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Embedded Science: Critical Analysis of Abstinence-Only Evaluation Research

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Since 1982, more than US\$1 billion have been spent through federally sponsored abstinence-only-until-marriage (AOUM) programs, including nearly \$800 million between 2001 and 2006, during the presidency of George W. Bush. With this increased funding has come pressure to evaluate the impact of AOUM programs. In 1998, a federally funded evaluation of AOUM programming was commissioned to assess its impact on young people. Because the abstinence policies and the evaluation of their success derive from the federal government, the authors identify the troubling potential of "embedded science." Using a recent example of research in the field of abstinence-only education (Maynard et al., 2005), the authors identify a number of practices and consequences of embedding research science within existing public policy. They find that when evaluation research is overly embedded, it tends to be dominated by political ideologies, information is omitted, and critique is virtually absent.

Keywords: *abstinence; embedded; evaluation; federal funding; Mathematica; research design*

As is evident in the discussions throughout this issue, the federal government has declared a "war on science" on numerous fronts (Mooney, 2005). Henry Kelly, president of the Federation of American Scientists, issued a stern warning in 2006: "The system [of federally-funded research] is in dangerous disrepair" (H. Kelly, 2006, p. 737). Kelly went on to enumerate the mounting threats to federally funded science, including the suppression of data and analysis, the explicit packing of advisory committees with unqualified members, punishment of whistle-blowers, and a repositioning of what he called "fringe science" as if it were mainstream and peer-reviewed science (Committee on Government Reform, 2003; Waxman, 2006).

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In such a federal context, we have entered what some consider an era in which the federal government systematically controls and censors information. One area where this control has been particularly evident is adolescent sexual health and development, within which sits the contentious field of abstinence-only-until-marriage (AOUM) education. Lessons that teach young people to abstain from all sexual activity until marriage have become one of the cornerstones of the Bush administration's attempts to legislate specific sexual, relational, and reproductive choices for Americans of all ages. In the case of abstinence-only education, this enforcement comes in the form of federal- and state-level requirements for what public schools and community programs are allowed (and not allowed) to teach young people about their own sexual development, relationships with partners, reproduction, contraception, and related topics usually falling under the umbrella of what was previously known as "sex ed." The sexuality education of young people has been radically made over as "abstinence-only education" and now includes mandated lessons, such as "sexual activity outside of the context of marriage is likely to have harmful psychological and physical effects" (U.S. Department of Health and Human Services [DHHS], 2003, p. 14).

Since 1982, when funding was first earmarked for abstinence education, more than US\$1 billion have been spent through federally sponsored programs (Sexuality Information and Education Council of the U.S. [SIECUS], 2004). Between 2001 and 2006, during the presidency of George W. Bush, nearly \$800 million were allocated to AOUM programs (SIECUS, 2006). As funding allocations have grown, so has the call for evaluation of the impact of AOUM programming on the sexual development and health of adolescents. In 1998, the DHHS commissioned a quasi-experimental, longitudinal evaluation of abstinence-only education by Mathematica Policy Research, Inc., a highly regarded, nonpartisan, social science research institute. This evaluation was tasked with assessing the impact of AOUM curricula on the sexual attitudes and behaviors of young people.

It is this move to assess—and the appeal to science and research methodology that has accompanied this evaluation effort—that interests us here. To examine this interrelationship between the federally funded Mathematica evaluation and the federally funded abstinence policies it was tasked with evaluating, we looked closely at the survey items in the Mathematica Wave II instrument (Mathematica Policy Research, 2000). This instrument serves as an illustration of the types of data emerging from the federal government's adoption of research science as a means to evaluate the same abstinence curricula it also sponsors. These data allowed us to assess the scope and parameters of the data collection tool, and ultimately the ideological positions that were produced using this assessment tool. This close reading of the survey instrument revealed key moves or the "micro-practices" (Lather, 2005) of what we term "embedded science."

Although evaluations are and will continue to be important aspects of any policy endeavor, we are concerned with the constricted nature of federally funded and contracted evaluation research on abstinence. We are attentive to the ways in which research can be affected by the very policies it is meant to evaluate, especially

when presuming the reverse is the point. In other words, research should be in the service of interrogating policies to make them more effective. Our concern is that if the federal government continues to embed research too tightly within the same structures that it is tasked with evaluating, the ability to find out things we don't already know will be lost from the scientific imagination. Research will serve a limited feedback loop, lose credibility, and be viewed as legitimating rather than explaining, particularly if new knowledge is deemed unsupportive of and/or contrary to existing policies. These are important considerations as evaluation research will continue to steer national policies on adolescent sexual development and other important public policies as well.

In our previous writing on this issue, we have critiqued the ideological foundation of AOUM education policies and have highlighted the disparate impacts that these policies have on young women depending on their race, class, sexual minority status, disability, and location in the United States (Fine & McClelland, 2006, 2007). In this piece, however, we turn away from the macro-ideological concerns and focus on the microproduction of science that has been used to evaluate and bolster the policies that are already in place. In this analysis, we examine studies that have already been conducted as a way of viewing how research *is* being used. We also suggest various ways that research *could* be used to understand the mechanisms that are at work when young people are educated using abstinence-only curricula.

Embedded: Reporting From Within

The production of embedded science as a tool of policy legitimation may best be understood if we borrow from the writings on embedded journalism. Hampton Sides, writer for *The New Yorker*, published a piece called "Unembedded" about his near involvement as an embedded journalist with the Marines preparing for a tour in Iraq in 2003:

Still I ha[d] trouble fathoming why an Administration that had shown no particular concern for world opinion in the previous months would go to such lengths to accommodate so many journalists. One military officer at the Hilton privately suggested an answer: "We want you here to document the gas and the other stuff Saddam has in his arsenal. If he has it, or God forbid, uses it, the world's not going to believe the U.S. Army. But *they'll believe you.*" (Sides, 2003)

The power to persuade lies at the heart of journalism and at the heart of science; this is why the metaphor of *being embedded* ("to be or become fixed or incorporated, as into a surrounding mass," *dictionary.com*, 2006) works as a problematic for both. In the example of embedded reporters in Iraq, the power to persuade was located in reporters who were granted "access" to the soldiers and the daily mechanisms of war. This level of access was meant as a means to transfer the rhetoric of war from the mouths of military officers and place it, instead, in the mouths of ostensibly impartial reporters.

Like embedded reporters who found themselves with limited access to military personnel, constricted views of the war they were tasked with reporting, and information blackouts, embedded scientists face similar situations. Research science has the potential to persuade and engage the public. We consistently rely on scientists to evaluate policies and products that affect our daily lives, including medications, food and air quality, and product safety. Embedded science uses this power to persuade but collapses the critical distance that is needed to allow for disagreement. We highlight these two moves of embedded science: one, the power to persuade through the use of scientific design and two, the foreclosure of disagreement due to the alignment of one's research questions with already existing ideology, policy, and practice. Hence, the dangerous power of embedded science lies in its ability to pass without critique—to appear as if objective and to obscure and discourage critical glances (see Dimitriadis, this issue).

A Trend Toward Embedded Science

Embedded science has also become a point of contention within medical journals in recent years. The role of pharmaceutical companies has come under scrutiny after a number of published studies were revealed to have been authored by pharmaceutical consultants and employees (e.g., Cohen et al., 2006; for analysis, see Angell, 2000; Armstrong, 2006; Bero & Rennie, 1996; Bodenheimer, 2000; Boyd & Bero, 2000; R. Smith, 2001). Journal editors refer to the “increased entanglement of academia with industry” (R. Smith, 2001, p. 588) as the reason why medical studies have the potential to be influenced by corporate interests. Like embedded reporters and embedded AOUM evaluators who have the power to persuade public opinion, “The work of these academic researchers highlights the role of ‘opinion’ or ‘thought’ leaders coveted by drug companies because of their ability to influence not only the practice of doctors, but popular opinion as well” (Armstrong, 2006, p. A1). Editors, such as those at the *British Medical Journal* have called to “protect the integrity of the scientific record” (R. Smith, 2001) because they are concerned about how commercial interests alter the methodology, presentation, and content of pharmaceutical studies. They fear that drugs will enter the marketplace and clinical practices across the world will be influenced without proper research and vetting by impartial research scientists.

Although we are not concerned with commercial interests in this analysis, we see an alarming trend across many sectors—namely, a trend toward embeddedness. Commercial, political, and ideological parameters cannot be allowed to dictate the production of science. Sixteen years ago, former President George H. W. Bush stated,

Science, like any field of endeavor, relies on freedom of inquiry; and one of the hallmarks of that freedom is objectivity. Now more than ever, on issues ranging from climate change to AIDS research . . . government relies on the impartial perspective of science for guidance. (Woolley & Peters, n.d.-a)

The trend we see toward embedding science within ideological and political interests will strip science of the power to inform public policy and clinical care—diminishing the role of scientists to spokespersons for the highest bidder.

With this embedded metaphor in mind, we turn back to abstinence-only education policies that have become well funded and highly supported since 2001 (see SIECUS, 2004, for timeline of AOUM funding). The Bush administration has taken the issue of what young people are taught in their classrooms and in their communities about their bodies, their sexual development, and sexual health as a serious point of policy intervention:

In my budget, I propose a grassroots campaign to help inform families about these medical risks. We will double federal funding for abstinence programs so schools can teach this fact of life: Abstinence for young people is the only certain way to avoid sexually transmitted diseases. (G. W. Bush, cited in Woolley & Peters, n.d.-b)

This investment in the sexual education of young people has been supported with dramatic funding increases for programs that teach exclusively about abstaining from sexual activity until marriage. Abstinence-only education policies have become a powerful method of changing the tenor and substance of what young people learn (and don't learn) about sex in their schools and in their communities.

History of AOUM Education

A brief history of AOUM takes us back to 1981, when the Adolescent Family Life (AFL) Act marked the first federal law that expressly funded sex education “to promote self-discipline and other prudent approaches” (Adolescent Family Life Act of 1981, pp. 579-580). Fifteen years later, with the Congressional passage of the Personal Responsibility and Work Opportunity Reconciliation Act (1996), states were flooded with AOUM education funds, each state receiving \$50 million in matching funds through what is commonly known as Title V.¹ In 2001, in addition to AFL and Title V, a third funding stream was added and has been the area where the majority of funding increases have been located. In 2001, Community Based Abstinence Education (CBAE) programs were funded at \$20 million per year; in 2005, CBAE received \$105 million, and by 2006, CBAE funding increased 475% from the original allocation to a total of \$115 million per year. President Bush proposed increasing this funding stream to \$141 million for 2007 (SIECUS, 2006). With these three federal and state funding streams in place, it is now estimated that 33% of all public schools now offer abstinence-only or AOUM curricula (K. Kelly, 2005).

Morality and Education

Today, very few young people take a class in “comprehensive sex education,” meaning they do not receive sex education that teaches them about adolescent

sexual development, age-appropriate sexual expression, contraception, pregnancy prevention, or lesbian/gay/bisexual/transsexual (LGBT) sexualities. If the school system depends heavily on federal funds, students are more likely to be instructed using an abstinence-only curriculum that insists that sexual education adhere to specific teaching guidelines. For example, programs funded under CBAE are explicitly restricted from providing young people information about contraception or safer-sex practices.² Comprehensive sex education, like abstinence education, teaches that abstinence is the most effective method of preventing unintended pregnancy and sexually transmitted diseases (STDs) for young people. There is, however, one major difference that marks the transition from comprehensive to AOUM sexuality education curricula: AOUM curricula teach that all sexual behavior must occur only within the confines of a heterosexual marriage.

The central beliefs of the AOUM philosophy emphasize the moral qualities of sexual activity, including the “harmful psychological effects” of nonmarital sexual activity and children born “out of wedlock” pose a threat to society. The Bush administration and the Religious Right have been vocal about the need for increased moral guidance for teens (and adults) when making the “right” decisions about their sexual lives (G. W. Bush, 1998). This conservative religious ideology has had a deep impact on crafting public policies that are designed to guide personal conduct (Arsneault, 2001).

Toward this end, federally funded AOUM programs are obligated to adhere literally to a series of principles called “A to H” (Section 510[b] of Title V of the Social Security Act, P.L. 104-193). AOUM programs are characterized by eight central beliefs. This means that each federally funded AOUM program:

- A. has as its exclusive purpose teaching the social psychological and health gains to be realized by abstaining from sexuality activity;
- B. teaches abstinence from sexual activity outside marriage as the expected standard for all school-age children;
- C. teaches that abstinence from sexual activity is the only certain way to avoid out-of-wedlock pregnancy, STDs, and other associated health problems;
- D. teaches that a mutually faithful monogamous relationship in the context of marriage is the expected standard of sexual activity
- E. teaches that sexual activity outside of the context of marriage is likely to have harmful psychological and physical effects;
- F. teaches that bearing children out of wedlock is likely to have harmful consequences for the child, the child’s parents, and society
- G. teaches young people how to reject sexual advances and how alcohol and drug use increase vulnerability to sexual advances; and
- H. teaches the importance of attaining self sufficiency before engaging in sexual activity.

The A to H list of abstinence-only tenets imposes a strict set of criteria on educators about what must be taught and what cannot be taught. Over the past 10 years, a number of curricula have been developed that adhere to these A to H tenets by organizations, such as the Worth the WAIT, Why kNOW, and Choosing the Best. These curricula are most often taught to young people in Grades 5 to 12

and include lessons about failure rates of condoms and other forms of birth control and “the very real, damaging, and often overlooked emotional consequences of premarital sexual involvement” (Choosing the Best, 2006, p. 4). These curricula are distributed among states, school districts, and community-based organizations across the United States. For example, Choosing the Best (2006) states that more than 1,500,000 students nationwide have completed their program.

Politics and Science

Of note in this discussion is the contested nature of the “science” informing these curricula. In 2004, a systematic review of the abstinence-only curricula was undertaken by the Committee on Government Reform. This Committee released a report evaluating the scientific and medical accuracy of 13 of the most commonly used abstinence-only curricula (Committee on Government Reform, 2004). This investigation found that two thirds of the programs contained basic scientific errors, relied on curricula that distorted information about the effectiveness of contraceptives, blurred religion and science, and reinforced stereotypes about girls and boys as scientific facts (see Committee on Government Reform, 2004, for details on curricular errors).

In October 2006, the nonpartisan Government Accountability Office (GAO) warned the DHHS that it was violating federal law (section 317P[c][2] of the Public Health Service Act) by failing to require that federally funded educational programs include medically accurate information about condom effectiveness (Kepplinger, 2006). DHHS had previously asserted that the law did not apply to materials used by federal abstinence education grantees because they were not designed to address specifics of sexual health but rather were designed to communicate the importance of abstinence. The GAO found this argument unpersuasive after they examined a workbook used by many abstinence education grantees. The workbook was found to include lessons on how HIV affects the body’s immune system; as a result, the GAO found that excluding information on condom use in a workbook with similar scientific themes violated the Public Health Service Act statute (Kepplinger, 2006; Vesely, 2006).

Above and beyond these abstinence-specific examples, there has been documentation of the imposition of politics and ideology across many scientific domains. In 2003, the Committee on Government Reform (2003) released a report titled *Politics and Science in the Bush Administration* in which they found numerous instances where the administration had manipulated the scientific process and distorted or suppressed scientific findings. This report, as well as other public critiques concerning the erosion of science in the public interest (Alexander, n.d.; Kaiser Family Foundation, 2005; H. Kelly, 2006; Mooney, 2005; “A Sad Day for Science,” 2005), alerts us to the intimacy of the relationship between federal abstinence policies and the federal sponsorship of an abstinence education evaluation.

Other AOUM Evaluations

A number of evaluations of AOUM programs have been conducted since 2000 (Borawski, Trapl, Lovegreen, Colabianchi, & Block, 2005; Carter, 2004; Dickson, Paul, Herbison, & Silva, 1998; Doniger, Adams, Utter, & Riley, 2001; Hauser, 2004; LeCroy & Milligan Associates, 2003; Manlove, Papillio, & Ikramullah, 2004; Mann, McIlhane, & Stine, 2000; Maynard et al., 2005; E. Smith, Dariotis, & Potter, 2003). This group of evaluators breaks into two distinct groups, a too-simple, but heuristically useful binary.

One group has assessed various AOUM programs and found evidence of pre- and post *attitudinal* shifts among preteens. These researchers find the data sufficiently compelling to declare AOUM programs “effective” in reducing or delaying sexual initiation (Borawski et al., 2005; Doniger et al., 2001; Mann et al., 2000). The youth in these studies tend to be young (4th through 9th grades), and in these evaluations the young people are asked about their *attitudes* and *intentions* to abstain from sex until marriage; these evaluators tend to find evidence of short-term effectiveness under these conditions. However, years of psychological research have demonstrated that attitudes are not good predictors of behavior (Aronson, 2004; LaPiere, 1934; Regan & Fazio, 1977; Wicker, 1969).³ In other words, even when a 10-year-old boy answers (or pledges) that he intends to remain abstinent until he is married, his own assessment of his intentions and attitudes is an unreliable indicator as to whether or not he will actually do what he says as he grows older and matures.

The second group (which shares the first group’s primary interest in reducing teen pregnancy rates and STDs, such as The National Campaign to Prevent Teen Pregnancy) has assessed AOUM programs for *behavioral* changes in teens, such as teen pregnancy rates or STD infection rates. These surveys tend to be administered over time, with older youth, focusing on attitudes and *behaviors*. These researchers tend to find no evidence that AOUM programs reduce teen pregnancy or STDs (Brückner & Bearman, 2005; DiCenso, Guyatt, Willan, & Griffith, 2002; Hauser, 2004; Kirby, 2002b; Manlove et al., 2004). In a meta-analytic review of 10 evaluation studies of Title V programs, Hauser (2004) joined Kirby (1997, 2002a, 2002b; Kirby et al., 1994) in concluding that abstinence-only programs showed little evidence of sustained impact on attitudes and intentions to remain abstinent. None of the 11 programs evaluated in Hauser’s meta-analysis demonstrated any evidence of long-term success in delaying sexual initiation among those who were exposed to the AOUM programs, nor was there any evidence that sexual risk-taking behaviors among participants were reduced.

These prior evaluations have provided a foundation of evidence—for both sides of the debate—on the impact of AOUM programming on adolescent sexual activity.

Faith and Policy

Despite the contentious empirical record, “abstinence works” is accepted simply as a matter of federal policy and faith. This epistemological position can be seen in a number of quotes that we collected from observing a public conference, sponsored by the DHHS, titled “Strengthening Abstinence Education Programs through Scientific Evaluation Conference” held in Baltimore in the fall of 2005. The conference was designed as a way of integrating evaluation research strategies into the abstinence movement.

At this conference, former domestic policy advisor Claude Allen took the stage and told the 500-person audience of researchers and abstinence program developers, “We need to continue to speak and tell the truth, lay out the facts. We’re here for science. *We already know the outcomes*” (C. Allen, personal communication, 2005). Later in the day, Wade Horn, assistant secretary for Children and Families at DHHS, delivered the keynote address and elaborated on what the government seeks in publicly funded abstinence science:

We don’t need research to prove that abstinence works, we need evidence for how it works. Anyone who has taken 8th or 9th grade biology knows that abstinence works. *We already know the end game*. Our critics insist that research is on their side . . . it’s not a question does abstinence work, but how to help young people make that choice. Evaluation is not a search for a new goal, but how to attain the goal. (Horn, personal communication, 2005)

These declarations by federal officials prompted us to consider the type of evaluation research that would be produced by an administration that was publicly declaring that they already knew the answer—that abstinence education “works.” We wondered about the processes involved in designing evaluation research from within this set of assumptions. What kind of data would be collected? What kinds of findings would be produced? These questions led us to examine the first federally funded abstinence education evaluation that was commissioned by the DHHS in 1998 (Devaney, Johnson, Maynard, & Trenholm, 2002; Maynard et al., 2005).

This brief history of the abstinence-only education movement—and some of the critiques it has faced—is offered as a background for understanding the highly contentious role that evaluators of AOUM programs step into. The role of science and evaluation, definitions of *program effectiveness* and *sexual health*, and how to evaluate a program’s impact are controversial and hotly debated issues in the hallways of governmental and advocacy organizations. The Mathematica evaluation sits at the politically charged intersection of national politics, conservative religious ideology, teen sexuality, and research science (see Sonfield, 2005). The Mathematica evaluation also occurs at a time when the increasingly political use of science has been documented throughout the Bush administration. We peer into this intimate space to assess how research is potentially affected by this closeness and proximity.

The Mathematica Evaluation

We turn now to the study done by Mathematica Policy Research Inc. as a way of examining the micropractices of evaluation commissioned within a policy environment where the answer is already assumed. Taking the study design, instrument, and initial findings as objects of study, we critically interrogated the survey at the item level to assess how information from young people was gathered. With the funding of this national, longitudinal study, many have hoped to discover more about the effectiveness of AOUM education, and a great deal of anticipation has developed around the findings of this study. However, in our analysis of this evaluation, we found a disturbing trend in how the data collection practices closely aligned with existing federal AOUM policies.

Study Design and Sampling

In 1998, Mathematica Policy Research, Inc., a highly reputable, nonpartisan research firm, was awarded nearly \$4 million by the DHHS to study the potential impacts of five school-based abstinence programs that had been funded through Title V over 4 consecutive years. The study is considered by many to be the most comprehensive and methodologically rigorous of the abstinence evaluations. In addition to assessing the underlying theories and the operational experiences of the abstinence education programs, Mathematica's interests were if the abstinence programs (a) changed the knowledge, attitudes, and intentions of youth; (b) reduced teen sexual activity; and (c) changed the risk of pregnancy and STDs among youth (Devaney et al., 2002, p. 5).

The study used a quasi-experimental design, meaning there was a program and control group and random assignment into each group. In all, there were four waves of data collection: baseline (Wave I); 6 to 12 months after enrollment (Wave II); 18 to 36 months after enrollment (Wave III); and 3 to 5 years after enrollment (Wave IV; "The Evaluation of Abstinence Education Programs," 2006). Mathematica's study has been of interest to both sides of the AOUM debate because its longitudinal data are expected to provide one of the first glimpses into understanding how adolescent sexual attitudes and outcomes might be affected by abstinence-only education, as well as how long those early changes are sustained.

In terms of experimental study design and sampling, the Mathematica study is as close to the "gold standard" research design as you can get. The study investigators used explicit criteria for comparison groups; created a professional, accessible, and transparent report of the findings; and crafted a carefully worded set of interpretations for the first-year assessments (Devaney et al., 2002; Maynard et al., 2005). In a press release about the 2005 "First Year Impacts" Report, Chris Trenholm, one of the study's principal investigators, noted that:

This study offers policymakers and the public the most solid empirical evidence to date on this important issue. By using scientifically rigorous evaluation methods, this report on first-year impacts offers highly credible estimates of the impacts of abstinence-only education on attitudes and perceptions that may be related to longer-term teen risk behaviors. (Mathematica, 2005)

A Closer Look at Method

In June 2005, Mathematica published the *First Year Impacts of Four Title V, Section 510 Abstinence Education Programs* report (Maynard et al., 2005), documenting the results of the first two waves of data collection (of the four waves assessed). *The First Year Impacts* report reviewed data on four of the five school-based abstinence education programs that were early recipients of Title V funds. In the four profiled programs, 2,310 youth (1,360 intervention group, 952 control group) were enrolled over three successive school years beginning in 1999–2000. Of note, nonparticipation rates ranged from 44% to 58% in the four profiled programs; when nonparticipation was taken into account, the sample size dropped to from 1,360 to 439 (Maynard et al., 2005, p. 50). The mean age at enrollment ranged from 10.3 to 13.3 years (representing largely fourth to eighth graders).

The *First Year Impacts* report focused on what the authors referred to as “intermediate outcomes,” which include “views on abstinence, teen sex, and marriage; peer influences and relations; self-concept, refusal skills, and parent communication; and expectations to abstain from sex” (Maynard et al., 2005, p. 4). Behavioral outcomes such as sexual activity, contraception, or pregnancy/abortion were not collected in Waves I and II. The reason these data were not collected in these first two waves was that the participants were not asked about sexual activities until they were in the seventh grade. In the final report, expected to be released in 2007, behavioral outcomes, including sexual activity and rates of abstinence, will be assessed and compared between the program and control groups. These behavioral outcomes, unfortunately, will have a shorter window in which they can be assessed, given that only two waves of data will include behavioral outcomes. In addition, it is important to note that in the last wave of data collection (3 to 5 years after enrollment), the mean age of respondents for approximately one half the sample will range 13.3 to 15.7 years.⁴ Although the longitudinal design of the Mathematica study design allows for the analysis of the sustainability of abstinence over 3 to 5 years—and it a tremendous improvement over other research that does not include a longitudinal component—the window of insight is still constricted given that the average age of intercourse in the United States is 17.4 (Feijoo, 2001). The study will not capture many of the youth’s perceptions and activities as they are becoming sexually active (or choosing to remain abstinent). It is important to note that the design does not allow for analysis of the role and impact of abstinence education at these transitional moments in young people’s lives.

Micropractices of Abstinence Evaluation

In our analysis, we focused on the Wave II data collection instrument (Mathematica Policy Research, 2000) to evaluate the strength of the data that were produced and analyzed in the reported findings. We view the survey instrument as a tool of evaluation and as a tool of instruction, insofar as the instrument was distributed to more than 2,000 youth (program and control groups) and read 4 years in a row by the sample being evaluated (Maynard et al., 2005, p. xxiv). We consider the survey items the mitochondria from which facts are built, public opinion is amassed, and federal policies are produced. Below, we offer five patterns in how survey items were worded and constructed, shedding skeptical light on the troubles of embedded science.

Ideological Binaries Are Repeated and Conflated

Throughout the survey, at the level of items and their interpretation, we found a pattern of repeated ideological binaries: (a) married versus unmarried sex and (b) safe versus dangerous sex. These comparisons were mostly made by linking *unmarried sexual activity with risk* and *married sex with safety*. Repeated with regularity throughout the evaluation instrument, these pairings come to be seen as natural couplings rather than as ideological interpretations.

For example, a full one third (28) of the 85 survey items explicitly link two ideas—unmarried sexual activity with risk and danger. To illustrate, participants were asked to agree or disagree with the following statement: “*It is likely that teens who have sexual intercourse before they are married will get pregnant*” (Maynard et al., 2005, p. 139). They were also asked to respond to the following statement: “*Does having sexual intercourse before marriage make it harder for someone to have a good marriage and a good family life in the future?*” (Maynard et al., 2005, p. 143). Evident in these two examples are slippages and connotations of unmarried sex (of all ages), risk, danger, and lifelong adverse consequences. These consequences, notice, are not just for teen sex but for “unmarried teens” in the first example and premarital sex (for all ages) in the second example. This slippage from teen to all ages is significant and highlights the theme as sex as dangerous for all unmarried people (Shorto, 2006).

In the current federal policy, heterosexual marriage is presumed to be the only “appropriate” and “safe” arrangement for sexual behavior.⁵ The press for marriage in AOUM curricula ignores the substantial evidence that all marriages, and young marriages in particular, can have high levels of divorce, poverty, STDs, unwanted pregnancies, and violence. Seiler (2002) found that marriage followed by divorce correlates with higher risks of poverty than never marrying at all and that those who marry younger are more likely to find themselves divorced. In fact, one half of young marriages (age 18 to 19 years) end in divorce within 15 years, compared to one third of marriages that end in divorce for women who marry after age 20

years. Young mothers who marry are far more likely to have a second child in a short period of time than those who do not, and teen women who marry and then divorce have worse economic outcomes than teen mothers who never marry (Seiler, 2002). Teen marriage significantly reduces the likelihood that a young woman, especially a young mother, will return to school. In fact in a study of African American teen mothers, 56.4% returned to school within 6 months of having a baby if they did not marry, but only 14.9% returned to school if they did marry (Seiler, 2002).

The ideological binary between premarital sex as inherently dangerous and marital sex as inherently safe is false, obviously heterosexist, and by holding up this binary as truth, these programs and our federal dollars are doing young people a serious disservice, in terms of their education, health, and economic outcomes.

Items Read in the Same Direction

When we analyzed the wording of the survey items, we found a surprising lack of variability in the direction of the items. Although the evaluators did include the simple, yet crucial, survey design element of reverse-scoring in some areas of the survey, in the section called “Views Unsupportive of Teen Sex,” they chose not to include any negatively worded items. The six items in this section all “read” in the same direction, meaning that if a respondent agrees with one of the six items, that respondent is likely to agree with all six. Although the practice of negatively wording items is considered controversial in psychometric circles (Benson & Hocevar, 1985), protecting against respondents simply acquiescing to proabstinence perspectives is an important factor to consider when designing research of this type (Barnette, 2000) and with this sample. In the Wave II survey, the inconsistent use of negatively worded items—reversing items in some sections and not others—alerts the reader to potential differences in how data will be collected in each of the survey sections.

There are also many items that we considered “teaching” items because they imparted information in the process of asking about a respondent’s own beliefs or attitudes. For instance, respondents were asked to agree or disagree with the following statement: “*It is likely that unmarried teens will get AIDS or other sexually transmitted diseases if they have sexual intercourse*” (Maynard et al., 2005, pp. 138-139). This item inquires about a respondent’s belief but also *teaches* a factually incorrect point about HIV transmission—that unmarried teens who have sex are more likely to get a STD than married teens who have sex. It also teaches that HIV (incorrectly referred to here as AIDS) and other STDs are a “likely” outcome of sex instead of something that can be actively prevented through condom use.

In our analysis, we found that many of these items that provided “educational” information throughout the survey were drawn directly from various AOUM curricula and were specifically worded in the proabstinence direction. For example, the researchers did not include any negatively worded items that evaluated attitudes

about abstinence. There are no items that read, for example, “*Teens who engage in sexual intercourse and use a condom have a decreased chance of getting AIDS or a sexually transmitted disease.*” Unfortunately, this lack of variability in the survey items leaves little independence or ability to reveal something new about young people’s understandings of their sexual health, condom use, or STDs. Achieving sexual health becomes aligned with avoiding STDs and is defined completely as an absence—an absence of sex, illness, and infection. Sexual health is collapsed into the mere avoidance of sexual injury, and with this collapse we lose the ability to examine young people’s more nuanced understandings of how they see the process of managing and protecting their own and others’ bodies.

No Room Left for Disagreement

A third move of the survey instrument concerns how the survey asks respondents to adopt a specific position as a respondent *vis-à-vis* abstinence, in other words how the “correct answer” is communicated through language and tone to the survey respondents. In a caricature of what are typically called “demand characteristics,” preteen respondents (in Wave I and II) were told in the survey instructions to assume the position of an abstinence advocate.⁶ In some sections, girls were required to adopt the position of a determined sex resistor. For example, in the section on “Refusal Skills,” participants are told to assume the position of someone who wants to abstain—“*Imagine you had been going out with someone you really liked and this person decided he wanted to have sexual intercourse with you, but you didn’t want to have sexual intercourse . . . What would you do?*” (Maynard et al., 2005, p. 142). The choices may seem innocuous on their own—“talk to your boyfriend about [your] decision not to have sexual intercourse,” “avoid getting into a situations that might lead to sexual intercourse,” and “say ‘NO’ to sexual intercourse”—but they speak to a larger trend within the abstinence education movement—and within the evaluation instrument—to consistently situate girls as passive heterosexual beings who are responsible for controlling (uncontrollable) male sexuality.

The inscription of heterosexual gender stereotypes in which girls are asked the degree to which they are willing and able to fend off the advances of boys, is meant to, on the one hand, gather data about how young girls see themselves as able to “protect” themselves. On the other hand, this assumption within the items also reinscribes young women’s heterosexuality, passivity, and disinterest in sex as assumed, unquestioned, and moral. The evaluation instrument does this by continually positioning the respondent as a girl who knows the right answer, which is always “No.” There are no gender-specific questions that ask boys to imagine themselves as pressured to have sex, nor are there questions that assess the rate at which boys feel the right to pressure girls to have sex. For girls, there are no questions that assess their desire to have sex, nor assessments of their wanting or resisting sex with another girl.

Narrow Feedback Loops

At the “Strengthening Abstinence Education Programs through Scientific Evaluation” in 2005, we had the opportunity to ask one of the principal investigators from Mathematica about the obvious “demand characteristics” of the survey. He responded, “Yes, the items are ‘demanding’ or loaded in one direction. We had to weigh scientific validity with community interests.” When pressed for detail on which community he consulted, he explained: “The abstinence community” (C. Trenholm, personal communication, November 3, 2005). In the evaluators’ “Interim Report” released in early 2002 (Devaney et al., 2002) the authors explained that adolescent sexual attitudes were adequately assessed through using items that were generated in previous studies of abstinence:

[Q]uestions on youth attitudes about sexual activity draw heavily on questions used in prior studies of abstinence education programs, such as Values and Choices (Olsen et al. 1991), Teen Aid (Weed et al. 1998), Responsible Social Values Program (Adamek 1993), Best Friends (Best Friends Foundation 1997), and Sex Respect (Weed and Olsen, no date). (Devaney et al., 2002, p. 36)

It is important to note that these “previous studies” of abstinence were generated from *within* the abstinence community. These previous studies were not interested in traditional measures of validity or reliability, nor were they interested (or required) to include critical perspectives in their research. Organizations such as Best Friends deliver a specific religiously informed message; this is within their explicit organizational mission. Mathematica’s job, however, was to look beyond the religious and political ideology to assess the effectiveness of the abstinence programming. This is not possible when the items meant to assess abstinence attitudes have been narrowly developed and tested. The presence of a too-narrow feedback loop between the abstinence “community” and its evaluation becomes increasingly clear. The report—at least using the data from Waves I and II—seems designed to *prove* state policy rather than *evaluate* it; lubricating with science the abstinence message so it can slip gently into popular discourse.

Missing Data

We found a number of omissions in the survey that could have yielded important information about young people’s lives and the contexts in which they engage in sexual activities, including the contexts of unprotected sex, masturbation, LGBT sexual behavior, when condoms are put on, pleasure, desire, sexual violence and coercion, and why young people want to engage in these behaviors or not. Perhaps most troubling, this well-funded research leaves us with little information about how to support healthy sexual development, intervene when sexual violence occurs, or how to respond to the vast and varied educational and health needs of

youth. There is a stunning silence on sex as a practice of pleasure, choice, power, agency, and on marital sex as potentially risky. By defining all unmarried sexual activity as inherently risky and therefore injurious, this research runs the risk of draining sex of its potential to be pleasurable and powerful for women and men of all ages and sexualities. Education that instructs young people to be only afraid of sex and silent about their own desires reduces their ability to make choices about, opt out of, and control their own sexual and reproductive lives.

Through this analysis, we found a trend in the items included in the Wave II instrument of the Mathematica study (Mathematica Policy Research, 2000). The evaluation features practices of “embedded science,” which (like embedded journalism) is designed to legitimate but not interrogate existing policy. It accomplishes this through constructing ideological binaries; limiting researchers and survey respondents to a single position, in the case of AOUM, as advocates for AOUM; thereby omitting evidence concerning the collateral effects of the AOUM policy; and circulating information through a narrow feedback loop of constituents and gatekeepers who are, today, disproportionately from the Religious Right.

Present Federal AOUM Evaluation Efforts

There is additional evidence that federal research has been co-opted as a means to legitimate instead of evaluate. In ongoing studies that have been funded by the U.S. Office of Population Affairs (OPA), there has been a move to collect systematic evaluation data through the use of a standardized survey tool. The OPA has constructed a short instrument that is used by all grantees funded by the Office of Adolescent Pregnancy Programs (OAPP). Although this instrument (and how it will be used in national policy-making efforts) deserves a separate analysis of its own, we look briefly here at the 11 items (including subitems) in the survey that ask about “having sex” (Adolescent Family Life [AFL], n.d., pp. 12-13). Overall, the 11 items ask participants from programs across the country, ranging in age from 5 to 18 years, to reflect and agree or disagree with whether they for example, “*admire teens who remain abstinent*” or if they think that, “*having sex as a teenager makes it harder for someone to study and stay in school in the future*” (AFL, pp. 12-13).

Evident in these items, and in the federal research priorities, is a consistent pattern—namely, the use of variables such as admiration of abstinent peers as the means to evaluate the effectiveness of abstinence education.⁷ These “soft markers” do not provide data on actual behavioral outcomes (e.g., “are you sexually active?”) or data on health outcomes. These items, designed by OAPP staff and distributed nationwide to federal grant recipients, provide data on whether young people feel admiration for those who abstain, not whether they themselves actually abstain.⁸ This decision at the federal level to emphasize attitudinal data and ignore behavioral data speaks to a much larger trend within the AOUM federal policy agenda.

When President Clinton signed the Personal Responsibility and Work Opportunity Reconciliation Act into law in 1996, AOUM programs funded under this act were expected to show demonstrable behavioral outcomes, such as a reduction in STDs and pregnancies among adolescents (Government Reform Minority Office, 2006). By 2001, the Bush administration and the DHHS stepped away from using behavioral and health outcomes as a way of judging a program's effectiveness and replaced these with the requirement that a program demonstrate that they "create an environment within communities that supports teen decisions to postpone sexual activity until marriage" (DHHS, 2006). As of 2006, programs needed only to demonstrate that they had increased the proportion of participants "who indicate understanding of the social, psychological, and health gains to be realized by abstaining from premarital sexual activity" (DHHS, cited in Government Reform Minority Office, 2006). In sum, behavioral changes need not be measured to be considered a successful AOUM program. This shift is important as it marks a distinct lack of accountability for education and health behaviors on the part of federally funded AOUM programs.

We hasten to add that the OAPP (as part of the DHHS) has a history of supporting research that examines adolescent sexual health with an inquisitive and critical lens, such as the National Longitudinal Study of Adolescent Health (Add Health). However, this same broad and inquisitive approach has not been present in exploring the complexity of abstinence-only education. In the case of AOUM, research and curricula development have been limited to lessons that teach young people that sex must only occur within marriage, between a man and a woman, and with no information regarding how to manage the pleasure or reproduction that occurs as a result.

An Argument for Critical Science

People across the political divides are anxious to discover which strategies and interventions will help adolescents develop optimal sexual health. Where they disagree, however, is on state policies as intervention strategies. Most parents and educators believe that young people should be well educated about sexuality and contraception in schools and communities (National Public Radio, Kaiser Family Foundation, & Harvard University, 2004). Nevertheless a small, but powerful and well-funded, advocacy group sees statistics on teen pregnancy, abortions, and STDs as evidence that sexual activity is inherently dangerous for young people and must be stopped. This latter group believes that sexual health can only be found in adult, married, heterosexual relations. Over the past 25 years, the influence of this group has gained substantial policy ascendance in the AOUM movement. The question remains, then, how best to understand the complex phenomenon of adolescent sexual development, namely the behaviors and attitudes teens develop as they mature into adulthood.

Below, we outline several suggestions for the future of adolescent sexual health research. These are not meant to be exhaustive but rather a beginning for those

looking to pursue the very real and important questions that concern people on all sides of the political spectrum—how young people can grow up to be sexually healthy adults.

Create a Critical Science of Adolescent Sexualities

We argue for a critical sexuality science—one that suspends the “givens” of adolescent sexualities. Our personal interests lie in methods for understanding sexual subjectivities and desire: how young women and men experience, name, voice, and act on sexual desire. We situate desire in theory, politics, and bodies, theoretically framed as “thick desire” (see Fine & McClelland, 2006) and believe that young women and men embody sexual subjectivities situated in larger yearnings for a life of economic, intellectual, and civic possibilities. These include freedom from violence, the right to healthy sexual and reproductive development in a State that cares for the needs of its most alienated men, women, and children (see Fine & McClelland, 2007, for further discussion of how the State could support the reproductive health of young women in particular). To understand “thick desire” and a critical sexuality project, we ally ourselves with sexuality researchers who dare to interrogate that which is outside the already assumed (Diamond, 2000, 2005, 2006a, 2006b; Horne & Zimmer-Gembeck, 2006; O’Sullivan, Meyer-Bahlburg, & McKeague, 2006; Thompson, 1990; Tolman, 1994, 2002, 2006; Tolman, Striepe, & Harmon, 2003). Below we offer a few examples of research and suggest that critical sexuality studies can be undertaken to learn more about adolescents’ sexualities. We believe that research in this area must trouble the normative, fracture the ideologically constructed consensus, and complicate what we think about “abstinence,” as well as “sex,” “marriage,” and “health.”

Complicate Research Terms

This discussion highlights the importance of unpacking words and definitions as an integral part of any critical research endeavor. For example, terms that are commonly used by researchers may be inadequate to capture the complexity of people’s behaviors and events in their lives. Looking more carefully at the terms used in abstinence research is, therefore, an essential first step in creating a critical science of adolescent sexualities.

Researchers including Haignere (Haignere, Gold, & McDanel, 1999) and Pinkerton (2001) have launched a line of research that moves past simply treating abstinence as a dichotomous variable (where one is either abstinent or sexually active). Haignere et al. (1999) reviewed the research on the user failure rates of abstinence, asking about the rates for those who attempt to be abstinent but

fail (Pinkerton, 2001). In assessing various studies she found that much like condom failure rates there is a difference between “perfect” use and “actual” use of the abstinence ideal. For condom failure rates, this entails collecting information on the rates at which condoms break, are not used correctly, or consistently. Using this as a model, Haignere et al. found that abstinence had a user failure rate between 26% and 86%. This rate is higher than the condom user failure rate, which is between 12% and 70%.

This move to complicate what being abstinent means is important because it brings new clarity to the process of abstinence negotiation and its ongoing maintenance. It removes ideological assumptions about abstinence and asks policy makers and researchers to assess the *process* of abstaining, a decidedly more complex phenomenon that does not simply divide adolescents into those who abstain and those who do not.

Like abstinence, the term *virgin* is complex and deserves researchers’ attention. Both contain personal and public significance and though seemingly both are yes/no variables, they are full of far more gray than black or white. *Virginity* and *abstinence* connote the absence of sex, but in what form? Heterosexual intercourse is the standard benchmark for defining virginity status, but this clearly leaves other forms of sexual activity (including oral and anal) unspoken. It also erases all same-sex sexual interactions. Many youth are being missed by current survey instruments that only consider adolescents who have had heterosexual intercourse, or only dividing them by whether they have had intercourse (Remez, 2000). The sexual lives of young people cannot be captured using these simple binary categories.

Furthermore, the typically used construct of *sexual debut*—a term suggesting freedom, agency, and choice—needs to be complicated to document the prevalence and contexts of coerced sex, especially for preadolescent and adolescent samples. Without good data in this area, findings such as the high prevalence of sexual intercourse for young people will remain undifferentiated between those who “chose” to engage in sexual activity and those who were coerced or forced (Oswald & Russell, 2006; Schaffner, 2004). Along these same lines, more nuanced understandings of the continuum between chosen and forced sex must be theorized by researchers looking to more carefully understand the complex rationales behind the reasons young women and men are sexually active.

Finally, a more comprehensive definition of *safe sex* would allow researchers to collect data on what contexts and environments young people do and do not feel safe—physically, sexually, and emotionally. Data on the processes that are involved in maintaining one’s sexual health, including negotiation with dating or sexual partners, managing medical and reproductive health services, and how information that is learned in a classroom setting is then psychologically managed within an individual would provide a wealth of useful information about the sexual lives of young people.

Study Sexualities Over Time

Research on adolescent sexualities—including but not limited to their behaviors, attitudes, and desires—must be designed to account for the changes that occur over any sexual life history. Simply taking a one-time snapshot of adolescent behaviors is bound to hide important information about physical changes, relational influences, peer pressures, maturity, puberty-related changes, just to name a few.

One example in which change over time revealed important data was in a study designed to assess the sustainability and long-term health consequences of AOUM programming. Bearman and Brückner (2001) undertook a systematic investigation of “virginity pledges” to assess the sustainability of these pledges and the consequences of pledging over time (Brückner & Bearman, 2005). At the first point of data collection, the researchers found that pledgers, compared to nonpledgers, typically deferred age of first heterosexual intercourse an average of 18 months (Bearman & Brückner, 2001). However, in subsequent data collection, Brückner and Bearman (2005) found that 88% of the middle and high school students who previously pledged to abstain had premarital sex anyway. In the second round of data collection, those who originally “pledged” were 30% less likely to use contraception when they did become sexually active. As measured with urine samples, pledgers had same rate of STDs as their nonpledging peers but were less likely to use condoms and less likely to seek medical testing and treatment. Pledgers were also more likely to be involved in oral and anal sex than nonpledgers (6 times more for oral and 4 times more for anal; Brückner & Bearman, 2005).

A second example of sexual development over time can be found in Lisa Diamond’s work (Diamond, 2003, 2006c). Using her 10-year longitudinal study with women who engage in same-sex sexuality, Diamond tracked four waves of data and examined changes in women’s sexual attitudes, identity, partners, and behaviors. If she had only examined the data collected in the first wave, she argues she would have simply identified her sample as lesbian and bisexual. Over time, however, these identities proved to be far more dynamic and over the 10 years of Diamond’s study proved to be far more fluid than previous theories would have allowed for. This process of identity development proves an invaluable model of sexual research that can more adequately conceptualize the process of sexual development and change over time (see also Rosario, Schrimshaw, Hunter, & Braun, 2006).

Investigate Sexual Desire as a Potential Moderator of Sexual Health

A number of feminist scholars have taken up the questions of sexual desire, sexual subjectivities, and sexual agency for young women. These researchers have argued that young people can learn to be healthy sexual adults through sex education that teaches them about positive sexual expressions and positive interpersonal relationships. Researchers in the forefront of this movement include Sharon

Thompson (1990), Tricia Rose (2003), and Deborah Tolman (1994, 2002, 2006). In particular, Tolman and her colleagues' argument has been that the sexual health of young women would be aided and supported by educating them in choosing sexual experiences based on their own experience of sexual desire instead of a male partner's (Tolman et al., 2003). They have been joined by other researchers in the field of adolescent sexual health in more fully theorizing how the construct of an adolescent, and in particular female, sexual self-concept can play a part in bringing sexual agency and sexual self-esteem to the forefront of research on adolescent sexual-choice making (Horne & Zimmer-Gembeck, 2006; O'Sullivan et al., 2006; Thompson, 1990).

In a recent study, Horne and Zimmer-Gembeck (2006) found that girls in their sample who reported "noncoital orgasmic responsiveness" (usually through masturbation) also reported feeling more entitled to sexual pleasure, reported less self-silencing in relationships, and reflected more on their sexual experiences compared to their nonorgasmic counterparts. It is important to note that these researchers have drawn a causal line between sexual self-efficacy and sexual health in a way that points our attention away from equating sex with danger for all unmarried people. This model redirects our gaze to evaluating how we can better support young people's sense of sexual agency as a means to help them evolve into sexually healthy adults.

The examples of critical science described above demonstrate that researchers have numerous ways of collecting and analyzing data to inform public policy concerning the sexual health of adolescents. The choices researchers make concerning their theoretical framework, their research design, variables that are included, how impact is assessed, and for whom all coalesce to fundamentally affect research outcomes in important and too often underanalyzed ways.

Conclusion

Today, in the United States, there is an emerging question about the relationship between politics and science, one that requires critical social scientists to take a more complex position than ever before. Our concern throughout this analysis has been that the AOUM movement seeks to not only situate AOUM curricula firmly inside public schools and community- and faith-based organizations but also to generate a scientific data base of its own that legitimates (instead of evaluates) this strategy. We took up the examination of the Mathematica study as a means to assess the interrelationships between the federal policies and the evaluation that originated from within the same set of policies and monies. This interrelationship creates what we refer to as "embedded science"—science that overdetermines the types of information that can be gathered and understood over the course of research.

Through our examination of the only comprehensive federally funded evaluation of AOUM education to date, we identified four characteristics of embedded science. We found that when evaluations are overly embedded, they tend to (a)

be dominated by political ideologies and binaries, (b) limit the potential for disagreement, (c) omit crucial information, and (d) reinforce existing policies and practices rather than critically investigating new ones.

One important outcome of embedded research is the narrow window of vision that results in researchers, and thereby the public. With this well-funded research campaign, a new “common sense” (Dimitriadis, this issue) of adolescent sexuality is being produced, even as the relatively underdocumented consequences for health, education, and sexual freedom indicate vast and uneven damage of this campaign (Fine & McClelland, 2006, 2007). Without good science, we are not able to see or investigate a broad range of collateral consequences for youth. Without the examination of unintended consequences, interventions are not adequately understood and the impacts of abstinence-only education are not sufficiently assessed.

We fear that Arsneault (2001) was correct when she characterized abstinence-only education policies as fundamentally “morality policies” (see also Fields, 2005; Mooney & Lee, 1995, 1999)—policies designed to shape the personal values of young people, *not* to reduce pregnancy or STD rates. We see startling parallels between this characterization and the federal sponsorship of attitudinal outcomes that have been allowed to stand in as proxies for “effective” abstinence programs. At the heart of this legislative focus on personal values lies a *symbolic*, rather than *instrumental*, interest in the sexual health of adolescents (Arsneault, 2001). Symbolic interest translates into research that examines beliefs, expectancies, and attitudes. As a research endeavor, symbolic interests turn away from assessing changed behaviors, lowered pregnancy rates, and fewer STDs. A significant problem arises when the ideologies of morality policies become located within research: Symbolic change (attitudinal) is misinterpreted—by policy makers and the public—as if it were instrumental (behavioral) change. The power of embedded AOUM science to persuade lies in its ability to erase this slippage from health outcomes to symbolic ones. Symbolic interventions, such as abstinence-only education, can be declared “successful” as soon as attitudinal shifts are measured. However, this victory speech is fundamentally misleading. It appropriates the language of science, research, and health—discourses that are traditionally associated with instrumental changes—and uses them to support ideological and symbolic successes in the field of adolescent sexual health.

Although this symbolic framework may be the intention behind the federal abstinence education policy, it must not be imported into evaluation research. Evident in the Wave II instrument (Mathematica Policy Research, 2000) is a political embeddedness that requires a complex analysis of motives, funding, politics, and science—and an attentiveness to how symbolic attention within morality policies leaks from the policy level into the science of abstinence. There is now, unfortunately, perfect alignment between federal support and the research endeavor.

We use the term *embedded science* to describe this phenomenon; however, we recognize the history of the term *embedded*, specifically how it has been used to

describe research for those engaged in critical inquiry. Across the disciplines of psychology, anthropology, and sociology, the term *embedded* has been used to describe a scientific paradigm that recognizes how scientists are formed and influenced by the worlds from which they emerge (Marcus, 1995; Marcus & Fisher, 1986). For example, in his essay “Ethnography In/Of the World System,” anthropologist George Marcus (1995) used the term to describe ethnographic research that was “embedding itself within the context of an historic and contemporary world system of capitalist political economy” (pp. 95-96). In this model, a researcher embeds oneself purposefully and self-consciously within historic, economic, and political contexts as a way of observing phenomenon. Similarly, the term *embedded* has been used to describe the quality of the observed situation as always embedded in larger social and cultural frameworks (e.g., Foucault, 1976/1990). We use the term in a slightly different way. Embedding oneself in these previous models has been a way of specifying that which surrounds an idea, a person, or a culture; it is a means to know *more* about a subject, not less.

We use the term *embedded* here to describe one more level up: as a way to describe how the political and epistemological context for the scientific endeavor—in this case, the federal funding of abstinence research—is embedded in political frameworks that demand that data conform to already existing assumptions and how these ideologies “drip feed” into research method. In the case of the Mathematica evaluation, the assumption that “abstinence works” leaks all over the survey, into the research findings and, ultimately, into the public policies and common sense that dictate how young people are educated.

We are not calling for a separation between science and politics. Both of us have been involved in litigation, legislation, and community organizing in which critical social science has played a pivotal role in garnering support for racial desegregation, gender integration of public schools, waivers from parental consent for young women seeking abortions, inadequate funding for urban schools, and college for women in prison.⁹ However, we are arguing against embedded science. When empirical inquiry is undertaken merely to justify already existing policies, to sell abstinence domestically (as well as abroad), we lose an essential aspect of science in the public interest. We lose the doubt, the uncertainty, the destabilized “given,” the urgency of science that can be used for justice and public education about how best to eat, breathe, have sex (or not), and live.

We want science to remain porous, critical, and even falsifiable in the old, contested, Popperian (Popper, 1945) sense—in its many forms and performances (Aronowitz & Ausch, 2003). That is, we call for a critical science to rupture false consensus. Critical science has the capacity to identify collateral damage, to identify fault lines of difference and power, to trouble binaries, to challenge existing policies—regardless of the administration. Critical science must help us to sustain democratic, noisy, and contentious public debate about what is and what must be.

Epilogue

Since this article was written, Mathematica Policy Research, Inc. released its final evaluation report, *Impacts of Four Title V, Section 510 Abstinence Education Programs* in April 2007 (Trenholm et al., 2007). The report describes the final phase of the Mathematica study and reports on the longitudinal findings that demonstrated that “the [abstinence education] programs had no effect on the sexual abstinence of youth” and that the young people who received the abstinence-only education reported having had sex at the same rates, having similar numbers of sexual partners, and initiating sex at the same age as those in the control group (Mathematica, 2007). Many on “both sides of the aisle” have agreed that these findings provide reliable and valid data on the ineffectiveness of abstinence-only education.

After the report’s release, there was a flurry of news reports (Beil, 2007; Sessions Step, 2007), op-ed pieces (Huber, 2007; Kay, 2007; Robb, 2007), and public commentary on the subject of abstinence-only education and the role of public funding. Because the 2007 report demonstrated that the federally funded programs did not delay sexual activity (Trenholm et al., 2007, p. xviii), did not increase abstinence rates (Trenholm et al., 2007, p. xvii), and did not change rates of condom use (Trenholm et al., 2007, p. 34), many critics have called for the funds to these programs to be cut (Medina, 2007; W. Smith, 2007) and for greater oversight of the programs on the part of the U.S. government (U.S. Government Accountability Office, 2006).

Regardless of the study’s findings, and the timely significance of research which demonstrates the inadequacies of abstinence-only policies, we write this essay with epistemological cautions about research projects that are cast in embedded contexts. We fear that while this type of research may indeed demonstrate the inadequacy of current policies, it is unlikely to expand political imaginations to consider radical (and potentially more effective) alternatives.

Notes

1. In October 2006, New Jersey became the fourth state after Maine, California, and Pennsylvania to reject Title V federal funding for abstinence-only programs. In 2006, New Mexico also restricted Title V money to programs that serve children in the sixth grade and below (Sexuality Information and Education Council of the U.S. [SIECUS], 2006). Even when states turn down Title V money, however, they often do accept abstinence money through the other two funding streams—Community Based Abstinence Education (CBAE) and Adolescent Family Life (AFL).

2. “Sex education programs that promote the use of contraceptives are not eligible for funding under this announcement” (U.S. Department of Health and Human Services, 2006, p. 1). See SIECUS (2005) for description of federal abstinence-only-until-marriage (AOUM) funding streams.

3. Research into the subject of metacognition, or what we know about what we know, has received a lot of attention over the years by psychologists (see, e.g., Metcalfe & Shimamura, 1994; Nelson, 1992). Research on people’s abilities to predict their own

behaviors has consistently shown that “attitudes will be unrelated or only slightly related to overt behaviors” (Wicker, cited in Aronson, 2004, p. 127).

4. The two samples in question come from the Teens in Control program and the Families United to Prevent Teen Pregnancy (FUPTP) program. The mean age of the young people when they enrolled in the Mathematica study 10.7 and 10.3 years, respectively. Together, these two programs accounted for 54% ($n = 1,353$) of the sample at baseline (Maynard et al., 2005). By Wave IV, the mean age of the portion of the sample will be only 15.7 years.

5. “The [FY 2006] Budget proposes to direct \$240 million in mandatory funds to new efforts to support healthy marriages and responsible fatherhood. Of this amount, \$100 million, plus dollar for dollar matching contributions from States, would fund competitive grants for States, territories, and tribal organizations to develop innovative approaches to promote healthy marriages. The Budget includes \$100 million for research, demonstration projects, and technical assistance, primarily focusing on family formation and healthy marriage activities. To support these programs, funds would be redirected from the Temporary Assistance for Needy Families High Performance Bonus (\$100 million) and the Illegitimacy Reduction Bonus (\$100 million). In addition, the 2006 Budget provides \$10 million in discretionary funds to increase support of community-based maternity group homes, where young, pregnant, and parenting women can receive access to faith- and community-based coordinated services” (U.S. Office of Management and Budget, 2006).

6. Due to the age range of the sample, the majority of respondents who were asked to “imagine [they] had been going out with someone . . . and this person decided he wanted to have sexual intercourse with [them]” were pre-teens in Waves I and II.

7. “The overarching goal of AFL (Adolescent Family Life) Prevention demonstration projects is to promote premarital abstinence for adolescents. To that end, instilling and/or maintaining positive attitudes toward abstinence is an essential measure of an intervention’s effectiveness” (*Adolescent Family Life*, n.d., p. 32).

8. “Fifty-eight abstinence education grantees are funded by the Office of Adolescent Pregnancy Programs (OAPP). These demonstration projects are part of the Adolescent Family Life (AFL) program and were awarded to public and private community agencies to promote abstinence as defined by the Welfare Reform legislation (P.L. 104–193) for up to 5 years . . . Most of these projects are focusing on reaching students between the ages of 9 and 14 in a variety of settings, including public schools, community settings and family households” (Office of Adolescent Pregnancy Programs, 2006).

9. To illustrate just one example from this list, the first author (McClelland) prepared and summarized various examples of social science research for a brief of amici curiae on behalf of National Coalition Against Domestic Violence in support of respondents Planned Parenthood of Northern New England in the 2005 U.S. Supreme Court case *Ayotte v. Planned Parenthood of Northern New England*.

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