

The role of alcohol behavioral research and neuroscience in the design of HIV prevention interventions targeting youth in the era of ART

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The **Mind**
RESEARCH NETWORK
FOR NEURODIAGNOSTIC DISCOVERY



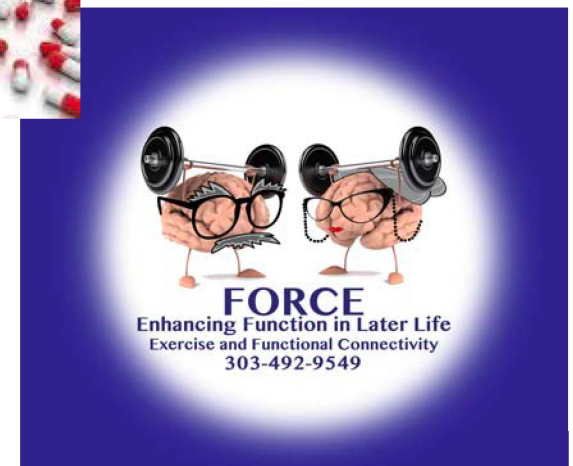
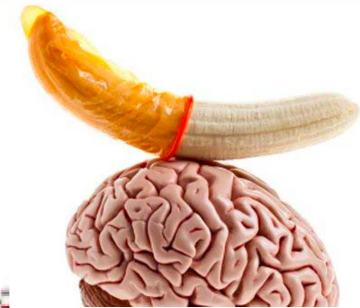


State of HIV Prevention Among Youth

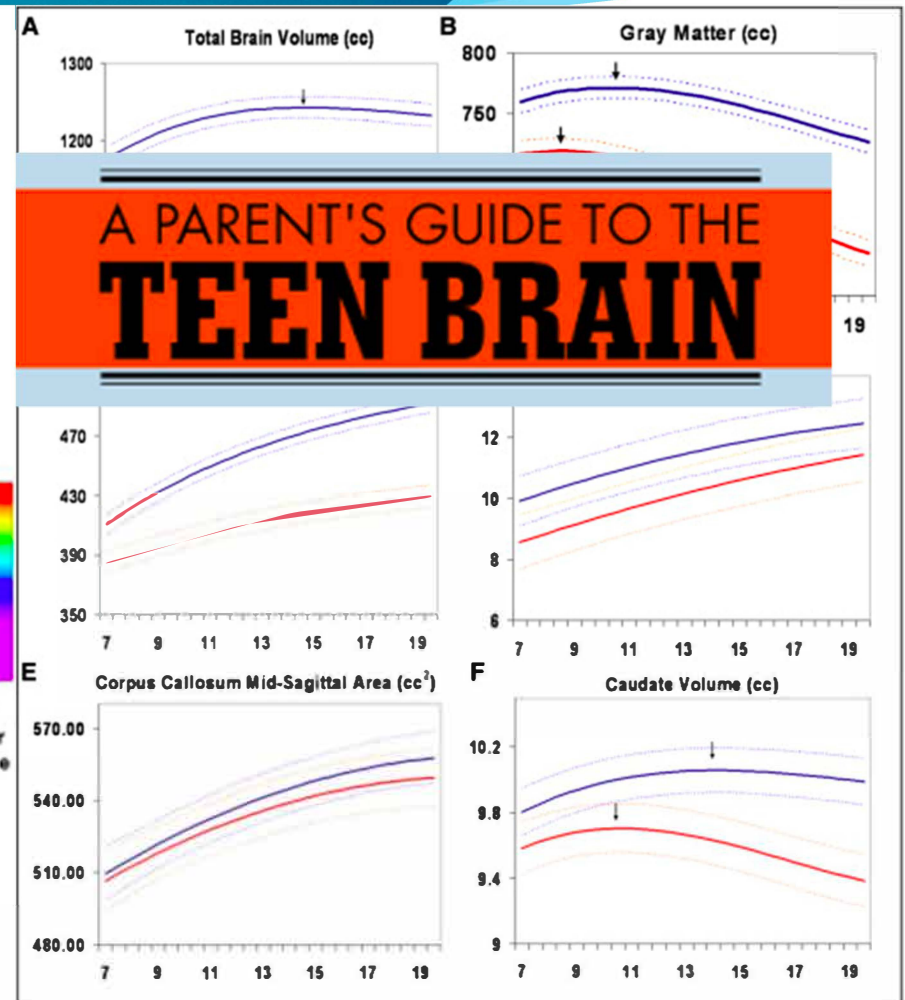
- ▶ Theory-based and empirically supported interventions to reduce sexual risk exist but the effects of these programs are small to moderate at best (Chin et al., 2012)
- ▶ Current interventions rely on traditional social cognitive theories of health behavior
- ▶ Though useful, SCT are limited in their ability to account for and change health behaviors (Sniehotta et al., 2014)
 - ▶ Usually do NOT incorporate situational factors like substance use
 - ▶ Do not account for affective, socioemotional, or relationship factors

Neurocognitive Perspectives

- ▶ Neurocognitive perspectives may add an important and novel insight into HIV/AIDS prevention
 - ▶ Plays a role in substance use (Naqvi & Morgenstern, 2015), eating behavior (Steinglass & Walsh, 2016), and smoking cessation (Kronke et al., 2015)
 - ▶ Emerging field of "Health Neuroscience" (Erikson et al., 2014)

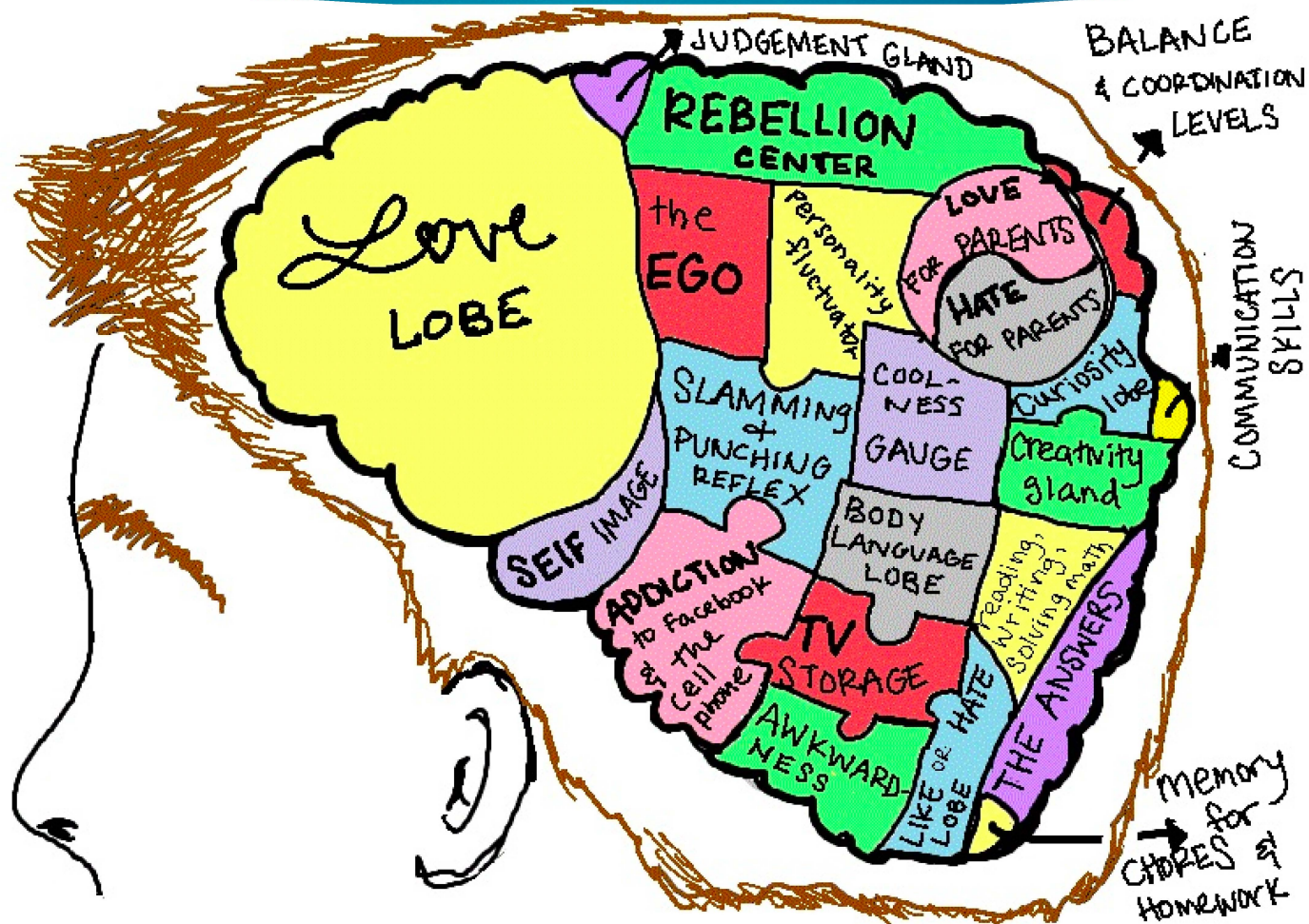


The Adolescent Brain



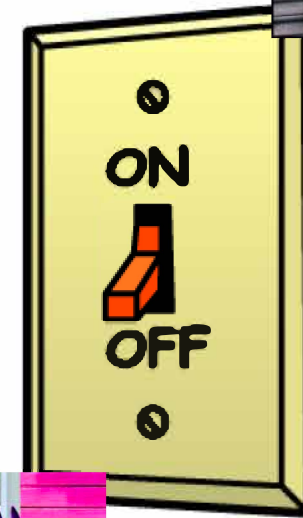
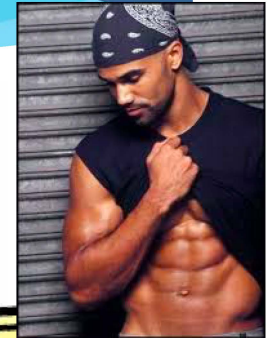
Giedd & Rappaport, 2010, Neuron

The Adolescent Brain...a work in progress!



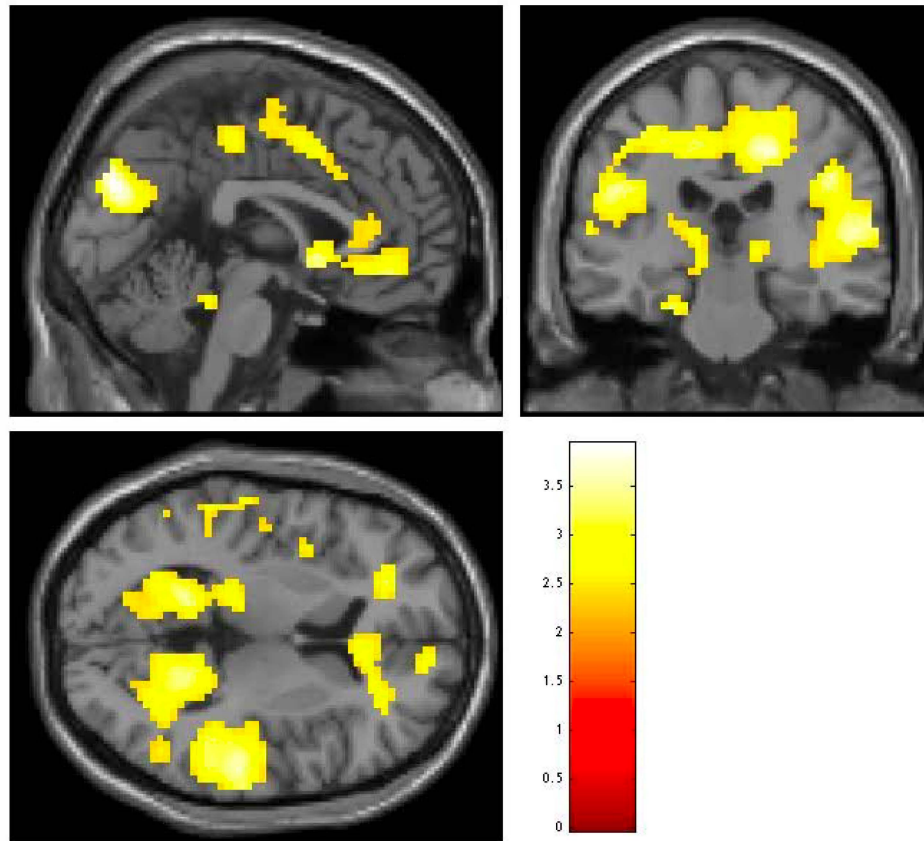
The Adolescent Brain...a work in progress!

- ▶ Is the adolescent brain massively imbalanced and predisposed towards "poor" and "risky" decision-making? Or is it perfectly adapted to the initiation of relatively "mature" behaviors?
- ▶ Perspective is critical for informing intervention approaches to encourage safer behavior.
- ▶ Changes in the brain during adolescence
 - ▶ Synaptic pruning
 - ▶ Gray and white matter changes
 - ▶ Increases in connectivity between areas
 - ▶ Differential speed of maturation of reward and control regions
 - ▶ Flood of pubertal hormones



Systems involved in adolescent sexual risk behavior

- ▶ 177 adolescents (26% female) aged 14-18
- ▶ **Reward** (e.g., ventral striatum, insula, caudate) and **control** (e.g., inferior frontal gyrus, dorsolateral prefrontal cortex) systems are BOTH critical (Gardiner et al., in press)
- ▶ Greater activation during DD task in BOTH areas was associated with increasing risk sex (frequency of condomless sex) behavior over time





Systems involved in adolescent sexual risk behavior

- ▶ In studies of other risk behavior, there was divergence between reward and control activation
 - ▶ In substance use work, often show reward and control working in opposition
- ▶ Why the difference?
 - ▶ Complexity of sexual behavior
 - ▶ Massive learning
 - ▶ Brain development
- ▶ Developmental context is critical

Feldstein Ewing et al., 2016

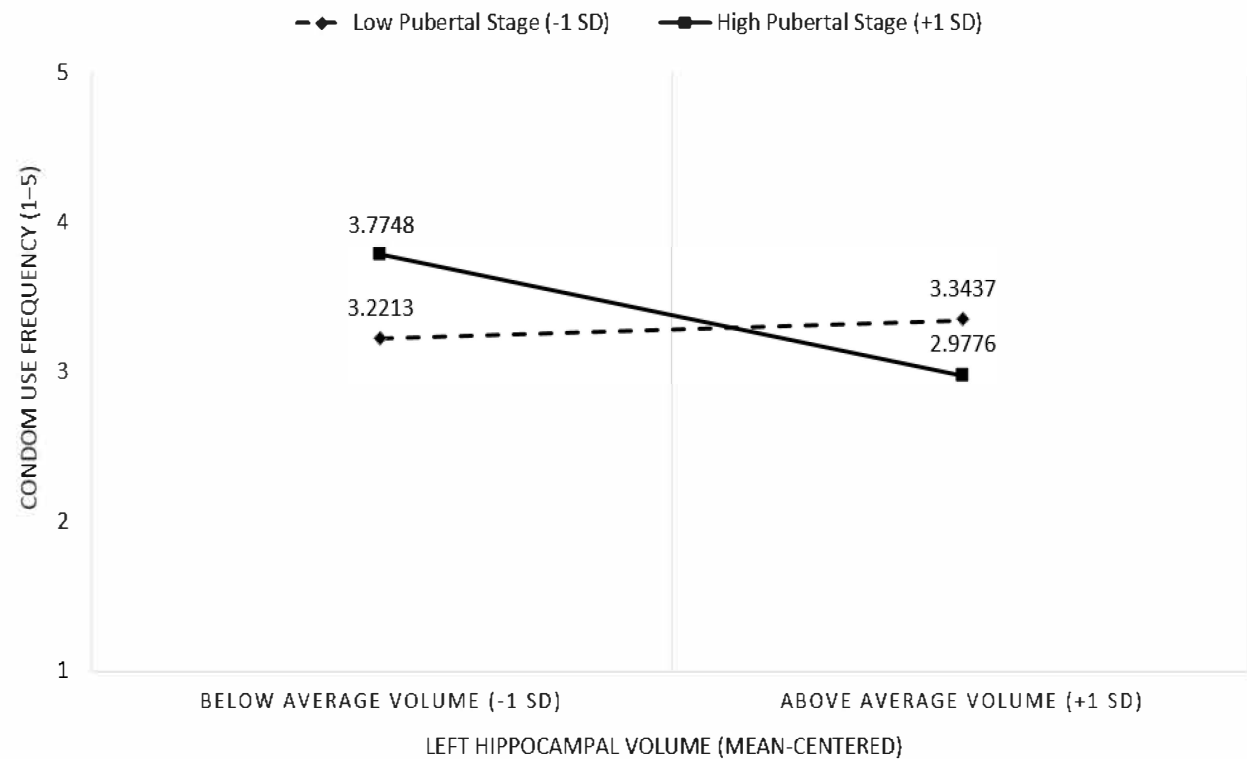


Systems involved in adolescent sexual risk behavior


- ▶ 169 adolescents (32% female) aged 14-18
- ▶ Examined relationship of VOLUME of various areas to sexual risk
- ▶ Relationships of size of limbic areas (amygdala, hippocampus) to risk behavior
- ▶ Size of reward and control regions was NOT related to risk behavior
- ▶ Pubertal development moderated these associations
- ▶ Developmental status of socioemotional centers critical for sexual decision making

Systems involved in adolescent sexual risk behavior

PUBERTAL DEVELOPMENT * LEFT HIPPOCAMPAL VOLUME DECOMPOSITION



Feldsein Ewing et al.,
in press



What have we learned from a developmental cognitive neuroscience perspective?

- ▶ Adolescent brains function differently from adult brains
 - ▶ This may be particularly the case around emergent sexual behavior
 - ▶ Focus on broad use of a range of systems (reward and control)
 - ▶ Socioemotional (limbic) centers are involved in sexual decision-making
- ▶ The role of substance use is likely social, status-related, peer-driven
 - ▶ “Not alcohol soaked brains of 50 year olds”
- ▶ Understanding the *motivation* of adolescents is critical to changing behavior

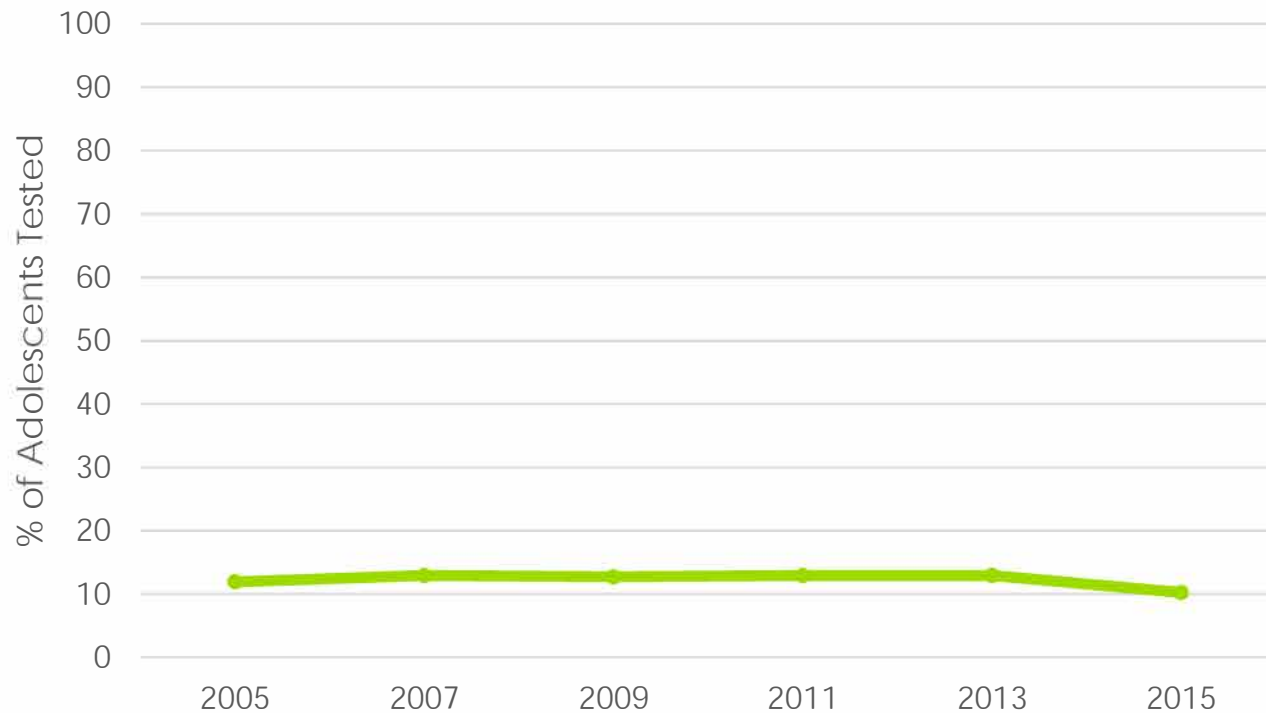
What does this mean in the age of ART?



- ▶ HIV Testing
- ▶ ART adherence
- ▶ PrEP
- ▶ PEP



HIV Testing among Adolescents (YRBS: 2005 to 2015)



Increasing HIV Testing among Adolescents

- ▶ Calderon et al. (2011)
- ▶ RCT with 15-21 year olds to increase HIV testing in the emergency room
 - ▶ Video versus in-person counseling
 - ▶ 51% of the video group accepted HIV testing, 22% in the control group (P .01).
 - ▶ 10.5% of sample was MSM
- ▶ Accepting testing was associated with
 - ▶ Watching the video
 - ▶ Being female
 - ▶ Engaging in oral sex
 - ▶ Being older than 18 years
- ▶ NONE tested positive...let's come back to this



ART Adherence among Adolescents and Young Adults

- ▶ Kim et al. (2014) comprehensive systematic review and meta-analysis in *AIDS* of adherence in adolescents/young adults (12-24 years)
- ▶ Differences by region
 - ▶ 70% adherence among HIV+ youth in Africa and Asia
 - ▶ 50-60% adherence among HIV+ youth in Europe and North America
- ▶ Kuhns et al. (2016) found worse adherence in 16-29 year olds (mean age 24) associated with
 - ▶ High depressive and anxiety symptoms
 - ▶ **High levels of marijuana and alcohol use**
 - ▶ High HIV-related stigma

Post-Exposure Prophylaxis among Adolescents

- ▶ Literature is SPARSE on PEP among adolescents and young adults!!!
- ▶ Ford et al. (2014), *AIDS* systematic review and meta-analysis of PEP completion rates
 - ▶ Completion rates are low overall
 - ▶ Differed dramatically by age and WORST for adolescents
 - ▶ adults (**59.1%**, 95% CI 53.9-64.2%)
 - ▶ children (**64.0%**, 95% CI 41.2-86.8%)
 - ▶ adolescents (**36.6%**, 95% CI 4.0-69.2%)



Pre-Exposure Prophylaxis among Adolescents

- ▶ According to CDC guidelines (2014):
 - ▶ Because none of the PrEP trials included people under 18, no specific guidance
 - ▶ Clinicians need to consider
 - ▶ Overall safety
 - ▶ Possibility of bone toxicities among youth who are still growing
- ▶ Mullins et al. 2015 including Adolescent Medicine Trials Network for HIV/AIDS Interventions
 - ▶ Interviews with providers
 - ▶ How to decide when benefits outweigh risk?
 - ▶ “ You want to use it with the highest risk people, but those are the kids—and adults too—who are least likely to follow through.”

Pre-Exposure Prophylaxis among “highest risk” Adolescents

- ▶ Mustanski et al., 2013
 - ▶ Study of 171 HIV negative YMSM
 - ▶ Age 16-20
- ▶ Goal was to study “interest” in prep among YMSM
- ▶ Interest was generally low, found youth were “somewhat” interested
- ▶ Interest increased under conditions of simpler regimens (i.e., single dose before a high risk event)
 - ▶ But this is NOT current regimen; adherence is critical and adherence is problematic among adolescents

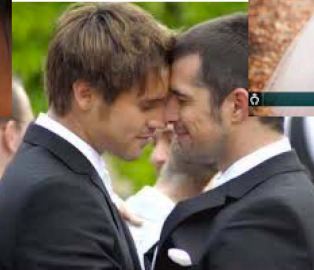
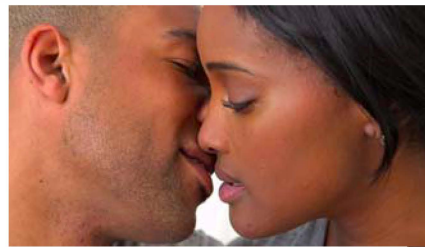
Adolescent HIV prevention in the age of ART

- ▶ Medication adherence (to ANY medication for ANY condition; juvenile diabetics, transplant recipients, sickle cell patients, cancer survivors) among adolescents is poor
 - ▶ Generally unrelated to measures of Health Literacy (Dharmapuri et al., 2015)
- ▶ All ART approaches require **high adherence for efficacy**
- ▶ In general population samples of adolescents, reservoir of virus is low
 - ▶ Not true for subsets (e.g., YMSM in U.S., young women with older partners in sub-Saharan Africa)
 - ▶ Need to carefully consider implications of repeated negative tests in the face of high risk behavior

What do adolescents care about?



VS





Implications for HIV prevention for Adolescents

- ▶ Biomedical approaches are **NOT** the **magic bullet**, particularly for adolescents
- ▶ Must be part of comprehensive prevention that includes
 - ▶ Behavioral primary prevention (barrier methods)
 - ▶ Understanding of motivations that drive adolescent behavior
 - ▶ Understanding of developmental context
 - ▶ Neurocognitive development
 - ▶ Pubertal development
 - ▶ Physical development



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Questions?

