

Practical Application to Include future Disease costs

User manual PAID 1.0

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PAID 1.0 is a toolkit that enables researchers to incorporate future medical costs in their economic evaluations. PAID 1.0 calculates annual per capita health expenditures stratified by sex, age and proximity to death. PAID 1.0 consists of a series of worksheets in Excel in which users can select diseases they want to exclude if they have already modeled costs of these diseases. In this document, it is briefly explained how to use PAID 1.0.

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Introduction

Conceptual model PAID 1.0

In PAID 1.0 it is assumed that total health care expenditure can be explained by age, sex and time to death and that the relation between costs and these three variables differs per disease and per health care provider. Based on this assumption lifetime health care costs can be estimated by summing up annual age specific costs specified by disease and health care provider distinguishing the last year of life and other years:

$$lhc(g) = \sum_a \sum_i \sum_j^{n-1} sc(a, g)_{i,j} + \sum_i \sum_j dc(g)_{i,j}$$

with

$lhc(g)$ lifetime health care costs for an individual gender g

a age in years

n age at death

dc decedents costs: per capita health care costs in the last year of life

sc survivor costs: per capita health care costs in all other years

i index for diseases

j index denoting the health care provider

To produce consistent estimates of disease specific costs for survivors and decedents we combined information from several data sources. As backbone we used the Costs of Illness (COI) study data for the Netherlands (Poos et al. 2008). In that study the 2005 total direct health care costs in different health care settings in the Netherlands were uniquely attributed to 107 disease categories (including rest categories as ‘not disease related’) and 8 categories of healthcare providers, specified by gender and age. In PAID 1.0 the annual health care expenditures per capita are partitioned into annual per capita expenditure in the last year of life and all other

years for all diseases and five categories of health care providers. For more details on how this is accomplished we refer to (van Baal et al.).

Output PAID 1.0


The output of PAID 1.0 consists of per capita annual health care expenditure summed over all disease categories that are selected in PAID 1.0 stratified by health care provider, sex, age and proximity to death. The estimates of annual per capita health care expenditures can be used in economic evaluations. For instance, these estimates can be combined with the survivor curves of the intervention and null scenario to estimate differences in costs for a set of diseases. The number of survivors in the scenarios can be multiplied with survivor costs of the selected diseases and the number of deaths in both scenarios can be multiplied by the decedent costs of these diseases estimated by PAID.

PAID 1.0: the Microsoft Excel worksheets

PAID 1.0 consists of a series of worksheets in Excel in which users can select diseases they want to exclude their costs from the estimates of per capita health expenditure if they have already modeled costs of these diseases themselves to avoid double counting of costs. For the user PAID 1.0 consists of three worksheets (sheets with data are hidden from the user but are available upon request):

- the 'Selections' worksheet: on this worksheet the user can select the diseases he/she wants to include in the calculation of per capita health expenditures;
- the 'Output' worksheet: this worksheet displays estimates of per capita annual health expenditures summed over the selected diseases;
- the 'OutputGraphs' worksheet: this worksheet displays graphically the estimates of the per capita annual health expenditures summed over the selected diseases.

Figure 1 displays a screenshot of part of the PAID 1.0 'Output' worksheet.



Per capita annual health care expenditure selected diseases

Price level: € 2005

Number of diseases included: 107

Number of diseases excluded: 0

<u>All health care providers combined</u>					<u>Hospitals</u>					<u>Nursing and residential care facilities</u>					<u>Providers</u>	
Last year of life			Other years		Last year of life			Other years		Last year of life			Other years		Last year	
Age	Men	Women	Men	Women	Age	Men	Women	Men	Women	Age	Men	Women	Men	Women	Age	Men
78,5	31.830	35.951	7.342	7.883	78,5	17.566	17.784	2.572	2.344	78,5	7.961	12.591	1.452	2.153	78,5	2.888
79,5	31.396	36.102	7.627	8.386	79,5	16.798	17.046	2.592	2.375	79,5	8.165	13.419	1.624	2.508	79,5	2.961
80,5	30.995	36.193	7.933	8.930	80,5	16.013	16.238	2.603	2.394	80,5	8.413	14.237	1.828	2.912	80,5	3.043
81,5	30.675	36.204	8.275	9.511	81,5	15.223	15.351	2.603	2.395	81,5	8.743	15.036	2.075	3.364	81,5	3.135
82,5	30.459	36.142	8.667	10.128	82,5	14.421	14.392	2.591	2.376	82,5	9.186	15.814	2.381	3.868	82,5	3.243
83,5	30.307	36.032	9.109	10.781	83,5	13.600	13.395	2.567	2.340	83,5	9.712	16.565	2.746	4.421	83,5	3.365

Figure 1: Screenshot of part of the PAID 1.0 'Output' worksheet

Figure 1 nicely illustrates the output generated by PAID 1.0. First of all, on top it is displayed that the per capita annual health expenditures are based on all 107 disease categories and thus, that no disease category is excluded. The yellow-shaded areas in Figure 1 display estimates of per capita annual health care expenditures (which in this case are total annual per capita health care expenditures since all disease categories are included). For instance, if we look at the first yellow column on the left we can see that the average per capital health care expenditure of a 78.5 year old man equals €7,342 if he does not die at that age but equals €31,830 if he dies at that age. The other yellow-shaded areas on the 'Output' worksheet display estimates of annual per capita health expenditures for each health care provider distinguished in PAID 1.0. Thus, if we take the example of a 78.5 year old man that does not die at that age, his annual per capita expenditure of €7, 342 consists of €2,572 of hospital care expenditures.

The 'OutputGraphs' worksheet consists simply of a series of graphs that graphically display the numerical data of the 'Output' worksheet. Figure 2 displays a graph displayed in the 'OutputGraphs' worksheets. From this figure it can be seen that per capita annual health expenditures are much larger in the last year of life compared to other years.

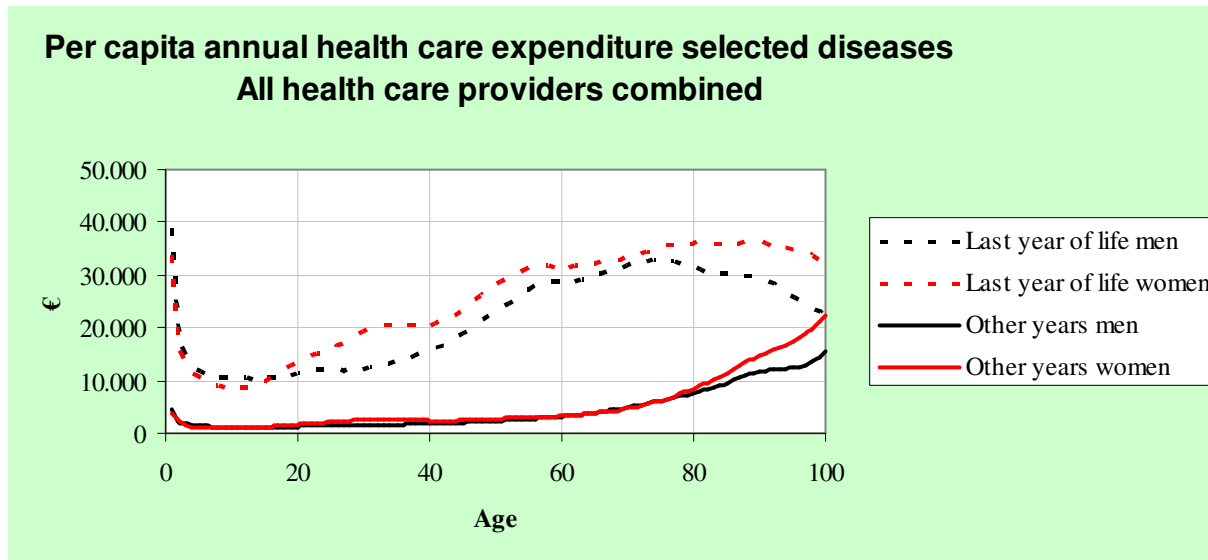


Figure 2: Screenshot of part of the PAID 1.0 'OutputGraphs' worksheet

If the user wants to alter his or her selection of diseases the 'Selections' worksheets needs to get focus. Figure 3 displays a screenshot of part the 'Selections' worksheet. The 'Selections' worksheet is nothing but a series of checkboxes (107 in total corresponding to the number of disease categories distinguished in the Dutch Costs of Illness study and PAID 1.0) indicating whether a disease is included (then the box is checked) or excluded (then the box is unchecked). In Figure 3 all checkboxes are checked and all diseases are thus included. In this case the output of PAID 1.0 equals the output displayed in Figures 1 and 2.



Infectious and parasitic disease	Mental and behavioral disorders	Diseases of the respiratory system
<input checked="" type="checkbox"/> Intestinal infectious diseases	<input checked="" type="checkbox"/> Dementia	<input checked="" type="checkbox"/> Acute upper respiratory infections
<input checked="" type="checkbox"/> Tuberculosis	<input checked="" type="checkbox"/> Schizophrenia	<input checked="" type="checkbox"/> Pneumonia and influenza
<input checked="" type="checkbox"/> Meningitis	<input checked="" type="checkbox"/> Psychotic disorders excluding schizophrenia	<input checked="" type="checkbox"/> Asthma and chronic obstructive pulmonary disease (COPD)
<input checked="" type="checkbox"/> Septicemia	<input checked="" type="checkbox"/> Depression	<input checked="" type="checkbox"/> Other respiratory diseases
<input checked="" type="checkbox"/> HIV/AIDS	<input checked="" type="checkbox"/> Anxiety	Diseases of the digestive system
<input checked="" type="checkbox"/> Sexually transmitted diseases	<input checked="" type="checkbox"/> Personality disorders	<input checked="" type="checkbox"/> Dental caries
<input checked="" type="checkbox"/> Hepatitis	<input checked="" type="checkbox"/> Alcohol and drugs	<input checked="" type="checkbox"/> Periodontitis
<input checked="" type="checkbox"/> Other infectious diseases	<input checked="" type="checkbox"/> Other mental disorders	<input checked="" type="checkbox"/> Loss of teeth

Figure 3: Screenshot of part of the PAID 1.0 'Selections' worksheet

If the user wants to exclude the costs of certain diseases he/she needs to uncheck that disease on the 'Selections' worksheet. As an example, Figure 4 displays how the costs of Dementia can be excluded from the estimates of annual per capita health expenditures.

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Select diseases

Infectious and parasitic disease

- ☒ Intestinal infectious diseases
- ☒ Tuberculosis
- ☒ Meningitis
- ☒ Septicemia
- ☒ HIV/AIDS
- ☒ Sexually transmitted diseases
- ☒ Hepatitis

Mental and behavioral disorders

- ☒ Dementia
- ☒ Schizophrenia
- ☒ Psychotic disorders excluding schizophrenia
- ☒ Depression
- ☒ Anxiety
- ☒ Personality disorders
- ☒ Alcohol and drugs

Diseases of the respiratory system


- ☒ Acute upper respiratory infections
- ☒ Pneumonia and influenza
- ☒ Asthma and chronic obstructive pulmonary disease (COPD)
- ☒ Other respiratory diseases

Diseases of the digestive system

- ☒ Dental caries
- ☒ Periodontitis

Figure 4: Screenshot of part of the PAID 1.0 'Selections' worksheet. Excluding the costs of Dementia

Figures 5 and 6 display the revised estimates of annual per capita health expenditures excluding the costs of Dementia.



Per capita annual health care expenditure selected diseases

Price level: € 2005

Number of diseases included: 106

Number of diseases excluded: 1

<u>All health care providers combined</u>					<u>Hospitals</u>					<u>Nursing and residential care facilities</u>					<u>Providers</u>	
Last year of life			Other years		Last year of life			Other years		Last year of life			Other years		Last year	
Age	Men	Women	Men	Women	Age	Men	Women	Men	Women	Age	Men	Women	Men	Women	Age	Men
78.5	27,707	29,509	6,744	6,845	78.5	17,463	17,700	2,562	2,333	78.5	3,965	6,256	879	1,147	78.5	2,881
79.5	27,079	29,126	6,929	7,143	79.5	16,690	16,959	2,581	2,362	79.5	3,984	6,556	956	1,302	79.5	2,953
80.5	26,452	28,704	7,115	7,452	80.5	15,900	16,150	2,591	2,380	80.5	4,015	6,868	1,044	1,476	80.5	3,033
81.5	25,863	28,234	7,310	7,768	81.5	15,107	15,263	2,589	2,380	81.5	4,083	7,193	1,149	1,670	81.5	3,125
82.5	25,328	27,730	7,522	8,088	82.5	14,302	14,305	2,576	2,360	82.5	4,214	7,536	1,281	1,885	82.5	3,232
83.5	24,824	27,199	7,756	8,415	83.5	13,479	13,309	2,551	2,323	83.5	4,393	7,875	1,443	2,123	83.5	3,354

Figure 5: Screenshot of part of the PAID 1.0 'Output' worksheet (costs of dementia excluded)

From Figure 5 it can be seen that the per capita annual health expenditures are based on 106 disease categories and that one disease category (dementia) is excluded. If we now look at the first yellow column on the left we can see that the average per capital health care expenditure of a 78.5 year old male has dropped to €6,744 if he does not die at that age and has dropped to €27,707 if he dies at that age due to exclusion of the costs of dementia.

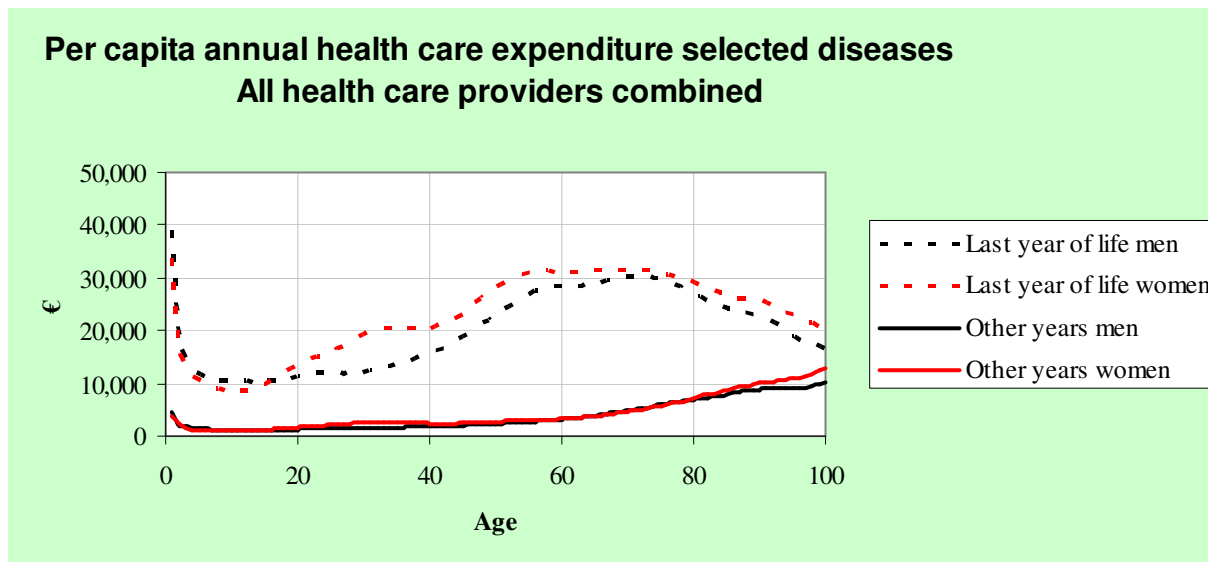


Figure 6: Screenshot of part of the PAID 1.0 'OutputGraphs' worksheet (costs of dementia excluded)

References

- Poos, M.J., Smit, J., Groen, J., Kommer G.J. and Slobbe, L. (2008) *Kosten van ziekten in Nederland 2005: Zorg voor euro's-8*. Bilthoven: Rijksinstituut voor Volksgezondheid en Milieu.
- Van Baal, P.H., Wong, A., Slobbe, L., Polder, J.J., Brouwer, W.B., de Wit, G.A. (2011) *Standardizing the inclusion of indirect medical costs in economic evaluations*. *Pharmacoeconomics* 29(3):175-87