ADOLESCENT BRAIN DEVELOPMENT

Aysenil Belger, Ph.D.

Professor and Director of Neuroimaging Research Department of Psychiatry, University of North Carolina at Chapel Hill & Director, Clinical Translation Core, UNC IDDRC Duke-UNC Brain Imaging and Analysis Center



ADOLESCENCE: A PERIOD OF RISK AND OPPORTUNITY

https://www.google.com/search?client=safari&rls=en&q=adolescent+brain+development&ie=UTF-8&oe=UTF-8#fpstate=ive&vld=cid:4e0def8d,vid:-1FRco3Bjyk,st:0



OUTLINE

- I. Adolescent Brain Development: critical periods
- II. Neural circuits of self-regulation and Cognition
- III. Trauma effects on Brain Development
- IV. Trauma and Adolescent Psychopathology
- **V. Prevention**





I. Critical periods of neurodevelopment

Adolescence

Early Childhood

Infancy

Prenatal









Aging

What is a "critical period"?



Hubel and Wiesel, 1963



Developmental Trajectories: Nature x Nurture



BIOSPSYCHOSOCIAL MODEL OF BRAIN DEVELOPMENT AND PSYCHOPATHOLOGY



Prenatal Brain Development: Complex Sequence Of Programs





Early Brain Development: setting the stage for lifetime



Gene-environment interactions across development - plasticity



Chiurazzi, Pietro & Pirozzi, Filomena. (2016).

Critical events and neurodevelopment



a Major depressive 32 disorder Bipolar 25 disorder Schizophrenia 22 Anxiety disorders Attention deficit hyperactivity disorder Autism spectrum disorders 15 20 25 30 35 40 0 10 5 Age of onset (years) ~ ~ ~ b Birth Synaptic pruning Myelination Synaptogenesis Gliogenesis Neuronal migration Neurogenesis 18 27 38 10 5 15 0 9 20 Age (pcw) Age (years)

Dehorter & Del Pino, 2020

Marin, 2016

Human Brain Development

Synapse formation is dependent on early experiences



Source: Nelson, C. A. in Neurons to Neighborhoods (2000), Shonkoff, J. and Phillips, D. (Eds.)

BUILDING THE BRAIN



Thompson & Nelson, 2001







Integrated Neural Networks





Plasticity: Opportunity For Rewiring Brain and Behavior



- *Neuroplasticity* : The ability of the brain to reorganize itself, both functionally and structurally. Changes in neural pathways and synapses due to behavior change, environment and neural processes, as well as bodily injury.
- **Synaptic plasticity** (epigenesis): varies throughout the whole life of the cerebral cortex. The adult synapse contains "molecular switches" leading to many distinct functional states. (Bourgeois, 2005)

II. Neural circuits of self-regulation and cognition

II. Neural Circuits Underlying Complex Cognition And Self-regulation

Executive Deficits ->

decreased inhibition, poor anticipation of consequences of action, or an inability to recognize contextually inappropriate behavior



II. Neural Circuits Underlying Complex Cognition And Self-regulation

Executive Deficits →

decreased inhibition, poor anticipation of consequences of action, or an inability to recognize contextually inappropriate behavior

Emotion Regulation \rightarrow

Emotional functioning deficits can lead to increased sensitivity to threat and reactive aggression, or an inability to empathize with the feelings of potential victims



Reward →

Reward sensitivity and lack of delayed gratification

Impulsivity Risk Taking Behavior leads to acting without forethought, reflection, or consideration of the consequences of behavior, and is the hallmark of much of the typical offending of adolescents

The Adolescent Brain



Summary of key aspects of brain development during adolescence



- Increase with age (+)
- Decreases with age (-)
- Peaks in activation during adolescence ([^])

All cortical regions highlighted here show decreased grey matter volume and cortical thickness during adolescence, while amygdala volume increases during adolescence, and striatum volume decreases during adolescence.

Dumontheil, Iroise (2016) Adolescent brain development.

III. Trauma changes brain and cognition development

What is trauma?

Forms of Trauma

- Trauma comes in a few forms:
 - Individual trauma
 - Societal/Collective trauma
 - Historical/intergenerational trauma
- Individuals can and often experience more than one form of trauma

SAMHSA's Definition of Individual Trauma

- An event or circumstance resulting in:
 - Physical harm
 - Emotional harm
 - Life-threatening harm
- The event or circumstance has lasting adverse effects on the individuals:
 - Mental health
 - Physical health
 - Emotional health
 - Social well-being
 - Spiritual well-being

EVAWI's Definition

- An event that combines fear, horror, or terror with actual or perceived lack of control.
- Trauma is often a life-changing event with negative, sometimes lifelong consequences.

Collective Trauma

- Collective trauma refers to a traumatic event that is shared by a group of people. It may involve a small group, like a family, or it may involve an entire society.
- Natural disasters, war, genocide, slavery, famine, pandemics, recession, acts of terrorism and community violence are examples

Historical trauma

- Historical trauma is multigenerational trauma experienced by a specific cultural, racial or ethnic group. It is related to major events that oppressed a particular group of people because of their status as oppressed, such as slavery, the Holocaust, forced migration, and the violent colonization of Native Americans.
- Sometimes referred to as generational trauma, intergenerational trauma.

How does trauma affect individuals?

- Fundamentally, trauma effects the brain, affecting our ability to think, react, and engage with the world.
- Affects our ability to trust new people.
- Affects our ability to recall and speak about events.
- Affects our ability to respond when confronted.

Trauma changes brain AND COGNITIVE development











III. Neurobiology of Stress



III. ACUTE STRESS TRIGGERS A COMPLEX MULTISYSTEM BIOLOGICAL RESPONSE

ACUTE

STRESS

Neural Regulators of Stress



HPAhysiological Regulators Autonomic





ACUTE STRESS


Adolescence: Critical Period For The Recalibration Of The Stress Response And Maturation Of Biological Systems Involved In Stress Response

- Neurodevelopmental Changes: The prefrontal cortex (PFC) continues to mature leading to improved executive functions, decision making and emotional regulation abilities.
- Hormonal Changes: Hormonal fluctuations influence brain development and contribute to the reorganization and refinement of neural circuits involved in stress and emotion regulation and can interact with the developing PFC to shape emotional responses and adaptive coping strategies.
- Stress Sensitivity: Increased sensitivity to stress. The brain's stress response system, including the hypothalamic-pituitary-adrenal (HPA) axis, is highly responsive during this period, which can lead to dysregulation of the stress response.
- Social and Environmental Influences: Time of increased exploration, noveltyseeking, and social interactions that shape the development and refinement of neural circuits related to stress adaptation and emotion regulation.

Persistent Stress Changes Brain Architecture



Stress Impacts ALL areas of Cognition And Emotion



Sensitive window for developing the stress response

Ceausescu's legacy to Romania: Communist Policy: 1966 Decree

- Raise production by increasing population
 Belief that greater population = greater power
- Establishment of the MENSTRUAL POLICE -State gynecologists who conducted monthly checks of women of childbearing age who had not borne at least 5 children
- Establishment of CELIBACY TAX families received a stipend for having more than 2 children; were levied tax for having fewer than 5 children
- * OUTLAWED all contraception and abortion



Children reared in institutions...

...are at dramatically increased risk for a variety of cognitive, social, and behavioral problems such as:

disturbances of social relatedness and attachment

- externalizing behavior problems
- inattention/hyperactivity
- * deficits in IQ and executive functions
- * syndrome that mimics autism
- stunting (next slide)

Effects of institutionalization on growth

17 year old girl

14 year old girl





Institutionalized children lose ~1 month of linear growth for every ~1 month in an institution (pictures courtesy of Dana Johnson, MD, Ph.D)

Neglect In Early Infancy Changes Brain Maturation



MRI Data Collection

- N = 115 T1 weighted structural scans at age 16 year follow-up.
- Data acquired on a 3T Siemens Scanner with a 16-channel head coil.
- Average age 16.67 years
 - CAUG N = 41 (54 % male)
 - FCG N = 41 (49 % male)
 - NIG N 33 (42 % male)

 Of these: N = 64 children with T1 weighted scans at age 9 and 16 years

- Average ages 9.84, 16.69
 - CAUG N = 27 (52 % male)
 - FCG N = 23 (56 % male)
 - NIG N = 14 (43 % male)

Neglect in Early Infancy changes brain maturation





VanderWelt et al., 2020 PLOSONE

Early caregiving environment on development of stress response in children

McLaughlin et al., 2015; *Bucharest Early Intervention Project*



Thicker prefrontal cortex for Care As Usual vs. Foster Care



Sheridan, et al., Science Advances (2022)

Deprivation shifts developmental trajectories from 9 to 16 years



Sheridan, et al., Science Advances (2022)

Differences in brain structure are related to behavioral outcomes



Thickness in the inferior frontal gyrus is associated with **IQ** and thickness in the dorsal anterior cingulate cortex is associated with **psychopathology**.

Sheridan, et al., Science Advances (2022)

Early Life Stress and White Matter: Physical Abuse in Early Infancy



IV. Trauma and Adolescent Psychopathology

Adolescence critical period: Early Trauma leads to psychopathology



Critical periods applied to Schizophrenia





Pattern of neurocircuit disruption across major psychiatric disorders in regions and networks key to adaptive emotional reactivity and regulation.

Psychiatric disorders may be productively formulated as dysfunction in transdiagnostic neurobehavioral phenotypes such as neurocircuit activation.



Adolescents in JJ

- Deficits in areas of executive functioning, including impulse control, planning, and decision making, compared with adults
- **45.5** percent of youth in residential justice settings met criteria for a mental health disorder (Shufelt & Cocozza, 2006).
- ~ 79 percent of youth with one mental health disorder also meeting diagnostic criteria for at least one other disorder, and more than 60 percent meeting criteria for a substance use disorder (Shufelt & Cocozza, 2006).
- Youth with co-occurring behavioral problems (e.g., substance use, conduct disorder) and emotional problems (e.g., anxiety, depression) are at elevated risk for recidivism (Cottle, Lee, & Heibrun, 2001; Hoeve, McReynolds, & Wasserman, 2013) and committing violent offenses during young adulthood (Copeland, Miller-Johnson, Keeler, Angold, & Costello, 2007).

Adolescents in JJ



Developmental differences in criminal and impulsive behavior and the brain. (A) Arrest rates sharply increase at the beginning of adolescence, peaking at around 17 years of age. (B) Criminal behavior is paralleled by an adolescent-specific increase in impulsive responses to threat cues and (C) increased brain activity in limbic (emotion-related) cortical regions when (D) successfully suppressing the impulse to respond. Data from Dreyfuss, M. et al. (2013)

A Glance at The Problem

- ~65% of justice—involved youth have a substance use and/or mental health disorder (Bowser et al., 2019):
 - Affective disorders (major depression, persistent depression, manic episodes)
 - Psychotic disorders
 - Anxiety disorders (panic, separation anxiety, generalized anxiety, obsessive-compulsive disorder, post-traumatic disorder
 - Disruptive behavior disorder (conduct, oppositional defiant disorder, and ADHD
 - Substance use disorder

Table 1. Comparison of Mental HealFindings From Recent Juvenile Justic	th Prevalence ce Studies
Authors (Year)	% with a Positive Diagnosis
NCMHJJ Prevalence Study (2006)	70.4%
Teplin et al. (2002)	69.0%
Wasserman et al. (2002)	68.5%
Wasserman et al. (2004)	67.2%

A Glance at The Problem

- 15% to 30% have diagnoses of depression or dysthymia (pervasive depressive disorder),
- 13% to 30% have diagnoses of attentiondeficit/hyperactivity disorder,
- 3%–7% have diagnoses of bipolar disorder,
- 11% to 32% have diagnoses of posttraumatic stress disorder.
- 20% has substance use disorders (Washburn et al., 2015)
- Both conduct disorder and substance use disorders are quite prevalent in youth in juvenile courts.





Psychiatric and Neurologic Disorders in Incarcerated Youth



	Young people in the general population	Incarcerated young people
Learning disability	2–4%9,10	10–32%11–17
Attention-deficit hyperactivity disorder	3–9%18	12–30%19
Fetal alcohol spectrum disorder	2–5%20	11–36%21,22
Traumatic brain injury	5–24%23	32–50%23
Psychiatric disorder	7–12%24	
Male		60–70%25–27
Female		60-80%25-27
Major depressive disorder	0.2–3%28	
Male		11%19
Female		29%19
Anxiety	4.4%29	9–21%16,26,30–32
Psychosis	0.4%33	
Male		3.3%19
Female		2.7%19
At least one type of adverse childhood experience	38–39%34	96%35
Experience of a potentially traumatic event	25–50%36,37	88–90%36,38,39
Post-traumatic stress disorder	0·4%40	
Male		10-37%38,41-46
Female		40–50%45–47

Hughes et al. 2020, Lancet

Current Psychotic Illnesses			В	Current Major Depression			
Study ID	ES (95% CI)	% Weight		Study ID		ES (95% CI)	% Weight
Boys Bolton, 1976 ⁵² Hollander, 1985 ⁵⁹ Shelton, 1998 ⁶⁸ Robertson, 2001 ²⁸ Teplin, 2002 ⁶⁹ Wasserman, 2002 ⁷³ Waite, 2002 ⁷² Gosden, 2003 ⁵⁸ Chitsabesan, 2006 ⁵⁴ Indig, 2009 ⁴¹ Karnik, 2010 ⁴² Gretton, 2011 ³⁷ Mitchell, 2011 ²⁷ Ghanizadeh, 2012 ³⁶ Harzke, 2012 ⁴⁰ Lennox, 2013 ⁴⁴ 2 smaller studies Subtotal (I-squared = 77.4%, p = 0.000) Girls Bolton, 1976 ⁵² Teplin, 2002 ⁶⁹	0.04 (0.02, 0.05) 0.02 (0.00, 0.04) 0.02 (0.00, 0.04) 0.02 (0.00, 0.04) 0.03 (0.02, 0.04) 0.03 (0.02, 0.04) 0.02 (0.01, 0.04) 0.02 (0.01, 0.04) 0.02 (0.01, 0.04) 0.02 (0.00, 0.07) 0.05 (0.02, 0.08) 0.05 (0.02, 0.02) 0.01 (0.00, 0.05) 0.03 (0.01, 0.08) 0.02 (0.00, 0.04) 0.02 (0.00, 0.07) 0.02 (0.00, 0.07) 0.02 (0.00, 0.04) 0.02 (0.00, 0.07) 0.02 (0.00, 0.04) 0.02 (0.00, 0.04) 0.02 (0.00, 0.04) 0.02 (0.00, 0.04) 0.02 (0.00, 0.04) 0.02 (0.00, 0.04) 0.03 (0.02, 0.03) 0.03 (0.00, 0.05) 0.03 (0.00, 0.05) 0.03 (0.00, 0.05)	7.20 5.64 6.95 5.69 9.69 6.74 11.98 2.86 2.34 4.14 4.90 4.94 2.80 2.86 12.21 6.67 2.38 100.00		Boys Shelton, 1998 ⁶⁸ Robertson, 2001 ²⁸ Ruchkin, 2002 ⁶⁷ Teplin, 2002 ⁶⁹ Wasserman, 2002 ⁷³ Gosden, 2003 ⁸⁶ Vreugdenhil, 2003 ⁷¹ Abrantes, 2005 ⁵⁰ Chitsabesan, 2006 ⁵⁴ Indig, 2009 ⁴¹ Karnik, 2010 ⁴² Gretton, 2011 ³⁷ Mitchell, 2011 ²⁷ Ghanizadeh, 2012 ³⁶ Harzke, 2012 ⁴⁰ Zhou, 2012 ⁴⁷ Lennox, 2013 ⁴⁴ Lindblad, 2015 ⁴⁵ Kim, 2017 ²¹ 11 smaller studies Subtotal (I-squared = 94.1%, p = 0.000)	* + * * + + * * * * * * * * * * * * * *	0.06 (0.03, 0.09) 0.14 (0.09, 0.20) 0.09 (0.06, 0.12) 0.13 (0.11, 0.15) 0.08 (0.05, 0.11) 0.02 (0.00, 0.07) 0.06 (0.03, 0.09) 0.24 (0.18, 0.30) 0.13 (0.07, 0.19) 0.13 (0.09, 0.18) 0.03 (0.01, 0.05) 0.04 (0.01, 0.08) 0.04 (0.01, 0.08) 0.01 (0.05, 0.17) 0.11 (0.11, 0.12) 0.01 (0.00, 0.03) 0.07 (0.04, 0.10) 0.17 (0.12, 0.23) 0.14 (0.11, 0.17) 0.09 (0.07, 0.12)	5.28 4.41 5.24 5.53 5.23 5.08 5.17 4.26 4.12 4.80 5.55 5.04 5.00 4.08 5.73 5.62 5.13 5.62 5.13 5.16 4.27 5.32 100.00
Waite, 2002 ⁷² Dixon, 2004 ⁵⁶ Harzke, 2012 ⁴⁰ 6 smaller studies Subtotal (I-squared = 0.0%, p = 0.925)	0.03 (0.02, 0.04) 0.05 (0.01, 0.09) 0.03 (0.02, 0.04) 0.04 (0.01, 0.06) 0.03 (0.02, 0.03)	33.46 1.69 33.19 7.36 100.00		Dixon, 2004 ⁵⁶ Lederman, 2004 ⁶⁴ Harzke, 2012 ⁴⁰ 14 smaller studies Subtotal (I-squared = 87.7%, p = 0.000)		0.33 (0.24, 0.42) 0.36 (0.31, 0.40) 0.25 (0.23, 0.28) 0.23 (0.20, 0.27) 0.27 (0.22, 0.32)	12.86 20.50 22.84 21.73 100.00
NOTE: Weights are from random effects analysis	.02 .04 .06 .08 .1			NOTE: Weights are from random effects analysi	is 0 .1 .2 .3 .4	1 5	

In male adolescents, 2.7% psychotic illness; 10.1% major depression. In female adolescents, 2.9% psychotic illness; 25.8% major depression

ıdy		%	Study			%
	ES (95% CI)	weight	U		ES (95% CI)	vve
ys 67			Boys	-		
chkin, 2002	0.14 (0.10, 0.17) 5.27	Shelton, 1998	-	0.36 (0.30, 0.42)	5.2
blin, 2002	• 0.17 (0.14, 0.19) 5.46	Ruchkin, 2002	*	0.70 (0.65, 0.75)	5.3
asserman, 2002."	0.02 (0.00, 0.04) 5.51	Teplin, 2002 ⁶⁹	•	0.38 (0.35, 0.41)	5.4
aite, 2002	0.23 (0.22, 0.24) 5.56	Wasserman, 2002 ⁷³	*	0.31 (0.26, 0.36)	5.3
sden, 2003	0.11 (0.05, 0.17) 4.72	Waite, 2002 ⁷²		0.67 (0.66, 0.68)	5.4
eugdenhil, 2003	0.08 (0.04, 0.12) 5.23	Gosden, 2003 ⁵⁸		0.31 (0.22, 0.40)	5.0
itsabesan, 2006	- 0.07 (0.02, 0.11) 5.07	Vreugdenhil, 2003 ⁷¹	-	0.73 (0.67, 0.79)	5.2
lig, 2009 ⁴¹	0.28 (0.22, 0.33) 4.84	Abrantes, 2005 ⁵⁰	*	0.82 (0.77, 0.87)	5.3
rnik, 2010 ⁻²	0.10 (0.07, 0.13) 5.30	Colins, 2009 ¹⁹	-	0.60 (0.53, 0.66)	5.2
etton, 2011	0.13 (0.06, 0.19) 4.71	India, 2009 ⁴¹	-	0.58 (0.51, 0.64)	5.2
chell, 2011	0.08 (0.03, 0.13) 4.99	Karnik, 2010 ⁴²		0.93 (0.91, 0.96)	5.4
anizadeh, 2012 ³⁰	0.33 (0.24, 0.42) 3.95	Gretton, 2011 ³⁷		0.74 (0.66, 0.82)	5.1
rzke, 2012 ⁴⁰	• 0.19 (0.18, 0.19) 5.57	Ghanizadeh, 2012 ³⁶		0.55 (0.45, 0.65)	4.9
ou, 2012 ⁴⁷	0.10 (0.06, 0.14) 5.19	Harzke 2012 ⁴⁰	•	0.83 (0.83, 0.84)	5.4
la, 2014	0.25 (0.17, 0.33) 4.19	Zhou 2012 ⁴⁷	-	0.78 (0.73, 0.84)	5.9
bi, 2015 ³³	0.18 (0.13, 0.22) 5.05	Aida 2014 ³⁴	_	0.59 (0.50, 0.68)	5.0
dblad, 2015") 5.20	Lindblad 2015 ⁴⁵		0.33 (0.30, 0.03)	5.0
bi, 2016 ³²) 4.74	$K_{im} = 0.017^{21}$		0.73 (0.09, 0.78)	5.0
n, 2017 ²¹	0.35 (0.28, 0.42) 4.47	Killi, 2017		0.55(0.47, 0.62)	5.1
maller studies	0.24 (0.19, 0.29) 4.99	Subtatel (Leasured 00.0% a 0.000)		0.55 (0.51, 0.60)	5.0
btotal (I-squared = 97.3%, p = 0.000)	O.17 (0.13, 0.20) 100.00	Subtotal (I-squared = 99.3% , p = 0.000)	\sim	0.62 (0.54, 0.69)	10
ls			Giris Tuli cocc ⁶⁹		0 44 /0 0T 0 44	
olin, 2002 ⁶⁹	• 0.21 (0.18, 0.24) 16.85	Teplin, 2002		0.41 (0.37, 0.44)	16
aite, 2002 ⁷²	0.24 (0.22, 0.27) 17.15	Waite, 2002		0.51 (0.48, 0.53)	16
kon, 2004 ⁵⁶	0.06 (0.01, 0.11) 15.99	Dixon, 2004		0.91 (0.85, 0.97)	16
derman, 2004 ⁶³	0.34 (0.30, 0.38) 16.28	Hamerlynck, 2007	· · · · ·	0.55 (0.48, 0.62)	16
rzke, 2012 ⁴⁰	0.15 (0.13, 0.17) 17.27	Harzke, 2012 ^{**}		0.83 (0.81, 0.85)	16
maller studies	0.16 (0.13, 0.20) 16.46	8 smaller studies		0.57 (0.52, 0.62)	16.
btotal (I-squared = 95.6%, p = 0.000)	0.20 (0.14, 0.26) 100.00	Subtotal (I-squared = 99.2%, p = 0.000)	\diamond	0.63 (0.46, 0.80)	10
TE: Weights are from random effects analysis			NOTE: Weights are from random effects and	alysis		

In male youth, 17.3% ADHD; 61.7% conduct disorder. In female youth 17.5%) ADHD; 59.0% conduct disorder al., 2021 JAACAP

Study ID	ES (95% CI)	% Weight
Boys		
Wasserman, 2002 ⁷³	0.05 (0.02, 0.07)	6.39
Abram. 2004 ¹²	0.11 (0.08, 0.14)	6.30
Abrantes, 2005 ⁵⁰	0.15 (0.10, 0.20)	5.22
Colins, 2009 ¹⁹	0.02 (0.00, 0.04)	6.64
India, 200941	0.18 (0.13, 0.22)	5.22
Karnik, 2010 ⁴²	0.07 (0.04, 0.10)	6.19
Gretton, 2011 ³⁷	0.02 (0.00, 0.06)	6.17
Mitchell, 2011 ²⁷	0.13 (0.07, 0.19)	4.47
Ghanizadeh, 2012 ³⁶	0.03 (0.01, 0.09)	5.59
Harzke, 2012 ⁴⁰	0.04 (0.04, 0.05)	6.93
Zhou, 201247	0.02 (0.00, 0.03)	6.67
Lennox, 201344	0.04 (0.01, 0.07)	6.31
Aebi, 2015 ³³	0.25 (0.19, 0.30)	4.95
Lindblad, 2015 ⁴⁵	0.24 (0.19, 0.28)	5.46
Aebi, 2016 ³²	0.12 (0.07, 0.17)	5.05
Kim, 2017 ²¹	0.03 (0.00, 0.05)	6.37
4 smaller studies	0.05 (0.02, 0.09)	6.08
Subtotal (I-squared = 93.5%, p = 0.000)	0.08 (0.06, 0.11)	100.00
Girls		
Abram, 2004 ¹²	• 0.15 (0.11, 0.18)	25.90
Dixon, 2004 ⁵⁶	0.20 (0.12, 0.28)	7.01
Harzke, 2012 ⁴⁰	0.19 (0.17, 0.21)	47.73
8 smaller studies	0.17 (0.13, 0.21)	19.36
Subtotal (I-squared = 23.1%, p = 0.272)	0.17 (0.15, 0.20)	100.00
NOTE: Weights are from random effects analysis		

In male adolescents, 8.6% PTSD. In female adolescents 18.2% PTSD. Female adolescents had higher prevalences of major depression and PTSD than male adolescents. Beaudry et al., 2022 JAACAP

- The two most common treatable disorders in male adolescents were depression (present in about 1 in 10) and ADHD (prevalent in 1 in 5). In female adolescents, approximately one in four had depression, and one in five had PTSD. Higher prevalences of depression and PTSD found in girls in custody compared with boys.
- Mental disorders are substantially more common among detained adolescents compared with general population counterparts. Approximately 3% of detained adolescents were diagnosed with a current psychotic illness, a 10-fold increase compared with age-equivalent individuals in the general population. Higher prevalence of current major depression were found in both male (10%) and female (26%) adolescents compared with the general adolescent population (5% and 11%, respectively).
- About 1 out of 5 detained adolescents had ADHD compared to 1 out of 10 adolescents in the general population. Nearly two-thirds of detained adolescents were diagnosed with any lifetime conduct disorder, whereas the estimated lifetime rate of conduct disorder in US adolescents is approximately 10%. In addition, adolescents in detention also had higher rates of PTSD than those in the general population, 9% versus 2% in male adolescents and 18% versus 8% in female adolescents. These differences underscore the large burden of psychiatric morbidity in detained adolescents.

Role Of Mental Health In Young Offenders In Predicting Criminal Recidivism: Mental Health In Young Detainees Predicts Perpetration Of And Desistance From Serious, Violent And Chronic Offending (ages 18-21).



Barra et al., 2022, Frontiers in Psychiatry.



Percentages of YSR/YASR, SCID-I and AUDIT clinical scores for the total sample (N = <u>106</u>) and for SVC offender status.

Mental Health and wellbeing in NC

- Mental Health Access: North Carolina <u>ranks 38th</u> in access to mental health care
- Workforce: <u>22 counties</u> have no psychiatrists; <u>28</u> have no psychologists
- Substance Abuse: Combined drug, alcohol, and suicide deaths <u>totaled 7,114</u> in 2021
- Pandemic Effects: Prevalence of mental health conditions worsened during COVID
- **Community Impacts:** <u>135 people</u> are exposed to each suicide

Gene-Envi



Van Os J., 2010, Nature

Adolescents In Transition

- Adolescents and transition age youth show deficits in areas of executive functioning, including impulse control, planning, and decision making, compared with adults (Eshelet al., 2007; Somerville & Casey, 2010). Indeed, tasks that require behavioral control over responses have a developmental brain maturation trajectory that continues until the early 30s (Hare et al., 2008; Liston et al., 2006). This continued brain development partially explains the challenges that many transition age youth face in making effective decisions, controlling impulsive behavior, and engaging in the long-term planning needed for success across all life domains.
- 45.5 percent of youth in residential justice settings met criteria for a mental health disorder (Shufelt & Cocozza, 2006).
- ~ 79 percent of youth with one mental health disorder also meeting diagnostic criteria for at least one other disorder, and more than 60 percent meeting criteria for a substance use disorder (Shufelt & Cocozza, 2006).
- youth with co-occurring behavioral problems (e.g., substance use, conduct disorder) and emotional problems (e.g., anxiety, depression) are at elevated risk for recidivism (Cottle, Lee, & Heibrun, 2001; Hoeve, McReynolds, & Wasserman, 2013) and committing violent offenses during young adulthood (Copeland, Miller-Johnson, Keeler, Angold, & Costello, 2007).

What Does Developmental Neurobiology tell us about Brain/Behavior Development in

Developmental differences in criminal and impulsive behavior and the brain. (A) Arrest rates sharply increase at the beginning of adolescence, peaking at around 17 years of age. (B) Criminal behavior is paralleled by an adolescent-specific increase in impulsive responses to threat cues and (C) increased brain activity in limbic (emotion-related) cortical regions when (D) successfully suppressing the impulse to respond. Data from Dreyfuss, M. et al. (2013)

V. ROADMAP FOR ADDRESSING WELLBEING OF YOUTH IN JJS Prevention: Building resilience at all levels

Pathways to Psychopathology

Opportunities for Intervention

Accumulative Model of Risk for Psychopathology

Genetic Risk Variants

Roadmap For Improving Outcomes For Youth In The JJS: Setting The Odds For Children



A LIFECOURSE APPROACH TO WELL CHILD DEVELOPMENT FOR PREVENTION OF YOUTH PSYCHOPATHOLOGYINg Protective and Risk Factors





Systemic Level

- Immigration policies
- Incarceration policies
- Civil rights
- Predatory banking

Community Level

- Differential resource allocation
- Racially or class segregated schools

Institutional Level

- Hiring and promotion practices
- Under- or over-valuation of contributions

Interpersonal Level

- Overt discrimination
- Implicit bias

Intrapersonal Level

- Internalized racism
- Stereotype threat
- Embodying inequities

Environmental Factors That Operate At Every Developmental Stage for Individual Children.



A LIFECOURSE APPROACH TO WELL CHILD DEVELOPMENT FOR PREVENTION OF YOUTH PSYCHOPATHOLOGY

•IDENTIFYING PROTECTIVE AND RISK FACTORS



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Recommendation: Mapping Assets/Strengths And Risk Factors For Individual Youth



Mapping Assets/Strengths And Risk Factors For Youth Re-entry



Systems Levels	Risks	Strengths
OCIETAL: (Media, Economy, Discrimination, Aigration, Violence,Poverty)		
NEIGHBORHOOD - COMMUNITY (Safety, Activity, School, Social Capital		
AMILY (Attachment, Parental Mental lealth, Housing)		
CHILD (ACESs, Sleep, Nutrition, Disability)		

For Individual Youth

Map out biological, psychological, and social risk and strengths, and best constellation of factors given their unique context Consider Health determinants (neurodevelopmental disability, traumatic brain injury, mental health, childhood experiences of trauma and adversity) and Social determinants (social marginalization, structural disadvantage, inequality, poverty) of youth criminalization

Identify environmental and organizational contexts and factors that can influence the implementation of EBPs.

Early identification of health and social determinants of risk can prevent offending or enable diversion to specialist support Identify specific and unique environmental, organizational, and economic factors that can enhance the downstream delivery of behavioral health services for justiceinvolved youth to meet the specific and distinct needs and circumstances of each child.

Requires assessment and responsive interventions.

Hughes et al., Lancet 2020.

Health and Social Determinants

Strong and consistent evidence shows the existence of important health determinants of criminal justice involvement in adolescence, with an increased risk of engagement in the criminal justice system for young people who have had neurodevelopmental disability, mental health difficulties, ACEs, or trauma.

Substantial numbers of young people are therefore left vulnerable to criminal behavior and criminalization because of a combination of health difficulties and social disadvantage. Furthermore, the adolescent population engaged by criminal justice systems has a considerable prevalence of complex needs

Health and Social Determinants

Transition age youth (16-25): High prevalence of substance abuse compounding disruptive behavior (highest rates of onset of problematic substance use and substance use disorders (i.e., abuse, dependence) (Chassin, et al., 2004; Delucchi, et al., 2008; SAMSHA, 2009)

This risk of criminal justice engagement appears to be amplified by experiences of social marginalization and inequality. Youth with <u>accumulated disadvantage</u> often includes poverty, poor relationships with parents and other family members, school failure and/or dropout, negative peer groups, and the lack of adult role models.

Re-entry programs for youth with mental health problems are often inappropriate or insufficient, as they are mostly designed for adults: lack of peer groups, family support, educational support, financial support, effective mental health interventions,



- Adolescence is a critical period of brain development with unique risk and opportunities
- Traumatic life experiences, including physical, emotional, psychological adverse events alter brain development, increasing risk for psychopathology
- Developmental trajectory is a product of its biological/genetic make-up and environmental modulators, creating a constant recalibration of their risk and resilience
- Early identification of constellational of factors that contribute to onset and severity of mental health and behavioral problems is critical for prevention of continued offending and recidivism, to increase their chances to develop into a healthy and non-criminal future and protect society from further crime.
- Assessing positive and negative pressure points and identifying rescue or strength factors for individual children is necessary for planning effective interventions and actions, beyond weekly psychotherapy and medication.
- Charting risk (exposure to trauma, social isolation, further exposure to risky environments and behaviors, management through correction systems) and resilience factors (community-based interventions, effective targeted interventions, identification of specialized needs) for individual children.



Integrating Evidence-Based Practices – NAS Reports



ALIGNING SCIENCE, PRACTICE, AND POLICY TO ADVANCE HEALTH EQUITY

Thank You!