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Does the Adolescent Brain Make Risk Taking Inevitable?

A Skeptical Appraisal

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Increasingly influential theories hold that the "teenage brain" suffers cognitive flaws that impel risk taking. Aside from warnings by leading researchers that brain science is insufficiently advanced to yield definitive findings that teenage behaviors are internally driven, the belief that adolescents take excessive risks has been developed using biased measures and without first ruling out alternative external explanations. In fact, the best demographic, crime, and health statistics show that adolescents do not take excessive risks compared to adults, adolescent risks are associated much more significantly with conditions of poverty and corresponding adult behaviors than with uniquely adolescent factors, and middle-aged adults exposed to the same high poverty levels as American youth display similar or higher levels of crime, violent death, firearms mortality, traffic fatalities, and other behaviors conventionally associates with adolescents. "Teenage brain" theories and the views of youth and policies they entail require much more rigorous scrutiny than they have received to date.

Keywords: *Adolescents; Risk-taking; Self-regulation; Decision making; Brain development; Social policy; Violence; Mortality*

If grown-ups are paragons of mature restraint, our discussion of teenagers and the "teenage brain" must be an exception. A survey of stories in the popular press on the teenage brain and risk taking found reporters and commentators, including experts, lambasting teens as "reckless," "stupid," "irrational," "callous," "lazy," "violent;" even "alien" (Males, 2006). Psychologist Michael Bradley's (2003) *Yes! Your Teen Is Crazy!* brands

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teens "stupid," "crazy," and "brain damaged" on virtually every page, wildly exaggerates the tolls of teens killed by guns (by 200%) and drunken driving (by 600%; Males, 2008), and still wins endorsement from psychologist Jay Giedd of the august National Institutes of Health. University of California public health professors Martha Campbell and Malcolm Potts (2006) blame global violence on young men's aggressive natures, as if political and military leaders played no part. The March 2008 *Developmental Review*'s special issue contains eight articles on "risk and decision making;" six of these entirely concern adolescents and the remaining two mostly so, and all adopt the framework of developmental theory (Reyna & Rivers, 2008). The National Research Council (2006) held a forum on the "emerging . . . science of adolescence" (p. 5) led by physician Ronald Dahl warning of "the tinderbox of the teenage brain."

Adolescence, this new science holds ((National Research Council, 2006) is a mélange of biohazard, a frightening mistake of nature. Temple University psychologist Laurence Steinberg (2007) declares, "Heightened risk-taking during adolescence is likely to be normative, biologically driven, and, to some extent, inevitable" (p. 57). The age range designated as biologically inferior is expanding rapidly. From minimum-subject experiments maximally interpreted, Steinberg (Lewin, 2006) has suggested no one less than the age of 25 years should be allowed to drive, Giedd (Shreeve, 2005) has questioned the rights of persons under that age to drive or vote, and Harvard School of Public Health assistant professor Deborah Yurgelun-Todd suggests even older teens should not be allowed to hold licenses or employment in such areas as lifeguard or military service (Farrell, 2007; Public Broadcasting System [PBS], 2002). Lobbies across the spectrum find the idea of biodetermined teenage incompetence useful to promote varied agendas, including imposing sweeping curfews on young people, requiring parental consent for adolescents' abortions, abolishing the death penalty for juveniles, and soliciting funding for youth management industries.

This article will argue that this new biodeterminist "science of adolescence" (National Research Council, 2006) now cascading through American media and political forums incorporates major violations of scholarly ethics, research fundamentals, critical scientific debate, and the right of young people to objective and accurate treatment. A future Stephen Jay Gould applying a science historian's skepticism is likely to find ample reason for alarm in the way brain research has proven "vulnerable to oversimplification, over-interpretation, and the confirmation of prior prejudices" (Sercombe, in press).

Biodeterminism's Cautionary History

Biodeterminist claims are the most profound and potentially dangerous that scientists can make about human beings. They posit a group as innately limited by unalterable biology. They obligate the state to take custodial measures to protect society and the inferior group by restricting the freedoms and behaviors of those pronounced inherently incapable of controlling themselves. When groups labeled by scientists as biologically limited are also publicly feared and politically powerless—as they always seem to be before brain scientists appear on the scene—legal and social repressions can be serious and long-lasting. For these reasons, biological claims should be subjected to the strictest levels of scientific skepticism, ethics, and scrutiny.

Yet as Gould (1981) documented, biodeterminist notions of the past were more likely to have received privileged rather than skeptical treatment. Indeed, they seemed self-evident. That "Colored" people were vastly inferior to White people was once considered scientifically indisputable. Statistics said so. In 1920, Colored people, just 10% of America's population, accounted for 25% of firearms deaths, 43% of murders, half of all illegitimate births, and 70% of births to mothers younger than 15 years. "Science" agreed. Testing by Carnegie Foundation-backed psychologist H. H. Goddard labeled 80% to 90% of Jews, Russians, and other non-Western European immigrants "morons" ruled by animalistic emotions who must be "carefully regulated" by law and never allowed "to act upon their own initiative or their own judgment" (Gould, 1981, p. 161). Even after University of Chicago sociologists meticulously demonstrated that immigrants' and non-Whites' dire behavior statistics flowed not from substandard brains but from conditions of severe poverty and disruption in blighted transitional communities, biodeterminist assumptions continued to drive decades of harsh segregation and anti-immigration policies.

But are past lessons still relevant? Scientists today might reasonably argue that the 21st century's vastly more rigorous research designs, sophisticated neuroimagings, and liberal social theories stand galaxies beyond 19th century "data" researchers misled by pseudo-Darwinian racial heirarchialism collected with primitive calipers and biased metrics (see Arnett, 1999). But however produced, data must be interpreted by subjective observers. A scan of cerebral activity vaguely indicating that adolescents rely on the amygdala more than adults can be interpreted as explaining either greater adolescent recklessness (the amygdala inhabits a "primitive . . . crocodile-like" brain area [Strauch, 2004, p. 67]) or greater adolescent

caution (the complex amygdala "inhibits the midbrain aggressive patterns of behavior" [Petri, 1990, p. 122]). Community education professor Howard Sercombe (in press) notes, "It hasn't been unusual to interpret these differences in ways that are unflattering to young people."Adults are not objective observers of adolescents, especially in comparison with us. Psychiatrist Daniel Offer's experiments found mental health and medical professionals drastically overestimated normal teenagers' (and even troubled teens') levels of depression, anxiety, and hostility (Offer, Ostrov, & Howard, 1981). Surveys such as Gallup's and Public Agenda's (2008) consistently show adults harbor sweeping negative views toward young people as "irresponsible" and "wild," perpetrating far more crime and other ills than can be statistically documented. Adults seem to discern great distinctions between ourselves and adolescents that we interpret in our favor.

There are, of course, genuine differences between adolescents and adults. Emotional states and expressions that seem unique to adolescence have been labeled everything from "storm and stress" (see Arnett, 1999) to obnoxious to delightful (Restak, 2001, Bradley, 2003). This article is more concerned with claims about risk taking as they relate to adolescent age and concerns about generational and demographic change. Anthropologist Margaret Mead's *Culture and Commitment* forecast modern Americans' rising fear and hostility toward youth. Burgeoning social and technological change amid increasing racial diversity was driving adults yearning for traditional, homogenous cultures to reject modern youth as "the advance guard of an invading army . . . a threat to whatever moral, patriotic, and religious values their parents uphold," warned Mead (1970, pp. 47, 49). Indeed, today's overwhelmingly White older generation confronting the increasingly minority composition of younger generations, widening economic gap between generally opulent Baby Boomers and poorer youth, rise of new technologies affording young people more independent intercommunication and information, and sharp deterioration in older generations' personal behaviors and stability all suggest a political climate in which assessment of young people is likely to be less than benign.

As the racial and ethnic minority component (the proportion not of White, European origin) of America's teenage population rose from around 15% in the 1960s to 43% in 2008 (Bureau of the Census, 2008a), fears toward young people have been organized into major institutional and political campaigns (see Boyle, 2006; Males, 2007). By the 1990s and 2000s, politicians and interest groups were cyclically pronouncing "teen suicide," "teenage pregnancy," "youth violence," "adolescent risk taking," "underage drinking," "kids and guns," "teens and drugs," and similar "youth crises" as

among America's worst social problems, if not the worst. At the same time that youth were increasingly identified as a problem population, scientists announced "new scientific discoveries" about the brain revealing that adolescence is a particularly dangerous stage of childhood incompetence.

Perhaps, as many believe, young people today really are acting worse. That would suggest that "new findings about the teenage brain," coinciding with public anxiety toward young people's increasingly visible racial diversity represent genuine scientific advances, not just youth-fearing politics prompting youth-disparaging science. But is this really the case? Further investigation into the basis of biodeterminist assertions is required.

Is "Adolescent Risk Taking" Scientifically Founded?

Claims about the "teenage brain" depend on the theory of "adolescent risk taking:" that "adolescents, on average, engage in more reckless behavior than do individuals of other ages" (Steinberg, 2007, p. 56; see also the review by Arnett, 1999). If adolescent behaviors are not generally riskier than those of adults when relevant factors are controlled, then interpreting teenage biologies as provoking riskier behavior would be a torturous exercise indeed.

"If kids are as smart as adults, why do they do such dumb things?" Steinberg asks (Kotulak, 2006, p. 1), presaging a biodeterminist explanation:

> The temporal gap between puberty, which impels adolescents toward thrill-seeking, and the slow maturation of the cognitive control system, which regulates these impulses, makes adolescence a time of heightened vulnerability for risky behavior . . . Risk-taking is the product of a competition between the socio-emotional and cognitive control networks . . . and adolescence is a period in which the former abruptly becomes more assertive at puberty while latter gains strength only gradually, over a longer period of time. (Steinberg, 2007, p. 56)

Theorists then link risk-prone teenage brain biology to enhanced social hazard:

> Studies of susceptibility to antisocial peer influence show that vulnerability to peer pressure increases between preadolescence and mid-adolescence, peaks in mid-adolescence, presumably when the imbalance between the sensitivity to socio-emotional arousal (which has increased at puberty) and capacity for cognitive control (which is still immature) is greatest, and gradually declines thereafter" (Steinberg, 2007, p. 57; 2004).

However, the biodeterminist views presented by Steinberg (2007) and others as scientific consensus are disputed. Eminent researchers caution that we know too little about brain biology to make sweeping claims. Asked, "How much do we know about the relationship between the anatomy or biology of the brain and behavior?" Kurt W. Fischer, Professor of Education and Human Development and director of the Mind, Brain, & Education Program at the Harvard Graduate School of Education replied,

> We do not know very much! . . . Most of the recent advances in brain science have involved knowledge of the biology of single neurons and synapses, not knowledge of patterns of connection and other aspects of the brain as a system . . . but we have a very long way to go . . . People naturally want to use brain science to inform policy and practice, but our limited knowledge of the brain places extreme limits on that effort (Public Broadcasting System, 2002).

Daniel Siegel of the University of California, Los Angeles's (UCLA) School of Medicine, coinvestigator at UCLA's Center for Culture, Brain, and Development, and director of the Center for Human Development, agreed: "We are just beginning to identify how systems in the brain work together in an integrated fashion to create complex mental processes" (Public Broadcasting System, 2002). Richard Lerner, director of Tufts University's Institute for Applied Research in Youth Development, likewise points out that brain research is "in its infancy" and "it's way too premature to make those specific links" between biology and behavior (Jayson, 2007, p. 1).

In addition to being premature, biological risk theories fail fundamental tests. What objective evidence shows that "adolescent risk taking" exists at all? What, in fact, is an "adolescent"?

Here arises the first major contradiction: True "adolescents" whose puberty-impelled risk taking would be highest and cognitive control systems the least developed according to biodeterminist theory, do not display inordinately high risks. Puberty now occurs from around the age of 10 to 13 years for girls and 12 to 15 years for boys. Thus, developmental, cognitive, and social influences should combine to render "mid-adolescence a time of heightened vulnerability to risky and reckless behavior" (Steinberg, 2008, p. 83). Second, modern "teenagers spend so much time with their peers" (Steinberg, 2007, p. 57). If the theory of greater thrill seeking driven by immature cognitive control, more peer association, and increasing independence from adults is correct, we would expect that adolescents would account for an increasing share of society's risks.

However, few of the results we would expect from this "adolescent risk" theory turn out to be true either in cross section or longitudinally. Modern,

presumably peer-socialized adolescents are not acting riskier than their parent-socialized counterparts of the past; the highest rates for most teenage ills occurred 30 to 40 years ago. Today, the parent generation seems more at risk. The latest statistics for rates of violent death—those from accidents, suicides, homicides, and those of undetermined intent—reveal that teens aged 15 to 19 years (49.7 deaths per 100,000 population in 2005) have lower rates than every adult age group. The worst rates are for ages 20 to 24 years (73.8 deaths per 100,000 population), followed closely by what had been assumed the safest grown-up ages: 45 to 49 years (70.1) 40 to 44 years (67.6), and 50 to 54 years (65.0) National Center for Injury Prevention and Control [NCIPC], 2008). For unintentional deaths (accidents) thought to be the scourge of reckless youth, age 45 to 49 years (44.6 deaths per 100,000 population) is the worst, followed by age 20 to 24, 50 to 54, and 40 to 44 years; age range 15 to 19 years (31.4) is safer than every adult age group. Even for the risk for which teenagers show the most excessive rate, motor vehicle fatality, travel survey, and accident reports show a 16-year-old would have to drive from Boston to Los Angeles and back 1,000 times to run even odds of being in a fatal traffic crash (FARS, 2008; Males, 2007, 2008).

More than 99.5% of all 16-year-olds live to be 17—a higher annual survival rate than for any single year of adult age to the next even if only violent deaths are considered. Indeed, the safest ages from accidental death for ages from 16 to 64 years are 16, followed by 17, and 35; middle-age now is riskier even than age 18. Yet authorities have failed to mention these trends and continue to insist that "statistics" prove adolescence is the time of greatest risk (i.e., Lewin, 2006; Reyna & Rivers, 2008).

That there are very few areas in which even the riskiest adolescent ages, 16 and 17 years, suffer the worst risk outcomes clearly is not due to adults' effective control. Such large majorities of high schoolers report alcohol, cigarettes, firearms, sex, and other risk enhancers are easy to obtain and/or frequently indulged that those who abstain must be doing so voluntarily. If self-reports such as Monitoring the Future's (Johnston et al., 2007) indicating adolescents experience widespread opportunities to take risks are creditable, then, it's hard to attribute the day-to-day safety of the overwhelming majority of teenagers to anything other than self-restraint. The argument that legal protections and supervision shield adolescents from the opportunities to engage in risky behaviors does not explain why, as noted later, teenagers do commit crimes and get in car wrecks at higher rates than adults do but experience lower rates of other risks.

Because adolescents of the ages that developmentalists and biodeterminists predict would be suffering the highest risks actually display relatively safe behavior, theorists have extended the definition of "adolescence" into the 18 to 25 age range when, paradoxically, risk outcomes are worse even though puberty is long past and cognitive controls more advanced. Indeed, Giedd (Shreeve, 2005) has questioned the rights of young people to vote before the age of 25 years and both Giedd and Steinberg (Lewin, 2006) have questioned the rights of young people to drive before that age, though neither has produced research findings justifying such radical assertions. In any case, the peculiar reality is that "adolescent risk taking" now is driven by emerging adults, not adolescents. Adding in statistics of age group 18 to 25 years or 20 to 24 years to artificially boost adolescent and teenage risk numbers should no longer be tolerated in the literature.

What Behaviors Define "Risk Taking?"

Beyond the extension of adolescence well into adulthood, the second troubling question involves why only certain risk behaviors, and only when adolescents engage in them, are considered evidence for biodeterminist theories. If the prevalence of certain risk behaviors demonstrates teenagers' developmental and/or cognitive immaturity, then how do we explain the similar or greater prevalence of these same or equally perilous behaviors in adult populations? For example, teenagers display lower risks than do adults for outcomes such as suicide, drug overdose, and accidents in general (National Center for Injury Prevention and Control, 2008). Why not use these measures as indexes of "risk taking?" We might then term teenagers' relative safety *adolescent prudence* and credit the cautionary influence of the amygdala.

Even when assessing the same behavior, characterizations of teenage and adult risks often seem inconsistent. For example, claims that teenagers' greater tendency than adults to commit crimes in groups demonstrates the developmental dangers of youthful peer associations become dubious when applied to similar variations by race. The National Crime Victimization Survey (Bureau of Justice Statistics, 2006), considered our best measure of crime, shows that victims report that around one fourth of the violent offenses perceived as involving offenders less than the age of 21 years were perpetrated by groups, triple the proportion for perceived older offenders. However, in addition to showing massive declines in group offending by teens in recent decades, the same survey shows an even larger proportion

(one third) of violent offenses by perceived African American offenders of all ages involved groups. The most logical inference is that group offending is a feature not of age or race, but of conditions common to both Blacks and young people, such as high rates of poverty.

In a particularly strange assertion, Steinberg (2007a) argues that adolescents' low rates of suicide do not imply low risks; rather, the fact that "the rate of attempted suicide is higher among teenagers than adults" (p. 20) means "adolescents take more risks; adults are merely more competent, so to speak—consistent with the brain science" (p. 20). True, teens in the age group of 15 to 19 years perpetrate around 40 self-inflicted injuries requiring medical attention for every actual suicide, compared with a 10:1 ratio for adults aged from 25 to 64 years (National Center for Injury Prevention and Control, 2008). But the NCIPC also reports 33 suicide "attempts" per completion for women of all ages versus 6 for men. If we accept Steinberg's logic that greater success in committing suicide reflects greater cognitive competence, then male brains are far more competent at every age than females'; teenage boys are more competent than women in their 30s and 40s; Whites' brains are more competent than those of Blacks; and Black females of all ages (averaging over 60 attempts for every suicide) are the least biologically competent of all. Alternatively, we could look at "suicide attempts" not as evidence of cognitive incompetence but as stemming from motives other than to die, as research on survivors finds (see Moscicki, 2001).

Similarly, a small study (widely cited in media stories) reported that adolescents perceived a wider variety of emotions in pictured "fearful faces" than adults did, yielding researchers' assertion that teenagers' reliance on the brain's "primitive" amygdala leads them to misjudge basic social cues such as fear (Killgore & Yurgelun-Todd, 2005). However, similar picture-image studies have found that economically disadvantaged subjects also are more prone to interpret facial expressions as communicating aggressiveness (Berk, 2008), suggesting that reactions to facial expressions stem more from differing social environments than differing brains. Likewise, video-game simulation experiments supposedly showing that teenagers react in more reckless, peer-pressured, unempathic, lazy, or otherwise objectionable ways compared with adults (Bjork et al., (2004); Blakemore & Choudhury (2006) Gardner & Steinberg, 2005; Steinberg, 2008) may "have nothing to do with the process of emotions and everything to do with a difference in the way teenagers process *simulations*" stemming from "generational differences in the experience teenagers and adults have" with visual media (Sercombe, in press; Epstein, 2007). Notably, even large racial differences in risk taking

found in these studies (Gardner & Steinberg, 2005) are not similarly attributed to brain differences.

Still another contradiction involves positing teenage behavior as "risky" if it fails to meet absolute standards of perfection.

> More than 90% of all American high school students have had sex, drug, and driver education in their schools, yet large proportions of them still have unsafe sex, binge drink, smoke cigarettes, and drive recklessly (some all at the same time). (Steinberg, 2008, p. 99)

Antidrunken driving, antidrug, safe sex, and similar messages have also been directed at grown-ups, yet tens of millions of adults engage in risky behaviors now extending well into middle age. It seems peculiar to brand "incompetent" adolescents as reckless for failing to meet standards stricter than those expected of "competent" grown-ups.

Ignoring Socioeconomic Context

Teenage brain and adolescent risk-taking theories seem to have been developed with a disregard for alternative explanations. "Brain research needs to be pulled alongside other established cognitive and sociological research, rather than common prejudice," Sercombe (in press) contends. Risk outcomes must be assessed not as absolutes but in the context of risk exposure—that is, the social factors governing teens' and adults' risk opportunities. Yet when behavior contexts are incorporated into the analysis, the entire "adolescent risk taking" construct becomes shaky indeed. Researchers who assert unique adolescent risk, whether blaming it on biology, peer pressure, developmental singularities, or some combination have failed to control even for the most rudimentary socioeconomic conditions.

Let us examine the two major behaviors cited by Steinberg and widely considered gold standards of adolescent risk: crime and automobile crashes. Compared straight across, older adolescents and emerging adults aged from 16 and 19 years do indeed display worse rates than do older adults for these behaviors. But even if we accept criminal arrest and traffic crashes as seminal indexes of risk, how do we know older adolescents' worse outcomes result from their teen age and not some other covariate? After all, males, African Americans, and urban dwellers of all ages display high arrest rates and males, Southerners, and Native Americans suffer excess traffic fatality, yet very few scientists (any longer) blame these on inferior biologies. Compelling warning signs loom that teenagers' higher

rates of criminal arrest and traffic accidents are not "adolescent" at all. Here, I will cite California's statistics, which are similar in magnitude and provided in greater demographic detail compared with those nationally.

If adolescents were generically miswired, we would expect teenagers from varied backgrounds to act more like each other and less like adults—in mathematical terms, the within-group risk variation for separate adolescent populations should be significantly less than the between-group risk variations for adolescent versus adult populations. Yet the opposite is the case. At the microlevel, teenagers from unstable, violent, drug- and alcohol-abusing, tobacco-using, mentally troubled families and communities are many times more likely to display corresponding problems than teenagers from nurturing, peaceful, healthy, nonsmoking homes, and communities (see Berk, 2008).

These parallels also show up in macrostatistics. The state-by-state correlations between teenage and adult rates of drinking, binge drinking, smoking, marijuana use, unwed births, drunken-driving deaths, firearms deaths, homicide, suicide, criminal arrest, and a host of other major risks are powerful, ranging from 0.70 to 0.95 (Males, 1998). If teenage and adult brains reason so fundamentally differently, we would not expect teenage behaviors to be better predicted by the behaviors of adults around them than by those of teenagers elsewhere.

If there is a consensus of literature and statistics, it is that teenage troubles are not randomly distributed, but highly concentrated. Most serious risks track socioeconomic inequalities more closely than age. For example,

- California's Black adolescents suffer felony arrest rates five times higher, including murder arrest rates 14 times higher, than do White non-Hispanic adolescents. The felony arrest rate for older African Americans (ages 30 to 69 years) is double that of older White teens, including homicide arrest rates four times higher (California Criminal Justice Statistics Center, 2008).
- Firearms homicide death rates are 25 times higher among California teens in areas in which adolescent poverty rates exceed 30% than among teenagers in areas in which their poverty levels are below 5%. African Americans in their 50s and 60s suffer gun murder rates five times higher than even the riskiest ages of White teens and emerging adults, while White teens have lower firearms mortality rates than every age group of White adults (Center for Health Statistics, 2008).
- Teen drivers aged between 16 to 19 years in California's poorest major counties suffer fatal traffic crash rates averaging six times higher per mile driven (the best measure of risk exposure) than teens in the richest counties. Middle-aged adults in poorer counties suffer fatal crash rates averaging three times higher per mile driven than do teenagers in wealthier counties (Males, 2007b).

Such wide variations in behavior within all ages along socioeconomic lines should raise a red flag to those asserting unique adolescent risk.

The Role of Poverty

Socioeconomic disparity does not just divide races; it divides age groups as well. For the population as a whole, each race, and most locales, American adolescents and emerging adults are two to three times more likely to live in households with annual incomes less than federal poverty guidelines ($16,000 for a family of three in 2006). This may seem puzzling: If teenagers tend to have middle-aged parents with whom they presumably share households, how can teens be so much poorer than their parent age group? Census figures, however, reveal substantial generational fragmentation. The 2006 Current Population Survey found more than 60% of Americans aged 40 to 59 years did not have a teen aged between 12 and 17 years living in their household (Bureau of the Census, 2008a, 2008b).

America's excessive adolescent poverty is no small matter. Age-based economic divergences are so dramatic that in only 14 of California's 58 counties do adolescents and emerging adults enjoy poverty levels of less than 15%, compared with 47 of 58 counties for middle-agers; meanwhile, young people suffer poverty levels exceeding 20% in 35 counties, versus none for middle-agers (Bureau of the Census, 2008a). Yet my search failed to turn up any studies by adolescent risk and teenage-brain researchers that factor out the vast discrepancies in socioeconomic status before pronouncing teens riskier than adults. The words "poverty," "socioeconomic," "race," and similar sociodemographic terms appear nowhere in the eight articles in *Developmental Review*'s special issue on adolescent risk taking (Reyna & Rivers, 2008). The authors in my literature search who assessed age-based risk taking simply compared adolescents (whose poverty levels average around 15%) with adults (whose poverty rates range from 8% for middle-agers to 12% for ages 25 to 34 years) straight across. Controlling for race, as Epstein (2007) does, is insufficient; teenagers are substantially more likely to live in poverty than are middle-aged adults within each race (Bureau of the Census, 2008a). Researchers' universal failure to account for crucial socioeconomic disparities should raise serious questions as to the validity of the large body of literature comparing adult and adolescent behavior.

This Sociology-1 method error is inexcusable. Poverty is strongly associated with nearly every risk behavior, regardless of race, sex, or age. Again,

using traffic deaths as the example, 16- and 17-year-old drivers in California's impoverished Stanislaus and Tulare counties suffer 45 fatal crashes per 100 million miles driven, six times the rate (7 per 100 million miles driven) in opulent Marin and San Mateo counties. Drivers aged from 45 and 54 years, supposedly the safest age, suffer fatal crash rates similar to those of adolescent drivers when poverty rates are equalized. In Sacramento and San Bernardino counties, for example, drivers aged from 45 to 54 years have poverty rates similar to those of teens in Marin and San Mateo and suffer similar fatal crash rates (8 per 100 million miles driven; Males, 2007b).

Driver fatality risk by age and county can be entered into a standard multiple regression weighing poverty rate, miles driven per year, median income by county, vehicle age, urbanization, vehicle registrations, unlicensed driver fatalities, and other relevant variables to produce fatality estimates controlled for poverty. Even for the worst adolescent risk, traffic crashes, it appears that poverty and its correlates, not young age, are the most important outcome predictors (Males, 2007b). Fatality data show that teens in fatal crashes were driving vehicles that were smaller (three fourths were in small cars, versus half of adults aged from 45 and 64 years), older (9.4 years old, versus 8.2 for adults), and more crowded (2.6 vehicle occupants, versus 2.1 for adults) (FARS, 2008). Residence in lower income areas very likely also entails less-maintained roads, slower police response, and lower levels of emergency and medical services.

This exercise can be repeated for virtually every behavior for which adolescents are accused of displaying excessive risks with similar results: Socioeconomic status predicts risk outcome more consistently than age. When poverty rates are held constant for California's major counties, adolescents and emerging adults even at the riskiest ages generally are less prone to risk taking than are middle-aged adults, with adults aged from 25 and 39 years, in between. For many serious risks—including, murder, rape, and assault arrest; homicide and motor vehicle death; and external injury—adolescents' and middle-aged adults' rates become startlingly similar under equalized levels of poverty. Some adolescent and emerging adult excesses do remain; robbery arrest, property crime arrest, and firearms injury (but not death) rates remain higher for older adolescents than for middle-agers. However, these teenage risks are dwarfed by middle-agers' much higher rates of risk outcome across a broad spectrum: violent death, accidental death, suicide, drug overdose, and firearms death as well as white-collar crimes that cost society far more than street crime. If "the cognitive control system of adults is more effective than that of adolescents" and "some things

just take time to develop, and, like it or not, mature judgment is probably one of them" (Steinberg, 2007, p. 57), why do adults do such dumb things?

The best generalization seems to be that most risks are tied to external conditions, and each age level displays its own particular hazards. In short, "adolescent risk" disappears on a level playing field. Unfortunately, the field is far from level. More than any other Western society, American grown-ups render youth a time of poverty and middle age a time of wealth, a political choice exposing our young to greater dangers. This suggests that claims of innate "adolescent risk" and "teenage brain" flaws not only reflect "a bias in interpretation that privileges the age, class, and culture position of the researcher" (Sercombe, in press) but serve to defend older age groups' economic privileges as well.

The Danger of New "Adolescent Science"

Theories affirming innate adolescent risk-taking benefit adults in many ways. "By emphasizing the irrationality and disturbance of young people we affirm our own basic rationality, peacefulness, conformity, and decency" (Sercombe, in press). Biodeterminist claims about adolescents shift attention away from social inequalities that form the genuine bases for the risky behaviors now mislabeled "adolescent risk," including the large and widening gap between the economic fortunes of young versus middle-aged Americans. They allow the dismissal of unsettling youthful complaints against adults as merely the products of faulty teenage thinking (see Bradley, 2003). They obscure the troubling eruptions in drug abuse, criminal arrest, imprisonment, HIV, family breakup, and related difficulties among middle-aged Americans over the last 25 to 35 years.

Ever-more restrictive policies against young people are being proposed and rationalized by claims that "new scientific discoveries" show teenagers and even emerging adults must be custodialized like children rather than afforded adult rights. The United States has instituted an unprecedented barrage of youth-control measures that are increasing in prevalence and intensity even as long-term research finds them ineffective or even harmful. Raising drinking ages to 21 years was initially associated with reduced traffic crashes among 18- to 20-year-olds, but later study associated it with even greater increases among 21- to 24-year-olds (Asch & Levy, 1987; Dee & Evans, 2001). Graduated driver licensing laws were followed by fewer traffic deaths among 16-year-olds, but 18-year-old driver fatalities rose even more sharply (Males, 2007a). Mandatory drug testing of public school

students not only has proven ineffective, it may foster greater use of harder, less detectible drugs (Yamaguchi, Johnston, & O'Malley, 2003). Research consistently finds curfews neither improve youth safety nor reduce crime (Adams, 2003; Reynolds, Seydlitz, & Jenkins, 2000). School uniforms and zero tolerance policies are associated with negative effects on school participation and academics and no demonstrable benefits (Brunsma & Rockquemore, 1998). Policies banning teenagers and emerging adults from legally acquiring lodging, transportation, and an increasing array of products, services, and medications pose distinct threats to their well-being.

Far from justifying antiprecocity measures, emerging brain science, viewed in social contexts, indicates the dangers of efforts to restrict youth and to banish them from adult behaviors and public spaces. Preliminary analyses of brain physiology suggest that "taking risks is precisely the experience that develops the pre frontal cortex . . . you don't learn what you need for adulthood by being excluded from it until you can demonstrate that you have got the right circuits" (Sercombe, in press). Viewed as a system, American social and health policies built on age-segregating measures may well be contributors to the extraordinarily high-risk behaviors prevailing among American youths and adults well into middle age compared with their counterparts in peer nations.

There may be a price to pay in the adaptability of larger society as well. If brain science is to be credited with biodeterminist findings, neuroscannings and cognitive tests reveal developments in the middle-aged brain that make worry over teenage brains look silly. Significant losses in key memory and learning genes (Lu et al, 2004), mental fluidity (Schaie & Willis, 2008), and measurable losses in IQ show up in middle age and accelerate in senior years. Although some research indicates that myelinization (the pruning and selection of certain cerebral nerve fibers for myelin sheathing) aids adult brains in handling familiar situations more efficiently, it also renders them less able to address new challenges than more flexibly circuited younger brains. Adults' difficulty in changing unhealthy behaviors as they age could be seen as a brain-based developmental stage promoting greater risk taking.

That young people's "brains are different because the experience of young people is different" than that of older adults (Sercombe, in press) confers distinct advantages in a changing, diversifying society. In the face of aging adults "managing clumsily and often unsuccessfully the tasks imposed on them by the new conditions" argued Mead (1970, pp. 59, 73), changing societies must learn to share leadership with the more flexible young informed by "experiential knowledge." Unfortunately, both young

people's well-being and the adaptive value to a changing society of integrating the diverse capacities of older and younger thinking are threatened by today's resurgence of biological determinism that, like its discredited predecessors, reveals more popular prejudice than scientific rigor.

References

Adams, K. (2003, May). The effectiveness of juvenile curfews at crime prevention. *Annals of American Academy of Political and Social Science,* 587, 136-159.

Arnett, J. J. (1999). Adolescent storm and stress, reconsidered. *American Psychologist, 54,* 317-326.

Asch, P. T., & Levy, D. T. (1987). Does the minimum drinking age affect traffic fatalities? *Journal of Policy Analysis and Management, 6*, 180-192.

Berk, L. (2008). *Child development* (8th ed.). Boston: Allyn & Bacon.

Bjork, J.M., Knutson, B., Fong, G.W., Caggiano, D.M., Bennett, S.M., and Hommer, D.W. (2004). Incentive-elicited brain activation in adolescents: Similarities and differences from young adults. *The Journal of Neuroscience, 24*(8):1793-1802.

Blakemore S.J., and Choudhury, S. (2006). Development of the adolescent brain: implications for executive function and social cognition. *Journal of Child Psychology and Psychiatry, 47*:296–312.

Boyle, P. (2006). Curfews and crime. *Youth Today,* 15,1-36.

Bradley, M. (2003). *Yes, your teen is crazy!: Loving your kid without losing your mind.* Gig Harbor, WA: Harbor Press.

Brunsma, D. L., & Rockquemore, K. A. (1998). The effects of student uniforms on attendance, behavior problems, substance use, and academic achievement. *Journal of Education Research, 92*, 53-62.

Bureau of the Census. (2008a). *Census of the population, 2000. Summary File 3*. Retrieved October 20, 2008, from http://www.census.gov/Press-Release/www/2002/sumfile3.html

Bureau of the Census. (2008b). *Current Population Survey 2006*. Retrieved October 20, 2008, from http://www.census.gov/population/www/socdemo/hh-fam/cps2006.html

Bureau of Justice Statistics. (2006). *Criminal victimization in the United States, 2005. Statistical tables*. Washington, DC: US Department of Justice.

Campbell, M., & Potts, M. (2006, February 27). The pill is mightier than the sword. *San Francisco Chronicle,* p. D4.

Center for Health Statistics. (2008). *Death public use file, 1960-2005* [Data file]. Sacramento: California Department of Health Services.

Criminal Justice Statistics Center. (2008). *Crime in California, 1965-2006* (Annual Report). Sacramento: California Department of Justice. Retrieved October 20, 2008, from http://ag.ca.gov/cjsc/pubs.php#crime

Dee, T., & Evans, E. (2001). Behavioral policies and teen traffic safety. American Economics Association. *AEA Papers and Proceedings, 91*, 91-96.

Epstein, R. (2007). The case against adolescence: Rediscovering the adult in every teen. Sanger, CA: Quill Driver Books.

Farrell, J. M. (2007, May 29). Inside their heads: Rebellious teen behavior could stem from biology. *McLean in the News.* Retrieved October 20, 2008, from http://www.mclean.harvard.edu/pdf/news/mitn/mh070529.pdf

FARS. (2008). *Fatality Analysis Reporting System encyclopedia*. Retrieved October 20, 2008, from http://www-fars.nhtsa.dot.gov/QueryTool/QuerySection/SelectYear.aspx

Gardner, M., & Steinberg, L. (2005). Peer influence on risk taking, risk preference, and risky decision making in adolescence and adulthood: An experimental study. *Developmental Psychology,* 41, 625-635.

Gould, S. J. (1981). *The mismeasure of man.* New York: W. W. Norton.

Jayson, S. (2007, September 26). Teens driven to distraction: Nature or nurture? *USA Today*. Retrieved October 20, 2008, from http://www.usatoday.com/news/health/2007-09-26-teen-freedom_N.htm

Johnston, L. D., O'Malley, P. M., Bachman, J. G., & Schulenberg, J. E. (2007). *Monitoring the Future national survey results on drug use, 1975-2006: Vol. I. Secondary school students*. Bethesda, MD: National Institute on Drug Abuse.

Killgore, W., Yurgelun-Todd, D. A. (2005). Social anxiety predicts amygdala activation in adolescents viewing fearful faces. *Neuroreport, 16*, 1671-1675.

Kotulak, R. (2006, March 24). Teens driven to distraction: Research shows why a teen brain capable of reasoning like an adult's is hijacked by emotions and impulses. *Chicago Tribune,* p. 1.

Lewin, T. (2006, January 8). Right stuff and wrong in the boys who dare. *The New York Times,* p. M4.

Lu, T., Pan, Y., Kao, S., Li, C., Kohane, I., Chan, J., et al. (2004). Gene regulation and DNA damage in the ageing human brain. *Nature, 429*, 883-891. Retrieved October 20, 2008, from http://www.nature.com/nature/journal/v429/n6994/abs/nature02661.html

Males, M. (1998). *California adolescent behavior: Subcultural, or integrated with adult behavior?* Unpublished doctoral dissertation, University of California, Irvine.

Males, M. (2006). More dangerous than anyone thought. *Extra, 19*, 29-30.

Males, M. (2007, February 15). The new Bull Connors. *Youth Today,* p. 16.

Males, M. (2007a). California's graduated driver license law: Effect on teenage drivers' deaths through 2005. *Journal of Safety Research, 38*, 651-659.

Males, M. (2007b). Poverty, not risk taking, may be the real problem in teenage accidents. *The Chronicle of American Driver and Traffic Safety Education Association, 55*, 4-5, 8, 19.

Males, M. (2008). Review of the book *Yes, your teen is crazy!* Retrieved October 20, 2008, from http://www.youthfacts.org/bradley.html

Mead, M. (1970). *Culture and commitment: A study of the generation gap*. New York: Doubleday.

Moscicki, E. K. (2001). Epidemiology of completed and attempted suicide: Toward a framework for prevention. *Clinical Neuroscience Research, 1*, 310-323.

National Center for Injury Prevention and Control (NCIPC). (2008). *WISQARS injury mortality reports, 1999-2005*. Retrieved October 20, 2008, from http://www.cdc.gov/ncipc/wisqars/

National Research Council. (2006). *A study of interactions: Emerging issues in the science of adolescence workshop summary* (Program committee for a workshop on the synthesis of research on adolescent health and development). Washington, DC: Author.

Offer, D., Ostrov, E., & Howard, K. I. (1981). The mental health professional's concept of the normal adolescent. *AMA Archives of General Psychiatry, 38*, 149-153.

Petri, H. L. (1990). *Motivation: Theory, research, and applications* (3rd ed.). Belmont, CA: Wadsworth.

Public Agenda. (2008). *Kids these days*. Retrieved October 20, 2008, from http://www.publicagenda.org/specials/Kids/kids.htm

Public Broadcasting System. (2002). *Inside the teenage brain* (Interviews of Deborah Yurgelun-Todd, Kurt W. Fischer, Jay Giedd, and Daniel Siegel). Retrieved October 20, 2008, from http://www.pbs.org/wgbh/pages/frontline/shows/teenbrain/interviews/todd.html

Restak, R. (2001). *The secret life of the brain.* Washington, DC: Joseph Henry.
Reyna, V., & Rivers, S. (Eds.). (2008). Current directions in risk and decision making (special issue). *Developmental Review, 28*, 1-152.
Reynolds, M., Seydlitz, R., & Jenkins, P. (2000, March). Do juvenile curfew laws work? A time-series analysis of the New Orleans law. *Justice Quarterly, 17*, 205-220.
Schaie, K. W., & Willis, S. L. (2008). The Seattle longitudinal study. Retrieved October 20, 2008, from http://geron.psu.edu/sls/researchers/index.htm
Sercombe, H. (in press). The teen brain research: Critical perspectives. *Youth and Policy, 101*.
Shreeve, J. (2005). Beyond the brain. *National Geographic, March*, 2-31.
Steinberg, L. (2004). Risk-taking in adolescence: What changes, and why? *Annals of the New York Academy of Sciences, 1021*, 51-58.
Steinberg, L. (2007). Risk-taking in adolescence: New perspectives from brain and behavioral science. *Current Directions in Psychological Science, 16*, 55-59.
Steinberg, L. (2007a, November, 20). Youth facts versus writer's fiction. *Youth Today,* p. 16.
Steinberg, L. (2008). A social neuroscience perspective on adolescent risk-taking. *Developmental Review, 28*, 78-106.
Strauch, B. (2004). *The primal teen: What the new discoveries about the teenage brain tell us about our kids.* New York: Doubleday.
Yamaguchi, R., Johnston, L., O'Malley, P. (2003, October). *Drug testing in schools: Policies, practices, and association with student drug use.* Ann Arbor: Institute for Social Research, University of Michigan.

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