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HEALTH STATUS AND HEALTHCARE SYSTEM BUDGETING IN ISRAEL IN THE CONTEXT OF DISABILITY-ADJUSTED LIFE YEARS (DALYS)

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Health Status and Healthcare System Budgeting in Israel in the Context of Disability-Adjusted Life Years (DALYs)

Dov Chernichovsky and Liora Bowers*

Abstract

This chapter briefly presents Israel's healthcare system in the context of the Disability-Adjusted Life Years (DALYs) metric. While accepted metrics in the healthcare system in Israel and in general often evaluate mortality, the Disability-Adjusted Life Years measure estimates disease burden that is caused either by premature death or by morbidity and disability, thus giving a more complete picture of health status in the country. An examination of the health status of Israelis shows that while cardiovascular diseases and major cancers are responsible for 42 percent of mortality, their contribution to overall disease burden as measured by DALYs stands at only 18 percent. In contrast, orthopedic problems and major depressive disorders, which contribute to 19 percent of overall disease burden, are almost non-existent among the causes of death. In terms of budgeting for the public healthcare system, current allocations for the 15-54 year-old age groups, populations which are very important in terms of their role within households and in the labor market, are relatively low compared to this group's share of disease burden. This study also found that the Health Basket Committee dedicates almost half of its annual budget to cancer-related illnesses and treatment, which are among the main causes of mortality. Nonetheless, new funding for treatment of orthopedic disorders and mental health issues is minimal due, in part, to the narrow mandate of this committee.

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1. The DALY Metric

Traditional metrics for examining health status and the quality of healthcare in various countries have generally been based on mortality rates. Mainly due to technological advances, modern medicine has unprecedented opportunities to extend life, although this does not always ensure a high level of functioning or good quality of life. In light of this, since the 1990s, various measures have been developed that attempt to measure life years in terms of "quality." These measures are an effort to give a value to levels of everyday functioning and a sense of enjoyment in life, and among other things, to allow for a broader perspective on the potential of modern medicine to contribute to the welfare of society.

One accepted method for capturing overall disease burden and quality of life uses Disability-Adjusted Life Years (DALYs). An important milestone in quantifying disease burden occurred with the release of the 1993 annual World Bank report (World Bank, 1993) which examined the burden of morbidity on the population. Today, there is an international project led by the Institute for Health Metrics and Evaluation at the University of Washington, which is coordinating this effort among 500 researchers at 300 institutions in 50 countries.

DALYs measure both the number of life years lost due to premature death[1], and the partial loss of function due to disease or disability. The concept of Disability-Adjusted Life Years among the population is the "burden of disease" on the population. Simply put, this burden can be thought of as the difference between the current health status of the population and the situation in which the population is at its full life potential, free of loss of function due to premature death, disease or

[1] The researchers leading the DALYs project at the Institute for Health Metrics and Evaluation established a life expectancy of 86 years for analytical purposes – a rather old age relative to the average life expectancy in developed countries – which is only reached by the leading group in terms of life expectancy in the world, Japanese women. Age 86 is thus used as the potential life expectancy for all individuals and any death younger than this age is considered premature.

disability. As such, Disability-Adjusted Life Years are defined as the total number of life years lost due to premature death (YLL – Years of Life Lost) plus the total number of life years without a certain amount of function (YLD – Years Lost due to Disability). That is,

$$DALYs = YLL + YLD$$

The DALYs metric is just one method within a family of metrics known as HALYs – Health-Adjusted Life Years – whose purpose is to quantify the quality of each year of life according to the possibility to derive enjoyment from it and experience full functioning (Chernichovsky, in preparation; Gold et al., 2002). All of these methods, including the attempt to apply them to Israel, are based on developing models, the latest data regarding incidence of disease, and estimates of the impact of various diseases, injuries or disabilities in terms of functioning ability. The major advantage of the DALYs measure relative to other similar methods is that it allows a comparison of data between different countries and areas.[2]

Using a method that is still in the process of development and refinement means that estimates of DALYs for Israel can change in the future. Nevertheless, it is reasonable to assume that the overall picture will not change in a meaningful way since the DALYs method relates to risk factors, diseases and injuries that affect functioning and that are not explicitly accounted for in other currently used health metrics, which are strictly based on mortality and are thus perhaps insufficient. In other words, the findings presented in the chapter are not greatly affected by the accuracy of the specific data or figures but rather by the method itself.

[2] A comparative analysis between Israel and other countries over time will appear in a future publication on this topic.

Data[3]

Mortality data comes from Israel's vital registry database. Morbidity estimates – including disease and injury incidence, prevalence, duration, and remission – are based on meta-regressions applied to data that comes from various sources, including household surveys, disease registries and monitoring data, and hospitalization and out-patient records, for 21 regions in the world (Israel is included in the Western Europe region). The weight or degree of disability assigned to a particular patient condition or impairment is based on surveys of the general public conducted in five countries (Murray et al., 2012). These surveys examined the public's perception of the extent of health impairment with regard to a variety of medical conditions. The results across the different countries showed that people's perceptions were relatively similar regarding the level of impairment caused by diseases and various disabilities (Murray et al., 2012).

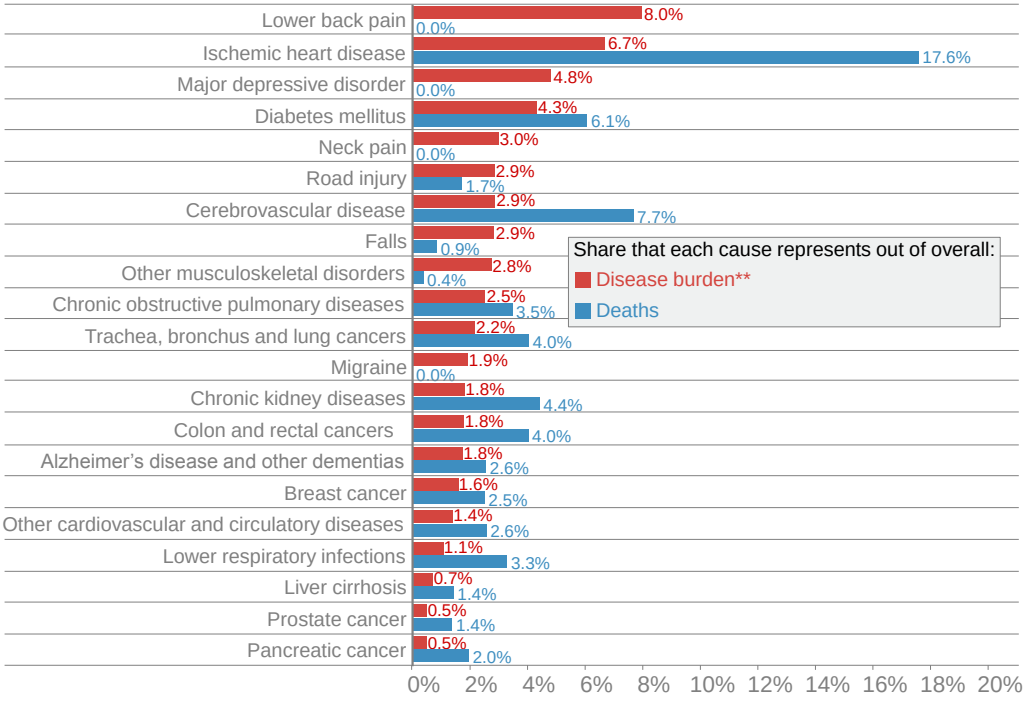
2. Causes of Death and Disease Burden in Israel

The data presented in Figure 1 show considerable differences between the top 15 causes of mortality and the top 15 causes of overall disease burden, as measured by DALYs, (for a total of 21 causes) in Israel. The main causes of death are cardiovascular and circulatory diseases and cancer while main drivers of disease burden (that do not lead to death) are lower back pain, major depressive disorders and migraines. The top causes of death – cardiovascular and circulatory diseases (together, 28 percent of total deaths) and major cancers (14 percent of total deaths) – contribute only 11 percent and 7 percent to overall disease burden, respectively. Orthopedic problems and depression are together responsible for about 19 percent of overall disease burden, but are almost negligible in their contribution to mortality rates.

[3] The analyses in this chapter are based on data from the Institute for Health Metrics and Evaluation.

Figure 1

Main causes* of death and disease burden, 2010**



* The top 15 causes of death and top 15 causes of disease burden (some of the causes overlap)

** Disease burden is measured via the Disability-Adjusted Life Years (DALYs) indicator, which accounts for both deaths and disability

Source: Dov Chernichovsky and Liora Bowers, Taub Center

Data: Institute of Health Metrics and Evaluation, Global Burden of Disease collaboration

Death and Disease Burden in Various Age Groups

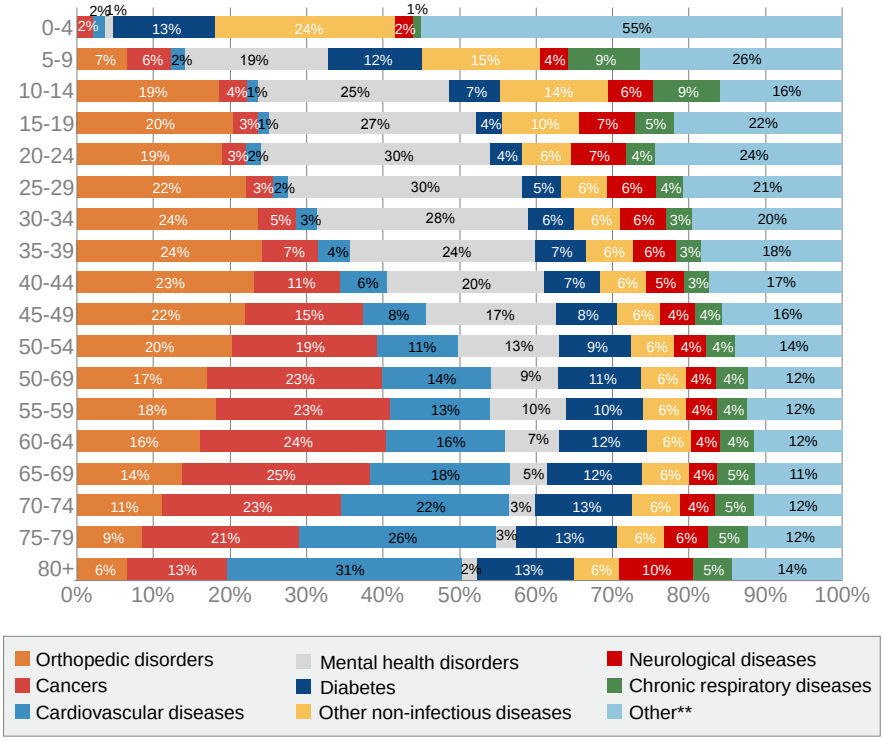
Figure 2 shows the distribution of the causes of disease burden, as measured by DALYs, across various age groups. As expected, the main causes of disease burden in the older age groups, such as cancers and vascular diseases, are also the causes of death. In contrast, the disease

burden among younger age groups is concentrated in conditions that are not fatal, like orthopedic and mental health issues. Likewise, in the younger ages, the disease burden from accidents is also high. That is, the DALYs measure gives more weight, relative to the current methodology based on mortality, to poor health among younger age groups.

Figure 2

Distribution of the causes of disease burden*

by age groups, 2010



* Disease burden is measured via the Disability-Adjusted Life Years (DALYs) indicator, which accounts for both deaths and disability.

** "Other" includes (the numbers in parentheses represent the range, across the various age groups, of the share of disease burden): accidents (3-6%); road injury (1-9%); childhood diseases (0-38%); infectious diseases (1-9%); deliberate injury (0-7%); digestive disorders (1-2%); malnutrition (0-5%); all other causes (0-2%)

Source: Dov Chernichovsky and Liora Bowers, Taub Center

Data: Institute of Health Metrics and Evaluation, Global Burden of Disease collaboration

3. Resource Allocation to the Healthcare System in the Context of Disability-Adjusted Life Years (DALYs)

In Israel, there are three integrated mechanisms for resource allocation to the public health system:

A. Allocation through the capitation mechanism. This allocation is designed to fund general medical care provided through the health funds. The central component in this mechanism is the capitation formula, which calculates a relative weight for each individual based on his age and gender, and also provides an addition for residents in the periphery of the country. According to this mechanism, money is distributed to the health funds for each insured member (Chernichovsky, 2011). About 72 percent of public financing for health services – some 34 billion shekels in 2010 – were allocated to the health funds via this mechanism.

B. Allocations through the government budget. This allocation is designed to fund Ministry of Health activities; namely preventive medicine, mental health and long-term care. This allocation accounts for about 28 percent of total public healthcare expenditure.[4]

C. Allocation through the Health Basket Committee. This allocation – totaling 300 million shekels in the latest budget – is designed to finance new technologies such as medications and medical devices.[5]

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[4] This figure also includes funding for maternity care and work-related injuries through National Insurance Institute taxes.

[5] In this context, it is important to note that there is a lack of congruence between decisions of the Health Basket Committee and changes in the capitation mechanism. While it might be expected that the capitation mechanism would be adjusted according to the decisions of the Committee, such is not the case. If the capitation mechanism were to include, for example, some components related to disease burden, medication and hospitalization, as it does in other Western European countries, the adjustment would be, in part, automatic (Chernichovsky, 2011).

This mechanism has a special significance despite its relatively small size, because this allocation is added annually to the other two allocations and helps determine the direction of the system from a technology perspective.

It is interesting to examine how the Israeli healthcare budgeting system aligns with both the current health metrics used in the country and with the DALYs metric that estimates overall disease burden. In this section, two comparisons will be drawn: a comparison between the actual capitation formula and the distribution of disease burden by age groups, and a comparison between the Health Basket Committee allocation and the distribution of disease burden by medical conditions.

Allocation Based on the Capitation Formula Versus Based on Disease Burden

In order to compare between the actual allocation based on the capitation formula and the distribution of disease burden using DALYs, the basic capitation formula was recalculated. The calculated capitation formula for this analysis also includes the allocation for services provided directly by the Ministry of Health and not just those provided by the health funds. Such adjustments for direct Ministry of Health services include accounting for the child health allocation (ages 0-4) and long-term care funding for those aged 65 and older.

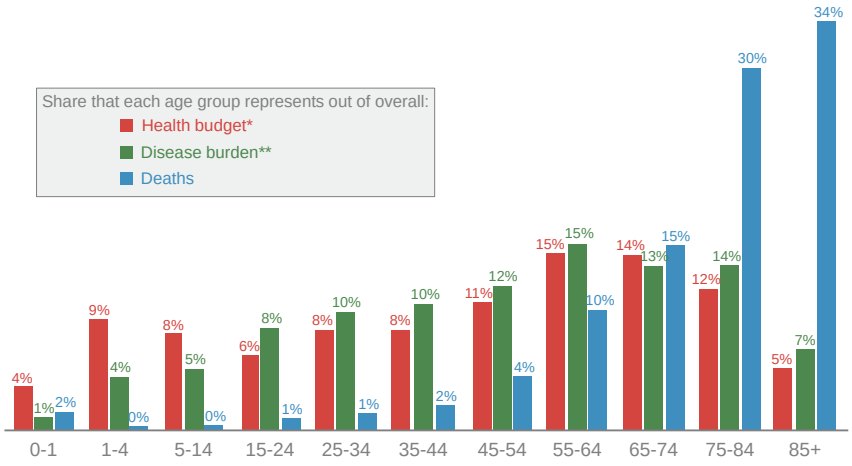
It is important to remember that the capitation formula is based on the relationship between the expected allocation per individual in a given age group as compared with the expected allocation per individual in the baseline age group (generally age 35-44). The assumption is that, on average, the actual allocation for each age group will equal the predetermined allocation that is based on the capitation formula. The formula expresses both the system's estimates of healthcare costs as well as societal preferences regarding the level of allocation for various age groups.

Figure 3 shows the distribution of mortality, disease burden (using DALYs) and the healthcare budget based on the capitation formula, by age group. For example, those aged 85 and over account for 34 percent of mortality and 7 percent of disease burden in Israel. This group receives 5 percent of healthcare funding according to the capitation formula. In contrast, those aged 1-4 account for a negligible share of mortality, while they account for 4 percent of disease burden and 9 percent of the budget via the capitation formula.

Figure 3

Distribution of the health budget*, disease burden and deaths**

by age groups, 2010



* The health budget shown here is based on allocation via the capitation formula, which includes Ministry of health direct expenditures and Health Basket expenditures.

** Disease burden is measured via the Disability-Adjusted Life Years (DALYs) indicator, which accounts for both deaths and disability.

Source: Dov Chernichovsky and Liora Bowers, Taub Center

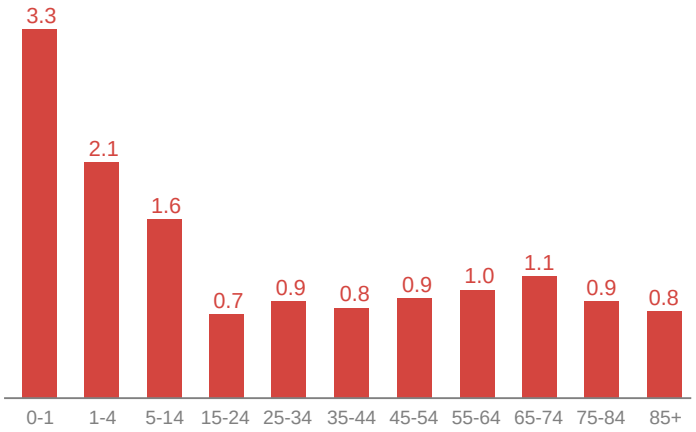
Data: Institute of Health Metrics and Evaluation, Global Burden of Disease

Figure 4 shows the ratio between the allocation according to the capitation formula (including the Ministry of Health's direct spending on the various age groups) and the distribution of disease burden by DALYs. The correlation coefficient between the budget allocation based on the capitation formula and the distribution of disease burden by age group is 0.84; the correlation between allocation based on the capitation formula and distribution of mortality rates by age group (not shown in figure) is 0.16. This means that the capitation formula in Israel yields allocations that are much more aligned with disease burden, as measured by DALYs, than they are with mortality rates. That is, the current allocation system is relatively well-matched to the public needs in terms of disease burden.

Figure 4

Ratio of the share of the healthcare budget to the share of overall disease burden*

by age group, 2010



* The amount allocated to each age group as a percent of the entire healthcare budget (according to the adjusted capitation formula) in ratio to the percent of the overall disease burden in each age group. For example, a figure of 1.0 would mean that an age group receives a budget allocation (as a share of the total budget) that is exactly equal to its share of the overall disease burden in Israel. Disease burden is measured via the Disability-Adjusted Life Years (DALYs) indicator, which accounts for both deaths and disability.

Source: Dov Chernichovsky and Liora Bowers, Taub Center

Data: Institute of Health Metrics and Evaluation, Global Burden of Disease collaboration

Nevertheless, the data shown in Figures 3 and 4 indicate that the actual budget allocation for the younger age groups (0-15 year olds) is larger than their share of disease burden in the distribution (from a ratio of 3.3 at age 0-1 to a ratio of 1.6 for ages 5-14), while the actual budget allocation to all other age groups – except ages 55-74 – is lower than their share of disease burden in the distribution. The relatively low allocation of the capitation formula relative to the disease burden (based on DALYs) for the age groups 15-54 is noteworthy.

The differences between the actual allocation based on the capitation formula and the distribution of disease burden shed light on both the government priorities in healthcare, even if they are not explicitly stated, as well as the limitations of the DALYs metric from a policymaking perspective. For example, the relatively high actual allocation for children according to the capitation formula reflects the decision by policymakers to invest relatively heavily in prevention. The DALYs metric, however, does not take into consideration the benefits of such prevention. Nevertheless, it is possible that a disease burden perspective could encourage different policies with regard to prevention than those in place today. For example, it is possible that a system that prioritizes the treatment of leading causes of disease burden would invest more in preventing problems like orthopedic and mental health issues early on.

The relatively low allocation for those aged 85 and over shows a government policy, although not explicit, that recognizes the limitations of dealing with death, and that is unwilling to invest unlimited amounts towards coping with mortality among the elderly. However, it is important to note that while those ages 85 and over represent a very high share of mortality in the country, they account for a much more modest share of the overall disease burden in the country. As such, while the allocation based on the capitation formula to those ages 85 and over is particularly low compared to their mortality rates, their allocation relative to disease burden is relatively similar to that of age groups 15-54.

The relatively low investment according to the capitation formula for ages 15-54 is also noteworthy, especially among the younger ages in this cohort. These groups are particularly likely to suffer from medical

conditions that are unrelated to death; as such, it would be appropriate to adjust their allocation accordingly – especially because of their relative importance with regard to household functioning and labor market participation.

Health Basket Committee Allocation Versus Disease Burden Distribution

As has been stated, the decisions of the Health Basket Committee impact only a small share of the healthcare system budget (the annual addition to the existing budget). Nevertheless, this component is of great significance since it reflects the additional amounts invested in new healthcare technologies, whose combined impact over time has the potential to determine the character of the system in the long term.

Making comparisons between the Health Basket Committee allocation and the distribution of disease burden, as measured by DALYs should be done with caution. The DALYs metric is static – it paints a picture of the health status of the population today, without providing any insight regarding those factors that lead to changes in disease burden. Taking such factors into consideration could lead to a different picture than the one presented solely by the metric itself. For example, even though mental health problems contribute greatly to disease burden in Israel today, their importance might be mitigated when considering that such problems are more prevalent among younger age groups, and demographic changes are leading to an aging population.

Nonetheless, there is value in comparing the Health Basket Committee allocation with both mortality rates and disease burden (as measured by DALYs) for each age group, in order to see how the Health Basket Committee allocation aligns with each metric and accordingly, what this indicates with regard to developments in the healthcare system over the long term. In terms of both promoting efficiency in healthcare budgeting and given the trend in the modern world towards using metrics such as DALYs, it is expected that the Health Basket Committee would allocate

money for technologies that would have the most impact on disease burden – as opposed to the most impact on preventing death.

Figure 5 presents a comparison of the share of funding allocated by the Health Basket Committee for 2014 to various medical conditions with the share of mortality and disease burden (DALYs) caused by such conditions.[6] Almost half of the Committee's allocation was devoted to cancer treatments, which is a major cause of death. In contrast, orthopedic and mental health problems, which contribute greatly to disease burden, received minimal additional allocation from the Health Basket Committee.

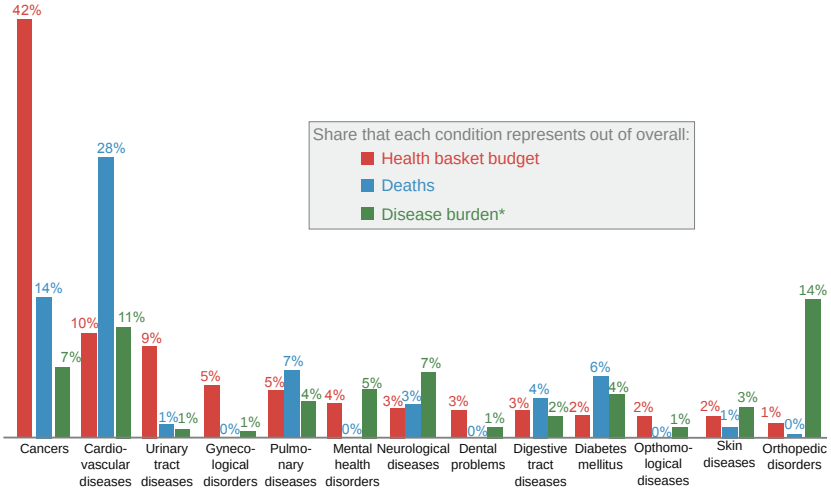
To some extent, these findings support the assumption that the Health Basket Committee has narrowed its focus towards life-saving medicines and mortality prevention, and does not give sufficient weight to disease burden stemming from poor health. This situation arises due to the narrow mandate of this Committee, which is limited to adopting new technologies – a scope that does not necessarily align with an approach that advocates for achieving the maximum health improvement from each additional shekel invested, based on the DALYs metric. For example, the Health Basket Committee cannot recommend using its budget to expand existing treatments to populations that currently do not benefit from them, such as expanding subsidized dental treatment to populations over the age of 11. Furthermore, the Committee cannot allocate more towards treating orthopedic problems using effective and innovative methods that are currently available but that do not involve adopting new technologies. That is, the Committee has no mandate to encourage new treatment approaches unless they are based on new technologies, even if such technologies are not necessarily proven yet.

[6] Ministry of Health, the Recommendations of the Public Committee to Increase the Basket of Healthcare Services, 2014 update health.gov.il/Services/Committee/vsal/HBS2014/Pages/default.aspx.

Figure 5

Distribution of Health Basket Committee budget

as compared to distribution of deaths and disease burden*, by select medical condition**, 2010



* Disease burden is measured via the Disability-Adjusted Life Years (DALYs) indicator, which accounts for both deaths and disability.

** Conditions are listed in order of those receiving the highest budget allocation by the Health Basket Committee; not all medical conditions budgeted by the Health Basket Committee appear in this figure.

Source: Dov Chernichovsky and Liora Bowers, Taub Center

Data: Institute of Health Metrics and Evaluation, Global Burden of Disease collaboration

4. Conclusions

The DALYs metric presents an alternative to metrics based on mortality rates or life expectancy alone. When health status in Israel is examined, significant differences are found between the impact of various medical conditions on mortality rates and their impact on overall disease burden as measured by DALYs.

Actual healthcare system budgeting according to the capitation formula (which takes into consideration age and gender and allocates more to those living in the geographic periphery), reflects a government policy that is more aligned with addressing disease burden than preventing death. As such, the healthcare system has been relatively successful with regard to matching funding with the needs of the public in terms of disease burden. However, the actual budget allocates more to the youngest age groups (0-15) than they would receive if allocation were based on disease burden (DALYs), while the actual allocation to the other age groups – except those ages 55-74 – is lower than it would be if allocation were based on disease burden. The relatively low allocation granted to the age groups 15-54 based on the capitation formula is particularly noteworthy given the importance of this age cohort to households' functioning and to the labor market.

Comparing the allocation through the Health Basket Committee to the distribution of disease burden as measured by DALYs shows that almost half of the Health Basket Committee's allocation is devoted to treatment for causes of death (namely cancer treatments). In contrast, the major contributors to disease burden, like orthopedic issues, receive almost no additional allocated funds. These results support the assumption that the Committee has a narrow vision focused on life-saving medications and technologies, and does not encourage innovative approaches to reduce disease burden from conditions that do not lead to death.

Beyond offering a new and thought-provoking approach to examining the health status of the population, this discussion presents some questions for policymakers in the health system. First, it is important to examine the issue of the large allocation granted to children according to

the capitation formula, which is not substantiated when assessing the distribution of disease burden via DALYs. Second, it should be assessed how the investment in the most productive age groups – ages 15-54 – can be bolstered, given that the distribution of disease burden suggests that these groups' actual allocation is lacking. Third, the possibility of changing the Health Basket Committee's mandate should be examined, to allow the Committee to examine the system from the perspective of disease burden and not just death prevention. In addition, it is important to explore the possibility of giving the Committee a wider mandate to allocate additional resources to the system (to widen current eligibility, for example, to dental care to include additional age groups) and to implement methods and innovative treatment approaches that are not specifically life-saving.

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