

B. SPECIFIC AIMS

A key developmental task of adolescence is to establish a stable identity. This period is characterized by experimentation and social role-taking during the transition from childhood to adulthood. As indicated by troublingly high rates of youth participation in risky behaviors such as alcohol consumption, smoking, and use of marijuana and other illicit drugs, substance use appears to be central to the identity-building enterprise for most U.S. youth. The most recent round (2009) of the nationally representative Monitoring the Future study (MTF), which surveys high school youths every year about substance use, indicated that: 1) 20% of grade 12 youths smoked cigarettes regularly, and over 20% of grade 8 youths have tried cigarette smoking; 2) almost three quarters (72%) of youths have consumed alcohol by grade 12, with 37% having done so by grade 8; and 3) almost 40% of grade 12 and 15% of grade 8 youths used illicit drugs in the prior year (Johnston et al. 2009).

A large body of empirical research in public policy and economics over the past few decades reports that trends in these outcomes are driven, in part, by state policies toward alcohol, tobacco, and other drugs such as excise taxes, age restrictions, and penalties and sanctions. Our project focuses on the effects of state health education curriculum requirements pertaining to instruction about alcohol, tobacco, and other drugs (ATOD) in US schools. Although previously unstudied, these policies have been adopted and/or strengthened by nearly every state in the past two decades. They generally require or recommend that health education courses include instruction on the effects of ATOD on youths. A common argument in support of these policies is that educating youths about the dangers of alcohol, tobacco, and other drugs would reduce substance use and misuse more effectively than harsher policies such as minimum purchase ages or tougher sanctions on use and possession. But several randomized ATOD interventions for youths – some of which have been school-based – have produced mixed results about their short and long term effectiveness. In fact, some studies find perverse effects of youth-targeted interventions (Dishion et al. 1999; Dodge et al. 2006).

Our conceptual approach to understanding the conditions under which ATOD policies might be expected to have positive or negative effects on youth is based on a developmental view of behavioral interventions. Interconnections among biological age, life course stage, individual capacity, and contextual factors (e.g., Bronfenbrenner 1998; Elder 1994, 1995) combine to produce a variety of hypotheses about *how*, *when*, and *for whom* these programs may have positive, null and even adverse effects. We test these hypotheses by exploiting the substantial variation in the timing of adoption of ATOD requirements across states; this will allow us to control for unobserved fixed-differences across states and common national trends through the inclusion of state and year fixed effects, respectively, into all of our difference-in-differences models. We will examine several outcomes relevant to youth substance use, including whether the ATOD laws significantly changed classroom instruction of ATOD topics (described below in our preliminary studies) and whether the ATOD laws affected youth substance use. We will compile multiple datasets on school and classroom environments, as well as multiple datasets on substance use to increase confidence in our findings. Our specific aims include:

Aim 1: Create and maintain a comprehensive database that tracks the implementation of the school health education curriculum standards, including those pertaining to alcohol, tobacco, and other drugs, in each US state since 1976. Make this dataset publicly available for future researchers.

Aim 2: Evaluate the effects of state regulations of curricular standards for health education pertaining to alcohol, tobacco, and other drugs (ATOD) on the actual delivery and instructional content of those topics using data from the 2000 and 2006 School Health Programs and Policies Survey (SHPPS) and the 1994-2008 School Health Profiles Survey (Profiles) and a fixed-effects empirical approach.

Aim 3. Evaluate the effects of ATOD education requirements on youth substance use using data from the 1991-2007 Youth Risk Behavior Surveys (YRBS), the 1976-2008 Monitoring the Future (MTF) study, and the 1997-2007 National Longitudinal Study of Youth (NLSY97) study and a fixed-effects empirical approach.

Aim 4. Describe the differential effects of ATOD education requirements related to age/grade, person/policy, and stage/environment fit using individual characteristics related to age, grade, gender, race, peers, psychological characteristics, and family background (depending on the dataset).

Aim 5. Within the broader context of our PO1 Network, synthesize the main findings from Aims 1-4 to identify key elements of successful ATOD interventions with the goal of designing future intervention studies.

These proposed analyses will extend our preliminary studies in important ways and further our knowledge about how public policy toward ATOD education affects health education and several youth risk behaviors.

C. RESEARCH STRATEGY

C.1 Significance

Substance use among youths is disturbingly prevalent in the United States. While very large literatures examine the correlates of these youth risk behaviors, less research considers the public policy determinants of these outcomes. Moreover, extant research has generally not focused on health education curriculum standards, which is surprising given that nearly all states require youths to take health education prior to high school graduation. Although there is some experimental evidence on the effectiveness of alcohol and drug education interventions on substance use, most of this evaluation research has not found beneficial effects on youth substance use or has found the interventions may actually increase youth substance use. Our project will examine whether, how, and to what extent alcohol, tobacco, and other drug (ATOD) education requirements have meaningful effects on youth substance use outcomes by focusing on an important intermediate channel (classroom instruction) and by using a developmental perspective that takes into account the importance of the person/environment/policy fit.

C.1.a Institutional Details: State Level School Policies

Our project will focus on analyzing the effects of state curriculum requirements pertaining to alcohol, tobacco, and other drug (ATOD) education in health education classrooms, while at the same time controlling for state activity pertaining to health education content requirements in other areas (e.g., nutrition and sex education) as well as state level policies pertaining to academic curricula (e.g., school accountability reforms and subject-specific content requirements). Here we describe each of the policies of interest.

C.1.a.1 State health education requirements pertaining to alcohol, tobacco, and other drugs. Our primary focus will be to evaluate the effects of state curriculum requirements pertaining to alcohol, tobacco, and other drug (ATOD) education. No research has previously evaluated these policies. The National Association of State Boards of Education (NASBE), which tracks these policies, lists the actual content in each state's requirement as well as the timing of policy adoption (www.nasbe.org). Because our main empirical approaches will control for unobserved time invariant differences within states, variation in the timing of policy adoption is critical to meaningfully identify effects of ATOD requirements. Indeed, this variation is plentiful: 8 states adopted ATOD requirements in 1991 or before (CA, CO, MD, NJ, OR, RI, VT, VA); 1 state in 1992 (SC); 1 state in 1994 (LA); 2 states in 1995 (CT, WV); 4 states in 1997 (ME, NM, TX, WI); 4 states in 1999 (AK, MA, MT, PA); 3 states in 2000 (MS, NV, SD); 3 states in 2001 (IA, MO, OH); 5 states in 2002 (FL, ID, OK, UT, WA); 3 states in 2003 (AL, NH, NC); 2 states in 2004 (MI, NY); 4 states in 2005 (AR, DE, HI, IN); 3 states in 2006 (IL, KY, NE); and 1 state in 2007 (TN).

The state ATOD requirements we will study generally specify that the effects of alcohol, tobacco, and other drugs on aspects of youth development must be addressed in health education classrooms. For example, Connecticut's 1995 policy states that "the knowledge, skills, and attitudes required to understand and avoid the effects of alcohol [and tobacco and other drugs] shall be taught every academic year to pupils in all grades in the public schools." Arizona's 2002 law permits (but does not require) instruction on the harmful effects of alcohol, tobacco, and other drugs in grades 4-12. Iowa's 2001 policy requires elementary and middle school students to receive instruction on the effects of alcohol on the human body, while high school students must receive instruction on substance use and misuse.

As illustrated by these examples, there is a great deal of variation along several dimensions in the actual content of the ATOD requirements in addition to the variation associated with differential timing of policy adoption. First, some states require that ATOD education be included in health classes, while other states simply recommend or permit such instruction. Second, there is variation in the specificity of ATOD topics that must be covered; for example, some states explicitly require education on the effects of ATOD on specific health or social outcomes, while the language in other state rules is far more vague and general. An important goal of our first aim will be to contact state education departments for examples of the actual curriculum standards pertaining to ATOD so that we can examine whether different types of curricular approaches are more or less effective at reducing youth substance use. We revisit this issue below in our hypotheses.

Finally, and importantly for many of our hypotheses (described below), there is a great deal of variation across states in which grades must include the ATOD instruction. Most states (27) specify that all youths in grades K-12 must be taught about ATOD (AL, CA, CT, DE, GA, HI, IN, ME, MD, MS, MO, NE, NH, NJ, NM, NC, OK, OR, PA, RI, SD, TX, UT, VA, WA, WV, WY). Three states require such instruction only for high school students (FL, IA, TN), and two states have rules that apply only to grades 4-12 (AZ, KY). Five states have

different rules (AR: grades 5-8; IL: grades 6-12; LA: grades 1-6; MT: grades 4, 8, and 12; NV: grades 3, 5, and 8-12; and SC: grades K-9), and the remainder do not specify which grades must receive ATOD instruction. As a result, the age at which students are exposed to ATOD requirements varies considerably across states. We will combine this with the policy timing variation to assess program efficacy across age and developmental stage.

C.1.a.2 State health education requirements in other areas. In addition to studying the ATOD curriculum requirements, it will be important to account for other state level education policies that may be correlated with adoption of ATOD regulations and may have independent effects on the outcomes we study (ATOD instruction and substance use). State health education curriculum requirements pertaining to other topics are likely suspects, as they were adopted over this same general time period, sometimes explicitly in tandem with ATOD requirements. We will therefore use similar information from NASBE to control for health education requirements pertaining to: physical education, nutrition, sex education, HIV prevention, injury prevention, and violence and injury prevention. We will also obtain information on state anti-bullying policies – laws adopted by over 30 states since 1995 that generally require schools within a state to adopt programs to address bullying – by consulting various sources such as www.bullypolice.org. While not addressing health education content directly, these laws are likely to affect school safety environments. To our knowledge, none of these policies has been comprehensively examined in the way we propose.

C.1.a.3 State policies pertaining to academic content. We will also account for the potentially confounding effects of state academic content standards and school accountability systems. The health policy requirements that are the primary focus of our analyses were designed and implemented in the context of a larger effort that began in the early 1980s and accelerated school reform with the 2001 *No Child Left Behind Act*. While health education curricular standards policies may only be weakly enforced, school accountability policies provide direct incentives for schools to meet state academic standards. High stakes academic standards are relevant for youth substance use because these standards may crowd out instructional time for health education, undermining the effects of ATOD health education standards. These academic curriculum policies could negatively affect youth substance use through simple incapacitation effects (Jacob & Lefgren 2003), or by changing students' future employment opportunities, expectations, and stress levels. Alternatively, stronger academic curriculum requirements may backfire if they increase at-risk student exposure to deviant peer groups, for example by aggregating deviant youths (Dishion et al. 1999; Dodge et al. 2006).

C.1.b Theoretical Perspectives: Why Should School Policies Matter for Youth Risk Outcomes?

The literature on school and non-school-based substance use interventions for youth is replete with null and modest effects, most notably demonstrated in the many evaluations of the popular Drug Abuse Resistance Education (D.A.R.E) program (e.g., Lynan et al. 1999; Sherman et al. 1997). Some interventions do worse than nothing; in a meta-analytic review of interventions for adolescents, Lipsey (1992) finds that almost 1/3 worsen the problem they intended to address (originally cited in Dishion et al. 1999). Though the average effect of many intervention programs may be quite modest, they are also likely to be heterogeneous and dependent on a variety of individual and contextual characteristics. The success or failure of an intervention program often depends on the degree of fit between the program and important facets of adolescent development. For example, adolescence is characterized by a transition from parent-centeredness to a greater orientation toward peer evaluations. This process, essential for healthy development and individuation, can also create problems. Interventions that congregate delinquent peers, for example, worsen outcomes because they subject vulnerable youth to problematic peers at precisely the developmental stage when peers matter most (Brown 1990; Dodge et al. 2006; Haynie & Osgood 2005). Other research suggests differences in the effects of ATOD programs across school, demographic, and psychological characteristics.

Person-Policy Fit and Hypotheses: A developmental view of behavioral interventions is first and foremost cognizant of age and life course stage. Adolescence is distinguished by rapid brain and biological development, multiple transitions (from elementary school to junior high and high school), and significant social and familial stressors. The interconnections among biological age, life course stage, individual capacity, and contextual factors (e.g., Bronfenbrenner 1998; Elder 1994, 1995) lead to hypotheses about the average effect of ATOD intervention as well as *how, when, and for whom* these programs may have the largest impact.

C.1.b.1 Biological age, grade level, and individual capacity. Recent research in developmental neuroscience is particularly relevant for an analysis of ATOD interventions. Steinberg (2004; 2007) argues that while cognitive capacity is largely developed by age 15, psychological capacities mature well into adulthood. Research supporting the gap between the cognitive and psychosocial capacities of youth is sufficiently well established that it provided the basis for the U.S. Supreme Court to overturn the juvenile death penalty in 2005

(Roper v. Simmons). By virtue of adolescence, youthful offenders cannot be subject to the death penalty because they lack the ability to fully appreciate the consequences of their actions. Interventions that seek to alter adolescent behavior purely by increasing knowledge will be less successful because ignorance is not often the problem. Rather, low self-control, an inability to resist peer pressure, and a tendency towards thrill seeking drives many adolescent behaviors such as substance use (Tarter et al. 2003; see also Gottfredson & Hirschi 1990). The gap between cognitive and psychosocial capacities is largest during the transition from elementary to middle school, a time of significant risk of substance abuse onset. Thus, we hypothesize:

Hypothesis 1: Youth with higher levels of self-control will more likely respond to ATOD curricula, holding cognitive capacity constant.

Hypothesis 2: ATOD curricula will be least successful during the middle school years because of the gap between cognitive and psychosocial capacities.

C.1.b.2 School level factors. An additional implication of the gap between cognitive and psychosocial capacities during adolescence is that “changing the contexts in which risky behavior occurs may be more successful than changing the way adolescents think about risk” (Steinberg 2007: 55). This view also conforms to the large research literature on school level factors that mediate individual characteristics and substance use. In a meta-analysis of school effects and substance use interventions, Fletcher and colleagues find that interventions that promote attachment to school are most successful (Fletcher et al. 2008; see also Henry & Slater 2007; Kumar et al. 2002). Gottfredson (1997; 2001) also suggests that school level factors such as attachment, overall level of substance use (Kumar et al. 2002), and measures of school disorder have moderate to strong effects on substance use. Schools with high rates of substance use are unlikely to counteract this contextual influence with curricula changes. Thus, we hypothesize:

Hypothesis 3: ATOD curricula will be more successful in schools with lower rates of substance use and greater than average levels of school attachment.

School characteristics are also likely to interact with socioeconomic status (SES) and race. Socioeconomic status (SES) is inconsistently related to substance use in adolescents and it is unclear whether SES or family structure drives observed relationships. Research suggests, however, that race and socioeconomic disadvantage combine with school factors to produce smaller than expected ATOD effects (Clinton-Sherrod et al. 2005). Although the rate of substance use is higher for whites relative to other ethnic minorities (Bachman et al. 1991), the average disadvantaged minority youth is likely to attend a very different school than the average disadvantaged white youth. Race remains a salient social characteristic and strongly influences residential location, neighborhood characteristics, school context, and the likelihood of living in poverty. Whether ATOD curricula impacts vary by SES and race/ethnicity also depends on the nature of the curriculum and its fit with the developmental needs of different groups. Project I argues that the compensatory nature of most early childhood programs fit the developmental needs of poor and minority preschoolers much better than the needs of children enjoying the richer learning opportunities often provided by more advantaged families, leading to expectations of larger program impacts for disadvantaged children. In contrast, ATOD curricula standard are often broadly-defined, targeted toward the average child and, perhaps formulated to avoid offending parents. As a result, while whites may have higher overall rates of substance use, poor and ethnic minority youth may benefit less from ATOD interventions because the curriculum will not match the needs of students in schools and neighborhoods with more disorder and poverty (Duncan & Brooks-Gunn 1997; Sampson et al. 2008; Sampson et al. 2005). Thus, we hypothesize:

Hypothesis 4: Disadvantaged and ethnic minority youth will benefit less from ATOD curricula.

C.1.b.3 Peer influences. A central feature of adolescence is that parents give way to peers as the most salient influence (Brown 1990). Moreover, especially during adolescence, delinquency and substance use often occurs in groups, (van Mastricht & Farrington 2009; Haynie & Osgood 2005). Peer influences are also the most widely studied unintended consequence of adolescent behavioral interventions (Dodge et al. 2006). Interventions that congregate deviant peers or introduce youth at risk for substance abuse to those who already use are likely to fail. Among youth with deviant peers, interventions are unlikely to overcome the more salient influence of peer appraisals. Thus, we hypothesize:

Hypothesis 5: ATOD interventions will be most successful among youth with no or few deviant peers.

C.1.b.4 Gender. A substantial literature has investigated differences in substance use by gender, race, and family characteristics. Boys exhibit higher rates of substance use relative to girls, though the gender gap in substance use is smaller in adolescence than in adulthood and delinquency rates are growing among girls.

Explanations for the gender gap in substance use (and delinquency more generally) are continually debated. Some criminologists have called for gender-specific theories of substance use while others argue that boys and girls are differentially exposed to opportunities for substance use. There is support for both perspectives. Girls tend to be more highly monitored by their parents, which may reduce opportunities for substance use. Other research reports gender interactions with SES and family characteristics (Hagan et al. 1987), peer influences (Mears et al. 1998), and biological development (Haynie 2003). For example, girls tend to be more influenced by appeals to morality and school attachment, and this strategy protects them from deleterious peer influences (Mears et al. 1998). Though the mechanisms are unclear and substance use rates for girls are relatively low, previous evaluations suggest that girls may be more amenable to intervention (Gottfredson 1997; but see Fletcher et al. 2008). Thus, we hypothesize:

Hypothesis 6: ATOD interventions will be more successful for girls than boys.

C.1.b.5 Curriculum features. We anticipate large differences in the effects of ATOD programs across states. As a long line of educational policy research makes clear, adopting curricular standards and implementing them are two very different things (Cohen & Spillane 1992). Policies related to ATOD education cannot influence student behavior if they are not implemented in schools. It seems likely, therefore, that programs that have a strong first-order effect on health education will have stronger effects on student behavior. Furthermore, the design of ATOD curricula may influence effectiveness. States with more specific guidelines and those that mandate more intense and long-lasting interventions are likely to have larger ATOD effects. We also expect the curricula effects to be conditional upon program and delivery characteristics. Adolescents are not amenable to “scared straight” programs or interventions that rely solely on knowledge dissemination (Steinberg 2007; Sherman et al. 1997). Promising programs promote school attachment, create small schools within schools to facilitate prosocial peer groups (Gottfredson 1990), and employ cognitive behavioral, rather than educational, interventions (Sherman et al. 1997). Thus, we hypothesize:

Hypothesis 7: ATOD curricula will be more effective in contexts in which they are fully implemented.

Hypothesis 8: ATOD curricula will be more effective in states that mandate intense interventions and continue programs through vulnerable developmental stages (for example, the transition from elementary school to middle school or middle school to high school).

Hypothesis 9: ATOD curricula that rely solely on knowledge dissemination will be less successful than those that incorporate other teaching strategies.

Hypothesis 10: ATOD curricula that rely on fear-based or “scared straight” tactics will be especially unsuccessful.

C.1.c Relevant Literature on the Policy Determinants of Youth Substance Use

We know of no previous research that has directly evaluated the statewide ATOD policies. There is, however, a large body of research on the policy environment toward youth substance use more generally. There is also evidence on the effectiveness of other, smaller-scale ATOD interventions for youths – some of which have been school-based. In this section we briefly review what is known from economics, sociology, and criminology in these areas. To conserve space, we do not review the developmental psychology literature here, as it is covered extensively in the hypotheses above.

C.1.c.1 Economics. Although economists have not evaluated ATOD requirements on youth substance use, a great deal of empirical work in economics has evaluated the effects of other public policies on youth substance use. Studies of youth alcohol use have employed quasi-experimental approaches to show, for example, that stricter drinking ages reduce youth alcohol consumption (Dee 1999, Cook & Moore 2001, Carpenter & Dobkin 2009, and others). State excise taxes on beer, wine, and spirits have also been studied extensively by economists, with some research finding that higher taxes reduce consumption (Cook & Moore 2001, Carpenter et al. 2007, and others), while others find no effect of taxes on youth drinking or youth highway fatalities (a common proxy for heavy drinking) (Dee 1999 and others). Age-targeted drunk driving laws adopted by all states over the 1990s have also been studied extensively, with most studies showing that they reduced heavy episodic drinking by youths (Carpenter 2004, Carpenter et al. 2007, and others). The policy determinants of youth cigarette smoking have similarly received a great deal of attention from economists. Excise taxes on cigarettes have been the most studied – and perhaps the most controversial – as some research has found that taxes significantly reduce youth smoking participation (Carpenter & Cook 2008, Lillard et al. 2010, and others), while other research has failed to find such a relationship (DeCicca et al. 2004 and others). State anti-tobacco program spending has also been shown to reduce youth smoking (Farrelly et al. 2003). Finally, in

contrast to smoking and drinking, youth consumption of other drugs has received less attention regarding the role of public policy. Existing research generally focuses on marijuana, which according to several surveys is the most prevalent drug used among youths other than alcohol and tobacco. Since marijuana is mostly illegal in the United States, the extent of regulations is naturally limited. Economists have mainly studied the relationship between local marijuana prices and reported use of marijuana by youths, with most finding a strong negative price/consumption relationship (Grossman 2004, Pacula et al. 2001, and others).

C.1.c.2 Sociology and criminology. Significant overlap between developmental psychology and life course/sociological criminology exists. Both fields emphasize the potential for beneficial *and* iatrogenic effects of interventions (see e.g., Wakefield & Uggen 2010; Uggen & Wakefield 2005 for examples regarding the unintended consequences of criminal punishment), the importance of psychological capacities (Moffitt 1993; Gottfredson & Hirschi 1990; Sherman et al. 1997), and an emphasis on variation in developmental trajectories from adolescence to adulthood (e.g., Mortimer et al. 2008; Sampson & Laub 1993). The major contribution of sociologists and criminologists to the literature on substance abuse is a concern for the social context in which interventions occur. The influence of peers and social context on substance abuse is among the strongest and most consistent relationships in criminology (Briar & Piliavin 1965; Felson et al. 1994; Gottfredson & Hirshi 1990; Reed & Wilcox Rountree 1997). While scholars argue about the mechanisms through which peers influence one another (Reed & Wilcox Rountree 1997) or whether parents or attitudes can mediate this process (Brown et al. 1993; Matsueda & Heimer 1997), any intervention that does not pay attention to contextual effects is likely to fail. In addition, sociologists tend to view adolescent substance abuse as, in part, normative youthful experimentation. Interventions, therefore, that unduly stigmatize youth or do not account for already existing deviant peer networks may have the unintended consequence of solidifying the very behaviors they hope to extinguish (e.g., Becker 1963; Goode & Ben-Neguda 1994; Wakefield & Uggen 2010). While there is an extensive literature on variation across schools in delinquency and substance use (e.g., Felson et al. 1994; Gottfredson & Gottfredson 1985) and evaluations of small-scale in-school or after-school programs like D.A.R.E (Sherman et al. 1997), we know of no studies that evaluate the effects of direct instruction and curricula within schools on substance use. Our analyses of ATOD interventions will add a developmentally-informed analysis of ATOD curricula interventions as well as contribute to the wider literature in sociology, criminology, and psychology on social context and adolescent substance use.

C.1.d Summary: Significance

Our proposed research is significant for several reasons. First, it is timely. Almost every state has adopted or changed health curriculum requirements regarding ATOD over the past two decades, but little research has directly evaluated their effects on youth risk behaviors.

Second, our research will increase our understanding of the ATOD education requirements. Rates of youth substance abuse are high throughout the US, and school health policies may be an effective approach for addressing this persistent social problem. However, it is not at all obvious that state policies related to ATOD education should be expected to improve youth outcomes. Since standards must influence instruction in order to influence youth behavior, our analyses begin by investigating the extent to which changes in ATOD standards actually influence the delivery of health education. We will then estimate these policies' effects on youth risk behaviors. These analyses may be particularly useful for future policy-makers, since some policies or combinations of policies may be more effective than others. For example, curricular standards that require instruction about substance use may have perverse consequences for youth who would have otherwise not been introduced to the substances save for the required instruction. Similarly, academic curricular standards may crowd healthy activities out of the school day.

Finally, this research may change our understanding of the effects of *other* more commonly studied policies on youth outcomes. For example, if increases in state curricular standards regarding tobacco use are correlated with increases in state tobacco taxes (as is likely), then failure to control for the effects of the state health standards will bias the estimated effects of tobacco taxes (in this case, likely in an upward direction).

C.2 Innovation

Several aspects of our proposed research are innovative. First, the database of ATOD education requirements does not currently exist, so compiling these and other policies is innovative. Second, our analyses of these data are also innovative in that: 1) we will examine intervening mechanisms through teacher reports of ATOD instruction; and 2) we will examine multiple, independent datasets on both teacher outcomes and youth self-reported substance use to corroborate key findings. Finally, the combination of human development theory

with gold standard econometric evaluation methods is an innovative strength of our proposal (and of the broader PO1 as well).

C.3 Approach

C.3.a Aim 1: Create and Maintain a Comprehensive Policy Database

The first aim of our research is to create and maintain a comprehensive database covering our main policies of interest – curriculum requirements for alcohol, tobacco, and other drug education. In addition to coding the presence of these laws, we will also attempt to collect current curriculum standards for additional detail regarding which specific content areas must be covered as well as insight into the different types of approaches that are recommended by each state in order to more formally test stage/policy fit (e.g., fear-based approaches versus knowledge dissemination approaches). Other dimensions on which we will code the policies include: specific grades covered by the requirements and whether the policy requires or simply permits ATOD instruction. We will also collect, code, and maintain a database of other relevant state education policies pertaining to non-ATOD domains such as physical activity and nutrition, injury and violence prevention, sex education, and HIV prevention. NASBE tracks all of these domains. We will also examine state policies pertaining to school safety environments as measured by state anti-bullying laws. Finally, we will code and maintain a database pertaining to various state academic policies adopted over this time period, including: state accountability reforms, graduation requirements, and curriculum requirements pertaining to academic subjects. We will create this database in the first year of the project, and we will maintain and update the database twice throughout the project period. We will also make the database available in excel format, along with a pdf codebook describing the sources and our decision rules for coding choices, for other researchers beginning in year 2 of the project by posting it on the network's website. We will use the Robert Wood Johnson Foundation funded ImpacTeen state policy database for tobacco control—a highly used and successful example of a state policy tracking effort—as our model.

C.3.b Aim 2: Evaluate the Effects of ATOD Regulations on Actual Delivery of Content

The second aim of our research is to evaluate the effects of state regulations for ATOD education on actual delivery and instructional content. For both Aims 2 and 3, an obvious concern with the raw associations between these state policies and teacher and youth outcomes is that unobserved characteristics about parents, teachers, and youths living in states with more restrictive state policies (e.g., unobserved risk preference or health spending) may contribute both to school and youth outcomes as well as to policy adoption. Moreover, many other changes to the policy environment for youth risk behaviors over our time period could introduce bias: for example, excise taxes on cigarettes increased substantially since 1990, tougher drunk driving laws for youths were adopted by all states in the 1990s, and school accountability reforms were widely expanded over this same period. In each of these cases, the association between ATOD requirements and teacher and youth outcomes is likely to be biased. The standard approach in economics and policy evaluation to deal with these potential omitted variables is to use variation in the timing of adoption of the sets of policies in state- and year-level fixed effects models of youth outcomes. To the extent that the unobserved factors contributing both to outcomes and to policy adoption are time invariant within a state, the two-way fixed effects models will remove this bias. Moreover, direct controls for other related policies and programs (e.g., taxes, drunk driving laws, school accountability reforms etc.) can further reduce the omitted variables bias problem. In these difference-in-differences (DD) models the key identifying assumption is that there were no other unobserved shocks to outcomes coincident with adoption of the ATOD requirements that affected teacher and youth risk outcomes. The fact that there is substantial variation in each of the sets of policies over our time period is important, since the differential timing of policy adoption across states drives our identification strategy.

To estimate the effect of the various public policies on outcomes we will estimate DD models that identify the effects of the ATOD curriculum requirements using variation across states in the timing of adoption and in the grades of youths targeted by the various policies. We begin with DD models of the form:

$$(1) Y_{ist} = \beta_0 + \beta_1 X_{ist} + \beta_2 (\text{State ATOD Curriculum Requirements})_{st} + \beta_3 Z_{st} + \beta_4 S_s + \beta_5 T_t + \varepsilon_{ist}$$

where Y_{ist} are the various outcomes pertaining to actual instruction and delivery of health education content reported by teacher or principal i in state s in year t . X_{ist} is a vector of individual level demographic characteristics that varies across the datasets depending on who is being surveyed but generally includes the respondent's age, race, ethnicity, and education. State ATOD Curriculum Requirements will be operationalized in a variety of ways, but in the baseline specifications will be an indicator variable that turns on when a state has any ATOD education requirement in place as recorded by NASBE (described above). Z_{st} is a vector of time-

varying state characteristics and related policies that may have independently affected youth risk outcomes, including: the state unemployment rate, fraction black, fraction of households below the federal poverty line, excise taxes on cigarettes and alcohol, age-targeted drunk driving laws, and graduated driver licensing policies with an intermediate phase. We will also experiment with controlling for past prices and taxes for cigarettes and alcohol to model and test for the possibly addictive nature of these substances (Gruber & Koszegi 2001). Importantly, Z_{st} also controls for other state curriculum requirements affecting different health education topics since adoption of tougher health education rules may occur in tandem with ATOD requirements. These other domains include curriculum requirements pertaining to: injury and violence prevention, physical activity and nutrition, sex education, and HIV prevention. We will also include in Z_{st} academic curriculum policies adopted over this period, including state accountability reforms and subject-based academic content requirements. Finally, we will include in Z_{st} relevant prices (as proxied by state cigarette and/or alcohol excise taxes) and other state level policies (such as youth access restrictions, state anti-tobacco spending, marijuana decriminalization statutes, and other policies that have been studied in previous research). S_s is a vector of state fixed effects, while T_t is a vector of year fixed effects. The state policy variables vary at the state and year level, and β_2 is the main coefficient of interest. In the presence of the S , T , and Z vectors, these coefficients identify the effects of the ATOD laws on outcomes using the staggered timing of policy changes across states. ϵ_{ist} is assumed to be a well behaved error term, and throughout we will cluster standard errors at the state level (Bertrand, Duflo, & Mullainathan 2004).

To test Aim 2 we will use two datasets on teacher and principal reports. First, we will use the School Health Policies and Programs Study (SHPPS), which is a national survey periodically conducted to assess school health policies and practices at the state, district, school, and classroom levels that asks teachers and school administrators a variety of questions about the school health environment and the health education curriculum. It is administered as part of the Centers for Disease Control and Prevention's (CDC) Healthy Youth program. It was fielded in 2000 and 2006, and state identifiers are publicly available. For our purposes, the classroom survey is particularly relevant, as it has asked health education teachers questions about whether specific topics are covered in the curriculum. These topics include: alcohol and other drugs (e.g., long vs. short term consequences of substance use, BAC/alcohol equivalents, peer pressure surrounding substance use, legal penalties for violating substance use rules, etc.); violence and injury prevention (e.g., prevalence of violence, strategies for preventing violence and injuries, etc.); sexual activity (e.g., abstinence, condom use, sexually transmitted infections, etc.); nutrition and exercise (e.g., healthy eating, importance of physical activity, etc.); and other health topics. These data also cover different grade levels, which will be useful for the state policies that pertain to some grades but not others. Using the SHPPS data and the DD models we will examine at the association between state health curriculum policies and coverage of specific topics as reported by health teachers.

Second, we will use the School Health Profiles Survey (Profiles), a biennial survey administered by the CDC of school principals and lead health teachers regarding their health education policies and academic content related to various health education topics, including alcohol, tobacco, and other drugs. Although the data are not publicly available, researchers can obtain confidential versions from individual states by signing a restricted data agreement with the CDC Division of Adolescent Health. (This is the same office at CDC that coordinates release of the confidential YRBSS data, described below. Carpenter has an ongoing data agreement with the CDC Division of Adolescent health for use of the area-identified national, state, and local YRBSS data, so obtaining the Profiles data should be straightforward.) Not all states are sampled for the purpose of producing representative data; we will restrict attention to the over 30 states that do produce data explicitly designed to be representative of schools within the state. The Profiles questionnaire includes items that are very similar to those in SHPPS (described above) with respect to coverage of specific health education topics, as well as limited information on teacher experience and teacher training. This analysis will allow us to verify the preliminary results we have obtained through the publicly available SHPPS data. The longer time series and more frequent periodicity of the Profiles data (every other year since 1994) relative to SHPPS should provide us increased power to identify the effects of ATOD requirements on classroom instruction.

C.3.b.1 Preliminary evidence on Aim 2. Below, we present preliminary evidence that the basic approach has viability using the publicly available 2000 and 2006 School Health Policies and Programs Study (SHPPS). Specifically, we have coded preliminary data from high school health education teachers using the classroom surveys from the 2000 and 2006 SHPPS data. Table 1 shows coefficients on the State ATOD Curriculum Requirements (i.e., β_2) from a modified version of equation (1) with controls only for the presence of any ATOD

requirements and state and year fixed effects. In the presence of these state and year fixed effects and given the timing of the surveys (2000 and 2006), these coefficients of interest are identified from the fact that 17 states adopted ATOD requirements from 2000 to 2006 (using the associated changes in the other states as controls).

The results from Table 1 suggest that state ATOD education requirements significantly increased the probability that high school teachers covered various ATOD topics, and these relationships are particularly strong for the case of tobacco and other drugs. For example, the estimate in row 2 suggests that statewide ATOD requirements were associated with an 18.3 percentage point increase in the probability that a high school teacher reports that she taught about tobacco in her health education classroom. Similarly, in results not reported (to conserve space) we found that statewide ATOD requirements significantly increased the number of classroom hours on tobacco instruction by 1.5 hours. The coefficients for teaching about alcohol and other drugs are positive but not statistically significant in these preliminary specifications (e.g., row 1), though several questions about specific topics related to alcohol and drug use do suggest significant increases in classroom instruction associated with ATOD requirements (such as teaching about the benefits from abstaining from alcohol in row 6 and the short and long term effects of drug use in rows 7 and 8, respectively). For the cigarette smoking topics in rows 10-12, these models reveal very consistent evidence that statewide ATOD education requirements significantly increased instruction of specific topics related to the short and long term effects of smoking, as well as (in results not reported) the influences of family and media in cigarette smoking.

Table 1: SHPPS Preliminary Sample Estimates of the Effects of ATOD Curriculum Requirements on Instruction of ATOD Content in High School Health Education Classrooms (N=590); Models with state and year fixed effects; *, **, and * indicate significance at 10%, 5%, and 1% level, respectively.**

	<u>Outcome: Did you teach about:</u>	<u>ATOD Coefficient</u>	<u>Std. error</u>
1	...alcohol/other drugs	0.0941	(0.0724)
2	...tobacco	0.1829	(0.0785)**
3	...blood alcohol content rules	0.0952	(0.0783)
4	...short term effects of alcohol	0.1009	(0.0698)
5	...long term effects of alcohol	0.1050	(0.0732)
6	...benefits of abstaining from alcohol	0.1552	(0.0745)**
7	...short term effects of drug use	0.1310	(0.0750)*
8	...long term effects of drug use	0.1579	(0.0741)**
9	...benefits of abstaining from drugs	0.1936	(0.0766)**
10	...short term effects of cigarettes	0.2140	(0.0736)***
11	...long term effects of cigarettes	0.1936	(0.0782)**
12	...benefits of abstaining from cigarettes	0.2136	(0.0778)***

Moreover, the point estimates are very large, generally suggesting increases on the order of 10-20 percentage points in the probability a teacher reported teaching various tobacco-related topics; first stage estimates of this magnitude imply that our outcome data (which contain several hundred thousand observations on youths when pooled across waves, depending on the dataset) are well-suited for identifying effects on youth substance use if they exist. These patterns therefore provide strongly suggestive evidence that the

basic approach of using the staggered timing of adoption of ATOD education requirements provides informative and plausibly exogenous variation for identifying the effects of ATOD instruction on youth substance use outcomes.

It is important to stress that these results in Table 1 above – while demonstrating project feasibility – are very preliminary. We have not, for example, differentiated between ATOD policies that require instruction versus simply recommend or permit such instruction. We have also not yet completed the coding of the other health education curriculum requirements or the state academic policies, and it is plausible that these could be correlated with adoption of ATOD requirements, thus imparting bias to the ATOD coefficients presented above. Future models will also need to control for other aspects of the public policy environment toward youth substance use; it is possible, for example, that tougher age-targeted drunk driving laws or graduated driver licensing programs adopted by states over this time period increased instruction of topics related to, say, knowledge of blood alcohol content (BAC) requirements or the legal sanctions associated with substance use. Our completed models will include these additional controls as well as investigate the sensitivity of our preliminary findings to alternative decision rules about the timing of effects. The current models assume that individuals (teachers and youths) respond immediately to the statewide ATOD requirements. We can relax this assumption by tracing out the time path of effects, particularly in datasets with more frequent periodicity. There are also additional statistical concerns that we must address. Teacher reporting bias, for example, may

be correlated with ATOD education requirements even in fixed-effects models (e.g., stricter policies may induce teachers to say they covered certain topics even if they did not); thus, it will be important to corroborate our findings on the first stage relationship using the independently drawn data from the Profiles data. Also, we will need to carefully examine important issues regarding missing data, measurement source bias, and violation of assumptions. We will carefully address each of these, for example by examining whether missingness is systematically related with ATOD education requirements and by testing for robustness to alternative methods for dealing with missing data (e.g., multiple imputation). We will also carefully assess the sensitivity of our estimates to different choices about the structure of error terms.

C.3.c Aim 3: Evaluate the Effects of ATOD Policies on Youth Substance Use

After completing the first stage analysis described in Aims 1 and 2 for the ATOD education requirements, in Aim 3 we will identify the effects of these statewide requirements on youth substance use. We will use three datasets that allow us to create comparable measures of recent (past month) consumption of alcohol, tobacco, and marijuana. First, we will use data from the 1991-2009 Youth Risk Behavior Survey (YRBS), which has interviewed high school age youths in schools every other spring since 1991. The YRBS, which has a response rate over 60%, includes questions about past month alcohol, tobacco, and marijuana use in every wave. The individual level data also contain demographic characteristics such as student age, gender, race/ethnicity, and self-reported academic performance. State identifiers are available through a confidential data agreement with the CDC. While the national YRBS was designed to be nationally representative, there are additional state and local versions of the YRBS, some of which were explicitly designed to be representative of the sampled state or locality. We will use the area-identified national, state, and local YRBS in DD and DDD models to isolate the independent effects of the statewide ATOD education policies on the youth substance use outcomes measured in the survey. Carpenter has previously used these data for studies of the policy determinants of youth smoking (Carpenter & Cook 2008), seatbelt use (Carpenter & Stehr 2008), and bicycle helmet use (Carpenter & Stehr 2010). Carpenter and Cook (2008) also show that state policy analyses of cigarette taxes yield qualitatively and quantitatively similar results whether one uses the full YRBSS sample or restrict attention to the surveys that were designed to be representative at the state level.

Second, we will use data from the 1976-2009 Monitoring the Future (MTF) study, a repeated cross sectional school-based survey of youth risk behaviors fielded annually in the spring by the Institute for Social Research (ISR) at the University of Michigan. These paper and pencil surveys have asked about 15,000 high school seniors each year about whether and how extensively they used marijuana, tobacco, and alcohol in the past 30 days and over the youth's lifetime in every year since 1976. Grade 8 and grade 10 samples were added in 1991. Response rates are above 80%. The individual level data also contain demographic characteristics such as student age, gender, race/ethnicity, and parental education. These data were designed to be nationally representative, and state identifiers are generally not available. Carpenter has an ongoing working relationship with the program directors at MTF, however, and has used confidential versions of these data with geographic identifiers on-site at ISR for previous projects (Carpenter et al. 2007). Patrick O'Malley, one of the MTF study co-investigators, has agreed to collaborate with us on this project and has agreed to make state identifiers available (see the accompanying letter of support). He has also agreed to allow us access to an anonymized school identifier, which we will use to test hypotheses about exposure to deviant peers.

Finally, we will use data from the National Longitudinal Survey of Youth 1997 (NLSY97). NLSY97 provides longitudinal data from a nationally representative sample of 9,000 youths who were age 12-16 as of December 31, 1996. These youths were re-interviewed annually; the most recent data are from the 2007 follow-up when the original cohort is aged 22-26. Response rates in the NLSY97 are over 90%. NLSY97 contains numerous risk behaviors pertaining to substance use, including alcohol, tobacco, and other drug use and have successfully been used in other contexts to study the effects of public policies (see, for example, Lillard et al. 2010). These data also contain detailed information on family background characteristics of the youth respondents, which may be important determinants of substance use. Confidential geographic identifiers are available through a data agreement with the Bureau of Labor Statistics.

Several strengths and weaknesses should be noted about our datasets. Each of the datasets is strong in providing multiple objective measures of substance use by youths, as well as standard demographic characteristics. The NLSY97 is the only one of the three that is a true panel dataset; MTF and YRBS are repeated cross-sections. The NLSY97 is also much deeper in terms of child and family characteristics relative to either the YRBS or MTF which include very limited information on family background. One drawback of NLSY97 involves its focus on a narrow age range of students. In contrast, the YRBS and MTF data cover youths

in grades 9-12 and 8/10/12, respectively, each year for a longer time period. In fact, a key advantage of the MTF grade 12 surveys is that we will have data back to 1976, such that we will have strong information on pre-existing trends in outcomes for isolating the effects of ATOD education requirements. As noted above, the MTF is also the only one of the three datasets that measures deviant peer influences (through the use of the school identifier). Like our independently drawn survey datasets on teacher and principal outcomes for Aim 2, the true collective advantage of the datasets is that they complement each other well and, taken together, should provide a comprehensive picture of the true effects of ATOD policies on outcomes. Finally, we note that the timing of the datasets for the first stage relationships (SHPPS, Profiles) does not exactly correspond to our outcome data for youths. We will make the reasonable assumption that the effects of ATOD education requirements on classroom instruction are constant over time, such that we can extrapolate the first stage estimates from Aim 2 to the entire sample periods in our outcome data so as to maximize the statistical precision from the youth samples, which are generally larger, longer, and more frequent than either of our datasets for the first stage relationship.

The empirical approach for Aim 3 follows that of Aim 2, except the respondents are youths instead of teachers or principals. Thus, we will continue to estimate equation (1), but we will replace the outcomes with measures of substance use as reported by youths. We will scale the average reduced form effects using the MTF, YRBSS, and NLSY97 by the first stage estimates from Aim 2 to obtain the implied instrumental variables estimates of the effects of ATOD instruction on the various measures of youth substance use. We will also augment the basic specification in equation (1) in several ways to examine robustness. First, we will investigate the sensitivity of the coefficient of interest, β_2 , to controls for smooth state-specific linear and/or quadratic time trends (i.e., we will interact each state indicator with a variable TREND that equals 1 in the first year of the data, 2 in the second year of the data, and so forth). These models will identify the effects of the ATOD requirements from sharp deviations from smooth pre-existing trends in state-specific youth outcomes and are a common way to account for unobserved confounding factors that are unique to a state and that change smoothly through time (Friedberg 1996). Second, we will estimate models that restrict attention to states that adopted new ATOD education requirements over the period of each outcome dataset to ensure that any results we find are not spuriously driven by offsetting behavior of the control youths in the same years as the requirements were strengthened.

Third, we will augment equation (1) by adding “lead” terms for each state ATOD policy change. Controlling for one and two year leads of the policies will help us test for policy endogeneity, since ATOD policies cannot have true effects on youth substance use outcomes *before* the policies are actually implemented. If we found that controlling for leads of the ATOD policies rendered β_2 small and statistically indistinguishable from zero, this would suggest that sharp state-specific changes in youth outcomes led to adoption of tougher ATOD education requirements instead of the other way around. We will also perform a related robustness test which estimates a dynamic specification that explicitly traces out the time path of effects relative to the year that a state’s ATOD education requirements were changed. This model changes equation (1) by replacing the Statewide ATOD Curriculum Requirements indicator with a series of indicators defined for each state for each year relative to the year the policy was changed (e.g., one year prior, two years prior, three years prior, and so forth; and one year after, two years after, three years after, and so forth). In addition to informing us about policy endogeneity (by examining the coefficients on the years just prior to a state’s ATOD law), this specification will tell us whether the effects of ATOD requirements show up immediately or reflect a more gradual process. We will also ensure that any average effects we find are not the result of different timing and coverage of our available datasets. Note that the YRBSS data only fields interviews every other year (in odd-numbered years). To ensure that outcomes follow policies (and not the other way around), we will estimate specifications that drop any state that adopted a policy in an even-numbered year, since assigning the timing of the treatment for these states is more tenuous. We will also follow Carpenter and Cook (2008) by restricting attention to YRBSS sites that explicitly designed their surveys to be representative of the sampled population.

Finally, we will consider a series of robustness analyses that account for both current and past exposure to state ATOD education requirements. This model tests whether the current year ATOD curriculum requirement matters for youth substance use decisions or whether the cumulative years of exposure to ATOD requirements matters. Since states adopted ATOD laws at different periods over our sample, and since these laws apply to youths in different grades depending on the state, there will be substantial variation in the number of years a youth was potentially exposed to strong ATOD curriculum requirements. That is, we will be able to account for the fact that otherwise similar youths in grade 12 in different states may have been exposed to different

cumulative amounts of ATOD instruction, even conditional on the same contemporaneous ATOD policy regime, due to differences in timing and grade requirements of the various state policies. We can test this model by replacing the Statewide ATOD Curriculum Requirements indicator with a continuous variable that equals the fraction of an individual's schooling years that s/he was exposed to strong ATOD education rules. A limitation of this approach is that the MTF and YRBSS data do not include direct information on whether youths move across state lines during their schooling careers; as such, this exposure variable may be measured with some error for these two datasets, though we do not expect such error to be systematically correlated with ATOD education requirements.

C.3.d Aim 4: Evaluate the Effects of ATOD Policies by Person/Policy Fit

Our analyses for Aim 4 will generally follow those for Aim 3 described immediately above. Specifically, we will continue to estimate variants of the difference-in-differences specification in equation (1), but for our hypotheses about person/policy and stage/environment fit we will be mainly interested in interactions between the Statewide ATOD Curriculum Requirements indicator and various individual and school level characteristics. These interactions will tell us whether and to what extent the ATOD rules have differential effects on youth outcomes according to our developmentally-based hypotheses described in Section C.1.b above. For example, to test Hypothesis 1 that curricula requirements will be more effective at reducing youth substance use for youths with higher levels of self control, we will estimate:

$$(2)Y_{ist} = \beta_0 + \beta_1X_{ist} + \beta_2(\text{State ATOD Curriculum Requirements})_{st} + \beta_3(\text{High Self Control})_{ist} + \beta_4(\text{State ATOD Curriculum Requirements} * \text{High Self Control})_{ist} + \beta_5Z_{st} + \beta_6S_s + \beta_7T_t + \varepsilon_{ist}$$

where all variables are as described above and where High Self Control will be an indicator equal to one for youths we identify in the NLSY97 datasets as being relatively high on various self-control measures. In practice we will experiment with various constructions of the self-control measure, such as youths at or above the median of self-control, at or above the 75th percentile of self-control, and so forth. In equation (2), the coefficient of interest is β_4 , which we expect to be negative if Hypothesis 2 is correct (i.e., the ATOD requirements will be more effective at reducing substance use for youths with high than low self control).

For the sake of brevity, we do not discuss each of the tests for the remaining hypotheses, though each takes a similar form as equation (2) above with the relevant interaction terms. For each hypothesis we will examine the sign, magnitude, and statistical significance of the estimated effects, and we will also benchmark the ATOD estimates against other commonly estimated effect sizes (e.g., cigarette or alcohol tax effects on youth substance use) in order to gauge plausibility of the findings.

C.3.e Aim 5: Synthesize Key Findings for Designing Future Interventions

Throughout the project (but mainly in years 3-5) we will work with the broader PO1 Network to produce policy recommendations for states and institutions implementing ATOD interventions. We will also devote significant effort to designing specific intervention programs that appropriately account for the special vulnerabilities of adolescence and the importance of individual and contextual factors. To do so, we will build on what we learn in Aims 1-4 about how state ATOD education requirements affect instruction and youth substance use outcomes. Specifically, in Aim 2 we will learn which specific components of ATOD instruction are affected by the broad state requirements. These results will inform our studies in Aims 3-4, since we assume that any effects on youth substance use outcomes will have been driven by the increases in specific sub-topical components of ATOD instruction identified in Aim 2. We may find, for example, that ATOD education requirements have protective effects on youth substance use outcomes by increasing the teaching about peer pressure or the short term effects of ATOD use relative to other specific aspects of ATOD instruction. Thus, the specific topics affected by the statewide ATOD rules may help us design interventions that directly target some ATOD education topics over others.

In addition, a goal of Aim 1 is to identify and consistently code the general types of strategies inherent in statewide ATOD curricula, such as knowledge dissemination versus fear-based strategies. A result of this effort is that we may be able to comment on the general approach of ATOD education in addition to the specific content topics discussed in Aim 2. Finally, the goal of Aim 4 is to identify the conditions under which statewide ATOD interventions have protective or harmful effects. The results from this Aim may indicate that ATOD curricula are more (or less) effective depending on school and individual characteristics. This information, combined with the results from Aims 1 and 2, may yield especially targeted results about which types of general strategies and which specific content topics are most effective at reducing harmful substance use for youths with different personal characteristics or in different types of school environments. Overall, then, our goal in

Aim 5 will be to start a dialogue about the degree to which statewide ATOD curriculum requirements can and should be tailored to address the unique needs of youths as predicted by our developmentally-based hypotheses about stage/environment and person/environment fit.

C.3.f Interdependence with the Core and other Subprojects

Our project makes strong use of interdisciplinary perspectives from scholars who are largely Irvine-based. The PI (Carpenter) and four of the collaborators (Bruckner, Domina, Pechmann, Wakefield) are all researchers at UC Irvine, and each has distinct but complementary training and intellectual perspective. Today, the various social science disciplines offer very little in the way of concrete guidance to states, schools, or policy makers because the effects of substance abuse interventions tend to be modest, negative, or vary substantially across studies. This problem is compounded by the fact that the social science disciplines tend to think about individual-level characteristics and contextual factors quite differently, making it difficult to discern similar results across disciplines. Our project, informed by experts in economics, sociology, criminology, and epidemiology, will bring together the insights of all of these disciplines with the ultimate goal of providing solid and specific policy guidance (see Aim 5, above). And while our proposal contributes substantial interdisciplinarity to the core, we have also benefited greatly from the other scholars in the network – particularly the senior researchers who have a great deal of expertise in youth development and developmental psychology (Vandell, Burchinal, Duncan, Farkas). We see the continued collaboration with these senior scholars as an important network resource which we will heavily utilize in carrying out the specific aims of Project II.

Our project has strong interdependence with the core and with each of the other projects owing to our developmental perspective for understanding the importance of a specific set of public policies – ATOD education requirements – on an important aspect of youth development: substance use. Our project brings the concerns raised in Project I (Farkas, Early Childhood Interventions) into late adolescence. Our project will provide a useful comparison to the others because we will examine outcomes during a developmental period (adolescence) when peers are relatively more important as compared with the early childhood period when parents or teachers are more salient. Our project also informs the contribution of Project IV (Duncan, Early Childhood Predictors), adding depth and highlighting a policy-relevant and amenable to manipulation outcome of interest. Our project complements these perspectives by examining an important aspect of the adolescent policy environment on contemporaneous (i.e., during adolescence) risk outcomes. Notably, Project IV also examines some of these same outcomes pertaining to youth risk behaviors.

Our project will also benefit greatly from the external advisory committee, especially the three experts who will work most closely with our project: Ken Dodge, Jens Ludwig, and Wayne Osgood. Dodge has expertise developing interventions in the developmental stage of adolescence that is the focus of our study. Ludwig is well versed in the strengths and weaknesses of quasi-experimental methods such as those we use here and has considerable substantive expertise in deviant criminal behaviors. Osgood brings area knowledge in youth substance use and delinquency, as well as methodological expertise from leading several large scale evaluations of prevention programs. We will also benefit from John Schulenberg, a consultant on Project IV, as he is a Co-PI on the Monitoring the Future survey – a key dataset in our Project. We will also draw on the expertise of Project IV's local expert in adolescence, Candice Odgers.

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E. PROTECTION OF HUMAN SUBJECTS

E.1 Protection of Human Subjects

E.1.a Risks to Human Subjects

E.1.a.1 Human subjects involvement, characteristics, and design. This proposal involves secondary analysis of five de-identified datasets: The School Health Programs and Policies Study (SHPPS), the School Health Profiles study (Profiles), the Youth Risk Behavior Surveys (YRBS), the Monitoring the Future study (MTF), and the National Longitudinal Survey of Youth 1997 (NLSY97). The first two datasets are surveys of teachers, while the last three datasets are surveys of youths.

The SHPPS data is nationally representative and surveys approximately 2500 health education teachers in each wave (2000 and 2006). The Profiles data is nationally representative and surveys on average 250 health education teachers per state in each wave (biennially since 1996). The YRBS data is nationally representative and surveys approximately 10,000 high school students (grades 9-12) in each wave (biennially since 1991). The MTF data is nationally representative and surveys approximately 15,000 students each of grades 8, 10, and 12 every year since 1991. The grade 12 MTF surveys have been completed since 1976. The NLSY97 is nationally representative and surveys a cohort of about 9,000 youths who were age 12-6 in December 1996 and has followed these youths up periodically since the initial interview.

We will not exclude any subpopulation. The datasets are designed to be representative of the population being studied. The YRBS, MTF, and NLSY97 data are surveys of youths, which is appropriate given the study's focus on the effects of state alcohol, tobacco, and other drug education requirements on youth substance use. There are no other vulnerable populations that will be studied. The research will take place in the offices of the study investigators. The only other site where the research will be performed is the Institute for Social Research (ISR) at the University of Michigan. ISR houses the restricted-use MTF data, and analyses will be performed on site at ISR's secure data facility.

E.1.a.2 Sources of materials. The datasets we will use collect survey reports of various outcomes from teachers and students. No biological specimens are collected. The investigators will not have access to individually identifiable private information about human subjects apart from standard demographic characteristics such as age, race, and sex. We will not, for example, observe private addresses, social security numbers, or date of birth information for any respondent. We are not collecting any new data – we are only performing secondary analyses of existing datasets.

E.1.a.3 Potential risks. The main risk to subjects in this study is the psychological risk that a person's individual identifying information (including their survey responses) may be compromised in the course of the research. This risk is minimized by the fact that study investigators will not have access to any individual identifying information beyond standard demographic characteristics such as age, race, and sex. Identifying individuals from these very basic characteristics is extremely unlikely, and thus the risks are very small.

E.1.b Adequacy of Protection Against Risks

E.1.b.1 Recruitment and informed consent. We are not recruiting any subjects for this study, so we will not obtain informed consent. The surveys of youths have their own protections for obtaining parental permission to survey youths.

E.1.b.2 Protections against risk. To minimize potential risks, we will only analyze de-identified data. That is, study investigators will not have access to individual identifying information that could be compromised, such as social security numbers, date of birth, or address.

E.1.c Potential Benefits of the Proposed Research to Human Subjects and Others

There are no potential benefits of the research to participants apart from the knowledge that will be gained from their participation. Given the risks are minimal, however, the lack of anticipated benefits to participating in the research is reasonable.

E.1.d Importance of the Knowledge to be Gained

The knowledge to be gained from this study has the potential to reduce youth substance use and its associated harms, which are substantial. Specifically, our study will identify whether and to what extent state requirements for alcohol, tobacco, and other drug education reduce youth substance use. Our project will also identify the groups for whom these interventions are likely to be particularly effective. As such, the minimal risks to participation are reasonable given the substantial knowledge that will be gained from the study.

E.2 Inclusion of Women and Minorities

The datasets we will use are designed to be representative of the populations from which they are drawn (teachers, students). As such, the characteristics of the samples will match the population characteristics. We will study both men and women and individuals of all race/ethnic backgrounds; we will not exclude any of these groups from the analysis. We are not doing any new data collection, so we will not need to do subject selection.

E.3 Targeted/Planned Enrollment Tables

We provide a targeted/planned enrollment table for the Youth Risk Behavior Survey (below). We do not have the exact sample size breakdowns for the Monitoring the Future, National Longitudinal Survey of Youth and School Health Profiles datasets, though again since they are representative of the sampled population the sex and racial/ethnic composition will match the population. The School Health Policies and Programs Study did not collect sex and race/ethnicity.

E.4 Inclusion of Children

The datasets we will use for the youth substance use outcomes include children under age 21. This is appropriate, since we are interested in the effects of the state education requirements on youth substance use. We will study all youths in the school self-report datasets (YRBS, MTF, NLSY97). Again, we are not contacting the youths directly – we are only doing secondary analysis of existing youth datasets.

F. VERTEBRATE ANIMALS

Not applicable

G. SELECT AGENT RESEARCH

Not applicable

H. INVESTIGATORS

Christopher Carpenter (Ph.D. in Economics from UC Berkeley, 2002) is Associate Professor of Economics/Public Policy at The Paul Merage School of Business at UC Irvine; Research Associate at the NBER in the Programs on Health Economics, Health Care, and Children; and managing editor and co-editor at the *Journal of Policy Analysis and Management (JPAM)*. Carpenter is a widely recognized authority on the policy-related causes and consequences of alcohol use among young adults. His work has appeared in *American Economic Journal – Applied Economics*, *Journal of Health Economics*, *Journal of Law and Economics*, *American Journal of Public Health*, *Journal of Human Resources*, and *JPAM*. Carpenter will have primary

responsibility for all aspects of the project, including: data management and analysis; supervision of research assistants; manuscript preparation; and grant administration. He will primarily be responsible for the SHPPS, MTF, and YRBSS analyses; he has published using both the MTF (Carpenter et al. 2007) and the YRBSS (Carpenter & Cook 2008, Carpenter & Stehr 2008). In the preliminary studies for this application Carpenter has collaborated extensively with Wakefield and Domina and is confident that the comparative expertise will lead to a more comprehensive and well-informed set of projects.

Sara Wakefield (Ph.D. in Sociology from University of Minnesota, 2007) is Assistant Professor of Criminology, Law & Society and Sociology at UC Irvine, faculty affiliate of the Center for Demographic and Social Analysis, and was a National Institute of Mental Health interdisciplinary predoctoral fellow in Sociology, Public Policy, and Child Development at the University of Minnesota. Her work examines the influence of crime and punishment on adolescent development, the transition to adulthood and social inequality. Her work has appeared in the *Annual Review of Sociology*, *Work and Occupations*, *Sociological Inquiry*, and several edited volumes. Wakefield will lend important expertise in integrating developmental theories of youth development. She will also take the lead on the NLSY97 analyses.

Thurston Domina (Ph.D. in Sociology from City University of New York, 2006) is Assistant Professor of Education at UC Irvine. Domina is an expert in educational policy analysis, focusing on policies related to high school completion and college access. His research, which uses quasi-experimental methods to assess the consequences of educational interventions, has appeared in *Educational Evaluation and Policy Analysis*, *Sociology of Education*, *Annals of the American Academy of Political and Social Science*, and *Social Forces*, among others. Domina will primarily be involved in the “first stage” analysis of how the ATOD requirements affect delivery of the health education curriculum. He will take the lead on the School Health Profile analysis.

Tim Bruckner (Ph.D., Epidemiology, University of California, Berkeley, 2007) is Assistant Professor of Public Health and Planning, Policy and Design at UC Irvine. Bruckner examines behavioral and biological responses to changes in the ambient environment with a focus on infant and child health. Bruckner has methodological expertise in fixed effects regression and time-series analyses, which are well-suited for policy evaluation. His research has appeared in *Health Services Research*, *Proceedings of the National Academy of Sciences USA*, *International Journal of Epidemiology*, and *Accident Analysis and Prevention*. Bruckner will assist with data analysis; interpretation of findings; and manuscript preparation.

Connie Pechmann (Ph.D. in Marketing from Vanderbilt, 1988) is Professor of Marketing at The Paul Merage School of Business at UC Irvine. Pechmann conducts controlled experiments to examine the effects of tobacco-related advertising on consumers, particularly youths. Her work appears in the top marketing journals including *Journal of Consumer Research*, *Journal of Marketing*, *Journal of Marketing Research*, *Journal of Consumer Psychology*, and *Journal of Public Policy and Marketing*. Pechmann will be responsible for collaborating on the effectiveness of different types of ATOD curricula. She and Carpenter have coauthored a paper on the effects of anti-drug advertisements on youth drug use (Carpenter and Pechmann 2010).

Patrick O'Malley (Ph.D. in Psychology, University of Michigan, 1975) is Research Professor at the Institute for Social Research at the University of Michigan and a Co-Principal Investigator of the Monitoring the Future (MTF) study. His publications deal with alcohol, tobacco, and illicit drug use and related attitudes and beliefs. O'Malley and Carpenter have collaborated on previous research examining the effects of youth-targeted drunk driving laws on alcohol use among high school students using the MTF data (Carpenter et al. 2007). O'Malley's three decades of research on the policy determinants of youth substance use, as well as his intimate familiarity with the MTF data, will provide important guidance on model conceptualization, variable definitions, and interpretation.

I. CONSORTIUM/CONTRACTUAL ARRANGEMENTS

Not applicable

J. LETTERS OF SUPPORT

A letter of support from consultant Patrick O'Malley is appended to this research plan.

K. RESOURCE SHARING PLAN

This project analyzes three existing datasets obtained from other sources: Youth Risk Behavior Survey, Monitoring the Future, and the National Longitudinal Survey of Youth 1997. All of them are or will soon be available to the general research community.

This project evaluates the effects of state regulations of curricular standards for health education

pertaining to alcohol, tobacco, other drugs on the actual delivery and instructional content of those topics, on school health and safety environments and on youth risk behaviors regarding substance use and abuse. In the course of conducting this research, the project will create a comprehensive database that tracks the implementation of the school health education curriculum standards in each US state since 1976. This database will be compiled from a variety of primary and secondary sources, including: the National Association of State Boards of Education's (NASBE) School Health Policy Database, the National Center for Education Statistics' State Education Reforms Database, state education websites, actual text of state education laws, and the National Council on State Legislatures (NCSL). If funded, we will compile and make this database publicly available for research via the Network website.