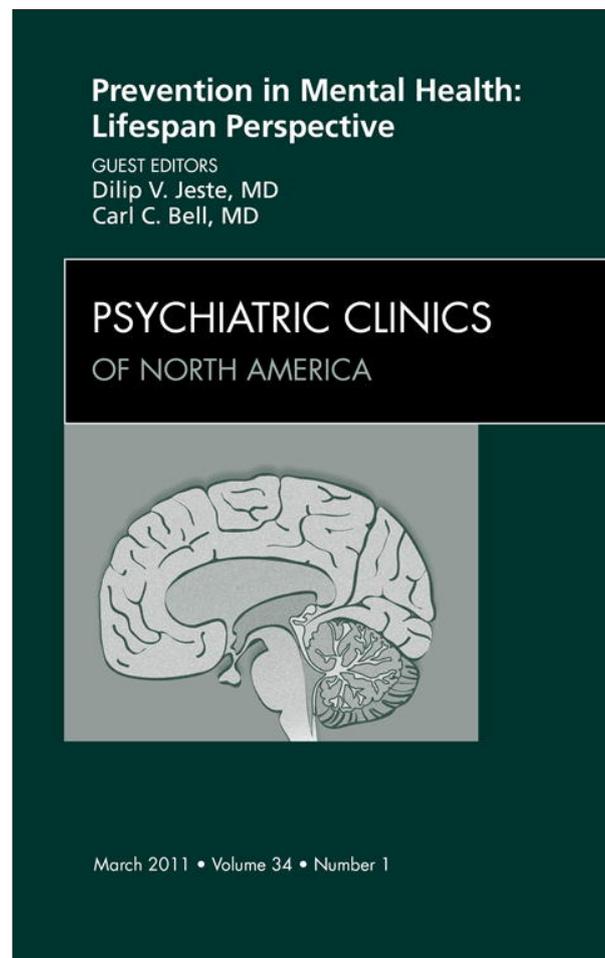


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Behavioral Vaccines and Evidence-Based Kernels: Nonpharmaceutical Approaches for the Prevention of Mental, Emotional, and Behavioral Disorders

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KEYWORDS

- Evidence-based kernels • Behavioral vaccines • Prevention
- Public health

The Institute of Medicine Report on the Prevention of Mental, Emotional and Behavioral Disorders Among Young People¹ (IOM Report) provides a powerful map for how the United States might significantly prevent mental illnesses and behavioral disorders like alcohol, tobacco, and other drug use among America's youth. This document is already shaping United States policies, and will almost certainly affect Canada and other countries' policies. Mental, emotional, and behavioral disorders (MEBs) among America's youth and young adults present a serious threat to the country's national security² and to our economic competitiveness compared with 22 other rich countries.³⁻⁷ Such MEBs are also the leading preventable cost center for local, state, and the federal governments.^{1,4} Further, safe schools, healthy working environments, and public events or places are seriously compromised by MEBs as well.

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The IOM Report opines:

Behavioral health could learn from public health in endorsing a population health perspective. (IOM^{p19})

Families and children have ready access to the best available evidence-based prevention interventions, delivered in their own communities...in a respectful non-stigmatizing way.^{p387}

Preventive interventions are provided as a routine component of school, health, and community service systems...^{p387}

Services are coordinated and integrated with multiple points of entry for children and their families...^{p387}

...Prevention strategies contribute to narrowing rather than widening health disparities...^{p388}

WHY A PUBLIC HEALTH APPROACH TO PREVENTION IS NEEDED

The first scientific public health approach to prevention was by John Snow, who removed the Broad Street water pump handle. He stopped the deadly cholera epidemic in London. His analysis and identification of water-borne disease from a single pump is an action metaphor for our own contemporary multiple, related epidemics (ie, syndemics)⁸⁻¹¹ of MEBs that cause so many afflictions and consequences for North American societies. Why is a public health approach to the prevention of MEBs (which includes all addictions) necessary in the United States and other countries? A few simple facts make the point:

- Every family in America has one or more family members who have been touched with MEBs during a given year, based on prevalence estimates.¹²⁻¹⁴ Common MEBs (eg, childhood attention-deficit/hyperactivity disorder [ADHD]) have adverse effects on child rearing, marriages, income, domestic violence, and health.¹⁵⁻²⁴
- Every American business has one or more employees who are directly or indirectly affected by MEBs, which have multiple documented adverse impacts on health, costs, and productivity.²⁵⁻²⁷ Worse still, the lack of health care for the employees in small businesses in America has a large negative impact on the productivity of small businesses in the United States as compared with rich countries with national health care.³
- Schools, health care carriers, and communities across America are struggling with the costly burdens of these disorders via special education and behavioral difficulties.²⁸⁻³⁵
- Some of these disorders are rising in prevalence in the United States,^{7,36,37} particularly the more disturbing costly problems such as conduct disorders.⁷
- The United States has more of these problems than many other rich countries,^{5,6} and there are increasingly clear epidemiological reasons why this might be so.³⁸⁻⁴⁴

Previous investigators have used these statistics to call for more mental health professionals.⁴⁵ However, this fails a public health approach in 2 ways: (1) treatment by professionals is perceived as stigmatizing, and many of the most vulnerable groups do not seek “treatment” because of such perceived stigma⁴⁶; and (2) focusing only on expanding treatment ignores that MEBs can be prevented by very low-cost procedures delivered by existing persons in communities.⁴⁷⁻⁶⁰ While expanding mental health professionals might be helpful in treatment issues, it is a “downstream” rather than “upstream” model. A public health “upstream” model is a logical alternative.

HOW IS A PUBLIC HEALTH APPROACH DIFFERENT?

A public health approach to the prevention of MEBs would look much different than the existing “rationing” approaches. It would be more like that of European countries (*IOM Report*^{pp388–95}), or like some Canadian provinces where access is far more universal. The benefits are evident in the Netherlands, for example, where the utilization of psychotropic drugs among children and youth is half of that of the United States.⁶¹ The Netherlands, for example, widely promotes two of the most highlighted universal access prevention approaches in the IOM Report—Triple P (a multilevel parenting support system)^{62,63} and the Good Behavior Game.^{52,64,65} The United Kingdom, which has lower rates of MEBs,^{7,36,37} even provided the parenting tips found in Triple P in the context of an 8-week TV show, which significantly reduced disturbing and disruptive behaviors of children whose parents followed the show.^{66–68} Another United Kingdom study remedied dietary deficiency widely linked to psychiatric disorders^{38,69,70} during the normal course of school^{44,71}; this resulted in fewer problematic behaviors and improvements in academic success.^{44,71} These types of preventive strategies can be delivered as a matter of course or choice, rather than limiting access by families, schools, or neighborhoods based on a “rationing model” of prevention in which only those who have positive “screening” at an individual, family, school, or neighborhood level receive prevention services.

A public health model of preventing MEBs might resemble the implementation of medical vaccines for childhood illnesses. Governments or private insurance subsidize such vaccines to reduce mortality or morbidity. Governments and private insurance companies also subsidize “behavioral” vaccines such as car safety seats for children or hand washing. *A behavioral vaccine is a repeated simple behavior that reduces morbidity or mortality and increases wellbeing.*^{52,72,73} Like medical vaccines, behavioral vaccines can provide “herd immunity” as protection against behavioral contagion—a phenomenon well documented in behavioral and epidemiological science.^{74–83}

What defines a public health approach? The author and his colleagues I propose some parameters:

1. *Universality of Harm:* A public health approach predicates that the risk of the problem or disease is widely distributed, and that vulnerability is common because of national, regional, or even basic human vulnerabilities. Thus, car safety seats are needed because any child can be in a serious car crash, and any child can fall victim to almost any of the serious childhood illnesses prevented by medical vaccines. Similarly, the adverse impact of tobacco can harm any person—including those exposed to tobacco second-hand or through social costs. MEBs pass that test, given that 20% to 25% of the population²⁵ experiences one or more in any given year.^{13,45}
2. *Personal or Group Risk is Common:* Although some individuals or groups may have higher levels of vulnerability because of genetics, social conditions, or history, the overall risk of the problem or disorder is widely distributed; this means that attempts to isolate or identify the individuals or groups at risk are inefficient and prone to error. While it is true that some children and their families, for example, are more likely to be victims of car crashes, morbidity and mortality risk of such crashes is as widespread as MEBs. For example, substantiated child-maltreatment or childhood ADHD are clearly associated with risk factors such as poverty,^{84–87} yet identification of such risks does not per se result in earlier treatment or prevention.⁸⁸ Indeed, an emphasis on static predictors can mask the opportunity to have a population-level, cost-efficient impact on serious issues such as child

- maltreatment, mental health outcomes, and conduct disorders.^{47,49,51,57,89} When a successful public health approach has been taken, the individuals or groups who need more intensive support are easier to identify than when access is rationed.^{49,90}
3. *Protection of the Whole Population:* Protection against car crashes, against contagious life-threatening diseases, against second-hand effects of tobacco, or against crime are examples of a public health approach. The burden of MEBs fits this framing with so many children, adolescents, and adults affected. In some cases, a broad approach is needed even when a smaller number of people with the problem have very costly consequences—such as a child with lifetime conduct disorders. This can cost between 2 and 4 million dollars per child, affecting public safety, health care, social services, school and workplace productivity, and so forth.⁹¹ As mentioned earlier, a public health approach can confer “herd immunity” for the population.^{92–95}
 4. *Stigmatizing Persons or Groups At Risk Reduces Prevention:* When policies or practices focus only or mostly on presumed persons or groups at risk, such individuals or groups decline to participate because of perceived stigmatization.⁹⁶ This is especially true when it involves racial or ethnic groups.⁸⁸
 5. *Cost Efficiency:* Population-level or public health approaches are often more cost effective in terms of preventive results than costly processes of identifying those at risk, recruiting participation of persons at risk, and dealing with the adverse effects of stigma. Often, just making the preventive strategy widely available is the most efficient way of “case finding” for at-risk populations. The tobacco control efforts clearly demonstrate the benefits of a public health approach (eg, clean indoor air or restricted access to tobacco)^{97–101} versus a risk-selection only approach.⁹⁸

COST EFFECTIVENESS AND PREVALENCE REDUCTION WITH A PUBLIC HEALTH APPROACH

Can a public health approach work for the prevention of MEBs? The author and colleagues say “yes”, especially with a “consumer” approach that allows individuals or groups to participate easily in proven strategies. Let us examine the evidence and rationale.

It is important to begin with an obvious, but not well-recognized detail about evidence-based prevention strategies for mental, emotional, and behavior disorders (including alcohol and other drugs) in the United States. That is, not a single evidence-based prevention tool on the National Registry of Effective Programs and Practices (NREPP) for mental, emotional, or behavioral disorders is available at Amazon (the largest bookstore), Walmart (the largest retail chain), or iTunes (the largest “apps” store) in North America or in Europe for that matter.

Consumer Prevention Product Logic

Compare the aforementioned to the prevention of childhood diseases or the prevention of childhood injuries. Most people can obtain a “walk-in” vaccination for children’s illnesses at “minute clinics” at Walgreens, CVS, or Shoppers Drug Mart (Canada) dotting major intersections all across North America. Most families can obtain injury prevention devices (car seats, bike helmets, fall gates, electric socket protectors, medicine cabinet safety latches, and so forth) at Walgreens, CVS, Target, Walmart, Loblaw (Canada), Sobeys (Canada), or Amazon within minutes. Some people may need free vaccines or car seats. Some people may need special supports to use or

apply the strategies. Some groups, including schools, may need special marketing or cultural adaptations to succeed. Nevertheless, the reach, adoption, and maintenance of these prevention products far outstrip the reach, adoption, and maintenance of prevention strategies for MEBs in the United States. In North America no parent, concerned family members, or concerned community person can easily purchase or obtain any evidence-based prevention strategy for MEBs. It is even difficult for any normal citizen (parent, teacher, or community person) to obtain the scientific journal articles about such prevention tools that would enable citizens to “roll their own” prevention strategies successfully.

Although the proven strategies that can prevent MEBs are not easily accessible in North America, the things that we are trying to prevent are very easy to obtain directly as consumers. Ironically, alcohol, tobacco, and illegal drugs are accessible to students on virtually every school campus. Prescription drugs that are widely abused are, too frequently, promoted on TV channels, in print, on the Internet, in movies, and on the radio. Your doctor gets free samples delivered to his or her office every week, by pharmaceutical sales staff. Paradoxically, things that are scientifically documented to increase the prevalence rates of MEBs are easy to get. Devices or entertainment that increase sleep deprivation and worsen multiple MEBs^{102–104} are a mouse-click away. Child-targeted foods that cause deficiency in essential brain nutrients involved in with MEB rates in America are advertised on children’s TV.^{40,41,105}

Cost-Offsetting Consequences

With no easy consumer access to proven prevention tools, the consumers (parents, teachers, businesses, and so forth) engage in shifting prevention, intervention, and treatment costs to third-party payers. Consider these examples:

1. *Parent Example:* When a parent receives a teacher’s complaint about a child’s inattentive or disturbing behaviors, most parents have no viable remedy except medication (cost offset to health insurance) or an Individualized Educational Plan (IEP; cost offset to school district).
2. *Teacher Example:* When a teacher faces a child with mental, emotional, or behavioral symptoms in the classroom, he or she has almost no options except to influence the parent to start the child on medication, or insist that the child have an IEP.
3. *Business or Organizational Example:* Business or organizational leaders face similar dilemmas of cost offsetting with a lack of options. A business or organization will rarely perceive actionable alternatives that do not involve either increased health care or service costs or employee turnover.

These cost-shifting issues are easily predictable from behavioral economics and common pool resources.^{106–108} Indeed, without easy to access consumer-based choices, the documented spiraling costs of psychotropic medications and special education in the United States are a foregone conclusion. The fact that businesses have no clear option to expensive offsets causes businesses to raise deductibles or restrict benefits or other strategies that hurt the common pool (eg, the wellbeing of children, youth, families, and communities).

Evidence for a Public Health, Consumer-Focused Approach to Prevention

Is there high-quality evidence—meeting the standards of evidence by the Society for Prevention Research¹⁰⁹—that population-level, public health consumer approaches

can prevent or reduce MEBs? Yes; here are a few examples, in which science-based prevention was not rationed but made widely available:

- *Triple P Parenting Support System (IOMP¹⁶⁷)*: There are now 3 population-level studies providing universal access to a system of parenting support so that families (not professionals) are able to determine how little or how much they want.
 1. A broadcast TV show (*Driving Mum and Dad Mad*) resulted in viewership outdrawing *Desperate Housewives* in the same time slot in the United Kingdom. Of the family viewers, some 360,000 families had children with high levels of MEBs, and 48% of those “high-risk” families were able to bring their children beneath the clinical score range using the tools from the TV show and Web site.⁶⁷
 2. An 18-county randomized study, sponsored by the Centers for Disease Control and Prevention (CDC) using Triple P, was able to reduce 3 major population-level indicators of child maltreatment in the 9 randomly selected Triple P counties.⁴⁹ All families, rather than risk-selected families, were the target of the strategy, which was highly cost efficient at reducing maltreatment indicators, at the cost of less than \$13.00 per child (ages 0–9 years) in the targeted counties.⁹⁰ Reducing exposure to adverse childhood experiences is one of the key pathways of preventing lifetime MEBs as well as high health care costs.^{110–113}
 3. A multi-city comparison study, called “Every Family”, was conducted in Australia. The target population was all parents of 4- to 7-year-old children residing in 10 geographical areas in Brisbane (Triple P), compared with 10 control matched areas in Sydney and Melbourne (Children are Unbeatable [CAU]). After intervention there were significantly greater reductions in the number of children with clinically elevated and borderline behavioral and emotional problems in the Triple P communities compared with the CAU communities. Similarly, parents in Triple P communities reported a greater reduction in the prevalence of depression, stress, and coercive parenting. Findings show the feasibility of targeting dysfunctional parenting practices in a cost-effective manner. Triple P is the first parenting system to demonstrate longitudinal, population-level effects for parents and children on MEBs.
- *Safe-Playing Injury Control Studies*: In late 1970s and through the mid-1980s, pedestrian injuries were one of the top 5 causes of death to preschool children 3 to 5 years old in the United States and many Organization of Economic Development (OECD) countries. Whereas fatal injuries were statistically uncommon per child, dangerous or risky behaviors such as dashing into the street before a car on a Bigwheel or chasing a ball or playmate were not. About half of any given sample of observed children entered the street every hour in the course of outdoor play without any parental awareness during baseline.^{114–118} When parents in North America and New Zealand were offered easy access to simple behavioral prevention tools, as much as 50% of community samples adopted and implemented the evidence-based recipe to alter children’s safety behaviors.^{116,118}
- *Tobacco Prevention*: The following paragraph is from a recent publication on involving communities with sustainable prevention strategies⁹⁷:

Project SixTeen is an example of a multimodal community intervention trial aimed at preventing youth tobacco use by random assignment. Eight Oregon communities received an intervention that included classroom-based prevention curricula, media advocacy, youth anti-tobacco activities, family communication activities, and a systematic campaign to reduce tobacco sales to underage youth¹⁰⁰. Another eight schools received classroom curricula only (ie, Project PATH).¹¹⁹

At one and five years post intervention, communities receiving the comprehensive intervention showed a significantly lower prevalence of cigarette use compared to those receiving the school-based intervention alone. At two years, ninth-grade boys in the comprehensive intervention, compared to those in the school intervention, reported lower use of smokeless tobacco. Over a span of four years, alcohol and marijuana use increased less rapidly in intervention communities than in the school-only communities.

A recently completed systematic replication took elements from Project SixTeen^{100,101} and applied it across 2 whole states, showing population-level reductions for those states on Youth Risk Behavior Survey (YRBS) data for any 30-day and everyday tobacco use, resulting in a NREPP designation as “environmental policy” with a valid experimental design.¹²⁰

- *School-Based Violence Prevention:* In the 1990s, youth violence rates significantly increased, and schools experienced a notable increase in school-based violence. PeaceBuilders was one of the first evidence-based strategies with both theoretical roots and demonstrable effects.¹²¹ In Pima County, some 85 elementary schools signed up in 1 year to participate in a community-wide effort of teaching, reinforcing, and promoting peaceful behavior.^{121,122} Within those schools, 8 sites were randomly assigned to a wait-list control that received extensive evaluation of 4-hour in-service, materials, and technical supports. The independent evaluation revealed that the schools receiving PeaceBuilders had fewer violent injuries coded by nurses.¹²³ The prevention strategy also had medium effect sizes on social competence and aggressive behavior as reported by teachers using psychometrically valid tools,¹²⁴ especially for the most disturbed and aggressive boys.¹²⁵

These examples actually have several features in common, which are not transparent when reading the published articles. One needs to examine the actual strategies to appreciate how these examples embody a consumer approach to prevention. Here are some common features:

1. *Small Units of Change:* Each example emphasizes small units of behavior change (ie, active ingredients) that can be adopted by the consumers (eg, children, teachers, parents, and so forth) via simple verbal explanations, demonstrations, or symbolic modeling. For example, in the Safe Playing initiative, parents read a storybook to the child with his or her name as the actor, which then depicted the caregiver setting a timer, giving simple stickers on a chart, and sharing surprise rewards for playing safely (ie, not going into the street or crossing other demarked boundaries).¹¹⁷ In the case of PeaceBuilders, adults and students created a chart of what they would see, hear, and do in a peaceful school, and those charts were posted throughout the site.¹²¹ Then adults learned to write “praise notes” to students for doing those “peacebuilding behaviors”; the students wrote similar notes to each other that were publicly posted, and they wrote praise notes to adults for building peace.¹²⁶ Consumer-based prevention typically does not require extensive training or face-to-face educational programs for the child or adult; rather, such strategies more resemble easy-to-use appliances or software.
2. *Proximal Benefits:* Consumer-friendly prevention “products” tend to produce easily noticed proximal benefits or “early wins” in the organizational change literature. For example, the Safe Playing intervention typically yields immediate change in less risky and safer behavior.^{116,117} Similarly, the various “praise notes” used in PeaceBuilders have effects that are noticeable among students or adults within a day or two, and tend to accelerate as more of the notes are used.^{127,128}

3. *Testing in ABA Studies:* MEBs are not abstractions or “just labels” to families, teachers, or even the young people affected by those disorders. Rather, the disorders entail noticeable events that can happen many times in a day or an hour. For example, a child with oppositional defiance disorder may easily engage in oppositional, disturbing, or disruptive behavior 10 to 50 times per hour at home or in the classroom, depending on the antecedents or behavior of parents, teachers, siblings, or peers.^{129,130} Therefore, consumer-friendly prevention products for oppositional defiance must have behavioral benefits that can be easily proven by direct observation and with consumer satisfaction. This proof is best done in reversal or multiple-baseline (ABA) studies that use repeated measures of the “symptoms” in real time.^{131,132} That is, the intervention can reliably demonstrate, within subjects, behavior change in symptoms. This feature is a critical one for dissemination and diffusion because it means that most consumers who adopt it will experience benefit for themselves—not just between group differences. That is, consumers can see, hear, feel, or otherwise notice differences directly. The subjects do not care whether 25% of the treatment group gets better; they care about their own situation getting better. The benefits are not abstract or delayed in time to consumers. It is useful to note that many of the most powerful prevention programs and practices listed in the IOM Report such as the Good Behavior Game or Triple P had some 60 or more ABA studies^{52,62} long-before any of major randomized trials, providing a thorough understanding of active ingredients, problems of use, and linkages to measureable benefits achieved quickly and reliably. Testing strategies used in ABA studies means that a developer must pay attention to producing measurable benefit to the consumer, rather than obfuscating weak strategies by blaming the consumer for denial, resistance, laziness, or other attributions. These proximal benefits, sensitive to an ABA design, are not limited to just home or classroom interventions. For example, in the case of the tobacco prevention effort, the community measures of reduced illegal sales of tobacco were easily measured in weeks at a community or even state level.^{100,101,120} Such designs can detect many community actions.^{133–137}

A USEFUL ADDITION TO PUBLIC HEALTH PREVENTION NOMENCLATURE: EVIDENCE-BASED KERNELS AND BEHAVIORAL VACCINES

The etiology and epidemiology of MEBs challenges the notion that prevention, intervention, and treatment require complex evidence-based programs. Consider a few examples that can be found of such etiology and epidemiology in the Institute of Medicine Report on Prevention.¹

- Dishion and colleagues (IOM^{p270}) proved deviant adolescent behavior follows the Matching Law,^{138,139} predicting delinquency rates over time.¹⁴⁰ Strategies, however, that deliberately manipulate the Matching Law to increase peer social reinforcement for nondeviant behaviors and reduce accidental attention to deviant behavior prevent such delinquent or risky behavior in the short and long term.^{54,57,59,124,125} This effect can be demonstrated experimentally in a single classroom.¹²⁷ Strategies such as Good Behavior Game⁵² or Peace-Builders¹⁴¹ explicitly make use of the Matching Law.
- Hibbeln and colleagues have clearly demonstrated that deficiency of omega-3 in the American diet is associated with MEBs (IOM^{pp213–4}). Randomized, placebo-controlled trials show that the provision of omega-3 reduces MEBs in children and adolescents.^{47,48,142}

- Multiple references in the IOM Report^{pp182,189,216} cite aggression at school as a significant and malleable predictor of MEBs. While such aggression can be clearly reduced by various programs and curricula, aggressive or disruptive behavior can be averted by multiple examples of interventions that do not rise to the level of programs or curricula. Here are a few simple strategies that have experimental demonstrations to reduce aggression at school, even among very high-risk children or teens: (1) positive notes home^{128,143–145}; (2) beat the timer in the classroom to reduce dawdling and disruption^{146,147}; (3) group public feedback with group rewards¹⁴⁸; (4) reduction of TV viewing and video game use at home reduces aggression at school¹⁴⁹; and (5) cooperative games on the playground.^{150,151}
- Parental substance abuse has many adverse effects on mental, emotional, and behavioral disorders among infants, children, and adolescents (IOM^{pp161,422}). Home-visiting programs such as the Nurse Family Partnership (NFP) have argued that much of NFP effects stem from reducing tobacco use in pregnant mothers.^{152,153} There is good epidemiological evidence to support this assertion, as reviewed by Biglan and colleagues.⁴ Can such impact on maternal smoking be achieved more cost efficiently? The answer is clearly yes. Multiple experiments have shown that straightforward contingency management systems have more robust impact on cessation rates of tobacco among high-risk women,¹⁵⁴ as well as for alcohol or illegal drugs, than home-visiting programs alone.^{155–157} A major reason for the substantial attrition rates in home-visiting programs (25%–75%) and poor outcomes are addictions and associated domestic violence.^{158–160} Thus, using simple cost-efficient tools such as contingency management has considerable public health or safety benefits in reducing addictions among women child-bearing age and men.^{156,161–170}

These and other examples of simple behavioral strategies in the prevention of MEBs have historically lacked any kind of a taxonomy or synthesis. Such examples are widespread in the scientific literature, but seldom rise in major awareness in policy and practice initiatives. The IOM Report, however, highlights an emerging nomenclature for such preventive, intervention, and treatment strategies^{pp210,420}: evidence-based kernels and behavioral vaccines, defined as follows.

- *Evidence-based kernels* are fundamental units of behavioral influence.¹⁷¹ Every kernel must have peer-reviewed, published experimental studies demonstrating effects. In an earlier article,¹⁷¹ Biglan and the author offered this definition:

An evidence-based kernel is an indivisible procedure empirically shown to produce reliable effects on behavior, including psychological processes.⁷² The unit is indivisible in the sense that it would be ineffective upon elimination of any of its components. Examples of kernels include timeout, written praise notes, self-monitoring, framing relations among stimuli to affect the value of a given stimulus, and increasing Omega-3 fatty acids in the diet in order to influence behavior. A kernel may increase the frequency of a behavior or it may make a behavior less likely. It can have its impact by altering antecedent or consequent events in the psychological environment of the person or it can affect behavior by directly manipulating a physiological function. Kernels, by definition, target a single behavior, whereas programs typically target multiple behaviors.

- *Behavioral vaccines* are a repeated use of kernel or a simple recipe of kernels that prevent or reduce morbidity or mortality or improve wellbeing. Hand washing or buckling a seatbelt are clear health examples of behavioral vaccines. The Good Behavior Game (IOM^{p184}) is a behavioral vaccine, which involves several kernels

in a recipe used several times a day to reduce disturbing and disruptive behavior in a classroom and has large immediate effects on such behaviors.⁵² The Good Behavior Game has major long-term outcomes for multiple MEBs in longitudinal randomized control trials.^{54,55,57,59} The Substance Abuse and Mental Health Services Administration is funding a 10-school district demonstration of the Good Behavior Game in 2010 (RFA SM-10-017).

Can evidence-based kernels (or, behavioral vaccines) be used for major public health and public safety benefit in the prevention of MEBs? The author argues affirmatively, yes.

Consider a proof of concept based on Biglan's earlier work on Reward and Reminder (R&R).^{100,101} R&R consists of 3 basic evidence-based kernels: (1) a relational frame about prosocial behavior of not selling tobacco to minors, (2) mystery shoppers who reward and recognize clerks/stores who do not sell tobacco to minors, and (3) public posting of the stores/clerks who do not sell. This recipe, which is repeated in communities or states, has immediate effects on reducing illegal sales of tobacco. When the kernel recipe is repeated in states for a year or so, there are related declines in any self-reported tobacco use by minors in the last 30 days and tobacco use every day in the last month.¹²⁰

There are other examples that suggest the use of kernels might have some impact on selected, indicated, and universal prevention, as shown in **Table 1**, which is adapted from the 2008 article by Embry and Biglan on kernels.¹⁷¹ **Table 1** provides an example from the 4 types of evidence-based kernels: reinforcement, relational, physiological, and antecedent.

Multiple kernels can be used for indicated, selected, and universal prevention, as illustrated in **Table 1**. Many can be used in homes, schools, organizations, clinical practice, and even the mass media for varying levels of intensity, as depicted in **Fig. 1**. **Fig. 1** also shows that kernels and related behavioral vaccines have potential impact across every human developmental stage.

These features have many advantages for policy and practice. First, this means that training of communities and individuals can be far more cost efficient. Second, the widespread utility means that it will be far easier to maintain outcomes in organizations or communities over time. Third, the modular nature of kernels means that community providers and organizations will be better able to respond effectively to new prevention or treatment issues, because new threats arise all the time for which there will be no evidence-based program per se, such as the methamphetamine epidemic. Such multilevel models are clearly more cost efficient, and are likely to be more effective in terms of Quality-Adjusted Life Years (QALYS).^{51,90}

For kernels or kernel recipes (or policy or program, for that matter) to have population-level effects on public health or public safety (eg, whole communities, counties, states, or provinces), it is necessary for the RE-AIM formula to be applied.^{172,173} RE-AIM stands for Reach, Efficacy, Adoption, Implementation, and Maintenance. This formula proposes that a large number of people must buy or select ("Adopt") the strategy, typically around 20% or more to have a major impact. More than 20% (say 30%–50%) will have to be "Reached" to get 20% to adopt the strategy. The adoption rate is moderated by the "Efficacy" of the strategy: the bigger the effect size, the fewer people required to impact population-level numbers. If a very large number of people adopt a weak strategy, there can still be population impact. "Implementation" means the percentage of people who actually use the adopted strategy. "Maintenance" refers to percentage of people who continue to use a strategy, if that is required to sustain effects.

| Table 1 Example of kernel utility for selected, indicated, and universal prevention | | | |
|--|--|---|--|
| Evidence-Based Kernel | Selected Prevention | Indicated Prevention | Universal Prevention |
| Prize bowl/mystery motivator (reinforcement kernel) | Reduce alcohol, tobacco or drug use ^{161,163,164} Improve engagement in treatment goals ^{169,170} | Reduce problem behavior in high-risk children or youth ²²²⁻²²⁴ | Improve engaged learning of whole class and reduce disruptions of whole class ²²⁵⁻²²⁷ |
| Goal/node mapping (relational frame kernel) | Reduce relapse or recidivism rates ^{228,229} Improve recovery ²³⁰ | Prevent use rates of alcohol, tobacco, and other drugs ^{228,231} Improve attainment of therapeutic goals ^{231,232} | Increase academic success or cognitive processes ²³³⁻²³⁶ |
| Omega-3 fatty acid supplementation (physiological kernel) | Treat depression, borderline and/or bipolar disorder ⁷⁰ Reduce autism symptoms ^{71,142} | Prevent emergence of psychotic episodes in prodromal adolescents ⁴⁷ | Improve children's cognitive performance and prevent behavioral disorders ^{69,237-239} |
| Public posting (antecedent kernel) | Reduce community illegal behaviors ^{100,101,120} | Improve problematic behavior in therapeutic settings ^{240,241} | Reduce impulsive or risky behaviors in general population ^{242,243} Improved academics ²⁴⁴⁻²⁴⁶ Promoting participation or community goods ^{247,248} |

POLICY ACTIONS

The IOM Report^{pp388-92} notes that other rich countries are far more advanced in applying prevention science, with the irony that most of the research for these efforts comes from the United States, and is even true for northern neighbors Canada. For example, the province of Manitoba established the Healthy Child Committee of Cabinet, which

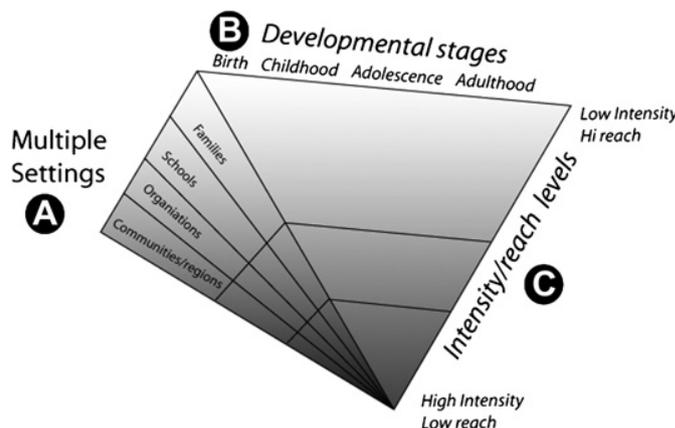


Fig. 1. Potential reach of evidence-based kernels for public health prevention effects. (Courtesy of PAXIS Institute, Tuscon, AZ; with permission. Available at: www.paxis.org.)

brought universal parenting support for the whole province as a true population-level, public health model using the Triple P model highlighted in the IOM Report. Norway has implemented the original parenting behavioral vaccine discovered in North America¹⁷⁴⁻¹⁷⁶ throughout the entire country,¹⁷⁷ which is probably one of the reasons why Norway has a lower national incidence of MEBs compared with other countries, as noted in the IOM Report.⁵ As injury-control research on car safety seats was translated into broad public policy years ago, so can prevention science involving evidence-based kernels for MEBs. A few policy actions exist that could make a big impact:

1. *Unleash Consumer Access:* Expand the scope of CDC and other health and/or prevention agencies, to deliver and promote evidence-based kernels or behavioral vaccine recipes, just as they promote medical vaccines for common childhood diseases. These agencies could facilitate and enable direct consumer access (eg, parents, teachers, business owners) to scientifically proven kernels or behavioral vaccines that can be easily adopted and implemented in homes, classrooms, and community settings. This process would follow along the same lines as those involving injury-control products that are now easily accessible consumer products and have clearly reduced injuries and deaths—from car seats, to latches, to nonslip rugs, to protective helmets, and so forth. The expansion of behavioral vaccines could include special calls for Small Business Innovation Research awards (SBIR) initiatives as well as special private sector incentives or state/local initiatives. Of note, not a single evidence-based program/practice on the NREPP is available at Amazon.com—the largest book store in the world.
2. *Create Third-Party Reimbursements:* HealthCare.gov (www.healthcare.gov/law/provisions/preventive/index.htm) notes some important inclusions and coverage about prevention in the Health Care Reform Act:

“Counseling from your health care provider on such topics as quitting smoking, losing weight, eating better, treating depression, and reducing alcohol use...”

Multiple evidence-based kernels cited in the Embry and Biglan 2008 article have such prevention effects.¹⁷¹ Thus, providers’ time taken to prescribe and recommend such kernels and the actual goods/materials/instructions ought to be reimbursable or otherwise covered.

“Counseling and guidance from your doctor about your child’s health development...” Because multiple evidence-based kernels and related behavioral vaccines actually improve the health outcomes, such kernels and services of the provider are logically reimbursable or otherwise covered.

“Special, pregnancy-tailored counseling from a doctor that will help pregnant women quit smoking and avoid alcohol use...” Again, multiple evidence-based kernels have clear evidence of those effects, noted in the review by Embry and Biglan. The time and related prescription for behavior change need to be covered, because these kernels are highly cost effective.

“Screenings and counseling to prevent, detect, and treat common childhood problems...” The IOM Report and the Embry and Biglan review clearly document low-cost kernels or behavioral vaccines that prevent or treat common childhood problems such as ADHD, oppositional defiance, anxiety, phobias, depression, aggression, and learning disabilities. By logic and legislative intent, such low-cost strategies when based in solid evidence ought to be fully covered and reimbursable.

“Immunizations like an annual flu vaccine and many other childhood vaccinations and boosters, from the measles to polio...” There are equally powerful

“behavioral vaccines,” and such behavioral vaccines are substantially less expensive and/or cost effective^{51,58,90} than any listed medical vaccine on the CDC Web site.

Make selected kernels or behavioral vaccines reimbursable in health-care reform just as childhood medical vaccines are. The United States government presently recommends that all children receive approximately \$2400 worth of medical vaccines (see www.cdc.gov/vaccines/programs/vfc/cdc-vac-price-list.htm), excluding the cost of promotion and delivery. The total costs of these medical vaccines to almost every child in the United States are paid for largely by third-party sources in the form of government or privately funded health care. In summary, cost-efficient kernels or behavioral vaccines in the IOM Report like Triple P, the Good Behavior Game, or supplementation of omega-3 deficiency can clearly prevent or reduce costly problems such as ADHD,^{51,64} oppositional defiance,^{51,64} conduct disorder,^{51,178} or psychotic disorders.^{47,48} Therefore, these cost-effective strategies must become reimbursable in the context of the reconciliation bill for Health-Care Reform passed by the US Senate. Quick deployment of these incentives gives patients and physicians or licensed caregivers additional, low-cost options, which could significantly affect health care costs quickly, as well as improve public indicators of wellbeing. It is useful to note that no prescription psychotropics, which are largely reimbursed by third parties, have been scientifically documented to prevent MEBs in children or adolescents. However, several evidence-based kernels or behavioral vaccines described herein have been scientifically proven in peer-reviewed, high-quality journals to prevent costly MEBs.^{47,49,54,55,57,59,64} Preventive childhood “behavioral vaccines” need to be on reimbursement parity with childhood medical vaccines, as do the kernels or behavior vaccines that are proven to reduce, abate, or stop the symptoms of MEBs. These kernels or behavioral vaccines need to be on parity with prescription medications for the same disorders, because there is compelling emerging evidence that such kernels or behavioral vaccines are often substantially more cost effective. Further, they are more correlated to positive outcomes with fewer measured adverse medical events (eg, sudden cardiac death, psychosis, suicidality, metabolic disorders, abuse of prescription drugs by others or self).^{38,51,55,58,59,90,179}

3. *Initiate Public/Private Prevention Mobilizations:* Key leaders (eg, governors, mayors, first spouses of high elected officials, CEOs, corporate boards, and other leaders) could convene these partnerships to facilitate focused community mobilization prevention efforts. When communities mobilize around clear, simple evidence-based prevention strategies for many or all, there is consistent evidence that rapid change in major outcomes can happen. This evidence comes from multiple sources including parenting literature,^{49,50,180,181} tobacco control literature,^{99,100,120} alcohol prevention efforts for communities,^{182–184} youth substance abuse,^{180,181} and health disparities efforts¹⁸⁵ as well as charitable activities such as United Way and Toys for Tots. Focused community mobilizations or projects are different than broad-capacity building or needs assessments efforts. Focused mobilizations or projects have clear objective goals and behavior-change strategies, rather than emphasizing developmental processes or attitudinal change. Successful focused mobilizations also avoid overt or accidental stigmatization by appealing to the broader good and not isolating those at risk or implying blame. Focused models are especially powerful when the risks are widely distributed and the harms or benefits are widespread, such as for the prevalence of most MEBs (including addictions) among children and youth. These public/private

partnerships leverage resources to contain the nation's most expensive problems, and reinforce and strengthen self-sufficiency rather than dependency.

4. *Use Proven, Powerful Marketing Campaign Strategies:* Collegiate and professional sports use powerful marketing strategies to engage many people, and these same strategies have powerful analogs in public health approaches for prevention. Media campaigns must urge people to join in common clear actions, rather than promote stigma, blame, fear, or mere "awareness." Campaigns must have highly publicized "scoreboards" of people joining and participating as well as goals being achieved. The campaigns must:

- Create a sense of belonging to something bigger and socially desirable
- Emphasize outcomes and measures that are visible or understandable to most citizens, not obtuse or infrequent measures
- Use "soft" competition between communities or groups to boost engagement in the goals
- Give everybody something to do that makes a difference (which can include cheering, wearing alignment symbols, and so forth).

Within the efforts, there are many opportunities for groups (businesses, individuals, organizations, and so forth) to be "sponsors" of the efforts. Further, such campaigns provide frequent rewards and recognition for change. These "social marketing" principles for prevention have been outlined in successful behavior-change studies.^{72,120} The campaigns must use powerful techniques that have previously demonstrated success, including:

- Testimonials¹⁸⁶
- "Tupperware" type events or "tell 2 friends" – which, interestingly, has even been used to market new tobacco products that the author and colleagues are trying to prevent¹⁸⁷
- "Mobbing" or "viral" methods with Internet media.^{187–190}

When these principles are used in prevention campaigns, very high levels of participation and behavior change are possible.^{50,72,118,120}

5. *Create Cost-Saving Estimators:* Every business plan includes a break-even analysis and a profit-and-loss analysis, but this simply does not happen with the prevention of MEBs (including addictions). It is true that the IOM Report includes a discussion of the benefits and costs of prevention (Chapter 9^{pp241–62}), as do other documents such as the *Shoveling UP Report*,¹⁹¹ which details the state-level burden of substance abuse. However, these documents are not sufficient for policy planning any more than reading an accounting textbook is sufficient for predicting the profitability of any given business per se, in the absence of a specific financial audit. While QALYS are used in academic literature, they are less useful for elected officials and the multiple agencies they govern when it comes to figuring out how to balance federal, state, county, or local budgets affected by MEBs. Policy makers need straightforward spreadsheet estimators (like one would find in a software package for a business plan) to show what the positive impact (costs averted or savings) might be across governmental agency budgetary silos. These spreadsheet estimators need to have sliders, which policy makers or their staff can easily adjust to examine different assumptions. These estimators are vital when considering prevention strategies because there are proximal, immediate, and distal benefits across budgetary silos.

Can this be done? The answer is yes. The population-level study of the effects of the Triple P study (see IOM^{P167} for description) funded by the CDC⁴⁹ provides an excellent platform for illustration. First, the effect sizes for child maltreatment are at a population level, meaning that one only needs to input population data and matching prevalence rates for any selected political jurisdiction—all of which are federally collected. Second, the costs of implementation are established in a peer-reviewed publication.⁹⁰ Third, collateral benefits across silos have been demonstrated in a peer-reviewed publication.⁵¹ Fourth, cost savings from problems prevented by Triple P have independent assessments.⁹¹ Accordingly, a demonstration of such an estimator has been created showing 3 benefit domains for each state, with adjusters for some assumptions. This estimator is visible and downloadable at www.paxis.org/triplep. **Figs. 2–4** illustrate a series of screen snapshots showing the impact on 3 specific outcomes associated with MEBs and the costs averted or saved using federally reported data: reduced substantiated cases of child maltreatment, reduced out-of-home placements of dependent children, and averted lifetime cases of conduct disorders (estimated from studies).

Businesses routinely develop profit-and-loss estimates and break-even analyses for new products that have not even been sold. It is also quite possible and realistic to develop similar estimators for proven and tested prevention strategies to guide policy and practice.

The estimator shows that the predicted prevention effects could avert many cases and save a great deal of money in the immediate term, with compounded long-term savings. The savings from reduced out-of-home placement alone would more than pay for the marginal costs of implementation. The impact on lifetime conduct disorders would solely have a major impact of billions of dollars on California public finances within 5 to 10 years.⁹¹

6. *Measuring Population-Level Impact of Major Public Health Initiatives: Academic and scientific journals are now filled with evidence-based prevention trials, almost all of them efficacy trials of individuals or schools. An efficacy trial, however, is deliberately designed to insulate both the strategy and subjects (persons or settings) from the vicissitudes of real-world conditions (policies, program staffing,*

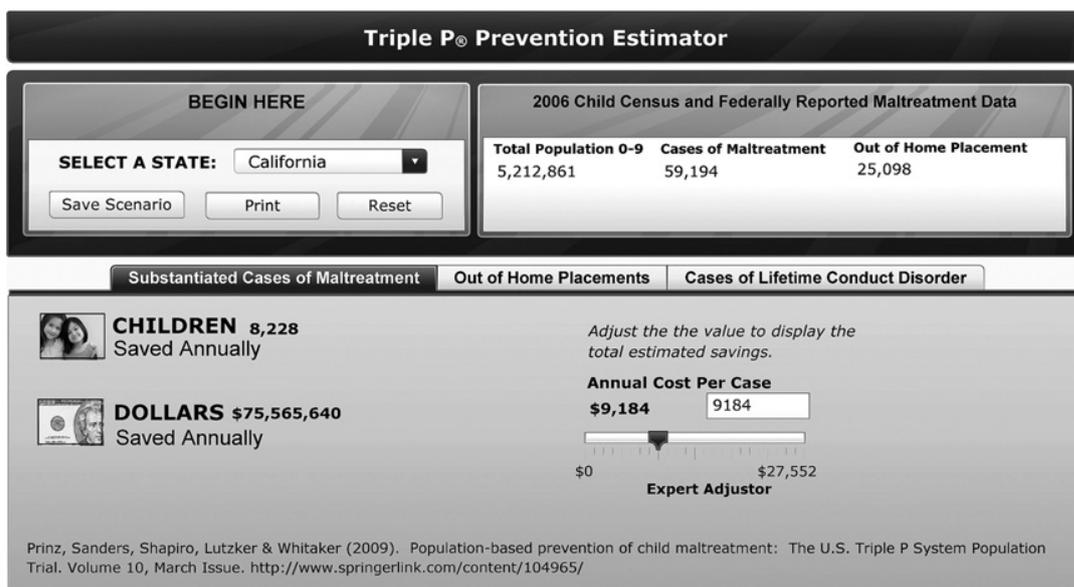


Fig. 2. Impact estimator on substantiated child maltreatment. (Courtesy of PAXIS Institute, Tuscon, AZ; with permission. Available at: www.paxis.org.)

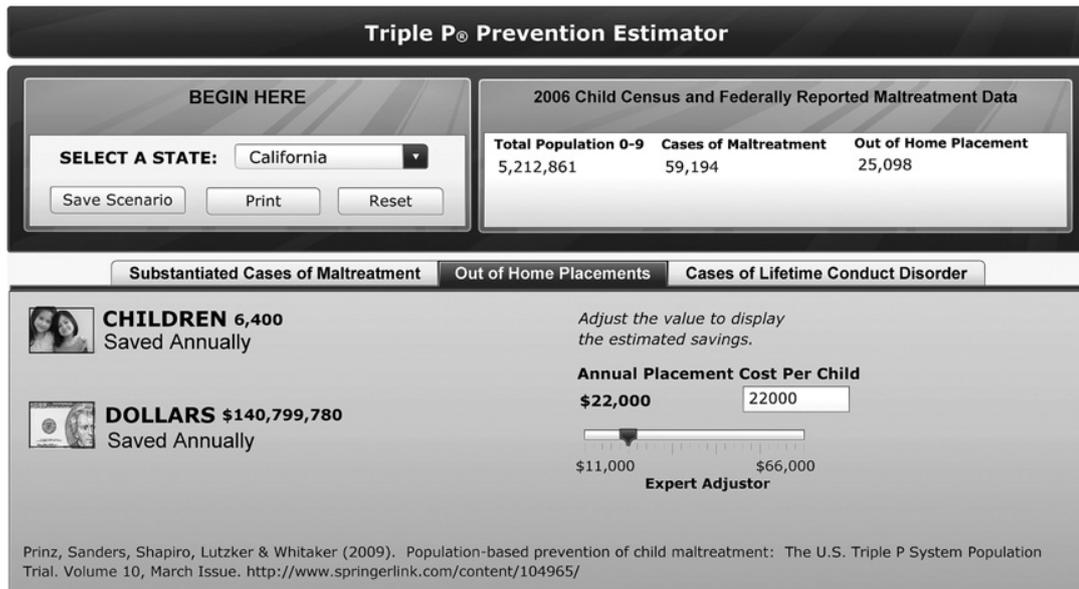


Fig. 3. Impact estimator for out-of-home placements. (Courtesy of PAXIS Institute, Tuscon, AZ; with permission. Available at: www.paxis.org.)

resources, management issues, and so forth) that might affect the main factors being tested. That said, stunning results in exquisite efficacy trials do not guarantee similar or desired results in other effectiveness trials, which has been demonstrated in a variety of controlled prevention studies.^{192,193} Efficacy trials of prevention protocols may show proximal changes on knowledge, attitudes, and some behaviors, yet not show any impact on “big-ticket” outcomes sought by policy makers when put in a large-scale effectiveness trial.¹⁹⁴ There are many sound reasons for this frequent finding:

Early randomized trials with simple pre- and post-test data alone will seriously underestimate natural and structural sources of variability associated with effectiveness. For example, efficacy trials often buy off in-service days, give teachers cash incentives, and offer exemptions from normal organization requirements. A few measures will not allow the investigators to see

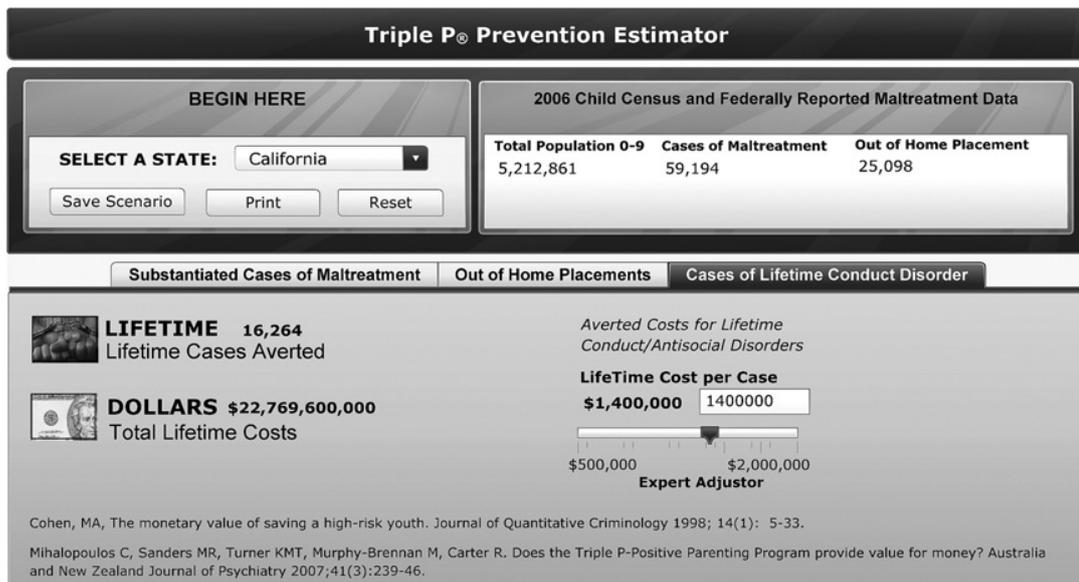


Fig. 4. Impact estimator on lifetime conduct disorders. (Courtesy of PAXIS Institute, Tuscon, AZ; with permission. Available at: www.paxis.org.)

confounding influences, such as new policies, rules, or other events. Thus, the experimental design masks important externalities and contingencies. Failure in the “real world” is then almost certain.

Studies using repeated measures (eg, hourly, daily, weekly, or monthly) in reversal or multiple baseline experimental designs, however, do allow identification of naturally occurring contingencies and externalities. Virtually all of the best preventive interventions in the IOM Report (eg, Triple P, Good Behavior Game, Incredible Years, Parent Management Training) all have very powerful histories of reversal designs or multiple baselines BEFORE they were evaluated in randomized trials. These designs are not well covered in most textbooks in graduate schools, and are often labeled as inferior by labels such as “quasi-experimental.” There is, however, a fundamental truth: if you cannot demonstrate experimental effects in an interrupted time-series design (reversal, multiple-baseline, multicomponent, or multi-probe design),^{195–198} a randomized trial will almost certainly show no effects, weak effects or, worse, adverse effects. There are sound logical, epidemiological, methodological, and practical reasons to measure early effects by such designs—especially when the ultimate intent is for large public health approaches.^{131,133,199} After such proof, efficacy trials are more likely to have robust effects when brought to scale.

Interrupted time-series designs (which can also be randomized) reemerge when it comes time to test big effects across big political units (eg, counties, states, or provinces). Such political units of analysis are important for public health and policies. It is theoretically possible to randomize such political units, but obviously difficult. In some cases, it will be impossible for legal or ethical reasons. One can then turn to interrupted time-series designs for measuring prevention outcomes at population levels. Wagenaar and colleagues proved the utility of such designs for community-level alcohol use prevention.^{134–137,200,201} Anthony Biglan and the author have used such designs for a multiple-baseline study across states using archival data collected under the direction of the Federal Government.

In **Fig. 5**, one can see the effects of R&R for not selling tobacco in Wyoming and Wisconsin. The author’s group replicated this earlier in an interrupted time-series and randomized trial in small communities in Oregon.^{100,101} In **Fig. 6**, one can also see the correlated impact of R&R on cigarette smoking, measured by the CDC’s YRBS survey, among Wyoming and Wisconsin adolescents. The time series design also allows for an analysis of other contextual events, such as the \$1 per pack tax increase in Wisconsin on smoking every day (but not on any smoking in the last 30 days). Because governments and agencies can rarely roll out a program in every large jurisdiction effectively, the use of interrupted time-series designs allows for a reasonable contextual approach to evaluating public health approaches to prevention. Another advantage of these designs is that the results are easy to convey to elected officials, policy makers, the general public, and the media.

ECONOMIC IMPACT

The United States and Canadian federal governments, state or provincial governments, local governments, businesses, and citizens or taxpayers have much to gain by widespread implementation of behavioral vaccines and kernels. For example, most states could recover the cost of implementation in 2 years by reducing expenditure for child maltreatment.^{51,90} In the course of 2 to 5 years, there should be lower

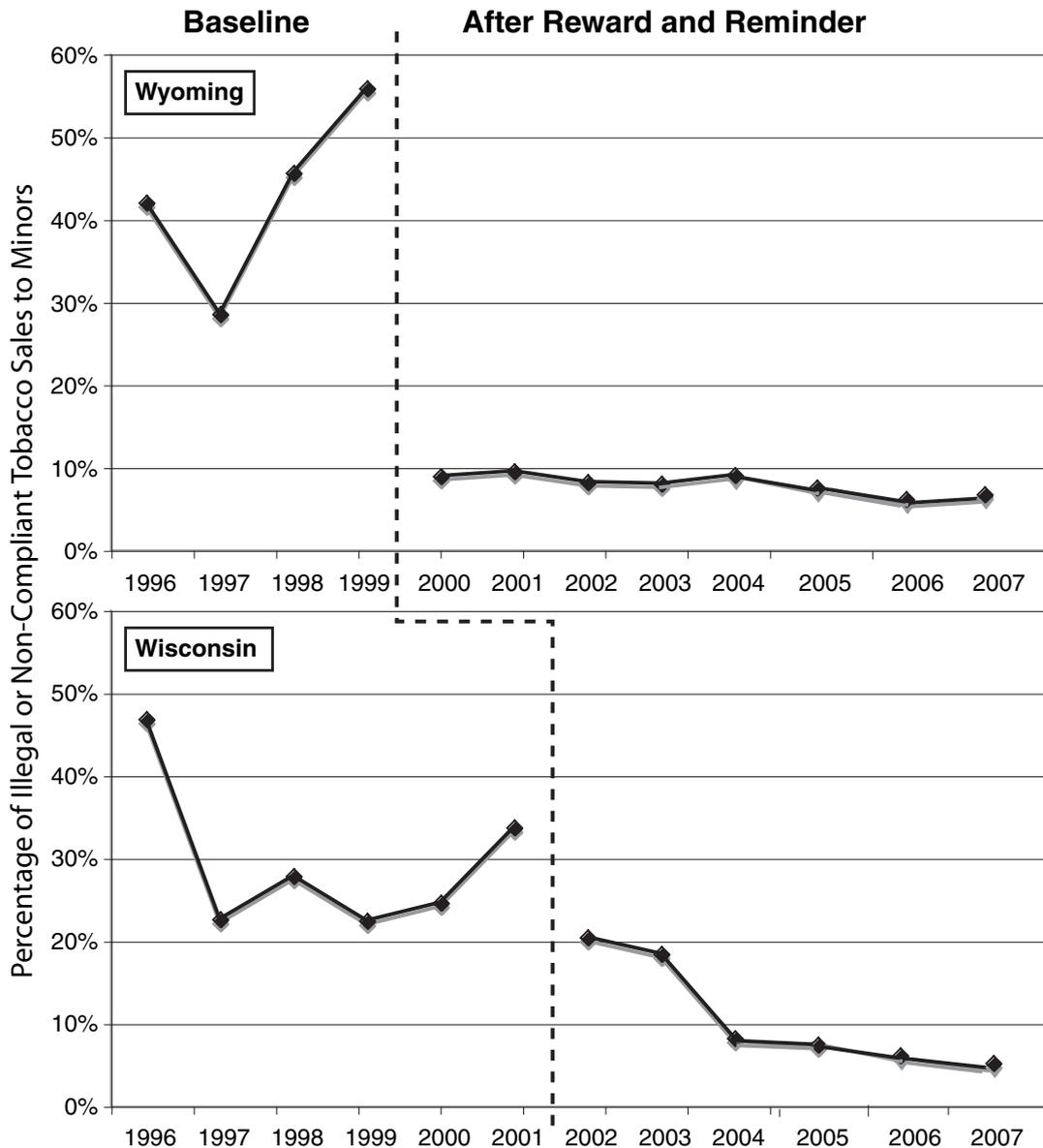


Fig. 5. Impact of reward and reminder on illegal tobacco sales across states. (Courtesy of PAXIS Institute, Tuscon, AZ; with permission. Available at: www.paxis.org.)

rates of DSM-IV (*Diagnostic and Statistical Manual of Mental Disorders* Fourth Edition, Text Revised) diagnoses and prescription for psychotropic medications in the pediatric population.^{47,51,64,70,178,202} Over the course of a decade, school districts could potentially cut their special education expenditures by one third, because fewer children would need such services.^{44,47,51,54,69,71,142} Over the course of the same decade, the juvenile and adult criminal justice system would see lower drug-related crimes and violent crime rates, including homicides.^{38,39,51,57,59,203–206} Communities would see lower rates of tobacco use in youth in 5 to 7 years^{60,207,208} as well as reductions in alcohol and illegal drug use by adolescents and young adults in 5 to 10 years.^{56,57,59,209,210} All of these changes translate into reductions of short-, medium-, and long-term health care, education, social service, and public safety costs.

Costs of Risky Behaviors

By any calculation imaginable, the costs associated with risky human behaviors from childhood through adulthood are the deepest well of private and public expenditures in the United States (IOM^{pp251–3}) and many industrialized nations. This well of despair

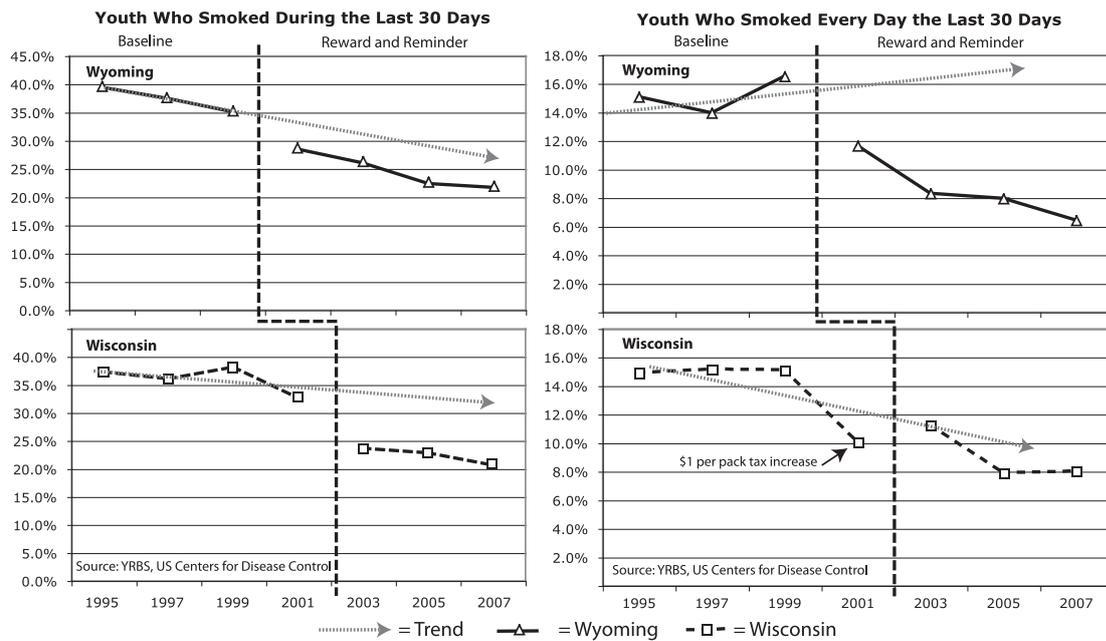


Fig. 6. Impact of reward & reminder on youth tobacco use across states. (Courtesy of PAXIS Institute, Tuscon, AZ; with permission. Available at: www.paxis.org.)

includes violence, addictions, mental illnesses, obesity, many cancers, cardiovascular diseases, unintentional injuries, and more. Consider just this one quotation from the IOM report²⁵²:

Miller (in Biglan, Brennan, and colleagues, 2004) provides a much higher estimate of \$435.4 billion in 1998 (\$557.3 in 2007 dollars) for the costs of problem behaviors among youth, defined as underage drinking, heroin or cocaine abuse, high-risk sex, youth violence, youth smoking, high school dropout, and youth suicide acts. More than half was attributable to suffering and quality of life, with the balance consisting of work losses, medical spending, and other resource costs. Averaged across all youth, this would be an average cost of \$12,300 per youth ages 12–20 (\$15,744 in 2007 dollars).

The IOM gives an alternative, lower estimate (IOM²⁵¹), suggesting that the total annual economic costs for MEBs of people younger than 25 are roughly \$247 billion as of 2007 (in 2007 dollars), or about \$2380 per person younger than 25 years. This per-person total includes about \$500 in health service costs and \$1900 in health, productivity, and crime-related costs.

Total Annual Cost Burden

The total cost burden of MEBs therefore almost certainly ranges from \$250 to \$500 billion per year for young people in the United States alone. This situation is not good for North America’s future and global competitiveness, when one considers that base rates for many such disorders are worse than other rich countries that compete against the United States. This burden is particularly acute for the more expensive problems involving disturbing, disruptive, aggressive, and criminal behaviors.^{7,36,37}

Cost-Burden Silo Example

Let us examine the cost of just one of the MEB “silos”, ADHD. Children who manifest early ADHD (about 3%–7% of children in the United States) have high probability of school failure or learning disabilities^{211,212}; intentional and unintentional injuries^{213,214};

conduct disorders, crime, and delinquency²¹⁵; alcohol, tobacco, and drug addictions²¹⁶; development of other serious mental illnesses such as bipolar disorder or other mental illnesses²¹⁷; increased cancer risk²¹⁸; sudden cardiac death²¹⁹; work-related problems²²⁰; and difficult social relationships in marriage and child-rearing as adults. The behavioral footprints of ADHD help explain its fiscal footprints.

In the United States in 2003, the direct cost of Medicaid attributable to children with ADHD was \$2.15 billion dollars annually—about 2% of all health care costs for children.²²¹ However, this is an underestimate of national costs. An analysis by a private insurance company suggests the total excess cost of ADHD in the United States in 2000 was \$31.6 billion. Of this total, \$1.6 billion was for the ADHD treatment of patients, \$12.1 billion was for all other health care costs of persons with ADHD, \$14.2 billion was for all other health care costs of family members of persons with ADHD, and \$3.7 billion was for the work loss cost of adults with ADHD and adult family members of persons with ADHD. Pelham and colleagues,¹⁵ using a conservative prevalence rate of 5%, computed the annual societal cost of illness for ADHD in childhood and adolescence at \$42.5 billion, with a range between \$36 billion and \$52.4 billion. Their estimates are preliminary because the literature is incomplete; many potential costs have not been assessed in extant studies.

There are now multiple behavioral vaccines and evidence-based kernels that prevent, reduce the symptoms, or avert the sequelae of ADHD,^{43,51,54,59,60,64,71,171} at a far lower cost and risk of adverse medical consequences. Those behavior vaccines or kernels, all together, do not rise to the cost of 1 or 2 months of therapy on any of the psychotropic drugs being used with ADHD-diagnosed children or youth.

SUMMARY

Policy and practice for the prevention of MEBs (which includes addictions) must include a public health approach to reach all children, families, and communities; this is one of the key messages of the IOM Report. The response to unique individual, family, school, neighborhood, or community risk factors will be most cost efficient, if the “pump handle of John Snow” for the contaminated well that serves all is removed first. This action must happen before implementation of special interventions that might be needed for those more vulnerable to the contaminated water.

The IOM Report¹ clearly outlines that we have a public health problem of MEBs, and a public health approach to affect all children and youth is required to move the population-level indicators. The population-level public health approach often remediates the most difficult problems and difficult instances in controlled studies,^{49,50} which then lessens the costs of reaching higher-risk groups. In this spirit, the IOM Report wisely calls on America to move from a “treatment-oriented” approach to prevention to a true public health approach, wherein prevention is available for every child, family, school, or community to prevent MEBs, including addictions. Evidence-based kernels and behavioral vaccines offer a unique opportunity for the prevention of MEBs to happen at a public health level. The fact that kernels can be used for universal, selected, and indicated prevention represents considerable cost efficiencies. Psychiatrists, physicians, mental health professionals, school counselors, juvenile justice professionals, and others can clearly make use of evidence-based kernels for selected or indicated prevention. An even larger number of parents, teachers, and others can use kernels to improve the odds for children, youth, and young adults.

The time to act is now: the IOM Report outlines the compelling reasons to expand prevention in North America.¹ There is an urgent need for the health of the nation, given epidemiological trends. There is an economic necessity for safety and security of the

Republic. While our most potent economic competitors are already acting for their immediate and long-term benefit, there are promising pathways for action via health care reform and related initiatives. The true wealth of a nation derives from the health of all the minds, bodies, spirits, and behaviors of its children and youth. Let us act for all our futures.

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