



## Research report

## Disability weights for suicidal thoughts and non-fatal suicide attempts

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## ARTICLE INFO

## Article history:

Received 26 August 2010

Received in revised form 30 March 2011

Accepted 12 May 2011

Available online 8 June 2011

## Keywords:

Suicide

Attempted suicide

Suicidal thoughts

Disability weights

Quality of life

Disability adjusted life year

## ABSTRACT

**Background:** Although there are disability weights available for a wide range of health states, these do not include suicidality. This makes it difficult to evaluate the severity of suicidality in comparison with other health states. The aim of this study therefore is to estimate disability weights for suicidal thoughts and for mental distress involved in non-fatal suicide attempts.

**Methods:** A Dutch expert panel of sixteen medical practitioners who were knowledgeable about suicidality estimated disability weights (DWs) for twelve health states by interpolating them on a calibrated Visual Analogue Scale. The DWs for ten of these health states had been estimated in previous studies and were used to determine the external consistency of the panel. The other two concerned health states for suicidal thoughts and non-fatal suicide attempts. The resulting DWs could vary between 0 (best imaginable health state) and 1 (worst imaginable health state).

**Results:** Both internal (Cronbach's  $\alpha=0.98$ ) and external consistency of the panel were satisfactory. The DWs for suicidal thoughts and non-fatal suicide attempts were estimated to be 0.36 and 0.46 respectively.

**Limitations:** The panel was relatively small, which resulted in broad confidence intervals.

**Conclusions:** Suicidal thoughts are considered to be as disabling as alcohol dependence and severe asthma. The mental distress involved in non-fatal suicide attempts is thought to be comparable in disability to heroin dependence and initial stage Parkinson's. These results demonstrate the severity of suicidality.

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## 1. Introduction

Suicidal behavior is a major public health problem worldwide. With approximately 1 million people dying by suicide each year it is among the leading causes of death, especially among those aged 15–44 years (Nock et al., 2008;

WHO, 2008b). In the Netherlands, around 1500 people die by suicide each year (Statistics Netherlands, 2010). In addition, an estimated 99,600 suicide attempts occur each year (0.9% of the Dutch adult population) (Hoeymans and Schoemaker, 2010; Ten Have et al., 2006). About 14,000 (15%) of these persons attempting suicide are treated in an emergency room, of whom 9500 are admitted to a hospital (Kerkhof et al., 2007). Another 8200 attempts (9%) are treated by general physicians (Marquet et al., 2005). From these figures it becomes apparent that the majority of attempts (76%) remain untreated or do not warrant medical intervention. The year-prevalence of suicidal thoughts in the Netherlands is 3.2% (Ten Have et al., 2006), which amounts to approximately

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462,500 persons in a population of 16 million (Hoeymans and Schoemaker, 2010).

Suicidal thoughts and suicide attempts may occur in a number of psychiatric disorders. Psychological autopsy studies show that 90%–95% of people who die by suicide had a diagnosable psychiatric disorder at the time of the suicide (Cavanagh et al., 2003). The most prevalent diseases/conditions are depression, alcohol/substance use, psychotic disorders, impulse–control disorders, and personality disorders (Nock et al., 2008). While often perceived to be a symptom of psychiatric disorders, it has also been suggested that suicidality can be regarded as a separate syndrome or DSM-V axis (Ahrens and Linden, 1996; Oquendo et al., 2008). Core symptoms of this *suicidality syndrome* are hopelessness, ruminative thinking and social withdrawal (Ahrens and Linden, 1996).

More than mortality and prevalence alone, burden of disease has become an important indicator of a population's health. Burden of disease can be described as the impact of a health problem on the population measured by mortality and morbidity. It is most frequently quantified by Disability Adjusted Life Years (DALYs). DALYs express both the loss of healthy life years due to premature death (Years of Life Lost, YLL) and the loss of healthy life years due to disability (Years Lived with Disability, YLD). One DALY therefore represents the loss of the equivalent of 1 year in full health. YLD for a particular health state are estimated by multiplying the incidence of a health state by the average duration of the disease and the disability weight (DW). The DW is an index between 0 (best imaginable health state) and 1 (worst imaginable health state), which expresses the severity of the disability associated with a certain health state. The DALY is described in detail in Murray and Lopez (1996).

In general, DWs are estimated using an expert panel, a patient panel or a general public panel, dependent upon the perspective of the researchers and the aim of the study. In epidemiological studies, in which DALYs are used to compare population health, expert panels are often used to estimate DWs. In cost-effectiveness studies, patient or general public panels are more often used to estimate utilities (the complement of DWs) and calculate Quality Adjusted Life Years (QALYs) (Gold et al., 2002). Both DALYs and QALYs have underlying assumptions which are not without controversy, and methods to estimate DWs and utilities continue to be a point of discussion (Anand and Hanson, 1997; Brazier, 2008; Mont, 2007; Murray et al., 2000; Nord et al., 2009). The study described in this paper has been conducted from an epidemiological perspective and therefore focuses on DWs and DALYs, which is in line with previous studies that estimated DWs for health states (e.g. Mathers et al., 1999; Murray and Lopez, 1996).

Disability weights (DWs) have been estimated for many health states (Murray and Lopez, 1996; Stouthard et al., 1997; Stouthard et al., 2000; Vos et al., 2001), including *self-inflicted injuries* (DW = 0.447) (Mathers et al., 1999). For burden of disease studies, self-inflicted injuries have been defined as “suicide attempts, whether or not resulting in death” (Harvard Initiative for Global Health, 2009). In 2004, self-inflicted injuries represented 1.3% of the global burden of disease, which places them among the leading causes of disease burden worldwide (WHO, 2008a). In a recent six year

follow-up study of a clinical sample of self-harm patients, Sinclair et al. (2010) conclude that in this group “mortality, morbidity and perceived quality of life (...) were significantly worse (...) than in the general population” (Sinclair et al., 2010, p. 250).

Suicidal thoughts are not included in the definition of self-inflicted injuries, but may contribute to the overall burden of suicidality. The first aim of this study therefore is to estimate the DW for suicidal thoughts. The second aim of this study is to estimate the DW for the mental distress involved in non-fatal suicide attempts.

## 2. Methods

### 2.1. Valuation procedure

The valuation procedure was carried out by mail with the help of an expert panel (see ‘panel’). Each panelist received descriptions of twelve health states (see ‘Health states’) which they were asked to interpolate on a Visual Analogue Scale (VAS), ranging from 0 (worst imaginable health state) to 100 (best imaginable health state). For the interpolation, they were instructed to consider the consequences of living with the health state for 1 year, unless otherwise specified. The VAS has been formally calibrated with 16 health states in the Dutch disability weights study using the person trade off (PTO) method (Stouthard et al., 2000). The PTO method is the preferred method for estimating DWs for burden of disease studies since it attempts to measure social preference instead of individual preferences more directly than other methods (Nord, 1995). Since the PTO method is a relatively complex one, this study used the calibrated VAS to value health states. Panelists received the calibrated VAS and the corresponding descriptions of the 16 reference points. The original calibrated VAS has been published in Stouthard et al. (2000).

The interpolation on the VAS results in a value between 0 and 100 for each health state. Since 0 represents the worst imaginable health state and 100 the best imaginable health state, the interpolated values correspond to so-called *Utilities* on a scale from 0 to 1 (after dividing them by 100). A utility (U) relates to a DW as  $DW = 1 - U$ . In the Dutch disability weight study (Stouthard et al., 1997) utilities were published. In order to be able to compare our DWs to the utilities from Stouthard et al., these utilities were converted to DWs.

### 2.2. Panel

Members of the expert panel were selected on the basis of three criteria. First, panelists had to be experienced medical practitioners. This was required because they needed to value a wide range of medical conditions. Second, a background in research was required since understanding the concept and usefulness of the DALY is important when valuing health states. Finally, panelists needed to be knowledgeable about suicidality. Panelists were recruited through personal networks of the authors.

In total, 26 experts were invited to participate. Six of them indicated they were unable to take part in the study (mostly due to lack of time), and two could not be reached. The remaining 18 received the set of necessary documents.

The sixteen experts who returned the set formed the final panel.

### 2.3. Health states

Ten health states for which DWs had been previously established were selected for this study in order to compare our panel to previously used panels. These health states needed to represent a broad range of DWs, include both acute and chronic diseases, and take both physical and psychiatric disorders into account. The selected health states were: meningitis with permanent locomotor impairment (DW=0.17), meningitis with permanent locomotor and cognitive impairment (DW=0.76), constitutional eczema (DW=0.07), moderate rheumatoid arthritis (DW=0.37), moderate heart failure (DW=0.35), severe heart failure (DW=0.65) (Stouthard et al., 2000), severe depression with psychotic features (DW=0.84), moderate to severe depression (DW=0.51) (Kruijshaar et al., 2005), cataract (DW=0.11) and macular degeneration (DW=0.25) (De Hollander et al., 2006).

Each health state consisted of a descriptive text based on criteria from the *International Classification of Diseases 10th revision (ICD-10)* (WHO, 2007) and the *Diagnostic and Statistical Manual of Mental Disorders (DSM-IV-TR)* (American Psychiatric Association, 2000). In addition, a standardized health classification derived from the EuroQol 5D+C5L (Janssen et al., 2008a; Janssen et al., 2008b; Krabbe et al., 1999) was added to the description. This rates the condition on six dimensions (mobility, self-care, usual activities, pain/discomfort, anxiety/depression and cognition) on a five-level scale (no problems to severe problems).

For suicidal thoughts and non-fatal suicide attempt (see De Leo et al., 2006 for the definitions), no DSM-IV-TR or ICD-10 criteria were available. The authors therefore composed these textual descriptions. The EuroQol descriptions of these health states were based on data from the Netherlands Mental Health Survey and Incidence Study (NEMESIS) (Ten Have et al., 2006). The eight scales of the Short Form-36 health survey (SF-36) (Ware et al., 1993) and two additional questions were used to indicate disability. These two additional questions were about the number of days spent in bed due to psychiatric problems, drug-related problems or alcohol-related problems, and the number of days being unable to work due to any of these problems. A formal algorithm (available from the authors on request) was used to transform the SF-36 data into EuroQol 5D+C5L classifications (Kruijshaar et al., 2005). Boxes 1 and 2 provide the full descriptions of suicidal thoughts and non-fatal suicide attempt.

### 2.4. Statistical analyses

Before calculating the mean DWs for suicidal thoughts and non-fatal suicide attempts we had to ascertain the reliability of the panel. First, the internal consistency of the panel was determined (a) by calculating Cronbach's alpha and (b) by calculating Pearson correlation coefficients and paired sample t-tests in which each panelist was compared with the mean of the other panelists in order to identify possible outliers (i.e. panelists who

valued health states systematically different from the mean of the panel).

Second, the external consistency of the panel was determined by using ten health states for which DWs had previously been estimated (see 'Health states'). These DWs were compared to the DWs of our panel using Pearson correlation coefficients and paired sample t-tests. In addition, a graph was constructed to visually inspect potential differences. Analyses were performed using SPSS 16.0.

## 3. Results

### 3.1. Characteristics of the panel

Most of the panelists are male (93.8%). Mean age of the panel is 54.6 years (SD=5.24), and the mean number of years in the medical profession is 25 (SD=6.83). The majority have a research background at PhD level (87.5%). Regarding specialism, 62.5% are psychiatrists and 37.5% are general practitioners. The majority are currently involved in patient care (81.2%).

### 3.2. Internal consistency of the panel

The reliability analysis demonstrates an excellent agreement among the panelists (Cronbach's  $\alpha=0.98$ ). Excluding one or another panelist does not improve the overall Cronbach's  $\alpha$ . The paired sample t-tests and Pearson correlations between

**Suicidality**

Suicidality is divided into the following stages:

1. Suicidal thoughts
2. Non-fatal suicide attempt

We now ask you to value:  
**People with suicidal thoughts**

These people experience one or more periods of suicidal thoughts within a year. During these periods they think about death and ask themselves if they would be better off dead. They possibly make a concrete plan, but they do not attempt suicide. The majority have a psychiatric condition; a minority receive treatment.

In a year, their condition is characterised by\*:

- No problems in walking about
- No problems with self-care
- Some problems with performing daily activities (e.g. work, study, housework, family or leisure activities)
- Moderate pain or discomfort (fatigue)
- Moderate anxiety or depression
- Few cognitive impairments (with memory, concentration, disorganization, IQ level)

**Box 1.** Health state description for attempted suicide.\* No bullet = no problems, 1 bullet = few problems, 2 bullets = some or moderate problems, 3 bullets = severe problems, 4 bullets = severe problems or incapacity.

<b>Suicidality</b>	
Suicidality is divided into the following stages:	
1. Suicidal thoughts	
2. Non-fatal suicide attempt	
We now ask you to value:	
<b>People who attempted suicide</b>	
These people attempted suicide one or more times within a year, without a fatal outcome. The majority made a concrete plan prior to the attempt. Almost half do not have the intention to die; for them the attempt was a 'cry for help'. After the attempt they are possibly treated at a hospital or by the GP. The majority have a psychiatric condition. A minority receive treatment.	
In a year, their condition is characterised by*:	
No problems in walking about	
No problems with self-care	
•• Some problems with performing daily activities (e.g. work, study, housework, family or leisure activities)	
•• Moderate pain or discomfort (fatigue)	
•• Moderate anxiety or depression	
•• Moderate cognitive impairments (with memory, concentration, disorganization, IQ)	

**Box 2.** Health state description for suicidal thoughts.\* No bullet = no problems, 1 bullet = few problems, 2 bullets = some or moderate problems, 3 bullets = severe problems, 4 bullets = severe problems or incapacity.

the individual panelists and the panel-mean indicate that most panelists correlate strongly with the mean of the other panelists (see Table 1). However, some panelists seem to value health states systematically lower (3, 5 and 8) or higher (1 and 10), as indicated by a significant deviation from the panel-mean. One panelist (2) correlates less strongly with the panel-mean, without significantly differing from it. This may indicate that certain health states were valued higher or lower, but that these differences canceled each other out. Panelist 16 correlates less strongly with the panel-mean, but also differs significantly from the panel-mean. Overall, these deviations are too small to be reflected in the Cronbach's  $\alpha$  when excluding a panelist. No panelist can therefore be identified as an outlier.

### 3.3. External consistency of the panel

Table 2 shows the paired sample t-tests and Pearson correlations between the DWs of our panelists and the corresponding DWs established in previous studies. Correlations are generally strong and the t-tests are not significantly different, indicating a fair external consistency. From Table 3 it becomes apparent that the majority of the DWs from our panel fall within the 95% confidence intervals (CIs) of previously estimated DWs. Health states 4, 7, 8 and 10 are exceptions. The 95% CIs reflect the uncertainty of the estimate, which may lead to an upper or lower bound that

**Table 1**

Internal consistency. Paired sample t-test, and Pearson correlation between each panelist and the panel-mean.

Pair	Panelist M (SD)	Panel <sup>a</sup> M (SD)	t (df)	r
1	0.55 (0.28)	0.40 (0.23)	5.95 (11)**	0.96**
2	0.48 (0.23)	0.41 (0.23)	1.38 (11)	0.65*
3	0.28 (0.22)	0.42 (0.23)	-9.44 (11)**	0.98**
4	0.47 (0.30)	0.41 (0.23)	1.41 (11)	0.89**
5	0.32 (0.23)	0.42 (0.23)	-3.43 (11)**	0.90**
6	0.38 (0.23)	0.41 (0.23)	-1.43 (11)	0.92**
7	0.37 (0.40)	0.41 (0.22)	-0.59 (11)	0.71**
8	0.31 (0.21)	0.42 (0.23)	-3.70 (11)**	0.90**
9	0.44 (0.26)	0.41 (0.23)	1.40 (11)	0.95**
10	0.50 (0.28)	0.40 (0.23)	2.44 (11)*	0.86**
11	0.44 (0.21)	0.41 (0.23)	0.72 (11)	0.84**
12	0.44 (0.30)	0.41 (0.23)	0.76 (11)	0.85**
13	0.43 (0.22)	0.41 (0.23)	0.97 (11)	0.94**
14	0.45 (0.30)	0.41 (0.23)	1.07 (11)	0.88**
15	0.42 (0.29)	0.42 (0.22)	0.30 (11)	0.95**
16	0.30 (0.17)	0.42 (0.24)	-2.46 (11)*	0.69*

N = 12.

M = mean.

SD = standard deviation.

R = Pearson correlation between panelist and panel mean.

<sup>a</sup> Panel mean excluding compared panelist.

\*\* p < 0.01.

\* p < 0.05.

exceeds the theoretical minimum and maximum values of DWs (0 and 1). Fig. 1 graphically displays the differences.

### 3.4. Disability weights for suicidality

The DW for suicidal thoughts is estimated to be 0.36 (SD = 0.16; 95% CI 0.05; 0.67). Expressed as a utility, this is 0.64 (SD = 0.16; 95% CI 0.33; 0.95). For mental distress

**Table 2**

External consistency. Paired sample t-test and Pearson correlation between each panelist and mean DW from previous studies.

Pair	Panelist M (SD)	Previous studies M (SD)	t (df)	r
1	0.57 (0.30)	0.41 (0.27)	6.50 (9)**	0.97**
2	0.44 (0.23)	0.41 (0.27)	0.44 (9)	0.70*
3	0.28 (0.24)	0.41 (0.27)	-4.73 (9)**	0.95**
4	0.49 (0.32)	0.41 (0.27)	1.85 (9)	0.89**
5	0.31 (0.25)	0.41 (0.27)	-3.58 (9)**	0.95**
6	0.36 (0.25)	0.41 (0.27)	-2.74 (9)*	0.98**
7	0.39 (0.43)	0.41 (0.27)	-0.19 (9)	0.65*
8	0.32 (0.23)	0.41 (0.27)	-2.11 (9)	0.86**
9	0.47 (0.29)	0.41 (0.27)	3.64 (9)**	0.98**
10	0.49 (0.30)	0.41 (0.27)	1.75 (9)	0.89**
11	0.45 (0.22)	0.41 (0.27)	0.67 (9)	0.75*
12	0.43 (0.33)	0.41 (0.27)	0.56 (9)	0.91**
13	0.42 (0.23)	0.41 (0.27)	0.54 (9)	0.98**
14	0.46 (0.33)	0.41 (0.27)	1.25 (9)	0.94**
15	0.41 (0.32)	0.41 (0.27)	0.14 (9)	0.90**
16	0.30 (0.18)	0.41 (0.27)	-1.50 (9)	0.59

N = 10.

M = mean.

SD = standard deviation.

r = Pearson correlation between panelist and mean previous studies.

\*\* p < 0.01.

\* p < 0.05.

**Table 3**  
Agreement between DWs of previous studies and current study.

Health state		Previous studies		Current study	
		DW	95% CI	DW	95% CI
1	Constitutional eczema	0.07 <sup>a</sup>	0.01; 0.13	0.08	−0.06; 0.22
2	Cataract	0.11 <sup>b</sup>	0.09; 0.14	0.14	−0.05; 0.33
3	Meningitis with permanent locomotor impairment	0.17 <sup>a</sup>	0.04; 0.30	0.25	−0.11; 0.61
4	Macular degeneration	0.25 <sup>b</sup>	0.21; 0.29	0.33 <sup>*</sup>	−0.10; 0.76
5	Moderate heart failure	0.35 <sup>a</sup>	0.19; 0.52	0.35	0.09; 0.61
6	Moderate rheumatoid arthritis	0.37 <sup>a</sup>	0.22; 0.52	0.33	0.05; 0.61
7	Moderate to severe depression	0.51 <sup>c</sup>	0.46; 0.56	0.39 <sup>*</sup>	0.09; 0.69
8	Severe heart failure	0.65 <sup>a</sup>	0.60; 0.71	0.75 <sup>*</sup>	0.42; 1.08
9	Meningitis with permanent locomotor and cognitive impairment	0.76 <sup>a</sup>	0.65; 0.87	0.75	0.46; 1.04
10	Severe depression with psychotic features	0.84 <sup>c</sup>	0.80; 0.88	0.74 <sup>*</sup>	0.40; 1.08

CI = confidence interval.

<sup>a</sup> Stouthard et al. (1997).

<sup>b</sup> De Hollander et al. (2006).

<sup>c</sup> Kruijshaar et al. (2005).

\* DW outside CI of previous studies.

involved in non-fatal suicide attempts, the DW is 0.46 (SD = 0.13; 95% CI 0.20; 0.72). This corresponds to a utility of 0.54 (SD = 0.13; 95% CI 0.29; 0.79).

#### 4. Discussion

This paper presents the DWs for suicidal thoughts and for mental distress of non-fatal suicide attempts. It is notable that our DW for attempted suicide is very similar to the DW estimated in the Australian burden of disease study for self-inflicted injuries (0.447) (Mathers et al., 1999). In contrast with the DW for physical injury after a suicide attempt (0.09) (Hoeymans and Schoemaker, 2010), the DW for mental distress involved in a non-fatal suicide attempt is relatively high. This implies that the disability of a non-fatal suicide attempt is largely attributable to the mental distress involved. When comparing the DW for suicidal thoughts with DWs for related psychiatric disorders, this shows that suicidal thoughts (0.36) are about as disabling as alcohol dependence (0.32) and cocaine dependence (0.33) (Smit et al., 2008). The DW for mental distress involved in non-fatal suicide attempts (0.46) is comparable with heroin dependence (0.43) (Smit et al., 2008) and the mean weight of 0.46 for the various manifesta-

tions of depressive disorder (Kruijshaar et al., 2005). Both the derived DWs are less severe than those for borderline personality disorder (0.54) (Mathers et al., 1999) and schizophrenia (0.71; several psychotic episodes and some permanent impairments) (Stouthard et al., 1997). When comparing the DWs for suicidality with somatic disorders, it becomes apparent that suicidal thoughts are as disabling as severe asthma (0.36) and moderate heart failure (0.35) (Stouthard et al., 1997). Non-fatal suicide attempts match the DW for initial stage Parkinson's (0.48) (Stouthard et al., 1997). The above comparisons demonstrate the severity of suicidality.

Suicidality is often co-morbid with or symptomatic of psychiatric disorders. In general, much more empirical research is needed to clarify and disentangle comorbidity in the light of DWs. Currently, there are two ways of dealing with co-morbidity, but these may not be adequate. The first is by using an additive model in which the DWs of the co-morbid disorders are simply added. However, this may lead to an overestimation of the disability and possibly a DW exceeding 1. A way to overcome this is by using a multiplicative model. This model assumes that the combination of two health states is equal to the multiplication of both DWs belonging to each of the component health states ( $DW_{12} = 1 - (1 - DW_1) \times (1 - DW_2)$ ) (Mathers et al., 1999). For example, if a person has alcohol dependence (DW = 0.32) and suicidal thoughts (DW = 0.36), the combined DW for both health states would be 0.56. As suicidality is regarded as a symptom of depression in the *DSM-IV-TR* it should be noted that our panel valued depression less severely than previous panels (0.39 versus 0.51 for moderate depression and 0.74 versus 0.84 for severe depression). This difference may have been caused by the implicit assumption of the panelists that suicidality was excluded from the descriptions of depression (while this was not the case). In future DW studies, it is recommended to bear this in mind.

##### 4.1. Future use of the DWs

As stated in the Introduction, DWs are an essential component in calculating DALYs and related metrics such as Quality Adjusted Life Years (QALYs; Dolan, 2000). Where data are available on necessary parameters (incidence and

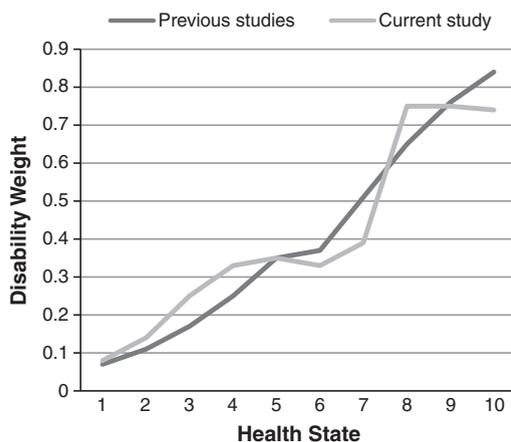


Fig. 1. Comparison of DWs of previous studies and the current study.

duration or point prevalence) the DWs estimated in this study can be used to calculate DALYs for suicidal thoughts and non-fatal suicide attempts. In the Netherlands, only data on year-prevalence are available. Using this would generate YLD of  $462,500 \times 0.36 = 166,500$  for suicidal thoughts and of  $99,600 \times 0.46 = 45,800$  for non-fatal suicide attempts. Adding the YLD of physical injury after attempted suicide (1400) and years of life lost (YLL) due to suicide (43,500) (Hoeymans and Schoemaker, 2010), would generate a total DALY disease burden of 257,100 for suicidality. Since no co-morbidity is taken into account and only data on year prevalence could be used, this calculation should be regarded as provisional. It should also be noted that a prevalence-based approach does not reflect recent changes in incidence and is mainly suitable for providing insight into present needs for health care, whereas an incidence-based approach would be more appropriate when estimating the effects of preventive interventions (Melse et al., 2000). Computing the DALY disease burden due to suicidal thoughts and behaviors would be valuable in informing debates regarding, for example, priority setting in health care and research funding.

The complement of the DW, the utility (U), can be used in calculating Quality Adjusted Life Years (QALYs) (Dolan, 2000). QALY can be described as a year of life, adjusted for its quality. A year in perfect health is expressed by 1, a year in ill health by a value between 1 and 0, depending on disease severity. QALYs are often used in cost-utility analyses of medical or psychological interventions. Interventions can then be ranked in terms of the cost of gaining one QALY, which is of use in decision-making by policymakers and public health planners. Following from this, DWs or Us can also be used in cost-effectiveness analyses of interventions, which provide information about which intervention offers better value for money than its alternative for gaining one QALY or avoiding one DALY. However, as mentioned in the Introduction, underlying assumptions and methodology for both health metrics have been criticized and should be taken into account when using the DWs.

#### 4.2. Strengths and limitations

There are several indications that our findings are valid. First, the internal consistency of our panel was high, indicating good agreement among the panelists. Second, a fair external consistency was found. Furthermore, the similarity of our DW for non-fatal suicide attempts to the DW estimated in the Australian burden of disease study for self-inflicted injuries (0.447) (Mathers et al., 1999) strengthens the reliability of our results.

The limitations of this study include the small panel of 16 experts, which resulted in relatively broad 95% confidence intervals. Also the fact that there is no standardized description or definition available of suicidal thoughts and non-fatal suicide attempts should be seen as a limitation. Furthermore, the DWs have been generated by an expert panel, whereas it is also possible to create a panel from a representative sample of the general population or people who experienced the health state directly. There is however no consensus in the literature on which kind of panel would be preferable. It is important to realize in this respect that using different kinds of panels may generate different estimations of the DWs. Patient panels for

example tend to rate health states better than the general public (Damschroder et al., 2005), and sometimes worse than expert panels (Suarez-Almazor et al., 2001). The agreement between expert panels and general public panels seems to be good (Schwarzinger et al., 2003). The decision to make use of an expert panel in this study was motivated by the fact that the studies with which we compared our results likewise made use of expert panels. Another, related, limitation may lie in the fact that the experts were not asked about personal experiences with any of the valued health states, which may have biased the results. However, since no outliers were detected in the analyses, there are no direct indications that any personal experiences have strongly affected the results. A final limitation lies in the fact that the DWs have been generated in a West European, high income country, which may limit the generalizability of the findings.

#### Role of funding source

Funding for this study was provided by the Ministry of Health, Welfare and Sport of the Netherlands. The ministry had no further role in the study design; in the collection, analysis and interpretation of data; in the writing of the report; and in the decision to submit the paper for publication.

#### Conflict of interest

The authors declare that they have no conflicts of interest.

#### Acknowledgments

The authors like to thank the experts who kindly took the time to value the health states in their busy schedules.

#### References

- Ahrens, B., Linden, M., 1996. Is there a suicidality syndrome independent of specific major psychiatric disorder? Results of a split half multiple regression analysis. *Acta Psychiatr. Scand.* 94, 79–86.
- American Psychiatric Association, 2000. *Diagnostic and Statistical Manual of Mental Disorders*. Author, Washington, DC (4th ed., text revision).
- Anand, S., Hanson, K., 1997. Disability-adjusted life years: a critical review. *J Health Econ* 16, 685–702.
- Brazier, J., 2008. Valuing health states for use in cost-effectiveness analysis. *Pharmacoeconomics* 26, 769–779.
- Cavanagh, J.T.O., Carson, A.J., Sharpe, M., Lawrie, S.M., 2003. Psychological autopsy studies of suicide: a systematic review. *Psychol. Med.* 33, 395–405.
- Damschroder, L.J., Zikmund-Fisher, B.J., Ubel, P.A., 2005. The impact of considering adaptation in health state valuation. *Soc Sci Med* 61, 267–277.
- De Hollander, A.E.M., Hoeymans, N., Melse, J.M., Van Oers, J.A.M., Polder, J.J., 2006. *Care for Health. The 2006 Dutch Public Health Status and Forecasts Report* (RIVM Report 270061003, in Dutch). RIVM, Bilthoven.
- De Leo, D., Burgis, S., Bertolote, J.M., Kerkhof, A.J.F.M., Bille-Brahe, U., 2006. Definitions of suicidal behavior, lessons learned from the WHO/EURO multicentre study. *Crisis* 27, 4–15.
- Dolan, P., 2000. The measurement of health-related quality of life for use in resource allocation decisions in health care. In: Culyer, A.J., Newhouse, J.P. (Eds.), *Handbook of Health Economics*. Elsevier Science B.V., Amsterdam, pp. 1723–1760.
- Gold, M.R., Stevenson, D., Fryback, D.G., 2002. HALYs and QALYs and DALYs, oh my: similarities and differences in summary measures of population health. *Annu. Rev. Public Health* 23, 115–134.
- Harvard Initiative for Global Health, 2009. *Institute for Health Metrics and Evaluation at the University of Washington, Johns Hopkins University, University of Queensland, World Health Organization. The Global Burden of Diseases, Injuries, and Risk Factors Study. Operations Manual*.
- Hoeymans, N., Schoemaker, C.G. (Eds.), 2010. *The Burden of Disease of Suicide and Attempted Suicide*. RIVM, Bilthoven (Report 270342001/2010, in Dutch).
- Janssen, M.F., Birnie, E., Bonsel, G.J., 2008a. Quantification of the level descriptors for the standard EQ-5D three-level system and a five-level version according to two methods. *Qual. Life Res.* 17, 463–473.
- Janssen, M.F., Birnie, E., Haagsma, J.A., Bonsel, G.J., 2008b. Comparing the standard EQ-5D three-level system with a five-level version. *Value Health* 11, 275–284.

- Kerkhof, A.J.F.M., Mulder, S., Draisma, J.A., 2007. Suicide attempts treated in Dutch hospitals (in Dutch). *TSG* 85, 37–42.
- Krabbe, P.F.M., Stouthard, M.E.A., Essink-Bot, M., Bonsel, G.J., 1999. The effect of adding a cognitive dimension to the EuroQol multiattributable health-status classification system. *J. Clin. Epidemiol.* 52, 293–301.
- Kruijshaar, M.E., Hoeymans, N., Spijker, J., Stouthard, M.E.A., Essink-Bot, M., 2005. Has the burden of depression been overestimated? *Bull. World Health Organ.* 83, 443–448.
- Marquet, R.L., Bartelds, A.I.M., Kerkhof, A.J.F.M., Schellevis, F.G., van der Zee, J., 2005. The epidemiology of suicide and attempted suicide in Dutch general practice. *BMC Fam. Pract.* 6, 45.
- Mathers, C., Vos, T., Stevenson, C., 1999. The Burden of Disease and Injury in Australia. AIHW Cat. No. PHE 17. Canberra: AIHW.
- Melse, J.M., Essink-Bot, M., Kramers, P.G.N., Hoeymans, N., 2000. A national burden of disease calculation: Dutch disability adjusted life years. *Am. J. Public Health* 90, 1241–1247.
- Mont, D., 2007. Measuring health and disability. *Lancet* 369, 1658–1663.
- Murray, C.J.L., Lopez, A.D. (Eds.), 1996. *The Global Burden of Disease: a Comprehensive Assessment of Mortality and Disability from Diseases, Injuries and Risk Factors in 1990 and Projected to 2020*. Harvard University Press, Cambridge.
- Murray, C.J.L., Salomon, J.A., Mathers, C., 2000. A critical examination of summary measures of population health. *Bull. World Health Organ.* 78, 981–994.
- Nock, M.K., Borges, G., Bromet, E.J., Cha, C.B., Kessler, R.C., Lee, S., 2008. Suicide and suicidal behavior. *Epidemiol. Rev.* 30, 133–154.
- Nord, E., 1995. The person trade-off approach to valuing health care programs. *Med. Decis. Making* 15, 201–208.
- Nord, E., Daniels, N., Kamlet, M., 2009. QALYs: some challenges. *Value Health* 12 (suppl 1), s10–s15.
- Oquendo, M.A., Baca-Garcia, E., Mann, J.J., Giner, J., 2008. Issues for DSM-V: suicidal behavior as a separate diagnosis on a separate axis. *Am. J. Psychiatry* 165, 1383–1384.
- Schwarzinger, M., Stouthard, M.E.A., Burström, K., Nord, E., 2003. Cross-national agreement on disability weights: the European Disability Weights Project. *Popul Health Metr* 1, 9.
- Sinclair, J.M.A., Hawton, K., Gray, A., 2010. Six year follow-up of a clinical sample of self-harm patients. *Journal of Affective Disorders* 121, 247–252.
- Smit, F., Van Laar, M., Croes, E., Busschbach, J., 2008. *Disability Weights for Drug and Alcohol Dependence, Misuse and Harmful Use* (in Dutch). Trimbos-instituut, Utrecht.
- Statistics Netherlands, 2010. StatLine Database. <http://statline.cbs.nl/statweb/>. Accessed May 3 2010.
- Stouthard, M.E.A., Essink-Bot, M., Bonsel, G.J., 2000. Disability weights for diseases, a modified protocol and results for a Western European region. *Eur. J. Public Health* 10, 24–30.
- Stouthard, M.E.A., Essink-Bot, M., Bonsel, G.J., Barendregt, J., Kramers, P., Van de Water, H., Gunning-Schepers, M., Van der Maas, P., 1997. *Disability Weights for Diseases in the Netherlands*. Department of Public Health, Erasmus University, Rotterdam.
- Suarez-Almazor, M.E., Conner-Spady, B., Kendall, C.J., Russel, A.S., Skeith, K., 2001. Lack of congruence in the ratings of patients' health status by patients and their physicians. *Med. Decis. Making* 21, 113–121.
- Ten Have, M., De Graaf, R., Van Dorsselaer, S., Verdurmen, J., Van't Land, H., Vollebergh, W., 2006. Suicidal thoughts and suicide attempts in the general population. Results from the 'Netherlands Mental Health Survey and Incidence Study' (NEMESIS) (in Dutch). Trimbos-Instituut, Utrecht.
- Vos, T., Mathers, C., Herrman, H., Harvey, C., Gureje, O., Bui, D., Watson, N., Begg, S., 2001. The burden of mental disorders in Victoria, 1996. *Soc. Psychiatry Psychiatr. Epidemiol.* 36, 53–62.
- Ware, J.E., Snow, K.K., Kosinski, M., Gandek, B., 1993. *SF-36 Health Survey: Manual and Interpretation Guide*. The Health Institute, New England Medical Center, Boston, MA.
- WHO, 2007. *International Statistical Classification of Diseases and Health Problems 10th Revision*. World Health Organisation, Geneva.
- WHO, 2008a. *The Global Burden of Disease: 2004 Update*. World Health Organisation, Geneva.
- WHO, 2008b. *World Health Organisation: Suicide Prevention (SUPRE)*. World Health Organisation, Geneva.