal Support on Maternal Harsh Parenting" <i>Journal of Community Psychology</i> .
Marcia Carlson, Alicia VanOrman	Forthcoming	"Trajectories of relationship supportiveness after childbirth: Does marriage matter?" <i>Social Science Research</i> .
Jared Durtschi, Kristy Soloski, Jonathan Kimmes	Forthcoming	"The Dyadic Effects of Supportive Coparenting and Parental Stress on Relationship Quality Across the Transition to Parenthood" <i>Journal of Marital and Family Therapy</i> .
Anne Martin, Rebecca Ryan, Elizabeth Riina, Jeannie Brooks-Gunn	Forthcoming	"Coreidential Father Transitions and Biological Parents' Coparenting Quality in Early and Middle Childhood" <i>Journal of Family Issues</i> .
Lawrence Berger, Sarah Font, Kristen Slack, Jane Waldfogel	Forthcoming	"Income and child maltreatment in unmarried families: evidence from the earned income tax credit" <i>Review of Economics of the Household</i> .
Sung-Bong Cho, Ming Cui, Amy Claridge	Forthcoming	"Cohabiting parents' marriage plans and marriage realization: Gender differences, couple agreement, and longitudinal effects" <i>Journal of Social and Personal Relationships</i> .
M. Blake Berryhill	Forthcoming	"Single mothers' home-based school involvement: a longitudinal analysis" <i>Journal of Family Studies</i> .
Colin Flood, Karen Sheehan, Marie Crandall	Forthcoming	"Predictors of Emergency Department Utilization Among Children in Vulnerable Families" <i>Pediatric Emergency Care</i> .
Sarah James, Lauren Hale	Forthcoming	"Sleep Duration and Child Well-Being: A Nonlinear Association" <i>Journal of Clinical Child & Adolescent Psychology</i> .

Paula Fomby	Forthcoming	"Motherhood in Complex Families" <i>Journal of Family Issues</i>
Glenn Walters	Forthcoming	"Parent and Child Reports of Animal Cruelty and their Correlations with Parent and Child Reports of Child Delinquency" <i>Psychology, Crime & Law</i>
Cong Zhang, Catherine Cubbin, Qinying Ci	Forthcoming	"Parenting stress and mother-child playful interaction: the role of emotional support" <i>Journal of Family Studies</i>
Kei Nomaguchi, Susan Brown, Tanya M. Leyman	Forthcoming	"Fathers' Participation in Parenting and Maternal Parenting Stress: Variation by Relationship Status" <i>Journal of Family Issues</i>
Tenah Hunt, Lawrence Berger, Kristen Slack	Forthcoming	"Adverse childhood experiences and behavioral problems in middle childhood" <i>Child Abuse & Neglect</i>
Jessica Su, Rachel Dunifon	Forthcoming	"Nonstandard Work Schedules and Private Safety Nets Among Working Mothers" <i>Journal of Marriage and Family</i>
Jay Fagan, Mollie Cherson	Forthcoming	"Maternal Gatekeeping: The Associations Among Facilitation, Encouragement, and Low-Income Fathers' Engagement With Young Children" <i>Journal of Family Issues</i>
Branden McLeod	Forthcoming	"Paternal dimensions and complexities: Understanding the relationships between parental dyads and fathers' involvement among Black fathers with criminal records" <i>Journal of Family Social Work</i>
M. Blake Berryhill, Jared Durtschi	Forthcoming	"Understanding Single Mothers' Parenting Stress Trajectories" <i>Marriage & Family Review</i>
Robert Morris	2017	* Mitigating the Effects of Parental Incarceration through Social Intervention: A Longitudinal and Comparative Analysis of the Efficacy of Big Brothers Big Sisters" <i>Journal of Applied Social Science</i> , 11(1): 25 - 47.
Melissa Radey	2017	"Unmarried Mothers' Postnatal School Enrollment: The Role and Intersection of Demographic and Socioeconomic Characteristics" <i>Journal of Social Service Research</i> , 43(1): 115-128.
Paula Fomby, Cynthia Osborne	2017	"Family Instability, Multipartner Fertility, and Behavior in Middle Childhood" <i>Journal of Marriage and Family</i> , 79(1): 75-93.
Kei Nomaguchi, Wendi Johnson, Mallory Minter, Lindsey Aldrich	2017	"Clarifying the Association Between Mother-Father Relationship Aggression and Parenting" <i>Journal of Marriage and Family</i> , 79(1): 161-178.
Kristen Sobba, Brenda Prochaska, Emily Berthelot	2017	"Maternal incarceration penalty: an examination of the effect of maternal conviction and incarceration on childhood delinquency" <i>Journal of Criminal Psychology</i> , 7(1): 29 - 46.
Kimberly Turner, Maureen Waller	2017	"Indebted Relationships: Child Support Arrears and Nonresident Fathers' Involvement With Children" <i>Journal of Marriage and Family</i> , 79(1): 24-43.
Amelia Branigan	2017	"(How) Does Obesity Harm Academic Performance? (How) Does Obesity Harm Academic Performance? Stratification at the Intersection of Race, Sex, and Body Size in Elementary and High School" <i>Sociology of Education</i> , 90(1): 25-46.
Lauren McClain, Susan Brown	2017	"The Roles of Fathers' Involvement and Coparenting in Relationship Quality among Cohabiting and Married Parents" <i>Sex Roles</i> , 76(5): 334-345.
Robyn Powell, Susan Parish	2017	"Behavioural and cognitive outcomes in young children of mothers with intellectual impairments" <i>Journal of Intellectual Disability Research</i> , 61(1): 50-61.

William Schneider, Jane Waldfogel, Jeanne Brooks-Gunn	2017	"The Great Recession and risk for child abuse and neglect" <i>Children and Youth Services Review</i> , 72: 71-81.
Kristin Turney	2017	"The Unequal Consequences of Mass Incarceration for Children" <i>Demography</i> , 54: 1.
Raymond Petren	2017	"Paternal Multiple Partner Fertility and Environmental Chaos Among Unmarried Nonresident Fathers" <i>Journal of Social Service Research</i> , 43(1): 100-114.
Christian King	2017	"Soft drink consumption and child behaviour problems: the role of food insecurity and sleep patterns" <i>Public Health Nutrition</i> , 20(2): 266-273.
Marcia Carlson, Alicia VanOrman, Kimberly Turner	2017	"Fathers' Investments of Money and Time Across Residential Contexts" <i>Journal of Marriage and Family</i> , 79(1): 10-23.
Niel Wilmot, Kim Dauner	2017	"Examination of the influence of social capital on depression in fragile families" <i>Journal of Epidemiology and Community Health</i> , 71(3): 296-302.
Cole Ratcliffe, Aaron Norton, Jared Durtschi	2016	"Early Romantic Relationships Linked With Improved Child Behavior 8 Years Later" <i>Journal of Family Issues</i> , 37(5): 717-735.
Kei Nomaguchi, Wendi Johnson	2016	"Parenting Stress among Low-Income and Working-Class Fathers: The Role of Employment" <i>Journal of Family Issues</i> , 37(11): 1535-1557.
Robin Högnäs, Jason Thomas	2016	"Birds of a Feather Have Babies Together? Family Structure Homogamy and Union Stability Among Cohabiting Parents" <i>Journal of Family Issues</i> , 37(1): 29-52.
Anna Haskins	2016	"Beyond Boys' Bad Behavior: Paternal Incarceration and Cognitive Development in Middle Childhood" <i>Social Forces</i> , 95(2): 861-892.
Tammy Chang, Michelle Moniz, Melissa Piegle, Ananda Sen, Matthew Davis, Caroline Richardson	2016	"Characteristics of Adolescents at Risk for Excess Weight Gain During Pregnancy" <i>Obstetrics & Gynecology</i> , 127.
Anthony Isacco, Richard Hofscher, Sonia Molloy	2016	"An Examination of Fathers' Mental Health Help Seeking: A Brief Report" <i>American Journal of Men's Health</i> , 10(6): NP33-NP38.
Deadric Williams, Jacob Cheadle	2016	"Economic Hardship, Parents' Depression, and Relationship Distress among Couples With Young Children" <i>Society and Mental Health</i> , 6(2): 73-89.
Erin Fletcher	2016	"Match Quality and Maternal Investments in Children" <i>Review of Economics of the Household</i> , 14(1): 83-102.
Amanda Geller, Kate Jaeger, Garrett Pace	2016	"Surveys, Records, and the Study of Incarceration in Families" <i>Annals of the American Academy of Political and Social Sciences</i> , 665(1): 22-43.
Christopher Wildeman, Kristin Turney, Youngmin Yi	2016	"Paternal Incarceration and Family Functioning: Variation Across Federal, State, and Local Facilities" <i>The ANNALS of the American Academy of Political and Social Science</i> , 665(1): 80-97.
Hope Corman, Marah Curtis, Kelly Noonan, Nancy Reichman	2016	"Maternal Depression as a Risk Factor for Children's Inadequate Housing Conditions" <i>Social Science and Medicine</i> , 149: 76-83.
Manuel Jimenez, Roy Wade, Yong Lin, Lesley Morrow, Nancy Reichman	2016	"Adverse Experiences in Early Childhood and Kindergarten Outcomes" <i>Pediatrics</i> , 137(2): 1-9.
Cedric Taylor, Dilshani Sarathchandra	2016	"Migrant Selectivity or Cultural Buffering? Investigating the Black Immigrant Health Advantage in Low Birth Weight" <i>Journal of Immigrant and Minority Health</i> , 18(2): 390-396.
Robyn Powell, Susan Parish, Ilhom Akobirshoev	2016	"Health of Young Children Whose Mothers Have Intellectual Disability" <i>American Journal on Intellectual and Developmental Disabilities</i> , 121(4): 281-294.

Kristin Turney, Daniel Schneider	2016	"Incarceration and Household Asset Ownership" <i>Demography</i> , 53(6): 2075-2103.
Yiwen Cao, Kathryn Maguire-Jack	2016	"Interactions with community members and institutions: Preventive pathways for child maltreatment" <i>Child Abuse & Neglect</i> , 62: 111-121.
William Schneider	2016	"Relationship Transitions and the Risk for Child Maltreatment" <i>Demography</i> , 53(6): 1771-1800.
Louis Donnelly, Sara McLanahan, Jeanne Brooks-Gunn, Irwin Garfinkel, Brandon Wagner, Wade Jacobsen, Sarah Gold, Lauren Gaydosh	2016	"Cohesive Neighborhoods Where Social Expectations Are Shared May Have Positive Impact On Adolescent Mental Health" <i>Health Affairs</i> , 35(11): 2083-2091.
M. Blake Berryhill	2016	"Mothers' Parenting Stress and Engagement: Mediating Role of Parental Competence" <i>Marriage & Family Review</i> , 52(5): 461-480.
Tyrone Cheng, Celia Lo	2016	"Racial Disparities in Children's Health: A Longitudinal Analysis of Mothers Based on the Multiple Disadvantage Model" <i>Journal of Community Health</i> , 41(4): 753-760.
Daniel Schneider, Kristen Harknett, Sara McLanahan	2016	"Intimate Partner Violence in the Great Recession" <i>Demography</i> , 53(2): 471-505.
Ashley Munger, Sandra Hofferth, Stephanie Grutzmacher	2016	"The Role of the Supplemental Nutrition Assistance Program in the Relationship Between Food Insecurity and Probability of Maternal Depression" <i>Journal of Hunger & Environmental Nutrition</i> , 11(2): 147-161.
Edward Vargas, Maureen Pirog	2016	"Mixed-Status Families and WIC Uptake: The Effects of Risk of Deportation on Program Use" <i>Social Science Quarterly</i> , 97(3): 555-572.
Lanlan Xu, Maureen Pirog, Edward Vargas	2016	"Child support and mixed-status families: an analysis using the Fragile Families and Child Wellbeing Study" <i>Social Science Research</i> , 60: 249-265.
Angela Rachidi	2016	"Child care assistance and nonstandard work schedules" <i>Children and Youth Services Review</i> , 65: 104-111.
Todd Jensen, Garrett Pace	2016	"Stepfather Involvement and Stepfather-Child Relationship Quality: Race and Parental Marital Status as Moderators" <i>Journal of Marital and Family Therapy</i> , 42(4): 659-672.
Jessica Lucero, Sojung Lim, Anna Maria Santiago	2016	"Changes in Economic Hardship and Intimate Partner Violence: A Family Stress Framework" <i>Journal of Family and Economic Issues</i> , 37(3): 395-406.
Richard Petts	2016	"Religious homogamy, race/ethnicity, and parents' relationship stability" <i>Sociological Focus</i> , 49(3): 163-179.
Rachel Razza, Anne Martin, Jeanne Brooks-Gunn	2016	"Links Between Motor Control and Classroom Behaviors: Moderation by Low Birth Weight" <i>Journal of Child and Family Studies</i> , 25(8): 2423-2434.
Kari Adamsons, Kay Pasley	2016	"Parents' Fathering Identity Standards and Later Father Involvement" <i>Journal of Family Issues</i> , 37(2): 221-244.
Joy Piontak	2016	"Household Composition and Maternal Depression: Examining the Role of Multigenerational Households" <i>Journal of Family Issues</i> , 37(7): 947-969.
Natasha Pilkauskas, Jane Waldfogel, Jeanne Brooks-Gunn	2016	"Maternal labor force participation and differences by education in an urban birth cohort study - 1998-2010" <i>Demographic Research</i> , 34(14): 407-420.
Natasha Pilkauskas, Rachel Dunifon	2016	"Understanding Grandfamilies: Characteristics of Grandparents, Nonresident Parents, and Children" <i>Journal of Marriage and Family</i> , 78(3): 623-633.

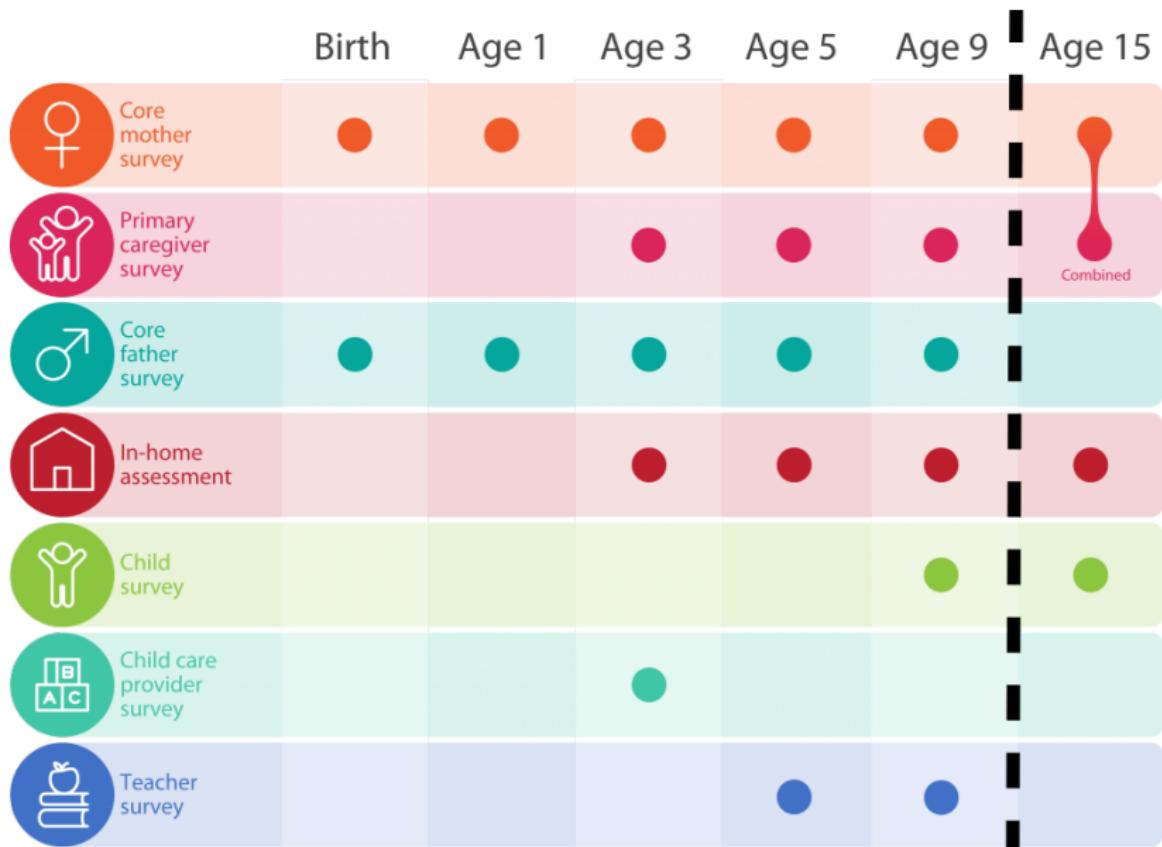
Robynn Cox, Sally Wallace	2016	"Identifying the link between food security and incarceration" <i>Southern Economic Journal</i> , 82(4): 1062-1077.
Sarah Halpern-Meekin, Kristin Turney	2016	"Relationship Churning and Parenting Stress Among Mothers and Fathers" <i>Journal of Marriage and Family</i> , 78(3): 715-729.
Tracey Woodard, Jennifer Copp	2016	"Maternal incarceration and children's delinquent involvement: The role of sibling relationships" <i>Children and Youth Services Review</i> , 70: 340-348.
Inna Altschul, Shawna Lee, Elizabeth Gershoff	2016	"Hugs, Not Hits: Warmth and Spanking as Predictors of Child Social Competence" <i>Journal of Marriage and Family</i> , 78(3): 695-714.
Tianca Crocker, Yolanda Padilla	2016	"Living On the Edge: Access to Liquid Assets as a Determinant of Unmarried Urban Mothers' Life Satisfaction" <i>Families in Society: The Journal of Contemporary Social Services</i> , 97(2): 132-141.
Lucy Markson, Michael Lamb, Friedrich Losel	2016	"The impact of contextual family risks on prisoners' children's behavioural outcomes and the potential protective role of family functioning moderators" <i>European Journal of Developmental Psychology</i> , 13(3): 325-340.
Julie Ma	2016	"Neighborhood and parenting both matter: The role of neighborhood collective efficacy and maternal spanking in early behavior problems" <i>Children and Youth Services Review</i> , 70: 250-260.
Brenden Beck, Anthony Buttaro, Mary Clare Lennon	2016	"Home moves and child wellbeing in the first five years of life in the United States" <i>Longitudinal and Life Course Studies: International Journal</i> , 7(3).

Social Scientists ←→ Data Scientists

Social Scientists \longleftrightarrow Data Scientists

$\hat{\beta}$ & \hat{y}

	Birth	Age 1	Age 3	Age 5	Age 9
 Core mother survey	●	●	●	●	●
 Primary caregiver survey			●	●	●
 Core father survey	●	●	●	●	●
 In-home assessment			●	●	●
 Child survey					●
 Child care provider survey			●		
 Teacher survey				●	●



5,000 families

Birth to age 9
12,000 features

Age 15
1,500 features

5,000 families

Birth to age 9
12,000 features

Age 15
6 key outcomes



Continuous outcomes:

- ▶ GPA
- ▶ Grit
- ▶ Material hardship

Binary outcomes:

- ▶ Housing eviction
- ▶ Layoff of a caregiver
- ▶ Job training for a caregiver

Fragile Families Challenge:

1. common task method

Fragile Families Challenge:

1. common task method
2. use submissions to do cool stuff

Common task method

- ▶ common data
- ▶ common metric
- ▶ evaluation on held-out test data

“secret sauce” of machine learning (Donoho 2015)

$$\hat{y} = \hat{f}_1(x)$$

$$\hat{y} = \hat{f}_2(x)$$

$$\hat{y} = \hat{f}_3(x)$$

$$\begin{aligned}\hat{y} &= \hat{f}_1(x) \\ \hat{y} &= \hat{f}_2(x) \\ \hat{y} &= \hat{f}_3(x)\end{aligned}$$

Community model

$$\hat{f}_c\left(\hat{f}_1(x), \hat{f}_2(x), \hat{f}_3(x)\right)$$

$$\hat{y} = \hat{f}_1(x)$$

$$\hat{y} = \hat{f}_2(x)$$

$$\hat{y} = \hat{f}_3(x)$$

Community model

$$\hat{w}_1\hat{f}_1(x) + \hat{w}_2\hat{f}_2(x) + \hat{w}_3\hat{f}_3(x)$$

What's so special about this community model?

Use community model to

- ▶ look for “dark matter”
- ▶ estimate causal effects

Use community model to

- ▶ look for “dark matter”¹
- ▶ estimate causal effects

¹Learn more at

<http://www.fragilefamilieschallenge.org/unmeasured-factors/>

Most social science models have poor predictive performance.
Why?

Most social science models have poor predictive performance.
Why?

- ▶ poor measurement

Most social science models have poor predictive performance.
Why?

- ▶ poor measurement
- ▶ wrong functional form

Most social science models have poor predictive performance.
Why?

- ▶ poor measurement
- ▶ wrong functional form
- ▶ “dark matter”

Look for dark matter:

- ▶ Interview kids and families that are beating the odds (and not)

Look for dark matter:

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- ▶ Three continuous outcomes: GPA, Material Hardship, Grit

Look for dark matter:

- ▶ Interview kids and families that are beating the odds (and not)
- ▶ Three continuous outcomes: GPA, Material Hardship, Grit
- ▶ Machine learning in the service of in-depth interviews

Use community model to

- ▶ look for “dark matter”
- ▶ estimate causal effects

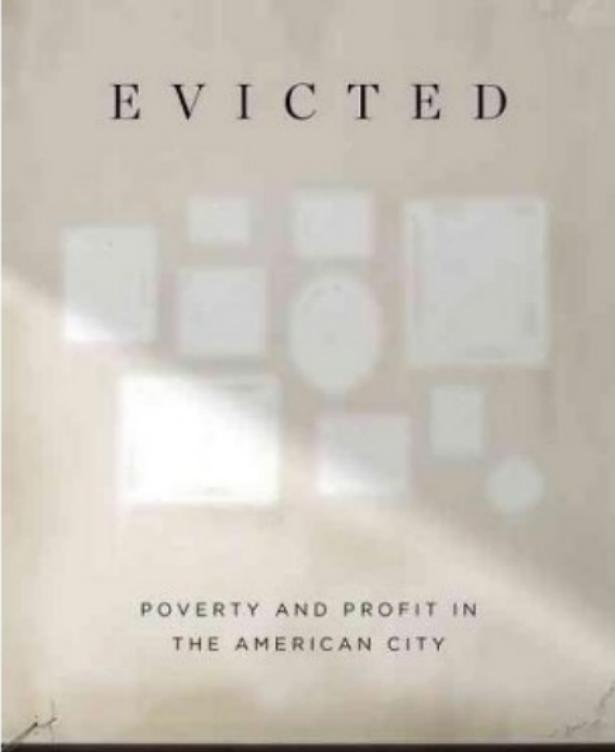
Use community model to

- ▶ look for “dark matter”
- ▶ estimate causal effects²

²Learn more at

<http://www.fragilefamilieschallenge.org/causal-inference/>

E V I C T E D

A very faint, blurry photograph of a living room interior serves as the background for the book cover. It shows a sofa, a chair, and some decorative items on a shelf.

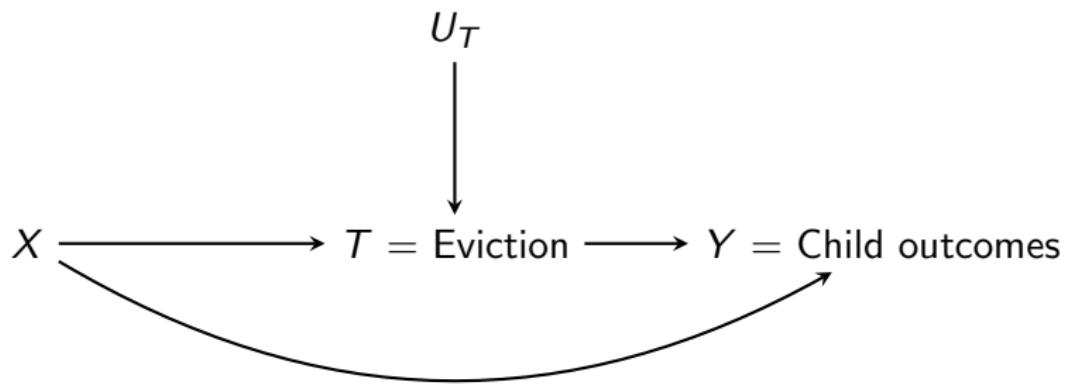
POVERTY AND PROFIT IN
THE AMERICAN CITY

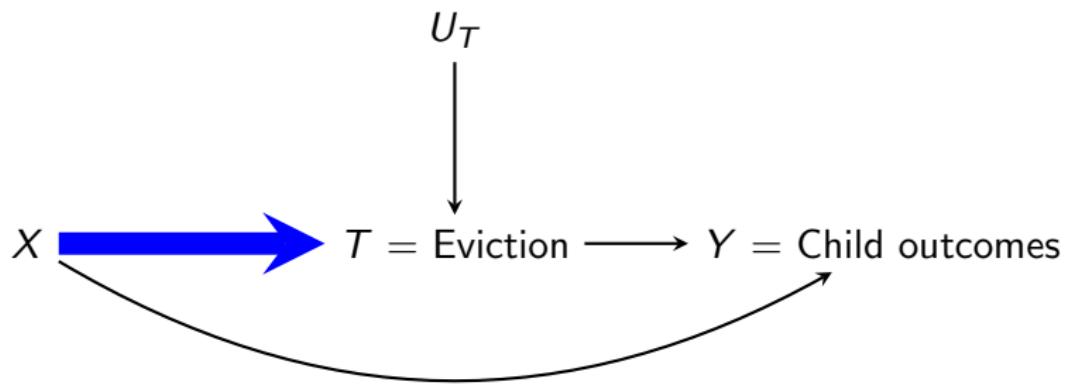
MATTHEW DESMOND

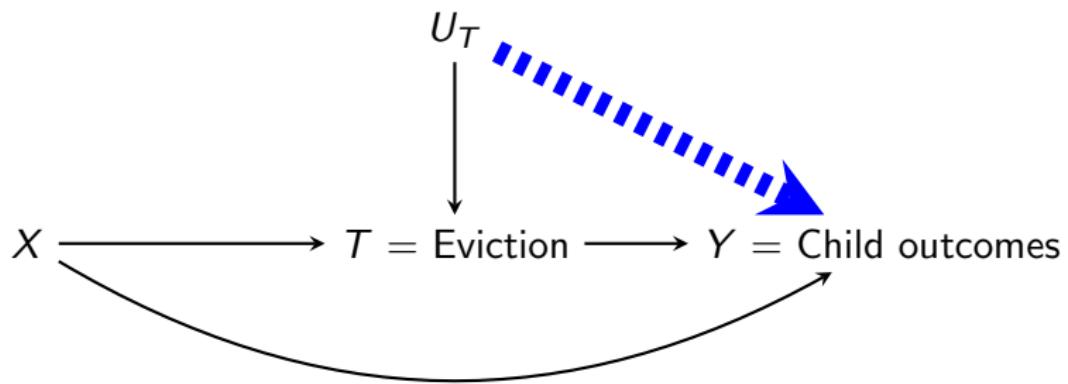
Does eviction **cause** children's outcomes to be worse?

Does eviction **cause** children's outcomes to be worse?

Or is eviction just **associated with** worse outcomes because those who are evicted are already disadvantaged in other ways?







Causal inference from observational data is hard but important

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- ▶ Community model produces propensity scores used for matching

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- ▶ Community model produces propensity scores used for matching
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Causal inference from observational data is hard but important

- ▶ Community model produces propensity scores used for matching
- ▶ Sensitivity analysis
- ▶ In-depth interviews to check assumption of selection on observables

Use community model to

- ▶ look for “dark matter”
- ▶ estimate causal effects

To enable future research,
at the end of the Challenge,
we will **open-source** all submitted
predictions, code, and narrative explanations.

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Some participants have **already** provided
open source examples submissions!

[http://github.com/fragilefamilieschallenge/
open-source-submissions](http://github.com/fragilefamilieschallenge/open-source-submissions)

How to participate

www.fragilefamilieschallenge.org

Introducing the outcome variables

GPA³

³Learn more at <http://www.fragilefamilieschallenge.org/gpa/>

GPA³

How do kids beat the odds academically?

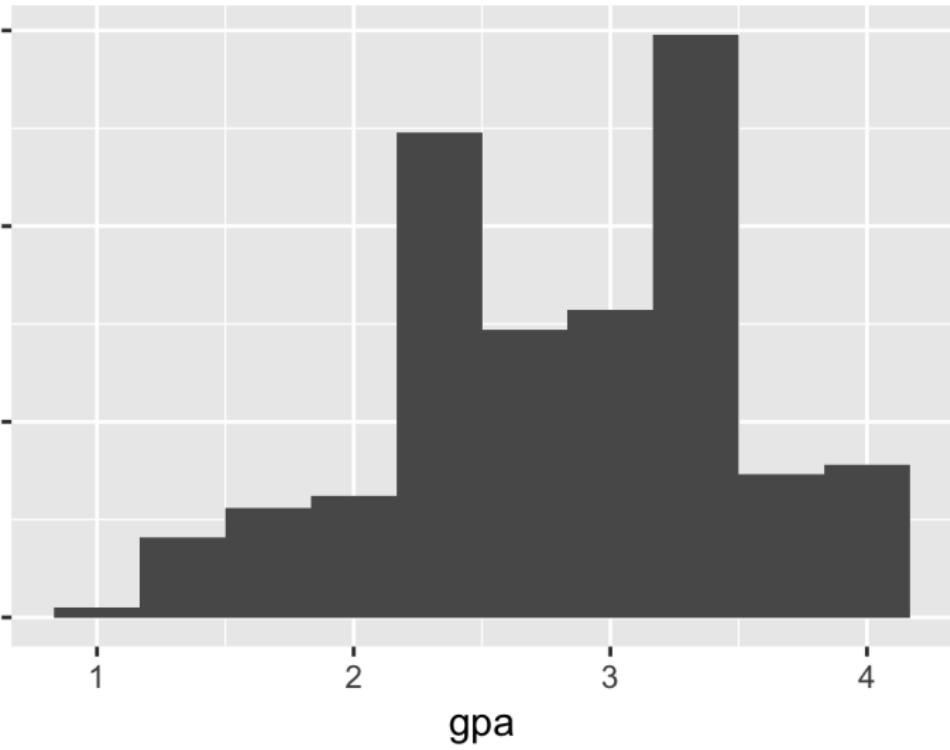
³Learn more at <http://www.fragilefamilieschallenge.org/gpa/>

GPA⁴

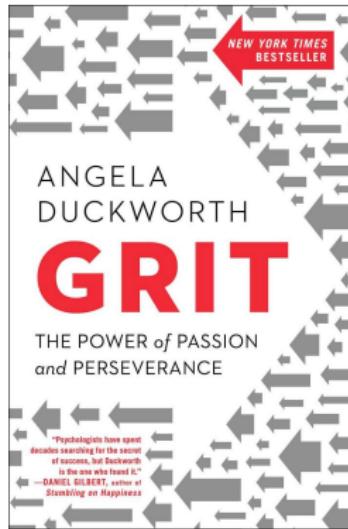
B20. At the {most recent grading period/last grading period in the spring} what was your grade in ...

	A	B	C	D OR LOWE R	NO GRADE OR PASS/FAIL	REF	DK	N/A HOMESCHOoled
B20A English or language arts? ..	1	2	3	4	5	-1	-2	7 → GO TO B22A
B20B Math?	1	2	3	4	5	-1	-2	7 → GO TO B22A
B20C History or social studies? ..	1	2	3	4	5	-1	-2	7 → GO TO B22A
B20D Science?	1	2	3	4	5	-1	-2	7 → GO TO B22A

⁴This variable is reverse-coded in the data file so that higher values represent higher GPAs.

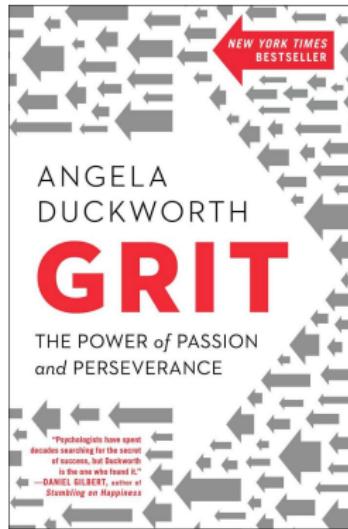


“Grit” predicts success, possibly more than IQ.⁵



⁵Learn more at <http://www.fragilefamilieschallenge.org/grit/>

“Grit” predicts success, possibly more than IQ.⁵



What makes some kids gritty?

⁵Learn more at <http://www.fragilefamilieschallenge.org/grit/>

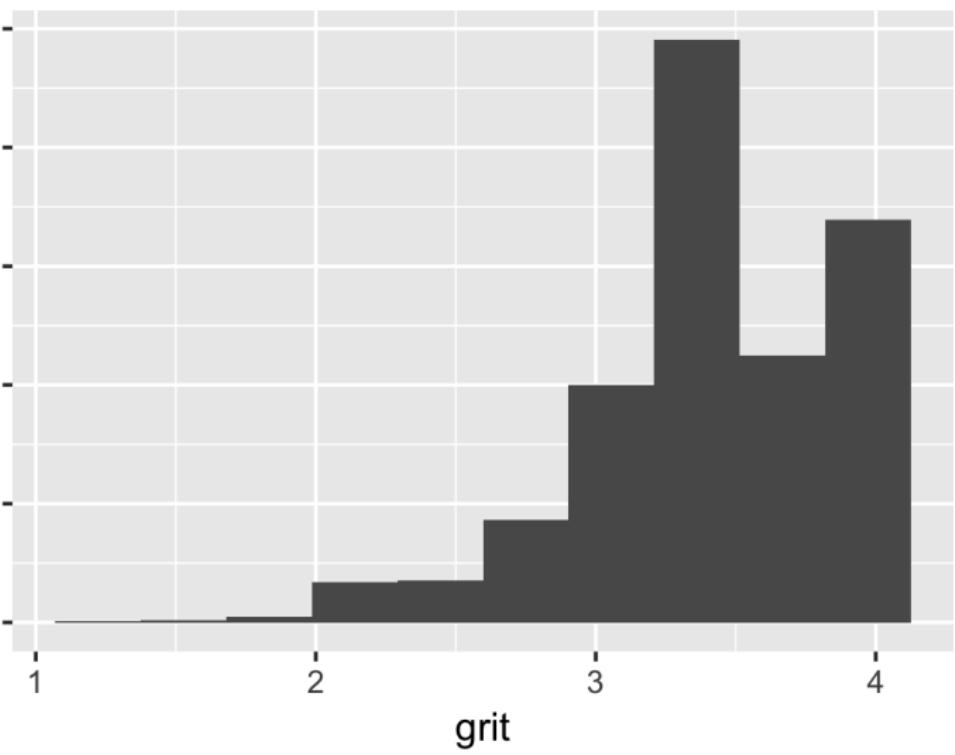
Grit⁶

- D2. Thinking about how you have behaved or felt during the past four weeks, please tell me whether you strongly agree, somewhat agree, somewhat disagree, or strongly disagree with the following statements.

PROBE: Thinking about the past four weeks, do you strongly agree, somewhat agree, somewhat disagree, or strongly disagree with this statement?

	STRONGLY AGREE	SOMEWHAT AGREE	SOMEWHAT DISAGREE	STRONGLY DISAGREE	REF	DK
D2I. I keep at my schoolwork until I am done with it.....	1	2	3	4	-1	-2
D2K. Once I make a plan to get something done, I stick to it.....	1	2	3	4	-1	-2
D2M. I finish whatever I begin.....	1	2	3	4	-1	-2
D2V. I am a hard worker	1	2	3	4	-1	-2

⁶This variable is reverse-coded in the data file so that higher values represent more grit.



Material hardship⁷

⁷Learn more at

<http://www.fragilefamilieschallenge.org/material-hardship/>

Material hardship⁷

What unmeasured predictors are associated with families unexpectedly escaping severe deprivation?

⁷Learn more at

<http://www.fragilefamilieschallenge.org/material-hardship/>

Material hardship⁷

What unmeasured predictors are associated with families unexpectedly escaping severe deprivation?

What sends families unexpectedly into deep poverty?

⁷Learn more at

<http://www.fragilefamilieschallenge.org/material-hardship/>

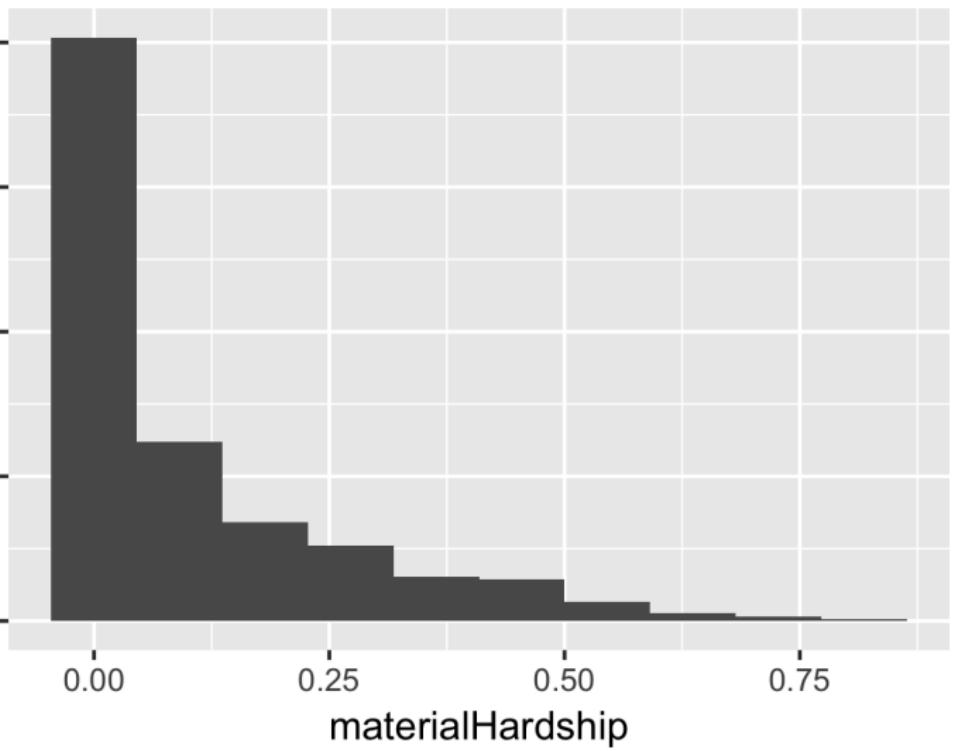
Material hardship

We are also interested in some of the problems that families face making ends meet. In the past twelve months, did you do any of the following because there wasn't enough money?

		YES	NO	REF	DK
J37.	In the past twelve months, did you receive free food or meals?	1	2	-1	-2
J38.	In the past twelve months, were you ever hungry, but didn't eat because you couldn't afford enough food?	1	2	-1	-2
J39.	In the past twelve months, did you ever not pay the full amount of rent or mortgage payments?	1	2	-1	-2
J40.	In the past twelve months, were you evicted from your home or apartment for not paying the rent or mortgage?	1	2	-1	-2
J41.	In the past twelve months, did you not pay the full amount of gas, oil, or electricity bill?	1	2	-1	-2
J42.	In the past twelve months, was your gas or electric services ever turned off, or the heating oil company did not deliver oil, because there wasn't enough money to pay the bills?	1	2	-1	-2
J43.	In the past twelve months, did you borrow money from friends or family to help pay bills?	1	2	-1	-2
J44.	In the past twelve months, did you move in with other people even for a little while because of financial problems?	1	2	-1	-2

Material hardship

J45.	In the past twelve months, did you stay at a shelter, in an abandoned building, an automobile or any other place not meant for regular housing, even for one night?	1	2	-1	-2
J46.	In the past twelve months, was there anyone in your household who needed to see a doctor or go to the hospital but couldn't go because of the cost?	1	2	-1	-2
J47.	In the past twelve months, was your telephone service (mobile or land line) cancelled or disconnected by the telephone company because there wasn't enough money to pay the bill?	1	2	-1	-2



Eviction⁸

⁸Learn more at <http://www.fragilefamilieschallenge.org/eviction/>

⁹Note: You will just create propensity scores for eviction given background variables; causal inference comes in the second stage of the Challenge when outcomes are measured several years from now.

Eviction⁸

Does housing eviction **cause** worse outcomes as kids transition to adulthood?⁹

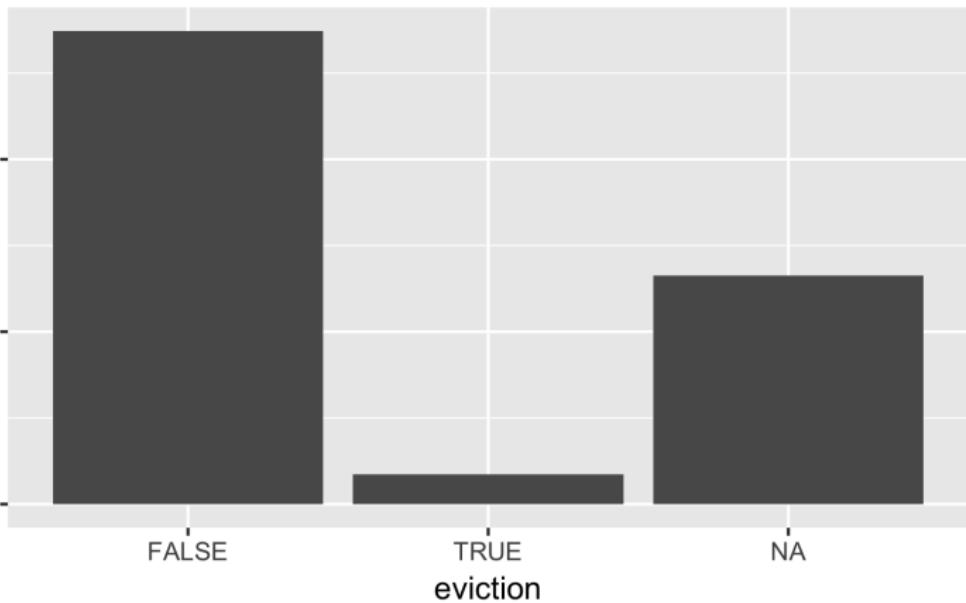
⁸Learn more at <http://www.fragilefamilieschallenge.org/eviction/>

⁹Note: You will just create propensity scores for eviction given background variables; causal inference comes in the second stage of the Challenge when outcomes are measured several years from now.

Eviction

J51. Since {MONTH AND YEAR COHORT CITY FIELDDED IN YR 9}, were you evicted from your home or apartment for not paying the rent or mortgage?

YES	1
NO	2
REFUSED	-1
DON'T KNOW	-2



Caregiver layoff¹⁰

¹⁰Learn more at <http://www.fragilefamilieschallenge.org/layoff/>

¹¹Note: You will just create propensity scores for caregiver layoff given background variables; causal inference comes in the second stage of the Challenge when outcomes are measured several years from now.

Caregiver layoff¹⁰

Does layoff of a caregiver **cause** collateral damage for kids?¹¹

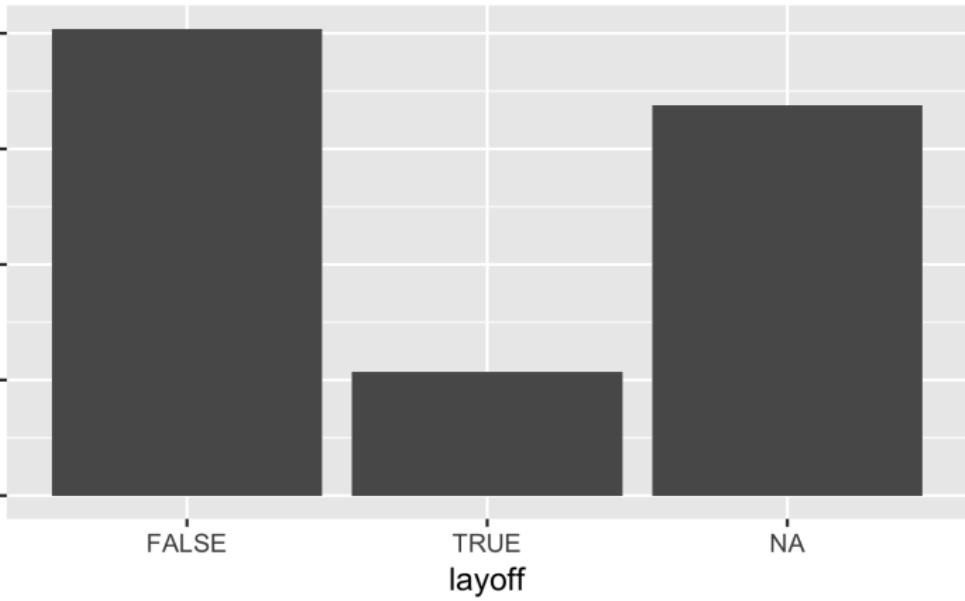
¹⁰Learn more at <http://www.fragilefamilieschallenge.org/layoff/>

¹¹Note: You will just create propensity scores for caregiver layoff given background variables; causal inference comes in the second stage of the Challenge when outcomes are measured several years from now.

Caregiver layoff

K13. Since {MONTH AND YEAR COHORT CITY FIELDDED IN YR 9}, have you been laid off from your employer for any time?

- | | |
|------------------|----|
| YES | 1 |
| NO..... | 2 |
| REFUSED..... | -1 |
| DON'T KNOW | -2 |



Job training¹²

¹²Learn more at

<http://www.fragilefamilieschallenge.org/job-training/>

¹³Note: You will just create propensity scores for job training given background variables; causal inference comes in the second stage of the Challenge when outcomes are measured several years from now.

Job training¹²

Does job training for a caregiver **cause** collateral benefits for children?¹³

¹²Learn more at

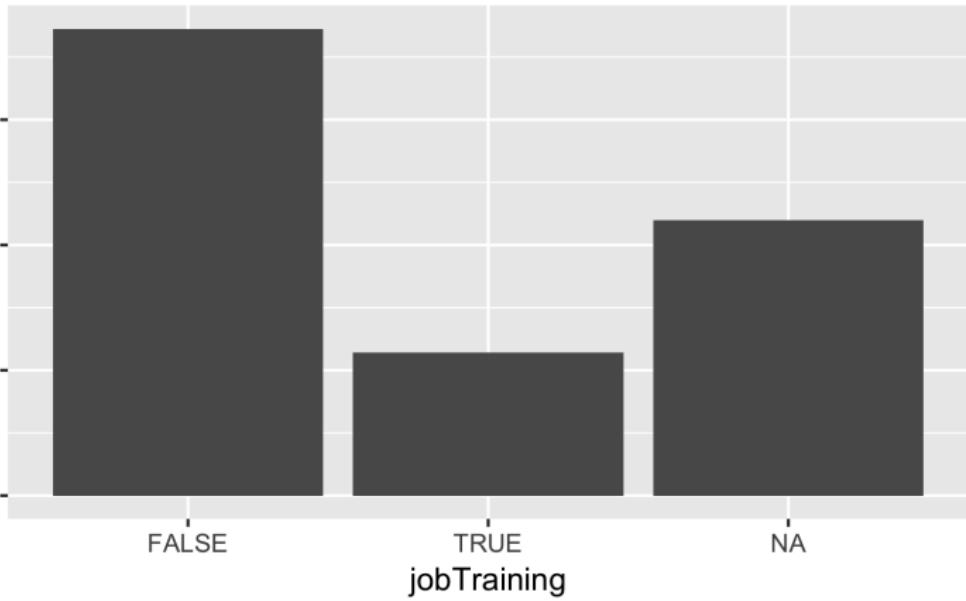
<http://www.fragilefamilieschallenge.org/job-training/>

¹³Note: You will just create propensity scores for job training given background variables; causal inference comes in the second stage of the Challenge when outcomes are measured several years from now.

Caregiver job training

K4. Since {MONTH AND YEAR COHORT CITY FIELDDED IN YR 9}, have you taken any classes to improve your job skills, such as computer training or literacy classes?

- | | |
|-----------------|-----|
| YES | .1 |
| NO..... | .2 |
| REFUSED..... | -.1 |
| DON'T KNOW..... | -.2 |



How do I know what the variables are?

- ▶ Blog post: <http://www.fragilefamilieschallenge.org/survey-documentation/>
- ▶ Fragile Families and Child Wellbeing Study website:
<http://www.fragilefamilies.princeton.edu/>

FF Fragile Families & Child Wellbeing Study PRINCETON | COLUMBIA



Search... 

Home

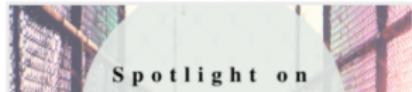
About

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Publications

Data and Documentation

Contact



Spotlight on

Spotlight on FFCWS and Incarceration
Research

Recent publications using the Fragile Families & Child
Wellbeing Study provide a broader understanding of the effects

General Documentation

Baseline

Year 1

[Links to](#)

Year 3

[documentation
for each wave](#)

Year 5

Year 9

Year 15

FAQ

Data and Documentation

Data

Data are free to download from Princeton University's [Office of Population Research \(OPR\) data archive](#).

Currently, there are five waves of publicly available data including baseline and Year 1, Year 3, Year 5, and Year 9 follow-ups. In order to protect the confidentiality of survey respondents, geographic identifiers, medical records data, contextual data (i.e., census tract characteristics), macroeconomic indicators, and genetic biomarkers are not available in the public use data files. Researchers may apply for these data via a [restricted use contract](#).

Documentation

General Documentation

Baseline

Year 1

Year 3

Year 5

Year 9

Year 15

FAQ

Data Alerts

Contract Data

Year 9

The Year 9 follow-up wave of data collection took place from 2007 to 2010, which makes the data useful for researchers interested in the effects of the Great Recession on children and families. It is different from previous waves because the home visit was integral to the wave procedures. In previous waves, we conducted core interviews before proceeding to the in-home components. At year 9, our initial interview was with the child's primary caregiver (usually the mother) and we scheduled a home visit at the time of that initial interview. As part of the home visit, we interviewed focal children for the first time. We attempted teacher surveys through the mail. Similar to previous waves, we have core interviews with mothers and fathers. Restricted Data at this wave include [census tract characteristics](#) of mother and father residences, [macroeconomic indicators](#), administrative data on children's [school characteristics](#), and [genetic](#) data from saliva samples from the mother and focal child.

PRIMARY CAREGIVER

[Primary Caregiver Survey](#)

[Primary Caregiver Self-Administered](#)

SCALES

[Scales documentation](#)

MOTHER

[Questionnaire](#)

[Codebook](#)

**Each survey has
a questionnaire
and
a codebook**

FATHER

[Questionnaire](#)

[Codebook](#)

CHILD

[Child Survey](#)

[Home Visit Workbook](#)

[Interviewer Observations](#)

[Codebook](#)

TEACHER

[Questionnaire](#)

[Codebook](#)

Questionnaire:

BOX A3A2

IF PCG=BIOFATHER IN THE PCG IDENTIFIER IN THE SCREENER,
GO TO A3C.

ELSE IF PCG= NON-PARENT AND RELATIONSHIP = MATERNAL
GRANDPARENT(S), PATERNAL GRANDPARENT(S), OTHER
RELATIVES OR FRIEND IN THE PCG IDENTIFIER IN THE
SCREENER, GO TO A3B1A.

ELSE IF PCG=NON-PARENT AND RELATIONSHIP=FOSTER CARE
IN THE PCG IDENTIFIER IN THE SCREENER, GO TO A3B.

ELSE IF PCG=NON-PARENT AND RELATIONSHIP = OTHER,
SPECIFY IN THE PCG IDENTIFIER IN THE SCREENER, GO TO
A3B1A.

ELSE IF PCG= "NOT MOTHER" IN THE PCG IDENTIFIER GO TO
A3D.

A3B. Are {CHILD}'s foster parents related to you?

YES	1
NO	2
REFUSED.....	-1
DON'T KNOW.....	-2

In the corresponding codebook, we see the count of respondents who gave each answer:

```
m5a3b                                         A1B. Child's foster parents related to you

type: numeric (byte)
label: BM_72F

range: [-9,2]                               units: 1
unique values: 5                           missing : 0/4898

tabulation: Freq.   Numeric  Label
            1383      -9  -9 Not in wave
            3499      -6  -6 Skip
              6      -3  -3 Missing
              1      -2  -2 Don't know
              9       2     2 no
```

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Things to note here:

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Things to note here:

- ▶ The question referred to in the questionnaire as A3B is called m5a3b in the codebook.

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              6     -3    -3 Missing
              1     -2    -2 Don't know
              9      2      2 no
```

Things to note here:

- ▶ The question referred to in the questionnaire as A3B is called m5a3b in the codebook.
- ▶ There are missing codes.

The general structure of the variable names is

[prefix for questionnaire type][wave number][question number]

Variable prefixes¹⁴

Common prefixes:

Prefix	Meaning
m	Mother
f	Father
h or hv	Home visit
p	Primary caregiver
k	Kid (interview with the child)
kind_-	Kindergarten teacher
t	Teacher
ffcc_[something]	Child care surveys. For a full list of the [something] see this documentation .

¹⁴For more info, see

<http://www.fragilefamilieschallenge.org/survey-documentation/>

Constructed variables

- ▶ Some variables are **constructed** from several questions.
- ▶ These tend to be important.
- ▶ These variables add the additional prefix **c** to the front of the variable name.
- ▶ For instance, cm1ethrace indicates constructed mother's wave 1 race/ethnicity.

Wave numbers \neq child ages

Wave number	Approximate child age
1	0, often called "baseline"
2	1
3	3
4	5
5	9

Common missing codes¹⁵

- ▶ -9 Not in wave - Did not participate in survey/data collection component
- ▶ -6 Valid skip - Intentionally not asked question; question does not apply to respondent or response known based on prior information.
- ▶ -2 Don't know - Respondent asked question; responded "Don't Know".
- ▶ -1 Refuse - Respondent asked question; refused to answer question
- ▶ NA also used occasionally

¹⁵For more complete list and explanation, see
<http://www.fragilefamilieschallenge.org/missing-data/>

Getting the data

1. Apply (<http://www.fragilefamilieschallenge.org/apply/>)
2. Complete terms and conditions

Building a submission

Submissions include:

1. Predictions
2. Code
3. Narrative explanation

Submission preparation instructions:

www.fragilefamilieschallenge.org/upload-your-contribution/

Get on the leaderboard

codalab.fragilefamilieschallenge.org

← → ⌂ codalab.fragilefamilieschallenge.org/#results

Fragile Families Help Sign Up Sign In

Download CSV

Results							
#	User	GPA ▲	Grit ▲	Material hardship ▲	Eviction ▲	Layoff ▲	Job training ▲
1	wjlei1990	0.36854 (1)	0.21896 (3)	0.02436 (1)	0.05341 (7)	0.17435 (5)	0.20224 (3)
2	OldDriverffc	0.37099 (2)	0.22979 (18)	0.02471 (2)	0.05341 (7)	0.17435 (5)	0.20224 (3)
3	yjpeng	0.37120 (3)	0.21759 (2)	0.02493 (3)	0.05223 (2)	0.17048 (1)	0.20169 (2)
4	hamidrezaomidvar	0.37136 (4)	0.22191 (13)	0.02523 (5)	0.05227 (3)	0.18784 (7)	0.21409 (7)
5	t.f.schaffner	0.37143 (5)	0.21755 (1)	0.02499 (4)	0.05660 (8)	0.22453 (9)	0.27736 (9)
6	andrewor	0.37143 (5)	0.21755 (1)	0.02499 (4)	0.06038 (10)	0.26792 (13)	0.30755 (13)
7	pc12	0.37583 (6)	6.18762 (29)	0.03536 (24)	0.94340 (18)	0.77547 (19)	0.72264 (18)
8	mannyg	0.37789 (7)	0.21997 (7)	0.02880 (17)	0.05341 (7)	0.17435 (5)	0.20224 (3)
9	ppz	0.37810 (8)	0.23896 (19)	0.02859 (14)	0.12830 (16)	0.30755 (15)	0.36981 (16)
10	lazs	0.38407 (9)	0.22054 (9)	0.02877 (16)	0.05660 (8)	0.22453 (9)	0.27736 (9)
11	miloyola	0.38644 (10)	0.21969 (4)	0.02880 (17)	0.05341 (7)	0.17435 (5)	0.20224 (3)
12	agalle	0.38846 (11)	0.22137 (11)	0.02740 (8)	0.05341 (7)	0.17435 (5)	0.20224 (3)
13	weggert	0.38868 (12)	0.24682 (21)	0.02546 (6)	0.05660 (8)	0.24528 (12)	0.29245 (11)
14	jeremyfreese	0.39077 (13)	0.22060 (10)	0.02803 (12)	0.05295 (5)	0.17379 (4)	0.20132 (1)

Powered by Codalab v0.1.1

Share ideas in the forum

codalab.fragilefamilieschallenge.org

The screenshot shows a web browser displaying the Fragile Families Challenge Forum at [codalab.fragilefamilieschallenge.org/forums/17/](https://codalab.fragilefamilieschallenge.org/). The page title is "Forums". The main content area is titled "Fragile Families Challenge Forum". It features a table with one row, representing a single forum topic:

Title	Started by	Date created	Latest post	Posts
Intro to the forum	ilundberg	Feb 18, 2017	1 month, 1 week	1

Navigation icons are visible at the bottom of the page.

Share code open source on Github

Participants have already contributed

- ▶ Code to support Stata users

<https://github.com/fragilefamilieschallenge/stata-support>

- ▶ Example submissions on which you can build

<https://github.com/fragilefamilieschallenge/open-source-submissions>

Why participate?

Why participate?

- ▶ care about the goals of the project

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- ▶ learn new skills

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- ▶ get involved in scientific research
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- ▶ publish papers

Why participate?

- ▶ care about the goals of the project
- ▶ learn new skills
- ▶ get involved in scientific research
- ▶ win prizes
- ▶ publish papers
- ▶ have fun

www.fragilefamilieschallenge.org

Questions?

- ▶ Email: fragilefamilieschallenge@gmail.com
- ▶ Blog: www.fragilefamilieschallenge.org/blog-posts/
- ▶ Github: www.github.com/fragilefamilieschallenge
- ▶ Forum: codalab.fragilefamilieschallenge.org