

# The economic burden of the care and treatment for people with Alzheimer's disease: the outlook for the Czech Republic

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**Abstract** The aim of this paper is to specify the cost of treatment and care for people with Alzheimer's disease (AD) in the Czech Republic and also with a view to the future. Data availability is evaluated as well as the quality of cost comparison with other developed countries. Data for the Czech Republic will include data from the health insurance company regarding medicines and treatment, as well as a selected home caring for people with dementia and, ultimately, the Social Security Administration. The basic methods include an analysis of data from publicly available sources, direct interviews with the representatives of nursing homes caring for people with dementia and the representative of the Social Security Administration of the Czech Republic. Items will be specified within the category of direct costs. For the study, the indirect costs related to the loss of patient as well as caring person productivity are not considered. Costs for treatment and care are based from the data on 4162 patients, the costs of a bed from data on 391 beds in homes for the elderly. The average annual cost per patient with AD in the Czech Republic was calculated and came to the amount of 12,783 EUR. These items include outpatient care, inpatient care in a medical facility, inpatient care in homes and medications. In terms of share of these items on the direct costs, the largest item are services provided by special homes which contributes to the direct costs by 94 %, medications create 1 % and treatment (both outpatient and inpatient) 5 %. In the case of home care the total costs are lower at 4698 EUR. The

Czech Republic as well as other developed countries are faced with the problem of unified accounting cost of people suffering from Alzheimer's disease. This then causes the calculation of the economic burden to be very difficult and indicative values.

**Keywords** The economic burden · Alzheimer's disease · The costs of treatment and care · The Czech Republic

## Introduction

Dementia occurs as a consequence of brain diseases. It is a deterioration of mental and cognitive activities. The centre of these operations is stored in the brain. Cognitive functions enables a human to perceive, respond to stimuli, to talk, to understand the information disclosed, to navigate in space, as well as memory, concentration and attention [1]. The number of people with dementia is increasing every year. Worldwide in 2013, there were 37 million people who were diagnosed with dementia, in Europe about 6 million, and in the Czech Republic 143,000 people. In 2014, the total number increased to 46.8 million people with dementia. In Europe, there were 7.4 million people with the disease and in the Czech Republic 153,000 people [2, 3]. The most common is Alzheimer's disease [2].

Increasing numbers of patients represent economic burden [4–6]. Many studies have evaluated the costs of AD [7, 8]. Some studies have focussed on the relationship between severity and cost [8, 9]. Others targeted the effect of drug therapies on the cost of dementia [10, 11], neuropsychiatric disorders [12], functional and the patients dependency grade [13] and co-morbid medical conditions. Reese et al. (2011) [14] reported service use and costs for patients with Alzheimer's disease (AD) and explored the

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incremental influence of socio-demographic and illness-related determinants in ambulatory and inpatient settings throughout the German health care system. Dodel et al. [15] identified the main factors associated with societal costs of Alzheimer's disease (AD) in community-dwelling patients across three European countries. Mean monthly costs per patient differed for France (€1881), Germany (€2349), and the UK (€2016), with informal care costs accounting for 50 % to 61 %. Bloom et al. [16] determined the validity and policy relevance of recent estimates from many countries of Alzheimer's disease (AD) costs. Their conclusion in 2002 showed that the cost of AD is high, although reliable estimates are not available.

The aim of this paper is to specify the cost of treatment and care for people with Alzheimer's disease in the Czech Republic and also with a view to the future. The data source for the Czech Republic will be health insurance company data regarding medicines and treatment, as well as the selected nursing home caring for people with dementia and ultimately, the Social Security Administration.

## Methods

Data for the analysis of costs and calculation of the expected economic burden were obtained from publicly available sources such as: Institute of Health Information and Statistics of the Czech Republic, Ministry of Labour and Social Affairs, the World Health Organisation and a health insurance company. Data related to the cost of a bed in a nursing home were obtained through an unstructured interview with the Head of the "Home at the fountain" and on the basis of the data of 391 beds. An open-ended question method was chosen for the work that allowed for a more detailed description of the issues discussed. This organisation focuses on providing care to seniors and people with dementia, to whom they provide a continuous service. What kind of client belongs in such an institute was discussed, and also at what stage of the disease, or what other options a family caring for a person with dementia has. Information regarding medicines and treatments are based on a sample of 4162 patients of a health insurance company.

The information obtained about the individual cost items were further classified into direct and indirect costs. Direct costs ensure the establishment and operation of the medical programme. The costs are understood as the sources and variable as well as fixed costs are taken into account [17]. Indirect costs related to the loss of productivity of the patient as well as caring person were not taken into consideration. For the analysis for the Czech Republic, the following expenditures were considered:

- Medicines
- Treatment: inpatient and outpatient care, visits to a general practitioner,
- Bed in a nursing home
- Informal care of caregivers.

Fulfilling the objective is then performed in three steps:

- Determination of the anticipated development of the number of people with Alzheimer's disease in the Czech Republic,
- Characteristics of the monitored costs,
- Calculating the expected economic burden for the Czech Republic.

## Results: expected economic burden in the Czech Republic

Estimates of the economic burden in the Czech Republic are based on data on the prevalence of people and from the surveyed costs.

### Development of the number of people with dementia and Alzheimer's disease for the Czech Republic

The anticipated trends in the number of people with dementia and Alzheimer's disease for the Czech Republic have a growing development as well as worldwide. In 2020, approximately 113,460 inhabitants with this disease are expected to live in the Czech Republic. About 30 years later, this number should be doubled [2] (Fig. 1).

### Characteristics of the monitored costs

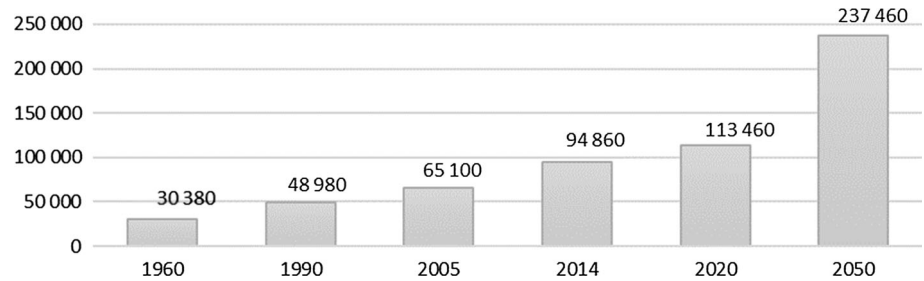
Costs for treatment of this disease are hardly traceable in the Czech Republic. We cannot say that the data are effectively grouped, so it was quite difficult to get the data from which it would be possible to create a cost analysis. Within this study we considered the expenditure for:

- Medication
- Treatment: inpatient and outpatient care,
- A bed in a nursing home.

### The cost of medication and treatment

Data on the cost of medication and treatment were obtained from the Departmental Health insurance company with 4162 patients in total and are presented in Table 1. Drugs are from N06DA02 group for the treatment of dementia, acetylcholinesterase inhibitors. Their active ingredient is donepezil. ACT N06DA02 group includes a number of

**Fig. 1** Expected trends in the number of people with AD in the Czech Republic. Source: own processing based on data from [2]



**Table 1** The costs of drugs and treatment of Alzheimer's disease. Source: own processing based on data from the insurance company

Year	Number of insured persons with AD	Total cost of treatment without drugs (€)	Average cost of treatment without drugs (€)	Total treatment costs incl. medication (€)	Average treatment costs incl. medication (€)
2013	1218	734,608	603	944,361	775
2014	1388	933,543	673	1,122,162	808
2015	1556	1,071,207	688	1,251,851	805

**Table 2** Overview of the cost of a bed in specialised institutions in 2014. Source: own processing based on data from the Regional Office of the Pardubice Region

Institution	Number of beds	Annual costs (€)	The annual cost per bed (€)	Average monthly cost (€)
Home for elderly	49	589,806	12,037	1003
Fountain home	174	2,107,801	12,114	1009
Pardubice Social services	168	1,977,536	11,771	981

authorised medicines, for example, adonep, alzil aricept, donepezil, donpethon, dospelin, kognezil, landex, promemore and yasnal. [18]

The treatment costs include inpatient and outpatient care that is provided to people with Alzheimer's disease to improve or maintain their health condition. For more detailed finding of what healthcare items are included in the outpatient care we used data that were obtained under investigation at the University Hospital in Hradec Kralove in 2014 in the Czech Republic. Information was provided by the Head of the neurology clinic. As part of outpatient care there are ongoing the following examinations:

- Initial visit to a neurologist—comprehensive as well as targeted (30€),
- Second visit to a neurologist with the participation of the monitored person (18€),
- Blood sampling 2× per year (15€),
- Cerebrospinal fluid sampling 1× per year (34€).

Total amount was 97€ per year per patient.

#### Costs for a bed

Costs for a bed in specialised facilities (special homes), providing assistance with normal activities (dressing,

eating, hygiene), provided care of doctors and nurses, were collected for 391 beds in the Czech Republic. The costs were based on three homes for the elderly, where after mutual comparison it is apparent that the average monthly cost is very similar (Table 2).

Standardised data indicate that around a quarter (26 %) of people with dementia uses outpatient health care and less than 6 % uses inpatient care [3]; thus 25 % of inpatient care and 75 % of home care. Cost calculation of home care is based on public available data, which indicate that informal caregivers provide about 10 h of care per day [2]. Costs are determined on the basis of average wage in the Czech Republic which is 1038 EUR [19]. It is considered that informal caregivers spend 50 h per month, i.e. 600 h per year. Opportunity costs are therefore 3889 EUR per year per patient.

Table 3 presents the average direct cost per client per month or year for the selected items, which were managed to be traced. These are the costs, which are described above. The highest item are the services provided by special homes, which contributes to the direct costs by 94 %, drugs make up 1 and 5 % consists of treatment. The average direct costs per client are € 1065 per month. It is important to realise that there are not included all items that concern the cost with Alzheimer's disease. Other costs that

**Table 3** Summary of the direct costs for the Czech Republic in 2014. Source: own processing

Individual costs in 2014	Average monthly cost (€)	Average annual cost (€)
Medication	11	136
Treatment	56	673
Costs of bed in special homes	998	11,974
Total	1065	12,783

**Table 4** An overview of development of the population, the number of people with AD and dementia. Source: own processing based on data from [2, 19]

	2014	2020	2050
Population	10,538,275	10,797,484	10,842,320
Number of people 65+	1,880,000	2,088,333	2,956,079
Persons with dementia	153,000	183,000	383,000
Persons with AD	94,860	113,460	237,460
25 % persons with AD	23,715	28,365	59,365
75 % persons with AD	71,145	85,095	178,095
Cost of AD	637,388.06	762,366.11	1,595,553.1

could be considered, include spending on medical aids, non-medical services, home health care, ambulance service and diagnostic or laboratory tests.

Data from the Hradec Kralove University Hospital specify outpatient and inpatient care. In the preceding table the category of medication includes outpatient and inpatient care, the amount of which is equal to € 673 for the year 2014. The University Hospital in the Czech Republic provided the amount of such costs for each item separately, where costs for outpatient care 12.3 % and inpatient care is 87.7 % were established.

### Calculation of the expected economic burden for the Czech Republic

Expected development of the direct costs of care and treatment of Alzheimer's disease in the Czech Republic is based on the calculated costs attributable to the 2014 and development of people with this diagnosis. Table 4 shows the evolution of the number of people older than 65 years, the estimated number of people with dementia and Alzheimer's disease for years 2020 and 2050 and the corresponding costs. The prevalence of dementia was 1.45 % for the Czech Republic in 2014. Estimation of the development of the direct costs for Alzheimer's disease treatment in the Czech Republic set for 2020 and 2050 consists of multiplying the expected development of number of patients by average costs per year.

Costs per year consist of the cost of medication, treatment, costs of bed in special homes (25 % of people with dementia) and costs of home care (opportunity method—75 % of people with dementia). The calculation does not consider a change in the price level.

Total costs in case of home care: 4686 EUR per year.

Total costs in case of institutional care: 12,783 EUR per year.

Formula: 25 % of estimated number of people with AD \* costs in case of institutional care +75 % of estimated number of people with AD \* costs in case of home care of informal caregivers.

It is important to note that it considers the situation where it is assumed that every person diagnosed with Alzheimer uses social service facilities. The cost of the bed is, therefore, multiplied by the number of persons with the disease, regardless of the percentage of people using this service (data of this type are not currently monitored in the Czech Republic).

### Discussion

The average annual cost per patient with AD in the Czech Republic was calculated and came to the amount of 12,783 EUR in the case of institutional care and 4686 EUR per year in case of home care. These items are including outpatient care, inpatient care in a medical facility, inpatient care in homes and medication. In terms of share of these items on the direct costs, the largest item services provided by special homes, which contributes to 94 % of the direct costs, up to 1 % is accounted to medication and treatment (both outpatient and inpatient) is 5 %. Despite all efforts to express the costs as accurately as possible, the above amount is indicative and does not provide information regarding the overall economic burden on the country in relation to the number of registered persons with AD. For clarification of this it would be necessary to obtain more detailed information concerning the direct costs, particularly in relation to the proportion of patients with AD who are cared for at home, or those who do not yet require constant assistance and are still self-sufficient. Therefore, it is not necessary to calculate the cost of each bed in homes for them and at the same time it is necessary to begin to record data about people in home care, which are not included in this calculation. At present there is no such evidence in the Czech Republic, which would have the information available.

Similarly, lots of data coming from foreign studies have the same problem. For example, Gervès et al. [20] state that the average direct costs in France are 8892 EURO per year and the cost varies significantly with the

**Table 5** Comparison of costs availability. Source: own processing based on data from [20–22], and own calculations

Individual costs	Germany	France	Czech Rep.	Czech Rep.: own calculation
Treatment	2400	2472	1080	673
Medication	1608	3720	996	136
Home health care	672	2700	×	(3888)
Hospital stay	3912	×	×	×
Costs of bed in the special homes	×	×	×	11,974
Remaining services	816	×	1020	×
Total direct costs (€)	9408	8892	3096	12,783

progress of the disease. The highest item was represented by the cost of drugs that help maintain cognitive function, alleviate anxiety and depression, eliminate aggressive behaviour or improve sleep. This expenditure was compared with research in the Czech Republic and was up to 27 times higher—spending on medicines in France was € 3720, in the Czech Republic it was € 136. However, individual items of direct costs are not itemised so that it is possible to deduce in what way the expenses fundamentally differ compared to the Czech Republic. Furthermore, Schwarzkopf et al. [21] drafted a very good study, where the costs are divided into many sub-categories, not only into medical and non-medical costs. The costs were determined for people with mild dementia, as well as moderate dementia, which allowing for the observation of the differences in spending. The annual average costs regardless of the type of dementia amounted to €9408. These expenditures were the second highest after the Czech Republic, although unlike the Czech Republic they still do not reflect the cost of a bed in special homes. Another study from the Czech Republic [22] amounting to 3096 EURO does not reflect the price per bed in special homes, takes into account only some selected additional services to improve quality for the patients. Retrievable items of individual studies are compared in Table 5.

This situation calls for a unified registration and data evidence at least within Europe.

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**Compliance with ethical standards**

**Conflict of interest** The authors declare that they have no competing interests to declare.

**Availability of data and materials** All the data and materials in this manuscript will be shared.

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