



# Analysis of the Benefits and Costs of CalMHSA's Investment in Applied Suicide Intervention Skills Training (ASIST)

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**S**uicide and suicide attempts are a substantial societal burden in the United States. Nationally, there were approximately 41,000 suicide deaths (a rate of 13.0 suicides per 100,000 people) in 2013 and 836,000 emergency department visits resulting from suicide attempts in 2011 (Centers for Disease Control and Prevention, 2015a). Suicide is a leading cause of death in the United States, especially among 15- to 24-year-olds (American Association of Suicidology, 2014), and the annual economic costs of suicide deaths nationwide are high: Estimates put this figure at \$34.6 billion in combined medical bills and lost wages (Centers for Disease Control and Prevention, 2012).

Preventing suicide in California is one of the three primary initiatives of the California Mental Health Services Authority (CalMHSA). CalMHSA's statewide suicide prevention initiative, part of the prevention and early intervention program funded by the Mental Health Services Act (Proposition 63) of 2004, includes activities and tools that target and support Californians at risk for suicide. Training and educational programs are a key component of this initiative. In partnership with LivingWorks Education (LWE), a suicide intervention training company, CalMHSA offered a training-for-trainers (T4T) course in Applied Suicide Intervention Skills Training (ASIST), an intensive two-day suicide intervention workshop, from 2011 to 2013. This course prepared individuals to conduct ASIST workshops, thereby building suicide prevention capacity within a community. ASIST is a form of gatekeeper training that teaches participants—community members such as clergy, first responders, teachers, and other “gatekeepers” who are likely to come in contact with people at risk of suicide—how to recognize suicide risk factors and how to intervene to improve immediate safety and link at-risk individuals to appropriate resources. The ASIST program was chosen because of evidence supporting its effectiveness in improving the confidence of participants to intervene with high-risk individuals (LWE, 2013).

In 2011, the RAND Corporation was asked to design and implement an evaluation of CalMHSA's three prevention and early intervention initiatives. As part of this ongoing evaluation,

we are estimating the financial return for investments in key program components, including suicide prevention. Using data collected during CalMHSA's ASIST efforts, as well as outside estimates of the effectiveness of ASIST and similar programs, we have calculated the possible economic benefits to California for each year of CalMHSA's investment in ASIST. We estimated the possible reductions in suicide attempts resulting from investment in suicide intervention training, then estimated the financial return to Californians from reduced medical costs associated with suicide attempts as well as increased earnings from each life saved.

## Key Findings

We estimate that California will benefit from CalMHSA's investment in ASIST in multiple ways: fewer suicide attempts and deaths, reduced spending on emergency care and recovery, and increased earnings. After calculating the associated state income tax revenue from increased earnings and the state government's portion of reduced health care spending, we project a positive financial benefit for the state government.

Because few studies have quantified the effectiveness of gatekeeper training programs such as ASIST on the outcomes we evaluated, we cannot precisely quantify the benefits of this program. Under reasonable assumptions of effectiveness based on existing research literature,<sup>1</sup> we estimate that for each year of CalMHSA investment in the ASIST T4T program at least 3,600 suicide attempts and 140 deaths will be prevented over the next 28 years. This represents a reduction of 0.13 percent in the number of suicide attempts and deaths.<sup>2</sup> We project the financial benefits of averting these attempts and deaths to be \$1,100 per dollar invested in ASIST by CalMHSA; these benefits include savings in medical costs and increased earnings. When we examined the financial gains to the state government alone, we estimated \$50 per dollar invested in ASIST training.

A macroeconomic cost-benefit analysis of a policy intervention can never be as complete as a narrow cost-benefit analysis of, say, a company's investment in a new machine. When a company calculates the financial return for investing in a machine,

the costs and benefits are internal to the company’s finances—a completely measurable microeconomic universe. However, once we apply this calculation to a macroeconomic universe (beyond the internal budgets of CalMHSA or the California state government, for example), the societal effects of CalMHSA’s investment in suicide prevention ripple forever outward and could indirectly affect every human being on Earth for decades into the future. In other words, it is always unrealistic to expect to capture all economic effects in a cost-benefit analysis of suicide prevention.

Therefore, this analysis of costs and benefits is designed to be comprehensible and informative, rather than exhaustive. Quantifying the relationship between CalMHSA’s investment in ASIST and California’s gain in wage employment, tax revenues, and averted medical costs will help policymakers put these investments into perspective.

### Methods

There are a number of challenges inherent in estimating the financial benefits of a training program like ASIST: choosing important outcomes that can be quantified and monetized; finding evidence of changes in these outcomes directly caused by the investment in training; defining the relevant time frame over which to assess the benefits and costs; and defining the relevant level of aggregation. This section describes our methods for addressing these challenges.

### Outcomes

Many of the most important outcomes of a suicide prevention program—increased confidence to intervene and decreased suffering for loved ones—are not financial. A financial analysis can evaluate only outcomes that can be quantified and monetized, and it is therefore, by its nature, limited in scope. Figure 1 illustrates the conceptual model we used to select outcomes. We focused on two types of outcomes: short-term and long-term. The short-term outcomes are the number of ASIST trainers trained and the number of people they then train during their tenure as trainers. The long-term outcomes are reductions in suicide attempts and suicide deaths. All these outcomes can be quantified, though none has a direct financial value. What is the value of a saved life in dollars? Even so, we can identify certain financial outcomes associated with suicide attempts and deaths and thus can provide an estimate of the value of these long-term outcomes. For example, when people attempt suicide, they inflict bodily harm that often leads to hospitalization and/or death. When attempts are averted, hospitalizations do not occur (medi-

cal costs are averted), and employment may continue (incapacitation from death or from severe injury is averted). Following other studies of the financial costs of suicide, we focused on wages earned and medical costs averted to provide an estimate of the financial benefits of ASIST (Goldsmith et al., 2002; Safe Work Australia, 2012; Trent, 2014). Our estimate of the financial benefits of suicide prevention is a lower-bound estimate because many important benefits of suicide prevention do not have monetary value, and we were limited to outcomes that can be monetized. For example, we did not factor in the value of decreased suffering for loved ones. Instead, we compared the costs of a one-year investment in ASIST to changes in wages and medical costs associated with decreased suicide attempts and deaths. We also addressed the tax implications of these changes in wages.

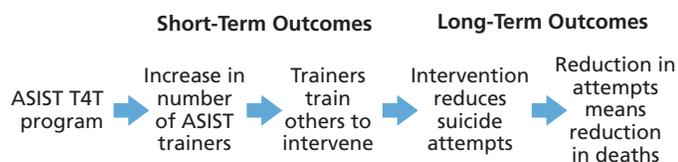
### Study Time Horizon

The data used in this analysis are from the ASIST T4T courses that CalMHSA delivered in the three fiscal years of 2011–2012, 2012–2013, and 2013–2014. A database tracking these “first-generation” ASIST trainers (the type of trainers who go on to train other trainers, and the type that CalMHSA sponsored) indicates that, on average, these first-generation trainers will lead ASIST workshops over the course of three years, and some will lead workshops for as long as 14 years. We assumed that people who complete these second-generation ASIST workshops (led by first-generation trainers) will then go on to work with vulnerable populations for an average of ten years. So, for example, a first-generation trainer who took the T4T course in 2014 would train a second generation of trainers through 2028, and a second-generation trainer who was trained in 2028 would work with vulnerable populations until 2038. Therefore, CalMHSA’s original cohort of first-generation ASIST trainers is assumed (directly and indirectly) to reduce suicide attempts during the years 2011 through 2038. This same period also covers all calculations related to the medical costs of suicide, since most of these costs occur at the time of the suicide attempt.

On the assumption that the average worker retires at age 65, theoretically, the last person affected by CalMHSA’s initial investment in ASIST would be 15 years old in 2038 and would retire in 2087. Thus, people benefiting from the original cohort of ASIST trainers could earn wages and pay taxes from 2011 through 2087.

These time frames made present value calculations particularly significant: Discounting the benefits occurring in future years to their present value allowed us to take into account the time value of money. All of the costs to CalMHSA occurred between the years 2011 and 2014, while most of the benefits will occur decades into the future. We discounted all these future benefits using a 3-percent annual discount rate<sup>3</sup> because receiving benefits sooner is better than receiving benefits later—not only because of inflation but also because of the opportunity cost of interest on any money invested over the same period. This time value of money causes, for example, an estimated \$136 million

**Figure 1. Simplified Conceptual Model for ASIST Outcomes**



in future nominal wage benefits of averting suicide deaths to discount to a present value of \$76 million.

We also assumed that the ASIST program benefits people between the ages of 15 and 65. We used this age range because the Centers for Disease Control and Prevention publishes data on actual suicide deaths in California only for decedents aged 15 to 64, and also because ASIST-trained personnel mostly engage vulnerable people aged 15 to 64. This assumption affects only wage income and tax calculations for people who avoided death or full incapacitation because a suicide attempt was averted.<sup>4</sup>

### The Investment Cost of ASIST

For the purposes of this study, the investment in ASIST included payments that CalMHSA made from fiscal years 2011–2012 to 2013–2014 to LWE to train ASIST trainers. The investment costs also included the portion of CalMHSA employees' salaries and benefits that covered CalMHSA's management of the ASIST under LWE. Since we present our results in terms of benefits per year of investment, we used the average annual spending over the three years as our estimate of the annual cost of training.<sup>5</sup>

### Estimating the Reach of ASIST

We know from LWE records that CalMHSA's investment produced, on average, 79 ASIST trainers per year. LWE's historical data indicates that the average trainer will teach 150 people in ASIST workshops over the course of 14 years. We assumed that each of these 150 trainees will then actively engage vulnerable populations for an average of ten years. This means that, taken together, the 79 trainers will teach suicide intervention techniques to a total of almost 12,000 people.

### Estimating the Number of Averted Suicide Attempts

Estimating the number of suicide attempts that these 12,000 trainees may help to avert was difficult. As one literature review aptly put it: "Reducing suicide attempts and deaths [is] the ultimate aim of suicide prevention programs, but, due to methodological restrictions, they can be difficult or impossible to measure reliably" (Rodgers, 2010). One of the primary challenges is the time needed to measure the impact of the ASIST program, which, as we described earlier, could last until 2087. We were therefore unable to say with much certainty how many suicide attempts and deaths could be prevented by this program.

Most of the research on the ASIST program has focused on the impact of the workshop on a trainee's confidence to intervene, rather than on estimating reductions in suicide attempts. One study found that ASIST workshops significantly enhanced suicide intervention outcomes among suicide hotline counselors (Gould et al., 2013). Other researchers have studied the impact of a similar program—QPR (Question, Persuade, Refer) Gatekeeper Training for Suicide Prevention—at 32 secondary schools and found that training increased staff suicide identification behaviors, knowledge, and perceived preparedness (Wyman et al., 2008). Only one study has looked for evidence of an ASIST-specific effect on attempted suicides. This study found that ASIST

trainees helped to avert more suicides than staff who did not participate in training—at least in the context of Virginia secondary schools (Cornell, Williams, and Hague, 2006). However, there are some serious limitations to the Virginia study, and we have supplemented its effect-size estimates with estimates of other similar suicide prevention programs.

Since we did not have a reliable study of the impact of ASIST itself on suicide outcomes, we looked for evidence of the impact of gatekeeper training in general. A study of another secondary school-based gatekeeper training curriculum, called Signs of Suicide (SOS), estimated the reduction in suicide attempts among students exposed to the program (Aseltine et al., 2007). Both the SOS and the Virginia studies focused on schools only, whereas our analysis attempted to quantify the impacts of a much broader range of ASIST trainees, including police, suicide prevention hotline staff, and so on. A large-scale suicide prevention initiative within the broad population of the U.S. Air Force featured gatekeeper training programs like ASIST, but we were unable to convert the effect size of this evaluation into effect per trainer because the Air Force initiative included more than just gatekeeper training programs, and the details of the intervention did not include the number of trainers. Also, generalizing from a military population to the full California population presented methodological challenges (Knox et al., 2003).

With these caveats in mind, we chose the SOS study as our primary source of data on the effectiveness of a gatekeeper training program like ASIST. That study, a randomized controlled study, documented a 34.8-percent reduction in self-reported suicide attempts between the control group and the group enrolled in health classes led by SOS-trained teachers. Assuming that it took one teacher per 30 students to produce this effect, and using California state data on youth suicide attempts applied to this cohort, we calculated that each SOS-trained teacher helped to avert 0.03 suicide attempts per year (see Table 1).<sup>6</sup> This is our estimate of the effectiveness per trainee of gatekeeper training programs like ASIST.

We know from LWE data collected at ASIST workshops that ASIST trainees work at schools, hospitals, churches, suicide-prevention organizations, military organizations, and many other places. Given these job categories, and using the general attrition rates observed by LWE among prior ASIST trainees, we assumed that the average second-generation ASIST trainee will use his or her suicide intervention skills over the course of ten years, and will thus prevent an estimated total of 0.3 suicide attempts (0.03 per year, times ten years). Using these calculations, every 100 ASIST-trained workers would help to avert 30 suicide attempts during the time they engage their vulnerable populations.

This is a rough estimate that takes into account the fact that some ASIST trainees will retire or change employment (attrition) and that some individuals and members of some professions will engage a higher number of vulnerable people than will others (intensity).

**Table 1. Translating SOS Study Results to Impact per ASIST Trainee**

	Serious Suicide Attempts Among High School Students <sup>a</sup>
Teachers do not have gatekeeper training	5.1
Teachers have gatekeeper training	3.3
Difference <sup>b</sup>	1.8
Difference per teacher <sup>c</sup>	0.03

<sup>a</sup> Requires visit to emergency department and/or hospitalization for treatment. Rate based on California Department of Public Health data for high school-age children.

<sup>b</sup> This represents a 34.8-percent reduction in attempts among teachers with gatekeeper training.

<sup>c</sup> This assumes a 30:1 student:teacher ratio.

It is estimated that the Air Force suicide prevention initiative reduced suicides by 33 percent. It is reassuring that both the Air Force and SOS initiatives produced similar rates of reduction in suicides for their respective populations; however, we did not have the same information on the number of gatekeepers trained or the number of members of the Air Force that each trainee had contact with, so we could not estimate the same per-trainee impact that we could for the SOS study.

The Virginia study estimated that, on average, every person who attended an ASIST workshop would prevent 0.5 suicide attempts in each year that he or she engages with vulnerable populations (Cornell, Williams, and Hague, 2006).<sup>7</sup> We have concerns about the validity of these estimates because of the limitations of that study. The treatment and comparison groups were not randomly assigned; the comparison students were chosen based on convenience. Given the weakness of the study design, the impact observed cannot be cleanly attributed to ASIST training. Because of this limitation and because the impact was estimated to be much larger than observed in any other gatekeeper training evaluation, we did not believe that the Virginia study was the best source for our projections. We therefore focused on projections using estimates from the SOS study.<sup>8</sup>

### Estimating Additional Short-Term Outcomes

After estimating the impact of CalMHSA’s investment in ASIST T4T on suicide attempts, we next estimated changes in the number of suicide deaths. On average, one out of every 25 suicide attempts in the United States will result in death (Drapeau and McIntosh, 2014). Assuming this ratio holds steady, if an ASIST trainee prevents 25 suicide attempts, he or she also prevents one suicide death.

We also project changes in the number of lost workdays. Using World Health Organization data cited in a recent suicide prevention costing study,<sup>9</sup> we divide the 24 nonlethal suicide attempts into those that result in minor physical injuries and those

that result in incapacitating (major) physical injuries. According to this study, 17 percent of nonfatal suicide attempts result in full incapacity, while the remaining 83 percent result in minor injuries and short absences from work (Doran and Ling, 2014).

### Wage Benefit Calculations

Our model distributes all people whose suicide attempts were averted across the age and sex spectrum of California’s actual reported suicides (Centers for Disease Control and Prevention, 2012). We then identified two groups: those who died or were incapacitated, and those who were not incapacitated. For those who will never work again (because of death or incapacitation), we calculated average lifetime wages earned, adjusted for age, sex, unemployment, death by other causes, and the time value of money (Lawrence et al. 2011). For all others, whose suicide attempts did not significantly affect their ability to work, we calculated a day’s lost wages for each person’s age and sex income group (Safe Work Australia, 2012).

To estimate the present value of the lifetime wages earned by thousands of people whose fatal or incapacitating suicide attempts were averted, we first assigned the wages earned by each person in each age and sex cohort, based on median weekly earnings data in the United States by age and sex from the Bureau of Labor Statistics (2014). As each cohort advances in age, its members enter higher wage-earnings brackets until leaving the workforce at 65. We adjusted (deflated) the number of people by their life expectancy, based on the national expected survival life table (National Cancer Institute, 2000) adjusted for California’s racial mix (U.S. Census Bureau, 2015). Then we deflated this number by America’s U-6 unemployment rate of 11 percent and assume this unemployment rate going forward (Bureau of Labor Statistics, 2015).<sup>10</sup> These adjustments significantly deflated the future wages earned by people whose death or incapacitation by suicide was averted, because many of them will die of other causes or will remain unemployed for other reasons. Finally, we discounted all wages to their value in 2015 (present value) using a 3-percent annual discount rate. A more detailed description of our method is available in the Appendix.

### Tax Benefit Calculations

Tax benefit calculations are a subset of the same wage benefits described above.<sup>11</sup> We broke out California state government tax revenues (the expected California income tax receipts from each age- and sex-specific cohort of wage earners whose suicide attempts were averted) because focusing solely on the state government’s finances can be useful for certain fiscal analyses and state budget preparations. As with wage benefits, these tax estimates took into account age, sex, unemployment, death by other causes, and the time value of money for each cohort of taxpayers.

There are additional benefits that taxpayers may receive from suicide prevention. Other studies have focused, for instance, on taxpayer-financed resource savings (averted government expenditures; see Lee et al., 2012, and Trent, 2014). In the case of averted

suicides, taxpayers could save money as a result of decreased publicly funded medical costs. We explore this topic further at the end of the next section.

### Medical Benefit Calculations

Whenever a fatal suicide, a physically incapacitating suicide attempt, or a suicide attempt resulting in a minor physical injury is averted, some short-term medical costs are also averted. In this study, we counted these averted medical costs as a benefit of suicide prevention. This entailed estimating the average short-term medical costs incurred in each of the three suicide scenarios just described, and then multiplying that cost by the estimated number of averted suicides and suicide attempts within each scenario.

At least two studies have estimated the costs associated with each of these three scenarios: one used Australia-specific data (Safe Work Australia, 2012) and the other used California-specific data (Trent, 2014; see Table 2). A more-detailed description of our method is available in the Appendix.

It is reassuring to note that both of these studies produced roughly similar estimates. For the discrepancies that do exist, there are many possible explanations, including differences in the study populations' suicide behaviors and differences in the medical costs by region. Because our study focused on a California-based investment, we used only the California estimates in our calculations. As we did for our lifetime earnings calculations, we discounted all averted medical costs to their present value.

Some portion of the averted medical costs associated with suicide prevention are costs that the state of California would have paid through Medi-Cal, California's Medicaid health care program. We estimated these averted Medi-Cal payments using age- and sex-specific emergency department data from California hospitals, as reported in 2009 and 2010 to the California Office of Statewide Health Planning and Development. Based on these data, and also taking into account the gender and age spectrum of actual suicide attempts in California, we calculated that Medi-Cal pays for 25.43 percent of all medical costs associated with suicide attempts. Because California pays one-half of all these Medi-Cal bills (the federal government pays the other half), we estimated that 12.7 percent of all averted medical costs related to suicide prevention will benefit the California state government.

**Table 2. Summary of Suicide Medical Cost Estimates**

	Australia	California
Suicides resulting in death	\$2,899	\$4,116
Suicide attempts resulting in medical incapacitation	\$13,235	\$11,023
Suicide attempts resulting in minor injuries	\$495	\$1,599

NOTE: All values in 2015 U.S. dollars.

### Impact Estimates

In 2015 dollars, we estimated that CalMHSA's annual investment costs in ASIST averaged just over \$350,000 (Table 3).

We estimated that one year of CalMHSA's investment in ASIST may help to avert 3,569 suicide attempts over the next 28 years, of which approximately 143 would have been fatal and 581 would have been otherwise incapacitating (see Table 4). Our projections indicate that averting these suicide attempts produces a present-value benefit of \$386 million in future wage income and \$8.6 million in averted medical costs. Taking into account that an original investment of only \$356,000 produced these results, the benefit-to-cost ratio is 1,108. From society's perspective, that's roughly \$1,100 returned for each dollar invested. From the more narrow perspective of the California state government, approximately \$50 will be returned to state coffers for every dollar invested in ASIST. Table 4 illustrates these calculations.

### Discussion

By combining the best available outside evidence of the effectiveness of gatekeeper training with data from LWE specific to its ASIST program, we have estimated some of the potential benefits to California of CalMHSA's investment in suicide intervention training. Despite conservative estimates of the effectiveness of gatekeeper training, we project that CalMHSA's investment in ASIST T4T will lead to a reduction in suicide attempts and deaths over the next 28 years and will yield a large financial return to the state.

Our projections are based on the ability of three second-generation trainees to prevent just one suicide attempt over ten years. This yields our estimated return to the state government of \$50 for each \$1 invested. In fact, the actual effectiveness of ASIST could be much lower and still yield a positive impact in terms of suicide outcomes and financial benefits to the state. We estimate that the actual effectiveness of ASIST could be one-fiftieth the effectiveness we have assumed in our projections, and the state government would still break even on its investment. This means that if the actual effectiveness of ASIST is as low as one prevented suicide attempt per 160 second-generation trainees, the state government would still get back at least \$1 for each \$1 invested. This is on top of the nonmonetary benefits of averted suicide attempts and deaths.

**Table 3. Summary of Investment Costs for ASIST T4T**

	FY 11/12–13/14 Annual Averages
Annual CalMHSA payments to LWE for ASIST T4T only	\$344,282
Annual CalMHSA staff salaries to manage ASIST portion of the LWE contract	\$12,144
Total annual (average) costs	\$356,426

NOTE: All values in 2015 U.S. dollars.

**Table 4. Annual Cost and Long-Term Benefit Calculations**

	Estimated Value
Annual costs of ASIST for trainers (see Table 2 for more details)	\$356,426
Annual number of ASIST trainers trained	79.3
Number of workers that 79 ASIST trainers will train	11,895
ASIST effect size (suicide attempts averted per 100 ASIST-trained workers)	30
Suicide attempts prevented by 11,895 ASIST-trained workers, each working for ten years	3,569
Of which...	
result in suicide deaths	143
result in incapacitation	581
result in minor injury	2,845
Present value benefits of all work income gained from averting suicide attempts	\$386,307,488
Of which goes toward paying California state income tax	\$17,031,661
Present value benefits of all medical costs averted by averting suicide attempts	\$8,587,784
Of which California state government would have paid for Medi-Cal	\$1,091,955
Present value of all wage plus medical benefits	\$394,895,273
Of which accrue specifically to the California state government	\$18,068,026
Broader societal perspective: Benefit:cost ratio of ASIST (dollars returned for each dollar invested):	\$1,108
Of which, California government budget perspective: Benefit:cost ratio of ASIST (dollars returned for each dollar invested):	\$51

NOTE: All values in 2015 U.S. dollars.

There are a number of limitations to our analysis. An important limitation is the estimate of ASIST effectiveness. We relied on an estimate from another gatekeeper program that took place in a specific environment—a high school—that is hard to generalize to a full population. Nonetheless, we felt that the effectiveness estimate we chose is conservative.<sup>12</sup> If so, the observed effectiveness could be higher and could lead to more averted attempts and higher returns.

We assumed that those whose lives are saved or who are not incapacitated by a suicide attempt will be able to live as long as the average Californian. However, many who attempt suicide suffer from depression or some other mental disorder and may have shorter lives, either because of a higher likelihood of attempting suicide again or because of complications from poor physical health (Colton and Manderscheid, 2006; While et al., 2012). Including this lower life expectancy in our lifetime earning

estimates could lead to a lower estimated return. To test this, we recalculated lifetime earnings under the assumption that all those whose suicides are averted have a mental disorder and therefore have lower life expectancies.<sup>13</sup> This had little effect on our estimates, lowering the estimated benefit-to-cost ratio to \$1,000 for the state as a whole, and \$49 for the state government.

In a broader economic analysis, one could consider many other costs associated with investing in ASIST. For example, the costs of second-generation training are costs borne by California, so they could be included in our calculation. We do not include these costs, however, because they were not part of CalMHSA's original investment. Using rough estimates provided by LWE, the cost of training each second-generation trainee could be as high as \$1,100. If so, the return to the state as a whole drops to \$30 per \$1 invested.<sup>14</sup> It is not clear how this would affect the return to the state government, but we do not believe training costs would come out of the state budget.

We have also not addressed the potential additional medical costs that may result from saving a person's life: a person who survives a suicide attempt would at least go on to incur a typical lifetime's worth of medical costs, whereas a deceased person would not. It is difficult to estimate lifetime health care spending for those who do not attempt suicide because of ASIST; however, we acknowledge such spending would, if included, decrease the net-benefit estimate.

In a broader economic analysis, one could consider many other benefits derived from investing in ASIST in addition to other costs. Most significantly, the incalculable value of lives saved and suffering averted—by the people who attempt suicide, their relatives, friends, and the surrounding community—was not included in this study, despite the existence of a body of legal literature devoted to calculating the dollar value of suffering. Including any of these additional benefits would increase the net-benefit estimate.

We also did not include the nonwage value of people's work. This could include fringe benefits for those who are employed (Lawrence et al., 2011), and an imputed value for lost household production/services for those who are otherwise unemployed (Haddix, et al., 2003; Lee et al., 2012). Even more significantly, we have not included the multiplier effects of paid wages (nor have we included the opposite effects of eliminating demand for medical services from the economy). Whenever economic activity is added to or subtracted from an economy (such as the added wages of a person whose suicide was prevented), the economic impacts reach well beyond the individual's wages earned as he or she spends this income and it becomes someone else's wages and profit. As stated in the introduction, our goal was not to be exhaustive, but rather to be comprehensible. We have intentionally focused on wage and medical benefits to highlight the relationships between one policy intervention and two large, quantifiable benefits that it produces.

It is impossible to predict exactly how CalMHSA's investment in ASIST T4T will impact California; however, we believe that the impact will be positive and will unfold over the next few decades.

## Methodology Notes and Appendix Tables

### Methodology for Calculating Lifetime Earnings

1. Calculate the number of suicides averted and incapacitating suicide attempts averted. Both of these would have resulted in a complete cessation of lifetime work, so both follow the same steps below.
2. Assign total number of averted suicide attempts and deaths to genders: 79.17 percent male and 20.83 percent female, based on the actual California suicide deaths reported in 2012. We assumed that these percentages hold into the future, and also that they reflect the distribution of incapacitating suicide attempts.
3. Assign the total males and total females into age groups, based on Table A.1.
4. Adjust (deflate) the total number of people in each age and gender group by their expected survival rate (Table A.2), multiplied by the number of years they will remain in that group. For example, for N females beginning in the 55–64 age group who remain in that age group for five years, the expected number of people to survive is  $(0.9926)^5 \times N$ .
5. Adjust (deflate) the total number of people in each age and gender group by the U-6 unemployment rate. That is to say, among all the people who survive death, some of them will remain unemployed. U-6 unemployment includes all forms of unemployment, not just those captured in standard unemployment rates. For example, California’s recent official unemployment rate of 7.3 percent does not include people who have given

up looking for work, but we must include such people in this analysis because we cannot assume they will produce income. We use a U-6 unemployment rate of 11 percent and assume it remains constant into the future.

6. Model the aging of this population, assigning surviving graduates (see Step 4 but NOT Step 5) of each age/gender group to progress to the next age cohort. After they enter each new age cohort, we repeat Steps 4 and 5. Again, note that Step 5 never deflates the number of people progressing to the next age cohort, because although they may be unemployed at any one point in time, they still live to progress to the next age cohort and may attempt employment again.
7. Assign starting salary to each averted incident based on age group and gender, using Table A.3. Multiply each age/gender cohort by their annual salary (\$) and the number of years that they remain in that age group (Y):  $N \times \$ \times Y$ .
8. Adjust (discount) the dollar amounts calculated in Step 7 for the time value of money, using a constant annual discount rate of 3 percent. The formula looks like this:  

$$\text{ResultOfStepSeven}/(1+\text{DiscountRate})^Y$$
9. Calculate Steps 7 and 8 for each age and gender group as they progress through their lifetimes.
10. Sum the results of all Step 8 calculations to get the total present value expected income.

**Table A.1. Distribution of California Suicides by Age and Sex, 2012**

Age Group	Males	Females
16–19	4.0%	4.9%
20–24	9.2%	8.6%
25–34	18.5%	13.4%
35–44	19.4%	20.4%
45–54	25.5%	27.8%
55–64	23.5%	25.0%

SOURCE: Centers for Disease Control and Prevention, 2015b.

NOTE: We only grouped the original raw data into the above age categories.

**Table A.2. Annual Expected Survival Rate for Californians, 2000**

Age Group	Male	Female
16–19	0.99905	0.99960
20–24	0.99874	0.99956
25–34	0.99868	0.99942
35–44	0.99769	0.99873
45–54	0.99491	0.99710
55–64	0.98813	0.99266

SOURCE: RAND calculation based on National Cancer Institute, 2000, and California’s racial profile as measured in U.S. Census Bureau, 2015.

NOTE: We have assumed year 2000 expected survival remains constant going forward. RAND has taken the year 2000 expected survival rates for each racial category, and then compiled a California-specific survival table based on California’s racial mix.

**Table A.3. Annual Income for Salaried Workers in the United States, 2013**

Age Group	Male (\$)	Female (\$)
16-19	20,972	18,821
20-24	26,456	23,768
25-34	40,007	35,759
35-44	51,407	41,244
45-54	53,451	40,921
55-64	54,365	41,889

SOURCE: Bureau of Labor Statistics, 2014.

NOTE: We annualized Bureau of Labor Statistics data by multiplying weekly data by 52 (weeks). We also inflated the original 2013 data to 2015 dollars using the Consumer Price Index calculator at <http://data.bls.gov/cgi-bin/cpicalc.pl>

**Methodology for Calculating Medical Costs**

1. Calculate the number of suicide attempts averted.
2. Calculate the number of suicide deaths based on the 25:1 ratio of attempts to deaths reported by the American Association of Suicidology (2014). In other words, one out of every 25 suicide attempts results in death.
3. Calculate the number of incapacitating and medically minor suicide attempts averted. Of the 24 nonfatal suicide attempts remaining after Step 1, assign 17 percent of them to incapacitating and 83 percent of them to medically minor groupings, based on Doran and Ling (2014) citing a World Health Organization study.

4. Each of these three categories corresponds to its own average medical costs, as outlined in Table 2 in the main body of this report. Multiply the number of people assigned to each category by the dollar amounts for each category given in Table 2.
5. We assumed that, on average, each medical event occurs ten years in the future. The base year is 2015, and the annual discount rate remains 3 percent. We adjusted Step 3 numbers to their present value to take into account the time value of money.

**Sensitivity of Assumptions on ASIST Effectiveness**

Our estimate of the effectiveness of ASIST is based on the effectiveness of SOS (another gateway training program) among high school students. There were two key assumptions that we made in translating the estimated effect from that study to an estimate that we used in our models. The first assumption was related to our definition of a suicide attempt, and the second was related to the ratio of students to teachers. We explore both of these assumptions in detail in this section. Table A.4 provides a summary. The rows contain the different definitions of suicide attempts that we considered, and the last two columns represent different counts of total teachers. The cells of the last two columns contain the estimated number of averted suicide attempts per teacher for each combination of definition and number of teachers. We have highlighted the value used in our analysis.

To estimate the effect of SOS training, the SOS study evaluated the difference between the treatment and comparison populations in the percentage of students who self-reported at least one suicide attempt in the prior three months. The reported

**Table A.4. Exploration of Effect Size Assumptions**

Definition of Suicide Attempt	Source	Percentage of High School Students	Averted Suicide Attempts per Teacher	
			Assumed 30:1 Student:Teacher Ratio	Assumed 1 Teacher per Study School
Self-report, any attempt	SOS study <sup>a</sup>	18.0	1.80	13.59
Self-report, any attempt	2003 YRBS <sup>b</sup>	8.5	0.85	6.42
Self-report, any injury needing treatment	2003 YRBS <sup>c</sup>	2.9	0.29	2.19
Claims, injury from self-harm emergency department and hospital	California Department of Public Health, 2006 <sup>d</sup>	0.3	0.03	0.23

<sup>a</sup> Aseltine et al., 2007. Percentage of students in 2003 treatment sample who reported attempting suicide at least once in the past three months multiplied by 4 to get annual percentage.

<sup>b</sup> Centers for Disease Control and Prevention, 2013. Percentage of respondents who said they had attempted suicide one or more times in the past 12 months.

<sup>c</sup> Centers for Disease Control and Prevention, 2013. Percentage of respondents who said their suicide attempt resulted in an injury, poisoning, or an overdose that had to be treated by a doctor or nurse in the past 12 months.

<sup>d</sup> EpiCenter, undated. California Department of Public Health data on the number of visits to an emergency department and the number of hospitalizations that resulted from self-harm.

percentages, when annualized, are much higher than the percentage reported in a national sample of high school students. In the comparison population, 4.5 percent reported at least one attempt in the prior three months in 2003. This is a much higher annual rate than the 8.5 percent reported in the Youth Risk Behavior Survey (YRBS; Centers for Disease Control and Prevention, 2013), so we did not want to rely on it as an estimate of the baseline suicide attempt rate.

For our medical cost calculations, we included the costs of treatment for suicide attempts. The YRBS includes another self-reported measure: the percentage of students who say they attempted suicide at least once in the past year, and that the attempt required medical treatment. We considered this definition as well, since it is related to our medical cost definitions. An alternative would be to use data on emergency department visits and hospitalizations that result from self-harm. The California Department of Public Health provides these counts on their website (EpiCenter, undated). This last definition was the one we chose for our analysis. It is directly related to our medical cost calculation, and it yields the most conservative estimate of the effectiveness of gatekeeper training. As you can see in Table A.4, the estimated effect of each teacher on suicide attempts varies substantially, from 0.03 averted attempts for the claims-based definition to 1.8 averted attempts for the annualized attempts reported in the SOS study (assuming the 30:1 student-to-teacher ratio).

We were concerned about generalizing the estimates from the SOS study to the broader California population for our analysis. The SOS study was based on a sample of high school students in other states, and the ratio of attempts to deaths among adolescents is very different than the average for the population. That means that what adolescents consider a suicide attempt may be different, and relying on an effect observed on a self-reported measure for this population could bias our estimates.

The second assumption we made was the assumed number of teachers that produced the observed decrease in suicide attempts in the SOS study. The authors of that study did not report the number of teachers who performed the SOS training. As we described in our report, we assumed a ratio of 30 students per teacher, but it is possible that there were fewer teachers. The effect per teacher would be higher with fewer teachers. There were nine schools in the SOS study, so we provided estimates under the assumption that there was only one teacher per school. This is likely to be too low but provides a lower bound. Under this assumption, the estimated effect per teacher was about 7.8 times higher than the estimate for the 30:1 assumption. It ranges from 0.23 to 13.59 averted suicide attempts per teacher. If there were more teachers, the estimated effects would be lower for each definition.

Table A.4 demonstrates that the estimated impact of CalMHSA's ASIST program can vary substantially depending on the assumptions we make about the effectiveness of that training. In the absence of clear data to assess effectiveness, we chose conservative assumptions. Nonetheless, we project positive benefits to the state as a result of these investments. It is possible that

the observed benefits will be higher or lower. Using our method for projecting the financial impact of the ASIST program, we calculated that if the observed effect of ASIST is as low as 0.0006 averted attempts per trainee, the financial benefit to the state government would be \$1 for each \$1 invested. In other words, the observed effectiveness per trainee would have to be 1/50th what we assumed for our projections for the state to just break even, using the model we present in the report. That means the observed effectiveness can be much lower than what we assumed in our models, and we would still project a positive financial return to the state government.

### Second-Generation ASIST Costs

In the report, we focus on the costs to CalMHSA of the T4T training performed by LWE. In this Appendix, we estimate the maximum costs per trainee that Californians may experience when CalMHSA's ASIST trainers train other workers to use ASIST. Table A.5 contains the summary of these second-generation training costs based on information provided by LWE. We estimated that each ASIST trainer that CalMHSA sponsored will go on to train 150 people on how to use ASIST and that this process is currently ongoing. We call these 150 people second-generation ASIST trainees, and we refer to their training workshops as second-generation training. We estimated that by 2027, some 12,000 such second-generation trainees will have been trained as an indirect result of CalMHSA's original investment in training 238 trainers. Note that CalMHSA will not necessarily pay for any of these second-generation workshops, so these costs are borne by a wide variety of people and organizations in California. For example, sometimes a school will decide to pay teachers to attend such a workshop, usually led by 2 ASIST-trained teachers per class of 30 second-generation trainees. Therefore, it would not be reasonable to assume that the state and local governments bear all of these costs; government organizations (indirectly or directly) pay only some of these costs. It is more reasonable to think of these costs as borne by society, even though members of society are not paying cash for each line item. For example, although some ASIST trainers are paid an honorarium, others volunteer their time. Either way, the cost of their time can be imputed. The same is true for the cost of whatever workshop

**Table A.5. Estimates of Second-Generation Training Cost Components (provided by LWE)**

Cost Category	Cost to train one trainee
Participant kits	\$41
Trainer/teacher honorarium/salary	\$133
Travel	\$320
Meeting room (paid or imputed)	\$40
Participants' salaries (imputed)	\$557
<b>Total</b>	<b>\$1,091</b>

conference room is used for these trainings—whether money changes hands for the use of the conference room or not, the conference room still has an implicit cost, often referred to as the opportunity cost of renting it to someone who would have paid cash. Table A.5, therefore, contains cost estimates that—whether imputed or actual—are real costs to society to train each second-

**Table A.6. California Income Tax Brackets, 2015**

Annual Income	Tax Rate
\$0+	1.00%
\$7,582+	2.00%
\$17,976+	4.00%
\$28,371+	6.00%
\$39,384+	8.00%
\$49,774+	9.30%
\$254,250+	10.30%
\$305,100+	11.30%
\$508,500+	12.30%
\$1,000,000+	13.30%

SOURCE: "California Income Tax Brackets 2015," Tax-Brackets.org, 2015.

NOTE: We assumed these same brackets remain unchanged to calculate Table A.7.

**Table A.7. 2015 California Income Tax Totals, as Percentage of Total Wages**

Age Group	Males	Females
16–19	1.9%	1.7%
20–24	2.4%	2.2%
25–34	3.5%	3.2%
35–44	4.6%	3.7%
45–54	4.7%	3.6%
55–64	4.8%	3.7%

NOTE: Calculations based on Tables A.3 and A.6.

generation ASIST trainer. If added to the costs that CalMHSA paid for the first generation of ASIST trainers, these costs reduce the overall society's benefit-to-cost ratio from 1,108:1 to 30:1. This is a significant reduction, but it still results in a positive benefit to society of \$30 returned for each \$1 invested.

**Table A.8. Percentage of Emergency Department Visits for Self-Harm Paid by Medi-Cal**

Age Group	Males (%)	Females (%)
16–19	35.9	40.7
20–24	21.1	27.1
25–34	15.9	30.3
35–44	15.2	29.0
45–54	22.7	22.4
55–64	21.5	24.3

SOURCE: All percentages are based on 2009 and 2010 emergency department records provided by the California Office of Statewide Health Planning and Development.

NOTE: Self-harm defined as primary e-code E950-E959. Weighted average (by percentage of all suicides by age and gender; Table A.1) of all the above percentages is 25.4 percent, half of which is paid by California (12.7 percent).

## Notes

<sup>1</sup> We base our projections on the assumption that three trainees combined will prevent at least one suicide attempt in ten years.

<sup>2</sup> We assume that the average number of deaths from suicide in California during the years 2011 to 2013 would remain the same for the 28 years of our projection. The average for 2011 to 2013 was 3,934 (EpiCenter, undated). We also assume a constant ratio (25:1) of suicide attempts to suicide deaths. This assumption is discussed in the methods section of this report.

<sup>3</sup> Three percent is commonly used as a discount rate for analyses like this. For example, it is the rate recommended by the Panel on Cost-Effectiveness in Health and Medicine (Gold et al., 1996). The Office of Management and Budget (2014) currently recommends a lower rate of 1.5 percent but, to keep this analysis consistent with other analyses of this type, we have used 3 percent. A lower discount rate would yield higher net benefits and would increase the ratio of benefits to costs.

<sup>4</sup> This methodology may slightly inflate benefits if ASIST helps a significant number of people over the age of 65, and it may deflate benefits if it helps a significant number of people under the age of 15.

<sup>5</sup> According to representatives of CalMHSA and LWE, spending was stable over the three years, so the average is a good estimate of CalMHSA's spending per year on training.

<sup>6</sup> This study found a 34.8-percent reduction in the rate of self-reported suicide attempts over the previous three months for the treatment students relative to the controls (3.0 percent versus 4.6 percent). Both of these three-month rates yielded annual rates that were much higher than the national average for this age group (7.8 percent, according to the Youth Risk Behavior Survey [Centers for Disease Control and Prevention, 2013]), so we used data on the number of emergency department visits for self-injury/suicide from the California Department of Public Health to estimate the number of attempts in a year. This gave us an estimated number of annual suicide attempts for the treatment (3.3 attempts) and control students (5.1 attempts). When we divided the difference (1.8 attempts) by the number of students and applied our assumed ratio of 30 students to each SOS-trained teacher, we got our estimate of 0.03 attempts per year.

<sup>7</sup> Cornell, Williams, and Hague (2006) found that the mean number of suicide attempts per year at schools where ASIST-trained personnel

worked was 0.7, while at control-group schools it was 3.2. This average annual difference of 2.5 suicide attempts, if it resulted from the effects of ASIST, mostly likely did not always occur at schools where there was only one ASIST-trained person. RAND contacted the report's lead author to find out how many schools were surveyed, but unfortunately he no longer had full access to that information. Therefore, we assumed that, on average, each averted suicide attempt resulted from five ASIST-trained people, making the effect size of one ASIST-trained person 0.5 suicide attempts averted per year. Again, because of the low confidence we have in this effect size estimate, we did not use these results for our projections.

<sup>8</sup> Estimates based on Cornell, Williams, and Hague (2006) are higher. They are not reported here but are available by request from the authors.

<sup>9</sup> We acknowledge that there are differences between the population studied by the World Health Organization and the population of California. These differences could bias our estimates; however, it is difficult to assess the direction of that possible bias.

<sup>10</sup> U-6 unemployment includes all forms of unemployment, not just those captured in standard unemployment rates. For example, California's recent official unemployment rate of 7.3 percent does not include people who have given up looking for work, but we must include such people in this analysis because we cannot assume they will produce income.

<sup>11</sup> When presenting our findings, we do not add these tax benefits to the wage and medical benefits because this would double count the taxable portion of wages. Some portion of each person's wages is paid in taxes, so all wage calculations already include taxes.

<sup>12</sup> We provide a detailed discussion of our assumptions in the Appendix. We also discuss the implications of our assumptions on the estimate and the sensitivity of our estimate to these assumptions. For the analysis presented above, we chose assumptions that generate the lowest estimate of effectiveness.

<sup>13</sup> We adjusted the likelihood of survival for each age/gender cohort in our models to reflect the highest relative mortality rate (4.9) reported in Colton and Manderscheid, 2006.

<sup>14</sup> We include a detailed discussion of this in the Appendix.

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This research was conducted in RAND Health, a division of the RAND Corporation. A profile of RAND Health, abstracts of its publications, and ordering information can be found at <http://www.rand.org/health>.

## CalMHSA

The California Mental Health Services Authority (CalMHSA) is an organization of county governments working to improve mental health outcomes for individuals, families, and communities. Prevention and Early Intervention programs implemented by CalMHSA are funded by counties through the voter-approved Mental Health Services Act (Prop. 63). Prop. 63 provides the funding and framework needed to expand mental health services to previously underserved populations and all of California's diverse communities.

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