

The Macroeconomics of Intergenerational Mental Health Transmission

Boaz Abramson
Columbia GSB

Job Boerma
Wisconsin

Diego Daruich
USC

Aleh Tsyvinski
Yale

October 2026

Motivation

- ▶ Over 20 percent of U.S. adolescents experience mental illness
 - “the defining public health crisis of our time” (U.S. Surgeon General)
 - “the crisis has existed for decades” (Currie, 2025, AEA Presidential Address)
- ▶ Policymakers target child mental health
 - school-based services, community clinics; parental treatment (perinatal)

This paper

- ▶ First quantitative macroeconomic theory of child mental health
- ▶ Which policies most effectively address the child mental health crisis?

Psychiatric Literature on Child Mental Health

Key determinants identified by the literature:

1. **Biological factors** Sullivan (2012); Madigan (2018)
genetic heritability; prenatal mental health
2. **Parenting quality** Fearon (2010); Pinquart (2017); Bowlby (1969)
involvement, sensitivity, responsiveness, warmth
3. **Parental mental health (via parenting quality)** Lovejoy (2000); Field (1990); Wilson (2010)
parent mental illness lowers parenting quality
4. **Other environmental factors** Widom (2007); Danese (2009); Fowler (2009)
death of loved one, bullying, abuse, neighborhood violence
5. **Treatment** Weisz (2017); Merikangas (2010)
low child treatment uptake despite documented efficacy

Child MH $\Rightarrow$ teenager, adult and parental MH

Kim-Cohen (2003); Kessler (2005)

Three Channels of Mental Illness in the Model

1. Child Development

Lovejoy et al. (2000); Sullivan (2012); Pinquart (2017)

Parental mental health affects fetus development and parenting quality (sensitivity, warmth,...)

- **Model:** parent MH enters the child MH + cognitive-skill development technology

→ Intergenerational transmission and lower investment productivity

2. Negative Thinking

Beck (1967, 1976)

Depression as a cognitive disorder of negatively biased expectations

- **Model:** subjective probabilities under relative entropy

→ Affects decisions about future, like reducing risk-taking (e.g., investments)

3. Rumination

Nolen-Hoeksema (1991, 2000)

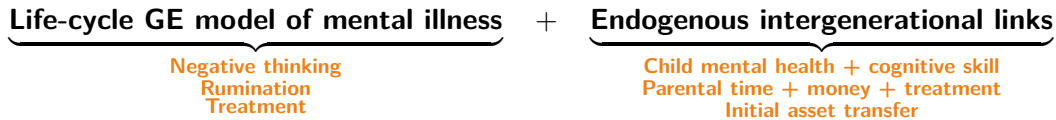
Repetitive negative thoughts crowd out attention and time

- **Model:** time endowment $\bar{n}(m)$ decreases in illness

→ Reduces leisure, labor hours, and time with child

→ Lower labor hours feed through into *earnings*

This Paper: Two Building Blocks



► Why is there a role for government intervention?

1. Incomplete markets (e.g., missing contract between parents and children)
2. Negative thinking

Outline

1. **Model** of life-cycle mental health with endogenous child development
2. **Calibration** using U.S. micro data + psychological literature
 - **Negative Thinking**: parental time investments by MH status (PSID)
 - **Rumination**: hours, wages and consumption by MH status (PSID)
 - **Child MH Technology**: Cunha-Heckman-Schennach with new measurements (NLSY)
 - **Treatment Efficacy**: RCTs from medical literature
3. **What is the Economic Impact of Mental Illness?**
Decomposition of key channels
4. **Policy Analysis**
Subsidy for MH treatment for children and/or parents

Preview of Results

Child mental illness is costly

- ▶ A cure is worth **\$164k** to the parent
- ▶ Aggregate cost: **\$13.2k** per adult

Parental mental illness is costly

- ▶ A cure is worth **\$86k** to the child
- ▶ Aggregate cost: **\$10.6k** per child

Policy: expanding treatment services (GE, budget-balanced)

- ▶ **Parent treatment** subsidy maximizes **welfare** but small impact on child MH
- ▶ **Child treatment** subsidy is the best measure for their **mental health**

Preliminary: Impact of social media

1. Model

life-cycle, intergenerational, GE

- Timeline and stages
- Parenthood problem with negative thinking
- Child development technology

Life-Cycle Timeline



Life-Cycle Timeline



Childhood (ages 0–15)

- ▶ **MH and cognitive-skill formation**
- ▶ Parental time, money, and treatment inputs
- ▶ **Transfer received from parent** at end of childhood

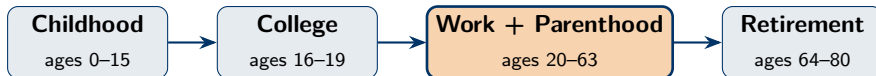
Life-Cycle Timeline



College (ages 16-19)

- ▶ **Initial adult MH m_t drawn; cognitive skill θ fixed**
- ▶ College enrollment decision; graduation prob. depends on cog. skill
- ▶ Borrowing constraint

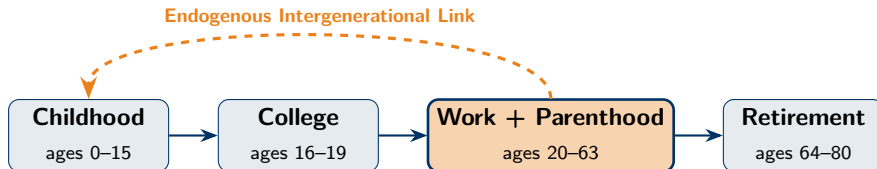
Life-Cycle Timeline



Work + Parenthood (ages 20-63)

- ▶ **MH m_t evolves** (markov-process, depends on child's MH); own treatment
- ▶ **Investment in child** MH / cognitive skill (time, money, treatment)
- ▶ **Transfer $\hat{a}_t$** closes the intergenerational link $\Rightarrow$ **Child leaves household**

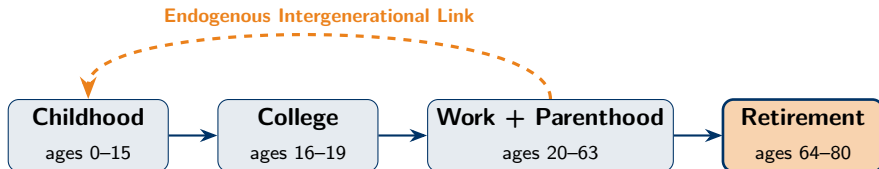
Life-Cycle Timeline



Endogenous Intergenerational Links

Any policy affecting parent choices (work, savings, treatment) endogenously shapes the next generation's initial conditions.

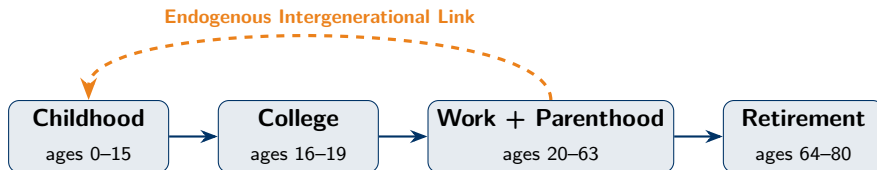
Life-Cycle Timeline



Retirement (ages 64–80)

- ▶ **Pension** income
- ▶ **Savings** drawn down to finance consumption

Life-Cycle Timeline



Aggregate Equilibrium

- ▶ **Open economy** $\Rightarrow$ interest rate r exogenous
- ▶ **College wage premium** clears the labor market
- ▶ **Government budget is balanced**

Household Problem: Working-Age Adult

$$v_t(a_t, m_t, z_t, e, \theta) = \max_{c_t, a_{t+1}} u(c_t, \ell_t) + \beta \mathbb{E} v_{t+1}(a_{t+1}, m_{t+1}, z_{t+1}, e, \theta)$$

subject to

$$c_t + qa_{t+1} \leq y_t(z_t, e, \theta) + a_t - T(\cdot)$$

$$\ell_t = \bar{n} - n_w$$

$$m_{t+1} \sim \Gamma_m(m_t)$$

Household Problem: Working-Age Adult

$$v_t(a_t, m_t, z_t, e, \theta) = \max_{c_t, a_{t+1}} u(c_t, \ell_t) + \beta \min_p \mathbb{E}_p v_{t+1}(a_{t+1}, m_{t+1}, z_{t+1}, e, \theta)$$

subject to

$$c_t + qa_{t+1} \leq y_t(z_t, e, \theta) + a_t - T(\cdot)$$

$$\ell_t = \bar{n} - n_w$$

$$m_{t+1} \sim \Gamma_m(m_t)$$

$$\sum_{\chi} p(\chi) \log \frac{p(\chi)}{q(\chi)} \leq \kappa(m_t)$$

► **Negative thinking:** distorted subjective probability p under relative-entropy budget $\kappa(m_t)$

Negative Thinking: How It Works

A simple example

Given objective q and future value $v(\chi)$, the agent picks subjective p to solve

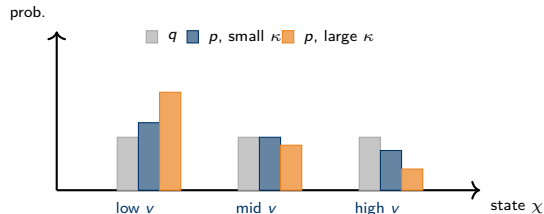
$$\begin{aligned} \min_p \quad & \mathbb{E}_p[v(\chi)] \\ \text{s.t.} \quad & \sum_{\chi} p(\chi) \log \frac{p(\chi)}{q(\chi)} \leq \kappa(m_t) \end{aligned}$$

Closed-form solution

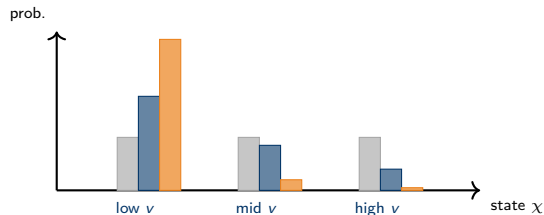
$$p(\chi) \propto q(\chi) \exp(-\lambda(m_t) v(\chi))$$

— $\lambda(m_t) \geq 0$: Lagrange multiplier

- **Higher $\kappa \Rightarrow$ more mass on bad states**
- **Larger dispersion of $v \Rightarrow$ more distortion**



(a) Small dispersion of $v(\chi)$



(b) Large dispersion of $v(\chi)$

Household Problem: Working-Age Adult

$$v_t(a_t, m_t, z_t, e, \theta) = \max_{c_t, a_{t+1}} u(c_t, \ell_t) + \beta \min_p \mathbb{E}_p v_{t+1}(a_{t+1}, m_{t+1}, z_{t+1}, e, \theta)$$

subject to

$$c_t + qa_{t+1} \leq y_t(z_t, e, \theta) + a_t - T(\cdot)$$

$$\ell_t = \bar{n}(m_t) - n_w(m_t)$$

$$m_{t+1} \sim \Gamma_m(m_t)$$

$$\sum_{\chi} p(\chi) \log \frac{p(\chi)}{q(\chi)} \leq \kappa(m_t)$$

- **Negative thinking**: distorted subjective probability p under relative-entropy budget $\kappa(m_t)$
- **Rumination**: time endowment $\bar{n}(m_t)$ decreasing in mental illness

Household Problem: Working-Age Adult

$$v_t(a_t, m_t, z_t, e, \theta) = \max_{c_t, a_{t+1}} u(c_t, \ell_t) + \beta \min_p \mathbb{E}_p v_{t+1}(a_{t+1}, m_{t+1}, z_{t+1}, e, \theta)$$

subject to

$$c_t + qa_{t+1} \leq y_t(z_t, e, \theta, m_t) + a_t - T(\cdot)$$

$$\ell_t = \bar{n}(m_t) - n_w(m_t)$$

$$m_{t+1} \sim \Gamma_m(m_t)$$

$$\sum_{\chi} p(\chi) \log \frac{p(\chi)}{q(\chi)} \leq \kappa(m_t)$$

► **Wage penalty:** $y_t = y_t(m_t, z_t, e, \theta)$

Household Problem: Working-Age Adult

$$v_t(a_t, m_t, z_t, e, \theta) = \max_{c_t, a_{t+1}, \tau_t} u(c_t, \ell_t) - \xi_\tau \tau_t + \beta \min_p \mathbb{E}_p v_{t+1}(a_{t+1}, m_{t+1}, z_{t+1}, e, \theta)$$

subject to

$$c_t + qa_{t+1} + \varphi_\tau \tau_t \leq y_t(z_t, e, \theta, m_t) + a_t - T(\cdot)$$

$$\ell_t = \bar{n}(m_t) - n_w(m_t) - n_\tau(\tau_t)$$

$$m_{t+1} \sim \Gamma_m(m_t, \tau_t)$$

$$\sum_\chi p(\chi) \log \frac{p(\chi)}{q(\chi)} \leq \kappa(m_t)$$

► **Wage penalty:** $y_t = y_t(m_t, z_t, e, \theta)$

► **Treatment** (with stigma ξ_τ): $\tau_t \in \{0, 1\}$ shifts $\Gamma_m(m_t, \tau_t)$

Household Problem: Parenthood

$$v_t(a_t, m_t, z_t, e, \theta, m_{kt}, \theta_{kt}) = \max_{\substack{c_t, a_{t+1}, \tau_t \\ x_t, n_t, \tau_{kt}}} u(c_t, \ell_t) - \xi_\tau \tau_t - \xi_{k\tau} \tau_{kt} \\ + \beta \min_p \mathbb{E}_p v_{t+1}(a_{t+1}, m_{t+1}, z_{t+1}, e, \theta, m_{k,t+1}, \theta_{k,t+1})$$

subject to

$$c_t + qa_{t+1} + \varphi_\tau \tau_t + x_t + \varphi_{k\tau} \tau_{kt} \leq y_t(m_t, z_t, e, \theta) + a_t - T(\cdot) \\ \ell_t = \bar{n}(m_t) - n_w(m_t) - n_\tau(\tau_t) - n_\tau(\tau_{kt}) - \nu n_t \\ m_{t+1} \sim \Gamma_m(m_t, \tau_t) \\ \sum_\chi p(\chi) \log \frac{p(\chi)}{q(\chi)} \leq \kappa(m_t)$$

► **Parental Investments:** time n_t , money x_t , child treatment τ_{kt} , transfer $\hat{a}_t$

Household Problem: Parenthood

$$v_t(a_t, m_t, z_t, e, \theta, m_{kt}, \theta_{kt}) = \max_{\substack{c_t, a_{t+1}, \tau_t \\ x_t, n_t, \tau_{kt}}} u(c_t, \ell_t) - \xi_\tau \tau_t - \xi_{k\tau} \tau_{kt} - \xi^k m_{kt} \\ + \beta \min_p \mathbb{E}_p v_{t+1}(a_{t+1}, m_{t+1}, z_{t+1}, e, \theta, m_{k,t+1}, \theta_{k,t+1})$$

subject to

$$c_t + qa_{t+1} + \varphi_\tau \tau_t + x_t + \varphi_{k\tau} \tau_{kt} \leq y_t(m_t, z_t, e, \theta) + a_t - T(\cdot) \\ \ell_t = \bar{n}(m_t) - n_w(m_t) - n_\tau(\tau_t) - n_\tau(\tau_{kt}) - \nu n_t \\ m_{t+1} \sim \Gamma_m(m_t, \tau_t) \\ \sum_\chi p(\chi) \log \frac{p(\chi)}{q(\chi)} \leq \kappa(m_t)$$

- ▶ **Parental Investments:** time n_t , money x_t , child treatment τ_{kt} , transfer $\hat{a}_t$
- ▶ **Disutility of child experiencing mental illness:** parents bear a direct utility cost

Household Problem: Parenthood

$$v_t(a_t, m_t, z_t, e, \theta, m_{kt}, \theta_{kt}) = \max_{\substack{c_t, a_{t+1}, \tau_t \\ x_t, n_t, \tau_{kt}}} u(c_t, \ell_t) - \xi_\tau \tau_t - \xi_{k\tau} \tau_{kt} - \xi^k m_{kt} \\ + \beta \min_p \mathbb{E}_p v_{t+1}(a_{t+1}, m_{t+1}, z_{t+1}, e, \theta, m_{k,t+1}, \theta_{k,t+1})$$

subject to

$$c_t + qa_{t+1} + \varphi_\tau \tau_t + x_t + \varphi_{k\tau} \tau_{kt} \leq y_t(m_t, z_t, e, \theta) + a_t - T(\cdot) \\ \ell_t = \bar{n}(m_t) - n_w(m_t) - n_\tau(\tau_t) - n_\tau(\tau_{kt}) - \nu n_t \\ m_{t+1} \sim \Gamma_m(m_t, m_{kt}, \tau_t) \\ \sum_\chi p(\chi) \log \frac{p(\chi)}{q(\chi)} \leq \kappa(m_t)$$

- **Parental Investments:** time n_t , money x_t , child treatment τ_{kt} , transfer $\hat{a}_t$
- **Disutility of child experiencing mental illness:** parents bear a direct utility cost
- **Child mental health feeds back:** m_{kt} enters $\Gamma_m(m_t, m_{kt}, \tau_t)$

Child Mental-Health Production

$$\underbrace{m_{k,t+1}}_{\text{next-period child MH}} = \left(\alpha_{1mt} \underbrace{\theta_{kt}^{\rho_{mt}}}_{\text{child cog. skill}} + \alpha_{2mt} \underbrace{m_{kt}^{\rho_{mt}}}_{\text{current child MH}} + \alpha_{3mt} \underbrace{\theta^{\rho_{mt}}}_{\text{parent cog. skill}} + \alpha_{4mt} \underbrace{m_t^{\rho_{mt}}}_{\text{parent MH}} + \alpha_{5mt} \underbrace{\iota_t^{\rho_{mt}}}_{\text{parental invest.}} \right)^{1/\rho_{mt}} e^{v_{mt} + v_{\tau} \tau_{kt}}$$

$$\iota_t = A_{\iota} \left(\alpha_{\iota} \underbrace{x_t^{\gamma}}_{\text{money}} + (1 - \alpha_{\iota}) \underbrace{n_t^{\gamma}}_{\text{time}} \right)^{1/\gamma}$$

Child Mental-Health Production

$$\underbrace{m_{k,t+1}}_{\text{next-period child MH}} = \left(\alpha_{1mt} \underbrace{\theta_{kt}^{\rho_{mt}}}_{\text{child cog. skill}} + \alpha_{2mt} \underbrace{m_{kt}^{\rho_{mt}}}_{\text{current child MH}} + \alpha_{3mt} \underbrace{\theta^{\rho_{mt}}}_{\text{parent cog. skill}} + \alpha_{4mt} \underbrace{m_t^{\rho_{mt}}}_{\text{parent MH}} + \alpha_{5mt} \underbrace{l_t^{\rho_{mt}}}_{\text{parental invest.}} \right)^{1/\rho_{mt}} e^{v_{mt} + v_{\tau} \tau_{kt}}$$

$$l_t = A_l \left(\alpha_l \underbrace{x_t^{\gamma}}_{\text{money}} + (1 - \alpha_l) \underbrace{n_t^{\gamma}}_{\text{time}} \right)^{1/\gamma}$$

- **Parent MH** m_t enters the CES directly *and* affects investment decisions

Child Mental-Health Production

$$\underbrace{m_{k,t+1}}_{\text{next-period child MH}} = \left(\alpha_{1mt} \underbrace{\theta_{kt}^{\rho_{mt}}}_{\text{child cog. skill}} + \alpha_{2mt} \underbrace{m_{kt}^{\rho_{mt}}}_{\text{current child MH}} + \alpha_{3mt} \underbrace{\theta^{\rho_{mt}}}_{\text{parent cog. skill}} + \alpha_{4mt} \underbrace{m_t^{\rho_{mt}}}_{\text{parent MH}} + \alpha_{5mt} \underbrace{l_t^{\rho_{mt}}}_{\text{parental invest.}} \right)^{1/\rho_{mt}} e^{v_{mt} + v_{\tau} \tau_{kt}}$$

$$l_t = A_l \left(\alpha_l \underbrace{x_t^{\gamma}}_{\text{money}} + (1 - \alpha_l) \underbrace{n_t^{\gamma}}_{\text{time}} \right)^{1/\gamma}$$

- ▶ **Parent MH** m_t enters the CES directly *and* affects investment decisions
- ▶ **Treatment** τ_{kt} raises the mean of next-period child MH via v_{τ}

Child Mental-Health Production

$$\underbrace{m_{k,t+1}}_{\text{next-period child MH}} = \left(\alpha_{1mt} \underbrace{\theta_{kt}^{\rho_{mt}}}_{\text{child cog. skill}} + \alpha_{2mt} \underbrace{m_{kt}^{\rho_{mt}}}_{\text{current child MH}} + \alpha_{3mt} \underbrace{\theta^{\rho_{mt}}}_{\text{parent cog. skill}} + \alpha_{4mt} \underbrace{m_t^{\rho_{mt}}}_{\text{parent MH}} + \alpha_{5mt} \underbrace{l_t^{\rho_{mt}}}_{\text{parental invest.}} \right)^{1/\rho_{mt}} e^{v_{mt} + v_{\tau} \tau_{kt}}$$

$$l_t = A_l \left(\alpha_l \underbrace{x_t^{\gamma}}_{\text{money}} + (1 - \alpha_l) \underbrace{n_t^{\gamma}}_{\text{time}} \right)^{1/\gamma}$$

- ▶ **Parent MH** m_t enters the CES directly *and* affects investment decisions
- ▶ **Treatment** τ_{kt} raises the mean of next-period child MH via v_{τ}
- ▶ **Parental investments** l_t aggregate money x_t and time n_t

Child Mental-Health Production

$$\underbrace{m_{k,t+1}}_{\text{next-period child MH}} = \left(\alpha_{1mt} \underbrace{\theta_{kt}^{\rho_{mt}}}_{\text{child cog. skill}} + \alpha_{2mt} \underbrace{m_{kt}^{\rho_{mt}}}_{\text{current child MH}} + \alpha_{3mt} \underbrace{\theta^{\rho_{mt}}}_{\text{parent cog. skill}} + \alpha_{4mt} \underbrace{m_t^{\rho_{mt}}}_{\text{parent MH}} + \alpha_{5mt} \underbrace{l_t^{\rho_{mt}}}_{\text{parental invest.}} \right)^{1/\rho_{mt}} e^{v_{mt} + v_{\tau} \tau_{kt}}$$

$$l_t = A_l \left(\alpha_l \underbrace{x_t^{\gamma}}_{\text{money}} + (1 - \alpha_l) \underbrace{n_t^{\gamma}}_{\text{time}} \right)^{1/\gamma}$$

- ▶ **Parent MH** m_t enters the CES directly *and* affects investment decisions
- ▶ **Treatment** τ_{kt} raises the mean of next-period child MH via v_{τ}
- ▶ **Parental investments** l_t aggregate money x_t and time n_t
- ▶ Shock v_{mt} makes the investment channel **risky**; analogous CES governs cognitive skill $\theta_{k,t+1}$

Cognitive skills are developed with a similar function, but without treatment

2. Calibration

data, estimation, validation

Calibration: Data and Approach

Data

- ▶ NLSY79 + NLSY-CYA — parent & child MH, cognitive skills, investments
- ▶ PSID — wealth, consumption, wages, labor supply by MH
- ▶ PSID CDS — child MH, parent MH, and time investments
- ▶ PSID TAS — college entry / graduation expectations

Two-step estimation

- ▶ **Step 1 (external).** Child dev. technology + Treatment efficacy
- ▶ **Step 2 (internal, SMM).** Negative thinking, stigma, college, investments, fiscal

Measuring Mental Health

Adult

PSID: K6 (Kessler) Scale

- 6 items on past-30-day frequency: (1) sad, (2) nervous, (3) restless, (4) hopeless, (5) everything an effort, (6) worthless
- Cutoffs (Kessler 2008): 0–7 healthy; 8–12 mild; 13–24 serious

NLSY: CES-D-7

- 7 items on past-week frequency: depressed; sad; restless sleep; could not get going; trouble concentrating; everything an effort; poor appetite

CES-D-7 & K6 load on common factor (*Kessler 2002*)

Child

15 items from three BPI subscales; caregiver reports “often true”, “sometimes true”, or “not true”.

Examples:

- **Antisocial:** bullies or is mean to others
breaks things deliberately
- **Anxiety/Depression:** too fearful or anxious
unhappy, sad, or depressed
- **Hyperactive:** difficulty concentrating
impulsive, acts without thinking

BPI score = sum of binary indicators across the three subscales; threshold anchored so CDS age 16–17 MH share matches TAS age 18–19 K6 share.

Child Mental Illness Worsens Parent Mental Health

$$m_{t+1} \sim \Gamma_m(m_t, \mathbf{m}_{kt}, \tau_t)$$

Parent MH today	Parent MH in four years		
	Healthy	Mild	Serious
Healthy, <i>child healthy</i>	94.0	4.3	1.7
Healthy, <i>child ill</i>	86.7	11.1	2.2
Mild	45.0	42.3	12.7
Serious	22.4	31.8	45.9

Four-year transition probabilities (%), no treatment.

A healthy parent whose child is experiencing mental illness is **twice as likely** to become ill: 6.0% vs 13.3%

Implied Probability of Child Mental Illness

Parent MH	Child healthy today	Child ill	
		No treatment	Treated
Healthy	19.5	44.5	27.1
Mild	37.4	64.0	42.6
Serious	52.8	74.6	53.0

Model-implied probability (%) that the child experiences mental illness next period.

Treatment is **curative**; parent mental health is **preventative** — a serious parent leaves the child at 52.8% risk even when the child is currently healthy

SMM: Main Endogenous Parameters

Parameter	Value	Moment	Data	Model
Adult Mental Health				
Negative thinking, mild $\kappa(m_1)$	0.123	Δ Time investment, mild	-0.118	-0.149
Negative thinking, serious $\kappa(m_2)$	0.204	Δ Time investment, serious	-0.212	-0.193
Stigma, serious ξ_τ	0.386	Treatment share, serious, 24-39	0.674	0.698
Stigma, mild σ_m	0.502	Treatment share, mild, 24-39	0.500	0.534
Stigma multiplier, late age σ_{post}	0.114	Treatment growth, 40-63 - 24-39	0.027	0.046
Child Mental Health				
Stigma cost of treatment ξ_τ^k	0.142	Child treatment, age 12	0.127	0.118
Utility cost of illness ξ^k	-1.023	Child treatment, age 12 - age 8	0.025	0.045
College				
Baseline college taste α_0	0.840	Enrollment share	0.426	0.432
College taste, college parents α_1	-1.196	Enrollment reg., parent college	0.242	0.239
College taste, cognitive skill α_θ	-1.129	Enrollment reg., cognitive skill	0.268	0.263
Scale college taste shock χ_s	3.007	Enrollment regression RMSE	0.419	0.424
Parental Investment Technology				
Parental resources share α_ι	0.160	Mean expenditures	5,758	5,437
Investment productivity A_ι	9.467	Normalized cognitive skill	0.000	-0.022
Leisure cost of parental time ν	0.050	Mean time investment	17.73	17.76

SMM: Main Endogenous Parameters

Parameter	Value	Moment	Data	Model
Adult Mental Health				
Negative thinking, mild $\kappa(m_1)$	0.123	Δ Time investment, mild	-0.118	-0.149
Negative thinking, serious $\kappa(m_2)$	0.204	Δ Time investment, serious	-0.212	-0.193
Stigma, serious ξ_τ	0.386	Treatment share, serious, 24-39	0.674	0.698
Stigma, mild σ_m	0.502	Treatment share, mild, 24-39	0.500	0.534
Stigma multiplier, late age σ_{post}	0.114	Treatment growth, 40-63 - 24-39	0.027	0.046
Child Mental Health				
Stigma cost of treatment ξ_τ^k	0.142	Child treatment, age 12	0.127	0.118
Utility cost of illness ξ^k	-1.023	Child treatment, age 12 - age 8	0.025	0.045
College				
Baseline college taste α_0	0.840	Enrollment share	0.426	0.432
College taste, college parents α_1	-1.196	Enrollment reg., parent college	0.242	0.239
College taste, cognitive skill α_θ	-1.129	Enrollment reg., cognitive skill	0.268	0.263
Scale college taste shock χ_s	3.007	Enrollment regression RMSE	0.419	0.424
Parental Investment Technology				
Parental resources share α_ι	0.160	Mean expenditures	5,758	5,437
Investment productivity A_ι	9.467	Normalized cognitive skill	0.000	-0.022
Leisure cost of parental time ν	0.050	Mean time investment	17.73	17.76

Negative thinking: $\kappa(m)$ calibrated to the parental time-investment gap by mental health status

SMM: Main Endogenous Parameters

Parameter	Value	Moment	Data	Model
Adult Mental Health				
Negative thinking, mild $\kappa(m_1)$	0.123	Δ Time investment, mild	-0.118	-0.149
Negative thinking, serious $\kappa(m_2)$	0.204	Δ Time investment, serious	-0.212	-0.193
Stigma, serious ξ_τ	0.386	Treatment share, serious, 24-39	0.674	0.698
Stigma, mild σ_m	0.502	Treatment share, mild, 24-39	0.500	0.534
Stigma multiplier, late age σ_{post}	0.114	Treatment growth, 40-63 - 24-39	0.027	0.046
Child Mental Health				
Stigma cost of treatment ξ_τ^k	0.142	Child treatment, age 12	0.127	0.118
Utility cost of illness ξ^k	-1.023	Child treatment, age 12 - age 8	0.025	0.045
College				
Baseline college taste α_0	0.840	Enrollment share	0.426	0.432
College taste, college parents α_1	-1.196	Enrollment reg., parent college	0.242	0.239
College taste, cognitive skill α_θ	-1.129	Enrollment reg., cognitive skill	0.268	0.263
Scale college taste shock χ_s	3.007	Enrollment regression RMSE	0.419	0.424
Parental Investment Technology				
Parental resources share α_ι	0.160	Mean expenditures	5,758	5,437
Investment productivity A_ι	9.467	Normalized cognitive skill	0.000	-0.022
Leisure cost of parental time ν	0.050	Mean time investment	17.73	17.76

Treatment stigma: disciplines endogenous take-up

SMM: Main Endogenous Parameters

Parameter	Value	Moment	Data	Model
Adult Mental Health				
Negative thinking, mild $\kappa(m_1)$	0.123	Δ Time investment, mild	-0.118	-0.149
Negative thinking, serious $\kappa(m_2)$	0.204	Δ Time investment, serious	-0.212	-0.193
Stigma, serious ξ_τ	0.386	Treatment share, serious, 24-39	0.674	0.698
Stigma, mild σ_m	0.502	Treatment share, mild, 24-39	0.500	0.534
Stigma multiplier, late age σ_{post}	0.114	Treatment growth, 40-63 - 24-39	0.027	0.046
Child Mental Health				
Stigma cost of treatment ξ_τ^k	0.142	Child treatment, age 12	0.127	0.118
Utility cost of illness ξ^k	-1.023	Child treatment, age 12 - age 8	0.025	0.045
College				
Baseline college taste α_0	0.840	Enrollment share	0.426	0.432
College taste, college parents α_1	-1.196	Enrollment reg., parent college	0.242	0.239
College taste, cognitive skill α_θ	-1.129	Enrollment reg., cognitive skill	0.268	0.263
Scale college taste shock χ_s	3.007	Enrollment regression RMSE	0.419	0.424
Parental Investment Technology				
Parental resources share α_ι	0.160	Mean expenditures	5,758	5,437
Investment productivity A_ι	9.467	Normalized cognitive skill	0.000	-0.022
Leisure cost of parental time ν	0.050	Mean time investment	17.73	17.76

College: taste calibrated to the enrollment share and regression

SMM: Main Endogenous Parameters

Parameter	Value	Moment	Data	Model
Adult Mental Health				
Negative thinking, mild $\kappa(m_1)$	0.123	Δ Time investment, mild	-0.118	-0.149
Negative thinking, serious $\kappa(m_2)$	0.204	Δ Time investment, serious	-0.212	-0.193
Stigma, serious ξ_τ	0.386	Treatment share, serious, 24-39	0.674	0.698
Stigma, mild σ_m	0.502	Treatment share, mild, 24-39	0.500	0.534
Stigma multiplier, late age σ_{post}	0.114	Treatment growth, 40-63 - 24-39	0.027	0.046
Child Mental Health				
Stigma cost of treatment ξ_τ^k	0.142	Child treatment, age 12	0.127	0.118
Utility cost of illness ξ^k	-1.023	Child treatment, age 12 - age 8	0.025	0.045
College				
Baseline college taste α_0	0.840	Enrollment share	0.426	0.432
College taste, college parents α_1	-1.196	Enrollment reg., parent college	0.242	0.239
College taste, cognitive skill α_θ	-1.129	Enrollment reg., cognitive skill	0.268	0.263
Scale college taste shock χ_s	3.007	Enrollment regression RMSE	0.419	0.424
Parental Investment Technology				
Parental resources share α_ℓ	0.160	Mean expenditures	5,758	5,437
Investment productivity A_ℓ	9.467	Normalized cognitive skill	0.000	-0.022
Leisure cost of parental time ν	0.050	Mean time investment	17.73	17.76

Parental investments: expenditure, time-use and skill data

Validation: Untargeted Moments

	Data	Model
<i>A. Intergenerational Persistence of Mental Health</i>		
Age controls	25.2	17.7
+ Income	22.7	16.6
+ Prior mental health	16.7	15.7
<i>B. Consumption and Parental Mental Health</i>		
Age controls	-15.9	-11.8
+ Wealth	-15.0	-11.4
+ Income	-3.1	-1.9

Validation: Untargeted Moments

	Data	Model
<i>A. Intergenerational Persistence of Mental Health</i>		
Age controls	25.2	17.7
+ Income	22.7	16.6
+ Prior mental health	16.7	15.7
<i>B. Consumption and Parental Mental Health</i>		
Age controls	-15.9	-11.8
+ Wealth	-15.0	-11.4
+ Income	-3.1	-1.9

A parent experiencing mental illness raises the child's risk

The model reproduces the level and the attenuation as controls are added.

Validation: Untargeted Moments

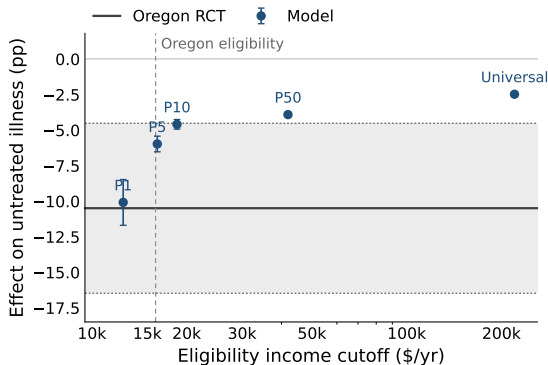
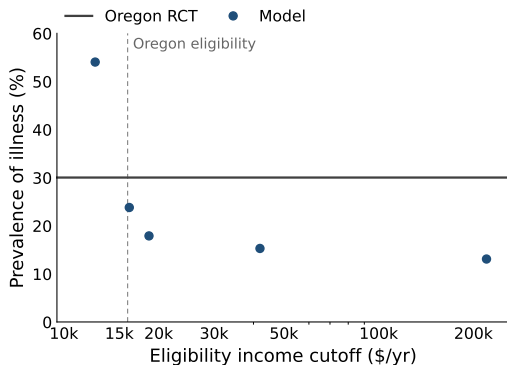
	Data	Model
<i>A. Intergenerational Persistence of Mental Health</i>		
Age controls	25.2	17.7
+ Income	22.7	16.6
+ Prior mental health	16.7	15.7
<i>B. Consumption and Parental Mental Health</i>		
Age controls	-15.9	-11.8
+ Wealth	-15.0	-11.4
+ Income	-3.1	-1.9

Households experiencing mental illness consume less

The model matches both the raw gap and its attenuation once income is controlled for.

Validation: The Oregon Health Insurance Experiment

- **Experiment:** 2008 lottery rationed new Medicaid slots among poor uninsured adults
- **Estimate:** depressed-and-untreated share -10.5pp , control mean 16.6% [Baicker et al., 2018]
- **Model:** treatment free below an income cutoff

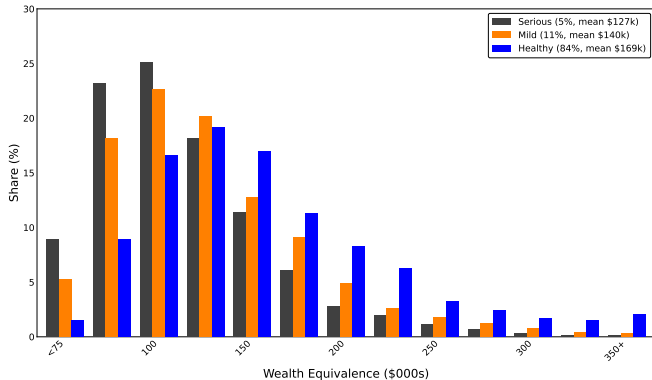


The model is in line with the Oregon effect near eligibility line

3. What is the Cost of Child Mental Illness?

1. **Cost of child mental illness:** what a cure is worth to a parent
2. **Transmission:** how parental illness reaches the child
3. **Policy:** treatment subsidies, in steady state and along the transition

Wealth-Equivalent Cost of Child Mental Health

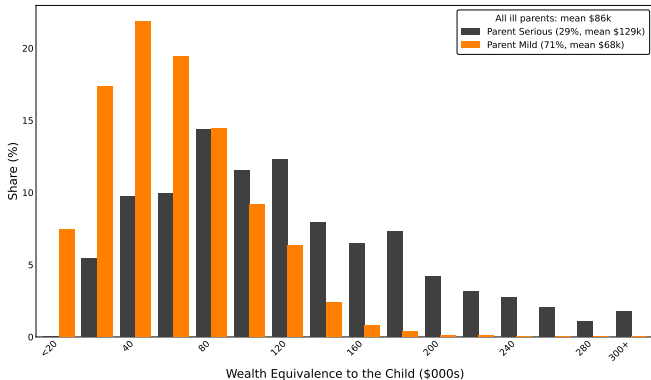


Wealth-equivalent value to the parent of curing their child's mental illness, by parent state.

Aggregate cost per adult

$$\underbrace{0.25}_{\text{share of adults raising a child}} \times \underbrace{0.322}_{\text{share of children experiencing mental illness}} \times \underbrace{\$164\text{k}}_{\text{value to the parent of curing the child}} = \underbrace{\$13.2\text{k}}_{\text{per adult}}$$

Wealth-Equivalent Value to the Child of Curing the Parent



Child's own wealth equivalent (age-16 entry assets) of curing an ill parent during childhood.

Aggregate cost per child

$$\underbrace{0.124}_{\text{share of children with a parent experiencing mental illness}} \times \underbrace{\$86\text{k}}_{\text{value to the child of curing the parent}} = \underbrace{\$10.6\text{k}}_{\text{per child}}$$

Transmission: Parent Mental Illness → Child

Channel	Parental Investments			Child Outcomes		
	Time	Money	Treatment	Cog. Skill	MH Healthy	Welfare (\$k)
<i>Baseline</i>						—
Negative thinking						
Child dev. (→ cognitive)						
Child dev. (→ child MH)						
Rumination						
Income effect						
Initial draw						
<i>Total</i>						

Shapley, parent serious illness → healthy. Percent except Treatment/MH Healthy (pp). Child welfare is the child's own wealth equivalent at age-16 entry.

Each row shows what happens when *that channel* of parent's mental illness is cured

Transmission: Parent Mental Illness → Child

Channel	Parental Investments			Child Outcomes		
	Time	Money	Treatment	Cog. Skill	MH Healthy	Welfare (\$k)
<i>Baseline</i>	<i>13.9 h/wk</i>	<i>\$4,328</i>	<i>35.5%</i>	<i>0.81</i>	<i>68.8%</i>	<i>—</i>
Negative thinking	+7.2	+6.4	−4.9	−0.3	−1.6	+9
Child dev. (→ cognitive)	+7.6	+6.0	+0.5	+16.3	+0.3	+68
Child dev. (→ child MH)	+4.2	+3.6	−17.3	−0.4	+13.4	+27
Rumination	+0.7	+0.0	+0.7	−0.1	−0.0	+1
Income effect	−0.0	+0.5	−4.5	−0.3	−1.4	+24
Initial draw	−0.1	−0.1	+0.3	−0.1	−0.3	+2
Total	+19.5	+16.5	−25.3	+15.2	+10.4	+129

Shapley, parent serious illness → healthy. Percent except Treatment/MH Healthy (pp). Child welfare is the child's own wealth equivalent at age-16 entry.

Curing parent is worth **\$129k** to the child

Transmission: Parent Mental Illness → Child

Channel	Parental Investments			Child Outcomes		
	Time	Money	Treatment	Cog. Skill	MH Healthy	Welfare (\$k)
<i>Baseline</i>	<i>13.9 h/wk</i>	<i>\$4,328</i>	<i>35.5%</i>	<i>0.81</i>	<i>68.8%</i>	<i>—</i>
Negative thinking	+7.2	+6.4	−4.9	−0.3	−1.6	+9
Child dev. (→ cognitive)	+7.6	+6.0	+0.5	+16.3	+0.3	+68
Child dev. (→ child MH)	+4.2	+3.6	−17.3	−0.4	+13.4	+27
Rumination	+0.7	+0.0	+0.7	−0.1	−0.0	+1
Income effect	−0.0	+0.5	−4.5	−0.3	−1.4	+24
Initial draw	−0.1	−0.1	+0.3	−0.1	−0.3	+2
<i>Total</i>	+19.5	+16.5	−25.3	+15.2	+10.4	+129

Shapley, parent serious illness → healthy. Percent except Treatment/MH Healthy (pp). Child welfare is the child's own wealth equivalent at age-16 entry.

Negative thinking raises investments most; the child gains +\$9k

Transmission: Parent Mental Illness → Child

Channel	Parental Investments			Child Outcomes		
	Time	Money	Treatment	Cog. Skill	MH Healthy	Welfare (\$k)
<i>Baseline</i>	<i>13.9 h/wk</i>	<i>\$4,328</i>	<i>35.5%</i>	<i>0.81</i>	<i>68.8%</i>	<i>—</i>
Negative thinking	+7.2	+6.4	−4.9	−0.3	−1.6	+9
Child dev. (→ cognitive)	+7.6	+6.0	+0.5	+16.3	+0.3	+68
Child dev. (→ child MH)	+4.2	+3.6	−17.3	−0.4	+13.4	+27
Rumination	+0.7	+0.0	+0.7	−0.1	−0.0	+1
Income effect	−0.0	+0.5	−4.5	−0.3	−1.4	+24
Initial draw	−0.1	−0.1	+0.3	−0.1	−0.3	+2
<i>Total</i>	<i>+19.5</i>	<i>+16.5</i>	<i>−25.3</i>	<i>+15.2</i>	<i>+10.4</i>	<i>+129</i>

Shapley, parent serious illness → healthy. Percent except Treatment/MH Healthy (pp). Child welfare is the child's own wealth equivalent at age-16 entry.

Child development dominates: the cognitive channel alone is \$68k of the \$129k

Policy Effects

Policy	Uptake (pp chg)	Uptake (pp chg)	(pp chg)	(pp chg)	(Δ)	(pp chg)	Wealth Eq. (\$k)
<i>Baseline level</i>						—	—
Children							
Young Parents							
All Parents							
All adults							

Every policy is evaluated in **general equilibrium**, with the government budget **balanced each period through the labour income tax**.

Policy Effects

Policy	Parent Uptake (pp chg)	Child Uptake (pp chg)	Unh. Par. (pp chg)	Unh. Kids (pp chg)	IGM (Δ)	Labor Tax (pp chg)	Welfare Wealth Eq. (\$k)
<i>Baseline level</i>	<i>50.9%</i>	<i>15.4%</i>	<i>12.8%</i>	<i>32.2%</i>	<i>0.17</i>	—	—
Children	−2.4	+56.4	−0.18	−2.48	−0.02	+0.99	−8.3
Young Parents	+7.7	−2.6	−0.33	−0.09	−0.00	+0.00	+1.3
All Parents	+12.8	−3.1	−0.57	−0.13	−0.00	−0.02	+3.1
All adults	+17.7	−4.3	−0.88	−0.13	−0.00	+0.26	−1.4

Policy Effects

Policy	Parent Uptake (pp chg)	Child Uptake (pp chg)	Unh. Par. (pp chg)	Unh. Kids (pp chg)	IGM (Δ)	Labor Tax (pp chg)	Welfare Wealth Eq. (\$k)
<i>Baseline level</i>	50.9%	15.4%	12.8%	32.2%	0.17	—	—
Children	−2.4	+56.4	−0.18	−2.48	−0.02	+0.99	−8.3
Young Parents	+7.7	−2.6	−0.33	−0.09	−0.00	+0.00	+1.3
All Parents	+12.8	−3.1	−0.57	−0.13	−0.00	−0.02	+3.1
All adults	+17.7	−4.3	−0.88	−0.13	−0.00	+0.26	−1.4

Children: Large take-up increase and child illness reduction but expensive, making it **welfare-reducing**.

Policy Effects

Policy	Parent Uptake (pp chg)	Child Uptake (pp chg)	Unh. Par. (pp chg)	Unh. Kids (pp chg)	IGM (Δ)	Labor Tax (pp chg)	Welfare Wealth Eq. (\$k)
<i>Baseline level</i>	50.9%	15.4%	12.8%	32.2%	0.17	—	—
Children	−2.4	+56.4	−0.18	−2.48	−0.02	+0.99	−8.3
Young Parents	+7.7	−2.6	−0.33	−0.09	−0.00	+0.00	+1.3
All Parents	+12.8	−3.1	−0.57	−0.13	−0.00	−0.02	+3.1
All adults	+17.7	−4.3	−0.88	−0.13	−0.00	+0.26	−1.4

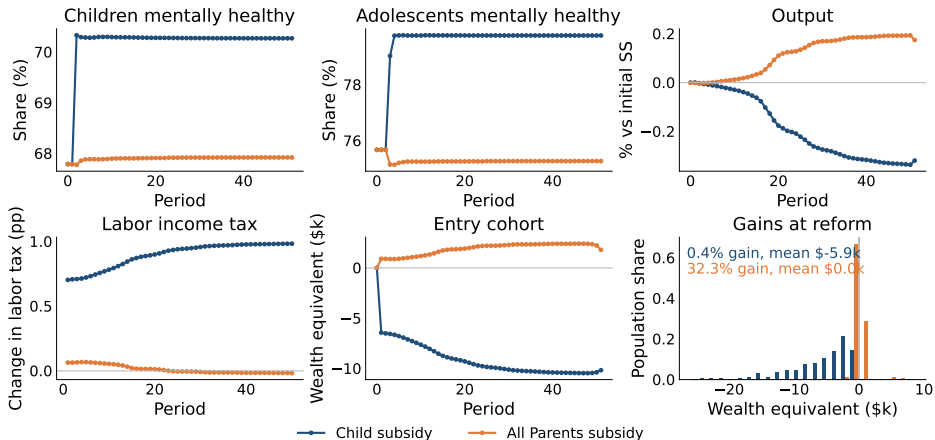
All Parents: It is **welfare-maximizing** but only **small reduction in child illness**.

Policy Effects

Policy	Parent Uptake (pp chg)	Child Uptake (pp chg)	Unh. Par. (pp chg)	Unh. Kids (pp chg)	IGM (Δ)	Labor Tax (pp chg)	Welfare Wealth Eq. (\$k)
<i>Baseline level</i>	<i>50.9%</i>	<i>15.4%</i>	<i>12.8%</i>	<i>32.2%</i>	<i>0.17</i>	—	—
Children	−2.4	+56.4	−0.18	−2.48	−0.02	+0.99	−8.3
Young Parents	+7.7	−2.6	−0.33	−0.09	−0.00	+0.00	+1.3
All Parents	+12.8	−3.1	−0.57	−0.13	−0.00	−0.02	+3.1
All adults	+17.7	−4.3	−0.88	−0.13	−0.00	+0.26	−1.4

All adults: reduces welfare and children mental health

Transition: Child vs. Parent Subsidy



- Transition results are qualitatively in line with steady state
- But limited political support for parents subsidy too

Social Media and Mental Health

preliminary

- ▶ **The experiment.** Remove social media — a change in *primitives*, unanticipated and permanent, not a policy
- ▶ **How it enters.** A shift of δ SD in a latent index: $p_0 \rightarrow \Phi(\Phi^{-1}(p_0) + \delta)$, calibrated to $\delta \in [0.03, 0.11]$. Adults: hazard of *becoming* ill. Children: latent mean, ages 8–15
- ▶ **Measurement.** Wealth equivalent, GE and budget balanced. The counterfactual saves treatment spending, so the tax is a rebate

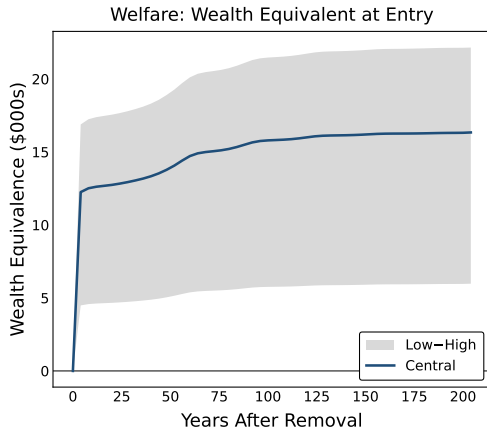
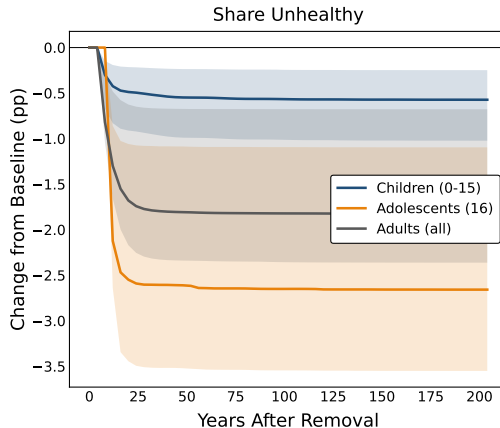
Everyone exposed	Central	[Low – High]
Wealth equivalent, entry cohort	\$16.3k	[6.0 – 22.2]
all ages alive at removal	\$7.4k	[2.8 – 10.2]
Share unhealthy: children (32.2%)	–0.57 pp	[–0.25 to –1.02]
adolescents (24.3%)	–2.66 pp	[–1.10 to –3.55]
adults (13.9%)	–1.82 pp	[–0.68 to –2.36]

2015 dollars; prevalence in pp from the baseline level in *italics*. Brackets span the low and high δ calibrations.

Adolescent illness falls most; the adult channel pays

Social Media: Transition

preliminary



- ▶ The entry cohort gets **most of the gain immediately** — it is born into the healthier environment; the slow remainder is the adult stock of illness working itself out

Conclusion

First quantitative macroeconomic theory of child mental health

- ▶ Integrates **psychiatric evidence** with the **macroeconomics of child development**
- ▶ Mental health flows **both ways**: parent → child, and child → parent

Child mental illness is costly

- ▶ A cure is worth **\$164k** to the parent
- ▶ Aggregate cost: **\$13.2k** per adult

Parental mental illness is costly

- ▶ A cure is worth **\$86k** to the child
- ▶ Aggregate cost: **\$10.6k** per child

Treating parents or children?

- ▶ **Parent treatment** subsidy maximizes **welfare** but small impact on child MH
- ▶ **Child treatment** subsidy is the best measure for their **mental health**

Appendix Slides

Parental Transfer Stage

Before the child becomes independent, parents choose a transfer $\hat{a}_t \geq 0$:

$$V_t^{\text{Tr}}(a_t, m_t, z_t, e, \theta, m_{kt}, \theta_{kt}) = \max_{\hat{a}_t \geq 0} \underbrace{\hat{v}_t(a_t - \hat{a}_t, m_t, z_t, e, \theta)}_{\text{parent's continuation value}} + \omega \underbrace{\mathbb{E}[\hat{v}_0^k(\hat{a}_t, m_{kt}, \theta_{kt})]}_{\text{child's value entering adulthood}}$$

- ▶ Transfer $\hat{a}_t$ becomes child's initial assets
- ▶ Parent's continuation $\hat{v}_t$ still embeds negative thinking
- ▶ Child's entry value $\hat{v}_0^k$ is the **college-enrollment decision**

Two margins: risky MH/skill investment vs. asset transfer

Child Mental Health Development Technology

$$\underbrace{m_{k,t+1}}_{\text{next-period child MH}} = \left(\alpha_{1mt} \underbrace{\theta_{kt}^{\rho_{mt}}}_{\text{child cog. skill}} + \alpha_{2mt} \underbrace{m_{kt}^{\rho_{mt}}}_{\text{current child MH}} + \alpha_{3mt} \underbrace{\theta^{\rho_{mt}}}_{\text{parent cog. skill}} + \alpha_{4mt} \underbrace{m_t^{\rho_{mt}}}_{\text{parent MH}} + \alpha_{5mt} \underbrace{\ell_t^{\rho_{mt}}}_{\text{parental invest.}} \right)^{1/\rho_{mt}} e^{v_{mt} + v_{\tau} \tau_{kt}}$$

Parameter	1st Stage	2nd Stage
Cognitive skill (α_{1mt})	0.000	0.000
Child mental health (α_{2mt})	0.513	0.835
Parent cognitive skill (α_{3mt})	0.043	0.000
Parent mental health (α_{4mt})	0.366	0.143
Investments (α_{5mt})	0.078	0.022
Complementarity (ρ_{mt})	-0.647	-1.069
Shock variance ($\sigma_{v_{mt}}^2$)	0.202	0.058

Cunha-Heckman-Schennach (2010) procedure but with MH measurements

Child Mental Health Development Technology

$$\underbrace{m_{k,t+1}}_{\text{next-period child MH}} = \left(\alpha_{1mt} \underbrace{\theta_{kt}^{\rho_{mt}}}_{\text{child cog. skill}} + \alpha_{2mt} \underbrace{m_{kt}^{\rho_{mt}}}_{\text{current child MH}} + \alpha_{3mt} \underbrace{\theta^{\rho_{mt}}}_{\text{parent cog. skill}} + \alpha_{4mt} \underbrace{m_t^{\rho_{mt}}}_{\text{parent MH}} + \alpha_{5mt} \underbrace{\ell_t^{\rho_{mt}}}_{\text{parental invest.}} \right)^{1/\rho_{mt}} e^{v_{mt} + v_{\tau} \tau_{kt}}$$

Parameter	1st Stage	2nd Stage
Cognitive skill (α_{1mt})	0.000	0.000
Child mental health (α_{2mt})	0.513	0.835
Parent cognitive skill (α_{3mt})	0.043	0.000
Parent mental health (α_{4mt})	0.366	0.143
Investments (α_{5mt})	0.078	0.022
Complementarity (ρ_{mt})	-0.647	-1.069
Shock variance ($\sigma_{v_{mt}}^2$)	0.202	0.058

Large self-productivity of child MH, increasing with age

Child Mental Health Development Technology

$$\underbrace{m_{k,t+1}}_{\text{next-period child MH}} = \left(\alpha_{1mt} \underbrace{\theta_{kt}^{\rho_{mt}}}_{\text{child cog. skill}} + \alpha_{2mt} \underbrace{m_{kt}^{\rho_{mt}}}_{\text{current child MH}} + \alpha_{3mt} \underbrace{\theta^{\rho_{mt}}}_{\text{parent cog. skill}} + \alpha_{4mt} \underbrace{m_t^{\rho_{mt}}}_{\text{parent MH}} + \alpha_{5mt} \underbrace{\ell_t^{\rho_{mt}}}_{\text{parental invest.}} \right)^{1/\rho_{mt}} e^{v_{mt} + v_{\tau} \tau_{kt}}$$

Parameter	1st Stage	2nd Stage
Cognitive skill (α_{1mt})	0.000	0.000
Child mental health (α_{2mt})	0.513	0.835
Parent cognitive skill (α_{3mt})	0.043	0.000
Parent mental health (α_{4mt})	0.366	0.143
Investments (α_{5mt})	0.078	0.022
Complementarity (ρ_{mt})	-0.647	-1.069
Shock variance ($\sigma_{v_{mt}}^2$)	0.202	0.058

Parental mental health plays a larger role than parental cognitive skills

Child Mental Health Development Technology

$$\underbrace{m_{k,t+1}}_{\text{next-period child MH}} = \left(\alpha_{1mt} \underbrace{\theta_{kt}^{\rho_{mt}}}_{\text{child cog. skill}} + \alpha_{2mt} \underbrace{m_{kt}^{\rho_{mt}}}_{\text{current child MH}} + \alpha_{3mt} \underbrace{\theta^{\rho_{mt}}}_{\text{parent cog. skill}} + \alpha_{4mt} \underbrace{m_t^{\rho_{mt}}}_{\text{parent MH}} + \alpha_{5mt} \underbrace{l_t^{\rho_{mt}}}_{\text{parental invest.}} \right)^{1/\rho_{mt}} e^{v_{mt} + v_{\tau} \tau_{kt}}$$

Parameter	1st Stage	2nd Stage
Cognitive skill (α_{1mt})	0.000	0.000
Child mental health (α_{2mt})	0.513	0.835
Parent cognitive skill (α_{3mt})	0.043	0.000
Parent mental health (α_{4mt})	0.366	0.143
Investments (α_{5mt})	0.078	0.022
Complementarity (ρ_{mt})	-0.647	-1.069
Shock variance ($\sigma_{v_{mt}}^2$)	0.202	0.058

Investment share is small (smaller than for cognitive) and declines with age

Child Mental Health Development Technology

$$\underbrace{m_{k,t+1}}_{\text{next-period child MH}} = \left(\alpha_{1mt} \underbrace{\theta_{kt}^{\rho_{mt}}}_{\text{child cog. skill}} + \alpha_{2mt} \underbrace{m_{kt}^{\rho_{mt}}}_{\text{current child MH}} + \alpha_{3mt} \underbrace{\theta_{mt}^{\rho_{mt}}}_{\text{parent cog. skill}} + \alpha_{4mt} \underbrace{m_t^{\rho_{mt}}}_{\text{parent MH}} + \alpha_{5mt} \underbrace{\iota_t^{\rho_{mt}}}_{\text{parental invest.}} \right)^{1/\rho_{mt}} e^{v_{mt} + v_{\tau} \tau_{kt}}$$

Parameter	1st Stage	2nd Stage
Cognitive skill (α_{1mt})	0.000	0.000
Child mental health (α_{2mt})	0.513	0.835
Parent cognitive skill (α_{3mt})	0.043	0.000
Parent mental health (α_{4mt})	0.366	0.143
Investments (α_{5mt})	0.078	0.022
Complementarity (ρ_{mt})	-0.647	-1.069
Shock variance ($\sigma_{v_{mt}}^2$)	0.202	0.058

Complementarity strengthens with age

Treatment Efficacy

Treatment τ_{kt} shifts the mean of the child-MH transition:

$$m_{k,t+1} = (\alpha_{1mt}\theta_{kt}^{\rho_{mt}} + \alpha_{2mt}m_{kt}^{\rho_{mt}} + \alpha_{3mt}\theta^{\rho_{mt}} + \alpha_{4mt}m_t^{\rho_{mt}} + \alpha_{5mt}l_t^{\rho_{mt}})^{1/\rho_{mt}} e^{v_{mt} + v_{\tau}\tau_{kt}}$$

- Under random allocation of treatment, the standardized mean difference satisfies

$$\text{SMD} = \frac{\mathbb{E}[\log m_{k,t+1} \mid \tau_{kt} = 1] - \mathbb{E}[\log m_{k,t+1} \mid \tau_{kt} = 0]}{\sqrt{\text{Var}[\log m_{k,t+1} \mid \tau_{kt} = 0]}} = \frac{v_{\tau}}{\sigma_{v_{mt}}}$$

Treatment Efficacy

Treatment τ_{kt} shifts the mean of the child-MH transition:

$$m_{k,t+1} = (\alpha_{1mt}\theta_{kt}^{\rho_{mt}} + \alpha_{2mt}m_{kt}^{\rho_{mt}} + \alpha_{3mt}\theta_t^{\rho_{mt}} + \alpha_{4mt}m_t^{\rho_{mt}} + \alpha_{5mt}l_t^{\rho_{mt}})^{1/\rho_{mt}} e^{v_{mt} + \boxed{v_{\tau}\tau_{kt}}}$$

- Under random allocation of treatment, the standardized mean difference satisfies

$$\text{SMD} = \frac{\mathbb{E}[\log m_{k,t+1} \mid \tau_{kt} = 1] - \mathbb{E}[\log m_{k,t+1} \mid \tau_{kt} = 0]}{\sqrt{\text{Var}[\log m_{k,t+1} \mid \tau_{kt} = 0]}} = \boxed{\frac{v_{\tau}}{\sigma_{v_{mt}}}}$$

- **Weisz et al. (2017)**: meta-analysis of child psychotherapy RCTs $\rightarrow$ average $\text{SMD} = 0.46$
- Analogous calibration for **adult treatment** from clinical meta-analyses

Treatment raises the mean of the child-MH transition by a known magnitude

Mental Illness Among Children: Prevalence and Types

Prevalence

- ▶ $\geq 20\%$ of U.S. children meet criteria for a mental disorder in a given year (Sapenfield et al., 2018)
- ▶ $\sim 50\%$ lifetime prevalence of any disorder by adolescence (Merikangas et al., 2010)
- ▶ WHO: ~ 1 -in-7 children (10–19) worldwide has a diagnosable mental disorder

Most common diagnoses

- ▶ Anxiety disorders, behavioral/conduct disorders, mood disorders (depression)

Treatment

- ▶ Only $\sim 40.6\%$ of children with a disorder receive any treatment (NIMH, 2021)

Child mental illness: high prevalence, broad composition, large untreated share

Mental Illness Among Adults: Scale of the Problem

Composition: depression and anxiety dominate

- ▶ ~26% of U.S. adults have a mental illness in a given year
- ▶ $\geq 70\%$ of those have **anxiety or depression** (Kessler, Chiu, Demler, Walters, 2005)
- ▶ Shared behavioral features: negative thinking, rumination, reinforcement learning deficits

vs. homelessness

- ▶ ~20% any MI; ~5% serious MI vs. 0.5–1.4% homeless
(Imrohoroglu and Zhao, 2022; SAMHSA, 2022)

vs. opioid misuse (NSDUH / SAMHSA, 2022)

- ▶ Past-year misuse: 2.2% (no MI); 7.7% (any MI); 10.3% (serious MI)
- ▶ Opioid epidemic a downstream manifestation (Abramson, 2024)

Adult mental illness is a first-order social problem, with depression and anxiety at its core

Negative Thinking: Psychiatric Evidence

Cognitive model of depression (Beck, 1967, 1976; Beck and Clark, 1991)

- ▶ Depression characterized as a **cognitive disorder with negatively biased expectations**
- ▶ Depressed agents hold biased priors over the likelihood of future outcomes

Not a flow-utility deficit (Huys, Daw, Dayan, 2015)

- ▶ Direct examinations of hedonic responsiveness to primary reinforcers (e.g., sweet solutions) show *no difference* between depressed patients and controls
⇒ Low expected utility stems from **continuation values**, not contemporaneous pleasure

Mapping to the model

- ▶ Subjective probabilities p chosen to minimise continuation value under relative-entropy budget $\kappa(m_t)$
- ▶ Larger mental illness $\Rightarrow$ larger $\kappa \Rightarrow$ more negative distortion

Negative thinking disciplines saving, labor, and investment via biased expectations

Negative Thinking: Measurement and Evidence

Data: RAND American Life Panel (2012)

- *Well-being module*: depression/anxiety items $\Rightarrow$ healthy / mild / serious (matched to NIMH shares)
- *Ellsberg module*: subjective loss probabilities p_i from ambiguity-urn bisection

Identification of κ (Raiffa 1961)

- Coin-toss: $p = \frac{1}{2}$ absent ambiguity aversion
- Deviations map directly to distortion: $p_i = \frac{1}{2} + \kappa_i$
- *Ambiguity index*: $\frac{1}{2} - p_i$

Estimate (regression on depression indicator D_i)

- $\hat{\kappa} \approx 4\text{--}5$ pp for depressed vs. non-depressed
- Significant at 1% across three MH measures

Connection with medical lit

- **Butler & Mathews (1983)**: depressed rate likelihood of negative events 4.3 vs. 2.2 (controls); positive events 3.2 vs. 3.7
- **Pyszczynski et al. (1997)**: negative-event ratings 23 vs. 13; positive-event ratings 23 vs. 31
- **Lavender & MacLeod (2005)**: depressed generate more negative and fewer positive future events in a 30-second recall task

Negative Thinking and Depression Intensity

$$\text{Elicited loss probability } p_i = \kappa_1 D_{1i} + \kappa_2 D_{2i} + \kappa_x X_i + \varepsilon_i$$

D_{1i} : mild; D_{2i} : serious. Dep. var.: subjective loss probability in Ellsberg urn.

	(1)	(2)	(3)	(4)	(5)
Mild κ_1	3.4	3.3	3.4	3.4	3.2
	(1.3)	(1.3)	(1.0)	(1.3)	(1.3)
Serious κ_2	6.4	6.9	6.9	6.9	7.0
	(2.2)	(2.2)	(2.2)	(2.2)	(2.2)
Controls	None	+ Income, Age	+ Education	+ Race, Gender	All
R^2	0.02	0.03	0.03	0.04	0.06

Controls: income, age, education, race, gender, employment, risk aversion. $n = 2,974$; mean subjective loss prob. 47.4%. RAND ALP, 2012.

Larger depression intensity $\Rightarrow$ larger κ ; monotone gradient by severity

Risk Aversion and Depression Intensity

$$\text{Risk aversion}_i = \kappa_1 D_{1i} + \kappa_2 D_{2i} + \kappa_x X_i + \varepsilon_i$$

Dep. var.: risk-aversion score. Controls include subjective loss probability.

	(1)	(2)	(3)
Mild κ_1	0.5 (2.7)	2.1 (2.7)	2.7 (2.7)
Serious κ_2	-1.1 (4.6)	-1.5 (4.6)	-1.2 (4.6)
Controls	None	+ Income, Age	All
R^2	0.01	0.03	0.03

Controls: income, age, education, race, gender, employment, subjective loss prob. $n = 2,974$. RAND ALP, 2012.

No significant gradient in risk aversion by MH status.

Consistent with psychiatric literature: the cognitive distortion is negative thinking,
not risk aversion.

Rumination: Psychiatric Evidence

Definition

- ▶ Repetitive, self-focused negative thinking; a core feature of depression (Nolen-Hoeksema, 1991; 2008)
- ▶ Distinct from worry: retrospective, about the self, and sustained

Behavioral implications (in our model)

- ▶ Crowds out productive attention $\Rightarrow$ **labor hours** and **time with child** fall
- ▶ Mapped in model as an additive utility cost $\xi^a(m)$ on labor *and* on parenting time
- ▶ Consistent with experimental and clinical evidence: rumination reduces task engagement and productivity

Rumination $\Rightarrow$ lower labor supply and lower parental time

Negative Thinking (Intuition)

- ▶ Agent forms a **subjective** probability p that may differ from the objective q
- ▶ Subjective probabilities chosen to *minimize* continuation value, subject to a *relative-entropy budget* $\kappa(m_t)$
- ▶ Larger mental illness $\Rightarrow$ larger $\kappa \Rightarrow$ more negative distortion
- ▶ Closed-form tilting: $p(\chi) \propto q(\chi) \exp(-\lambda w(\chi))$
- ▶ Distortion is **state-contingent**: most pronounced over the worst outcomes

Negatively tilted subjective probabilities discipline precautionary saving, transfers, and investment decisions

College Enrollment Problem: $\hat{v}_0^k$

At age 18, the young adult chooses $e \in \{0, 1\}$ given $(a, m, \theta, e_p, \chi)$ with school-taste shock χ (Type I EV, scale χ_s):

$$\hat{v}_0^k(a, m, \theta) = \max_{e \in \{0, 1\}} \left\{ \underbrace{\min_p \mathbb{E}_p v_t(a, m, z, e = 0, \theta) + \chi_0}_{\text{work: labor-market entry}}, \right. \\ \left. \underbrace{v_t(a, m, e = 1, \theta) + \Upsilon(\theta, e_p) + \chi_1}_{\text{enroll: one period of college}} \right\}$$

- ▶ **College** (period 5, $e = 1$): time cost n_e , tuition τ_e , subsidized loans; graduate w.p. $p_e(\theta, m)$
- ▶ **Non-college** (period 5, $e = 0$): enter labor market with productivity $\log z \sim N(0, \sigma_t^0)$
- ▶ **Negative thinking distorts** perceived return: downward-biased subjective probabilities over $p_e(\theta, m)$ and first productivity draw z
- ▶ $\Upsilon(\theta, e_p) = \chi_s[\alpha_0 + \alpha_1 \mathbf{1}\{e_p = 1\} + \alpha_\theta \log \theta]$: direct utility from college

Parental transfer $\hat{a}_t$ enters as initial assets a

K6 Scale: Validation and Relation to CES-D-7

K6 (Kessler) Scale — PSID / TAS

- Sum of 6 past-30-day frequency items; range 0–24; cutoffs from **Kessler (2008)**
- Primary MH measure in U.S. government surveys and WHO World Mental Health Surveys
- Extensively validated against clinical mood and anxiety diagnoses (*Kessler 2002, 2003; Furukawa 2003; Cairney 2007*)

CES-D-7 — NLSY79

- K6 not administered in NLSY79 $\Rightarrow$ we use CES-D-7 short depression scale
- **Items:** poor appetite; trouble concentrating; felt depressed; everything an effort; restless sleep; felt sad; could not get going

Relation between K6 and CES-D-7

- Both load on a common “non-specific psychological distress” latent factor (*Kessler 2002; Mirowsky–Ross 2003*); high empirical correlation in overlapping samples
- BPI threshold anchored so CDS age 16–17 MH share matches TAS age 18–19 K6 share $\Rightarrow$ scales harmonised at cohort boundary

Adult MH Transition Matrix $\Gamma_m(m_k, \tau)$

Identification (Abramson, Boerma & Tsyvinski, 2024)

- 12 transition probabilities matched to 12 moments
- 8 transitions from the **PSID** (unconditional on treatment); 2 population shares from **NIMH**; 2 efficacy estimates from the medical literature
- Treatment is not beneficial for the healthy; only the healthy row varies with child MH

No Treatment				Treatment			
	Healthy	Mild	Serious		Healthy	Mild	Serious
Healthy, child healthy	94.0	4.3	1.7	Healthy, child healthy	94.0	4.3	1.7
Healthy, child ill	86.7	11.1	2.2	Healthy, child ill	86.7	11.1	2.2
Mild	45.0	42.3	12.7	Mild	80.7	13.4	5.9
Serious	22.4	31.8	45.9	Serious	52.3	27.1	20.6

Rows: current MH m (and child MH, where it matters); columns: MH four years ahead. Percent.

Treatment raises Serious→Healthy from 22% to 52%

Superseded: Income-Dependent Transitions $\Gamma_m(\tau, z)$

In the **previous specification** the healthy row varied with **low income** z , not with child mental health. Kept for comparison.

	<i>No Treatment</i>		
	Healthy	Mild	Serious
Healthy ($z < \underline{z}$)	0.894	0.078	0.028
Healthy ($z \geq \underline{z}$)	0.901	0.077	0.022
Mild	0.611	0.255	0.134
Serious	0.331	0.316	0.353

	<i>Treatment</i>		
	Healthy	Mild	Serious
Healthy ($z < \underline{z}$)	0.894	0.078	0.028
Healthy ($z \geq \underline{z}$)	0.901	0.077	0.022
Mild	0.893	0.076	0.031
Serious	0.635	0.220	0.145

Two-year transitions, probabilities. Low-productivity cutoff $\underline{z}$ at the 25th percentile of idiosyncratic z . The income gradient was small: 2.8% vs 2.2% serious-illness risk.

Income mattered little; child mental health matters much more

Validation: Additional Untargeted Moments

	Data	Model
C. College Enrollment (pp effect of MH on enrollment)		
No controls	−13.5 (3.3)	−4.1
+ Income, parental ed.	−10.0 (3.0)	−2.8
D. College Graduation (pp effect of MH on graduation, unconditional)		
No controls	−7.3 (4.2)	−4.1
+ Income, parental ed.	−5.4 (4.0)	−3.0
E. Graduation Expectations (pp effect of MH on subj. expectation)		
No controls	−3.7 (1.2)	−11.6

- ▶ Model replicates sign and order of magnitude of enrollment/graduation penalties
- ▶ Panel E overestimates: entropy-based distortion over-shifts perceived returns
- ▶ Controls attenuate the gap in both data and model (income + parental education)

Individual Welfare: Full Table (Serious → Healthy)

Channel	Cons.	Savings	Labor		Parental Invest.		Transfers	Welfare
	(%)	(%)	Inc. (%)	Hrs (%)	Time (%)	Money (%)	(%)	CEV (%)
<i>Baseline</i>	<i>\$30,150</i>	<i>\$150,689</i>	<i>\$45,749</i>	<i>29.9 h</i>	<i>13.9 h</i>	<i>\$4,328</i>	<i>\$97,116</i>	—
Negative thinking	3.1	−3.3	0.0	0.0	7.2	6.4	6.7	5.0
Rumination	−0.0	0.1	0.0	0.0	0.7	0.0	−0.1	1.4
Income effect	3.3	6.8	19.0	12.9	−0.0	0.5	4.5	2.5
Child development	0.0	0.2	0.0	0.0	11.7	9.6	−0.0	1.7
Initial draw	−0.1	0.1	0.0	0.0	−0.1	−0.1	−0.0	0.1
Total	6.3	3.9	19.0	12.9	19.5	16.5	11.0	10.8

Weighted (Kalai–Samet) Shapley; % change relative to the seriously ill baseline. Consumption equivalent: 10.8%.

- ▶ Negative thinking is the largest single channel: 5.0 of the 10.8% total CEV
- ▶ Transfers respond most to negative thinking (+6.7 of +11.0%)
- ▶ Child development moves investments most (+11.7% time, +9.6% money)

Individual Welfare: Mild Illness → Healthy

Channel	Consumption	Savings	Parental Investments		Welfare
	(%)	(%)	Time (%)	Money (%)	CEV (%)
<i>Baseline</i>	<i>\$30,982</i>	<i>\$159,693</i>	<i>15.4 h/wk</i>	<i>\$4,789</i>	—
Negative thinking	2.5	−2.7	4.6	4.1	3.7
Rumination	−0.0	0.1	1.9	0.1	1.0
Income effect	1.4	2.3	0.1	0.5	1.1
Child development	−0.0	0.3	6.3	4.8	1.1
Initial draw	−0.0	0.1	−0.3	−0.1	0.1
Total	3.7	0.1	12.6	9.3	7.1

- ▶ Consumption equivalent: 7.1%
- ▶ Welfare ranking preserved: **negative thinking dominant** (3.7 of 7.1% CEV)
- ▶ Investments are instead driven by child development (+6.3% time vs +4.6%)
- ▶ Consistent with Beck's cognitive model of depression

Aggregate Effects: Labor, Consumption, Hours

Channel	Output	Labor Inc.	Consumption	Hours	Savings
<i>Baseline level</i>	<i>\$51,184</i>	<i>\$35,399</i>	<i>\$38,107</i>	<i>0.334 sh.</i>	<i>\$127,710</i>
Income effect	0.8	0.8	0.6	1.0	0.3
Rumination	-0.1	-0.1	-0.0	-0.0	0.2
Negative thinking	-0.1	-0.1	-1.3	-0.1	-10.7
Initial draw (parent MH)	-0.0	-0.0	-0.0	-0.0	0.0
Initial draw (child MH)	-0.1	-0.1	-0.0	-0.0	0.0
Child dev.: parent MH → child cog.	4.5	4.5	3.1	-0.0	3.9
Child dev.: parent MH → child MH	-0.4	-0.4	-0.3	-0.0	-0.5
Child dev.: child MH → child MH	-0.4	-0.4	-0.5	0.1	-2.5
Child MH disutility	-2.9	-2.9	-1.7	-0.0	-1.0
Child MH → parent MH	0.4	0.4	0.2	0.1	-0.4
Total	1.5	1.5	0.1	1.0	-10.6

Weighted (Kalai–Samet) Shapley, PE; % change from baseline steady state.

- Income effect is the only channel that moves aggregate hours (+1.0%)
- Negative thinking drives the whole savings response (-10.7 of -10.6%)
- Output gain is small (+1.5%): child cognition (+4.5%) offset by child MH disutility (-2.9%)

Aggregate Welfare Decomposition

Channel	CEV (%)	Wealth Eq. (\$k)
Income effect	0.9	9
Rumination	0.2	2
Negative thinking	5.7	69
Initial draw (parent MH)	0.0	0
Initial draw (child MH)	1.4	16
Child dev.: parent MH → child cog.	4.7	57
Child dev.: parent MH → child MH	0.8	9
Child dev.: child MH → child MH	1.6	19
Child MH disutility	4.6	56
Child MH → parent MH	0.7	7
Total	20.6	244

Weighted (Kalai–Samet) Shapley of aggregate welfare, PE (CEV and wealth-equivalent per capita).

- **Negative thinking:** largest single channel (5.7 of 20.6% CEV)
- **Child development:** three sub-channels sum to 7.1%, mostly parent MH → child cognition (4.7%)
- **Child MH disutility** (4.6%) is nearly as large; the three groups are ~85% of the total

Shapley: Education and Parental Investments

Channel	Parental Investments			Cognitive	College
	Time	Money	Transfers	Skills	(pp)
<i>Baseline level</i>	<i>17.8 h/wk</i>	<i>\$5,437</i>	<i>\$121,275</i>	<i>0.98</i>	<i>43.2%</i>
Income effect	-0.4	-0.3	-0.8	-0.5	-0.16
Rumination	-0.0	-0.1	0.2	-0.2	-0.08
Negative thinking	-0.2	-0.3	-16.3	-0.5	0.07
Initial draw (parent MH)	-0.1	-0.1	0.0	-0.1	-0.03
Initial draw (child MH)	-0.8	-0.7	-0.1	-0.1	-0.07
Child dev.: parent MH → child cog.	4.3	4.0	5.0	7.0	2.62
Child dev.: parent MH → child MH	-0.3	-0.4	-1.5	-0.6	-0.21
Child dev.: child MH → child MH	-1.5	-1.7	-4.7	-0.8	-0.22
Child MH disutility	-11.0	-10.1	-0.1	-4.8	-1.70
Child MH → parent MH	-0.1	-0.0	-0.5	0.6	0.24
Sum	-10.1	-9.6	-18.8	0.1	0.46

Weighted (Kalai–Samet) Shapley, PE; % change except college (pp).

- ▶ Removing mental illness *lowers* parental investment (-10.1% time, -9.6% money)
- ▶ **Child MH disutility** dominates (-11.0% time); child cognition offsets (+7.0% skills)
- ▶ Skills net out (+0.1%); college +0.46 pp; transfers -18.8%, mostly negative thinking

Policy: Aggregate Economic Effects

Policy	Labor tax	Output	Labor Inc.	Consumption	Hours	Savings
<i>Baseline level</i>	—	<i>\$51,184</i>	<i>\$35,399</i>	<i>\$38,107</i>	<i>0.334 sh.</i>	<i>\$127,710</i>
Children (100%)	0.99	−0.36	−0.35	−1.58	0.04	−2.49
Young parents (100%)	0.00	0.10	0.10	0.10	0.01	−0.08
All parents (100%)	−0.02	0.24	0.24	0.23	0.02	−0.13
All parents + children (100%)	0.98	−0.09	−0.09	−1.36	0.07	−2.60

Labor tax in pp change of the tax parameter (+ is a tax increase); all other entries in % change from baseline steady state.

- ▶ Aggregate output effects *small and mixed* in the long run (−0.36 to +0.24%)
- ▶ Child subsidy lowers savings (−2.49%) and measured cognitive skill (−0.73%): treated children draw less parental investment
- ▶ Fiscal footprint is *not* small: financing raises the labour tax by up to +0.99 pp, and that is what drives the welfare ranking

Policy: Treatment Uptake (full)

Policy	Children	Adults, by model age j			
		$j=5-6$	$j=7-8$	$j=7-11$	$j=12-16$
<i>Baseline level</i>	15.4%	25.5%	66.4%	50.9%	12.6%
Children (100%)	71.8	25.8	62.1	48.5	12.5
Young parents (100%)	12.7	22.2	83.5	58.6	12.7
All parents (100%)	12.3	22.0	83.4	63.7	12.8
All parents + children (100%)	71.3	21.7	79.3	61.6	12.7

Treatment uptake as % of the non-healthy population, in levels. Model ages: $j=5$ is age 16, $j=7$ age 24, $j=11$ age 40, $j=16$ age 60.

- ▶ Large behavioral response among children (15 → 72% under the child subsidy)
- ▶ Adult response is large where targeted: young parents 66 → 83%, all parents 51 → 64%
- ▶ Cross-margin crowd-out: subsidising adults cuts child take-up (15.4 → 12.3%), and subsidising children cuts parents' own take-up (66.4 → 62.1%)

Policy: Prevalence of Mental Illness (full)

Policy	All Adults		Parents		Children	Adolescents	
	Mild	Serious	Mild	Serious	With MI	Mild	Serious
<i>Baseline level</i>	9.6%	4.4%	9.0%	3.8%	32.2%	17.9%	6.4%
Children (100%)	-0.34	-0.13	-0.12	-0.06	-2.48	-3.01	-1.07
Young parents (100%)	-0.04	-0.04	-0.19	-0.14	-0.09	0.32	0.12
All parents (100%)	-0.10	-0.08	-0.33	-0.24	-0.13	0.30	0.11
All parents + children (100%)	-0.49	-0.24	-0.49	-0.31	-2.62	-3.10	-1.10

Baseline in %, policy rows in pp change.

- ▶ Child subsidy: largest effects among adolescents (-3.0 pp mild, -1.1 pp serious) and children (-2.5 pp)
- ▶ Adult-only subsidies barely move child prevalence (-0.1 pp) and slightly *raise* adolescent illness ($+0.3$ pp mild): parents substitute away from treating the child ($15.4 \rightarrow 12.3\%$)

Policy: Parental Investments and Education

Policy	Parental Investments			Cognitive	College
	Time	Money	Transfers	Skills	(pp)
<i>Baseline level</i>	<i>17.8 h/wk</i>	<i>\$5,437</i>	<i>\$121,275</i>	<i>0.98</i>	<i>43.2%</i>
Children (100%)	-1.56	-1.46	-3.38	-0.73	-0.22
Young parents (100%)	0.21	0.14	-0.22	0.21	0.07
All parents (100%)	0.42	0.35	-0.40	0.44	0.14
All parents + children (100%)	-1.23	-1.15	-3.87	-0.27	-0.08

% change from baseline, except college (pp).

- ▶ Child subsidy crowds out private investments (-1.56% time, -1.46% money) and lowers measured cognitive skill (-0.73%)
- ▶ Parental subsidy works the other way: healthier parents invest more (+0.42% time, +0.44% skills) — different margins
- ▶ Transfers fall under every policy (-0.22 to -3.87%); combining the two still lowers college (-0.08 pp)

Policy: Welfare and Fiscal Effects (full)

Policy	Welfare		Fixed Distribution		Tax
	Wealth (\$k)	CEV (%)	Wealth (\$k)	CEV (%)	Labor tax
Children (100%)	-8.3	-0.97	-9.1	-1.08	0.99
Young parents (100%)	1.3	0.13	1.5	0.16	0.00
All parents (100%)	3.1	0.32	2.4	0.26	-0.02
All parents + children (100%)	-5.0	-0.57	-7.3	-0.84	0.98

- ▶ Child subsidy: the loss is *not* compositional — holding the distribution fixed makes it worse (-1.08 vs -0.97% CEV)
- ▶ Young parents are non-compositional (0.13 vs 0.16); all parents is partly compositional (0.32 vs 0.26)
- ▶ Combined: -0.57% of annual consumption, financed by +0.98 pp on the labour tax

The Child Mental-Health Penalty

“What if we could cure your child’s mental illness?”

	Consumption eq. (%)	Wealth eq. (\$k)
Value to the parent	9.9	164
Value to the child	10.2	145

Parents whose child is experiencing mental illness during ECD; baseline consumption \$26,642/y, savings \$202,192. 32.2% of children are experiencing mental illness. The child’s wealth equivalent is the exact perceived measure: the compensation in the child’s own assets at age-16 entry that matches the cure, so it is not the same object as the parent’s figure beside it.

- ▶ Curing the child raises time investment **+2.3%** and money **+1.6%**
- ▶ Child treatment take-up **falls 15.4 pp** — the cure substitutes for treatment

A cure is worth \$164k to the parent and \$145k to the child

Aggregate Effects of Child Mental Health

Each row: effect of curing *that one channel* of the child's mental illness.

Channel	Cons.	Savings	Parental Investments			Parent	Child
			Time	Money	Treatment	Parent CEV (%)	
<i>Baseline</i>	<i>\$26,642</i>	<i>\$202,192</i>	<i>17.4 h/wk</i>	<i>\$5,313</i>	<i>15.4%</i>	—	
Child MH disutility	+0.0	+0.2	+0.7	+0.2	−6.5	+7.6	
Child development	+0.6	−0.6	+0.9	+0.6	−7.9	+1.7	
Child MH → parent MH	+0.2	−0.3	+0.7	+0.7	−1.0	+0.6	
<i>Total</i>	+0.9	−0.7	+2.3	+1.6	−15.4	+9.9	

Weighted Shapley over the three child-specific channels, curing the child's mental illness during ECD. Percent changes except Treatment (pp).

Curing the child is worth **9.9%** of consumption to the parent and **10.2%** to the child

Aggregate Effects of Child Mental Health

Each row: effect of curing *that one channel* of the child's mental illness.

Channel	Cons.	Savings	Parental Investments			Parent	
			Time	Money	Treatment	Parent CEV (%)	Child CEV (%)
<i>Baseline</i>	<i>\$26,642</i>	<i>\$202,192</i>	<i>17.4 h/wk</i>	<i>\$5,313</i>	<i>15.4%</i>	—	—
Child MH disutility	+0.0	+0.2	+0.7	+0.2	−6.5	+7.6	+7.6
Child development	+0.6	−0.6	+0.9	+0.6	−7.9	+1.7	+1.7
Child MH → parent MH	+0.2	−0.3	+0.7	+0.7	−1.0	+0.6	+0.6
<i>Total</i>	+0.9	−0.7	+2.3	+1.6	−15.4	+9.9	+9.9

Weighted Shapley over the three child-specific channels, curing the child's mental illness during ECD. Percent changes except Treatment (pp).

Disutility is most of the parent's gain (7.6 of 9.9%): the child's illness is costly in itself

Aggregate Effects of Child Mental Health

Each row: effect of curing *that one channel* of the child's mental illness.

Channel	Cons.	Savings	Parental Investments			Parent	Child
			Time	Money	Treatment	Parent CEV (%)	
<i>Baseline</i>	<i>\$26,642</i>	<i>\$202,192</i>	<i>17.4 h/wk</i>	<i>\$5,313</i>	<i>15.4%</i>	—	
Child MH disutility	+0.0	+0.2	+0.7	+0.2	−6.5	+7.6	
Child development	+0.6	−0.6	+0.9	+0.6	−7.9	+1.7	
Child MH → parent MH	+0.2	−0.3	+0.7	+0.7	−1.0	+0.6	
<i>Total</i>	+0.9	−0.7	+2.3	+1.6	−15.4	+9.9	

Weighted Shapley over the three child-specific channels, curing the child's mental illness during ECD. Percent changes except Treatment (pp).

Child MH disutility is most of the *child's* own gain (6.9 of 10.2%)

Aggregate Effects of Child Mental Health

Each row: effect of curing *that one channel* of the child's mental illness.

Channel	Cons.	Savings	Parental Investments			Parent	
			Time	Money	Treatment	Parent CEV (%)	Child CEV (%)
<i>Baseline</i>	<i>\$26,642</i>	<i>\$202,192</i>	<i>17.4 h/wk</i>	<i>\$5,313</i>	<i>15.4%</i>	—	—
Child MH disutility	+0.0	+0.2	+0.7	+0.2	−6.5	+7.6	+0.0
Child development	+0.6	−0.6	+0.9	+0.6	−7.9	+1.7	+0.6
Child MH → parent MH	+0.2	−0.3	+0.7	+0.7	−1.0	+0.6	+0.6
<i>Total</i>	+0.9	−0.7	+2.3	+1.6	−15.4	+9.9	+0.6

Weighted Shapley over the three child-specific channels, curing the child's mental illness during ECD. Percent changes except Treatment (pp).

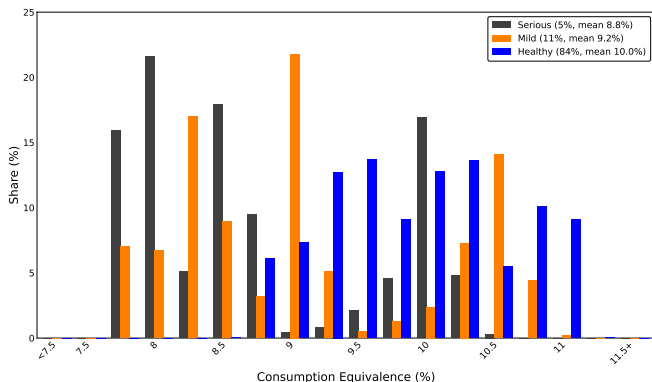
The **child** → **parent** feedback is new, and small: 0.6 of 9.9%, about 6% of the parent's gain

Joint Decomposition: All Ten Channels

Channel	Output	Labor Inc.	Cons.	Hours	Savings
<i>Baseline</i>	<i>\$51,184</i>	<i>\$35,399</i>	<i>\$38,107</i>	<i>0.334</i>	<i>\$127,710</i>
Income effect	+0.8	+0.8	+0.7	+1.0	+1.3
Rumination	-0.2	-0.2	-0.1	-0.0	+0.1
Negative thinking	-0.1	-0.1	-0.9	-0.1	-10.7
Initial draw (parent MH)	-0.0	-0.0	-0.0	-0.0	-0.0
Initial draw (child MH)	-0.1	-0.1	-0.1	+0.0	-0.5
Child dev. (parent → cog.)	+4.5	+4.5	+3.2	-0.0	+3.6
Child dev. (parent → child MH)	-0.4	-0.4	-0.3	-0.0	-1.2
Child dev. (child → child MH)	-0.4	-0.4	-0.4	+0.1	-1.6
Child MH disutility	-2.9	-2.8	-2.0	-0.0	-1.0
Child MH → parent MH	+0.3	+0.3	+0.1	+0.0	+0.4
<i>Total</i>	<i>+1.5</i>	<i>+1.5</i>	<i>+0.1</i>	<i>+1.0</i>	<i>-10.6</i>

Weighted Shapley over the ten joint adult-and-child channels, partial equilibrium. Percent changes from the baseline steady state. Total welfare: 20.6% CEV.

Consumption-Equivalent Cost of Child Mental Health



Consumption-equivalent value to the parent of curing the child's mental illness, by parent state.

Aggregate cost = $0.25 \times 0.322 \times 9.9 = 0.80$ percent of consumption

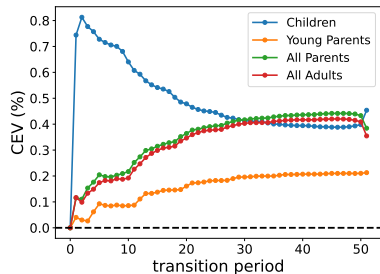
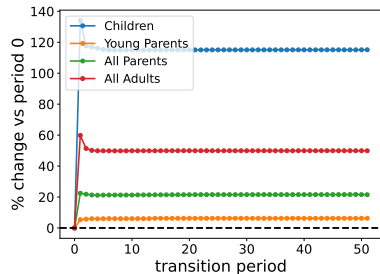
Who Gains at the Reform, by Age

j	Age	Child subsidy	Parent subsidy
6	20–23	+0.24	+0.21
7	24–27	+0.25	+0.21
8	28–31	+0.26	+0.17
9	32–35	+0.28	+0.15
10	36–39	+0.29	+0.15
11	40–43	+0.23	+0.16
12	44–47	+0.0003	+0.0011
16	60–63	+0.0021	+0.0031
20	76–79	−0.0000	+0.0011

Mean CEV gain (%) at the reform, by age of the adult, weighted by the period-0 distribution. Shaded: parenting ages ($j = 8–11$). Rows below the rule are post-parenting.

- ▶ Gains collapse by a factor of ~ 200 the period after parenting ends
- ▶ Post-parenting adults are **not in favour** — **they are indifferent** ($< 0.01\%$ CEV)
- ▶ The residual sign is second order: a small early tax rise against a later tax cut

Transition: Welfare and Fiscal Paths



Left: welfare under the veil of ignorance. Right: government mental-health spending.

Arm	CEV along transition (%)	CEV terminal SS (%)
Children	+0.225	+0.454
Young parents	+0.136	+0.213
All parents	+0.210	+0.384
All adults	+0.288	+0.355

Optimal Treatment Subsidy

GE, budget-balanced search over the grid of parent (ages 24–39) $\times$ child subsidy rates, in 10% steps.

Policy	Wealth eq. (\$k)	CEV (%)
All parents (100%) + children (10%)	+3.6	+0.38
All parents (100%)	+3.1	+0.32
Children (10%)	+0.3	+0.03
All parents (100%) + children (100%)	−5.0	−0.57
Children (100%)	−8.3	−0.97

- ▶ A **small** child subsidy on top of the full parent subsidy is optimal: +\$0.5k over parents alone
- ▶ The child subsidy stops raising welfare beyond 10%: at 100% it costs \$8.3k

Subsidize parents fully; children only lightly

Social Media: By Exposed Group

Exposed	Entry cohort, long run			All ages at removal		
	Low	Central	High	Low	Central	High
Minors only	1.2	3.0	4.7	1.1	2.7	4.1
Young adults (16–27)	1.6	4.3	5.6	0.3	1.1	1.4
Adults (all ages)	4.6	13.1	16.8	1.7	4.6	5.9
Everyone	6.0	16.3	22.2	2.8	7.4	10.2

Wealth equivalent, \$000s. All GE and budget balanced; all converged. Low/Central/High are the δ calibrations.

- ▶ The **adult** channel is 4× the minors channel on the entry cohort — not the developmental story one would expect
- ▶ Minors + adults **reproduces everyone** to within \$0.7k in every case: the two margins barely interact
- ▶ Minors gain **almost as much at impact as in the long run**; adults only a third — their stock of illness adjusts slowly

Social Media: Calibration

Shifts a latent normal index by δ SD: $p_0 \rightarrow \Phi(\Phi^{-1}(p_0) + \delta)$.

Study	Ages	Design	Outcome	δ
<i>Clinical outcomes — these set δ</i>				
Braghieri et al. (2022)	18–22	Facebook rollout	PHQ-9 / GAD-7 ≥ 10	0.085
Donati et al. (2025)	11–19	Broadband IV	MH hospitalisations	0.034
Arenas-Arroyo et al. (2025)	15–19	Fibre IV	MH + self-harm discharges	0.079 / 0.110
Abrahamsson (2026)	13–16	Phone bans	Any psych. consultation	0.000
<i>Adults — index outcomes, corroborating not calibrating</i>				
Allcott et al. (2020)	adults	4-week RCT	Wellbeing index	(0.090)
Allcott et al. (2025)	35+	6-week RCT	Emotional-state index	(0.083)

	Low	Central	High
Adult hazard multiplier	0.946	0.853	0.813
Child shift, ages 8–11	0.02	0.04	0.085
Child shift, ages 12–15	0.03	0.085	0.11

No clinical evidence exists below age 11, so the child shift is zero before age 8.

- ▶ Adult δ **not extrapolated from teenagers**: college (0.085), over-35s (0.083) and the 2018 RCT (0.090) agree. Parentheses = index, not clinical cutoff
- ▶ **Incidence only**: the hazard of *becoming* ill is scaled; recovery is **untouched**