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The Economic Cost of Suicide to Society

An Estimation of the Net Economic Cost of all Completed Suicides in Sweden in 2015

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Abstract

The aim of this study is to estimate the net economic cost of all suicides that occurred in Sweden in 2015. The purpose is to provide a more thorough assessment of this cost compared to previous research. Based on the theoretical and methodological framework of so called Cost of Illness (COI) studies, previous research, as well as original solutions, this study estimates direct costs, indirect costs and potential savings from suicide. Summing the costs and subtracting the savings yields an estimated net economic cost of 2,90 – 3,17 billion SEK in total and an average of 2,46 – 2,69 million SEK per suicide. In addition, what are considered intangible costs of suicide in terms of life and health are analyzed in a theoretical, interdisciplinary framework, offering a brief exploration into a discussion that can and ought to be elaborated on extensively.

1.0 Introduction

1.1 Background

Suicide is defined as an intentional, self-destructive act that results in death. It is a public health issue that claims an estimated 1200 lives each year in Sweden (NE, n.d.). In 2015, 1179 people committed suicide in Sweden, of these, 331 were women and 848 were men. The total number of suicides constituted about 1,3% of all deaths in 2015. Although it pales in comparison to cardiovascular disease and tumors, which in 2015 made up 61% of all fatalities, it is a relatively prevalent cause of death and its prevalence varies between different age groups. For example, among people aged 15-29, suicide is the most common cause of death (SS, 2016a; Public Health Agency, 2017).

Suicide is more than twice as common among men as it is among women (NE, n.d.). In 2015, more men than women committed suicide in every age group except children aged 10-14 where girls were the majority (SS, 2016b). In contrast, suicide attempts are significantly more prevalent among women than men (NE, n.d.). In absolute numbers, the greatest number of suicides occurred among people aged 45-59 in 2015, while ages 14 and younger as well as 90 and older had the lowest number of suicides (SS, 2016b). The prevalence of suicide is also tied to education levels. Suicide is most common among people with compulsory- and upper secondary education, while those with post – upper secondary education have a lower risk of suicide (Public Health Agency, 2017).

Considering its prevalence and traumatic nature, suicide is an issue that ought to be addressed widely and thoroughly. Applying an economic perspective to the topic of suicide is one way

of addressing the issue and problematizing it, which can serve to raise awareness for policy makers as well as the general public, all of whom play a role in creating an environment working to properly address the issue of suicide. It may be argued that addressing suicide from an economic perspective undermines the intangible gravity of the issue, however, this perspective simply serves as a component in a discourse that should encompass numerous perspectives of varying depth and nature.

1.2 Purpose

Generally, calculating the costs of conditions such as specific diseases or types of accidents serves the purpose of describing and quantifying the subsequent burden to society, enabling comparisons of costs over time and between conditions, as well as informing and educating policy makers (Olofsson, 2008 p.3, 72). The purpose of this study in particular is to present a more thorough and encompassing measure of the economic cost of suicide to society by improving and expanding on previous research. By identifying the most relevant factors and methods from various previous studies and combining them with original solutions, this study offers a more thorough assessment, and thus a potentially more accurate result. In addition, this study includes an interdisciplinary analysis based on economic and philosophical perspectives, in which the intangible costs of suicide are discussed at greater length.

1.3 Important notes

This study concerns only completed suicides and it is the cost of a suicide itself, not of the conditions that led to suicide, that is being assessed. This means that the costs considered are the opportunity costs in terms of what would have been had people not committed suicide, *all else equal*, meaning all other circumstances remain. In addition, most previous research presents estimates of the gross economic cost of suicide to society, meanwhile, this study purposes to calculate the net economic cost by taking potential savings from suicide into consideration as well.

2.0 Previous Research

Several studies have been conducted and subsequent articles published on the topic of suicide and its cost to society. They originate from different countries all over the world and collectively provide a nuanced overview of this issue, as well as varying perspectives on how to define and approach it. These studies differ somewhat in terms of the framing of the main research question, methods, and results. Some of them are concerned only with completed suicides and the cost thereof, while others also consider suicide attempts and other factors

pertaining to suicide and mental health issues. The following is a presentation and summary of a select number of previous studies on the economic cost of suicide, highlighting the factors considered, methods used, and results achieved. The selection of studies was made based on scientific or academic quality as well as usefulness in contributing to this study.

Yang, Bijou & Lester, David (2007) *Recalculating the Economic Cost of Suicide*
Country of origin: United States of America

Factors considered: This study concerns all completed suicides in the USA in the year 1990. It takes into consideration both costs and savings to society resulting from suicides in estimating the net economic cost. The costs included are direct cost in terms of medical care for suicides admitted to the hospital, costs associated with forensic pathology (autopsies), legal investigations, and indirect costs in terms of earnings lost due to premature death. The alleged savings from suicide are avoided expenditures for pensions, nursing home care, and treatment of depressive illness that those who committed suicide supposedly would have needed had they not passed away. In addition, the potential savings from assisted suicide are included.

Methods: This study may be considered a somewhat rough, non-technical overview of estimated costs and savings from suicide, and the methods used for calculation are not discussed at length. The estimated costs of suicides, the avoided expenditures for treatment of depressive illness, and the potential savings from assisted suicide were gathered from previous research, while the avoided expenditures for pensions and nursing home care were estimated using figures on average pension income, the cost of nursing home care, and estimates of the number of years that people receive these benefits, taking into account inflation rates and assumed rises in pensions. The savings were then subtracted from the cost, yielding the net economic cost of suicide. All dollar amounts were presented in 2005 dollars.

Results: The results were an estimated net economic savings of 5.07 billion USD from all suicides that occurred in the USA in 1990.

Kennelly, Brendan (2007) *The Economic Cost of Suicide in Ireland*
Country of origin: Ireland

Factors considered: This study concerns all suicides that occurred in Ireland in 2001 and 2002 and aims to calculate the total cost of these suicides. The direct costs included are costs in terms of emergency services, medical care, funeral expenses, and administrative costs such as

those pertaining to insurance claims and police investigations. The indirect costs are productivity loss in terms of lost earnings (market output), lost unpaid productivity in the form of housework and volunteer work (nonmarket output), and intangible human costs which Kennelly summarizes as the value that individuals place on their lives in addition to the value of the output of their productivity, the value of all other aspects of living.

Methods: The direct costs were assumed to constitute less than one percent of the indirect costs, based on evidence from previous research, and were calculated using this ratio. All suicides were categorized by age and gender and the lost earnings (the present value of future gross earnings) were calculated for each group, taking into account wage growth, employment rates, and the fact that people with mental illness are likely to be less productive, which indicates that future earnings for those who committed suicide would have been below average had they stayed alive battling their supposed mental health issues. The lost earnings for one individual in each group were multiplied by the number of suicides in that group, and the products were summed for a total amount of lost earnings resulting from all suicides in the time period considered.

The value of lost unpaid productivity was calculated using data on the amount of time spent doing house work and volunteer work and this time was valued at minimum wage. The value of household- and volunteer production was assumed to grow at the rate of real wages. The human costs were estimated using the so called willingness to pay method. Put briefly, the willingness to pay method measures the value that individuals place on their lives based on how much they are willing to pay to reduce their risk of dying. Willingness to pay-values were elicited from survey estimates by the UK Department of Transport and used in previous research on the cost of suicide by a UK center for mental health, figures from which were used in this study. All figures were converted and expressed in 2001 euros.

Results: The estimated costs of all suicides that occurred in Ireland in 2001 and 2002 were ca. 907 million euros for 2001 and 836 million euros for 2002.

Rivera, Berta; Casal, Bruno & Currais, Luis (2016) *Crisis, suicide, and labour productivity losses in Spain*
Country of origin: Spain

Factors considered: This study examines the relationship between the economic cycle and suicide rates, and estimates the losses in labor productivity resulting from suicides. Of course

the latter objective is most relevant in the present context. The study concerns all suicides that occurred in Spain every year from 2004 to 2013. The cost to society in terms of lost labor productivity is constituted by lost earnings. In relation to losses in labor productivity, years of potential life lost (YPLL) and potentially productive years of life lost (PPYLL, years up until age 65) are calculated and taken into consideration.

Methods: The lost earnings (the present value of future gross earnings) were calculated for separate age- and gender groups, adjusting for employment rates and expected salary earnings for each group. The lost earnings for the number of suicides in each group were summed yielding a total amount of lost earnings from premature deaths by suicides each year. In addition, a one percent yearly increase in labor productivity was assumed, and three different discount rates were used in the calculation of the present value of lost earnings in order to adjust for uncertainty and create a range of possible variation. The years of potential life lost (YPLL) were calculated as the number of additional years a person would have lived had they not committed suicide, based on the remaining life expectancy for their age group. The potentially productive years of life lost were calculated as the additional years that a person would have lived up until the age of 65. All figures were presented in 2013 USD.

Results: In the most conservative scenario (with a 5% discount rate) the total expected losses in labor productivity resulting from all suicides in Spain during 2004-2013 were ca. 3.9 billion euros, in the base case (with a 3% discount rate) it was 6.05 billion euros, and 12.8 billion euros in the most generous case (with a 0% discount rate). In 2013, YPLL was 97377 and PPYLL was 38038.

Gurewich, Deborah; Lwin, Aung K; Reed, Gerald A; Shepard, Donald S & Silverman, Morton M. (2015) *Suicide and Suicidal Attempts in the United States: Costs and Policy Implications*
Country of origin: United States of America

Factors considered: This study attempts to calculate the cost of all completed suicides and all suicide attempts that occurred in the USA in 2013. Both direct and indirect costs are taken into consideration. The direct costs include costs for medical care (particularly emergency departments and inpatient hospitalization), ambulance transports, forensic pathology (autopsies), nursing home care, physician's care, and follow up care. The indirect costs are

constituted by the net present value of future salaries and wages, bonuses, and the value of unpaid housework lost due to suicide attempts or premature deaths by suicide.

Methods: All suicide-related acts that occurred in the USA in 2013 were categorized by age, gender, state of residence, and outcome (completed or attempted suicide). In addition, the number of completed suicides was adjusted for potential under-reporting. Direct and indirect costs were calculated for individual suicides and suicide attempts for each combination of gender, age, and state of residence, then multiplied by the number of suicides or suicide attempts in each combination, and the products were summed to yield the total national cost. Data on both direct and indirect costs were gathered from external sources. This data was then updated and refined to fit the current analysis, with adjustments for aspects such as increases in per capita health expenditures and changes in per capita gross GDP (which incorporates inflation and increases in earnings due to higher productivity). In addition, interviews were conducted for more nuanced information on the health care system and how it can be improved to reduce the number of suicide-related acts.

Results: The estimated total national cost for all suicides and suicide attempts that occurred in the USA in 2013, adjusted for under-reporting, was 93.5 billion USD, in 2013 dollars.

O'Dea, Des & Tucker, Sarah (2005) *The Cost of Suicide to Society*
Country of origin: New Zealand

Factors considered: This study estimates the cost of all completed suicides in 2002 and all attempted suicides in 2001-2002, in New Zealand. For completed suicides, it takes into consideration direct costs for police involvement, forensic pathology (autopsies and inquests), fire service attendance, funeral expenses (funeral director's transports to mortuary, burial or cremation, and funeral receptions), and counseling of families (including traveling costs). For attempted suicides it considers direct costs for police involvement, emergency response teams for psychiatric emergencies, ambulance transports, emergency department admittance, hospital health care, and victim support. In addition, productivity loss due to suicides and suicide attempts is included as indirect costs. For suicide attempts, lost production is measured based on lost gross earnings resulting from short-term absences from work following a suicide attempt. Both the person attempting suicide and an estimated two family members (or friends) are expected to take these absences. For suicides, lifetime lost production is measured as the market income (which includes income from wages and salaries as well as income from self-employment, investments, and rent) that people would have

earned throughout the rest of their lives had they not committed suicide. In addition, family members are expected to take time off work in the case of a completed suicide as well.

Another type of cost taken into consideration in this study is the number of disability adjusted life years (DALYs) which is a type of health gap measure (measuring the gap between current and ideal health status). One DALY is the loss of one year of healthy life, and DALYs for some health condition are the sum of years of life lost (YLL) and years lost due to disability (YLD) for the people living with the condition and its complications (WHO, n.d.). DALYs pertaining to suicides and suicide attempts are considered a cost to society.

Methods: The direct costs for suicides and suicide attempts were estimated using information on cost per work hour, the number of work hours spent on cases of completed or attempted suicide, and the cost of resource usage and practical measures carried out by the various professionals in handling suicides and suicide attempts. This information was mainly gathered through direct communication with representatives of relevant authorities, agencies, companies etc. whose practices and services are involved in case of suicide and suicide attempts. Some cost estimates were also retrieved from a previous study of the cost of suicide in New Zealand by Coggan, Fanslow & Norton (1995). Lost production in terms of gross earnings was calculated using statistics on average earnings from 2004 and estimates of the number of days of work absence incurred by people attempting suicide and by family members of people committing or attempting suicide. Lost lifetime market income was calculated for different gender- and age groups as well as averaged over all ages, using several discount rates for variation, under scenarios of no productivity increase as well as with an assumed one percent yearly productivity increase. The DALYs were valued using a willingness to pay method and the concept of the value of a statistical life. Estimates of the value of a statistical life are commonly based on survey data on willingness to pay to reduce the risk of death. From estimates of the value of a statistical life, approximations of the value of a statistical life year can be derived and used to value DALYs, which is the approach followed in this study. All dollar amounts were converted to and presented in 2004 NZD.

Results: The estimated total costs (excluding DALYs) for all suicides that occurred in New Zealand in 2002 was ca. 206 million NZD and the estimated total cost (excluding DALYs) for all suicide attempts in 2001-2002 was ca. 32 million NZD. The value of DALYs was ca. 1,1 billion NZD. The total cost of both suicides and suicide attempts, including direct and indirect costs as well as the value of DALYs, was ca. 1,4 billion NZD.

Swedish Civil Contingencies Agency (MSB) (2015) *Socioeconomic consequences of completed suicides* (author's translation)
Country of origin: Sweden

Factors considered: This study aims to calculate the socioeconomic costs of all suicides that occurred in Sweden in 2014. The direct costs included are medical costs, transportation costs, costs associated with police involvement, emergency services, forensic pathology (autopsies), and property damage. The indirect costs are constituted by productivity loss both from gainful employment and unpaid housework. Another type of cost taken into consideration is a so called human cost, and in this study, this cost is constituted by the number of life years lost due to premature death by suicide.

Methods: The cost estimations in this report were based largely on previous calculations in a 2011 MSB report titled *The Cost of Accidents to Society* (author's translation), and it is considered an update of a 2004 MSB report titled *Suicide and Socioeconomic Costs* (author's translation). The medical costs included refer to costs incurred from suicides where the person does not die immediately and is instead treated in hospital until he or she eventually passes. These costs were calculated using information on the total number of days that people who died by suicide spent in hospital pre-mortem, and the daily cost of in-hospital intensive care. Transportation costs were estimated based on the assumption that each suicide victim is transported one-way from the scene of the incident to another facility, and the average cost of an ambulance turnout was multiplied by the number of one-way transportations. It was assumed that emergency services are called out in 20-50% of all instances of suicide (representing low and high scenarios) and the associated costs were calculated using the average cost of emergency services for fatal road traffic accidents. The cost of police involvement was estimated similarly, assuming police are on scene in 75-100% of suicide cases. More than 95% of suicides lead to subsequent autopsies and these are assumed to entail a cost equal to that of an average autopsy as presented in the 2014 Swedish National Board of Forensic Medicine annual report. The cost associated with property damage was assumed to be the same for suicides resulting in property damage as it is for fatal road traffic accidents, and it was estimated that an average of 20-40 suicides a year lead to property damage.

The indirect costs in terms of lost productivity were estimated by multiplying expected loss of future earnings (discounted and adjusted for expected future employment rates and wage levels) for individuals in separate gender- and age groups, by the number of suicides in each group, and the products were summed to yield the total productivity loss from all suicides. It

is not explicitly explained how the value of unpaid housework was calculated but a primary source detailing three common methods for calculating this value is referenced. One method is based on the cost of hiring a domestic worker who is paid to do all otherwise unpaid housework, another uses the average wage of professionals trained for each particular task within the realm of unpaid housework, and a third refers to the pay that a person performing unpaid housework would receive in the market (Olofsson, 2008 p.49). The number of life years lost per suicide was calculated using remaining life expectancies for the different ages at which suicides occurred, also with respect to gender, and the number of life years lost were summed in total. All cost amounts were converted to and presented in 2014 SEK.

Results: The total socioeconomic costs of all suicides that occurred in Sweden in 2014 was an estimated 46-60 million SEK in direct costs, 9 billion SEK in indirect costs, and more than 38000 years of life lost.

3.0 This Study

The main objective of this study is to estimate the net economic cost to society of all suicides that occurred in Sweden in 2015. For this purpose, direct costs, indirect costs, and potential savings from suicide are taken into consideration. In addition, an interdisciplinary analysis of the intangible costs of suicide in terms of life and health is included. The following is an overview of the 2015 suicide statistics, the costs and savings taken into consideration in this study, as well as some discussion of what is omitted.

Table 1: Suicide Statistic 2015

		Age																
Gender	Total	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85-89	90+
Women	331	5	14	24	17	31	22	19	24	35	28	23	31	20	14	9	6	9
Men	848	3	20	48	67	41	47	63	81	96	93	64	62	48	44	33	24	14
Total	1179																	

Data source: SS (2016b).

Direct costs

Direct costs in this context refer to costs that are incurred immediately as a result of the suicide act itself, constituted by consumption of resources that could have been otherwise used (MSB, 2015 p.8). In this study, the following types of direct costs are included:

- Transportation costs: the costs associated with transporting the suicide victim from the scene of the incident to hospital, mortuary or other destination
- Medical costs: the costs incurred when suicide victims are treated in hospital, presumably in intensive care, before they die
- Costs associated with:
  - Police involvement: the cost of police responding to and handling suicides
  - Emergency services: the cost of emergency personnel such as fire patrols responding to the scene of a suicide
  - Forensic pathology: the cost of autopsies
  - Property damage: the cost of property damage resulting from suicides

This selection is based on the previous research presented and the direct costs most often included in those studies. Direct costs that appear in previous research but are omitted from this study include funeral expenses and costs associated with counseling of families and insurance claims. O'Dea and Tucker (2005 p.8) include funeral expenses in their estimation, but as they point out, these costs would have been incurred eventually regardless of the cause of death. Of course the present value of funeral expenses in the future is lower than that of funeral expenses today, and could be deducted from the current estimate to yield a more exact amount (O'Dea & Tucker, 2005 p.8). However, including these costs still seems somewhat redundant. Direct costs associated with counseling of families and insurance claims have been omitted from this study mainly due to lack of data availability. It is possible that estimates could be made using average costs of counseling services and insurance claim processes but without knowing to what degree families of suicide victims seek counseling or what kind of insurance plans they have, such estimates are likely to be uncertain and arbitrary.

It is likely that there are numerous other types of direct costs involved when a suicide occurs. Depending on the situation and the consequences of the incident, each case may require different resources, and to estimate the associated costs would require case by case analysis (MSB, 2015 p.14). However, the combined direct costs resulting from suicide are typically small compared to the total indirect costs and thus do not significantly affect the total cost estimate (MSB, 2015 p.5; O'Dea & Tucker, 2005 p.30), which is why a rough, general estimate of these costs may be considered sufficient.

Indirect Costs

Indirect costs are measured in terms of resources that are lost or that never come into existence due to premature death by suicide (MSB, 2015 p.8). Based on the indirect costs included in previous research, the following are included in this study:

- Lost productivity in terms of lost future income that people who committed suicide would have earned throughout the rest of their lives had they stayed alive
- Lost productivity in terms of lost earnings due to bereaved family members of suicide victims taking time off work

Kennelly (2007), Gurewich et al (2015), and MSB (2015) all include lost productivity from unpaid housework (or volunteer work) in addition to lost productivity from paid work. This cost is not calculated for this study, but the MSB (2015) estimate of the lost productivity from unpaid housework resulting from suicides in Sweden in 2014, is considered a useful approximation of what the corresponding 2015 value would be. This will be discussed further in the Results section of this study.

Rivera, Casal and Currais (2016 p.84) mention that another indirect cost may be constituted by investments in education or training that will generate no return if people die before they can put their education or training to productive use. These investments may then be considered lost resources. However, it would be difficult to estimate how much of these investments would be lost depending on when a death occurs. Perhaps such investments can be considered lost entirely if a person commits suicide right after they finish their education or vocational training, and it might be assumed to have generated maximum return at the end of a person's working life. However, there is no way of knowing how much of the investment can be considered lost if a person dies at some point in time in between. In addition, people often invest time and resources in education and training throughout their lifetime, so there might be numerous investments made that may or may not generate return, and these can hardly be kept track of at an aggregate level.

Clearly there are other potential indirect costs that probably should be taken into consideration to generate a more accurate estimate of the total cost of suicide to society. For example, if the people who committed suicide would have been able to teach, inspire, and otherwise aid others, this would have generated additional future productivity which would be lost as a result of the premature deaths. However, actually measuring such costs is not feasible, and in

order to maintain a reasonable scope of this study, a selection of which factors to consider had to be made.

Savings

Each person poses certain economic costs to society throughout their lifetime by consuming resources that could have been otherwise used. When a person dies prematurely, whatever costs they would have posed to society throughout the rest of their lives are avoided in the sense that the resources that this person would have consumed will be available for some other use. Out of the previous research presented, only Yang and Lester (2007) take potential savings into consideration in their estimation of the economic cost of suicide. Based on their discussion, potential savings from the following sources are included in this study:

Medical care: Throughout their lives, people are likely to require some amount of primary care as well as specialized somatic care. However, if a person dies prematurely, whatever medical resources they would have consumed during their remaining years are spared. The savings to society are measured using the estimated cost of these resources.

Psychiatric care: It is likely that people who commit suicide struggle with mental health issues and are in need of some form of psychiatric care. If, however, they refrain from actually committing suicide, they will probably still require psychiatric care for some time. As in the case of somatic care, avoided psychiatric care expenditures would constitute savings to society.

Geriatric care: Here, geriatric care refers to the care, services, and assistance elderly people may receive either in their own homes or in special accommodation. It does not refer to specialized somatic care for the elderly. It can be assumed that at least some share of the people who commit suicide would have gone on to require geriatric care in old age. Just like in the case of somatic and psychiatric care, society will save resources if some people never reach the point of needing geriatric care.

Pensions: In Sweden, when someone dies, their pension balance (the amount they have saved so far for their pension) in the form of income pension, premium pension, and occupational pension will either be distributed to other pensioners and people saving for their pensions, or to family members if the person has signed an insurance contract bequeathing the money to them (income pension will only be distributed to other pensioners and people saving for their

pension, it cannot be bequeathed to family) (Collectum, n.d; Fora, n.d; SPV, 2017; Swedish Pensions Agency, 2017a; Valcentralen, n.d.a-b).

This results in a financial gain for the remaining pensioners and pension savers. For the surviving family, it is unclear whether the redistributed pension balances could result in a financial gain or not. If the money was going to be used to support the family even if the person in question had not died, receiving the money after the person's death may not make much of a difference, even if it will then be shared by fewer people. In addition, once someone acquires the insurance bequeathing their pension to their family, they will receive smaller pension payments while they are still alive (Swedish Pensions Agency, 2017a). Therefore, a family supported in part by this pension seems less likely to see a net financial gain from receiving the pension balance of the deceased. However, it is clear that, since the pension balance of the deceased is not lost but rather salvaged to be used elsewhere, this could be considered a type of gain or saving to society.

Without a doubt, there is a plethora of other potential savings to society from premature death (by suicide or otherwise); everything from reduced wear and tear on sidewalks to a smaller collective carbon footprint. It is not possible to produce an exact estimate of these numbers. Rather, what is presented here is merely a suggestion of what may be potential savings from premature deaths by suicide and a very rough estimate of what they amount to.

Table 2: An overview of factors considered in previous research and in this study (Drawn and adapted from a similar table featured in MSB (2015 p.10))

Study	Direct costs	Indirect costs	Savings	Quantification or analysis of intangible costs
Yang, Bijou & Lester, David (2007)	x	x	x	
Kennelly, Brendan (2007)	x	x		x
Rivera, Berta; Casal, Bruno & Currais, Luis (2016)		x		
Gurewich et al (2015)	x	x		
O'Dea, Des & Tucker, Sarah (2005)	x	x		x
MSB (2015)	x	x		x
Asker Svedberg (2017)	x	x	x	x

4.0 Theory

Studies on the economic cost of suicide to society may be categorized as versions of what is called a Cost of Illness (COI) study. MSB (2015), for example, mentions COI and references it as a methodological framework. This study does not constitute an explicit attempt at an

actual COI study, but it relies to some extent on methods and principles found in the theoretical and methodological framework of COI. The following is an overview of the theoretical concepts and methods found in COI that, with some differences and variations, are applicable and relevant to this study.

COI is a method for calculating the total costs to society of diseases and accidents; a way of assessing the economic impact of various types of problems (Olofsson, 2008 p.13, 15). A central theoretical baseline in COI is the opportunity cost principle, hence costs in this context refer to opportunity costs. The concept of opportunity costs refers to the idea that when resources are used or lost, the opportunity to use them elsewhere is forsaken. The cost then, is the value of this lost opportunity, and COI can be thought to measure the value of the lost opportunity to use elsewhere the resources expended due to diseases and accidents; the value of what has to be abstained from. Calculating opportunity costs requires the identification of an alternative, representing what would have been if no resources had been spent or lost due to diseases and accidents. This alternative is simply constituted by a scenario where there are no diseases or accidents (Olofsson, 2008 p.15), and in the context of this study; a scenario where there are no suicides.

For any COI study, it is imperative to establish from what perspective the study will be conducted. Adopting a societal perspective means including the costs incurred by all individuals, as well as other public- and private actors affected by a disease or accident nationwide, and this generates the most extensive calculation. From such a societal perspective, transfers, meaning costs to one party that are also gains to another party, are not considered costs to society. Only the net sacrifices for each party are considered economic costs to society (Olofsson, 2008 p.16). This type of societal perspective is implicitly adopted in this study.

It is also crucial to decide within what time frame the costs should be calculated. A COI study can adopt either a retrospective or a prospective approach, meaning it either calculates costs after they occur or before, or it can use a combination of both (Olofsson, 2008 p.20-21). It is not immediately obvious which of these theoretical concepts best describes the approach used in this study. It might be considered a retrospective approach since it calculates now the costs that resulted from suicides in 2015. However, that reasoning only applies to the costs incurred directly following the suicides in 2015. Since most of the costs resulting from suicide are costs in terms of lost future productivity, it is reasonably argued that these costs are being calculated before they occur, indicating a prospective approach.

Another distinction regarding the time perspective of a COI is that between a prevalence strategy and an incidence strategy. Using a prevalence strategy means calculating the costs incurred from diseases and accidents during a short period of time, normally one year. Meanwhile, the incidence strategy involves calculating the costs of instances of diseases and accidents that occur within one year, from the onset until the end of each case, the end normally referring to cure or death (Olofsson, 2008 p.21). This study uses a form of incidence strategy, calculating the costs incurred from all suicides from the moment of death in 2015 until the future point in time when these people presumably would have died had they not committed suicide. The costs that occur after the first year are discounted on account of the fact that costs incurred in the future have a lower value today since there is a higher preference for immediate rather than future consumption, and since resources spent today involve an opportunity cost in terms of returns from a lost investment opportunity (Olofsson, 2008 p.22).

The results of any COI study depend on various factors such as methodology, choice of data and other material, as well as numerous assumptions. Presumably, it is not possible to achieve an exact result representing the costs to society of diseases and accidents with guaranteed accuracy. The results of a COI study should therefore be presented along with a discussion of its uncertainties and dubiety, as well as some form of sensitivity analysis. In a COI, a sensitivity analysis involves investigating the effects of different variables and assumptions on the results; namely on the size of the costs (Olofsson, 2008 p.26). No formal, theoretically sound sensitivity analysis was implemented in this study, but in order to account for some uncertainty, high and low scenario estimates were calculated and the total costs were estimated using three alternative discount rates.

It is standard praxis for COI studies to include direct and indirect costs. In COI theory, direct costs refer to the resources used to prevent and remedy diseases and injuries, and indirect costs refer to productivity loss resulting from disease, injury, or death (Olofsson, 2008 p.17). In this study, and previous ones like it, direct and indirect costs hold similar definitions. As previously described, direct costs are costs incurred immediately following a suicide, constituted by the consumption of resources that could have been otherwise used. The direct costs can be illustrated using a production possibility curve, as figure 1 shows. The production possibility curve illustrates society's available resources. An increase in the amount of resources expended due to suicide constitutes an opportunity cost in terms of a decrease in

other consumption; once the resources have been exhausted handling suicides, the opportunity to use them elsewhere is forsaken (Olofsson, 2008 p.31).

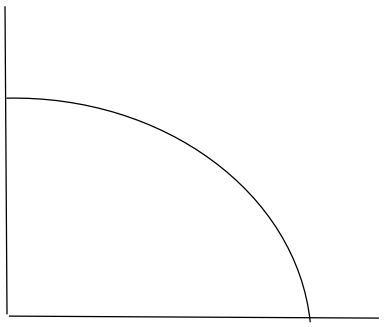


Figure 1: Production possibility curve direct costs. Drawn and adapted from figure featured in Olofsson (2008, p.31); Primary source: Jacobson L – Lindgren B, Socialstyrelsen (1996). Vad kostar sjukdomarna?- sjukvårdskostnader och produktionsbortfall fördelat på sjukdomsgrupper 1980 och 1991.

In measuring these opportunity costs, COI normally uses average costs, not marginal costs. For example, in calculating the direct costs of a fire, the average cost of a fire rescue mission is used rather than the cost of an additional fire rescue on the margin. The average cost is calculated by dividing the total cost of a number of fires by that number, while the marginal cost is the change in total costs divided by the change in the number of fires (Olofsson, 2008 p.35). This ties into a discussion of whether it is short- or long term costs that are being calculated; short term means some costs are variable and others fixed while long term means all costs are variable. In the short term, only variable costs can be said to constitute costs to society since fixed costs have no alternative use and thus entail no opportunity cost. The average cost then, may be an overestimation in the short term since it includes both fixed and variable costs (Olofsson, 2008 p.35). In this study, average costs are used in the calculations of direct costs, but for at least some of them, fixed costs have been omitted to avoid overestimation (MSB, 2009 p.23).

Another methodological distinction made regarding the calculation of direct costs is that of top-down versus bottom-up. The top-down method means multiplying the total cost of, for example medical care, by the percentage share of these costs constituted by a particular disease, which yields the cost to society of that disease. The bottom-up method means multiplying the average cost per person for a particular disease or type of accident by the

number of instances thereof (Olofsson, 2008 p.39-40). The bottom-up method is most suitable to describe the practices used in this study.

Indirect costs are constituted by the productivity loss, which can be described in terms of resources that are lost or never come into existence, due to premature deaths by suicide. Indirect costs can also be described using a production possibility curve as shown in figure 2. Again, the production possibility curve illustrates society's available resources. When people die, the production possibility curve shifts inward, and the indirect costs in terms of productivity loss from premature deaths are represented by the inward shift (Olofsson, 2008 p.43).

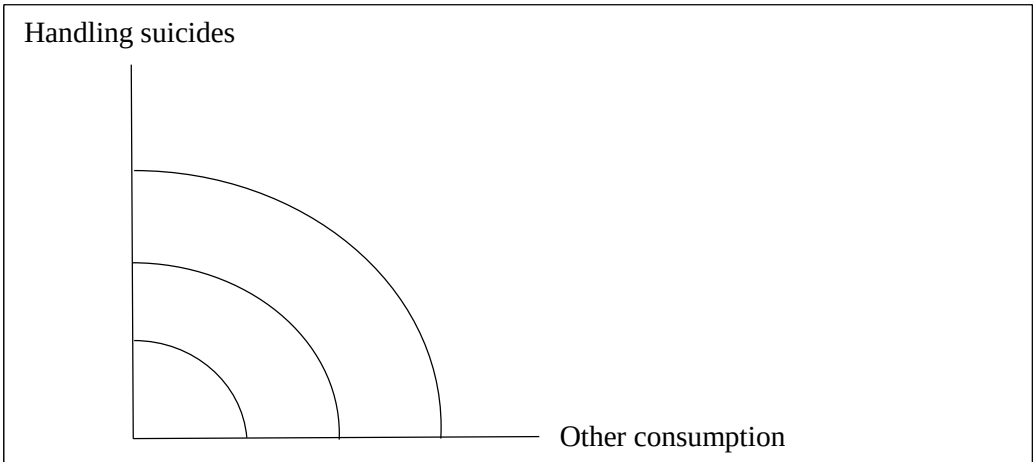


Figure 2: Production possibility curve indirect costs. Drawn and adapted from figure featured in Olofsson (2008, p.43) Primary source: Jacobson L – Lindgren B, Socialstyrelsen (1996). Vad kostar sjukdomarna?- sjukvårdskostnader och produktionsbortfall fördelat på sjukdomsgrupper 1980 och 1991.

The most common approach for measuring indirect costs in COI studies is the so called human capital method (HCM). HCM measures these indirect costs in terms of productivity loss as the present value of lost future income. Traditionally, HCM assumes full employment and an efficient labor market. If full employment prevails, one person's productivity loss due to illness, injury, or death will involve an equal loss to society since no one can replace that individual. The value of labor then, measured as average gross salary plus social fees, represents the opportunity cost to society from an individual's productivity loss from paid work (Olofsson, 2008 p.45-46). Productivity loss from unpaid work should preferably be included as well in order to avoid underestimation of the indirect costs, especially in terms of productivity loss among certain groups such as women and the elderly (Olofsson, 2008 p.47-48).

The human capital approach has been subject to some criticism. For example, the assumptions of full employment and efficient labor markets have been questioned. Another method for calculating the productivity loss from paid work is the friction cost method (FCM), which relaxes the assumptions in HCM and thereby claims to yield more accurate estimates of productivity loss. According to FCM, HCM overestimates the productivity loss due to premature death by measuring it in terms of the present value of all future potential income. The actual productivity loss, according to FCM, is much smaller as a result of replacement mechanisms in the labor market (Olofsson, 2008 p.59). FCM suggests that indirect costs are simply the costs incurred during the friction period; the time it takes to replace an individual who can no longer work with someone who is unemployed (Olofsson, 2008 p.61). However, FCM has yet to replace HCM as the dominant approach, mainly due to lack of theoretical and empirical anchoring (Olofsson, 2008 p.63).

Another criticism of the human capital approach concerns the very idea of using productivity loss as a measure of indirect costs (Olofsson, 2008 p.59). This measure is considered flawed since it does not take into account intangible costs, or so called human costs, of illness, injury or death. It has been implied that the productivity loss serves as a measure of individuals' and society's willingness to pay to reduce the risk of dying or becoming injured, but it seems implausible that people would value life and health in terms of future income. In addition, such a valuation implies that the life and health of people with high income are more valuable than that of people with lower income (Olofsson, 2008 p.67).

Another way of valuing life and health, and an alternative to HCM, is the willingness-to-pay approach (WTP), which involves directly measuring individuals' willingness to pay to reduce the risk of dying or becoming injured. This opens up for a distinction between, and inclusion of, three types of costs: direct-, indirect-, and intangible costs. Measuring indirect costs in terms of productivity loss and intangible costs in terms of willingness to pay may result in overlapping if people consider productivity loss when reporting their willingness to pay to reduce the risk of dying or becoming injured. However, it is deemed unlikely that individuals accurately take into account the loss of economic resources in terms of indirect costs to society (Olofsson, 2008 p.67). Hence, it seem there is reason to consider indirect costs and intangible costs respectively.

Intangible costs can be summarized to include costs in terms of life and health. The value of these costs can be monetary, measured by willingness to pay, or estimated using some quantitative measure such as Quality Adjusted Life Years (QALY) or Disability Adjusted Life Years (DALY). The value of life is often estimated using the concept of Value of a Statistical Life (VSL), which is normally calculated using willingness-to-pay methods, while different health states are commonly assessed using QALY or DALY (Olofsson, 2008 p.68). It is of interest to explore each of these measures in turn.

WTP to reduce the risk of death can be estimated using a so called stated preference approach (SP) where subjects are asked to make hypothetical choices about how much money they would pay for some small mortality risk reduction. Studies on WTP for mortality risk reduction are commonly conducted by national transport administration authorities in the context of road traffic safety measures (Hultkrantz & Svensson, 2012 p.303-304). VSL then, refers to the value of preventing a death (Hultkrantz & Svensson, 2012 p.302), and based on SP-estimates of WTP, VSL is calculated by dividing the WTP by the risk reduction hypothetically offered (Hultkrantz & Svensson, 2012 p.304).

QALY is a measure of the number of remaining life years, adjusted for the quality of life, based on particular health conditions. One QALY represents one year in perfect health, and the number of QALYs for a certain health condition is calculated by multiplying the number of remaining life years by a quality-of-life score on a scale from 0 to 1. For example, if a person has an expected 3 years of life remaining and quality of life for these years is 0,2, then the number of QALYs for the 3 year period is 3 x 0,2 = 0,6, meaning there is 0,6 years in perfect health remaining in the presence of some health condition. The number of QALYs can be increased by taking measures to increase the quality of life score and the number of remaining life years (MSB, 2012 p.9; NICE, n.d).

DALY is a similar measure to that of QALY, though expressed in negative terms (O'Dea – Tucker, 2005 p.18). One DALY is the loss of one year of healthy life, and DALYs for some health condition are the sum of years of life lost (YLL) and years lost due to disability (YLD) for the people living with the condition and its repercussions. Calculating DALYs across a population for some health condition, YLL is the number of deaths multiplied by the average life expectancy at the age of death, and YLD is the number of cases multiplied by a disability weight (which is similar to the quality-of-life score except it measures the severity of the condition on a scale from 0 to 1) and the average duration of the condition until cure or death

(WHO, n.d.). For both QALYs and DALYs, future years may be discounted to yield present value life years (O'Dea & Tucker, 2005 p.18).

This study uses a version of the human capital approach to calculate the indirect costs of suicide to society. It does not assume full employment but rather calculates expected productivity loss, adjusting for employment rates. Similar to the measure of lost incomes traditionally used in HCM, consisting of gross salary plus social fees (Olofsson, 2008 p.57), the productivity loss in this study is measured as expected gross income plus payroll tax. As for intangible costs, this study does not estimate the value of such costs resulting from suicide, instead, the issue of intangible costs is discussed and analyzed in a theoretical, interdisciplinary framework.

5.0 Methods

This is a detailed description of the methods used to calculate the direct costs, indirect costs, and savings resulting from suicide. In addition, there are some methodological principles and assumptions that apply to the study as a whole. First, all monetary amounts are presented in 2015 prices and all conversions to 2015 prices were done using the SCB price converter (SCB, n.d.a). Second, 2015 figures for all variables (income, salary, costs for geriatric-, psychiatric-, and somatic care, employment rates, life expectancy, number of people receiving care etc.) are assumed to apply in the future as well, meaning for example that the average income of a 37 year old woman is assumed to be the same in 2025 as it was in 2015 for the purpose of the calculations in this study. No growth effects in terms of productivity increase, inflation, or demographic changes are taken into consideration. Instead, the study is based entirely on the 2015 system. Third, all future monetary amounts are discounted with three different real discount rates; 2,5, 3,5, and 5%, using the following formula: $present\ value = \frac{amount}{(1+r)^t}$ (Olofsson, 2008 p.23). Fourth, all suicides are categorized into age- and gender groups and most calculations were made for each group separately in order to account for differences among these groups. Fifth, all suicides in each age group are assumed to have occurred at the median age in that age interval so that all calculations refer to the median person within each age group (Kennelly, 2007 p.91). Sixth, each person would have had the average remaining life expectancy of their gender and age at the time of the suicide, had they not died prematurely.

Empirical Calculations

Direct Costs

All direct costs, except those associated with police involvement, were calculated using methods and figures from the 2015 MSB report titled *The Economic Cost to Society of Completed Suicides* (author's translation).

Transportation costs: To calculate transportation costs, MSB (2015) uses figures on the average cost of an ambulance mission (transportation) from a 2009 MSB report titled *The Cost to Society of Road Traffic Accidents – Calculations* (author's translation). Assuming each suicide requires a one-way transportation from the scene, and multiplying the average cost of an ambulance mission by the total number of suicides, an estimate of the total transportation costs is obtained. This study uses the average cost of an ambulance mission presented in MSB (2015), converted to 2015 prices, and multiplied by the number of suicides in 2015 to yield an estimate of the total transportation costs incurred as a result of suicides in 2015.

Medical costs: The costs of suicide victims being treated in hospital before they die are estimated in MSB (2015) based on the number of days suicide victims spent in hospital in 2014, which was obtained through a special excerpt from the patient- and cause of death registry of the The National Board of Health and Welfare. The cost of one day in intensive care was obtained from a 2014 MSB report titled *The Cost to Society of the Breakout of Pandemic Flu A(H1N1)* (author's translation). This cost was multiplied by the lowest and highest values in the range of days spent in hospital by suicide victims to yield low and high scenario estimates of the total cost. The same approach is adopted in this study, using the same range of days spent in hospital (assuming these 2014 numbers can serve as an approximation for 2015 as well) and the cost of one day in intensive care, converted to 2015 prices.

Emergency Services: MSB (2015) assumes that emergency services respond to suicides that are committed through drowning, jumping from height or with an object in movement (such as in road- or rail traffic), and these constituted about 20% of suicides in 2014. The cost per emergency service turnout in response to suicide is assumed to be equal to that of a fatal road traffic accident and an estimate of this cost was obtained from the 2009 MSB report on the cost of road traffic accidents. The total cost was then calculated by multiplying the number of

suicides (20% of the total number) by the cost per emergency service turnout. A high scenario was also calculated where emergency services are assumed to respond to 50% of all suicides.

The same methods were used in this study, with the additional assumption that emergency services also respond to suicides committed with smoke and open fire. In the Swedish National Board of Health and Welfare's Cause of Death Registry, deaths by suicide are grouped by the specific type of self-destructive act committed (SS, 2016 table 4A). From these statistics, the number of suicides committed through means warranting emergency service response was obtained, and the cost per emergency service turnout presented in MSB (2015) was converted to 2015 prices. Total costs for emergency services were calculated using these numbers. In addition, a high scenario estimate was calculated with an assumed 50% emergency response frequency.

Forensic Pathology: MSB (2015) uses the average cost per autopsy in 2014, obtained from the 2014 National Board of Forensic Medicine annual report, multiplied by the number of instances of suicide where an autopsy was performed. Based on information from a 2013 National Board of Health and Welfare report titled *Causes of Death 2012*, MSB (2015) states that autopsies are performed in 95-100% of suicide cases. The total cost of autopsies was estimated by multiplying the cost per autopsy by the number of suicides; 95% of all suicides in the low scenario and 100% in the high scenario. Assuming the cost per autopsy is the same in 2015 as in 2014, and converting it to 2015 prices, the total cost of autopsies performed on suicide victims in 2015 was calculated using the same methods.

Property damage: MSB (2015) assumes that property damages occurred in 20-40 suicide cases in 2014 and that the cost of these damages in each case is equal to that of an average fatal road traffic accident. In this study, property damages are assumed to occur as a result of suicides involving motorized vehicles and fire. For suicides involving motorized vehicles, the average cost of a fatal road traffic accident was used as an approximation as in MSB (2015). For suicides involving smoke and open fire, the cost for property damages per suicide was estimated using information on the cost of property damage as a result of fire from a 2008 report by the Swedish Rescue Services Agency (the predecessor of MSB) titled *The Cost to Society of Fires – Results* (author's translation). The report states that the total costs of the 40000 fires that occurred in 2005 amounted to 4,2 billion SEK (SRV, 2008 p.16). The average cost per fire was estimated by dividing the total costs by the number of fires, and it is assumed that this average applies to suicide fires as well. By multiplying the number of suicides in

2015 that involved motorized vehicles or fire by the respective costs per case (converted to 2015 prices), the total costs of property damage was estimated.

Police Involvement: The cost of police involvement in suicide cases was estimated through a series of steps. First, the 2015 average monthly salary of a police officer working in the field and handling suicide cases was divided by the number of hours such an officer can be expected to work each month, in order to yield an estimated cost per police work hour. The average monthly salary for a police officer was obtained from the SCB statistical database (SCB, n.d.b), while the expected number of hours worked each month was obtained from a collective agreement from police labor union Polisförbundet (ASA/Polis, 2013 p.6-7). Second, the cost per police work hour was multiplied by the total number of hours worked by all police officers involved in each suicide case, yielding the cost of police involvement per suicide.

The estimated number of police officers involved and the number of hours they work for each suicide case were obtained through a phone conversation with an investigation officer of the Gästrikland investigation squad (personal communication, 28 March 2017). Third, the total cost of police involvement in suicide cases in 2015 was calculated by multiplying the cost per suicide by the number of suicide cases where police were involved. As in MSB (2015), a low and a high scenario were estimated by calculating the total cost assuming police were involved in 75 or 100% of suicide cases in 2015.

Indirect Costs

Lost productivity – Suicide Victims

Lost lifetime income was estimated for each age- and gender group using data on the 2015 average annual income from employment and business. The following initial assumptions were made: A person's future earnings would have been equal to that of people in higher age groups in 2015, meaning a person committing suicide at age 37 in 2015 would in 2025 have earned the average annual income of a 47-year old in 2015 (Kennelly, 2007 p.91). Everyone would have earned the average annual income of each age interval for every year that they would have been in that age interval.

The expected income for each year that a person would have lived had they not committed suicide was calculated by multiplying the average annual income of each age interval by the employment rate among people that age. The employment rate represents the probability that

a person would have been employed and earned the average annual income for that year (Kennelly, 2007 p.91). There are no statistics on the employment rate of people aged 75 and older and it is here assumed to be zero, which means suicides occurring after the age of 74 result in no productivity loss in terms of lost income.

In addition, payroll taxes that would have been paid by employers were added to each average annual income since these constitute lost tax revenue. The payroll tax is 31,42% of salaries (Swedish Tax Agency, n.d.a), and to include these taxes in the estimated productivity loss, 31,42% of average annual salaries for each age- and gender interval between the ages of 20 and 66 were added to the corresponding incomes. The expected lost incomes and payroll taxes for each year were then discounted and summed to yield the total lost lifetime income and payroll taxes for an individual suicide victim within each age- and gender group. This total was then multiplied by the number of suicides in each group, and the products were summed to give the total productivity loss in terms of lost income and payroll taxes resulting from all suicides in 2015.

Lost productivity – Family Members

It is assumed that when a suicide occurs, members of the victim's family are likely to take time off work to process the shock and grief. In this context, the term family members has been restricted to include immediate family only. In order to calculate the costs associated with these work absences, the number of family members taking time off work, the duration of the absences, and the subsequent lost gross earnings needed to be estimated.

According to SCB (2017) statistics, the average number of children born per woman has been between 1,5 and 2,5 since 1960 and is projected to be close to 2 until 2060. From this, some intuitive reasoning yields that for each suicide, there should be about two bereaved working people (immediate family members). The intuitive reasoning goes as follows: if the suicide victim is aged 10-24, two parents will be bereaved, if the suicide victim is 25-64 years old, one spouse and one sibling (somewhat close in age) will be bereaved, and if the suicide victim is aged 65+, two adult children will be bereaved.

Figures on the number of bereaved working people expected to take time off, and the duration of these absences, were estimated using information from a research article titled *Functional impairment due to bereavement after the death of adolescent or young adult offspring in a national population study of 1,051,515 parents,* by Alexanderson, Kjeldgård, Mittendorfer Rutz, Runeson, & Wilcox (2015). The study examines offspring death in relation to parental

sickness absence and includes fathers and mothers of all offspring aged 16-24 in Sweden on December 31, 2004 (Alexanderson et al, 2015 p.1549). Assuming that the experience of parents losing their offspring to suicide is similar to that of spouses and siblings losing each other, the findings in this study may be applicable to all bereaved working people. According to this study, 45% of parents who lost a child to suicide took time off work exceeding 30 days due to psychiatric diagnoses and 21% took time off due to somatic diagnoses. For simplicity, it is assumed that the average duration of these absences was 30 days.

The cost to society in terms of productivity loss resulting from each absence may reasonably amount to a one month salary. Since there is no way of knowing the exact age, gender, or profession of the bereaved working people, the 2015 average monthly salary of people aged 18-64 was used as an approximation of the value of lost production. Multiplying the cost for each absence by the number of bereaved working people expected to take time off, the total cost of family members' work absences was estimated.

Savings

Psychiatric care

The estimated savings from avoided psychiatric care expenditures were calculated using two different methods to yield a variety of estimates, including a minimum low scenario and a maximum high scenario. For both methods, it is assumed that everyone who committed suicide was in need of some sort of psychiatric care, and that if they would not have come to the point of actually committing suicide, they would still have needed psychiatric care to treat their presumed mental health issues. However, it is not certain that they all would have received care, since not everyone in need of psychiatric care can be assumed to seek and actually receive it. Therefore, estimations and assumptions of the number of people who would have received care were made. It is also assumed that those who would have received care would have started treatment in 2015. In addition, since there is no available data on the total duration of treatment for each patient, both methods include assumptions about the duration of treatment.

Method 1: The first method used 2015 annual cost per patient data for people over the age of 18, and by dividing the 2015 budget of the Child and Adolescent Psychiatry Stockholm chapter by the number of patients in 2014 (BUP, 2016) (assuming the number of patients was about the same in 2015), the average annual cost per patient under 18 was estimated. Four different cost estimates were generated by assuming that either 10% or 100% of suicide

victims would have received care and that each of these people would have been in treatment for either 1 or 5 years. The yearly cost of treatment is assumed to be the same every year, but different depending on whether the person is under 18 or over.

The cost per person was estimated either as the cost of 1 year worth of treatment or as the sum of 5 years worth of discounted annual treatment costs. The four total cost estimates were calculated by multiplying the cost per person by the number of people receiving care in the following four scenarios:

1. 100% of suicide victims would have received care for 5 years
2. 100% of suicide victims would have received care for 1 year
3. 10% of suicide victims would have received care for 5 years
4. 10% of suicide victims would have received care for 1 year

Method 2: The second method estimates the 2015 annual cost per patient by dividing the total local public sector cost for specialized psychiatric care by the number of people likely to receive treatment, and this cost is assumed to be the same every year. The number of people receiving treatment was estimated based on information from a 2009 National Board of Health and Welfare healthcare report, according to which 5-10% of the Swedish population are in need of psychiatric treatment but every year only 3-4% of the population seek it (SS, 2009 p.305). If 10% of the population need psychiatric care and 3% seek it, then 30% of those in need of treatment will receive it. If 5% of the population need treatment and 4% seek it, then 80% of those who need it will receive it. Assuming again that the duration of treatment is either 1 or 5 years, the following scenarios can be stipulated:

1. 80% of suicide victims would have received care for 5 years
2. 80% of suicide victims would have received care for 1 year
3. 30% of suicide victims would have received care for 5 years
4. 30% of suicide victims would have received care for 1 year

The scenario yielding the lowest total estimate of savings from psychiatric care is scenario 4 in method 1, and the highest is scenario 1 in method 2. Hence, these are used to create an estimated range of the total savings in terms of avoided psychiatric care expenditures.

Geriatric care

In order to calculate the savings from avoided geriatric care expenditures, estimates of the following needed to be made; the annual cost of geriatric care per person, the number of suicide victims who would likely have received geriatric care, and the number of years for

which they would have received care. The expected annual cost of geriatric care per person was estimated by dividing the 2015 total local public sector cost of geriatric care by the number of people over the age of 65 in 2015.

Since 19% of everyone over 65 received some type of geriatric care in 2015 (SS, 2016 table 1b), it is assumed that 19% of the people who committed suicide would have received geriatric care after the age of 65. It is also assumed that if a person starts receiving geriatric care at age 65, they will receive it every year for the rest of their life. The expected savings from geriatric care were calculated for each age- and gender group by summing the discounted annual costs for all the years that an individual in each group could receive care, then multiplying this sum by the number of people from that group expected to actually receive care – namely 19% of the total number of people in the group, and these numbers were rounded to the nearest integer. By summing the expected savings for each group, the total savings from avoided geriatric care expenditures were estimated.

Medical care

In estimating the savings from avoided medical care expenditures (expenditures for primary care and specialized somatic care), a couple of initial assumptions had to be made. It is assumed first, that all people receive some sort of medical care every year throughout their lives. Second, that people receive more medical care in old age than they do earlier in life, which means the annual cost of medical care is higher for older people.

The annual cost of medical care per person was estimated by dividing the total local public sector cost of primary care and specialized somatic care by the number of people in the Swedish population in 2015. This serves as the basic estimate of the cost of medical care per person every year. It was then assumed that for the first 64 years of a person's life, the annual cost of medical care is half of the 2015 estimate. The the sum of the costs that were subtracted from the first 64 years were then added to and distributed evenly over the years after age 65 to give an estimate of the higher cost of medical care in old age. For each age- and gender group, the discounted annual costs of medical care for the remaining lifetime were summed to yield the total savings for each suicide in that group. The total savings from avoided medical care expenses were then estimated as the sum of the savings from each group.

Pensions

The financial gain to society resulting from redistributed pension balances was estimated as the sum of the suicide victims' income-, premium-, and occupational pension balances at the time of their deaths (taking into account only people over the age of 15 since anyone younger is unlikely to have a positive pension balance). For income- and premium pension, the average pension balance for each age- and gender group was multiplied by the number of suicides in that group, and the products were summed to give the total amount gained from income- and premium pensions respectively. Since no data on total occupational pension balances was obtained, these were estimated using an algebraic method based on data on the income-, premium-, and occupational pensions paid out to individuals over the age of 55 in 2015. The total amount gained from occupational pensions was estimated algebraically as follows:

$$\frac{annual\ occupational\ pension}{(annual\ income\ pension + annual\ premium\ pension + annual\ occupational\ pension)} = x < 1$$

$$\begin{aligned} &Total\ occupational\ pension\ balance\ for\ all\ suicides \\ &\quad = x(total\ income\ pension\ balance\ for\ all\ suicides \\ &\quad + total\ premium\ pension\ balance\ for\ all\ suicides \\ &\quad + total\ occupational\ pension\ balance\ for\ all\ suicides) \end{aligned}$$

$$Solve\ for\ total\ \ occupational\ pension\ balance\ for\ all\ suicides$$

This procedure was repeated for women and men respectively, and the results were summed to give the total amount gained from occupational pensions. The total gains to society from income-, premium-, and occupational pension balances were simply calculated as the sum of their respective totals.

6.0 Data

The following is an overview of the data used in this study, including reasoning and explanations for which data was or was not chosen and why. Also, note that the data used in this study consists entirely of 2015 figures.

Number of Suicides: Data on the number of suicides that occurred in Sweden in 2015 was obtained from the Swedish National Board of Health and Welfare's Cause of Death Registry, from data spreadsheets accompanying the report titled *Statistics on Causes of Death 2015* (SS, 2016b). The causes of death are coded according to ICD-10, which is a system for

classification of diseases, operated by the World Health Organization (WHO, 2016). All deaths in the registry are quantified by age and gender.

The deaths from suicide considered in this study are classified as death by "deliberately self-destructive act" with ICD codes X60-X84 (SS, 2016 table 4A), these are considered certain instances of suicide, where there is no doubt that the person intended to kill themselves (NASP, 2016a). There are also, however, deaths classified as death by "injurious events of undetermined intent" with ICD codes Y10-Y34 (SS, 2016 table 4A). These are considered uncertain instances of suicide, where it is not clear whether the person intended to kill themselves or if an accident occurred (NASP, 2016a).

Statistics presented by the National Centre for Suicide Research and Prevention of Mental Ill-Health (NASP, 2016b) include both certain and uncertain instances of suicide which gives a higher total number of suicides for a given year. It is argued that only considering certain suicides results in underreporting since a large share of uncertain suicides turn out to be considered certain upon further investigation. In addition, possible overestimations due to inclusion of uncertain suicides might be balanced by underestimations due to wrongful labeling of suicides as deaths by disease or accident, particularly among the elderly and in cases of fatal road traffic incidents (NASP, 2016a). However, in order to avoid ambiguity and potential measurement errors, this study includes only certain instances of suicide.

Life expectancy, employment rates, and population: Data on life expectancy, employment rates, and population was obtained from Statistics Sweden's (SCB) statistical database which provides estimates of these variables by age and gender (SCB, n.d.c; SCB, n.d.d; SCB n.d.e).

Income and Salary: Data on average total annual income from employment and business, as well as average monthly salaries (both categorized by age and gender), were also obtained from SCB's statistical database (SCB, n.d.f; SCB, n.d.g). Income from employment includes salary, pension, sick pay, and other taxable government compensation (SCB, n.d.h). Income from business in this context means income from professionally running a lasting, independent, for-profit business (Swedish Tax Agency, n.d.b). This income measure, though it does not include income from capital gains, can be considered broad and versatile. In addition, this measure extends to all ages 16-85+. Figures on average monthly salaries are averages from all employment sectors and all professions, nationwide.

Pensions: Data on pensions was gathered from the Swedish Pensions Agency's official statistics database and from SCB's statistics on income and taxes. In Sweden, pensions can

come from numerous different sources and be made up of several components (Swedish Pensions Agency, 2017b). In this study, only data on income pension, premium pension, and occupational pension is used. Income pension and premium pension make up the standard national public pension and most people receive occupational pension from their employers (Swedish Pensions Agency, 2017b), which means these types of pension are suitable to be included in the estimation of an average pension balance. Other types of pension such as guarantee pension, supplementary pension, private pension, and additional private savings are omitted since not everyone receives them and at least the latter two have scarce data availability.

The Swedish Pensions Agency manages income pension and premium pension, and provides national statistics on average balances for these types of pensions by age and gender (Swedish Pension Agency n.d.a-b). SCB provides statistics on average yearly pension incomes, including average occupational pension, for men and women over the age of 55 (SCB, n.d.i).

Geriatric Care: Data on the total local public sector cost of geriatric care (care, services, and assistance for the elderly) was obtained from the Swedish Association of the Local Authorities and Regions (SALAR) (SALAR, 2016a). SALAR provides statistics on the combined annual costs of geriatric care for all municipalities in Sweden. Statistics on how many people received some type of geriatric care in 2015 was gathered from the National Board of Health and Welfare, from data spreadsheets belonging to a 2016 report titled *Statistics on Care and Services for the Elderly 2015* (SS, 2016c). It shows nationwide how many people over the age of 65 (and in 5-year age intervals after that) received care or services during 2015, both in absolute numbers and as percentages of the population in each age interval.

SALAR also provides data on the cost per user of geriatric care (SALAR, 2016b). However, these figures are provided for people receiving care at home and people living and receiving care in special accommodation separately, which make them more difficult to interpret and use as a general estimate. In addition, the cost per user estimate is the average cost per person among people actually receiving care, not the expected cost per person among people who may or may not receive care in the future, therefore it may be less suitable in the context of this study.

Medical care: Data on the total local public sector cost of primary care and specialized somatic care was also acquired from SALAR (SALAR, 2016a). Although there are statistics

on the average cost of medical care visits (SALAR, 2016c), these are not the same as cost per patient averages, and would be misleading if used to estimate the yearly cost of medical care per person.

Psychiatric care: Data on the total local public sector cost of specialized psychiatric care was obtained from SALAR as well (SALAR, 2016a). Specialized psychiatric care in this measure includes general psychiatry, child- and adolescent psychiatry, forensic psychiatry, as well as psychiatric practices related to substance abuse (SCB, 2009 p.5). SALAR also provides cost per patient estimates for psychiatric care, and these are useful in this context. An average yearly cost per patient for specialized psychiatric care, including various types of diagnoses, was obtained from the SALAR KPP (cost per patient) database for psychiatric care (SALAR, 2016d). As mentioned, this average does not include people under the age of 18 receiving psychiatric care (SALAR 2016d). The SALAR cost per patient for psychiatric care also does not include forensic psychiatry (SALAR, 2016d), but it may be argued that the average psychiatric patient is unlikely to be receiving this form of care, and that the SALAR estimate suffices for the purposes of this study.

7.0 Results

This section is a presentation of all main results found in this study. It includes an overview of the results of the empirical calculations of direct costs, indirect costs, and savings resulting from all suicides that occurred in 2015 in Sweden. The numerical results presented are those calculated with a 3,5% discount rate, which serves as the base case of this study. However, the total costs estimated using a 2,5 and 5% discount rate are also presented for reference. Additional details, discussion, and analysis of the numerical results are also included. Note that the contents of tables 3-17 and figures 9-10 are based on information and data from several different sources, for simplicity, these sources are detailed in the Methods and Data sections of this study.

7.1 Summary of Results

Table 3: Summary of costs

Category	Amount (2015 SEK, 3,5% discount rate)
Productivity loss – Suicide victims	5201752000 5,2 billion
Transportation costs	3299762 3,3 million
Medical costs (the costs of suicide victims being treated in hospital before they die)	4483042 – 11149129 4,5 – 11,2 million

Police Involvement	2627248 – 3503988 2,6 – 3,5 million
Emergency Services	655813 – 1590954 0,66 – 1,6 million
Forensic Pathology (Autopsies)	30114840 – 31701247 3 – 3,2 million
Property Damage	4391382 4,4 million
Productivity – Family members	49792000 49,8 million
Total: Low scenario	5297116087 5,34 billion
Total: High scenario	5307180462 5,31 billion

Table 4: Summary of savings

Category	Amount (2015 SEK, 3,5% discount rate)
Pensions	1424846739 1,4 billion
Psychiatric Care	5381022 – 265046202 5,3 – 265,05 million
Geriatric Care	106427894 101,6 million
Medical Care	599791348 599,8 million
Total: Low scenario	2136447003 2,14 billion
Total: High scenario	2396112183 2,40 billion

Total

The total net economic cost to society of all suicides is the total cost minus the total savings. Since some of the costs and savings are presented as range estimates and both total costs and total savings are calculated in low and high scenarios, the following four scenarios are stipulated:

1. High costs, high savings: 2,91 billion SEK
2. High costs, low savings: 3,17 billion SEK
3. Low costs, high savings: 2,90 billion SEK
4. Low costs, low savings: 3,16 billion SEK

The total cost should then fall within the range 2,90 – 3,17 billion SEK, which yields an average cost per suicide within the range 2,46 – 2,69 million SEK.

Table 5: Total costs

Total cost	2,90 – 3,17 billion SEK
Average cost per suicide	2,46 – 2,69 million SEK

The total cost estimate varies slightly depending on the discount rate used to calculate the present value of future monetary amounts. Tables 6 and 7 show what the total cost would be using a 2,5 or 5% discount rate. A lower discount rate implies a higher valuation of future amounts while a higher discount rate implies a lower valuation of future amounts.

Table 6: Total costs 2,5% discount rate

2,5% discount rate	Total cost	3,41 – 3,69 billion SEK
	Average cost per suicide	2,89 – 3,13 million SEK

Table 7: Total costs 5% discount rate

5% discount rate	Total cost	2,29 – 2,55 billion SEK
	Average cost per suicide	1,94 – 2,16 million SEK

7.2 Detailed Results

Direct costs

Table 8: Transportation costs

Cost per transportation	2798,78 SEK
Total transportation costs	3299762 SEK

Table 9: Medical costs

Number of days spent in hospital by suicide victims	115-286 days
Cost per day in intensive care	38982,97 SEK
Total Medical costs	4483042 – 11149129 SEK

Table 10: Police involvement

Cost per police work hour	Average monthly salary: 31700 Number of work hours per month: 160 (40h/week x 4) Cost per work hour: 198,125 SEK
Number of police officers working on each suicide case	3
Number of hours worked per suicide case and per officer	5
Total cost of police involvement per suicide	2971,875 SEK

Number of suicide cases where police are involved	884 (75%) – 1179 (100%)
Total costs of police involvement	2627248 – 3503988 SEK

Table 11: Emergency services

Number of suicides requiring emergency services response	243 (20,6%) – 590 (50%)
Cost per emergency service turnout	2698,82 SEK
Total cost of emergency services	655813 – 1590954 SEK

Table 12: Forensic pathology (autopsies)

Number of instances of suicide where autopsies are performed	1120 (95)% – 1179 (100%)
Cost per autopsy	26888,25 SEK
Total cost of forensic pathology	30114840 – 31701247 SEK

Table 13: Property damage

Number of suicides assumed to result in property damage	Motorized vehicles: 11 Smoke and open fire: 14
Cost of property damages per suicide	Motorized vehicles: 249890,83 SEK Smoke and open fire: 117327,31 SEK
Total cost of property damage	4391382 SEK

Indirect costs

Productivity loss – Suicide victims

The present value of lost lifetime income and payroll taxes for each suicide depends heavily on the age and gender of the person. Figure 3 shows the present value of the total lost lifetime income and payroll taxes for individual suicides depending on the person's gender and age at which the suicide occurred. For ages 24 and younger, there is a greater number of potentially productive years lost, but at such a young age, the annual incomes are low. The higher annual incomes lie further in the future for these people which means the present value of lifetime income is lower.

The greatest costs in terms of lost income are incurred from the deaths of people aged 25-34 since these result in a large number of potentially productive years lost and the higher annual incomes lie fairly close in time. For deaths that occur after the age of 34, each extra year results in a slightly smaller productivity loss (the loss decreases on the margin) since fewer potentially productive years are lost and a larger number of higher income years have already

passed. After age 66, payroll taxes are no longer included in the expected annual productivity loss, and after age 74, productivity loss in terms of lost income is zero.

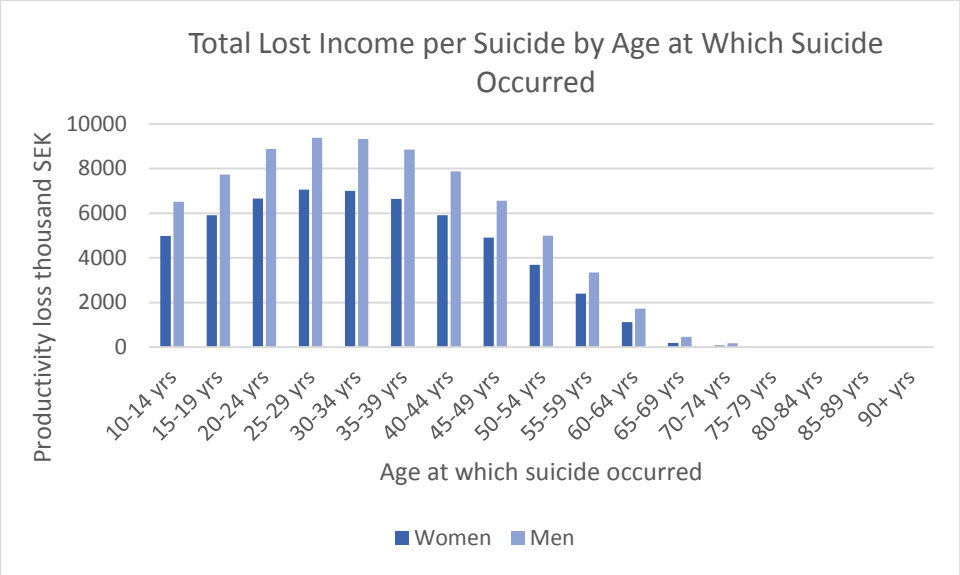


Figure 3: Data sources: SCB (n.d.f); SS (2016b).

The total cost in terms of lost income for each age- and gender group, however, also depends on the number of people who committed suicide in each group. For some groups, the cost associated with each individual suicide is lower than that of individuals in other groups, but the number of suicides is so large that the group as a whole represents a greater total cost. Figure 4 shows the total productivity loss from each age- and gender group.

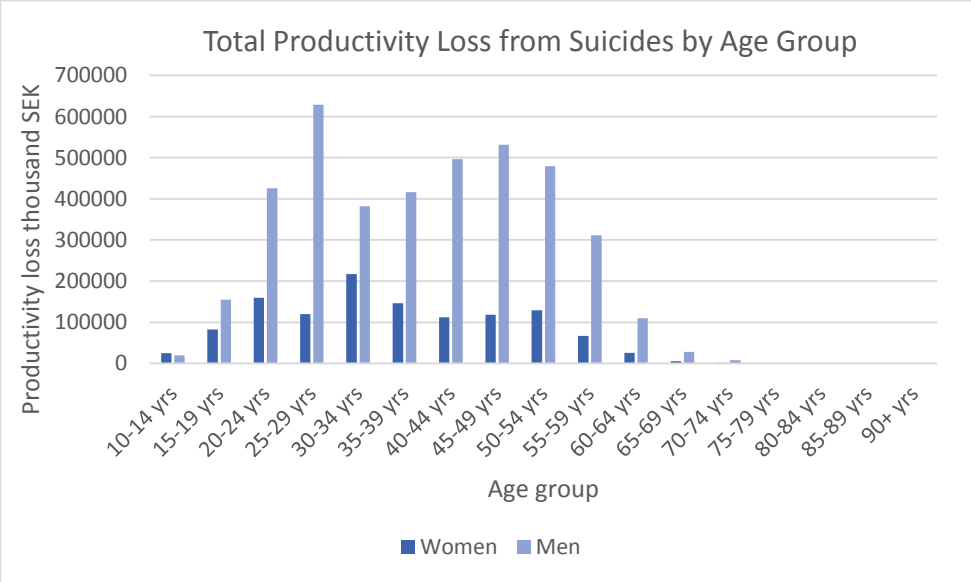


Figure 4: Data sources: SCB (n.d.f); SS (2016b)

It may also be of interest to address the differences in lost income and payroll taxes between men and women. Male suicides account for a much larger share of the total productivity loss than female suicides for three main reasons. First, men's future incomes would have been higher. Second, employment rates among men are higher in all age intervals. Third, the majority of people who committed suicide were male; out of all the suicides that occurred in 2015, 72% were male and 28% were female. Figure 5 and table 14 illustrate the total productivity loss from male and female suicides.

Table 14: Productivity loss by gender

Women	Men	Total
1,21 billion SEK	3,99 billion SEK	5,20 billion SEK

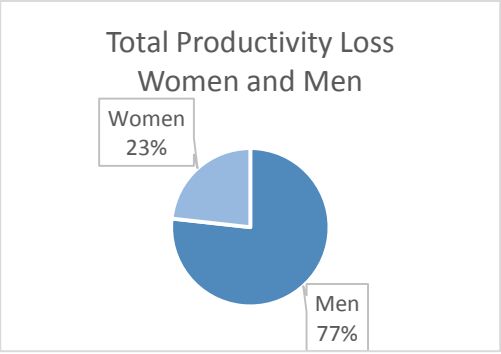


Figure 5: Data sources: SCB (n.d.f); SS (2016b)

The measure used to estimate productivity loss in this study includes income from employment and business, as well as payroll taxes. However, it does not include lost productivity from unpaid work such as house work or volunteer work. MSB (2015) estimates the total productivity loss from house work resulting from suicide in 2014. The total value of lost productivity from house work was 4,6 billion SEK, which gives an average loss per suicide of ca. 4 million SEK, and this is about the same in 2015 prices. Based on this estimate, the value of lost productivity from unpaid housework due to premature deaths by suicide in 2015 would be ca. 4,72 billion SEK. Taking this productivity loss into consideration results in a much larger estimated total cost of suicide to society. It would take into account and emphasize additional productivity from women and older people that is otherwise overlooked (MSB 2015, p.18). However, in order to limit the scope of this study, the value of productivity loss from unpaid work was not calculated here. In addition, it is difficult to estimate the true value of unpaid work since it can include a plethora of different activities of varying productivity and value.

Table 15: Productivity loss – Family members

Total number of bereaved working people (two per suicide)	2358
Number of bereaved working people taking 30 days off work	Psychiatric diagnoses: 1061 (45%) Somatic diagnoses: 495 (21%)

	Total: 1556
Cost per absence	Average monthly salary: 32000 SEK
Total cost in terms of productivity loss among family members	49792000 SEK

Savings

Savings from avoided psychiatric care expenditures

Table 16: Psychiatric care method 1

Yearly cost of treatment per person under 18	Child and Adolescent Psychiatry Stockholm chapter budget 2015: 600000000 SEK Number of patients in 2014: 22000 Yearly cost of treatment per person under 18: 27273 SEK
Yearly cost of treatment per person over 18	46245 SEK
Total savings from avoided psychiatric care expenditures if 10% of suicide victims would have received treatment for 1 year	5381022 SEK

Table 17: Psychiatric care method 2

Yearly cost of treatment per person if 4% of the population receive it	60146 SEK
Total savings from avoided psychiatric care expenditures if 80% of suicide victims would have received treatment for 5 years	265046202 SEK

Savings from avoided medical care expenditures

The present value of the future somatic health care resources that people who committed suicide would have consumed varies depending on the person's age at the time of the suicide. It also depends to some extent on the person's gender since women have slightly longer remaining life expectancies than men at any given age. Figure 6 shows how the total savings from avoided lifetime medical care expenditures depends on a person's age and gender at the time of death.

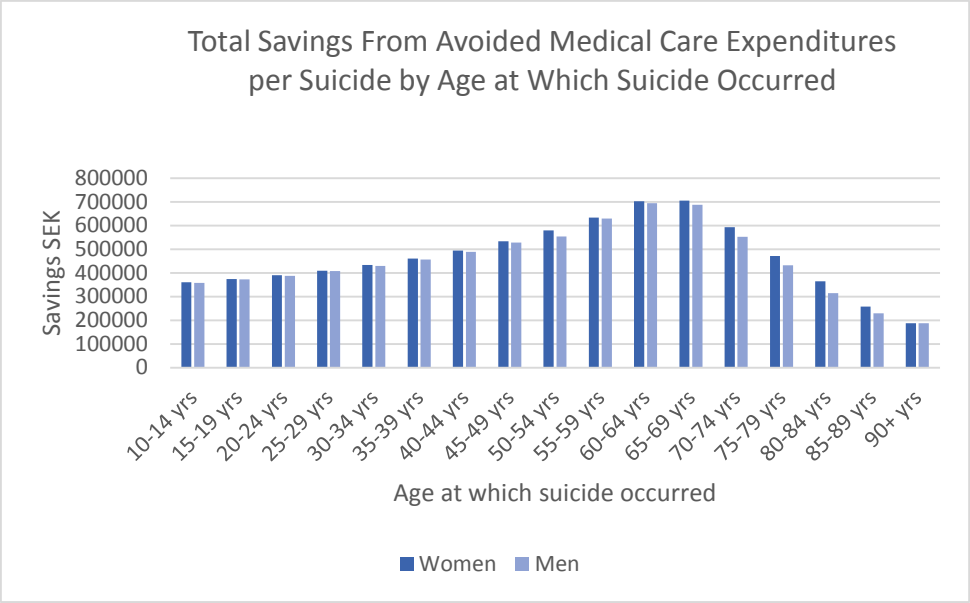


Figure 6: Data sources: SALAR (2016a); SCB (n.d.h); SS (2016b)

The total savings increase with age at the time of death (henceforth referred to as age of death), until they peak at age of death 65-69 for women and at 60-64 for men, after which point total savings decrease as age of death increases. A young age of death is associated with a larger number of avoided years of medical care expenditures, but since the years before 64 represent a lower cost than later years, and since the high cost years are further in the future for young people, the present value of the savings from avoided medical care expenditures is lower when people commit suicide at a younger age. The ages of death where total savings peak are the ages where the high cost years begin, which means that there are only high cost years left in the remaining lifetime and these years are closer in time, that is why the present values of the total savings are highest at these ages. For older ages of death, the avoided years of medical care expenditures are high cost years, but because they are fewer, the total savings are smaller.

Savings form avoided geriatric care expenditures

As in the case of medical care, the present value of the geriatric care resources that people who committed suicide may have consumed depends on the person's age at the time of the suicide and on the person's gender. Figure 7 illustrates this relationship.

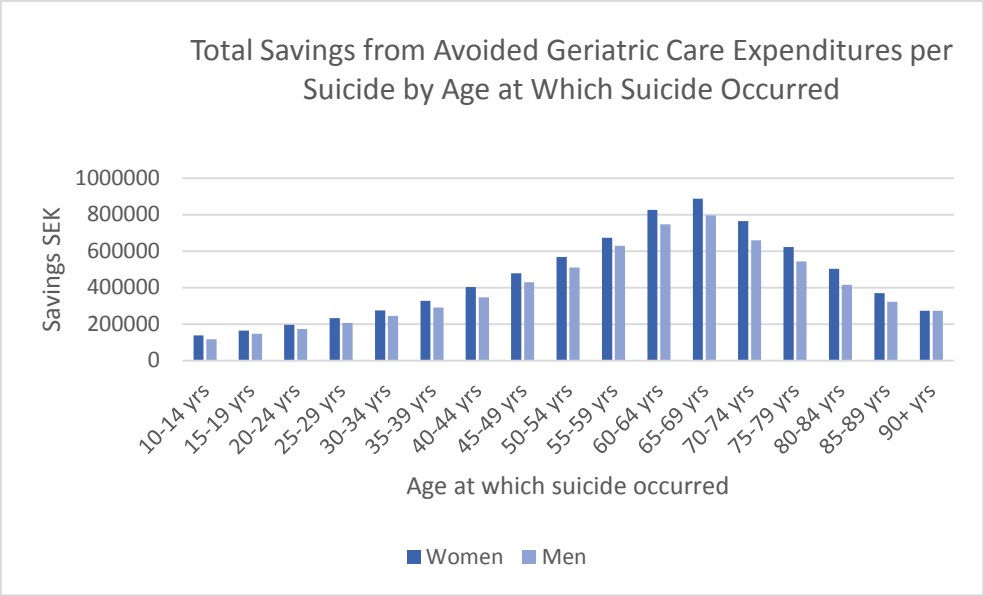


Figure 7: Data sources: SALAR (2016a); SCB (n.d.h); SS (2016b); SS (2016c).

Since it is assumed that no one starts receiving geriatric care before the age of 65, the present value of the care that a person would have potentially received in the future will be strictly lower for younger ages of death; the years before age 65 are not associated with any costs of geriatric care and so do not add to the total potential savings. For both women and men, the potential savings peak at age of death 65-69 because this age interval is when they would have started receiving care, meaning the years of potential resource consumption are close in time and have yet to pass. The potential savings are higher for women since they tend to live longer and thus require geriatric care for a larger number of years. After age 69, suicides result in smaller savings (the savings decrease on the margin) since the higher the age of death, the more years of potential resource consumption will have already passed. It is important to note that not everyone who committed suicide would have received geriatric care had they stayed alive. It is estimated that only 19% of suicide victims would have received care after age 65.

Financial gain from pensions

The older people get, the greater are their pension balances, at least up until the age of 55-59 when people may stop saving and perhaps start using the money they have saved for their pension, which decreases their pension balances. Assuming the average suicide victim would have acted in this way, this means that the closer to age 55-59 a person is at the time of their death, the greater the financial gain to society from redistributed pension balances. This relationship is illustrated in figure 8.

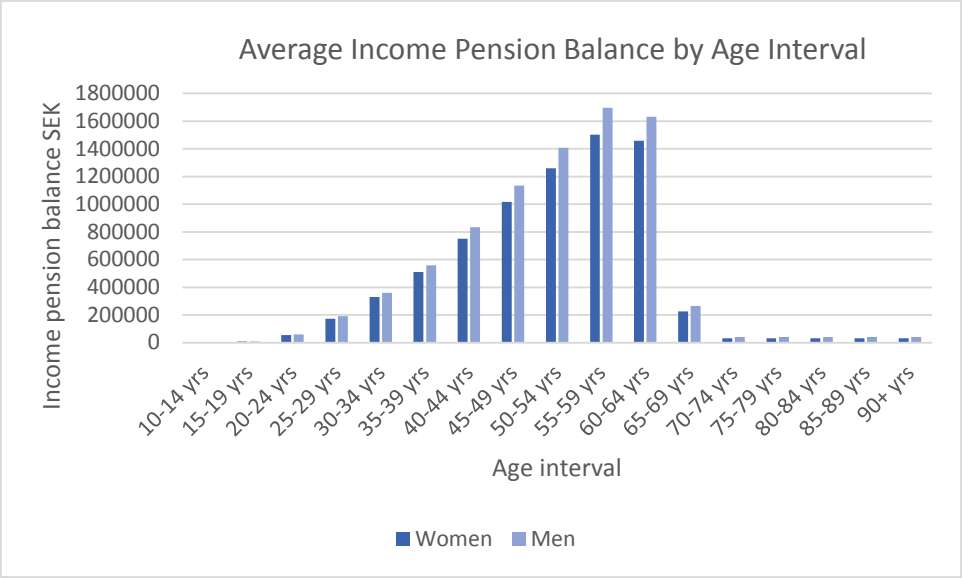


Figure 8: Data sources: Swedish Pension Agency (n.d.a); SS (2016b).

7.3 Summarizing Remarks

The results show that the greatest costs are constituted by productivity loss in terms of lost income and payroll taxes. The second greatest costs are the direct costs, closely followed by the lost productivity among family members, but neither of these costs come anywhere near the magnitude of the productivity loss from suicide victims, and both categories make up very small shares of the total costs. In terms of savings, the financial gain from pensions greatly trumps the savings from avoided psychiatric-, medical-, and geriatric care expenditures. However, the savings from medical care are substantial and outweigh that of psychiatric- and geriatric care. Figures 9 and 10 illustrate how the different costs and savings compare to each other (based on the high cost, high savings scenario).

Figure 9: Total Costs

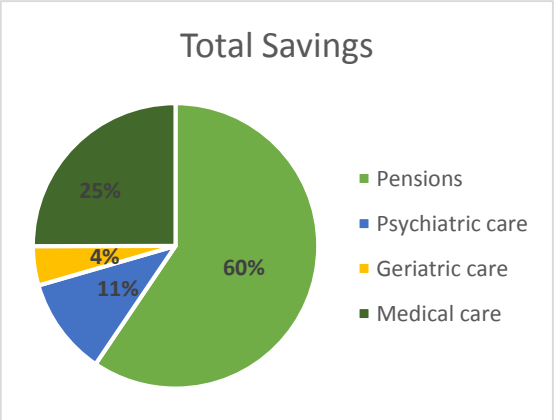


Figure 10: Total Savings

7.4 Comparisons with Previous Research

Among the previous studies on the economic cost of suicide to society, the 2015 MSB report titled *Socioeconomic consequences of completed suicides* (author's translation) is most suitable for comparison with this study. In MSB (2015), the total direct costs of all suicides in 2014 amounted to an estimated 45,5-59,7 million SEK and an average of ca. 40000 – 52000 SEK per suicide (MSB, 2015 p.16). In this study, the corresponding estimate is ca. 45,6-55,6 million SEK in total and an average of ca. 39000 – 47000 SEK per suicide, which falls within the same range. MSB (2015) also includes indirect costs in terms of productivity loss both from paid and unpaid work.

The estimated total indirect costs were 4,4-9 billion SEK, where 4,4 billion was the productivity loss from paid work and 4,6 billion was the productivity loss from unpaid work (MSB, 2015 p.18). In this study, productivity loss from paid work was estimated for suicide victims and family members and these costs amount to ca. 5,3 billion SEK. This is slightly higher than the MSB (2015) estimate and the discrepancy can likely be attributed to differences in methodology, factors included, data selection, and the number of suicides. However, the different estimates still fall on the same scale. The main difference between this study and the MSB 2015 report is that the MSB (2015) study does not take into account any potential savings from suicide. Excluding the productivity loss from unpaid work, the MSB (2015) total cost estimate is still higher than the estimate in this study since it does not account for potential savings; ca. 5 billion (direct and indirect costs included) compared to 2,90-3,17 billion in total, and an average of ca. 4,36 million compared to 2,46 – 2,69 million per suicide.

It would be interesting to compare the results of this study to those conducted in other countries as well, but such comparisons have proven difficult. Because of differences in fundamental factors such as methodology, factors included, measurement units, data selection, and suicide statistics, comparisons of monetary amounts would likely be misleading.

8.0 Potential Problems and Inaccuracies

The following is an exploration and discussion of the potential problems and inaccuracies that may be present in the methodology and subsequent results of this study. First, one central, general concern is that it may be considered problematic not to take into account any growth effects, systemic changes or demographic developments that may affect productivity, income,

resource consumption, and costs over time. Assuming that 2015 figures will apply in the future as well is a heroic and inaccurate assumption. However, it can be argued that as productivity increases, incomes rise, the population grows, and life expectancies are prolonged, costs increase as well, and all these changes combine to result simply in a scale effect. Accounting for such a scale effect arguably would not have a crucial impact on the results or the informative value of this study.

In addition, although there are long-term predictions of some of the relevant variables such as demographic changes and employment rates, there is great uncertainty surrounding future growth effects and other developments. Factors such as economic fluctuations, political progression, and changes in resource allocation may all contribute to these developments, and these changes are unpredictable. Making assumptions about the future in terms of, for example, income growth rates or annual health care expenditures may therefore be difficult, and there is no guarantee that these assumptions will generate more accuracy as opposed to applying the 2015 figures to future years. It is possible that past fluctuations and growth rates could have been used to make estimations for the future, but because of the aforementioned unpredictability, such estimates presumably do not guarantee greater accuracy.

Using only 2015 figures may not yield a realistic image of the future, but that is not the point of this study, nor is it entirely necessary for the purposes of delivering what is in fact the point of this study. In order to estimate the cost of suicide to society it is crucial to take into account the changes in income, probability of employment, life expectancy, and resource consumption that would have taken place throughout a person's remaining lifetime. Relevance lies mainly in these effects themselves and to a lesser extent in the exact figures, and these lifetime progression effects are well captured using the 2015 figures. In the face of uncertainty, this study assumes the current system and proceeds with perceivably sufficient precision.

However, it is not only the assumption regarding the applicability of 2015 figures that is problematic. This study relies heavily on numerous assumptions of varying legitimacy and reliability. Viewed together, these assumptions may be thought to negatively affect the precision and accuracy of the presented results. Although the aim of this study is simply to give an idea of the magnitude of the potential costs and savings to society from suicide by calculating rough estimates, it is important to consider potential problems and inaccuracies resulting from assumptions and other methodological procedures. Such considerations will here be explored for direct costs, indirect costs, and savings respectively.

Direct Costs

- It is assumed that property damage occurs as a result of suicides involving motorized vehicles and fires. However, property damage might also occur when suicides are committed with a moving object. This category, though, is unspecific and there is no way of knowing how many of the suicides in that category result in property damages or the extent of these damages. Still, the total costs of property damage may be slightly underestimated.

- The estimated cost of police involvement per suicide may be less precise than that of the MSB (2015) study which uses an average cost estimate per police turnout from the 2009 MSB report on the cost of road traffic accidents. The MSB (2009) estimate of the cost per police work hour includes, in addition to gross salaries, payroll taxes and compensation for inconvenient working hours, as well as vehicle and equipment depreciation and fuel (MSB, 2009 p. 22-23). In addition, the information obtained through personal communication with an investigation officer may not be entirely accurate since it was based on personal experience rather than official statistics. However, the cost estimate of a police work hour is still close to that of the MSB (2009) estimate, which indicates accuracy despite the methodological differences.

Indirect Costs

- Most previous studies use the present value of future gross earnings as a measure of productivity loss resulting from suicide. This study uses total income from employment and business instead. There are both advantages and disadvantages to using the income measure instead of the gross earnings measure. Total income from employment and business includes, in addition to salaries, taxable government compensations and pensions. However, government compensations and pensions cannot be considered costs to society if a person dies and never receives them. They are not resources that are lost or that never come into existence, which means they do not constitute indirect costs in terms of productivity loss. Instead, they are resources that can be otherwise used if a person does not live to consume them. Hence, including them in the measure of productivity loss may be considered problematic. Gross earnings may then be thought to constitute a purer measure of productivity loss in this context. However, the gross earnings measure only takes into account the value of productivity from employment while the total income measure includes that of business as well. In addition, the total income measure includes data for people over the age of 65, which gross earnings measures normally do not (SCB, n.d.g), despite the fact that there is data on average employment rates up until the age of 74 (SCB, n.d.d).

- Kennelly (2007 p.90) points out that people with mental health issues tend to be less productive, they might generally have lower employment rates and more work absences. Since people who commit suicide are likely to have some sort of mental health issues, it is probable that they would have had lower than average productivity in the future, meaning they might have had lower employment rates and lower incomes had they stayed alive. Kennelly (2007 p.90) takes this into account by revising employment rates downward by 2,25%. In this study, it is assumed that those who committed suicide would have had average productivity in terms of employment rates and income, which probably results in an overestimation of the productivity loss from suicide. However, there is no way of knowing how far below average the productivity among suicide victims would have been, and in what way this discrepancy would manifest itself. Simply assuming lower employment rates, more frequent absences or lower incomes seems unlikely to result in more reliable estimates of productivity loss.

- Regarding productivity loss among family members, an underestimation may have been made since there are probably more than two bereaved working people for each suicide. This estimate takes into account immediate family members only, but there may be other relatives, friends, and colleagues who are affected in much the same way. However, it is difficult to estimate an average number of bereaved working people per suicide taking all of these candidates into consideration. Depending on each person's lifestyle and social context, this number probably varies greatly on a case by case basis. In addition, immediate family members may still be assumed to be most severely affected, which means the consequences of their bereavement will be most substantial.

- Another potential issue regarding the measure of productivity loss among family members is the duration of work absences. The time that bereaved working people take off work following a suicide probably varies both below and above 30 days. Using 30 days as the default duration may again result in imprecision, but it serves as an approximation of the average duration. In addition, the average monthly salary used to measure the productivity loss among family members is the average for all men and women aged 18-64, which may be considered too broad. However, since the ages and genders of the bereaved working people are not known on an individual level, an aggregate measure requires this kind of width in order to include all possibilities.

Savings

One general concern regarding the very concept of savings from suicide is acknowledged by Stack (2007), he points out that one may wish to be cautious in interpreting avoided future costs of medical care as savings to society since people requiring medical care leads to employment opportunities for medical professionals. This means that whatever savings may result from people no longer requiring medical care, could also constitute costs in terms of lost job opportunities (Stack, 2007 p.363, 368). This reasoning is applicable to savings in terms of psychiatric and geriatric care as well. While this may well be a legitimate concern, it is unlikely that deaths from suicide would result in a sharp enough decline in demand for somatic, psychiatric or geriatric care to cause a decrease in employment opportunities for professionals within these fields. If evidence of such an effect would appear, it is still highly improbable that this effect, in terms of the productivity loss resulting from unemployment among care professionals, would be great enough to offset the savings from avoided lifetime care expenses of those who committed suicide. Apart from this general consideration regarding savings from suicide, there are some additional concerns pertaining to each category of savings which are presented below.

Psychiatric care

- The estimated number of suicide victims who would have received psychiatric care is uncertain since the number of people in need of treatment who actually receive it is not actually known.

- Since the duration of treatment is likely to vary on a case by case basis, depending on the underlying mental health issues, the assumptions regarding the minimum and maximum expected durations are arbitrary.

- The uncertainties and methodological variations in the measurement of the total savings from psychiatric care result in a wide range estimate, which might make it less reliable and informative.

Pensions

- Using age 15 as a cutoff for having a positive pension balance may lead to a slight overestimation of the financial gain from redistributed pensions. At that age, few people are employed earning income-, occupational-, or premium pension. However, the data on income- and premium pension balances includes the age group 19 and younger, and for simplicity, age 15 was used as a cutoff for that group.

- Since the data used in the estimation of total occupational pension balances include only people aged 55 and older, but the total occupational pension balance is calculated for all suicide victims, this measure is imprecise. It serves as a rough estimate in combination with the more exact measures of income- and premium pension balances, but additional age specific data is needed for a more accurate estimate of occupational pension balances.

- Figure 8 depicts the same average income pension balance for all ages 70 and older. That is because the data on income pension balances lists only one average for all people over 70. For a more accurate estimate, data on average income pension balances for each 5-year age interval after 70 is needed.

Geriatric care

- For age groups 80 and older, a much larger share than 19% may be assumed to receive some form of geriatric care, and for age groups 75 and younger a much smaller share presumably receives care. It may therefore be inaccurate to use the 19% estimation for all age groups. However, 19% over the age of 65 receiving care is the most general and easily applied estimate. Perhaps underestimations of the number of people receiving care in some groups and overestimations in others can be thought to outweigh each other, yielding an estimate of acceptable accuracy.

Medical care

- Subtracting half the annual cost from each of the first 64 years of a person's life and adding these costs to the years after 65 is an arbitrary maneuver. It is simply a way of adjusting for the assumption that older people generally require more health care resources, meaning old age is associated with greater health care costs. Since this maneuver is not based on actual statistics, the estimated savings from medical care must be considered somewhat arbitrary.

9.0 Interdisciplinary Analysis

This section addresses the intangible costs in terms of life and health that result from suicide by discussing and analyzing their nature in an economic and philosophical framework, rather than quantifying them empirically. It may be reasonable to assert that direct and indirect costs of suicide are incurred by society as a whole, while intangible costs are incurred by the people committing suicide and their bereaved family members (Olofsson, 2008 p.18). Hence, the subsequent analysis of the intangible costs will be carried out from the perspective of those who commit suicide and their family members only. Family members, however, can be taken

to include anyone close to the person committing suicide who may be personally affected by the incident.

Costs to family members

It can be assumed that when a suicide occurs, bereaved family members will incur great costs. If the person committing suicide is a vital bread winner, the surviving family may experience severe financial strain following his or her passing, and if the incident impairs remaining family members' productivity, the financial losses will be even more drastic. However, the greatest costs to family members presumably come in the form of grief, trauma, guilt, and other forms of emotional and mental anguish resulting from the loss of a loved one to suicide. It may seem futile examining these intangible costs in an economic framework. However, it is of interest to discuss how these costs might manifest from an economic and philosophical perspective.

One possible way of illustrating these costs may be through the concept of DALYs. As mentioned in the theory section of this study, one DALY is one lost year of healthy life and DALYs for some health condition are the sum of years of life lost (YLL) and years lost due to disability (YLD) (WHO, n.d.). If bereavement can be considered a type of health condition or disability, then DALYs for this condition could theoretically be estimated (O'Dea & Tucker, 2005 p.25). In that case, YLL is likely to be zero since bereavement does not cause premature death (unless it drives surviving family members to suicide, but that may be considered a separate issue and will be disregarded). YLD, however, should be greater than zero and, for the entire population of bereaved family members, it will amount to the product of the number of bereaved people, the disability weight associated with bereavement, and the average duration of this condition.

The number of bereaved people is of course difficult to estimate and is likely to vary on a case by case basis. Chen, Choi, Mori, Sawada, & Sugano (2009 p.535) estimate the number of family members of suicide victims in Japan to be 5 people per suicide, and this is perhaps a reasonable estimate for other countries as well. The disability weight associated with bereavement should reasonably be based on people's ability (or inability) to live normal, active lives, as well as the potential presence of anxiety, depression, or other mental health issues pertaining to the grief condition (Beautrais, 2004 cited in O'Dea & Tucker, 2005 p.25). The duration of the condition may vary, possibly from a few months to an entire remaining lifetime. Though it may not yield an accurate estimate in practice, it seems theoretically feasible to illustrate and quantify the intangible costs of suicide to bereaved family members

by calculating the number of DALYs of this condition, and possibly valuing them using WTP and VSL estimates as in O'Dea & Tucker (2005) (O'Dea & Tucker, 2005, p.25).

The costs of bereavement could also be discussed in a simple utility framework. Bereavement can be assumed to constitute a loss of utility or a cost in terms of disutility incurred by the family members. In addition, the utility that the family members used to gain from the presence of the person who committed suicide will be lost. It can be argued, however, that the utility from the presence of the person in question may be reduced if he or she is struggling with mental health issues or other perils that cause suicidal tendencies. In that case, watching the person suffer, as well as bearing the burden of this suffering by having to monitor, care for, and withstand potential backlash from the person, may be associated with disutility or utility loss. Overall though, the loss of a loved one to suicide likely results in a net utility cost.

Costs to the people who commit suicide

The cost of suicide to people who commit it is the loss of one's own life and everything that it entails. However, since the person in question is choosing to incur this loss, it is not prima facie obvious that the loss of life is a cost rather than gain to this person (since no utility is gained post-mortem, a gain in this context refers to an avoided cost in terms of negative utility or disutility, rather than a positive utility increase). It seems that this issue is no dichotomy and that it is worth considering the different ways in which the loss of life might manifest as a cost or gain to the person committing suicide.

The concept of DALYs could be used to illustrate the costs of suicide to the people committing it as well (O'Dea & Tucker, 2005 p.18). In this case, the health condition is the suicide itself and it can be assumed to result in YLL greater than zero since the entire remaining lifetime is lost, but YLD equal to or less than zero since no years lived with disability follows a suicide. However, if whatever circumstances that led to suicide were generating a positive number of YLDs and would have continued to do so had the person not committed suicide, the suicide might actually result in avoided costs in terms of future YLDs. If suicide results in spared YLDs, then the number of DALYs from suicide will be reduced and thus the cost to the person committing suicide will be smaller. However, unless the number of spared YLDs is greater than or equal to the number of YLLs, suicide will still result in a positive number of DALYs, which constitutes a net cost incurred by the person committing suicide.

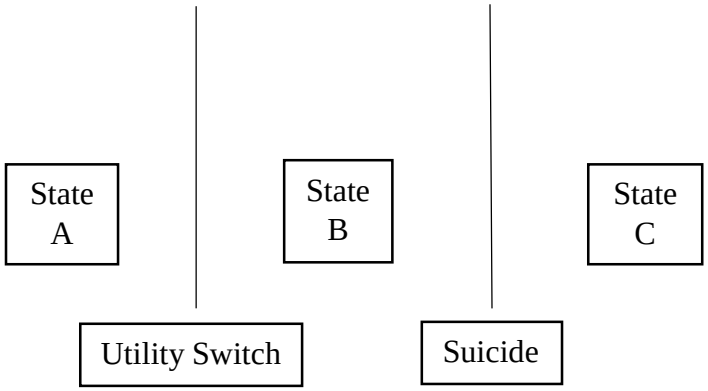
The question of whether the loss of life is a cost or a gain to people committing suicide becomes a bit more nuanced in a utility framework. In their economic theory of suicide, Hamermesh & Soss (1974) assert that a person will commit suicide when the total discounted remaining lifetime utility reaches zero. They further claim that, because remaining lifetime utility decreases with age, this point must be a maximum. The present value of expected lifetime utility as a function of age and permanent income is used to illustrate this conclusion (Hamermesh & Soss, 1974 p.85). However, it seems that this utility function could theoretically include everything relevant to the utility of life, and depict the same conclusion. If it is true that suicide occurs when the present value of remaining lifetime utility is zero and that this is a maximum, then it can be argued that the loss of life from such a suicide is a gain.

Dixit & Pindyck (1994) argue that Hamermesh & Soss, in drawing their conclusion, ignore the option value of staying alive. They suggest that since suicide is an irreversible act, and the future is uncertain, there is an option value to postponing suicide and waiting for potential improvement. This option value will exist as long as there is some positive probability of improvement (Dixit & Pindyck, 1994 p.24). What then, is meant by improvement, and how much of it is needed for the loss of life to be a net cost to the person committing suicide? Perhaps it can be imagined that when a person wants to commit suicide, they are in a state where dying now generates more utility (or rather less negative utility or less disutility) than staying alive and dying at some unknown point in the future. Improvement, then, might mean leaving that state and entering a state where the opposite condition prevails; where staying alive and dying later is better than dying now. However, in order for the loss of life to be a net gain, a greater share of the remaining lifetime must be spent in the second state than in the first.

Hence, the loss of life can be considered a net cost if the person, for the majority of the remaining lifetime, would have been in a state where staying alive and dying at some unknown point in the future generates more utility (less negative utility/disutility) than dying now, and it would be a net gain if vice versa. This is illustrated with the help of figure 11. The loss of life is a net cost if a larger share of the remaining lifetime would have been spent in state A than in state B, and a net gain if a larger share of the remaining lifetime would have been spent in state B than in state A. Note that the two states A and B are not representations of something final, but rather of conditions that may change in time, and such change consists of transitioning to another state. It is thus assumed that a person can move between state A

and B via the "Utility Switch" which is simply an illustration of some process that a person presumably goes through in transitioning from one state to another.

Figure 11: The Two-line Structure



State A: Staying alive and dying at an unknown point in the future generates more utility (less negative utility/less disutility)

State B: Dying now generates more utility (less negative utility/less disutility)

State C: Non-existence

It may be objected that this reasoning requires that suicide is rational in the sense that it is a choice based on reasoning and careful consideration (in the utility framework stipulated above or in some similar form), rather than a result of mental health issues, crisis or intoxication, which may fuel impulsive action (NE, n.d.). However, this is a misconception. The argument is not that a person uses the stipulated utility framework, reaches a conclusion as to whether suicide constitutes a net cost or gain, and decides accordingly. Instead, the utility framework describes what is presumably the case regardless of how, and based on what information, a person decides to commit suicide.

If it is true that the majority of the remaining lifetime would have been spent in state A, then suicide is a net cost to the person committing it, and this is not contingent on whether the person made a rational choice or not. Expressed another way; whether a person *knows* if suicide is a cost or a gain as described in the stipulated utility framework is not relevant to whether it *is* in fact a cost or a gain from this perspective. It can of course be questioned whether there can be any knowledge regarding in which state a person would have spent the majority of their remaining lifetime, considering the future is uncertain. However, the current

reasoning merely claims that *if* it is true that the majority of the remaining lifetime would have been spent in state A, *then* suicide is a net cost, and this holds (if it holds at all) regardless of whether it is possible to ever know this.

In conclusion, it is important to note that this theoretical analysis is not an attempt at grasping the intricacies of the individual decision making behind suicide. Its only purpose is to discuss some ways in which the loss of life may theoretically constitute a net cost or gain to a person committing suicide, and even in this endeavor this analysis is by no means definitive. It is merely a brief exploration into the issue of potential costs and gains from suicide, if yet from a rather abstract and narrow perspective.

10.0 Conclusion and Further Research

The aim of this study was to estimate the net economic cost to society of all suicides that occurred in Sweden in 2015. This was achieved through empirical calculation of direct costs, indirect costs, and savings. Direct and indirect costs were summed and savings subtracted to yield an estimated net economic cost of 2,90 – 3,17 billion SEK in total and an average of 2,46 – 2,69 million SEK per suicide. These are rough estimates based on various assumptions and subject to possible inaccuracies. A theoretical analysis of the intangible costs of suicide in terms of life and health was attempted, but no definitive conclusion can be drawn from this. Instead, it should be viewed as a brief exploration into the discussion of intangible costs of suicide, which ought to be elaborated on from various perspectives.

Further research is needed to improve and expand the analysis to yield a more accurate, encompassing measure of the net economic cost of suicide to society. The methodology can be improved upon by relaxing certain heroic assumptions and performing a more formal and thorough sensitivity analysis. In addition, a greater number of potential costs and savings can be identified and included in the calculation, even if an all-encompassing measure is not feasible. It may also be of interest to further investigate the nature and possible quantification of the intangible costs of suicide. It seems an interdisciplinary approach would be the most fruitful in framing such an analysis. By combining economic and philosophical theory and methodology, these intangible aspects can in some respect be rendered tangible.

References

Chen, Joe – Choi, Yun Jeong – Mori, Kohta – Sawada, Yasuyuki – Sugano, Saki (2009). Those Who are Left Behind: An Estimate of the Number of Family Members of Suicide Victims in Japan, *Social Indicators Research*, vol.94, no.3, pp.535-544, Available Online through: Lund University Libraries website (LUBsearch) http://eds.a.ebscohost.com/eds/search/basic?sid=507d795f-cdb2-45ea-a817-53a2baea6ee5%40sessionmgr4010&vid=0&hid=4208 [Accessed 2017-05-13]

Child and Adolescent Psychiatry (BUP) (2016) BUP – en snabbguide, Available Online: http://www.bup.se/sv/Om-BUP/Pressrum/BUP-en-snabbguide/ [Accessed 2017-04-11]

Collectum (n.d.). Återbetalningsskydd, Available Online: https://www.collectum.se/sv/Privat/Skydd/Aterbetalningsskydd/ [Accessed 2017-04-20]

Dixit, Avinash K. – Robert S. Pindyck (1994) Investment Under Uncertainty [e-book] Princeton: Princeton University Press. Available at: Google books: https://books.google.com/ [Accessed 2017-05-13]

Fora (n.d.). Återbetalningsskydd, Available Online: https://www.fora.se/privat/din-tjanstepension/aterbetalningsskydd/ [Accessed 2017-04-20]

Hamermesh, Daniel S. – Soss, Neal M. (1974). An Economic Theory of Suicide, *Journal of Political Economy*, vol.82, no.1, pp.83-98, Available Online through: Lund University Libraries website (LUBsearch) http://eds.a.ebscohost.com/eds/search/basic?sid=507d795f-cdb2-45ea-a817-53a2baea6ee5%40sessionmgr4010&vid=0&hid=4208 [Accessed 2017-05-13]

Hultzkrantz, Lars – Svensson, Mikaeal (2012) The value of a statistical life in Sweden: A review of the empirical literature. *Health Policy*, vol.108, no.2-3, pp.302-310, Available Online through: Lund University Libraries website (LUBsearch) http://eds.a.ebscohost.com/eds/search/basic?sid=507d795f-cdb2-45ea-a817-53a2baea6ee5%40sessionmgr4010&vid=0&hid=4208 [Accessed 2017-05-12]

Kennelly, Brendan (2007). The Economic Cost of Suicide in Ireland, *Crisis: The Journal of Crisis Intervention and Suicide Prevention*, vol.28, no.2, pp.89-94, Available Online through: Lund University Libraries website (LUBsearch) http://eds.a.ebscohost.com/eds/search/basic?sid=507d795f-cdb2-45ea-a817-53a2baea6ee5%40sessionmgr4010&vid=0&hid=4208 [Accessed 2017-04-23]

National Board of Health and Welfare (Socialstyrelsen, SS) (2009). Hälso- och sjukvårdsrapport 2009 [pdf] Available at: http://www.socialstyrelsen.se/Lists/Artikelkatalog/Attachments/8496/2009-126-72-rev2.pdf.pdf [Accessed 2017-04-11]

National Board of Health and Welfare (Socialstyrelsen, SS) (2013). Dödsorsaker 2012 – Causes of Death 2012 [pdf] Available at: https://www.socialstyrelsen.se/Lists/Artikelkatalog/Attachments/19175/2013-8-6.pdf [Accessed 2017-04-28]

National Board of Health and Welfare (Socialstyrelsen, SS) (2016a). Statistik om dödsorsaker 2015 [pdf] Available at: http://www.socialstyrelsen.se/Lists/Artikelkatalog/Attachments/20289/2016-8-3.pdf [Accessed 2017-05-17]

National Board of Health and Welfare (Socialstyrelsen, SS) (2016b). Statistik om dödsorsaker 2015, Available Online: http://www.socialstyrelsen.se/publikationer2016/2016-8-3 [Accessed 2017-03-31]

National Board of Health and Welfare (Socialstyrelsen, SS) (2016c). Statistics on Care and Services for the elderly 2015, Available Online: http://www.socialstyrelsen.se/publikationer2016/2016-4-29/Sidor/default.aspx [Accessed 2017-03-29]

National Centre for Suicide Research and Prevention of Mental Ill-Health (NASP) (2016a). Hur räknar man självmordsstatistik?, Available Online: http://ki.se/nasp/hur-raknar-man-sjalvmordsstatistik [2017-03-27]

National Centre for Suicide Research and Prevention of Mental Ill-Health (NASP) (2016b). Självmord i Sverige, Available Online: http://ki.se/nasp/sjalvmord-i-sverige-0 [Accessed 2017-03-27]

National Government Employee Pensions Board (SPV) (2017). Om du dör när du är statligt anställd, Available Online: https://www.spv.se/privatperson/statlig-tjanstepension/handelser-i-livet/dodsfall/om-du-dor-nar-du-ar-statligt-anstalld/ [Accessed 2017-04-20]

National Institute for Health and Care Excellence (NICE) (n.d.) Glossary, Available Online: https://www.nice.org.uk/glossary?letter=q [Accessed 2017-05-12]

Nationalencyklopedin (NE) (n.d.). självmord, Available Online: http://www.ne.se.ludwig.lub.lu.se/uppslagsverk/encyklopedi/l%C3%A5ng/sj%C3%A4lvmord [Accessed 2017-05-17]

O'Dea, Des – Tucker, Sarah, Ministry of Health (2005). The Cost of Suicide to Society [pdf] Available at: http://www.health.govt.nz/system/files/documents/publications/thecostofsuicidetosociety.pdf [Accessed 2017-04-24]

Olofsson, Sarah, Swedish Rescue Services Agency (SRV) (2008). Cost of Illness – Teoretisk genomgång [pdf] Available at: https://www.msb.se/RibData/Filer/pdf/24080.pdf [Accessed 2017-04-25]

Polisförbundet, Rikspolisstyrelsen (2013). Lokalt kollektivavtal om arbetstider, arbetstidsberoende ersättningar och semester m.m. (ASA/Polis) [pdf] Available at: http://www.polisforbundet.se/lokala_avtal/ASA_Polis_131015.pdf [Accessed 2017-03-28]

Rivera, Berta – Casal, Bruno – Currais, Luis. (2016). Crisis, suicide, and labour productivity losses in Spain, *The European Journal Of Health Economics: HEPAC: Health Economics In Prevention And Care*, vol.18, no.1, pp.83-96, Available Online through: Lund University Libraries website (LUBsearch) http://eds.a.ebscohost.com/eds/search/basic?sid=507d795f-cdb2-45ea-a817-53a2baea6ee5%40sessionmgr4010&vid=0&hid=4208 [Accessed 2017-04-23]

Gurewich, Deborah – Lwin, Aung K. – Reed, Gerald A. – Shepard, Donald S – Silverman, Morton M. (2015). Suicide and Suicidal Attempts in the United States: Costs and Policy Implications, *Suicide and Life-Threatening Behavior*, vol.46, no.3, pp.352-362, Available Online: http://onlinelibrary.wiley.com/doi/10.1111/sltb.12225/pdf [Accessed 2017-04-23]

Stack, Steven (2007). Societal Economic Costs and Benefits from Death: Another Look, *Death Studies*, vol.31, no.4, pp.363-372, Available Online through: Lund University Libraries website (LUBsearch) http://eds.a.ebscohost.com/eds/search/basic?sid=507d795f-cdb2-45ea-a817-53a2baea6ee5%40sessionmgr4010&vid=0&hid=4208 [Accessed 2017-04-28]

Statistics Sweden (SCB) (2009). Definitioner till tabellerna – Bokslut 2009 [pdf] Available at: http://www.scb.se/statistik/oe/oe0107/2009a01d/definitioner%20lt.pdf [Accessed 2017-04-07]

Statistics Sweden (SCB) (2017). Antal födda barn per kvinna 1960-2016 och prognos 2017-2060, Available Online: http://www.scb.se/hitta-statistik/statistik-efter-amne/befolkning/befolkningsframskrivningar/befolkningsframskrivningar/pong/tabell-och-diagram/sveriges-framtida-befolkning-20162060/antal-fodda-barn-per-kvinna-och-prognos/ [Accessed 2017-04-29]

Statistics Sweden (SCB) (n.d.a). Prisomräknaren, Available Online: http://www.sverigeisiffror.scb.se/hitta-statistik/sverige-i-siffror/prisomraknaren/ [Accessed 2017-04-25 – 2017-05-24]

Statistics Sweden (SCB) (n.d.b). Lönedatabasen (database), Available Online: http://www.scb.se/sv_/hitta-statistik/lonedatabasen/ [Accessed 2017-03-28]

Statistics Sweden (SCB) (n.d.c). Återstående medellivslängd efter kön och ålder. Prognosår 2009-2110 (database), Available Online: http://www.statistikdatabasen.scb.se/pxweb/sv/ssd/START__BE__BE0401__BE0401B/BefPrognosLivslang09/?rxid=bc6b7056-2db2-4d72-8445-ef6a8ad9fcc2 [Accessed 2017-04-05]

Statistics Sweden (SCB) (n.d.d). Befolkningen 15-74 år (AKU) efter kön, ålder och arbetskraftstillhörighet. År 2005 – 2016 (database), Available Online: http://www.statistikdatabasen.scb.se/pxweb/sv/ssd/START__AM__AM0401__AM0401A/NAKUBefolkningAr/?rxid=4454ed63-3a28-4c4c-82ef-c35dd8bf6520 [Accessed 2017-04-24]

Statistics Sweden (SCB) (n.d.e). Befolkning efter ålder och kön. År 1860 – 2016 (database), Available Online: http://www.statistikdatabasen.scb.se/pxweb/sv/ssd/START__BE__BE0101__BE0101A/BefolkningR1860/?rxid=d84b71c5-8425-41d1-ac30-faf5ef355f67 [Accessed 2017-04-08]

Statistics Sweden (SCB) (n.d.f). Sammanräknad förvärvsinkomst för boende i Sverige hela året (antal personer, medel- och medianinkomst samt totalsumma) efter region, kön, ålder och inkomstklass. År 1999 – 2015 (database), Available Online: http://www.statistikdatabasen.scb.se/pxweb/sv/ssd/START__HE__HE0110__HE0110A/SamForvInk1/?rxid=dd1c2143-b195-4bbd-87ed-60d8f785962d [Accessed 2017-03-27]

Statistics Sweden (SCB) (n.d.g). Genomsnittlig grund- och månadslön samt kvinnors lön i procent av mäns lön efter sektor, yrke (SSYK 2012), kön och ålder. År 2014 – 2015 (database), Available Online:

http://www.statistikdatabasen.scb.se/pxweb/sv/ssd/START__AM__AM0110__AM0110A/LonYrkeAlder4A/?rxid=5e6d777a-6023-48a0-af47-1907c48fde01 [Accessed 2017-04-04]

Statistics Sweden (SCB) (n.d.h). Sammanräknad förvärvsinkomst per kommun 2000 och 2013–2015. Medianinkomst i 2015 års priser: Definitioner och förklaringar, Available Online: http://www.scb.se/hitta-statistik/statistik-efter-amne/hushallens-ekonomi/inkomster-och-inkomstfordelning/inkomster-och-skatter/pong/tabell-och-diagram/inkomster--individer-lankommun/sammanraknad-forvarvsinkomst-per-kommun-medianinkomst/ [Accessed 2017-04-04]

Statistics Sweden (SCB) (n.d.i). Skatter och inkomster – Pensioner 2015, Available Online: http://www.scb.se/hitta-statistik/statistik-efter-amne/hushallens-ekonomi/inkomster-och-inkomstfordelning/inkomster-och-skatter/ [Accessed 2017-04-19]

Swedish Association of the Local Authorities and Regions (SALAR) (2016a). Sektorn i siffror, Available Online: https://skl.se/ekonomijuridikstatistik/ekonomi/sektornisiffror.1821.html [Accessed 2017-03-29]

Swedish Association of the Local Authorities and Regions (SALAR) (2016b). Årets jämförelse av KPB-nyckeltal, Available Online: https://skl.se/ekonomijuridikstatistik/statistik/kostnadperbrukarekpb/aretsjamforelseavkpbnyckeltal.803.html [Accessed 2017-04-02]

Swedish Association of the Local Authorities and Regions (SALAR) (2016c). KPP Databas, Available Online: https://skl.se/ekonomijuridikstatistik/statistik/kostnadperpatientkpp/kppdatabas.1079.html [Accessed 2017-04-02]

Swedish Association of the Local Authorities and Regions (SALAR) (2016d). KPP-databas psykiatri-publika rapporter (database), Available Online: https://statva.skl.se/KPP_psykiatri_publik.html [Accessed 2017-03-29]
Swedish Association of the Local Authorities and Regions (SALAR) (2016d). KPP Psykiatri öppen och sluten vård-PUBLIK RAPPORT (database), Available Online: https://statva.skl.se/SASVisualAnalyticsViewer/guest.jsp?reportPath=/Web/Prod/Rapporter/Publik/KPP/&reportName=kpp_psyk_svov_publ_3ar_sum_dia&commentsEnabled=false&appSwitcherDisabled=true&propertiesEnabled=false&reportViewOnly=true [Accessed 2017-03-29]

Swedish Civil Contingencies Agency (MSB) (2009). Samhällets kostnader för vägtrafikolyckor – beräkningar [pdf] Available at: https://www.msb.se/RibData/Filer/pdf/25603.pdf [Accessed 2017-04-20]

Swedish Civil Contingencies Agency (MSB) (2011) Samhällets kostnader för olyckor [pdf] Available at: https://www.msb.se/RibData/Filer/pdf/26114.pdf [Accessed 2017-05-09]

Swedish Civil Contingencies Agency (MSB) (2012). Riskvärdering [pdf] Available at: https://www.msb.se/RibData/Filer/pdf/26246.pdf [Accessed 2017-05-12]

Swedish Civil Contingencies Agency (MSB) (2014). Samhällets kostnader för utbrottet av pandemisk influensa A(H1N1) [pdf] Available at: https://www.msb.se/RibData/Filer/pdf/27505.pdf [Accessed 2017-04-20]

Swedish Civil Contingencies Agency (MSB) (2015). Samhällsekonomiska konsekvenser av fullbordade suicid [pdf] Available at: https://www.msb.se/RibData/Filer/pdf/27977.pdf [Accessed 2017-04-20]

Swedish Pensions Agency (2017a). Vad händer med pensionen när du dör? Available Online: https://www.pensionsmyndigheten.se/forsta-din-pension/om-pensionssystemet/vad-hander-med-pensionen-nar-du-dor [Accessed 2017-04-19]

Swedish Pensions Agency (2017b). Your pension is made up of several components, Available Online: https://www.pensionsmyndigheten.se/other-languages/en/en/din-pension-bestar-av-flera-delar [2017-04-26]

Swedish Pensions Agency (n.d.a). Statistik om ålderspension – Intjänande till inkomstpension, SF0302 officiell statistik, Available Online: https://www.pensionsmyndigheten.se/statistik-och-rapporter/statistik/statistik-for-alderspension#2 [Accessed 2017-04-19]

Swedish Pensions Agency (n.d.b). Statistik om premiepension – Premiepensionssparande, Available Online: https://www.pensionsmyndigheten.se/statistik-och-rapporter/statistik/statistik-for-premiepension#1 [Accessed 2017-04-19]

Swedish Rescue Services Agency (SRV) (2008). Bränders samhällsekonomiska kostnader – resultat [pdf] Available at: https://www.msb.se/RibData/Filer/pdf/24341.pdf [Accessed 2017-04-20]

Swedish Tax Agency (n.d.a). Arbetsgivaravgifter, Available Online: https://www.skatteverket.se/foretagochorganisationer/arbetsgivare/arbetsgivaravgifterochskatteavdrag/arbetsgivaravgifter.4.233f91f71260075abe8800020817.html [Accessed 2017-04-04]

Swedish Tax Agency (n.d.b). Inkomst av näringsverksamhet, Available Online: https://www.skatteverket.se/foretagochorganisationer/foretagare/enskildnaringsverksamhet/inkomstavnaringsverksamhet.4.361dc8c15312eff6fd2b612.html [Accessed 2017-04-04]

The Public Health Agency of Sweden (2017). Suicid (självmord), Available Online: https://www.folkhalsomyndigheten.se/folkhalsorapportering-statistik/folkhalsans-utveckling/sjalvmord/ [Accessed 2017-05-17]

Valcentralen (n.d.a). Om AKAP-KL, Available Online: https://www.valcentralen.se/Valcentralen/Page.aspx?page=180 [Accessed 2017-04-20]

Valcentralen (n.d.b). Om KAP-KL, Available Online: https://www.valcentralen.se/Valcentralen/Page.aspx?page=108 [Accessed 2017-04-20]

Alexanderson, Kristina – Kjeldgård, Linnea – Mittendorfer Rutz, Ellenor – Runeson, Bo – Wilcox, Holly C (2015). Functional impairment due to bereavement after the death of

adolescent or young adult offspring in a national population study of 1,051,515 parents, *Social Psychiatry And Psychiatric Epidemiology*, vol. 50, no.8, pp.1249 – 1256, Available Online through: Lund University Libraries website (LUBsearch) http://eds.a.ebscohost.com/eds/search/basic?sid=507d795f-cdb2-45ea-a817-53a2baea6ee5%40sessionmgr4010&vid=0&hid=4208 [Accessed 2017-04-23]

World Health Organization (WHO) (2016). Classifications, Available Online: http://www.who.int/classifications/icd/en/ [Accessed 2017-03-27]

World Health Organization (WHO) (n.d.). Metrics: Disability Adjusted Life Year (DALY), Available Online: http://www.who.int/healthinfo/global_burden_disease/metrics_daly/en/ [Accessed 2017-04-25]

Yang, Bijou – Lester, David. (2007). Recalculating the Economic Cost of Suicide, *Death Studies*, vol. 31, no.4, pp.351-361, Available Online through: Lund University Libraries website (LUBsearch) http://eds.a.ebscohost.com/eds/search/basic?sid=507d795f-cdb2-45ea-a817-53a2baea6ee5%40sessionmgr4010&vid=0&hid=4208 [Accessed 2017-04-23]

Acronyms

BUP: Child and Adolescent Psychiatry (Barn- och ungdomspsykiatri)

COI: Cost of Illness

DALY: Disability Adjusted Life Year

FCM: Friction Cost Method

GDP: Gross Domestic Product

HCM: Human Capital Method

ICD-10: International Statistical Classification of Diseases and Related Health Problems 10th Revision

KPB: Cost per User (Kostnad per brukare)

KPP: Cost per patient (Kostnad per patient)

MSB: Swedish Civil Contingencies Agency (Myndigheten för samhällsskydd och beredskap)

NASP: National Centre for Suicide Research and Prevention of Mental Ill-Health

NE: Nationalencyklopedin

NICE: National Institute for Health and Care Excellence

NZD: New Zealand dollars

PPYLL: Potentially Productive Years of Life Lost

QALY: Quality Adjusted Life Year

SALAR: Swedish Association of the Local Authorities and Regions (Sveriges kommuner och landsting, SKL)

SCB: Statistics Sweden (Statistiska Centralbyrån)

SEK: Swedish Krona

SP: Stated Preference Approach

SPV: National Government Employee Pensions Board

SRV: Swedish Rescue Services Agency (Räddningsverket)

SS: National Board of Health and Welfare (Socialstyrelsen)

USD: United States dollar

VSL: the Value of a Statistical Life

WHO: World Health Organization

WTP: Willingness to Pay

YLD: Years Lost Due to Disability

YLL: Years of Life Lost

YPLL: Years of Potential Life Lost