FLETCHER GROUP ECONOMIC CALCULATOR

Fletcher Group Rural Center of Excellence

FLETCHER GROUP ECONOMIC CALCULATOR

Authors: Madison Ashworth, Health Economist, with assistance from CEO David Johnson, Vice President of Project Development Grant Meyer, and Director of Research and Evaluation Robin Thompson

Published September 2023

This research is supported by the Health Resources and Services Administration (HRSA) of the US Department of Health and Human Services (HHS) under grant number UD9RH33631-01-00 as part of an award totaling $17.1M with 0% financed with non-governmental sources. The contents are those of the authors and do not necessarily represent the official views of, nor endorsed by HRSA, HHS, or the US Government.

Recommended Citation: Ashworth M, Johnson D, Meyer G, Thompson R. Fletcher Group Economic Calculator. Fletcher Group, Inc.; 2023. https://www.fletchergroup.org/economic-calculator/

EXECUTIVE SUMMARY

Substance use disorder continues to impact millions of Americans and mortality and morbidity associated with this chronic disease continues to increase. The expansion of recovery support services is a national priority, with many government agencies calling for a national, state, and local focus on the expansion of accessible, quality treatment and recovery options. As with all healthcare services, the relative cost effectiveness of substance use disorder treatment modalities is of interest to funders, policymakers, and practitioners. There are numerous types of substance use disorder treatment including traditional medical models of treatment like medication for opioid use disorder, intensive outpatient, and residential treatment, as well as social models of treatment like mutual aid groups and recovery housing. As each treatment modality comes with its unique programmatic costs and different efficacies, it can be difficult to understand the costs and benefits associated with different programs.

In this brief, we outline a recently developed economic calculator that demonstrates the economic costs and benefits of recovery programs. Unlike standard cost-benefit analyses of recovery programs, this tool goes beyond measuring only avoided costs and includes benefits of recovery programs in terms of morbidity risk reductions and economic productivity gains. Economic benefits incorporated into the model include avoided healthcare, criminal justice, and productivity costs, and individual willingness to pay for reductions in mortality and morbidity associated with substance use disorders.

This calculator will allow users to input key recovery program characteristics including the state in which it is operating, the number of individuals it serves annually, operating and start-up costs, the time frame of analysis, and rurality of the recovery program. As such, this tool will provide a practical estimate of the economic costs and benefits associated with individual recovery programs. These numbers, when they result in substantial equated returns, can be used in grant applications and to increase support for recovery programs in local communities.

The tool is constructed to provide individualized estimates of the economic costs and benefits associated with different recovery programs. Specifically, it returns total economic benefits, net benefits, return on investment calculations, and the benefits and return on investment across different assumptions of the program’s success rate.

INTRODUCTION

Substance use disorder (SUD) continues to impact millions of Americans, and mortality and morbidity associated with this chronic disease continues to increase.[1,2] The expansion of recovery support services is a national priority, with many government agencies calling for a national, state, and local focus on the expansion of accessible, quality treatment and recovery options.[3,4] Beyond the loss of human life and individual suffering, SUD imposes significant cost burdens on society via healthcare costs, crime, and individual productivity losses. The total estimated economic cost of SUD in the U.S. is $3.7 trillion accounting for costs associated with healthcare, criminal justice, public assistance, research, mortality, and productivity losses.[5]

As with all healthcare services, the relative cost effectiveness of SUD treatment modalities is of interest to funders, policymakers, and practitioners. Cost-benefit analysis of SUD treatment has been conducted on many types of treatment methods including intensive outpatient services and intensive residential treatment.[6–8] Of the cost-benefit analyses that exist of SUD treatment, most find that the economic benefits of treatment exceed the costs. For example, in a cost-benefit analysis of treating everyone with a SUD that required treatment, the Recovery Centers of America found that the net benefits of universal treatment in the U.S. would be approximately $545 billion.[5] Further, one cost-benefit analysis conducted on a recovery housing program found that for every dollar invested into the program, there was a $2 return on investment.[6] Despite the number of cost-benefit and cost-effectiveness studies for different types of SUD treatment, it is difficult to compare findings across different studies as they each employ a different set of methods and include different economic benefits and costs in their studies. As such, we have developed a cost-benefit model that can be adapted for a variety of recovery programs to provide comparable estimates of the return on investment and net benefits of different recovery programs and treatment modalities.

With this calculator, we create a cost-benefit model that calculates the costs, benefits, net benefits, and return on investment of a recovery program. We estimate the benefits of a recovery program by calculating the avoided costs per individual served and the additional economic productivity of individuals who enter long term recovery. Avoided costs included in the model include state level criminal justice costs and healthcare costs. Additionally, we account for the avoided economic productivity costs associated with SUD. We measure the added benefit of recovery programs as the willingness of an individual to pay for an additional life year at a healthier state as measured by the quality adjusted value of a statistical life year. This calculator will allow users to input key recovery program characteristics including the state in which it is operating, the number of individuals it serves annually, operating and start-up costs, the time frame of analysis, and rurality of the recovery program. As such, this tool will provide a practical estimate of the economic costs and benefits associated with individual recovery programs.

In the following sections, we describe the methods used in the cost benefit model, provide an overview of key parameter assumptions, and walk through the use of the model using an example from a representative recovery program. Further, we demonstrate the capabilities of the model at calculating break-even values of key parameters.

METHODS

The model calculates both benefits and costs associated with recovery programs. Benefits incorporated into the calculation include avoided internal and external costs of SUD to the individual and the community around them. Internalized costs can be captured via an individual's willingness to pay for reductions in mortality risk, i.e., quality adjusted value of a statistical life year. Externalities imposed by SUD are numerous and include healthcare utilization costs, criminal justice costs, productivity costs, family and generational costs, emotional costs, and public administration costs. As the full suite of external costs imposed by SUD can be difficult to quantify, we focus on the largest, and most easily quantifiable external costs including avoided healthcare, criminal justice, and productivity costs; additionally, indicators selected are those for which large, robust, recent datasets are available. As such, the sum of benefits from recovery programs included in our model include quality adjusted value of statistical life years and avoided healthcare, criminal justice, and productivity costs. Costs in the model include operating and initial start-up costs of the recovery program which can be individualized by the specific recovery program utilizing the tool. We begin by examining the benefits associated with recovery programs.

AVOIDED HEALTHCARE COSTS

To calculate avoided healthcare costs per person served by a recovery program, we use the total healthcare costs of SUD as calculated by Recovery Centers of America.[5] In their analysis, Recovery Centers of America calculate the total costs associated with SUD in the United States (U.S.). These healthcare costs include costs associated with inpatient and outpatient hospital stays, specialty disease costs, health insurance administration, crime victim healthcare costs, and other costs associated with emergency services and prescriptions. As we already calculate the cost associated with a recovery program for each individual, we subtract healthcare costs associated with SUD treatment to avoid double counting. Further, we subtract healthcare costs that are likely to remain after an individual enters long term recovery, like costs associated with diseases caused by SUD. The total estimated healthcare cost of SUD in the U.S., after subtracting SUD treatment costs and specialty disease costs, in 2019 was approximately $52 billion.[5]

We then calculate the healthcare costs of SUD per person with a SUD in 2019 by dividing the total healthcare costs of SUD by the estimated number of people with a SUD ages 12 and up in 2019 as estimated by the National Survey of Drug Use.[9] We find that the average healthcare costs associated with SUD per person with a SUD in 2019 was $2,575. As healthcare costs vary by state of residence, we then weight the per person healthcare cost by comparing per capita healthcare spending in each state to the U.S. average. We then adjust the per person healthcare cost by state for general inflation as this number was calculated in 2019 dollars.

AVOIDED CRIMINAL JUSTICE COSTS

To calculate avoided criminal justice costs per person served by a recovery program, we estimate the per person with a SUD state-level criminal justice costs. We begin by using the state level criminal justice expenditures from 2017 provided by the Bureau of Justice Statistics.[10] These costs include wages, capital outlays (e.g., funds spent to maintain, upgrade, acquire, or repair capital assets), and other expenditures related to police protection, judicial and legal functions, and Department of Corrections. We then calculate how much of this criminal justice expenditure was associated with SUD related crimes. The National Center for Drug Abuse Statistics estimates that, in 2020, 26% of all arrests in America were related to drug offenses.[11] While this estimate may underestimate the total number of criminal justice expenditures related to SUD, it provides a point estimate from which sensitivity analysis may be conducted.

We are then able to calculate the individual SUD criminal justice cost by multiplying the state criminal justice expenditures by the percent of criminal justice expenditures related to SUD and dividing by the estimated number of individuals with a SUD per state in 2017.[12] We then adjust the per person criminal justice cost by state for inflation as this number was calculated in 2017 dollars.

AVOIDED PRODUCTIVITY COSTS

Another significant cost associated with SUD is lost productivity driven by premature death, incarceration, absenteeism, and diminished productivity. To calculate the avoided productivity costs per person served by a recovery program, we use the total productivity costs estimated by Recovery Centers of America. We subtract the productivity costs of SUD treatment from the total estimate as we are already accounting for the costs of treatment. The estimated total productivity cost is estimated to be just under $192 billion per year.[5]

We then calculate the productivity cost per person with a SUD in 2019 by dividing the total productivity cost of SUD by the estimated number of people with a SUD in 2019.[9] We find that the average productivity cost per person with a SUD is $9,443. As incomes and earnings potential vary significantly between rural and non-rural areas in the U.S.[13], we weight productivity costs by rurality. This weighting allows our model to account for the differences in occupation and wage rates in rural and non-rural areas in the U.S. To weight productivity costs we compare employment earnings in rural and non-rural areas to that of the U.S. and multiply the average per person productivity cost by that weight.[13] We find that the average productivity cost per person with a SUD, adjusted to 2021 dollars, is $7,307 for rural individuals and $10,409 for non-rural individuals.

VALUE OF A STATISTICAL LIFE YEAR

The value of a statistical life (VSL) is a measure used by many economists and government agencies to monetize the benefits associated with health improvements which reduce mortality and morbidity of diseases.[14] The VSL measures the tradeoff between fatality risk and money, or the additional cost individuals are willing to bear in order to reduce fatality risk. VSL estimates can also be broken down into value of a statistical life year (VSLY) estimates, which measure the willingness to pay for an additional year of life expectancy. VSLY estimates have ranged from $116,000 per year in 1998 to $369,000 in 2016.[14] Let L be the life expectancy of an individual at the age in which the intervention occurs, r_{VSL} be the personal time discount rate, and *VSL* be the VSL estimate used. Then, VSLY can be calculated with the following formula:

$$VSLY = \frac{r_{VSL} * VSL}{1 - (1 + r_{VSL})^{-L}}$$

As is recommended by the U.S. Department of Transportation and the Environmental Protection Agency, we set VSL to be approximately $11.7 million per person.[14–16] While there have been attempts to estimate VSL for different populations including individuals of different ages and health statuses, there has been no research looking at how VSL may differ across rurality. However, we can estimate the VSLY across rural and non-rural areas using the observed differences in life expectancies. There is a discrepancy between expected lifespans between rural and non-rural individuals with an average life expectancy of 77 years in rural areas and 79 years in non-rural areas.[17] Based on a review of literature examining individuals who are in SUD treatment, we set the average age of a recovery program participant at 38 years old.[18–21] There is no documented evidence that the age of recovery housing residents differs significantly across rurality. Assuming a standard life expectancy for those who enter long term recovery, we then set the remaining life years to be 39 and 41 for rural and non-rural individuals respectively.

As we are valuing non-fatal morbidity reductions, we use quality adjusted life years (QALY) metric to measure the increased utility of the health status of the individual.[22,23] Estimates suggest that SUD reduces quality of life by 0.13 and 0.20 QALYs, with higher estimates reserved for more severe SUDs.[24] As those in recovery programs likely have more severe SUDs requiring higher levels of care, we assume the added QALY from successful utilization of a recovery program is 0.20. As such, we calculate the added value of health improvement as QALY multiplied by the VSLY. Thus, we estimate that improved health status and reduced mortality risk per year is valued at $102,301 and $99,661 for rural and non-rural residents, respectively. We use these values to estimate the benefit of each additional year of life lived at the improved health state.

RECOVERY PROGRAM BENEFITS AND COSTS

We calculate the benefits of a recovery program as the sum of the discounted benefits discussed in the previous sections multiplied by the cumulative number of individuals and the percentage of individuals that successfully enter long-term recovery. The benefit function is as follows:

$$B(g,s) = \sum_{t=0}^{T} (N_t * A) * [P(g) + CJ(s) + HC(s) + QALY(g)] * (1+r)^{-t}$$

where *T* is the timeframe of analysis, *r* is the real discount rate, N_t is the cumulative number of individuals served annually, *A* is the percent of individuals that achieve long term recovery due to the recovery program, *P(g)* is the avoided productivity cost per person, *CJ(s)* is the state specific avoided criminal justice cost per person, *HC(s)* is the state specific avoided healthcare cost per person, and *QALY(g)* is the rurality specific, quality adjusted monetary benefit from the increased quality of life due to the recovery program. Estimated benefits of a recovery program is a function of whether the house is in a rural or non-rural area, *g*, and the state in which it is located, *s*. Specifically, the quality adjusted monetary benefit from increased quality of life due to the recovery program and the avoided productivity costs depend on rurality and the avoided healthcare and criminal justice costs differ by the state that the program is located in.

We capture two aspects of costs associated with a recovery program, both of which are a key input into the model. First, we capture the variable operating cost of a recovery program across each year. This cost can be assumed to be constant across all years or increase according to planned expansions in the number of individuals served. Further, we include start-up costs that may be associated with a recovery program including the cost of purchasing land and construction of buildings. The cost function is as follows:

$$C = S + \sum_{t=0}^{T} O_t * (1+r)^{-t}$$

where C is the total discounted costs, S is the start-up costs of the project, O_t is the operating cost each year t, and r is the real discount rate. As we want to account for the residual value that land and construction may have after the lifetime of the project, we calculate our total start-up costs as follows:

$$S = \frac{[CapX * (1 - l)]}{39} * T$$

where *CapX* is the initial capital investment purchase price, *l* is the percentage of the capital investment that was spent on land, and *T* is the time horizon. According to the above equation, we see that the start-up cost is the initial capital investment minus the depreciated residual value of the investment at the end of the planning horizon. We assume standard straight-line depreciation for nonresidential property as outlined by the Internal Revenue Service.[25]

We then combine the benefits and costs of a recovery program to calculate the present value of net benefits. The net present value of benefits is given by the following formula:

$$NB(g, s) = -\frac{[CapX * (1 - l)]}{39} * T + \sum_{t=0}^{T} (N_t * A) * [P(g) + CJ(s) + HC(s) + QALY(g)] * (1 + r)^{-t} - O_t * (1 + r)^{-t}$$

We also calculate the return on investment for every dollar invested in the recovery program by dividing the net benefits by the total costs of the program.

Model parameters not specific to each recovery program were chosen based on central values of values often used in the literature. See Table 1 for an overview of parameter values used. A few key parameters to note are the chosen discount rate and value of a statistical life. Currently, most government agencies recommend and utilize a discount rate of 3% for regulatory analysis affecting health and substance use outcomes.[26,27] However, sensitivity analysis may be conducted for discount rates as high as 7%. Further, meta-analyses on central estimates for the VSL generally place the value between $9 and $12 million, with values ranging from $5 to $18 million. To accommodate for these factors, we have parameterized our model with a central estimate used by both the Department of Transportation and Environmental Protection Agency when examining health related regulatory policies.

Table 1. Key parameter values and relevant citations for value.

Parameter	Central/Average Estimate	Citations (author, date)
Percent of Crime/CJ* Expenditure related to SUD	26%	National Center for Drug Abuse Statistics, 2020[11]
Lifespan in Rural U.S.	77 years	Singh and Siahpush (2014)[17]
Lifespan in Non-Rural U.S.	79 years	Singh and Siahpush (2014)[17]
Average Age of Recovery Program Participants	38 years	Mericle et al. (2022), Jason et al. (2007), Polcin et al. (2010), Kelly et al. (2017)[18–21]
Value of a Statistical Life	$11,666,535	Department of Transportation (2016), Kniesner and Viscusi (2019), Environmental Protection Agency[14–16]
Discount Rate	3%	Environmental Protection Agency, Office of Management and Budget[26,27]
Earnings in Non-Rural U.S.	$71,738	USDA Economic Research Service (2023)[13]
Earnings in Rural U.S.	$50,558	USDA Economic Research Service (2023)[13]

*CJ = criminal justice

USE EXAMPLE

In this section we provide a use example of the tool. To run the model, a recovery program must provide the following information: annual operating costs excluding any amount spent to purchase land, start-up costs including initial capital and land costs, state of operation, rural status, number of individuals served, time horizon to run the calculation over, and success rate. We define the success rate as the percentage of individuals served that enter long term recovery for the duration of the time horizon. Due to constraints in the simulation of individual life cycles, the time horizon has a maximum of 30 years. Table 2 provides an example of recovery program characteristics that could be used.

Table 2. Example recovery program characteristics (model inputs).

Annual Operating Cost	$110,000 per year
Start-Up Cost	$1,500,000
State	Wyoming
Rural?	Yes
Success Rate	50%
Number of Participants Served Annually	10
Time Horizon	10 years

The model will produce results like those presented in Table 3. For our example recovery program, we find that a total of 100 participants are served over 10 years. The present value of those benefits is approximately $26.4 million, and the total costs of the program are approximately $1.2 million. Net benefits of this program is $25.2 million. The total return on investment of the project is $20.20 per dollar invested.

Table 3. Results output from model for example recovery program.

Variable	**Output**
Total Individuals Served	100
Total Benefits	$26,142,615
Total Costs	$1,249,219
Net Benefits	$24,893,396

Total Return on Investment	$19.90

As the success rate of the program can be the most difficult to estimate accurately and is often most important to funders, we also calculate the present value of net benefits and total return on investment for different success rates, i.e., percent of individuals that successfully enter long term recovery for the duration of the time horizon. (Table 4). Further, we calculate the breakeven value of the success rate, or the success rate in which all net benefits will be negative.

Table 4. Net benefits and total return on investment across different success rate assumptions for the example recovery program.

Success Rate (%)	Net Benefits ($)	Total Return on Investment ($)
0	-1,249,219	-1.00
20	9,207,828	7.37
40	19,664,874	15.74
60	30,121,920	24.11
80	40,578,966	32.48
100	51,036,012	40.85

Breakeven Value: 2.3%

REFERENCES

1. Ahmad F, Rossen L, Sutton P. *Provisional Drug Overdose Death Counts*. National Center for Health Statistics; 2021. Accessed December 9, 2021. https://www.cdc.gov/nchs/nvss/vsrr/drug-overdose-data.htm#citation

2. Substance Abuse and Mental Health Services Administration. *2020 National Survey of Drug Use and Health*. U.S. Department of Health and Human Services; 2021. Accessed January 10, 2022. https://www.samhsa.gov/data/release/2020-national-survey-drug-use-and-health-nsduh-releases

3. Office of National Drug Control Policy. *The Biden-Harris Administration's Statement of Drug Policy Priorities for Year One*. Executive Office of the President; 2021:1-11. Accessed March 17, 2022. https://www.whitehouse.gov/wp-content/uploads/2021/03/BidenHarris-Statement-of-Drug-Policy-Priorities-April-1.pdf

4. Biden J. 2022 State of the Union Address. Presented at: March 1, 2022. https://www.whitehouse.gov/state-of-the-union-2022/

5. Recovery Centers of America. *Economic Cost of Substance Abuse Disorder in the United States, 2019*. Recovery Centers of America; 2019. Accessed January 31, 2023. https://recoverycentersofamerica.com/resource/economic-cost-of-substance-abuse-disorder-in-united-states-2019/

6. Cole J, Logan T, White A, Scrivner A. *Findings from the Recovery Center Outcomes Study: 2023 Annual Report*. University of Kentucky, Center on Drug and Alcohol Research.; 2023.

7. Leukefeld CG. *Compulsory Treatment of Drug Abuse: Research and Clinical Practice*. U.S. Department of Health and Human Services, Public Health Service, Alcohol, Drug Abuse, and Mental Health Administration, National Institute on Drug Abuse; 1988.

8. Cartwright WS. Cost–benefit analysis of drug treatment services: review of the literature†. *The Journal of Mental Health Policy and Economics*. 2000;3(1):11-26. doi:10.1002/1099-176X(200003)3:1<11::AID-MHP66>3.0.CO;2-0

9. 2019 National Survey of Drug Use and Health (NSDUH) Releases. Accessed March 24, 2023. https://www.samhsa.gov/data/release/2019-national-survey-drug-use-and-health-nsduh-releases

10. Justice Expenditures and Employment in the United States, 2017. Bureau of Justice Statistics. Accessed March 13, 2023. https://bjs.ojp.gov/library/publications/justice-expenditures-and-employment-united-states-2017

11. Drug Related Crime Statistics [2023]: Offenses Involving Drug Use. NCDAS. Accessed March 13, 2023. https://drugabusestatistics.org/drug-related-crime-statistics/

12. 2017 National Survey of Drug Use and Health (NSDUH) Releases. Accessed March 24, 2023. https://www.samhsa.gov/data/release/2017-national-survey-drug-use-and-health-nsduh-releases

13. State Data. Accessed March 24, 2023. https://data.ers.usda.gov/reports.aspx?ID=17854

14. Kniesner T, Viscusi K. The Value of a Statistical Life. *Oxford Research Encyclopedias*. Published online 2019. https://law.vanderbilt.edu/phd/faculty/w-kip-viscusi/368_Value_of_Statistical_Life_Oxford.pdf

15. US EPA O. Mortality Risk Valuation. Published April 20, 2014. Accessed March 24, 2023. https://www.epa.gov/environmental-economics/mortality-risk-valuation

16. Moran M, Monje C. *Guidance on Treatment of the Economic Value of a Statistical Life in U.S. Department of Transporation Analyses - 2016 Adjustment*. U.S. Department of Transportation https://www.transportation.gov/sites/dot.gov/files/docs/2016%20Revised%20Value%20of%20a%20Statistical%20Life%20Guidance.pdf

17. Singh G, Siahpush M. Widening Rural–Urban Disparities in Life Expectancy, U.S., 1969–2009. *American Journal of Preventive Medicine*. 2014;46(2):19-29. doi:https://doi.org/10.1016/j.amepre.2013.10.017

18. Jason LA, Davis MI, Ferrari JR. The need for substance abuse after-care: longitudinal analysis of Oxford House. *Addict Behav*. 2007;32(4):803-818. doi:10.1016/j.addbeh.2006.06.014

19. Polcin DL, Korcha R, Bond J, Galloway G. Eighteen-month outcomes for clients receiving combined outpatient treatment and sober living houses. *Journal of Substance Use*. 2010;15(5):352-366. doi:10.3109/14659890903531279

20. Mericle AA, Slaymaker V, Gliske K, Ngo Q, Subbaraman MS. The role of recovery housing during outpatient substance use treatment. *J Subst Abuse Treat*. 2022;133:108638. doi:10.1016/j.jsat.2021.108638

21. Kelly JF, Bergman B, Hoeppner BB, Vilsaint C, White WL. Prevalence and pathways of recovery from drug and alcohol problems in the United States population: Implications for practice, research, and policy. *Drug Alcohol Depend*. 2017;181:162-169. doi:10.1016/j.drugalcdep.2017.09.028

22. Salomon JA. Quality Adjusted Life Years. In: Quah SR, ed. *International Encyclopedia of Public Health (Second Edition)*. Academic Press; 2017:224-228. doi:10.1016/B978-0-12-803678-5.00368-4

23. Cost-Effectiveness, the QALY, and the evLYG. ICER. Accessed March 24, 2023. https://icer.org/our-approach/methods-process/cost-effectiveness-the-qaly-and-the-evlyg/

24. Nicosia N, Pacula RL, Kilmer B, Lundberg R, Chiesa J. *The Economic Cost of Methamphetamine Use in the United States, 2005*. RAND Corporation; 2009. Accessed March 24, 2023. https://www.rand.org/pubs/monographs/MG829.html

25. *How To Depreciate Property*. Internal Revenue Service; 2022. Accessed April 3, 2023. https://www.irs.gov/publications/p946

26. Office of Management and Budget. *Circular A-4*.; 2023:1-91. https://www.whitehouse.gov/wp-content/uploads/2023/04/DraftCircularA-4.pdf

27. US EPA O. Guidelines for Preparing Economic Analyses. Published April 21, 2014. Accessed March 24, 2023. https://www.epa.gov/environmental-economics/guidelines-preparing-economic-analyses

GLOSSARY OF KEY TERMS

Substance Use Disorder (SUD): a treatable, chronic diseases characterized by a problematic pattern of use of a substance or substances leading to impairments in health, social function, and control over substance use.

Value of a Statistical Life (VSL): estimates of how much people are willing to pay for small reductions in their risks of dying from adverse health conditions.

Value of a Statistical Life Year (VSLY): value of each expected year of life that is implied by the VSL.

Quality Adjusted Life Year (QALY): generic measure of disease burden, including both the quality and the quantity of life lived.