Suicidality and depression in older adults

Prevalence, predictors, and outcomes

Mattias Jonson

Department of Psychiatry and Neurochemistry
Institute of Neuroscience and Physiology
Sahlgrenska Academy, University of Gothenburg

UNIVERSITY OF GOTHENBURG

Gothenburg 2023

Cover illustration: Place des Lices (Cropped) by Paul Signac

mattias.jonson@vgregion.se

ISBN: 978-91-8069-365-3 (PRINT)
ISBN: 978-91-8069-366-0 (PDF)

Printed in Borås, Sweden 2023
Printed by Stema Specialtryck AB

A distinction can be made between measuring the quantity of life, and attempts to measure its quality, although it is generally accepted that improvements in both are desirable.

Macdonald AJ, Dunn G. 1982[1]

Suicidality and depression in older adults

Prevalence, predictors, and outcomes

Mattias Jonson

Department of Psychiatry and Neurochemistry, Institute of Neuroscience and Physiology
Sahlgrenska Academy, University of Gothenburg
Gothenburg, Sweden

ABSTRACT

Older adults have the highest risk of suicide of all age groups. Depression is a major risk factor for suicide in late life, but is also associated with lower quality of life, somatic disorders, and premature death. The aim of the thesis was to deepen the understanding of suicidality and depression in the oldest segment of the population.

In **Paper I** we showed that there was a substantial decrease in suicidal ideation in 85-year-olds between 1986 and 2008, but no change between 2008 and 2015. Suicidal ideation in these cohorts was associated with depressive symptoms, feelings of loneliness and residing in a long-term care facility. In **Paper II** we found that there was a decrease in depression in 85-year-olds, from 1986 to 2008, and further (in minor but not major depression) from 2008 to 2015. Changes in known risk factors for depression did not explain the decrease. Proportions using antidepressant medication more than doubled from 1986 to 2008 but remained stable from 2008 to 2015. In **Paper III** we found that a wish to die was associated with all-cause mortality more strongly than both life-weariness and active suicidal ideation. The association remained after adjusting for both somatic and mental disorders and psychosocial factors. In **Paper IV** we mapped healthcare contacts of older adults (75+) who self-harmed. During the year before self-harm, most contacts were in primary care. There was a sharp increase in contacts with specialized care, and an increase in antidepressant prescriptions, in the months after self-harm. Psychotherapy was rare both before and after self-harm.

The conclusion of this thesis is that there has been a positive development for the oldest age group in Sweden during the past decades regarding depression and suicidality. However, there are still areas with potential for improvement.

Keywords: Older adults, late-life depression, suicidal ideation, self-harm, suicide, time trends, all-cause mortality, epidemiology

ISBN: 978-91-8069-365-3 (PRINT)
ISBN: 978-91-8069-366-0 (PDF)

SAMMANFATTNING PÅ SVENSKA

Det är välkänt att äldre personer har en statistiskt högre risk att ta sitt liv. Kopplingen mellan depression och suicid är stark bland äldre personer. Depression innebär dock även andra risker. Bland annat ökar risken för många vanliga sjukdomar och risken för att dö i förtid av ”naturliga” orsaker. Målet med denna avhandling var att utöka kunskapen om depression och suicidalitet bland äldre personer.

I det första delarbetet kunde vi visa att suicidtankar bland 85-åringar blivit mindre vanliga under de senaste decennierna. Bland 85-åringar var suicidtankar överrepresenterade hos de med depression, de som kände sig ensamma, och de som bodde på äldreboende.

I det andra delarbetet visade vi att förekomsten av både lindrig och svår depression har minskat bland 85-åringar sedan 1980-talet. Andelen 85-åringar som använde antidepressiva läkemedel dubblerades mellan 1986 och 2008, men förändrades ej mellan 2008 och 2015.

I det tredje delarbetet följde vi upp äldre personer som i en befolkningsundersökning svarat på frågor om olika typer av suicidala tankar. Vid uppföljning efter tre år hade det gått sämst för dem som uttryckt en önskan att dö. De hade 70% ökad risk att dö i naturliga dödsorsaker, jämfört med personer som inte hade några suicidala tankar. För dem som kände att livet var meningslöst eller för de som hade tankar på att faktiskt ta sitt liv var det ingen statistiskt säkerställd ökad risk att dö.

I det sista delarbetet kartlade vi sjukvårdskontakter bland äldre personer i Västra Götalandsregionen som gjort ett suicidförsök. Den vanligaste kontakten under året före försöket var med vårdcentralen. Efter suicidförsöket hade många en kortare tids kontakt med specialistpsykiatrin. Användningen av antidepressiv medicin ökade efter suicidförsöket. Det var ovanligt att denna grupp fick psykoterapi.

Sammanfattningsvis har avhandlingen visat på en positiv utveckling för äldre personer, vad gäller depression och suicidalitet.

LIST OF PAPERS

This thesis is based on the following studies, referred to in the text by their Roman numerals.

I. **Jonson M**, Sigström R, Mellqvist Fässberg M, Wetterberg H, Rydén L, Rydberg Sterner T, Hedna K, Lagerlöf Nilsson U, Skoog I*, Waern, M*. *Passive and active suicidal ideation in Swedish 85-year-olds: Time trends 1986-2015.* Journal of affective disorders. 2021; 290: 300-307. *IS and MW are shared last authors.

II. **Jonson M***, Sigström R*, Hedna K, Rydberg Sterner T, Falk Erhag H, Wetterberg H, Mellqvist Fässberg M, Waern M†, Skoog I†. *Time trends in depression prevalence among Swedish 85-year-olds: repeated cross-sectional population-based studies in 1986, 2008, and 2015.* Psychological medicine. 2021; 53(6):1-10. *MJ and RS are shared first authors. †IS and MW are shared last authors.

III. **Jonson M**, Sigström R, Van Orden KA, Mellqvist Fässberg M, Skoog I, Waern M. *Life-Weariness, Wish to Die, Active Suicidal Ideation, and All-Cause Mortality in Population-Based Samples of Older Adults.* The American journal of geriatric psychiatry : official journal of the American Association for Geriatric Psychiatry. 2023;31(4):267-276.

IV. Hedna K, **Jonson M**, Sigström R, Åberg M, Wilhelmson K, Waern M. *Healthcare visits for mental disorders and use of psychotropic medications before and after self-harm in a cohort aged 75.* Aging & mental health. 2023: 1-9. Online ahead of print.

CONTENTS

ABBREVIATIONS

WHO	World Health Organization
ICD-10	International Classification of Diseases, 10th revision
DSM-5	Diagnostic and Statistical Manual for Mental Disorders
SSRI	Specific Serotonin Reuptake Inhibitors
MMSE	Mini Mental State Examination
OR	Odds Ratio
RCT	Randomized Controlled Trial
CPRS	Comprehensive Psychopathological Rating Scale
MADRS	Montgomery Åsberg Depression Rating Scale
ATC	Anatomic Therapeutic Chemical Classification System

DEFINITIONS IN SHORT

Major depression	A psychiatric disorder where the core symptoms are depressed mood or loss of interest. Other symptoms include sleep disturbances, appetite disturbances, concentration difficulties and suicidal ideation. According to the DSM-5, at least five of nine symptoms are required.
Minor depression	A depressive disorder not meeting criteria for major depression. Apart from depressed mood or loss of interest, only one other symptom is required. The disorder was listed in the DSM-IV-TR, but not the latest edition of DSM, the DSM-5
Psychological autopsy	A study method in which psychiatric diagnoses are made postmortem based on patient records and/or interviews with close informants.
Self-harm	The act of intentionally causing oneself physical harm, regardless of degree of suicidal intent.

INTRODUCTION

SUICIDE

A BRIEF HISTORY OF SUICIDE IN EUROPE

In Christian Europe before the Enlightenment, suicide was viewed as an immoral act and was criminal in most countries. During the Enlightenment, views on suicide started to change.[2] In an essay from 1756, the Scottish philosopher David Hume[3] argued against the criminalization of suicide: "*A man who retires from life does no harm to society: He only ceases to do good; which, if it is an injury, is of the lowest kind.*"

In the 19th century, French psychiatrist Jean-Étienne Esquirol described suicide as mainly an effect of mental disorder. He noted that the risk of suicide was increased in persons suffering from, for example melancholy and alcoholism.[4] A few decades later, Emile Durkheim published his seminal book *Le Suicide*[5] in which he investigated suicide as a sociological phenomenon. Although he concurred with Esquirol that suicide could be due to mental disorders, he argued that this was not the main reason. He built his argument on that the fact that rates of suicides in different societies and religions did not correlate with rates of mental disorders.

Durkheim constructed a model of suicide consisting of two dimensions. One dimension was between altruism and egoism, the other between anomie and fatalism. He proposed that suicides increase the more extreme a society is on any of those dimensions. Altruistic suicides, he argued, result from over-integration, where individuals sacrifice themselves for the greater good of society. The opposite, egoistic suicides, take place in societies with too little integration, and result from of a sense of not belonging. Anomic suicides result from moral deregulation in society, which might occur during larger societal changes. Fatalistic suicides are instead due to over-regulation, such as in a prison.

Durkheim's model has later been questioned. For example, his perhaps most central finding, that suicide rates among Protestants are consistently higher than among Catholics, has been criticized for being an artefact of reporting differences.[6]

SUICIDE IN THE WORLD TODAY

WHO estimated that there were 703 000 suicides in the world in 2019. That translates to a suicide rate of 9 suicides per 100 000 persons in one year. However, only 60 of the 183 WHO member nations have high quality data on suicides. To compensate for this, suicide rates were modeled in countries with poor data quality. Of the countries with the highest age-standardized suicide rates (per 100 000 persons in one year) in 2019, many are in sub-Saharan Africa: Lesotho (88/100 000), Eswatini (41/100 000), and Zimbabwe, South Africa, and Central African Republic (all at 23/100 000). However, all these countries have poor data quality, so estimates have a large degree of uncertainty. South America generally has better data quality, and although most countries on the continent have low suicide rates, some have high: Guyana (41/100 000), Suriname (26/100 000), and Uruguay (19/100 000). Eastern Europe has relatively good data quality and several countries with moderately elevated suicide rates: Russia (22/100 000), Lithuania (20/100 000), Kazakhstan and Ukraine (both at 18/100 000). South Korea is an outlier in Asia with a relatively high suicide rate (21/100 000) based on good quality data.[7]

From 2000 to 2019 the global suicide rate decreased by 36%.[7] The only region that saw an increase in suicides was the Americas, where the suicide rate increased by 17%. This trend was driven by increases in some populous countries such as Mexico (+36%), Brazil (+42%), and the U.S. (+45%). Despite the increase, rates in Mexico and Brazil were still low in 2019 (5 and 6 per 100 000), while the rate in the U.S. was slightly above the global average (15 per 100 000).[8] The U.S. suicide rate might be underestimated due to the large, and increasing share of deaths due to opioids, where intent is often unknown.[9] In 2021 there were 75 477 deaths due to opioids in the U.S, accounting for more than 20% of deaths in ages 20-39.[10] This can be compared to a total of 47 646 suicides in the U.S. in the same year.[11]

In almost all countries of the world, suicide rates are higher among males than females. However, the ratio of male to female suicides differs considerably. In for example India and China, there is little sex difference, while there are more than four times more male suicides than female suicides in Eastern Europe, many countries in sub Saharan Africa and South America.[7] The difference by sex, “the gender paradox in suicide”, has been suggested to in part be due to different expectations on men and women concerning suicidal behavior.[12]

SUICIDE IN SWEDEN

Suicide was a criminal offense in Sweden until 1864 and burial restrictions for suicide decedents were not fully lifted until 1908.[13] During the 1960s, Sweden reported rates of suicide above many other developed countries (Figure 1). Suicide rates are however often underreported to varying degrees[14] and Sweden might be among countries that have the most accurate reporting, even by European standards.[15]

During the past decades, the suicide rate in Sweden has been just above the global average.[7] In 2022 there were 12 certain suicides per 100 000 person-years (7 for females and 17 for males).[16] In global comparisons, suicide rates are referring to certain suicides (ICD-10 codes X60-84). In Swedish national data, uncertain suicides (ICD-10 codes Y10-34) are often included as well. In 2022, the age-standardized suicide rate in Sweden, when uncertain suicides were included, was 15 per 100 000 (9 for females and 21 for males).[16]

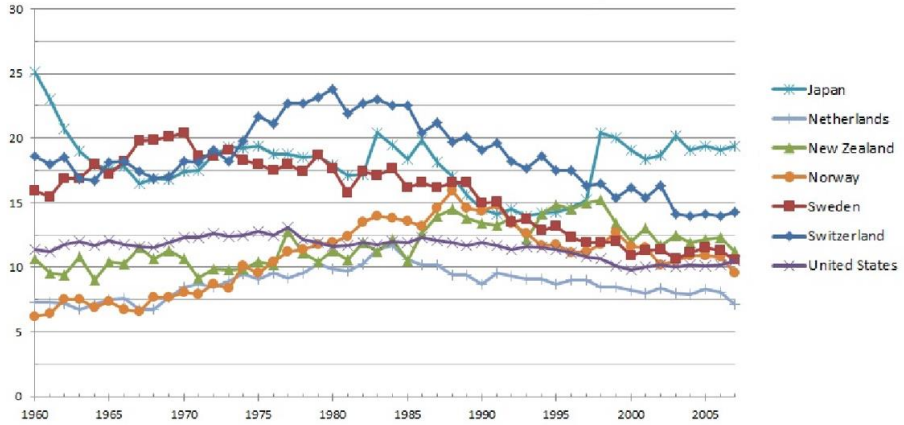

Figure 1. Suicides per 100 000 persons, 1960-2007 in Sweden compared to some other OECD countries. Source: Wikipedia[17]

RISK FACTORS FOR SUICIDE

A consistent finding is that previous self-harm is a very strong, perhaps the strongest, risk factor for suicide. In studies on all age groups, the risk among those who have self-harmed is approximately 30-40 times that of the general population of same age and sex[18-20]. However, the majority of suicide

decedents die as a result of their first attempt.[21] Several psychiatric disorders are strong risk factors for suicide. Borderline personality disorder[22], substance use disorders[23], bipolar disorder[24], schizophrenia[25], severe depression[26], anorexia nervosa[27], and attention deficit hyperactivity disorder[28] have all been associated with a risk of suicide more than ten times that of the general population. In psychological autopsy studies, almost all who died by suicide had diagnosable mental disorders, most commonly depressive disorders and alcohol use disorders[29], which have a high prevalence in the general population.

Persons at high risk of suicide are often admitted to psychiatric inpatient care. Being a psychiatric inpatient is associated with a high risk of suicide. Especially the first week of inpatient care, and the first week post discharge are periods with a very high risk (200-400 times that of the general population).[30]

In a study on all Swedes born between 1950 and 1970, there was a massively increased risk of suicide after a diagnosis of alcohol use disorder. The risk (adjusted for other psychiatric disorders and sociodemographic factors) was increased 128-fold for women and 28-fold for men in the five-year period after diagnosis. The reason for the higher risk in women is the lower base-rate for women. For persons with alcohol use disorders there was no sex difference in suicide rate.[31] Further evidence of the strong association between alcohol consumption and suicide comes from a Swedish autopsy study in which alcohol was detected in almost 40% of suicide decedents.[32] Somewhat lower proportions have been reported in similar studies from the U.S.[33] and Australia[34].

Somatic disorders increase the risk of suicide to a far lesser degree than mental disorders, approximately doubling the risk compared to persons with no somatic disorder.[35] Activity limitation due to somatic disorder seems to be an important factor.[35,36] The time shortly after a diagnosis of serious conditions such as cancer[37] and some neurological disorders[38] has been shown a high risk period.

Physical pain has been associated with suicide, although the effect size in a meta-analysis was modest (OR 1.3; 95% CI: 1.1-1.7).[39] A related concept is psychological pain which has been defined as *"a lasting, unsustainable and unpleasant feeling resulting from negative appraisal of an inability or deficiency of the self"*.[40] Psychological pain has been suggested to be central

to the suicidal process.[41] A meta-analysis found that individuals with previous or current suicide attempts and/or suicidal ideation had higher levels of psychological pain, compared to individuals with no suicide attempts or suicidal ideation, with large effect sizes (standardized mean differences between 0.7 and 1.5).[42]

Transgender identity was associated with elevated risk of suicide in a register-based study of all individuals in Denmark between 1980 and 2021. There were 12 suicides in 3759 transgender individuals. All suicides occurred among those born as males, which translated into a suicide rate nearly five times higher than the general population, adjusted for age.[43] A Swedish cohort study of individuals who had sex reassignment surgery between 1973 and 2003 found a suicide rate that was almost 20 times higher than that of age-matched controls, although analyses were based on only 10 suicides. As in the Danish study, especially those born as males were at risk for suicidal behavior.[44]

Persons convicted of violent and sexual crimes, especially homicide, have increased suicide rates. In a Danish national study, the odds were elevated five times for men convicted of violent crimes compared to the general male population, and 12 times for men convicted of homicide. For women convicted of homicide odds were 30 times higher than for women in the general population.[45] Incarceration, particularly the first day in prison, and the first day after release, is associated with a high suicide risk.[46]

Negative socio-economic factors are associated with an elevated risk of suicide, particularly for men.[47] Being unemployed or having a low income is associated with a two to four-fold increase in risk.[48] Living alone, as well as feeling lonely, was associated with a two to three-fold increase in risk for suicide in men, but not in women, in a large British cohort study.[49] Having never married, being divorced or widowed was more common in suicides than in the general population in a study from Finland.[50]

Only a few large, prospective studies have investigated the risk of suicide in persons who have suicidal thoughts. In population-based studies from South Korea[51] and the U.S.[52], and one study on U.S. veterans[53], those who reported suicidal thoughts had about three times higher risk of suicide than those who negated such thoughts, during a follow up of a few years. This makes suicidal ideation a statistically much weaker risk factor than previous self-harm and most mental disorders. Further evidence of the relatively weak association between expressed suicidal ideation and suicide comes from a meta-analysis

on retrospective studies. It found that 60% of persons who took their own lives had no record of expressing suicidal ideation.[54] In a study of persons who took their lives and had been assessed by a clinician in the previous 30 days, two thirds had denied suicidal thoughts, and half of the suicides happened within two days of the assessment.[55]

SUICIDE PREVENTION

Suicide prevention can target a whole population, for example in the form of policy changes, or it can target certain high-risk groups or individuals.

Concerning prevention at the population level, suicide rates correlate epidemiologically with consumption of alcohol.[56-59], particularly consumption of spirits.[60] One example, strongly suggestive of a causal link between alcohol consumption and suicide rates, was the large reduction in suicides in the former Soviet Union during Gorbachev's anti-alcohol campaign in the 1980s. The high male suicide rate at the time, fell by half in a few years, after prices on alcoholic beverages were increased and sales times were restricted.[61]

Restrictions on common suicide methods are also associated with reduced suicide rates. The change from coal-based, high carbon monoxide domestic household gas to less toxic gas, led to fewer suicides in the U.K. in the 1960s.[62] U.S. states with more restrictive firearm policies have fewer firearm suicides and fewer suicides overall.[63] National bans on highly toxic pesticides, one of the most common suicide methods globally, have been followed by decreases in suicides using this method, and in some studies, decreases in overall suicides.[64] Reduction in pack sizes of over-the-counter medications such as paracetamol[65] and caffeine tablets[66] have been followed by decreases in suicides using those methods.

One argument against means restrictions as a way to reduce suicides is that if one method of suicide is removed, there will be a compensatory increase in other methods. This argument has been countered by natural experiments in Australia[67] and Canada[68]. When anti-suicide barriers were mounted on bridges, this led to fewer suicides from those bridges, and no compensatory increase in suicides from nearby bridges that had no barriers.

Whether antidepressants are anti-suicidal or not is debated. The introduction of the less toxic, and less side-effect prone new generation of antidepressants

(SSRIs) in the 1990s has been suggested to be an important cause of the reduction in suicide rates seen for example in Sweden during the same period.[69] However, others have argued that when examining the trend of increased sales of SSRIs and the trend of decreased suicides more thoroughly, the association is less clear. For instance, suicide rates started to decrease in the Nordic countries before the dramatic increase in SSRI[70].

Some support of an anti-suicidal effect of SSRIs comes from a nationwide register-based Swedish study, using within-person design. The risk of suicidal behavior was highest the month before initiation of SSRI treatment, and fell by almost 30% during the first month of treatment.[71]

Despite the high rate of depression in suicides[29, 72], less than a quarter of suicide decedents had detectable levels of an antidepressant in the blood in autopsy studies.[73, 74] This may indicate an undertreatment of depression, or that poor adherence to treatment increases the risk of suicide. In a study from the 1990s, only three percent of suicide decedents with major depression had received antidepressant medication in an adequate dose.[75]

Lithium has since long been viewed as an anti-suicidal medication in mood disorders. A meta-analysis of RCTs in major depression and bipolar disorder found that the odds of suicide was almost eight-fold lower (OR: 0.13; 95% CI: 0.03-0.66) in those randomized to lithium compared to those randomized to other treatments or placebo.[76] A more recent meta-analysis found no significantly protective effect of lithium (OR: 0.41; 95% CI: 0.03-2.49).[77] However, that meta-analysis has been criticized for its selection of included studies.[78]

Very low doses of lithium have been suggested to have a suicide-protective effect. In a meta-analysis of ecological studies, areas with a higher concentration of naturally occurring lithium in the drinking water had lower suicide rates.[79] In contrast, a Danish whole-population study with individual-level lithium exposure estimates did not find an association with suicide.[80] Although it might sound mechanistically implausible that doses of lithium <1% of those normally prescribed would have a biological effect, doses in that range has shown effect on mood in a small RCT of 24 former drug users.[81]

No psychotherapeutic intervention has shown an effect in reducing suicides[82], although sufficiently powered studies may be lacking. Some psychotherapies have shown to reduce non-fatal self-harm. For example dialectical behavioral

therapy reduced non-fatal self-harm in persons with borderline personality disorder.[83] Brief cognitive behavioral therapy reduced non-fatal self-harm by 60% in patients with suicidal ideation or previous self-harm.[84] Attempted Suicide Short Intervention (ASSIP), a short psychotherapeutic intervention, reduced repeat non-fatal self-harm by 80% compared to treatment as usual in one RCT[85]. However, there was no difference in rates of repeat non-fatal self-harm in a later RCT, when ASSIP was compared to crisis counselling.[86]

A potentially anti-suicidal intervention is safety planning. Safety planning means that a patient works together with a clinician to make a plan with the aim of preventing suicidal acts. The plan includes warning signs, coping strategies, and contacts to reach out to in the case of a suicidal crisis. Safety planning reduced suicidal behavior by 43% in a meta-analysis that consisted of six studies (four of them RCTs). However, four of the studies had high risk of bias and there was also possible publication bias.[87] Of the two included studies that did not have high risk of bias, one was the previously mentioned RCT testing ASSIP.[85] The other one was a RCT testing crisis response planning compared to contracts for safety. The results favored crisis response planning, but was based on only eight suicide attempts, three in the intervention group and five in the control group (Hazard ratio: 0.24; 95% CI: 0.06-0.96). Notably, one of the suicide attempts in the intervention group was fatal.[88]

SUICIDE RISK ASSESSMENT

Suicide is a rare event even in high-risk populations. For example, a 30-fold increase in risk compared to the general population, such as in persons who have self-harmed, translates to about a 0.5% risk of suicide in one year[20]. Although certain subgroups, such as bipolar men, the year after a non-fatal self-harm event have significantly higher risk (~5%)[89], suicide is impossible to predict with any clinically significant precision at the individual level, using suicide assessment tools.[90] A perhaps logical consequence of this is that clinicians often rely on "gut-feeling" instead[91], although it is questionable whether this is any better. Of those who took their own lives in the U.K. who had been assessed by a clinician in the previous week, 85% had been judged to have either a low risk of suicide or no risk at all.[92]

Although there are some newly developed tools that might be of clinical value[93], there have been calls for a paradigm shift, away from trying to predict

suicide, to an approach that focuses on how to handle the risk for the individual patient, and emphasizing the therapeutic, rather than predictive value of assessing suicide risk.[94]

SUICIDE IN OLDER ADULTS

High rates of suicide in old age were reported already by Durkheim [5] at the end of the 19th century. Since then, this has been a consistent finding.[95-97] According to the Global Burden of Disease study in 2016, suicide rates were the highest in the oldest age segment, in both men and women, in all regions of the world [98]. Suicide rates in older adults in Sweden have decreased during the past 40 years (Figure 2), but older men still have the highest rates (Figure 3).

Risk factors for suicide in old age mostly mirror those found in younger age groups. Previous self-harm is perhaps an even stronger risk factor among older adults. Two U.K.-based studies on persons 60 years and above, found a 50-fold[99], and almost 70-fold[100] increase in risk of suicide among those who had self-harmed compared to those who had not.

Mental disorders are very strong risk factors for suicide in old age. In psychological autopsy studies, the odds for a psychiatric diagnosis in older adult suicides were 40 to 100 times higher than in controls.[101] In a case-control study that included also serious suicide attempts, the authors concluded that up to three quarters of suicidal behavior in older adults could be attributed to mental disorders.[102]

Depressive disorders were more common in older adult suicides, compared to younger adult suicides, in a study from England and Wales[103] and in a study from Sweden[104]. In a Swedish psychological autopsy study, 82% of older adults who died by suicide had a mood disorder, most commonly major depression. Nevertheless, almost one in five had minor depression, which was significantly more than in controls.[105]

Despite the strong link between mental disorders and suicide in older adults, a study from Finland found that older suicide decedents had more seldom been referred to psychiatric specialist care prior to their suicides compared to younger adults. The authors suggested that the lower referral rate might be due to “therapeutic nihilism”, a perception that it is not worth treating mental ill-

health in older adults.[106] In line with this finding, a recent systematic review of 47 studies found a lower degree of referral to psychiatric specialist care for older adults compared to younger after emergency contact for self-harm.[107]

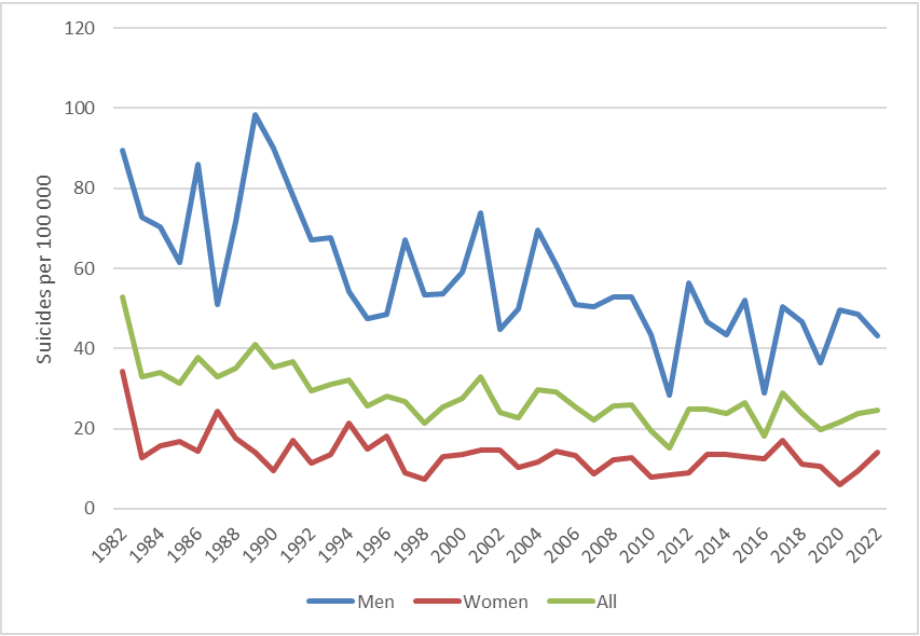

Figure 2. Suicides in persons 85-89 (years 1982-1996)[108] and 85 years and older (years 1997-2022)[16], per 100 000 persons. Including deaths with undetermined intent. Original by the author.

A Swedish study on older adult suicides from the 1990s, found that almost 40% had detectable levels of antidepressants or lithium in the blood [109], a larger share than in previously mentioned studies on all ages (less than 25%)[73, 74]. The percentage is very close to a recent register-based study on all Swedish residents, 75 years and above. In that study 42.5% of those who took their lives had recently been prescribed an antidepressant.[110] Although this might seem like a large share, it is only slightly more than half of older adult suicide decedents estimated to have a depressive disorder.[105]

As in younger adults, somatic disorders are less strong risk factors than mental disorders also in older adults. The risk increases with number of disorders. Among somatic factors, pain stands out, with an eight-fold increase in risk.[111] Functional impairment was associated with suicide in old age independent of physical and mental health in a U.S.-based case-control study.[112] A Swedish

case-control study found that somatic disorders might be a stronger risk factor for older men than for older women.[113] A recent cohort study on older adults found that a low body mass index (<18,5) was associated with a more than doubled risk of suicide.[114] Similar associations have previously been made in

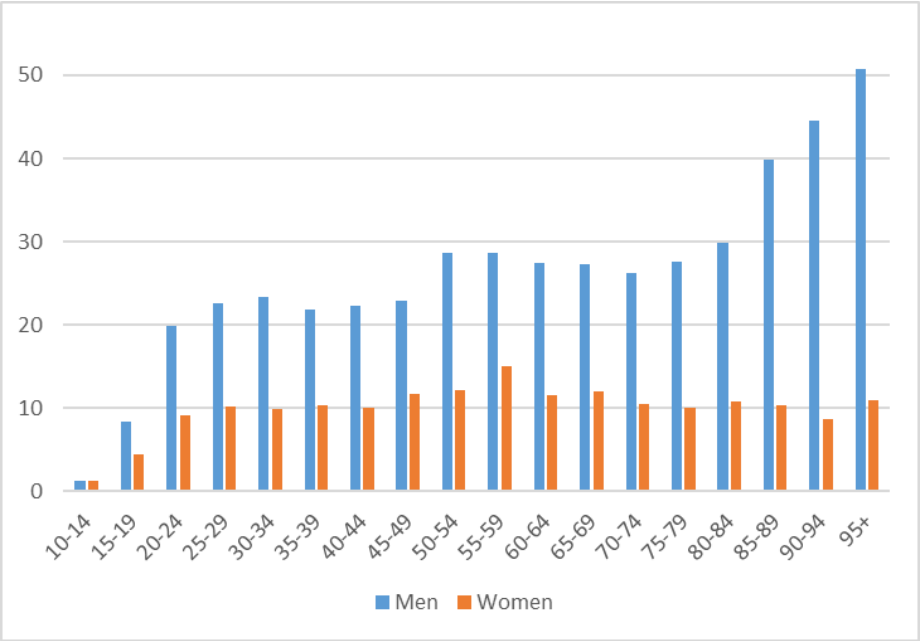

Figure 3. Average suicides per 100 000 person years in Sweden 2018-2022 by sex and age group (including deaths of undetermined intent). Original by the author. Based on data from Swedish cause of death register.[16]

adults of all ages.[115] Concerning dementia, there was no overall association with suicide in a meta-analysis.[116] However, the risk seems to be elevated in the early stages of dementia.[117, 118]

Regarding psychosocial factors, a shorter education[119], a lower income[112, 119], living alone[112], not being married[112, 120], material deprivation[121], and a low level of social network[102] have been associated with suicide in old age. However, these are less strong associations, compared to mental disorders and previous self-harm. For example, a low level of social network was associated with five times higher odds of suicide or severe self-harm in a case-control study. Having a mood disorder was associated 180 times higher odds in the same study.[102]

Regarding suicide methods, both a Finnish study[106], and a study from the U.K.[103] found drowning to be a more common method of suicide in older adults compared to younger adults. The Finnish study found intoxication to be a more rarely employed method among older adults, in the U.K. study there was no difference. In Swedish data from 2022, intoxication (ICD-10 codes X60-69) was the method in 25% of suicides, both under and over the age of 70.[16]

NON-FATAL SELF-HARM

Non-fatal self-harm encompasses all actions when a person harms her- or himself physically, without dying. Although such actions can have vastly varying degrees of intent to end life, it is difficult to distinguish between non-suicidal self-harm, and suicidal self-harm.[122] An illustration of the overlap between suicidal and non-suicidal self-harm comes from a recent study on persons who came to an emergency department after self-harm. Of those with self-harm that was deemed non-suicidal, two thirds had previously self-harmed with suicidal intent, and some of those who had previously only self-harmed with no suicidal intent went on to self-harm with suicidal intent during 12 months of follow up.[123]

NON-FATAL SELF-HARM IN OLDER ADULTS

Non-fatal self-harm that is presented to health services is less common in older adults, than younger (Figure 4). The distribution is opposite that of suicides, both in terms of age and sex (Figure 3). In young women, there are approximately 30 non-fatal self-harm episodes for every fatal, while in older men the ratio is close to one. One reason for this age paradox is that older adults have higher suicide intent.[124] Older adults are also frailer and might have a smaller chance of surviving an act of self-harm.

As is the case with suicide, psychiatric disorders, especially mood disorders are strong risk factors. Of 103 older adults (70+) admitted to hospital after self-harm, 92% had a mood disorder (63% major depression, 6% bipolar depression, 23% minor depression).[125] In a Finnish study of persons 60 years or older who had self-harmed, 65% received a diagnosis of mood disorder, 20% had schizophrenia spectrum disorders, 28% had substance use disorders,

and 7% had personality disorders. Substance use disorder and personality disorder were less common in those 60 years and over who had self-harmed,

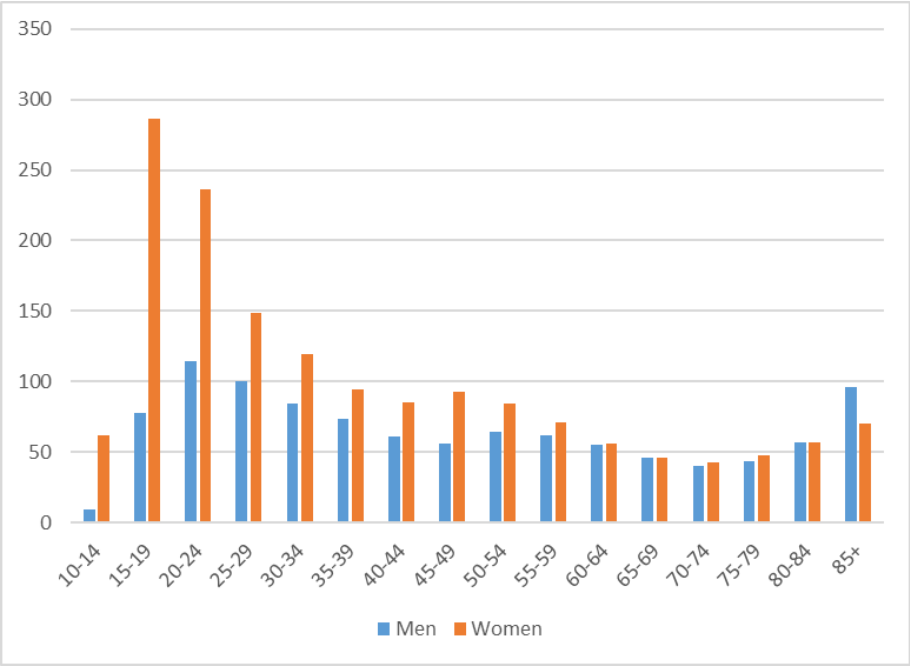

Figure 4. Average number of self-harm episodes registered with health services in Sweden per 100 000 persons, by sex and age group. Based on years 2017-2021. Original by the author. Based on data from National board of Health and Welfare.[126]

compared to those under 60. A further finding of that study was that of those 60 years and above, who had been in contact with primary care during the year before self-harm, only four percent had been diagnosed with a mood disorder. After self-harm 57% were diagnosed with such a disorder disorder, indicating that many cases were missed in primary care.[127]

In an interview study of older adults who had attempted suicide, the most common self-reported reasons were (in falling order): wanting to escape, reduced sense of autonomy, psychological problems, physical problems or pain, having no memory or understanding of the attempt, perceived burdensomeness, and thwarted belongingness. Those who reported thwarted belongingness had used more violent methods, such as hanging or cutting. They also re-attempted at a higher rate.[128]

SUICIDAL IDEATION

Suicidal ideation is a continuum ranging from thoughts that life is not worth living to thoughts of actually killing oneself. Less intense ideation, such as feeling that life is not worth living or wishing to die, are sometimes referred to as passive suicidal ideation, while thoughts of suicide are termed active suicidal ideation.

Prevalence estimates of suicidal ideation depend strongly on type of ideation, passive suicidal ideation is more common. Paykel et al[129] found that eight percent of a general population sample had felt that life was not worth living during the past year, while less than two percent had seriously considered suicide during the same period. De Leo et al[130] found a lifetime prevalence in a general population sample, of feeling that life is not worth living of 21%, compared to 10% that reported that they had seriously considered suicide during their life. Prevalence estimates also depend on the period assessed. The study by Paykel and colleagues found approximately doubled frequencies when questions regarded lifetime, compared to past year. Miret et al[131] found a five-fold higher prevalence when questions considered lifetime compared to past year.

FROM IDEATION TO ACTION

Suicidal ideation is far more common than suicide. Hence, most people who have suicidal ideation will not die by suicide. Further, the demography of populations with suicidal ideation, non-fatal self-harm and suicide differ. Suicidal ideation and non-fatal self-harm are more common in women[12] and younger persons[132], while suicide is more common in older men[7, 98]. As previously noted, suicidal ideation might not even be a requirement for suicidal action.[54]

Several theories have tried to explain the route from ideation to action. Beck and colleagues identified hopelessness as a key factor.[133] Shneidman suggested that psychological pain ("psychache"), played a central role.[134] The Fluid Vulnerability theory underlines the importance of within-person variability in suicidal ideation as a predictor of suicidal behaviour.[135] According to the interpersonal theory of suicide, a capability of suicide is required to go from thought to action. This capability can be acquired through exposure to pain or death.[136] The three-step theory of suicide combines hopelessness, pain,

connectedness and capability.[137] The motivational-volitional model of suicidal behaviour emphasizes defeat and entrapment.[138] Common themes across these theories are pain and hopelessness as motivational factors, and capability as a key distinguisher between ideators and actors.

SUICIDAL IDEATION IN OLDER ADULTS

PREVALENCE

Prevalence estimates of suicidal ideation in older adults vary greatly. The lowest estimates are below one percent [131] and regarded active suicidal ideation during the past year in a Spanish population sample aged 65 years and older. The highest estimates come from South Korea, where 28 percent of a population-based sample of persons aged 80 years and over reported active suicidal ideation during the past year [139]. One other Asian study, from Taiwan, reported a high estimate of active suicidal ideation in a community sample of older adults, 17% during the past week in 65-74 year-olds.[140] Apart from those two studies, estimates of active suicidal ideation in older adults are generally around or below five percent[131, 141-146]. Studies that include passive types of suicidal ideation such as life-weariness and wish to die generally yield higher estimates [129, 147-160] (Figure 5 and Table 1).

Suicidal ideation rates seem to differ by age in a u-shaped manner. The highest rates are in young adults and the oldest old adults. A Danish population-based study found that 13% of 16-24 year olds reported suicidal ideation during the past year, compared to less than 3% in those 67 years and above.[132] Similar patterns, with decreasing prevalence by age come from studies conducted in Australia[130] and the U.S.[161] However, after approximately 70 years of age, it seems that the prevalence of suicidal ideation increases again. In a Swedish study, three percent of septuagenarians reported some kind of passive or active suicidal ideation during the past month, while corresponding percentages in octogenarians, nonagenarians and centenarians were 9%, 12% and 13%.[162]

TIME TRENDS IN SUICIDAL IDEATION IN OLDER ADULTS

Only a few studies have compared cohorts of older adults in a similar manner at different time points to investigate potential time trends (Table 2). All these previous studies focused on relatively young older adults and investigated rather short periods. No study found a significant trend.

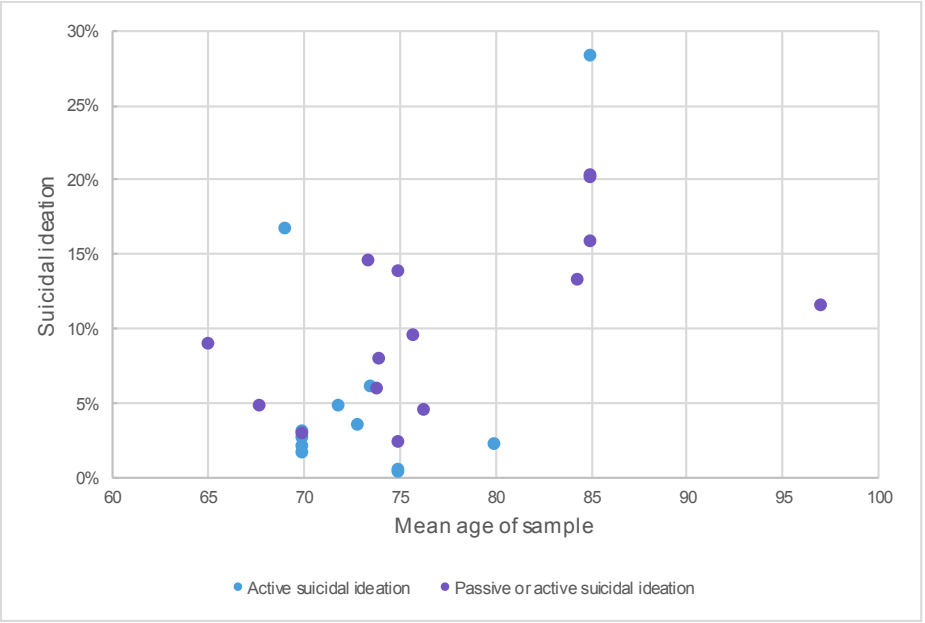

Figure 5. Prevalence of suicidal ideation (up to 12 months back), in older adult community samples, versus mean age of samples. Original by the author. Based on studies listed in Table 1.

FACTORS ASSOCIATED WITH SUICIDAL IDEATION IN OLDER ADULTS

Factors associated with suicidal ideation in older adults are similar to factors associated with suicide in older adults. The strongest and most consistent factor is depression.[143, 153, 159, 163] In a Swedish older adult community sample, half of those with frequent suicidal ideation had major depression.[155]

In a Taiwanese community sample, almost three quarters of older adults with suicidal ideation were depressed[140]. The association between suicidal ideation and depression may be less strong in oldest old. Less than a quarter of Swedish 97-year-olds who reported past month passive or active suicidal ideation fulfilled criteria for either minor or major depression[160]. Although less studied, anxiety is associated with suicidal ideation in older adults[143], even after adjustment for major depression[152].

Regarding somatic factors, suicidal ideation in older adults has been associated with poor self-rated health[153, 164] as well as many somatic disorders and

functional disability[165]. Somatic illness was associated with suicidal ideation in studies on older adults in Taiwan[140] and South Korea[166], however, after adjusting for other factors, such as socioeconomic factors and depression, the associations with somatic illness disappeared, arguing that somatic illness is of lesser importance.

Table 1. Prevalence estimates of suicidal ideation (past 12 months or less) in older adult community samples.

	Authors	Mean age*	Time-frame	Location	Prevalence (%)
Active suicidal ideation	Miret et al 2014[131]	75	12 months	Spain	0.5
	Cooper et al 2015[146]	80	12 months	England	2.2
	Loprinzi et al 2015[142]	70	2 weeks	USA	2.7
	Dong et al 2014[141]	73	2 weeks	Chicago, USA	3.5
	Almeida et al 2012[143]	72	2 weeks	Australia	4.8
	Chan et al 2011[144]	74	Present	Taiwan	6.1
	Yen et al 2005[140]	69	1 week	Taiwan	16.7
	Park 2014[139]	85	12 months	South Korea	28.3
Passive or active suicidal ideation	Jorm et al 1995[153]	75	2 weeks	Australia	2.3
	Jonson et al 2012[152]	70	1 month	Gothenburg, Sweden	2.9
	Cohen et al 2008[147]	68	2 weeks	Brooklyn, NY, USA	4.8
	Lapierre et al 2012[151]	74	12 months	Quebec, Canada	5.9
	Dewey et al 1993[148]	74	Recently	Liverpool, UK	8.0
	Paykel et al 1974[129]	65	12 months	Connecticut, USA	9.0
	Scocco et al 2002[150]	76	12 months	Padua, Italy	9.5
	Mellqvist Fässberg et al 2013[160]	97	1 month	Gothenburg, Sweden	11.5
	Forsell et al 1997[155]	84	2 weeks	Stockholm, Sweden	13.3
	Ayalon & Litwin 2009[154]	75	4 weeks	Israel	13.8
	Suh et al 1999[149]	73	2 week	South Korea	14.6
	Skoog et al 1996[159]	85	1 month	Gothenburg, Sweden	15.9
	Tuvesson et al 2017[156]	85	2 weeks	Sweden	20.1
	Barnow & Linden 1997[157]	85	1 week	Berlin, Germany	20.3

**Mean age is approximated for studies that did not state this.*

A meta-analysis found no association between suicidal ideation and dementia, although results were leaning in that direction (OR 1.4, 95% CI: 0.8-2.4).[116] However, a recent study found mild cognitive impairment to be associated with suicidal ideation, even after adjustment for depression.[167] This aligns with studies that found lower MMSE-score in suicide attempters compared to

controls[168], as well as previously mentioned findings regarding suicide, which is over-represented in the early stages of dementia.[117, 118]

Table 2. Studies that have investigated trends in suicidal ideation in older adults.

Age	Country	Period	Type of study	Type of ideation	Time-frame	%
65+	USA[161]	1991-2001	Mail survey	Active suicidal ideation	Lifetime	2.8 -> 3.1
60+	USA[142]	2005-2011	Mail survey	Passive or active suicidal ideation	Past two weeks	2.1 -> 2.7
65+	Spain[131]	2001-2011	Face-to-face interview	Active suicidal ideation	Past year Lifetime	0.3 -> 0.5 2.6 -> 1.8

A low level of education was one of few factors besides depression that were associated with suicidal ideation in a Taiwanese study on older adults[140]. Poor economic status was the only factor other than age that was associated with suicidal ideation, after adjustment for depression in a study on older adults from South Korea[149]. Some studies in older adults have found suicidal ideation to be more common in those that are not married or those that live alone, while other studies have not found such associations.[169]

SUICIDAL IDEATION AND MORTALITY

Macdonald and Dunn [1] were the first to show that older adults with suicidal ideation had increased all-cause mortality. Several studies have since found similar increases in all-cause mortality among older adults with different types of passive or active suicidal ideation.[148, 159] The association has held for adjustments of both physical and mental disorders.[170]

DEPRESSION

A depressive disorder is a mental state of low mood that inhibits a person's functioning or leads to a significant suffering. To be diagnosed with depression according to the widely used DSM-5, a person must fulfil at least five of nine

of the criteria shown in Box 3, during a period of two weeks or more. At least one of the core criteria (depressed mood or anhedonia) must be fulfilled, and the symptoms should not be due to some other physical or mental disorder, or intake of a psychotropic substance.[171]

A critique of the major depression diagnosis has been its low inter-rater-reliability, deemed as "questionable".[172] The DSM-5-diagnosis of depression has also been criticized for its heterogeneity, due to the numerous symptoms, several of which may count at either high or low levels (e.g. insomnia or hypersomnia). One study counted 227 possible symptom combinations qualifying for a diagnosis of major depression according to DSM-5 criteria.[173]

PREVALENCE OF DEPRESSION

According to a systematic review, the lifetime prevalence of major depressive disorder is 7%, but there was high variation in estimates among included studies.[174] The past-year prevalence of major depression in a U.S.-based interview study on a representative adult sample was 10%, the life-time prevalence was 20%.[175]

Studies that have employed a prospective longitudinal design have reported considerably higher prevalence estimates. In the Dunedin study in New Zealand, 41% of participants had fulfilled criteria for a major depressive episode at least once at age 32, after being examined at ages 18, 21, 26, and 32.[176] Similar results come from a Swiss study in which 33% (39% among women, 25% among men) of a population-representative cohort had fulfilled criteria for major depressive disorder at least once at age 50, after being interviewed at seven time-points since age 18.[177] The conclusion of these studies is that people forget that they have been depressed and that retrospective studies, because of this, underestimate the prevalence of depression.

DEPRESSION IN OLDER ADULTS

Although the same criteria apply, late-life depression can differ somewhat in presentation compared to depression in younger age groups. Feeling "slowed down", feeling hopeless, and having sleep difficulties were more commonly

reported depression symptoms in older adults in one study.[178] As cognitive deficits may be common, close informant information can be important in order not to miss symptoms.[179]

Late-life depression can either have appeared earlier in life or be of late-life onset. The latter form accounts for a little more than half of cases.[180] Early onset depression has higher heritability[181] and a higher degree of comorbidity with personality disorder[182]. Late-onset depression is more often associated with cognitive deficits and dementia.[183]

Most studies have found that depressive symptoms decrease with age.[178, 184] In a U.S. population-based interview study, the past year prevalence of major depression was a little over 10% in younger adults, while it was 5% in those 65 years or over.[175] However, there is vast heterogeneity in estimates across studies. A review of population-based prevalence studies on depression in older adults found rates between 0.4% and 35%. After stratifying by severity, the average point-prevalence of major depression was 1.8%, while minor depression was much more common (9.8%).[185] In a meta-analysis of studies in the oldest older adults (75+), the prevalence of major depression was higher (7.2%).[186] This pattern mirrors that of suicidal ideation, which after a gradual decrease over the adult life span, increases again after approximately 70 years of age.

As noted above, minor depression is a common condition in older adults. However, it is not without importance. The prognosis for remission is poor and there is a high risk of converting to major depression.[187] Minor depression has also been associated an elevated risk of suicide in older adults.[105]

TREATMENT OF DEPRESSION IN OLDER ADULTS

Depression treatment in older adults does not differ significantly from treatment in younger adults. While pharmaceutical treatment is less studied compared to younger adults, there is evidence of effect.[188] Some antidepressant medications have a strong anticholinergic effect, which can affect older adults more negatively, for example cause dizziness, confusion, and obstipation. Electroconvulsive therapy is an effective treatment for depression in older adults.[189] Several studies have even found it to be more effective in older compared to younger adults.[190-192] Psychotherapy is as effective in older adults as in younger adults.[193]

DEPRESSION AND MORTALITY IN OLDER ADULTS

Depression is associated with various somatic disorders in older adults[194] and has also been associated with increased all-cause mortality; a meta-analysis estimated a 34% increased risk.[195] It is not known why depressed persons die at increased rates. Suggested mechanisms include less healthy behaviour (e.g. smoking, non-adherence to treatment), as well as autonomic dysfunction and genetic, immunological, and endothelial phenomena.[196] The causality between depression and somatic disorders is thought to be bidirectional, with depression increasing the risk of somatic disorders, and somatic disorders increasing the risk of depression.[197] According to the vascular depression hypothesis, deterioration of the vascular system is a cause of late-life depression.[198] However, depression has also been found to precede vascular disorders such as unstable angina, myocardial infarction, as well as ischaemic and haemorrhagic stroke.[199]

TIME TRENDS IN DEPRESSION IN OLDER ADULTS

Only a few studies have applied the same questions and method to compare the prevalence of depression in older adults at different times. These are summarized in Table 3. All three studies that employed face-to-face interviews show a trend of decreasing depression prevalence over time.

Table 3. Studies that have investigated time trends in depression prevalence in population-based samples of older adults.

Age	Country	Period	Type of study	Definition of depression	%
65+	UK[200]	1990-2008	Face-to-face interview	Case-level depression	7.9 -> 6.8
80-84	USA[201]	1998-2008	Face-to-face interview	Elevated depressive symptoms	14.3 -> 9.6
70	Sweden[202]	1976-2014	Face-to-face interview	Major depression	3.3 -> 2.4
65-84	Sweden[203]	2006-2014	Mail survey	Depressive disorder	2.1 -> 2.1

THE STUDY OF TIME TRENDS IN MENTAL HEALTH

There are two main strategies to study time trends in mental health. The first is to interview population-representative samples in a similar manner at different time-points. The second is to use healthcare registers. Although both strategies have sources of systematic error, the first strategy arguably gives more valid results.

Regarding the first strategy, one possible source of bias is that, although structured interviews are employed, it may not be the same persons conducting the interviews. Even if it is, those persons will inevitable have changed during the years between interviews, which may influence their interpretation of participant responses. Another possible bias is that people in different times may rate psychiatric symptoms differently. For example, it might be that during a certain time, being able to concentrate is seen as very important. Then, participants who have concentration difficulties will rate their problems higher.

The second strategy, to use registers, is biased by factors that determine who ends up in a register with a certain diagnosis, as this will change over time. For instance, healthcare-seeking behavior, the availability of healthcare, diagnostic criteria, and available treatments change over time. Further, there will be a shift in the "popularity" of certain diagnoses, even if there are no new treatments. An example of this is the dramatic increase in autism spectrum diagnoses although autistic symptoms in the population have not increased.[204]

An additional way of studying time trends in mental health using registers is comparing suicide rates over time. Suicide rates can be considered a proxy variable for mental health, given the very strong association between suicide and mental disorders. Suicide registers, in countries such as Sweden with good data quality, are not subject to some of the biases associated with other registers, such as differences over time in health seeking behavior. However, as it is often not obvious if a death is a suicide or not, it is possible that even this data is biased.

AGE, PERIOD, AND COHORT EFFECTS

Time trends are effects of either age, period, or cohort. The effect of age are the physiological changes and accumulation of experiences that happen during life. The age effect can be controlled by comparing same-aged individuals at different times. If a difference is detected it is either a period effect or a cohort effect, or both. A period effect is something that affects all persons living in a specific time. For example, the introduction of new types of antidepressant medication during the 1990s changed depression treatment for persons with depression, no matter what age they were. The expansion of the education system in Sweden during the first half of the 20th century, is an example of a cohort effect. Mandatory schooling was longer for those born later compared to those who were born earlier.

COVID-19 PANDEMIC AND SUICIDE IN SWEDEN

The Covid-19 pandemic is an example of both a period effect and a cohort effect. It is a period effect in the regard that it affected everyone living during it, but also a cohort effect, as it affected age-segments differentially. For example, older persons were isolated to a higher degree, and had a higher risk of severe illness and death than younger. Somewhat paradoxically, suicide rates in older adults in Sweden were at an all-time low in 2020, when Sweden had its highest death toll from Covid-19. The age-standardized suicide rate for persons 70 years and above in 2020, including uncertain suicides, was 17 per 100 000. In 2022 the rate was back at a pre-pandemic level of 20/100 000.[16] It is possible that the drop in suicide rate was due to the competing risk of dying from Covid-19. Another possible explanation is a crisis-effect, similar to the lower suicide rates sometimes seen after natural diasters[205] and during war[206]. A recent review found heterogeneity in trends of suicide rates across countries and demographic groups during the pandemic.[207]

CORRELATION AND CAUSATION

All studies in this thesis are observational. Because of this causality cannot be determined with the same definitiveness as in intervention studies. For example, if we study loneliness and suicidal ideation, we will most likely find a strong association between them. But we cannot determine whether loneliness causes suicidal ideation, suicidal ideation causes loneliness, or if some other factor, such as depression, causes both loneliness and suicidal

ideation. To be certain that loneliness causes suicidal ideation, we would have to randomize people to loneliness or not. Many times, as in this case, randomized studies are not possible. This could be due to ethical reasons, the rarity of certain outcomes, or economic reasons. One way to estimate the likelihood of an observational association being causal or not is to employ the Bradford Hill criteria[208] (Box 1). The criteria were established by Austin Bradford Hill who together with Richard Doll had established that smoking causes lung-cancer, in a seminal paper, based on observational data.[209] The more criteria that are fulfilled, the higher the likelihood that an association between an exposure and an outcome is causal.

1. **Strength of an association**
2. **Consistency:** an association that has been found repeatedly.
3. **Specificity:** a specific exposure leads to a specific outcome.
4. **Temporality:** the exposure happens before the outcome, within a plausible time-frame.
5. **Biological gradient** : a dose-response relationship, more exposure associated with higher risk of a certain outcome.
6. **Plausibility:** a plausible mechanism exists.
7. **Coherence:** associations align with, for example laboratory findings.
8. **Experiment**: sometimes quasi-experimental situations happen in observational studies.
9. **Analogy:** causality has been determined between similar exposures and outcomes.

Box 1. Bradford-Hill criteria for causation.[208]

AIMS

The overall aim of this thesis was to expand the knowledge on suicidality and depression in older adults. The specific aims were:

PAPER I

To investigate how rates of passive and active suicidal ideation have changed over time in 85-year-olds. A secondary aim was to assess factors potentially associated with suicidal ideation in this age group.

PAPER II

To investigate if the prevalence of minor and major depression, and rates of treatment with psychotropic medication have changed over time in 85-year-olds. A secondary aim was to investigate whether changes in known risk factors for depression could explain potential changes in depression prevalence.

PAPER III

To test if different levels of passive and active suicidal ideation (life-weariness/wish to die/active suicidal ideation) were differently associated with all-cause mortality in older adults.

PAPER IV

To investigate health-care contacts and prescription psychotropic medications in older adults (75+), during the year before and the year after an episode of non-fatal self-harm.

METHODS

PARTICIPANTS

Papers I-III are based on data from the Gothenburg H70 Birth Cohort Studies (H70). These are multidisciplinary studies that started in 1971 with the purpose of investigating the health of the older adult population. The studies have previously been described in detail.[210,211] Paper III also includes data from the Prospective Population Study of Women in Gothenburg (PPSW).[212]

The H70 and the PPSW employ a systematic sampling method in order to produce population-representative samples of older adults. Persons with specific birth dates each month were invited for examinations and face-to-face interviews. Participation rates in the studies have varied between 58% and 73%.[162,213]

PAPER I & II

The first two papers are based on three cohorts of 85-year-olds that were part of the H70-studies. Participants in the first cohort were born in 1901-02 and were interviewed at age 85 in 1986-87. A total of 494 persons (143 men and 351 women) participated. The response rate was 64%. Those who took part in second cohort were born in 1923-24 and were interviewed in 2008-10. Of those invited, 571 individuals (212 men and 359 women) participated. The response rate was 61%. The third cohort was born in 1930 and participants were interviewed in 2015-17. Of those invited 416 (165 men and 251 women) participated. The response rate was 62%.

In order to get valid answers on suicidal ideation and depressive symptoms, those who had dementia or suspected dementia were excluded. This was done based on MMSE[214] scores. Those with a score under 24 were excluded. Because of low MMSE scores or missing MMSE scores 146, 138, and 94 participants were excluded in the first, second, and third cohort, leaving 348, 433, and 321 participants in the respective cohorts. A further 1, 7, and 1 participants had no responses on the questions on suicidal ideation, which made the cohorts somewhat smaller in paper I than in paper II (347, 426, and 320).

PAPER III

The third study included all persons who, since 1986, at age 79 or above, had been interviewed in the H70 or the PPSW. The year 1986 was chosen because that was the first time the Paykel questions[129] on suicidal ideation were included. In order to achieve higher statistical power, we opted to include persons with possible dementia in this study, as long as the participants, or key informants, could provide the necessary information. As the outcome was all-cause mortality and death is relatively uncommon in Sweden among "younger older" we included only those who were 79 years or older at their examination. As some persons took part in more than one examination wave (e.g. at both 79 years and 85 years), we included only answers from their first examination/interview. In total 2438 persons (1737 women and 701 men), born between 1901 and 1930, and examined between 1986 and 2017 were included. The mean age was 87 years (range 79 to 101).

PAPER IV

The fourth paper is a registered-based study that includes all persons aged 75 and older who had a self-harm diagnosis registered in the regional healthcare database VEGA[215] between 2007 and 2015. The VEGA database registers all healthcare contacts in the Västra Götaland region, private and publicly funded, in both primary care and specialized care. The Västra Götaland region has a population of 1.7 million, which is about 17% of Sweden's population. The region includes Sweden's second largest city, Gothenburg.

EXAMINATIONS

A major part of the examinations in the H70 and the PPSW is a semi-structured, face-to-face interview. In cases of cognitive decline, key informants are interviewed for additional informational. Research nurses, medical doctors, or psychiatrists conduct the interviews. One part of the interview focuses on psychiatric symptoms. This part includes the Comprehensive Psychopathological Rating Scale (CPRS)[216] and the Paykel questions on suicidal feelings[129].

The CPRS is a rating scale consisting of 65 questions rated from 0-6, covering many symptoms of common mental disorders. Several subscales can be derived from the CPRS, such as the MADRS[217] that assesses depressive symptom severity. Based on responses on the CPRS questions it is possible to make research diagnoses of mental disorders, such as minor and major depression.

VARIABLES AND OUTCOME MEASURES

THE PAYKEL QUESTIONS

In **Papers I & III** the Paykel questions[129] were used to assess passive and active suicidal ideation. The Paykel questions (Box 2) are five questions on suicidal feelings, ideation, and behavior of increasing severity.

1. Have you ever felt that life was not worth living?
2. Have you ever wished you were dead? – For instance, that you could go to sleep and not wake up?
3. Have you ever thought of taking your life, even if you would not really do it?
4. Have you ever reached the point where you seriously considered taking your life, or perhaps made plans how you would go about doing it?
5. Have you ever made an attempt to take your life?

All questions are asked, even if there is a negative response on an earlier question. For each question, if the answer is yes, the last time for this is noted: More than one year ago/During the last year/During the last month/During the last week

Box 2. The Paykel questions on suicidal feelings.[129]

In **Papers I-III**, a positive response for the last month or last week was coded as past month suicidal ideation. In **Paper III** we trichotomized responses. The most intense type of suicidal ideation during the past month was noted: Life-

weariness (positive response to item 1 but no other), wish to die (positive response to item 2, but not on 3-5), active suicidal ideation (positive response to any of items 3-5).

MAJOR AND MINOR DEPRESSION

In **Papers II & III** depression diagnoses were based on responses to CPRS items, using an algorithm (Box 3), designed to follow DSM-5[171] criteria (for major depression), and DSM-IV-TR[218] (for minor depression) as closely as possible.

1. Depressed mood, subjective (2-6), or observed (4-6).
2. Diminished interest (2-6).
3. Significant weight loss, weight gain, or decrease or increase in appetite (2-6).
4. Insomnia (3-6) or hypersomnia (4-6) nearly every day.
5. Psychomotor agitation (4-6), or retardation (observed) (4-6), or decreased amount of speech (observed) (2-6).
6. Fatigue or loss of energy (3-6) or loss of initiative (3-6) nearly every day.
7. Feelings of worthlessness or excessive or inappropriate guilt (3-6).
8. Diminished ability to think or concentrate (4-6), indecisiveness (3-6), inability to think or concentrate (4-6), or distractibility (observed) (4-6).
9. Suicidal ideation (2-6).

Numbers in parentheses are CPRS symptom severity that is required for an item to be coded as present. At least one of symptoms 1 (depressed mood) or 2 (diminished interest) are required. For major depression, at least five symptoms are required. For minor depression, two to four symptoms are required.

Box 3. Depression diagnosis algorithm used in the Gothenburg H70 Birth Cohort Studies and Prospective Population Study of Women in Gothenburg.

MADRS

In **Papers I & II**, the The Montgomery Åsberg Depression Rating Scale (MADRS) was used to measure depressive symptoms. The MADRS was originally derived from the CPRS in order to make a depression rating scale that was sensitive for change. This was achieved by selecting the items from the CPRS, that changed the most in antidepressant medication trials.[217] The MADRS consists of ten items, nine of which are reported, and one (apparent sadness) that is observed (Box 4).

1. **Apparent sadness:** Representing despondency, gloom and despair, (more than just ordinary transient low spirits) reflected in speech, facial expression, and posture.
2. **Reported sadness:** Representing subjectively experienced mood, regardless of whether it is reflected in appearance or not. Includes depressed mood, low spirits, despondency, and the feeling of being beyond help and without hope.
3. **Inner tension:** Representing feelings of ill-defined discomfort, edginess, inner turmoil, mental tension mounting to either panic, dread or anguish.
4. **Reduced sleep:** Representing a subjective experience of reduced duration or depth of sleep compared to the subjects own normal pattern when well.
5. **Reduced appetite:** Representing a feeling of a loss of appetite compared to when well.
6. **Concentration difficulties:** Representing difficulties in collecting ones thoughts mounting to incapacitating lack of concentration.
7. **Lassitude:** Representing a difficulty getting started or slowness initiating and performing everyday activities.
8. **Inability to feel:** Representing the subjective experience of reduced interest in the surroundings, or activities that normally give pleasure. The ability to react with adequate emotion to circumstances or people is reduced.
9. **Pessimistic thoughts:** Representing thoughts of guilt, inferiority, self-reproach, sinfulness, remorse and ruin.
10. **Suicidal thoughts:** Representing the feeling that life is not worth living, that a natural death would be welcome, suicidal thoughts, and preparations for suicide.

Each item is rated from 0-6, yielding a depressive symptom score of 0-60.

Box 4. The Montgomery Åsberg Depression Rating Scale (MADRS).[217]

REGISTER DATA

Death dates for participants in **Paper III** were retrieved from the Swedish Tax Agency. Causes of death for **Papers III & IV** were retrieved from the Swedish Cause of Death Register.[219]

For **Paper IV**, we identified persons 75 years or older with a diagnosis of self-harm (ICD-10 codes X60-X84 and Y10-Y32) from the regional VEGA register.[215] Information on psychotropic drug use was retrieved from the National Prescribed Drug Register.[220] Information on hospitalizations were retrieved from the National Inpatient Register.[221] Demographic data was retrieved from the LISA-database, administered by Statistics Sweden. To identify those residing in long-term care, data was retrieved from the National Register of Care and Social Services for Older Adults and Persons with impairment, held by the National Board of Health and Welfare.

COVARIATES

Data on all covariates in **Papers I-III**, such as history of somatic disorders, education, activities of daily living, pain, self-rated health, living situation, and psychotropic drug use were based on information from the participant report during the interview. Psychotropic drugs were categorized according to ATC-codes.[222] In some cases in **Paper III**, when participants with dementia were included, interviews with key informants provided additional data.

In **Paper III**, dementia was used as a covariate. Research diagnoses of dementia were based on DSM-III-R criteria.[223] The procedure to diagnose dementia in the H70 has been described in detail previously.[224] Briefly, an algorithm sorts out suspected cases based on information retrieved during interviews with participants and key informants. At least two clinical experts then make a consensus decision after reviewing the cases.

STATISTICAL ANALYSES

In **Papers I-III** we used Pearson Chi-square tests to test for differences in proportions. In **Papers I & II** we used independent samples t-tests to test for differences in means.

In **Paper I** we used binary logistic regression models to investigate associations with suicidal ideation, and Bonferroni correction to adjust for multiple testing.

In **Paper II** we used a multinomial logistic regression model to examine the effect of cohort on the prevalence of depression and adjust for confounders.

In **Paper III** we used the Spearman rank-order correlation coefficient to test correlation between ordinal data. We used Kaplan-Meier curves to plot survival and Cox regression models to calculate Hazard Ratios. We tested the proportional hazards assumption by calculating Shoenfeld residuals.

In **Paper IV** we used McNemar's test to compare healthcare contacts and psychotropic medications in the year before and after the index self-harm episode. We followed healthcare contacts for mental disorder and the use of psychotropic medication, in three-month intervals, adjusting the denominator for the number of persons alive at each time point.

RESULTS

PAPER I

The main result of the first paper was the substantial decrease in suicidal ideation from first to later born cohorts of 85-year-olds. In 1986, 16.4% reported some type of suicidal ideation. Proportions in the later born cohorts were less than half of that (7.3% in 2008 and 7.2% in 2015). Passive ideation (life-weariness and wish for death) were the most common types of ideation in all cohorts. Active suicidal ideation was rare (Figure 6). After stratifying by sex, the decrease in suicidal ideation was statistically significant in women only.

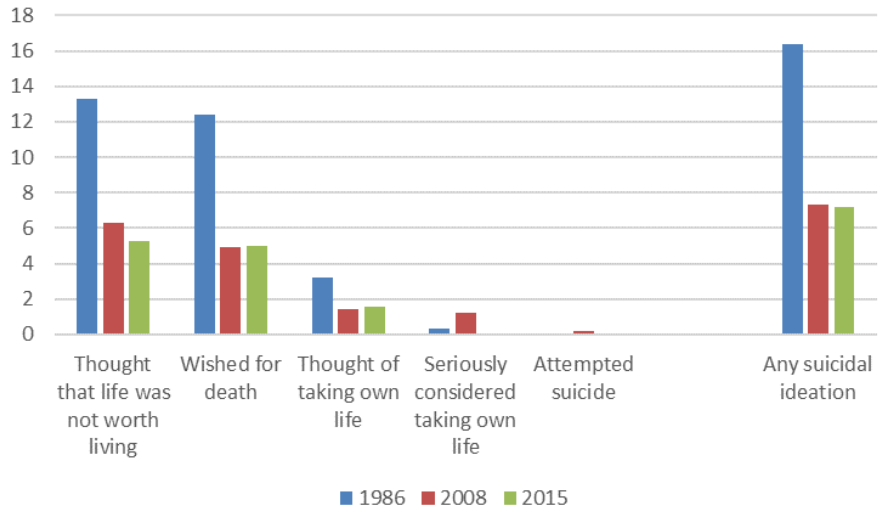

Figure 6. Percent of 85-year-olds examined in 1986, 2008, and 2015 that reported different types of suicidal ideation, according to the Paykel questions. [129]

The factors that had the strongest association with suicidal ideation in a regression model were MADRS-score (without the suicide item) (OR: 1.2, 95% CI: 1.1-1.2), feeling lonely (OR: 2.7, 95% CI: 1.4-5.2), and living in a long-term care facility (OR: 3.9, 95% CI: 1.7-8.9). There was no associations between having many somatic disorders (three or more of the following: myocardial infarction, stroke, cancer, lung disorder, diabetes, angina, peptic ulcer, arthtritis, fractures of hip, wrist, or upper arm) and suicidal ideation, except for the univariate analysis in the first cohort.

PAPER II

Paralleling the decrease in suicidal ideation, there was a clear reduction in major depression when 85-year-olds examined in 1986 were compared to same-aged individuals examined nearly two decades later. In 1986 12.4% fulfilled criteria for major depression, in 2008 6.9% fulfilled the same criteria (p=0.01). The proportion with major depression had decreased further in 2015 (4.7%), but the difference from 2008 was not significant. The prevalence of minor depression did not change significantly between 1986 and 2008, but was halved from 2008 (16.2%) to 2015 (8.1%, p<0.001) (Figure 7). MADRS score decreased significantly between each successive cohort (p=0.003). Mean score was 7.1 in 1986, 5.7 in 2008 , and 4,5 in 2015.

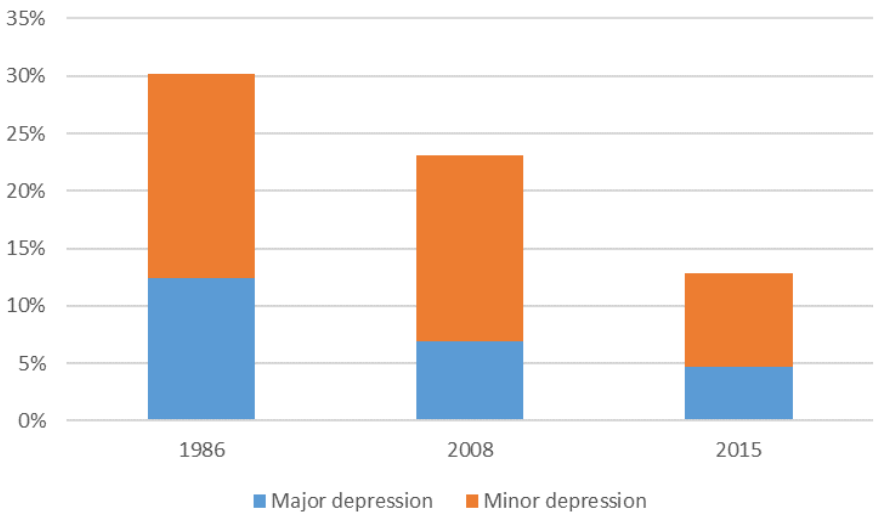

Figure 7. Percent fulfilling criteria for depressive disorders in three cohorts of 85-year-olds.

When we introduced known sociodemographic risk factors for late-life depression (female sex, partner-loss, not having a partner, low education, living in a long-term care facility, and feeling lonely) in regression models (Table 4), this did not meaningfully affect risk estimates. In fully adjusted models, including also health-related factors (poor self-rated health, pain, ADL-dependence, somatic disorders), the lower odds for depression in later born cohorts remained. If anything, they were even lower.

Table 4. Multinomial regression models showing odds ratios of receiving a research-diagnosis of major or minor depression for 85-year-olds in 2008 and 2015, compared to 85-year-olds examined in 1986.

	Major depression			Minor depression		
	Models*, OR (95% Confidence interval)			Models*, OR (95% Confidence interval)		
	1	2	3	1	2	3
Cohort 1986	ref	ref	ref	ref	ref	ref
Cohort 2008	0.51 (0.31-0.84)	0.49 (0.28-0.88)	0.37 (0.19-0.70)	0.82 (0.56-1.20)	0.74 (0.48-1.13)	0.69 (0.44-1.08)
Cohort 2015	0.30 (0.16-0.56)	0.31 (0.16-0.63)	0.24 (0.11-0.51)	0.36 (0.22-0.59)	0.32 (0.19-0.55)	0.28 (0.16-0.49)

*Model 1: Univariate analysis; Model 2: including sex, long-term care residence, education level, partner loss within five years, having no partner, and feeling lonely; Model 3: Including all factors in model 2 and also: Poor self rated health, deprendence in ADL, pain, number of somatic disorders.

Regarding psychotropic medication (Figure 8), the proportion using some type of psychotropic medication remained stable, across cohorts: 37% in 1986, 37% in 2008, and 36% in 2015. There was a slight decrease over time in the use of anxiolytics and sedatives. Proportions using antipsychotics were lower in the later born cohorts. Use of antidepressants doubled from the 1986 cohort to the 2008 cohort.

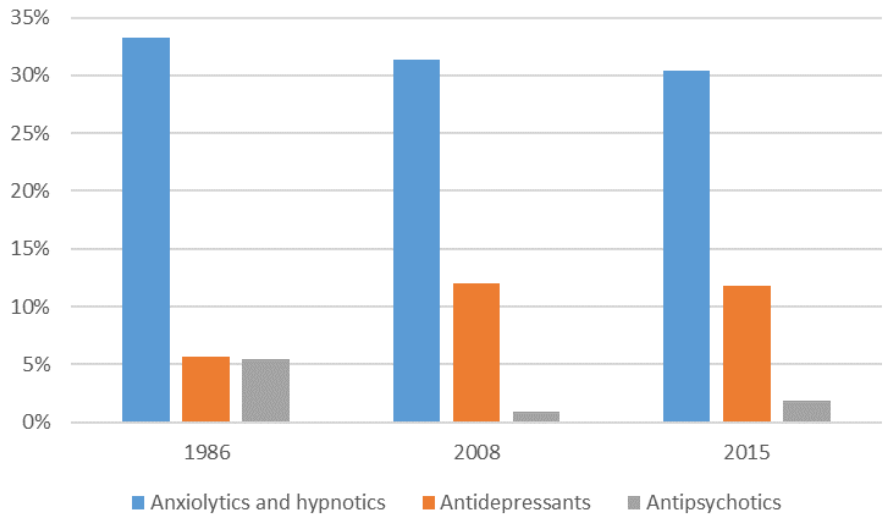

Figure 8. Proportion of three cohorts of 85-year-olds using psychotropic medication.

PAPER III

In the third paper, we investigated associations between levels of suicidal ideation and all-cause mortality in 2438 older adults between the age of 79 and 101. Of the participants, 240 (9.8%) reported some level of suicidal ideation at baseline. After three years of follow-up, 672 (28%) participants had died. Causes of death were: cardiovascular (23%), cancer (14%), stroke (10%), respiratory (8%), and dementia (5%). None of the participants died of suicide. Causes of death did not differ significantly in those who had reported suicidal ideation compared to those who had not.

Among suicidal ideation levels, the risk of all-cause mortality was only increased for those who had reported a wish to die as the most intense level of suicidal ideation during the past month (Table 5). In a model (Model a) including only age, sex, and year of examination as covariates, the risk of death (any cause) was doubled for this group compared to those with no suicidal ideation. Neither those who had reported life-weariness nor those who had reported active suicidal ideation were at increased risk of all-cause mortality. The risk for those with a wish to die was marginally reduced after including also dementia and somatic disorders (Model b). In the final model, including depression and loneliness, there was a risk of death from any cause was elevated 70% in participants who had reported a wish to die.

Table 5. Cox regression models for time to death from all causes within three years, in a population sample of older adults (n=2438), by most intense level of suicidal ideation during the past month.

	Participants	Events	Model a		Model b		Model c	
	n	n	HR	95% CI	HR	95% CI	HR	95% CI
No ideation	2198	570	ref		ref		ref	
Life-weariness	63	19	1.4	0.9-2.2	1.4	0.9-2.1	1.2	0.8-1.9
Wish to die	132	65	**2.0**	**1.6-2.6**	**2.0**	**1.5-2.5**	**1.7**	**1.3-2.3**
Active suicide ideation	45	18	1.1	0.7-1.8	1.2	0.7-1.9	1.0	0.6-1.7
Total	2438	672						

*Model a: Including sex, age, and year of examination. Model b: Factors from model a plus somatic conditions (history of myocardial infarction, history of hip fracture, diabetes) and dementia. Model c: Factors from model b plus minor and major depression and loneliness.

PAPER IV

In the final paper of the thesis, we investigated healthcare contacts and psychotropic medication before and after self-harm in older adults aged 75 years or more. Between 2007 and 2015, 659 older adults (352 women, 307 men) had received a diagnosis of self-harm in the regional database. Their mean age was 82 (range: 75-103). The most common method of self-harm was poisoning (73%), followed by cutting (14%), jumping (4%), and hanging (2%). Most (78%) were hospitalized after the self-harm. Within one year, 8.8% repeated non-fatal self-harm and 2.6% died of suicide.

The most common level of care for mental disorders in the year before self-harm was primary care; 33.7% had had such care contacts. Somewhat fewer had been in contact with specialized psychiatric care (27.8%). Many had had contacts with both primary and specialized care; 38.5% of those with a contact in primary care had also been in contact with specialized care and 47.8% of those with a contact in specialized care had also been in contact with primary care.

Contacts with specialized care increased after self-harm. During the year after self-harm, 63.3% were in contact with specialized care at some point. The majority of those contacts occurred during the first six months after self-harm. After six months, proportions in contact with specialized care were almost back to pre-self-harm levels.

The proportion prescribed any type of psychotropic medication was 83% both in the year before and the year after self-harm. However, there were increases in proportions prescribed antidepressants (from 50% to 67%) and antipsychotics (from 12% to 19%). Proportions prescribed anxiolytics (46% before, 47% after) and hypnotics (67% before, 66% after) did not change.

Most contacts both before and after self-harm were with doctors. Five percent were in contact with a nurse in primary care during the year before self-harm, ten percent had such a contact in specialized care. Proportions with contacts with a nurse in primary care were unchanged; contacts with nurses in specialized care increased to almost one in five during the year after self-harm. Only a few percent were in contact with a social worker or a psychologist during the year before self-harm. Although these proportions increased somewhat after self-harm, they were still well below five percent.

DISCUSSION

In **Paper I** we found that later born cohorts of 85-year-olds had less suicidal ideation. Those who had suicidal ideation had higher depression scores, more often reported loneliness, and were more often living in long-term care facilities. In **Paper II** we found that both major and minor depression have decreased in prevalence in 85-year-olds while antidepressant medication has become more common.

The first two papers indicate a positive time trend for older adults during the past decades. There are very few previous similar studies on time trends in suicidal ideation and depression in older adults to compare with. Concerning suicidal ideation, the reduction seen in Paper I mirrors the declining suicide rates in Sweden for the oldest old during the same period.[16, 108] The few previous studies on suicidal ideation focused on younger older adults and examinations were only a few years apart, which could explain why none of those studies found a reduced prevalence.[131, 142, 161] Of the previous studies that have investigated depression prevalence, all that had a similar design as ours, with face-to-face interviews, found a reduced prevalence.[200-202] The reduced prevalence of depression in older adults is in line with a register-based study from the U.K.[225], but is contrasted by findings from register-based studies from the U.S.[226, 227] The contrasting findings from registered-based studies are not surprising given that such studies may be biased by detection rates varying over time, as discussed previously.

The positive development is in line with many other positive trends in the health of older adults. Examples include reduced frailty[228], decline in age-specific dementia prevalence[229, 230], decrease in dependence in activities in daily living[231], and increase in life-expectancy.[232]

Somewhat surprisingly, the lower odds for depression in later born cohorts did not change when we adjusted for risk factors for depression, such as sex, education, somatic disorders, disability, and partner loss. This means that changes in these factors are not major reasons behind the reduction in depression. There was a large increase in use of antidepressant medication, from the first to the second cohort, which was when the decrease in major depression occurred. To what extent that was behind the reduction in depression was not possible to estimate due to the cross-sectional nature of our data.

In **Paper III** we found that having a wish to die was associated with increased risk of all-cause mortality. This association remained even after adjustments for sociodemographic factors and somatic and mental disorders. The causes of death for this group did not differ from the pattern in those with no death wishes or other type of suicidal ideation. Heart disorders and cancers were the most common causes of death. No participant died of suicide.

The findings emphasize the importance of death wishes in older adults, not only as a risk factor for suicide, but also as a risk factor for all-cause mortality. Although older adults have high suicide rates, the share of deaths that are suicides is very small, given that the overall mortality is so high in old age. For example, a tenth of all 85–89-year-olds died in Sweden in 2022. Of those deaths, only 0.2% were suicides.[16] The study of death wishes in old age is of importance in light of the current discussions on medical assistance in dying.[233] A wish to die might be rational in the context of physical decline, disability, and pain, with exhausted treatment options. However, it might be a symptom of depression, which can often be treated.

In **Paper IV** we found that the most healthcare contacts in older adults (75+) who self-harmed were in primary care, prior to the self-harm. Use of specialized care and use of antidepressants increased after self-harm. Very few older adults who self-harmed received psychotherapeutic treatment, both before and after self-harm.

Of those who had self-harmed, a little over a third had been in contact with primary care during the year before self-harm. The corresponding proportion for specialized care was 28%. It is not surprising that a larger share had contact with primary care, given Swedish guidelines that place a major part of the responsibility for the care of common mental disorders on primary care. In a systematic review of studies from many countries, 41% of older adults who self-harmed had been in contact with specialized psychiatric care.[234] The larger share might reflect differences in healthcare systems across countries.

In the months after self-harm, the proportion in contact with specialized care increased; 63% had such a contact during the year after self-harm. This is a relatively small proportion given that regional guidelines stipulate that all persons should be followed in specialized care after self-harm, until their conditions have stabilized.[235] Previous studies have found lower referral rates to specialized care for older adults after self-harm.[106, 107] It could be that older adults more often refuse contact with specialized psychiatric care. It could also

be that, in cases with substantial somatic comorbidity, it makes more sense that a general practitioner manages all treatment. However, it may also be due to "therapeutic nihilism". Suicidal behavior in the oldest old may be interpreted as a normal reaction to an aging process and proximity to death. Thus, suicidal older adults may not receive the best possible psychiatric care. Such attitudes are at odds with previous studies that have shown that suicidality is not a part of a normal aging process.[125, 236]

In the year before self-harm 50% were at some point prescribed an antidepressant. Although antidepressants may have non-psychiatric indications, this relatively high proportion suggests a high detection rate of depression (or anxiety) in primary care. The proportion is in contrast with the previously mentioned Finnish study, which found that only 4% of older adults who were in contact with primary care before self-harm had been diagnosed with a mood disorder.[127] As the Finnish study was published almost 20 years ago, this might indicate an improvement in the detection of depression in older adults.

Very few of the older adults who self-harmed had contact with psychologists according to the register data. Although this finding should be interpreted with some caution as type of care professional was not registered for a third of primary care contacts and a fifth of specialized care contacts, the proportion was remarkably low. Given that psychotherapy for depression has been shown to have just as good an effect in older adults as in younger[193], ageist beliefs might help to explain this small proportion.

STRENGTHS

Strengths of Papers I-III include the population representative samples and the thorough psychiatric interview, conducted in a face-to-face setting. This might increase the probability of valid responses. As questions in these interviews have remained unchanged over many decades, responses are comparable over long periods. This made it possible to investigate time trends with great validity. Regarding Paper III this made it possible to pool data from individuals born at different times, to gain study power. Therefore, we were able to compare levels of suicidal ideation in a way that few previous studies have been able to.

A further strength of Papers I-III is the use of the Paykel questions on suicidal ideation, as they encompass a broad spectrum of suicidal ideation and behavior, from passive ideation to self-harm.

Experienced nurses, medical doctors, or psychiatrists conducted all interviews, in H70 and PPSW. They were trained by the psychiatrist (Ingmar Skoog) who performed all interviews in the first cohort included in this thesis (85-year-olds born in 1901-02).

A major strength of Paper IV is the VEGA-register which includes data from primary care, which is often not included in national registers.

LIMITATIONS

As all data from the population studies (Papers I-III) are cross-sectional and purely observational, this limits us from drawing definite causal conclusions. Further, as in all studies of this kind, not all who are invited will participate. This will bias the sample in unknown ways. However, response rates in most of the interviewed cohorts that Papers I-III are based on are above 60%. In Papers I & II, the three-year mortality was higher in non-participants than in participants in the later born cohorts, but not in the first cohort. This indicates that the later born cohorts were healthier than the population they were meant to represent. This might have overestimated reductions in suicidal ideation and depression.

Some of the participants in Papers I-III were interviewed almost four decades ago, and associations found in these cohorts might not be generalizable to today's older adults. For instance, the association between living in long-term care and having suicidal ideation is driven by such an association in those who were 85 years old in 1986, as long-term care was much more common in that age group at that time.

As noted previously, a limitation in Paper IV is that the VEGA register lacks some data, for example, registration of professional category was far from complete.

A limitation in Papers I-III was that there were relatively few men. This is a common limitation in studies on older adults, as men have shorter life

expectancy. In Paper III the proportion of men was even smaller as some of the included cohorts were all female by design.

CONCLUSION

The conclusions of Paper I & II are that mental health in older adults, regarding depression and suicidality, has improved over the past decades. Although the exact reasons for this development are impossible to pinpoint, it is hard to overlook the introduction of new generation antidepressant medication.

The conclusion of Paper III is that older adults with a wish to die are at increased risk of death from natural causes, even after considering many possible confounders.

Conclusions from Paper IV are that much of the care for older adults who self-harm rely on primary care. In addition, there might be an unmet need for psychosocial interventions in this group.

One general observation during the work with this thesis is that published studies utilize diverse cut-offs to define the older adult population. Firstly, there is no consensus on when older adulthood might begin, with cut-off for inclusion ranging between 50 and 75 years of age. Secondly, regarding psychiatric manifestations, many things are not that different in older adults, compared to younger adults. Most risk factors for suicidal ideation and depression do not differ significantly by age.

A further observation concerns the difficulty in establishing time trends. The data behind Papers I & II are about as good as it can be in terms of similar selection, similar questions, same age individuals, same geographic area, and response rates over several examinations spanning several decades. In spite of this, results are still limited by potential differences in attrition and in interpreting responses. Further, even if we are certain that we have valid results, it is uncertain to what degree these can be generalized. These limitations, even when data is good, are important to consider when interpreting research findings or news reports regarding time trends, which might be much more biased.

A final reflection is that suicidality is rarely an independent phenomenon. Persons who have suicidal thoughts, or self-harm almost always have problems or disorders behind their suicidality. Most common are mental ill-health, such as depression, but it can also be somatic ill-health, life crises, or economic problems. Accordingly, there are few, if any, treatments specific for suicidality. Treatments that are suggested to be anti-suicidal either work by

treating the underlying condition (e.g. lithium for mood disorders), or are a way of handling the suicide risk, for example by admission to psychiatric inpatient care or safety planning. Because of this, it might be counterproductive to focus too much on suicide risk assessments in clinical settings if this is at the expense of treatment for the underlying cause.

FUTURE PERSPECTIVES

There is a need for follow up studies of time trends in depression and suicidal ideation. Recently released Swedish data for 2022 shows that the suicide rate in persons aged 70+ is the highest since 2017.[16] Whether this is merely a minor fluctuation or the start of a new trend remains to be seen.

Future studies should further explore, quantitatively and qualitatively, the subgroup of older adults who express a wish to die. Randomized controlled trials in this group could investigate if interventions such as psychotherapy or antidepressant medication might have a positive effect, even in the absence of typical depression.

Future studies should also investigate why a relatively large proportion of older adults who self-harm are not in contact with specialized psychiatric care afterwards, in spite of guidelines. Is it due to patient preference or failures to fulfill the need for these individuals?

In order to advance the field of suicidology, a greater emphasis should be on testing interventions, preferably with suicide as outcome, as reductions in suicidal ideation or self-harm may not translate to reductions in suicide. As suicides are rare, this will of course require large studies. There are a number of interventions with enough clinical equipoise to motivate randomization: Both safety-planning and structured suicide risk assessments could be cluster-randomized by region in nationwide trials. Low-dose lithium could be randomized and placebo-controlled as a trans-diagnostic add-on treatment for psychiatric patients.

ACKNOWLEDGEMENTS

I want to thank my main supervisor Margda Waern, for your encouragement and support, for always providing advice and for thoroughly reviewing my texts. My co-supervisor Robert Sigström, for your sincere wish to make good science and always questioning everything. My co-supervisor Ingmar Skoog, for showing how science needs to be an integral part of society.

I want to thank all co-authors in the studies of this thesis: Madeleine Mellqvist-Fässberg, Khedidja Hedna, Hanna Wetterberg, Therese Rydberg Sterner, Lina Rydén, Ulrika Lagerlöf Nilsson, Hanna Falk Erhag, Kimberly Van Orden, Maria Åberg, Katarina Wilhelmson.

Thank you Valter Sundh and Nazib Seidu for statistical consultations.

Thank you to all participants in the H70 and PPSW.

All researchers, doctoral students, and administrators within the Sahlgrenska Suicide Studies and Epinep. Thank you for everything, from discussions about life and research, to beating me at chess, or just your good company. Stefan Wiktorsson, Sara Hed, Petter Olsson, Malin Rex, Anna-Maria Nilsson, Sabrina Doering, Sophie Liljedahl, Isak Erling, Carl Anton Waltersson, Irma Rymo, Tina Jacobsson, Xinxin Guo, Pia Gudmundsson, Silke Kern, Lena Johansson, Karolina Thörnqvist, Jonas Molinder, Johan Skoog, Jessica Samuelsson, Jenna Najar, Felicia Ahlner, Anna Dittrich, Anna Zettergren, Isak Fredén Klenfeldt, Johan Nilsson, Mats Ribbe, Kelly Rombauts, Simona Sacuiu, Cecilia Doshé, Agnes Wiberg.

A special thank you to Simon Larsson.

Finally I want to thank my family. My parents Mona and Åke, my sisters Malin and Anna and my brother Anders. My wife Maria and my children Leia, Sixten, and Ebba.

REFERENCES

1. Macdonald AJ, Dunn G. Death and the expressed wish to die in the elderly: an outcome study. *Age and ageing*. Aug 1982;11(3):189-95. doi:10.1093/ageing/11.3.189
2. Ekeberg O, Retterstol N. Christianity and suicide. In: Wasserman D, ed. *Oxford textbook of suicidology and suicide prevention*. Oxford university press; 2021:61-67:chap 9.
3. Hume D. Essays on suicide and the immortality of the soul. 1756.
4. Esquirol J-ÉD. *Mental Maladies. A Treatise on Insanity*. 1845.
5. Durkheim E. *Suicide*. 1897.
6. Van Poppel F, Day LH. A Test of Durkheim's Theory of Suicide--Without Committing the "Ecological Fallacy". *American Sociological Review*. 1996;61:500-507. doi:10.2307/2096361
7. World Health Organization. *Suicide worldwide in 2019: global health estimates*. 2021.
8. Ilic M, Ilic I. Worldwide suicide mortality trends (2000-2019): A joinpoint regression analysis. *World J Psychiatry*. Aug 19 2022;12(8):1044-1060. doi:10.5498/wjp.v12.i8.1044
9. Oquendo MA, Volkow ND. Suicide: A Silent Contributor to Opioid-Overdose Deaths. *The New England journal of medicine*. Apr 26 2018;378(17):1567-1569. doi:10.1056/NEJMp1801417
10. Gomes T, Ledlie S, Tadrous M, Mamdani M, Paterson JM, Juurlink DN. Trends in Opioid Toxicity-Related Deaths in the US Before and After the Start of the COVID-19 Pandemic, 2011-2021. *JAMA Netw Open*. Jul 3 2023;6(7):e2322303. doi:10.1001/jamanetworkopen.2023.22303
11. Curtin SC. Provisional Numbers and Rates of Suicide by Month and Demographic Characteristics: United States, 2021 (2022). https://www.cdc.gov/nchs/pressroom/nchs_press_releases/2022/20220930.htm
12. Canetto SS, Sakinofsky I. The gender paradox in suicide. *Suicide & life-threatening behavior*. Spring 1998;28(1):1-23.
13. Appelquist M. *Insania Simplex. Empiriska studier av psykisk sjukdom vid förra sekelskiftet*. Lund University; 2019.

14. Snowdon J, Choi NG. Undercounting of suicides: Where suicide data lie hidden. *Glob Public Health*. Dec 2020;15(12):1894-1901. doi:10.1080/17441692.2020.1801789

15. Reynders A, Scheerder G, Van Audenhove C. The reliability of suicide rates: an analysis of railway suicides from two sources in fifteen European countries. *Journal of affective disorders*. Jun 2011;131(1-3):120-7. doi:10.1016/j.jad.2010.11.003

16. National Board of Health and Welfare. Statistic Database for Causes of Death. https://sdb.socialstyrelsen.se/if_dor/val.aspx Accessed 2023-06-18.

17. Wikipedia. Suicide in Sweden. Updated 2022-10-13. Accessed 2023-05-15.

18. Harris EC, Barraclough B. Suicide as an outcome for mental disorders. A meta-analysis. *The British journal of psychiatry : the journal of mental science*. Mar 1997;170:205-28. doi:10.1192/bjp.170.3.205

19. Olfson M, Wall M, Wang S, Crystal S, Gerhard T, Blanco C. Suicide Following Deliberate Self-Harm. *The American journal of psychiatry*. Aug 1 2017;174(8):765-774. doi:10.1176/appi.ajp.2017.16111288

20. Cooper J, Kapur N, Webb R, et al. Suicide after deliberate self-harm: a 4-year cohort study. *The American journal of psychiatry*. Feb 2005;162(2):297-303. doi:10.1176/appi.ajp.162.2.297

21. Isometsä ET, Lönnqvist JK. Suicide attempts preceding completed suicide. *The British journal of psychiatry : the journal of mental science*. Dec 1998;173:531-5. doi:10.1192/bjp.173.6.531

22. Temes CM, Frankenburg FR, Fitzmaurice GM, Zanarini MC. Deaths by Suicide and Other Causes Among Patients With Borderline Personality Disorder and Personality-Disordered Comparison Subjects Over 24 Years of Prospective Follow-Up. *The Journal of clinical psychiatry*. Jan 22 2019;80(1)doi:10.4088/JCP.18m12436

23. Crump C, Sundquist J, Kendler KS, Edwards AC, Sundquist K. Comparative risk of suicide by specific substance use disorders: A national cohort study. *Journal of psychiatric research*. Dec 2021;144:247-254. doi:10.1016/j.jpsychires.2021.10.017

24. Webb RT, Lichtenstein P, Larsson H, Geddes JR, Fazel S. Suicide, hospital-presenting suicide attempts, and criminality in bipolar disorder: examination of risk for multiple adverse outcomes. *The*

Journal of clinical psychiatry. Aug 2014;75(8):e809-16. doi:10.4088/JCP.13m08899

25. Osby U, Correia N, Brandt L, Ekbom A, Sparén P. Mortality and causes of death in schizophrenia in Stockholm county, Sweden. *Schizophr Res*. Sep 29 2000;45(1-2):21-8. doi:10.1016/s0920-9964(99)00191-7

26. Brådvik L, Mattisson C, Bogren M, Nettelbladt P. Long-term suicide risk of depression in the Lundby cohort 1947-1997--severity and gender. *Acta psychiatrica Scandinavica*. Mar 2008;117(3):185-91. doi:10.1111/j.1600-0447.2007.01136.x

27. Papadopoulos FC, Ekbom A, Brandt L, Ekselius L. Excess mortality, causes of death and prognostic factors in anorexia nervosa. *The British journal of psychiatry : the journal of mental science*. Jan 2009;194(1):10-7. doi:10.1192/bjp.bp.108.054742

28. Ljung T, Chen Q, Lichtenstein P, Larsson H. Common etiological factors of attention-deficit/hyperactivity disorder and suicidal behavior: a population-based study in Sweden. *JAMA Psychiatry*. Aug 2014;71(8):958-64. doi:10.1001/jamapsychiatry.2014.363

29. Isometsä ET. Psychological autopsy studies--a review. *European psychiatry : the journal of the Association of European Psychiatrists*. Nov 2001;16(7):379-85. doi:10.1016/s0924-9338(01)00594-6

30. Madsen T, Erlangsen A, Hjorthøj C, Nordentoft M. High suicide rates during psychiatric inpatient stay and shortly after discharge. *Acta psychiatrica Scandinavica*. Nov 2020;142(5):355-365. doi:10.1111/acps.13221

31. Edwards AC, Ohlsson H, Sundquist J, Sundquist K, Kendler KS. Alcohol Use Disorder and Risk of Suicide in a Swedish Population-Based Cohort. *The American journal of psychiatry*. Jul 1 2020;177(7):627-634. doi:10.1176/appi.ajp.2019.19070673

32. Gravensteen IK, Ekeberg Ø, Thiblin I, et al. Psychoactive substances in natural and unnatural deaths in Norway and Sweden - a study on victims of suicide and accidents compared with natural deaths in psychiatric patients. *BMC psychiatry*. Jan 18 2019;19(1):33. doi:10.1186/s12888-019-2015-9

33. Kaplan MS, Huguet N, McFarland BH, et al. Use of alcohol before suicide in the United States. *Ann Epidemiol*. Aug 2014;24(8):588-592.e1-2. doi:10.1016/j.annepidem.2014.05.008

34. Kõlves K, Koo YW, de Leo D. A drink before suicide: analysis of the Queensland Suicide Register in Australia. *Epidemiology and psychiatric sciences*. Jan 24 2020;29:e94. doi:10.1017/s2045796020000062

35. Onyeka IN, Maguire A, Ross E, O'Reilly D. Does physical ill-health increase the risk of suicide? A census-based follow-up study of over 1 million people. *Epidemiology and psychiatric sciences*. Jul 8 2020;29:e140. doi:10.1017/s2045796020000529

36. Kaplan MS, McFarland BH, Huguet N, Newsom JT. Physical illness, functional limitations, and suicide risk: a population-based study. *Am J Orthopsychiatry*. Jan 2007;77(1):56-60. doi:10.1037/0002-9432.77.1.56

37. Henson KE, Brock R, Charnock J, Wickramasinghe B, Will O, Pitman A. Risk of Suicide After Cancer Diagnosis in England. *JAMA Psychiatry*. Jan 1 2019;76(1):51-60. doi:10.1001/jamapsychiatry.2018.3181

38. Alejos M, Vázquez-Bourgon J, Santurtún M, Riancho J, Santurtún A. Do patients diagnosed with a neurological disease present increased risk of suicide? *Neurologia (Engl Ed)*. Jan-Feb 2023;38(1):41-46. doi:10.1016/j.nrleng.2020.03.005

39. Calati R, Laglaoui Bakhiyi C, Artero S, Ilgen M, Courtet P. The impact of physical pain on suicidal thoughts and behaviors: Meta-analyses. *Journal of psychiatric research*. Dec 2015;71:16-32. doi:10.1016/j.jpsychires.2015.09.004

40. Meerwijk EL, Weiss SJ. Toward a unifying definition: response to 'The concept of mental pain'. *Psychother Psychosom*. 2014;83(1):62-3. doi:10.1159/000348869

41. Baryshnikov I, Isometsä E. Psychological pain and suicidal behavior: A review. *Front Psychiatry*. 2022;13:981353. doi:10.3389/fpsyt.2022.981353

42. Ducasse D, Holden RR, Boyer L, et al. Psychological Pain in Suicidality: A Meta-Analysis. *The Journal of clinical psychiatry*. May/Jun 2018;79(3)doi:10.4088/JCP.16r10732

43. Erlangsen A, Jacobsen AL, Ranning A, Delamare AL, Nordentoft M, Frisch M. Transgender Identity and Suicide Attempts and Mortality in Denmark. *Jama*. Jun 27 2023;329(24):2145-2153. doi:10.1001/jama.2023.8627

44. Dhejne C, Lichtenstein P, Boman M, Johansson AL, Långström N, Landén M. Long-term follow-up of transsexual persons undergoing sex reassignment surgery: cohort study in Sweden. *PloS one*. Feb 22 2011;6(2):e16885. doi:10.1371/journal.pone.0016885

45. Webb RT, Shaw J, Stevens H, Mortensen PB, Appleby L, Qin P. Suicide risk among violent and sexual criminal offenders. *J Interpers Violence*. Nov 2012;27(17):3405-24. doi:10.1177/0886260512445387

46. Bukten A, Stavseth MR. Suicide in prison and after release: a 17-year national cohort study. *European journal of epidemiology*. Oct 2021;36(10):1075-1083. doi:10.1007/s10654-021-00782-0

47. Hawton K, Harriss L, Hodder K, Simkin S, Gunnell D. The influence of the economic and social environment on deliberate self-harm and suicide: an ecological and person-based study. *Psychological medicine*. Jul 2001;31(5):827-36. doi:10.1017/s0033291701003993

48. Qin P, Syeda S, Canetto SS, et al. Midlife suicide: A systematic review and meta-analysis of socioeconomic, psychiatric and physical health risk factors. *Journal of psychiatric research*. Oct 2022;154:233-241. doi:10.1016/j.jpsychires.2022.07.037

49. Shaw RJ, Cullen B, Graham N, et al. Living alone, loneliness and lack of emotional support as predictors of suicide and self-harm: A nine-year follow up of the UK Biobank cohort. *Journal of affective disorders*. Jan 15 2021;279:316-323. doi:10.1016/j.jad.2020.10.026

50. Heikkinen ME, Isometsä ET, Marttunen MJ, Aro HM, Lönnqvist JK. Social factors in suicide. *The British journal of psychiatry : the journal of mental science*. Dec 1995;167(6):747-53. doi:10.1192/bjp.167.6.747

51. Khang YH, Kim HR, Cho SJ. Relationships of suicide ideation with cause-specific mortality in a longitudinal study of South Koreans. *Suicide & life-threatening behavior*. Oct 2010;40(5):465-75. doi:10.1521/suli.2010.40.5.465

52. Kleiman EM, Liu RT. Prospective prediction of suicide in a nationally representative sample: religious service attendance as a protective factor. *The British journal of psychiatry : the journal of mental science*. 2014;204:262-6. doi:10.1192/bjp.bp.113.128900

53. Louzon SA, Bossarte R, McCarthy JF, Katz IR. Does Suicidal Ideation as Measured by the PHQ-9 Predict Suicide Among VA

Patients? *Psychiatric services (Washington, DC)*. May 1 2016;67(5):517-22. doi:10.1176/appi.ps.201500149

54. McHugh CM, Corderoy A, Ryan CJ, Hickie IB, Large MM. Association between suicidal ideation and suicide: meta-analyses of odds ratios, sensitivity, specificity and positive predictive value. *BJPsych Open*. Mar 2019;5(2):e18. doi:10.1192/bjo.2018.88

55. Berman AL. Risk Factors Proximate to Suicide and Suicide Risk Assessment in the Context of Denied Suicide Ideation. *Suicide & life-threatening behavior*. Jun 2018;48(3):340-352. doi:10.1111/sltb.12351

56. Xuan Z, Naimi TS, Kaplan MS, et al. Alcohol Policies and Suicide: A Review of the Literature. *Alcohol Clin Exp Res*. Oct 2016;40(10):2043-2055. doi:10.1111/acer.13203

57. Ramstedt M. Alcohol and suicide in 14 European countries. *Addiction*. Feb 2001;96 Suppl 1:S59-75. doi:10.1080/09652140020021189

58. Norström T, Ramstedt M. The Link Between Per Capita Alcohol Consumption and Alcohol-Related Harm in Sweden, 1987-2015. *J Stud Alcohol Drugs*. Jul 2018;79(4):578-584.

59. Lange S, Kaplan MS, Tran A, Rehm J. Growing alcohol use preceding death by suicide among women compared with men: age-specific temporal trends, 2003-18. *Addiction*. Sep 2022;117(9):2530-2536. doi:10.1111/add.15905

60. Landberg J. Alcohol and suicide in eastern Europe. *Drug Alcohol Rev*. Jul 2008;27(4):361-73. doi:10.1080/09595230802093778

61. Jukkala T, Stickley A, Mäkinen IH, Baburin A, Sparén P. Age, period and cohort effects on suicide mortality in Russia, 1956-2005. *BMC public health*. Mar 7 2017;17(1):235. doi:10.1186/s12889-017-4158-2

62. Kreitman N. The coal gas story. United Kingdom suicide rates, 1960-71. *Br J Prev Soc Med*. Jun 1976;30(2):86-93. doi:10.1136/jech.30.2.86

63. Kaufman EJ, Morrison CN, Branas CC, Wiebe DJ. State Firearm Laws and Interstate Firearm Deaths From Homicide and Suicide in the United States: A Cross-sectional Analysis of Data by County. *JAMA Intern Med*. May 1 2018;178(5):692-700. doi:10.1001/jamainternmed.2018.0190

64. Gunnell D, Knipe D, Chang SS, et al. Prevention of suicide with regulations aimed at restricting access to highly hazardous pesticides: a systematic review of the international evidence. *Lancet Glob Health*. Oct 2017;5(10):e1026-e1037. doi:10.1016/s2214-109x(17)30299-1

65. Hawton K, Townsend E, Deeks J, et al. Effects of legislation restricting pack sizes of paracetamol and salicylate on self poisoning in the United Kingdom: before and after study. *BMJ (Clinical research ed)*. May 19 2001;322(7296):1203-7. doi:10.1136/bmj.322.7296.1203

66. Thelander G, Jönsson AK, Personne M, Forsberg GS, Lundqvist KM, Ahlner J. Caffeine fatalities--do sales restrictions prevent intentional intoxications? *Clin Toxicol (Phila)*. May 2010;48(4):354-8. doi:10.3109/15563650903586752

67. Law CK, Sveticic J, De Leo D. Restricting access to a suicide hotspot does not shift the problem to another location. An experiment of two river bridges in Brisbane, Australia. *Aust N Z J Public Health*. Apr 2014;38(2):134-8. doi:10.1111/1753-6405.12157

68. Perron S, Burrows S, Fournier M, Perron PA, Ouellet F. Installation of a bridge barrier as a suicide prevention strategy in Montréal, Québec, Canada. *American journal of public health*. Jul 2013;103(7):1235-9. doi:10.2105/ajph.2012.301089

69. Isacsson G. Suicide prevention--a medical breakthrough? *Acta psychiatrica Scandinavica*. Aug 2000;102(2):113-7. doi:10.1034/j.1600-0447.2000.102002113.x

70. Zahl PH, De Leo D, Ekeberg O, Hjelmeland H, Dieserud G. The relationship between sales of SSRI, TCA and suicide rates in the Nordic countries. *BMC psychiatry*. 2010;10:62. doi:10.1186/1471-244x-10-62

71. Lagerberg T, Fazel S, Sjölander A, Hellner C, Lichtenstein P, Chang Z. Selective serotonin reuptake inhibitors and suicidal behaviour: a population-based cohort study. *Neuropsychopharmacology*. Sep 24 2021;doi:10.1038/s41386-021-01179-z

72. Cavanagh JT, Carson AJ, Sharpe M, Lawrie SM. Psychological autopsy studies of suicide: a systematic review. *Psychological medicine*. Apr 2003;33(3):395-405.

73. Isacsson G, Holmgren P, Ahlner J. Selective serotonin reuptake inhibitor antidepressants and the risk of suicide: a controlled forensic

database study of 14,857 suicides. *Acta psychiatrica Scandinavica*. Apr 2005;111(4):286-90. doi:10.1111/j.1600-0447.2004.00504.x

74. Leon AC, Marzuk PM, Tardiff K, et al. Antidepressants in adult suicides in New York City: 2001-2004. *The Journal of clinical psychiatry*. Sep 2007;68(9):1399-403. doi:10.4088/jcp.v68n0911

75. Isometsä ET, Henriksson MM, Aro HM, Heikkinen ME, Kuoppasalmi KI, Lönnqvist JK. Suicide in major depression. *The American journal of psychiatry*. Apr 1994;151(4):530-6. doi:10.1176/ajp.151.4.530

76. Cipriani A, Hawton K, Stockton S, Geddes JR. Lithium in the prevention of suicide in mood disorders: updated systematic review and meta-analysis. *BMJ (Clinical research ed)*. Jun 27 2013;346:f3646. doi:10.1136/bmj.f3646

77. Nabi Z, Stansfeld J, Plöderl M, Wood L, Moncrieff J. Effects of lithium on suicide and suicidal behaviour: a systematic review and meta-analysis of randomised trials. *Epidemiology and psychiatric sciences*. Sep 16 2022;31:e65. doi:10.1017/s204579602200049x

78. Bschor T, Adli M, Alda M, et al. Letter of response to Nabi Z, Stansfeld J, Plöderl M, Wood L, Moncrieff J. Effects of lithium on suicide and suicidal behaviour: a systematic review and meta-analysis of randomised trials. Epidemiol Psychiatr Sci. 2022 Sep 16;31:e65. doi: 10.1017/S204579602200049X. *Epidemiology and psychiatric sciences*. Nov 28 2022;31:e84. doi:10.1017/s2045796022000671

79. Memon A, Rogers I, Fitzsimmons S, et al. Association between naturally occurring lithium in drinking water and suicide rates: systematic review and meta-analysis of ecological studies. *The British journal of psychiatry : the journal of mental science*. Dec 2020;217(6):667-678. doi:10.1192/bjp.2020.128

80. Knudsen NN, Schullehner J, Hansen B, et al. Lithium in Drinking Water and Incidence of Suicide: A Nationwide Individual-Level Cohort Study with 22 Years of Follow-Up. *International journal of environmental research and public health*. Jun 10 2017;14(6)doi:10.3390/ijerph14060627

81. Schrauzer GN, de Vroey E. Effects of nutritional lithium supplementation on mood. A placebo-controlled study with former drug users. *Biol Trace Elem Res*. Jan 1994;40(1):89-101. doi:10.1007/bf02916824

82. Yiu HW, Rowe S, Wood L. A systematic review and meta-analysis of psychosocial interventions aiming to reduce risks of suicide and self-harm in psychiatric inpatients. *Psychiatry Res*. Nov 2021;305:114175. doi:10.1016/j.psychres.2021.114175

83. DeCou CR, Comtois KA, Landes SJ. Dialectical Behavior Therapy Is Effective for the Treatment of Suicidal Behavior: A Meta-Analysis. *Behav Ther*. Jan 2019;50(1):60-72. doi:10.1016/j.beth.2018.03.009

84. Rudd MD, Bryan CJ, Wertenberger EG, et al. Brief cognitive-behavioral therapy effects on post-treatment suicide attempts in a military sample: results of a randomized clinical trial with 2-year follow-up. *The American journal of psychiatry*. May 2015;172(5):441-9. doi:10.1176/appi.ajp.2014.14070843

85. Gysin-Maillart A, Schwab S, Soravia L, Megert M, Michel K. A Novel Brief Therapy for Patients Who Attempt Suicide: A 24-months Follow-Up Randomized Controlled Study of the Attempted Suicide Short Intervention Program (ASSIP). *PLoS medicine*. Mar 2016;13(3):e1001968. doi:10.1371/journal.pmed.1001968

86. Arvilommi P, Valkonen J, Ruishalme O, et al. A randomized clinical trial of the ASSIP vs. crisis counselling in preventing suicide attempt repetition: a two-year follow-up study. *Nord J Psychiatry*. Mar 23 2022:1. doi:10.1080/08039488.2021.2019916

87. Nuij C, van Ballegooijen W, de Beurs D, et al. Safety planning-type interventions for suicide prevention: meta-analysis. *The British journal of psychiatry : the journal of mental science*. Aug 2021;219(2):419-426. doi:10.1192/bjp.2021.50

88. Bryan CJ, Mintz J, Clemans TA, et al. Effect of crisis response planning vs. contracts for safety on suicide risk in U.S. Army Soldiers: A randomized clinical trial. *Journal of affective disorders*. Apr 1 2017;212:64-72. doi:10.1016/j.jad.2017.01.028

89. Runeson B, Haglund A, Lichtenstein P, Tidemalm D. Suicide risk after nonfatal self-harm: a national cohort study, 2000-2008. *The Journal of clinical psychiatry*. Feb 2016;77(2):240-6. doi:10.4088/JCP.14m09453

90. Kessler RC, Bossarte RM, Luedtke A, Zaslavsky AM, Zubizarreta JR. Suicide prediction models: a critical review of recent research with recommendations for the way forward. *Molecular psychiatry*. Jan 2020;25(1):168-179. doi:10.1038/s41380-019-0531-0

91. Waern M, Kaiser N, Renberg ES. Psychiatrists' experiences of suicide assessment. *BMC psychiatry*. Dec 9 2016;16(1):440. doi:10.1186/s12888-016-1147-4

92. Appleby L, Kapur, N., Shaw, J., Hunt, I.M., Ibrahim, S., Gianatsi, M., Rodway, C., Williams, A., Tham, S-G., Raphael, J. The National Confidential Inquiry into Suicide and Homicide by People with Mental Illness. Annual Report 2017: (2017). https://www.hqip.org.uk/resource/national-confidential-inquiry-into-suicide-and-homicide-annual-report-2017/

93. Sariaslan A, Fanshawe T, Pitkänen J, Cipriani A, Martikainen P, Fazel S. Predicting suicide risk in 137,112 people with severe mental illness in Finland: external validation of the Oxford Mental Illness and Suicide tool (OxMIS). *Translational psychiatry*. Apr 18 2023;13(1):126. doi:10.1038/s41398-023-02422-5

94. Hawton K, Lascelles K, Pitman A, Gilbert S, Silverman M. Assessment of suicide risk in mental health practice: shifting from prediction to therapeutic assessment, formulation, and risk management. *Lancet Psychiatry*. Aug 8 2022;doi:10.1016/s2215-0366(22)00232-2

95. Kiorboe E. Suicide and attempted suicide among old people. *J Gerontol*. Jul 1951;6(3):233-6. doi:10.1093/geronj/6.3.233

96. Sainsbury P. Suicide in later life. *Gerontol Clin (Basel)*. 1962;4:161-70. doi:10.1159/000244735

97. Gardner EA, Bahn AK, Mack M. SUICIDE AND PSYCHIATRIC CARE IN THE AGING. *Archives of general psychiatry*. Jun 1964;10:547-53. doi:10.1001/archpsyc.1964.01720240001001

98. Naghavi M. Global, regional, and national burden of suicide mortality 1990 to 2016: systematic analysis for the Global Burden of Disease Study 2016. *BMJ (Clinical research ed)*. Feb 6 2019;364:l94. doi:10.1136/bmj.l94

99. Hawton K, Harriss L. Deliberate self-harm in people aged 60 years and over: characteristics and outcome of a 20-year cohort. *International journal of geriatric psychiatry*. Jun 2006;21(6):572-81. doi:10.1002/gps.1526

100. Murphy E, Kapur N, Webb R, et al. Risk factors for repetition and suicide following self-harm in older adults: multicentre cohort study. *The British journal of psychiatry : the journal of mental science*. May 2012;200(5):399-404. doi:10.1192/bjp.bp.111.094177

101. Conwell Y, Van Orden K, Caine ED. Suicide in older adults. *The Psychiatric clinics of North America*. Jun 2011;34(2):451-68, ix. doi:10.1016/j.psc.2011.02.002

102. Beautrais AL. A case control study of suicide and attempted suicide in older adults. *Suicide & life-threatening behavior*. Spring 2002;32(1):1-9. doi:10.1521/suli.32.1.1.22184

103. Hunt IM, Kapur N, Robinson J, et al. Suicide within 12 months of mental health service contact in different age and diagnostic groups: National clinical survey. *The British journal of psychiatry : the journal of mental science*. Feb 2006;188:135-42. doi:10.1192/bjp.188.2.135

104. Crump C, Sundquist K, Sundquist J, Winkleby MA. Sociodemographic, psychiatric and somatic risk factors for suicide: a Swedish national cohort study. *Psychological medicine*. Jan 2014;44(2):279-89. doi:10.1017/s0033291713000810

105. Waern M, Runeson BS, Allebeck P, et al. Mental disorder in elderly suicides: a case-control study. *The American journal of psychiatry*. Mar 2002;159(3):450-5. doi:10.1176/appi.ajp.159.3.450

106. Pitkälä K, Isometsä ET, Henriksson MM, Lönnqvist JK. Elderly suicide in Finland. *International psychogeriatrics*. Jun 2000;12(2):209-20.

107. Feng YR, Valuri GM, Morgan VA, et al. Secondary mental health service utilisation following emergency department contact for suicidal behaviour: A systematic review. *The Australian and New Zealand journal of psychiatry*. May 10 2023:48674231172116. doi:10.1177/00048674231172116

108. Statistics Sweden. Cause of death reports 1982-1996. 2019. https://www.scb.se/hitta-statistik/sok/?Query=causes+of+death+&Tab=older Accessed 1 February 2019.

109. Waern M, Beskow J, Runeson B, Skoog I. High rate of antidepressant treatment in elderly people who commit suicide. *BMJ (Clinical research ed)*. Nov 2 1996;313(7065):1118.

110. Hedna K, Waern M. Use of Psychoactive Medications and Risk of Suicide in Late Life (75+): A Total Population Study. *Drugs Real World Outcomes*. Jul 8 2023;doi:10.1007/s40801-023-00380-4

111. Juurlink DN, Herrmann N, Szalai JP, Kopp A, Redelmeier DA. Medical illness and the risk of suicide in the elderly. *Archives of*

internal medicine. Jun 14 2004;164(11):1179-84. doi:10.1001/archinte.164.11.1179

112. Conwell Y, Duberstein PR, Hirsch JK, Conner KR, Eberly S, Caine ED. Health status and suicide in the second half of life. *International journal of geriatric psychiatry*. Apr 2010;25(4):371-9. doi:10.1002/gps.2348

113. Waern M, Rubenowitz E, Runeson B, Skoog I, Wilhelmson K, Allebeck P. Burden of illness and suicide in elderly people: case-control study. *BMJ (Clinical research ed)*. Jun 08 2002;324(7350):1355.

114. Tu CY, Chiu MR, Wang YW, Hsu CY, Chen YY, Chang SS. Association of Body Mass Index and Cardiometabolic Factors With Elderly Suicide: A Cohort Study of 101,518 Older Taiwanese. *The American journal of geriatric psychiatry : official journal of the American Association for Geriatric Psychiatry*. May 9 2023;doi:10.1016/j.jagp.2023.05.002

115. Bjerkeset O, Romundstad P, Evans J, Gunnell D. Association of adult body mass index and height with anxiety, depression, and suicide in the general population: the HUNT study. *Am J Epidemiol*. Jan 15 2008;167(2):193-202. doi:10.1093/aje/kwm280

116. Álvarez Muñoz FJ, Rubio-Aparicio M, Gurillo Muñoz P, García Herrero AM, Sánchez-Meca J, Navarro-Mateu F. Suicide and dementia: Systematic review and meta-analysis. *Rev Psiquiatr Salud Ment (Engl Ed)*. Oct-Dec 2020;13(4):213-227. Suicidio y demencia: revisión sistemática y metaanálisis. doi:10.1016/j.rpsm.2020.04.012

117. Choi JW, Lee KS, Han E. Suicide risk within 1 year of dementia diagnosis in older adults: a nationwide retrospective cohort study. *J Psychiatry Neurosci*. Oct 29 2020;46(1):190219. doi:10.1503/jpn.190219

118. Alothman D, Card T, Lewis S, Tyrrell E, Fogarty AW, Marshall CR. Risk of Suicide After Dementia Diagnosis. *JAMA Neurol*. Oct 3 2022;79(11):1148-54. doi:10.1001/jamaneurol.2022.3094

119. Hung GC, Kwok CL, Yip PS, Gunnell D, Chen YY. Predicting suicide in older adults - a community-based cohort study in Taipei City, Taiwan. *Journal of affective disorders*. Feb 1 2015;172:165-70. doi:10.1016/j.jad.2014.09.037

120. Erlangsen A, Bille-Brahe U, Jeune B. Differences in suicide between the old and the oldest old. *The journals of gerontology Series B,*

Psychological sciences and social sciences. Sep 2003;58(5):S314-22. doi:10.1093/geronb/58.5.s314

121. Wu J, Li Y, Waern M. Suicide among Older People in Different European Welfare Regimes: Does Economic (in)Security Have Implications for Suicide Prevention? *International journal of environmental research and public health*. Jun 8 2022;19(12)doi:10.3390/ijerph19127003

122. Huang X, Ribeiro JD, Franklin JC. The Differences Between Individuals Engaging in Nonsuicidal Self-Injury and Suicide Attempt Are Complex (vs. Complicated or Simple). *Front Psychiatry*. 2020;11:239. doi:10.3389/fpsyt.2020.00239

123. Waern M, Strömsten L, Wiktorsson S, Runeson B, Renberg ES. Overlapping Patterns of Suicide Attempts and Non-suicidal Self-Injuries in Adults: A Prospective Clinical Cohort Study. *The Journal of clinical psychiatry*. Oct 24 2022;83(6)doi:10.4088/JCP.21m14330

124. Wiktorsson S, Strömsten L, Renberg ES, Runeson B, Waern M. Clinical Characteristics in Older, Middle-Aged and Young Adults Who Present With Suicide Attempts at Psychiatric Emergency Departments: A Multisite Study. *The American journal of geriatric psychiatry : official journal of the American Association for Geriatric Psychiatry*. Mar 2022;30(3):342-351. doi:10.1016/j.jagp.2021.08.001

125. Wiktorsson S, Runeson B, Skoog I, Ostling S, Waern M. Attempted suicide in the elderly: characteristics of suicide attempters 70 years and older and a general population comparison group. *The American journal of geriatric psychiatry : official journal of the American Association for Geriatric Psychiatry*. Jan 2010;18(1):57-67. doi:10.1097/JGP.0b013e3181bd1c13

126. National Board of Health and Welfare. Statistical database for external causes of injury or poisoning. https://sdb.socialstyrelsen.se/if_ska/val.aspx Accessed 2023-06-16.

127. Suominen K, Isometsä E, Lönnqvist J. Elderly suicide attempters with depression are often diagnosed only after the attempt. *International journal of geriatric psychiatry*. Jan 2004;19(1):35-40. doi:10.1002/gps.1031

128. Van Orden KA, Wiktorsson S, Duberstein P, Berg AI, Fässberg MM, Waern M. Reasons for attempted suicide in later life. *The American journal of geriatric psychiatry : official journal of the American Association for Geriatric Psychiatry*. May 2015;23(5):536-44. doi:10.1016/j.jagp.2014.07.003

129. Paykel ES, Myers JK, Lindenthal JJ, Tanner J. Suicidal feelings in the general population: a prevalence study. *The British journal of psychiatry : the journal of mental science*. May 1974;124(0):460-9.

130. De Leo D, Cerin E, Spathonis K, Burgis S. Lifetime risk of suicide ideation and attempts in an Australian community: prevalence, suicidal process, and help-seeking behaviour. *Journal of affective disorders*. Jun 2005;86(2-3):215-24. doi:10.1016/j.jad.2005.02.001

131. Miret M, Caballero FF, Huerta-Ramirez R, et al. Factors associated with suicidal ideation and attempts in Spain for different age groups. Prevalence before and after the onset of the economic crisis. *Journal of affective disorders*. Jul 2014;163:1-9. doi:10.1016/j.jad.2014.03.045

132. Kjoller M, Helweg-Larsen M. Suicidal ideation and suicide attempts among adult Danes. *Scandinavian journal of public health*. Mar 2000;28(1):54-61.

133. Beck AT, Kovacs M, Weissman A. Hopelessness and suicidal behavior. An overview. *Jama*. Dec 15 1975;234(11):1146-9.

134. Shneidman ES. Suicide as psychache. *J Nerv Ment Dis*. Mar 1993;181(3):145-7. doi:10.1097/00005053-199303000-00001

135. Rudd MD. Fluid Vulnerability Theory: A Cognitive Approach to Understanding the Process of Acute and Chronic Suicide Risk. *Cognition and suicide: Theory, research, and therapy*. American Psychological Association; 2006:355-368.

136. Van Orden KA, Witte TK, Cukrowicz KC, Braithwaite SR, Selby EA, Joiner TE, Jr. The interpersonal theory of suicide. *Psychol Rev*. Apr 2010;117(2):575-600. doi:10.1037/a0018697

137. Klonsky ED, Pachkowski MC, Shahnaz A, May AM. The three-step theory of suicide: Description, evidence, and some useful points of clarification. *Preventive medicine*. Nov 2021;152(Pt 1):106549. doi:10.1016/j.ypmed.2021.106549

138. O'Connor RC, Kirtley OJ. The integrated motivational-volitional model of suicidal behaviour. *Philos Trans R Soc Lond B Biol Sci*. Sep 5 2018;373(1754)doi:10.1098/rstb.2017.0268

139. Park SM. Health status and suicidal ideation in Korean elderly: the role of living arrangement. *Journal of mental health (Abingdon, England)*. Apr 2014;23(2):94-8. doi:10.3109/09638237.2013.869569

140. Yen YC, Yang MJ, Yang MS, et al. Suicidal ideation and associated factors among community-dwelling elders in Taiwan. *Psychiatry and*

clinical neurosciences. Aug 2005;59(4):365-71. doi:10.1111/j.1440-1819.2005.01387.x

141. Dong X, Chen R, Wong E, Simon MA. Suicidal ideation in an older U.S. Chinese population. *Journal of aging and health*. Oct 2014;26(7):1189-208. doi:10.1177/0898264314541696

142. Loprinzi PD, Cain DS. Updated trends in suicidal ideation among U.S. adults, 2005-2012. *Preventive medicine*. Sep 2015;78:14-6. doi:10.1016/j.ypmed.2015.06.003

143. Almeida OP, Draper B, Snowdon J, et al. Factors associated with suicidal thoughts in a large community study of older adults. *The British journal of psychiatry : the journal of mental science*. Dec 2012;201(6):466-72. doi:10.1192/bjp.bp.112.110130

144. Chan HL, Liu CY, Chau YL, Chang CM. Prevalence and association of suicide ideation among Taiwanese elderly--a population-based cross-sectional study. *Chang Gung Med J*. Mar-Apr 2011;34(2):197-204.

145. Awata S, Seki T, Koizumi Y, et al. Factors associated with suicidal ideation in an elderly urban Japanese population: a community-based, cross-sectional study. *Psychiatry and clinical neurosciences*. Jun 2005;59(3):327-36. doi:10.1111/j.1440-1819.2005.01378.x

146. Cooper C, Rantell K, Blanchard M, et al. Why are suicidal thoughts less prevalent in older age groups? Age differences in the correlates of suicidal thoughts in the English Adult Psychiatric Morbidity Survey 2007. *Journal of affective disorders*. May 15 2015;177:42-8. doi:10.1016/j.jad.2015.02.010

147. Cohen CI, Colemon Y, Yaffee R, Casimir GJ. Racial differences in suicidality in an older urban population. *The Gerontologist*. Feb 2008;48(1):71-8.

148. Dewey ME, Davidson IA, Copeland JR. Expressed wish to die and mortality in older people: a community replication. *Age and ageing*. Mar 1993;22(2):109-13. doi:10.1093/ageing/22.2.109

149. Suh G, Kim J, YJ J. Wish to Die and Associated Factors in the Rural Elderly. *J Korean Geriatr*. 1999;3:70-77.

150. Scocco P, De Leo D. One-year prevalence of death thoughts, suicide ideation and behaviours in an elderly population. *International journal of geriatric psychiatry*. Sep 2002;17(9):842-6. doi:10.1002/gps.691

151. Lapierre S, Boyer R, Desjardins S, et al. Daily hassles, physical illness, and sleep problems in older adults with wishes to die. *International psychogeriatrics*. Feb 2012;24(2):243-52. doi:10.1017/s1041610211001591

152. Jonson M, Skoog I, Marlow T, Mellqvist Fassberg M, Waern M. Anxiety symptoms and suicidal feelings in a population sample of 70-year-olds without dementia. *International psychogeriatrics*. Nov 2012;24(11):1865-71. doi:10.1017/s1041610212000993

153. Jorm AF, Henderson AS, Scott R, Korten AE, Christensen H, Mackinnon AJ. Factors associated with the wish to die in elderly people. *Age and ageing*. Sep 1995;24(5):389-92.

154. Ayalon L, Litwin H. What cognitive functions are associated with passive suicidal ideation? Findings from a national sample of community dwelling Israelis. *International journal of geriatric psychiatry*. May 2009;24(5):472-8. doi:10.1002/gps.2140

155. Forsell Y, Jorm AF, Winblad B. Suicidal thoughts and associated factors in an elderly population. *Acta psychiatrica Scandinavica*. Feb 1997;95(2):108-11.

156. Tuvesson H, Hellstrom A, Sjoberg L, Sjolund BM, Nordell E, Fagerstrom C. Life weariness and suicidal thoughts in late life: a national study in Sweden. *Aging & mental health*. Jul 7 2017:1-7. doi:10.1080/13607863.2017.1348484

157. Barnow S, Linden M. Suicidality and tiredness of life among very old persons: results from the Berlin Aging Study (BASE). *Archives of suicide research*. 1997;3:171-182. doi:10.1023/A:1009689431168

158. Scocco P, Meneghel G, Caon F, Dello Buono M, De Leo D. Death Ideation and Its Correlates: Survey of an Over-65-Year-Old Population. *The Journal of Nervous and Mental Disease*. 2001;189(4):210-218.

159. Skoog I, Aevarsson O, Beskow J, et al. Suicidal feelings in a population sample of nondemented 85-year-olds. *The American journal of psychiatry*. Aug 1996;153(8):1015-20. doi:10.1176/ajp.153.8.1015

160. Fassberg MM, Ostling S, Borjesson-Hanson A, Skoog I, Waern M. Suicidal feelings in the twilight of life: a cross-sectional population-based study of 97-year-olds. *BMJ open*. 2013;3(2)doi:10.1136/bmjopen-2012-002260

161. Baca-Garcia E, Perez-Rodriguez MM, Keyes KM, et al. Suicidal ideation and suicide attempts in the United States: 1991-1992 and 2001-2002. *Molecular psychiatry*. Mar 2010;15(3):250-9. doi:10.1038/mp.2008.98

162. Fassberg MM, Vanaelst B, Jonson M, et al. Epidemiology of suicidal feelings in an ageing Swedish population: from old to very old age in the Gothenburg H70 Birth Cohort Studies. *Epidemiology and psychiatric sciences*. Apr 1 2019:1-14. doi:10.1017/s2045796019000143

163. Rurup ML, Deeg DJ, Poppelaars JL, Kerkhof AJ, Onwuteaka-Philipsen BD. Wishes to die in older people: a quantitative study of prevalence and associated factors. *Crisis*. 2011;32(4):194-203. doi:10.1027/0227-5910/a000079

164. Jun J, Park D. Factors Associated with Self-Rated Health among Korean Elderly. *Iran J Public Health*. Feb 2023;52(2):360-370. doi:10.18502/ijph.v52i2.11889

165. Fassberg MM, Cheung G, Canetto SS, et al. A systematic review of physical illness, functional disability, and suicidal behaviour among older adults. *Aging & mental health*. 2016;20(2):166-94. doi:10.1080/13607863.2015.1083945

166. Kang HJ, Stewart R, Jeong BO, et al. Suicidal ideation in elderly Korean population: a two-year longitudinal study. *International psychogeriatrics*. Jan 2014;26(1):59-67. doi:10.1017/s1041610213001634

167. Rymo I, Fässberg MM, Kern S, et al. Mild cognitive impairment is associated with passive suicidal ideation in older adults: A population-based study. *Acta psychiatrica Scandinavica*. Mar 30 2023;doi:10.1111/acps.13549

168. Olsson P, Wiktorsson S, Sacuiu S, et al. Cognitive Function in Older Suicide Attempters and a Population-Based Comparison Group. *Journal of geriatric psychiatry and neurology*. May 2016;29(3):133-41. doi:10.1177/0891988715627015

169. Fassberg MM, van Orden KA, Duberstein P, et al. A systematic review of social factors and suicidal behavior in older adulthood. *International journal of environmental research and public health*. Mar 2012;9(3):722-45. doi:10.3390/ijerph9030722

170. Batterham PJ, Calear AL, Mackinnon AJ, Christensen H. The association between suicidal ideation and increased mortality from

natural causes. *Journal of affective disorders*. Sep 25 2013;150(3):855-60. doi:10.1016/j.jad.2013.03.018

171. American Psychiatric Association. *Diagnostic and statistical manual of mental disorders, Fifth edition*. American Psychiatric Association; 2013.

172. Freedman R, Lewis DA, Michels R, et al. The initial field trials of DSM-5: new blooms and old thorns. *The American journal of psychiatry*. Jan 2013;170(1):1-5. doi:10.1176/appi.ajp.2012.12091189

173. Zimmerman M, Ellison W, Young D, Chelminski I, Dalrymple K. How many different ways do patients meet the diagnostic criteria for major depressive disorder? *Compr Psychiatry*. Jan 2015;56:29-34. doi:10.1016/j.comppsych.2014.09.007

174. Waraich P, Goldner EM, Somers JM, Hsu L. Prevalence and incidence studies of mood disorders: a systematic review of the literature. *Canadian journal of psychiatry Revue canadienne de psychiatrie*. Feb 2004;49(2):124-38. doi:10.1177/070674370404900208

175. Hasin DS, Sarvet AL, Meyers JL, et al. Epidemiology of Adult DSM-5 Major Depressive Disorder and Its Specifiers in the United States. *JAMA Psychiatry*. 2018:1-11. doi:10.1001/jamapsychiatry.2017.4602

176. Moffitt TE, Caspi A, Taylor A, et al. How common are common mental disorders? Evidence that lifetime prevalence rates are doubled by prospective versus retrospective ascertainment. *Psychological medicine*. Jun 2010;40(6):899-909. doi:10.1017/s0033291709991036

177. Angst J, Paksarian D, Cui L, et al. The epidemiology of common mental disorders from age 20 to 50: results from the prospective Zurich cohort Study. *Epidemiology and psychiatric sciences*. Feb 2016;25(1):24-32. doi:10.1017/s204579601500027x

178. Christensen H, Jorm AF, Mackinnon AJ, et al. Age differences in depression and anxiety symptoms: a structural equation modelling analysis of data from a general population sample. *Psychological medicine*. Mar 1999;29(2):325-39. doi:10.1017/s0033291798008150

179. Davison TE, McCabe MP, Mellor D. An examination of the "gold standard" diagnosis of major depression in aged-care settings. *The American journal of geriatric psychiatry : official journal of the American Association for Geriatric Psychiatry*. May 2009;17(5):359-67. doi:10.1097/JGP.0b013e318190b901

180. Fiske A, Wetherell JL, Gatz M. Depression in older adults. *Annual review of clinical psychology*. 2009;5:363-89. doi:10.1146/annurev.clinpsy.032408.153621

181. Heun R, Papassotiropoulos A, Jessen F, Maier W, Breitner JC. A family study of Alzheimer disease and early- and late-onset depression in elderly patients. *Archives of general psychiatry*. Feb 2001;58(2):190-6. doi:10.1001/archpsyc.58.2.190

182. Brodaty H, Luscombe G, Parker G, et al. Early and late onset depression in old age: different aetiologies, same phenomenology. *Journal of affective disorders*. Oct 2001;66(2-3):225-36. doi:10.1016/s0165-0327(00)00317-7

183. Linnemann C, Lang UE. Pathways Connecting Late-Life Depression and Dementia. *Front Pharmacol*. 2020;11:279. doi:10.3389/fphar.2020.00279

184. Kessler RC, Birnbaum HG, Shahly V, et al. Age differences in the prevalence and co-morbidity of DSM-IV major depressive episodes: results from the WHO World Mental Health Survey Initiative. *Depression and anxiety*. 2010;27(4):351-364. doi:10.1002/da.20634

185. Beekman AT, Copeland JR, Prince MJ. Review of community prevalence of depression in later life. *The British journal of psychiatry : the journal of mental science*. Apr 1999;174:307-11. doi:10.1192/bjp.174.4.307

186. Luppa M, Sikorski C, Luck T, et al. Age- and gender-specific prevalence of depression in latest-life--systematic review and meta-analysis. *Journal of affective disorders*. Feb 2012;136(3):212-21. doi:10.1016/j.jad.2010.11.033

187. Meeks TW, Vahia IV, Lavretsky H, Kulkarni G, Jeste DV. A tune in "a minor" can "b major": a review of epidemiology, illness course, and public health implications of subthreshold depression in older adults. *Journal of affective disorders*. 2011;129(1):126-142.

188. Kok RM, Nolen WA, Heeren TJ. Efficacy of treatment in older depressed patients: a systematic review and meta-analysis of double-blind randomized controlled trials with antidepressants. *Journal of affective disorders*. Dec 10 2012;141(2-3):103-15. doi:10.1016/j.jad.2012.02.036

189. O'Leary D, Gill D, Gregory S, Shawcross C. The effectiveness of real versus simulated electroconvulsive therapy in depressed elderly

patients. *International journal of geriatric psychiatry*. 1994;9(7):567-571. doi:https://doi.org/10.1002/gps.930090711

190. Brus O, Cao Y, Gustafsson E, et al. Self-assessed remission rates after electroconvulsive therapy of depressive disorders. *European psychiatry : the journal of the Association of European Psychiatrists*. Sep 2017;45:154-160. doi:10.1016/j.eurpsy.2017.06.015

191. van Diermen L, van den Ameele S, Kamperman AM, et al. Prediction of electroconvulsive therapy response and remission in major depression: meta-analysis. *The British journal of psychiatry : the journal of mental science*. Feb 2018;212(2):71-80. doi:10.1192/bjp.2017.28

192. Stenmark L, Kellner CH, Landén M, Larsson I, Msghina M, Nordenskjöld A. Electroconvulsive therapy and psychiatric readmission in major depressive disorder - A population-based register study. *Acta psychiatrica Scandinavica*. Dec 2021;144(6):599-625. doi:10.1111/acps.13373

193. Cuijpers P, Karyotaki E, Eckshtain D, et al. Psychotherapy for Depression Across Different Age Groups: A Systematic Review and Meta-analysis. *JAMA Psychiatry*. Jul 1 2020;77(7):694-702. doi:10.1001/jamapsychiatry.2020.0164

194. Huang CQ, Dong BR, Lu ZC, Yue JR, Liu QX. Chronic diseases and risk for depression in old age: a meta-analysis of published literature. *Ageing research reviews*. Apr 2010;9(2):131-41. doi:10.1016/j.arr.2009.05.005

195. Wei J, Hou R, Zhang X, et al. The association of late-life depression with all-cause and cardiovascular mortality among community-dwelling older adults: systematic review and meta-analysis. *The British journal of psychiatry : the journal of mental science*. Aug 2019;215(2):449-455. doi:10.1192/bjp.2019.74

196. Stapelberg NJ, Neumann DL, Shum DH, McConnell H, Hamilton-Craig I. A topographical map of the causal network of mechanisms underlying the relationship between major depressive disorder and coronary heart disease. *The Australian and New Zealand journal of psychiatry*. May 2011;45(5):351-69. doi:10.3109/00048674.2011.570427

197. Alexopoulos GS. Mechanisms and treatment of late-life depression. *Translational psychiatry*. Aug 5 2019;9(1):188. doi:10.1038/s41398-019-0514-6

198. Alexopoulos GS, Meyers BS, Young RC, Campbell S, Silbersweig D, Charlson M. 'Vascular depression' hypothesis. *Archives of general psychiatry*. Oct 1997;54(10):915-22. doi:10.1001/archpsyc.1997.01830220033006

199. Daskalopoulou M, George J, Walters K, et al. Depression as a Risk Factor for the Initial Presentation of Twelve Cardiac, Cerebrovascular, and Peripheral Arterial Diseases: Data Linkage Study of 1.9 Million Women and Men. *PloS one*. 2016;11(4):e0153838. doi:10.1371/journal.pone.0153838

200. Arthur A, Savva GM, Barnes LE, et al. Changing prevalence and treatment of depression among older people over two decades. *The British journal of psychiatry : the journal of mental science*. Oct 7 2019:1-6. doi:10.1192/bjp.2019.193

201. Zivin K, Pirraglia PA, McCammon RJ, Langa KM, Vijan S. Trends in depressive symptom burden among older adults in the United States from 1998 to 2008. *Journal of general internal medicine*. Dec 2013;28(12):1611-9. doi:10.1007/s11606-013-2533-y

202. Rydberg Sterner T, Gudmundsson P, Sigstrom R, et al. Depression and neuroticism decrease among women but not among men between 1976 and 2016 in Swedish septuagenarians. *Acta psychiatrica Scandinavica*. Apr 2019;139(4):381-394. doi:10.1111/acps.13005

203. Liang Y, Rausch C, Laflamme L, Möller J. Prevalence, trend and contributing factors of geriatric syndromes among older Swedes: results from the Stockholm County Council Public Health Surveys. *BMC geriatrics*. Dec 29 2018;18(1):322. doi:10.1186/s12877-018-1018-6

204. Lundström S, Reichenberg A, Anckarsäter H, Lichtenstein P, Gillberg C. Autism phenotype versus registered diagnosis in Swedish children: prevalence trends over 10 years in general population samples. *BMJ (Clinical research ed)*. Apr 28 2015;350:h1961. doi:10.1136/bmj.h1961

205. Kõlves K, Kõlves KE, De Leo D. Natural disasters and suicidal behaviours: a systematic literature review. *Journal of affective disorders*. Mar 20 2013;146(1):1-14. doi:10.1016/j.jad.2012.07.037

206. Lester D. Involvement in war and suicide rates in Great Britain, 1901-1965. *Psychol Rep*. Dec 1994;75(3 Pt 1):1154. doi:10.2466/pr0.1994.75.3.1154

207. Martínez-Alés G, Szmulewicz A, López-Cuadrado T, Morrison CN, Keyes KM, Susser ES. Suicide Following the COVID-19 Pandemic Outbreak: Variation Across Place, Over Time, and Across Sociodemographic Groups. A Systematic Integrative Review. *Current psychiatry reports*. May 25 2023:1-18. doi:10.1007/s11920-023-01427-7

208. Hill AB. The environment and disease: association or causation? *Proc R Soc Med*. 1965;58:295-300.

209. Doll R, Hill AB. The mortality of doctors in relation to their smoking habits: a preliminary report. 1954. *BMJ (Clinical research ed)*. Jun 26 2004;328(7455):1529-33; discussion 1533. doi:10.1136/bmj.328.7455.1529

210. Rinder L, Roupe S, Steen B, Svanborg A. Seventy-year-old people in Gothenburg. A population study in an industrialized Swedish city. *Acta medica Scandinavica*. Nov 1975;198(5):397-407.

211. Rydberg Sterner T, Ahlner F, Blennow K, et al. The Gothenburg H70 Birth cohort study 2014-16: design, methods and study population. *European journal of epidemiology*. Feb 2019;34(2):191-209. doi:10.1007/s10654-018-0459-8

212. Bengtsson C, Ahlqwist M, Andersson K, Bjorkelund C, Lissner L, Soderstrom M. The Prospective Population Study of Women in Gothenburg, Sweden, 1968-69 to 1992-93. A 24-year follow-up study with special reference to participation, representativeness, and mortality. *Scandinavian journal of primary health care*. Dec 1997;15(4):214-9.

213. Jonson M, Sigström R, Mellqvist Fässberg M, et al. Passive and active suicidal ideation in Swedish 85-year-olds: Time trends 1986-2015. *Journal of affective disorders*. May 2 2021;290:300-307. doi:10.1016/j.jad.2021.04.060

214. Folstein MF, Folstein SE, McHugh PR. "Mini-mental state". A practical method for grading the cognitive state of patients for the clinician. *Journal of psychiatric research*. Nov 1975;12(3):189-98. doi:10.1016/0022-3956(75)90026-6

215. Västra Götalandsregionen. Data from: Statistics and analyses. 2021.

216. Åsberg M, Montgomery SA, Perris C, Schalling D, Sedvall G. A comprehensive psychopathological rating scale. *Acta Psychiatrica Scandinavica Supplementum*. 1978;(271):5-27.

217. Montgomery SA, Asberg M. A new depression scale designed to be sensitive to change. *The British journal of psychiatry : the journal of mental science*. Apr 1979;134:382-9.

218. American Psychiatric Association. *Diagnostic and statistical manual of mental disorders: DSM-IV TR*. 4 ed. American Psychiatric Association; 2000.

219. Brooke HL, Talbäck M, Hörnblad J, et al. The Swedish cause of death register. *European journal of epidemiology*. Sep 2017;32(9):765-773. doi:10.1007/s10654-017-0316-1

220. Wettermark B, Hammar N, Fored CM, et al. The new Swedish Prescribed Drug Register--opportunities for pharmacoepidemiological research and experience from the first six months. *Pharmacoepidemiol Drug Saf*. Jul 2007;16(7):726-35. doi:10.1002/pds.1294

221. Ludvigsson JF, Andersson E, Ekbom A, et al. External review and validation of the Swedish national inpatient register. *BMC public health*. Jun 9 2011;11:450. doi:10.1186/1471-2458-11-450

222. World Health Organization. *Guidelines for ATC classification and DDD assignment 2014*. 17 ed. WHO Collaborating Centre for Drug Statistics Methodology; 2013.

223. American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders: DSM III-R*. 3 ed. American Psychiatric Association; 1987.

224. Skoog I, Nilsson L, Palmertz B, Andreasson LA, Svanborg A. A population-based study of dementia in 85-year-olds. *The New England journal of medicine*. Jan 21 1993;328(3):153-8.

225. Rait G, Walters K, Griffin M, Buszewicz M, Petersen I, Nazareth I. Recent trends in the incidence of recorded depression in primary care. *The British Journal of Psychiatry*. 2009;195(6):520-524.

226. Akincigil A, Olfson M, Walkup JT, et al. Diagnosis and treatment of depression in older community-dwelling adults: 1992-2005. *Journal of the American Geriatrics Society*. Jun 2011;59(6):1042-51. doi:10.1111/j.1532-5415.2011.03447.x

227. Akushevich I, Kravchenko J, Yashkin AP, Yashin AI. Time trends in the prevalence of cancer and non-cancer diseases among older U.S. adults: Medicare-based analysis. *Experimental gerontology*. Sep 2018;110:267-276. doi:10.1016/j.exger.2018.06.017

228. Horder H, Skoog I, Johansson L, Falk H, Frandin K. Secular trends in frailty: a comparative study of 75-year olds born in 1911-12 and 1930. *Age and ageing*. Sep 2015;44(5):817-22. doi:10.1093/ageing/afv084

229. Wetterberg H, Najar J, Rydberg Sterner T, et al. Decreasing incidence and prevalence of dementia among octogenarians. A population-based study on three cohorts born 30 years apart. *J Gerontol A Biol Sci Med Sci*. Feb 27 2023;doi:10.1093/gerona/glad071

230. Wu YT, Beiser AS, Breteler MMB, et al. The changing prevalence and incidence of dementia over time - current evidence. *Nature reviews Neurology*. Jun 2017;13(6):327-339. doi:10.1038/nrneurol.2017.63

231. Falk Erhag H, Wetterberg H, Johansson L, Rydén L, Skoog I. Activities of daily living (ADL) and instrumental activities of daily living (IADL) disability in Swedish 85-year-olds born three decades apart-findings from the H70 study. *Age and ageing*. Jun 9 2021;doi:10.1093/ageing/afab112

232. Statistics Sweden. *Life expectancy at birth and age 65 by sex 1970–2022 and projection 2023–2070*. 2023. Accessed 2023-06-15. https://www.scb.se/en/finding-statistics/statistics-by-subject-area/population/population-projections/population-projections/pong/tables-and-graphs/life-expectancy-at-birth-and-age-65-by-sex-and-projection/

233. Castelli Dransart DA, Lapierre S, Erlangsen A, et al. A systematic review of older adults' request for or attitude toward euthanasia or assisted-suicide. *Aging & mental health*. Mar 2021;25(3):420-430. doi:10.1080/13607863.2019.1697201

234. Troya MI, Babatunde O, Polidano K, et al. Self-harm in older adults: systematic review. *The British journal of psychiatry : the journal of mental science*. Apr 2019;214(4):186-200. doi:10.1192/bjp.2019.11

235. Regionalt processteam suicidprevtion Västra Götalandsregionen. Suicidalitet hos vuxna - akut bedömning/handläggning (2021). https://mellanarkiv-offentlig.vgregion.se/alfresco/s/archive/stream/public/v1/source/available/SOFIA/HS9766-305841775-246/SURROGATE/Suicidalitet%20hos%20vuxna%20-%20akut%20bed%c3%b6mning%2c%20handl%c3%a4ggning.pdf

236. Van Orden KA, O'Riley AA, Simning A, Podgorski C, Richardson TM, Conwell Y. Passive Suicide Ideation: An Indicator of Risk

Among Older Adults Seeking Aging Services? *The Gerontologist*. Dec 2015;55(6):972-80. doi:10.1093/geront/gnu026