

Indicators for monitoring the socio-economic dimension of NCDs: A pilot study in Chile

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1.0 Introduction

In September 2011, the United Nations set a new international agenda for non-communicable diseases (NCDs) with the Political Declaration of the UN High-level Meeting (UNHLM) on NCDs, acknowledging that NCDs and their risk factors pose a serious threat to public health and economic and social development. WHO, upon the call from the Declaration, has developed global targets and a comprehensive global monitoring framework to monitor trends and assess progress on NCD prevention and control. WHO regional offices have considered the implications of the targets and monitoring framework for their own regions, taking into account their specific situations and diversity, as well as their existing commitments and progress to date on NCDs.

In the Americas, this process coincided with revised Regional Strategy for NCDs in 2012 and Regional Plan of Action for the Prevention and Control of Non-communicable Diseases in the Americas, 2013-2019 (PAHO, 2014). The new strategy and Action plan represent a balance of continuity and change: to put NCDs on the development and economic agenda nationally and regionally, to strengthen the multi-stakeholder “all of society” approach, to strengthen communications using traditional and new media, and to include explicit outcome and exposure goals and targets in alignment with the WHO global monitoring framework and targets.

The UNHLM Declaration called for addressing the centrality of NCDs to development as well as underscoring the importance of measurement. The declaration (in paragraphs 40, 45, and 47) acknowledged that resources are not commensurate with the magnitude of the problem, called for an increase and prioritization of budget allocations, and called for fulfillment of official development assistance related commitments. In addition to specifying NCD targets and indicators that are appropriate to the regional situation in the Americas, the WHO Regional Office for The Americas convened an expert think tank group to define development-related and multi-sector policy indicators that may be suitable for the Americas. As a result of these discussions, three indicators were proposed to aid in the monitoring of the socio-economic dimension of NCDs. These indicators were chosen based on consideration of their policy impact, contribution to development in the region, and availability of data for calculating a baseline estimate and subsequent follow-up analysis. This paper reports the results of a pilot study² in Chile aimed at measuring these indicators undertaken as part of a tripartite

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² Cristóbal Cuadrado and José Luis García. 2015. “Estudio sobre el cálculo de indicadores para el monitoreo del impacto socioeconómico de las enfermedades no transmisibles en Chile.” Informe final. Submitted to Chilean Ministry of Health and Pan American Health Organization, July 2015.

cooperative effort by the Chilean Ministry of Health, the United Nations Economic Commission for Latin America and the Caribbean, and the Pan American Health Organization.

2.0 Three indicators

The goal of the pilot study undertaken in Chile was to estimate three socioeconomic indicators of the economic and multi-sectoral aspects of non-communicable diseases (NCDs). The three indicators were (1) public sector investment in NCD prevention and health promotion; (2) the affordability of a healthy diet; and (3) households experiencing catastrophic health expenditures due to NCDs. This study focused on 4 NCDs: cancer, cardiovascular disease, chronic respiratory disease, and type-2 diabetes. In the three sections below, we review the estimation methods developed for each indicator, the challenges encountered in estimation, and the estimates themselves. Following this, we conclude with reflections on lessons learned from this pilot study and future challenges.

2.1 Public sector investment in NCD prevention and health promotion

The first indicator was the amount of public sector investment in prevention of NCDs and health promotion, expressed relative to all government spending as well as relative to GDP. We estimate that in 2013 0.7% of Chilean public sector spending was devoted to NCD prevention and health promotion. This represented 4.1% of total public health care spending and two-tenths of one percent of GDP (0.19%). Tracking public investments in NCD prevention and health promotion creates greater awareness of the wide array of measures and policies that contribute to prevention, and highlights the need for multiple sectors to participate in creating a healthful environment. The value of such an indicator is to clearly embrace a “whole of government” policy for NCD prevention and health promotion: recognizing that the response of government extends beyond the Ministry of Health. This broader perspective in viewing public sector actions also lays the foundation for a “whole of society” response to NCDs – which extends well beyond a narrow focus on public health activities and well beyond a focus on government activities alone.

Health promotion involves actions aimed at four key activities: eliminating the use of tobacco; eliminating excessive use of alcohol; promoting physical activity; and promoting healthy diets. Government activities aimed at promoting these healthy lifestyles can range from creation of healthful environments (for example, the construction of bicycle paths) to information dissemination (for example, dietary recommendations) to market interventions to alter prices (for example, taxation of tobacco products). In this study, NCD prevention activities refer to primary prevention: those activities aimed at preventing the onset of NCDs. Excluded from the analysis are secondary prevention activities aimed at screening the population for early identification of those who already have a NCD and tertiary prevention activities aimed at improving the functioning of those with NCDs.

Several methodological challenges were encountered in the pilot study. First, the accounting systems that track government spending were not designed to identify expenditures on health promotion and NCD prevention. Therefore, identification of relevant activities in this area required the review of program-level data and interpretation of programmatic function based on the program's title, description, and stated objectives. Sometimes a program contained multiple activities – some of which were related to health promotion and others not. In this case, investigators sought out reasonable approximations to determine the share of the program's budget devoted to health promotion. In addition, identifying an expenditure in primary prevention (as opposed to secondary or tertiary) requires knowledge about the NCD status of the population being served – which was not always possible using the budgetary information.

Importantly, within the Ministry of Health, the overwhelming majority of spending (86,5%) on NCD prevention and health promotion was deemed to occur within the Family Health Plan. In this program, the Ministry provides funding to municipalities to support primary care facilities. The amount received by each municipality is based on a per-capita allocation that is adjusted for the particular health needs of each municipality's population. The formula for this calculation is primarily based on an estimate by the Ministry of the number of hours of medical attention needed to provide a given set of services (e.g., vaccination, nutritional consultation, etc.). There are currently more than 80 such services provided as part of the Family Health Plan. Based on an analysis of these services, it was concluded that 30% of the Family Health Plan was directed toward NCD prevention and health promotion. It is important to stress that our overall estimate of the amount of resources devoted by the government to NCD prevention and health promotion relies heavily on the accuracy of this estimate of 30%.

Second, while noting that municipalities made significant investments in health promotion (for example, in the construction of bike paths in the capital city of Santiago), data on spending by program municipalities was not readily available. An attempt to survey municipalities was largely unsuccessful with only 14 of 345 municipalities responding. Therefore, the pilot study focused solely on central government investments in NCD prevention and health promotion.

Third, even within the central government, there was difficulty in collecting data from other ministries outside the Ministry of Health. Twenty ministries were identified as likely having some programmatic activities related to NCD prevention and health promotion. Of the 20, data from only 7 ministries was available for the estimation of the pilot study: the ministries of health; social development; education; sports; interior and public safety; environment; and public property. In this context, we note that no data was available from the Ministry of Agriculture – likely an important partner in a whole-of-government approach to NCD prevention and health promotion. In this context it is important to note that a substantial effort was required to define the potential health promotion activities of most ministries outside that of the Ministry of Health (with the exceptions of Education and Sports).

Despite these difficulties in collecting the data, an estimate was possible based on the data obtained from these 7 ministries. In 2013, the central government in Chile spent 215,237

million Chilean pesos, representing 4.1% of public health spending, 0.7% of total government expenditures and 0.19% of GDP. This indicator serves as a valuable benchmark in assessing future changes in investments. However, it is also useful to compare this figure to other types of current spending as shown in Table 1 to aid in the interpretation of this value. For example, it is interesting to compare the amount spent on NCD prevention to that spent on NCD treatment. The amount of public investment in NCD prevention in Chile is about one-third of the amount spent (695,000 million pesos) on NCD treatment by the public health sector (FONASA) and private insurers (ISAPRE). Alternatively, we can also compare the investment in NCD prevention and health promotion to the consumptions of different goods in the economy. By coincidence, the annual amount of popsicle and ice cream sales in Chile is approximately equal to that spent on NCD prevention and health promotion. The processed food industry had sales totaling US\$ 11 billion dollars in Chile in 2012 or about 4.4% of GDP – or roughly 20 times the amount invested in NCD prevention and health promotion. As the reader will have noticed in this short comparison, the question of whether investment in NCD prevention and health promotion is “too low” or “too high” or “just right” remains unanswered. Among other things, the answer to this question requires an economic cost-benefit analysis the current marginal returns to prevention assessed against those for treatment. Currently, there are no international standards or targets with respect to the optimal level of investment in prevention relative to other activities.

Table 1. Comparison of public investments in NCD prevention and health promotion in Chile.

Item	Amount (millions of Chilean pesos)	As percent of public spending on health ^a	As percent of public spending ^b	As percent of GDP ^c
Public sector spending on NCD prevention and health promotion. ^d	215,227	4.1%	0.7%	0.19%
Spending on NCD treatment for covered health conditions under AUGE/GES by FONASA and ISAPRE. ^e	695,000			0.61%
Consumer spending on popsicles and ice cream. ^f				0.26%
Consumer spending on processed foods. ^f				4.4%

Table Notes: (a) Public spending on health by central government in 2013 was CHL 5,224,724 millions; (b) Total public spending by central government was CHL 29,704,287 million; (c) GDP in 2013 was CHL 114,022,307 millions; (d) Based on estimate from this pilot study (Cuadrado & García, 2015); (e) Based on 13 of the 81 GES which are NCDs (Bitrán and Associates, 2013); (f) Analysis by United States Department of Agriculture, 2013. Sales of processed foods were US\$11 billion in 2012, of which 6% were sales of popsicles and ice cream. GDP in 2013 was US\$ 250.8 billion.

We can quantify the extent to which the government is responding to NCDs in a “whole of government” approach by examining the amount investment in NCD prevention and health promotion by ministry. On the one hand, the vast majority of government effort is concentrated in the Health Ministry. As shown in Table 2, this ministry directed 86% of government spending in this area. On the other hand, it is notable that 6 other ministries (Sports; Environment; Social Development; Interior and Security; Education; and Public Property) reported some expenditure in this area. In fact, from the viewpoint of the ministries

themselves, there are two ministries that devote a greater share of their resources toward health promotion and NCD prevention than the Health Ministry. The Sports Ministry devotes 23% of its resource to this area and the Environment Ministry devotes 7% of its resources to this area. The Health Ministry occupies third place with 3.5% of its budget devoted to these health promotion and NCD prevention. The other four ministries devote less than 1% of their budgets to these activities.

As previously noted, several ministries that the group identified as likely important sources of investment in health promotion did not respond to the inquiry, among them the Agricultural Ministry. Therefore, it is important to view this indicator in the context of that missing data. A more complete response from the other ministries would both raise the estimate of the overall public investment in health promotion while also showing a broader response of the government – less centralized in the Health Ministry.

Table 2. Public investment in NCD prevention and health promotion in Chile, by ministry.

Ministry	As percent of total public sector investment in NCD prevention and health promotion.	As percent of Ministry's Budget.
Health	85.7%	3.5%
Sports	8.5%	22.8%
Environment	2.1%	11.8%
Social Development	1.7%	0.7 %
Interior and Public Safety	1.4%	0.1 %
Education	0.5%	0.0%
Public Property	0.1%	0.1%
TOTAL PUBLIC SECTOR	100%	0.8%

2.2 The affordability of a healthy diet

The second indicator calculated the proportion of the population that cannot afford a healthy diet. We estimated that in 2013 about 28% of the Chilean population could not afford to purchase a healthy diet -- one based on national dietary recommendations. The appeal of this indicator is its link to poverty, its focus on prevention via nutrition – a high priority as evidenced by major global summits in 2012 and 2013, and its promoting of multi-sectoral actions. By examining the cost of healthy diets relative to household income, this indicator can be used to address the issue of finding equitable policy responses to the rise of nutrition-related chronic diseases. Insuring access to nutritional foods (by removing financial and other barriers) is a duty that states must undertake to insure the exercise of the right to health. It is important to

recognize that the inability to purchase a healthy diet is, in and of itself, a form of impoverishment.

This indicator relies on two key measures: the cost of a healthy food basket and the income-level of families. Accordingly, there are two main courses of action that societies can undertake to insure affordability of healthy food for all. Both are aimed at removing financial barriers to healthy diets. The first are anti-poverty actions aimed at raising income among the poor through a variety of state actions such as direct income transfers, job training, and minimum wage laws. The second set of actions are those aimed at increase access to affordable healthy foods. This can be accomplished in a variety of ways: from interventions aimed at reducing the price of whole foods relative to processed foods (via Farmer's Markets in urban settings or increasing whole foods in school lunch program) to provision of information on low-cost healthy diets (for example, plant-based, whole food diets). This indicator by focusing on the poor allows countries to monitor the accessibility of a healthy diet for those people with high risk of poor health and often the least access to quality health care.

The measurement of this indicator was based on a standard method employed for measuring poverty: the cost of basic needs approach. In this approach, the cost of purchasing enough food to satisfy energetic needs (usually 2,100 calories per person) is estimated. Then, a minimum-needs budget is estimated by multiplying this minimum food budget by a factor (the Orshansky coefficient) to reflect other needs. This factor is typically taken as 2, meaning the poverty line in a country is defined as twice the cost of meeting basic food needs. A household whose income falls below this line is deemed to be poor. Adjustments to this measure are made based on household composition to reflect both differences in energetic needs of household members as well as presumed economies of scale in lower per-capita costs of some items in larger households (for example, housing). In addition, adjustment can also be made for variations in prices of food and other goods by region within a country.

In this widely used approach to poverty measurement, the cost of food is the central determinant of poverty levels. This cost is typically measured by establishing a "basic food basket." The basic food basket is based on a diet that meets energetic and essential nutritional needs. A small sample of items is selected to be representative of the types of foods purchased by the near-poor (those in the income strata just above poverty). The average prices of these items are then estimated and monitored over time. Rather than estimate a single national average of prices, often food prices are estimated for local geographies to reflect the geographic differences. A country will update its poverty measure each year based on changes in the prices of these foods. However, it is typical to keep the same items in the food basket. That is, new estimates of the types of food purchased by the near-poor are made infrequently.

Measuring affordability of a healthy food diet is based on this same method – except that the "basic food basket" is replaced with a "healthy food basket." How should this "healthy food basket" be defined? One clear path is to use the government's own nutritional guidelines. In 2013, the Ministry of Health adopted a set of nutritional guidelines of 11 recommendations including:

1. Five daily portions of fruits and vegetables in a variety of colors.
2. Water as the principal beverage (6-8 glasses per day), avoiding sugary drinks.
3. Beans, lentils or other legume, twice per week.
4. Fish (baked or steamed), twice per week.
5. Three daily servings of low-fat dairy products
6. Avoid sugar, candy, and sugary drinks.
7. Avoid fried foods and fatty foods such as mayonnaise or sausages.
8. Avoid processed foods high in fat, sugar, or salt.
9. Reduce use of salt.

These guidelines could have been used as a basis to construct an alternative “healthy food basket.” This would have required two intensive efforts. First, an overall list of products that meet the “healthy” nutritional requirements of the population would need to be constructed as well as a sample of about 50 products from this list. Second, the prices for each of these 50 products would need to be calculated (perhaps for a variety of geographic locations). Both steps were deemed to require a substantial effort. As a pragmatic alternative, rather than develop a new healthful diet from scratch, the “Healthy Food Basket” was based on an adaptation of the food items already contained in the “Basic Food Basket.” The quantities of these foods were adjusted to reflect the 9 national nutritional recommendations cited above.

Table 3 shows the changes in quantities (grams or cubic centimeters per day) among the main food groups, comparing the new Healthy Food Basket with the Basic Food Basket. The largest percentage increases are in dairy product and eggs – which are 2.7 times larger. Consumption of drinks (via increased consumption of bottled water) and consumption of fruits, vegetables, legumes, and tubers doubled. Fish and seafood show a modest increase of 17%. While consumption of bread and cereals and oils show nearly no change. The Healthy Food Basket is also noted for what it does not contain. The food group consisting of sugar, candy, coffee, tea, and condiments shows a large drop of 44%; while meat consumption decreases by 54%. Expenses for meals outside the home (which mainly consisted of “fast foods”) are completely eliminated in the Healthy Food Basket.

Table 3. Change in food quantities: Healthy Food Basket vs. Basic Food Basket

Food Group	Quantity (Grams or cubic centimeters per day)		Change
	Healthy Food Basket	Basic Food Basket	
Dairy products and eggs	310	116	167%
Drinks	129	63	105%
Vegetables, fruits, legumes, and tubers	805	440	83%
Fish and seafood	35	30	17%
Bread and cereals	223	219	2%
Oils	20	20	0%
Sugar, candy, coffee, tea, and condiments	36	64	-44%
Meat	35	76	-54%
Meals outside of home	0	18	-100%

Table 4 summarizes the impact of the changes in the quantities food items on the overall distribution of calories from various food groups. In the Healthy Food Basket, the main source of calories (34%) are vegetables, fruits, legumes, and tubers – whereas in the Basic Food Basket this food group accounts for 23% of calories. Another large shift is seen in the amount of calories from dairy products and eggs – accounting for 17% of calories in the Healthy Food Basket, up from 6% of calories in the Basic Food Basket. These two large increases in calories are offset by sharp reductions in calories from meals consumed outside the home – which fall to zero in the Healthy Food Basket and account for 12% of calories in the Basic Food Basket. Meat consumption is also reduced – falling to 3% of calories in the Healthy Food Basket and accounting for 8% of calories in the Basic Food Basket. Another important decline is seen in calories from sugar, candies, tea, and coffee – which accounted for 8% of calories in the Basic Food basket but fall to 5% of calories in the Healthy Food Basket. Finally, breads and cereals are an important source of calories in both the Healthy Food plan (29%) and in the Basic Food plan (30%).

Table 4. Caloric distribution of Healthy Food Basket and Basic Food Basket

	Healthy Food Basket	Basic Food Basket	Difference
Vegetables, fruits, legumes, and tubers	34%	23%	11%
Bread and cereals	29%	30%	-2%
Dairy products and eggs	17%	6%	12%
Oils	9%	9%	0%
Sugar, candy, coffee, tea, and condiments	5%	8%	-3%
Meat	3%	8%	-5%
Fish and seafood	3%	3%	0%
Drinks	0%	1%	-1%
Meals outside of home	0%	12%	-12%

Based on these changes in the quantities of food items, the cost of a healthy food basket is substantially higher than the cost of the basic food basket. Whereas the Basic Food Basket costs 32.239 Chilean pesos per person, the Healthy Food Basket would cost 43.872 pesos, or 36% more. Table 5 shows the contribution of food groups to the change in price (an increase of 11.5 thousand pesos). The increase in consumption of dairy products and eggs is the main contributor to the cost increase: adding 10 thousand pesos to costs. The increase in consumption of vegetables, fruits, legumes, and tubers adds another 7.5 thousand pesos. Offsetting these increases are declines in costs from reduction in consumption of bread (saving 4 thousand pesos); of carbonated beverages and powdered juice drinks (saving 2 thousand pesos), and finally reductions in cookies, candies, sugar, tea, and coffee (saving less than 1 thousand pesos). Essentially, the national nutritional recommendations substitute healthy and more expensive sources of calories for cheaper and less healthy sources of calories. It is important to stress that healthy diets do not necessarily cost more than unhealthy diets. The results of this pilot study indicate an increase in costs due to following the specific set of

nutritional recommendations adopted by the Chilean government. It is possible that alternative healthy diets could be devised which would cost less than the Basic Food Basket – for example, a healthy diet based on plant-based, whole foods. Though it should be noted that in some sense the basic food basket is designed around the concept of providing the minimum of caloric needs at the lowest cost – and from that perspective, healthy alternatives are likely to be more costly. This is an important topic for empirical investigation.

Table 5. Monthly costs of Healthy Food Basket and Basic Food Basic per person (in Chilean pesos, 2013)

	Healthy Food Basket	Basic Food Basket	Difference	Percent change
Food Groups	43,872	32,239	11,635	36%
Dairy products and eggs	14,233	4,205	10,028	238%
Vegetables, fruits, legumes, and tubers	14,853	7,322	7,531	103%
Fish and seafood	1,827	1,737	89	5%
Oils	1,024	1,024	0	0%
Bread and cereals	6,146	6,206	-60	-1%
Drinks	1,207	1,361	-154	-11%
Sugar, candy, coffee, tea, and condiments	1,367	2,625	-1,257	-48%
Meals outside of home	0	2,249	-2,249	-100%
Meat	3,216	5,509	-2,293	-42%

Finally, it is important to note that this indicator reflects the degree to which there are financial barriers to healthy diets. That is, it uses the Healthy Food Basket to measure access in exactly the same way that traditional poverty measures use the Basic Food Basket to measure poverty. The baskets measure access and affordability, not actual consumption. Financial barriers are just one type of barrier to healthy eating. Governments are responsible for insuring access to health foods -- actually adopting a healthy diet and a healthy lifestyle is the choice of individuals. The issue of access is to insure that this choice is informed and freely made – and not a product of poverty.

How affordable is a healthy diet in Chile? We measure affordability for each household by calculating its monthly food costs relative to household income. The monthly household food costs are based on the hypothetical costs were the household to purchase a healthy food basket for each household member. As noted above, the Healthy Food Basket costs 36% more than the Basic Food Basket. Using the CASEN survey 2013, a nationally representative survey of Chilean households, we estimate affordability of healthy diets for the entire population. To insure comparability, we use the exact same methodology and same data set employed by the Chilean government in calculating its poverty measure -- only we replace the cost of the Basic Food Basket with the Healthy Food Basket. The current poverty methodology used by the Chilean government multiplies the monthly cost of the basic food basket by a factor of 2.68 (the Orshansky coefficient) to arrive at a poverty threshold. Households that fall below this

threshold are deemed to be in poverty. The threshold varies by the size of household to reflect lower per-capita costs in larger households due to economies of scale (Gobierno de Chile, 2015). We estimate that 27.1% of the Chilean population is unable to afford a healthy diet. As noted earlier, lack of access to healthy food is a form of impoverishment. This estimate of 27.1% of the population or 4.7 million people who lack access to healthy, affordable food is nearly double the official estimate of people in poverty (2.5 million people or 14.4% of the population). Despite its favorable macroeconomic situation, Chile faces an enormous challenge in providing access to healthy foods.

We also note that the majority of those who cannot afford to eat healthy diets reside in urban areas: 3.7 million of the estimated 4.7 million people. However, the incidence of lack of access to healthy foods appears to be much greater in rural areas (an astounding 46% of the rural population) compared to urban areas (24% of the population). This is most likely an artifact of the way our indicator was constructed – using one single healthy food basket for the entire population: both rural and urban residents. It is possible that rural residents face substantially lower prices for healthy foods, considering that many of these foods are produced locally and indeed in the case of farmers are produced by the household. In future work, the method will be revised to account for lower costs of healthy foods in rural areas. For now we note that the estimate for the rural population is biased upward and the true rate is between 28% (using the Basic Food Basket) and 46% (using the Healthy Food Basket). In any event, since the vast majority of the population is concentrated in urban areas, this biased estimate for rural areas does not significantly affect our national estimates.

Table 6. Population unable to afford healthy diets and population that is poor, Chile 2013.

	Unable to afford a healthy diet		Poverty	
	Proportion of population	Number of people	Proportion of population	Number of people
National	27.10%	4,677,000	14.4%	2,482,000
Urban areas	24.30%	3,657,000	12.4%	1,868,000
Rural areas	46.39%	1,019,000	27.9%	614,000

2.3 Households experiencing catastrophic health expenditures due to an NCD

The third indicator reflects growing concerns about the impoverishing effects of NCDs on the most vulnerable members of the population. One of the core objectives of health care systems is protection from financial risks associated with healthcare. Household medical expenditures can often be ‘catastrophic’—exceeding a sizable fraction of total household expenditures. Out-of-pocket medical payments for treatment of chronic NCDs are more likely to cause impoverishment or financial distress than treatment for acute conditions due to the complexity, longevity, and technologically demanding nature of chronic NCD care.

The key estimation challenge for this indicator was the lack of a data source that contained both information on health spending on NCDs as well as information on household income. The main survey instrument used to measure catastrophic health costs incurred by households was the VII Chilean Household Budget Survey (2012). This instrument records information in household income and expenditures, including health expenditures. However, it does not distinguish these health expenditures by causes and thus it is not possible to discern which health spending is due to NCDs and which due to other conditions. In addition, no information was collected on whether an individual had an NCD. The lack of data for these two important factors meant that this indicator on catastrophic health care costs due to NCDs had to be estimated using indirect methods. One important recommendation from this pilot study is the inclusion of questions in future rounds of the Household Budget Survey on NCD status of individuals and on health expenditures by cause.

Using data from the Household Budget Survey, we can calculate the proportion of households facing catastrophic costs using a standard methodology employed by the World Health Organization (Xu, 2003). Each household's capacity to pay is calculated based on the differences between their average monthly expenditures and a minimum threshold of subsistence expenditures (based on the poverty line). The household's average monthly out-of-pocket expenditures on health care are measured in the survey based on a daily diary (for health expenditures in the last two weeks), a recall diary of 3 months for doctor office visits, and a recall diary of 12 months for hospitalizations. If the average household monthly out-of-pocket expenditures on health care exceed 40% of the household's capacity to pay, the household is deemed to be facing catastrophic health costs. Application of this method to Chilean data shows that 2.1% of households experienced catastrophic health care costs. As there is some debate in the literature over the 40% threshold, Table 8 presents estimates of those facing catastrophic health costs (from any cause) using a variety of thresholds. About 9% of Chilean households faced average monthly health expenditures that exceeded 20% of their capacity to pay; while about 4% faced average monthly health expenditures that exceeded 30% of their capacity to pay.

The low percentage of Chilean households facing catastrophic medical costs is striking. It may reflect effective health policies aimed at guaranteeing access to health care for certain health conditions (the AUGE/GES system). But it may also partly reflect the failure of health financing systems for non-AUGE/GES conditions in which expensive treatment options (e.g., cancer drugs) are simply out of reach for impoverished families. In a sense, they are too poor to have catastrophic expenditures. Finally, it may simply reflect downward bias on estimates of catastrophic hospitalization costs. Since hospitalization is a relatively rare event, a 12-month recall questionnaire was used rather than a two-week daily diary. As a matter of simple statistics, taking an average over a 12-month period instead of a two-week period will lower the variance of the distribution of expenditures. Consider for example a household with only one hospitalization during the previous 12-month period. The average monthly health costs for that household are 1/12 the actual cost that the household experienced. Thus, this 12-month average is unlikely to represent the catastrophic impact of health expenditures among the poor – who generally do not have access to savings, loans, and other financial vehicles to enable

them to ease the burden of catastrophic expenses by spreading them out over the course of a year. For future work, an alternative estimation strategy would be to use the highest monthly cost observed over the 12-month recall period rather than the average amount over the 12-month period. A similar but less severe bias is also present in estimates of doctor consultations using a 3-month recall.

While health costs due to NCDs could not be determined in the survey, an indicator variable was created based on reporting for health products or services that were deemed to be possibly related to NCDs. This indicator was broadly defined to include spending not only on obvious NCD treatments such as cardiac surgery but also services not solely related to NCDs such as blood tests and hospital examinations. Thus, the indicator of individuals with NCD expenditures is likely to include some individuals without NCDs – it is best viewed as an upper limit. Using this method, we find that 59% of households reported an NCD expenditure. (And within these households, NCD expenditures account for 62% of total household health expenditures). A multivariate regression showed that the probability of having catastrophic health expenditures was 3 times greater among these households with NCD expenditures. By this measure, NCDs have a dramatic impact on the likelihood of experiencing catastrophic expenditures.

The distribution of medical expenditures of those 2 percent of Chilean households facing catastrophic health expenditures is presented in the first data column of Table 7. Medicines accounted for 25.9% of expenditures in these households, hospitalizations for 19.6%, and finally all other types of spending accounted for the remaining 55%. Various source of data were used to derive an estimate of the proportion of expenditures in each of those 3 categories (medicines, hospitalizations, and other) due to NCDs, which are reported in the second data column of Table 7. Estimates of drug spending based on the general population taken from the National Health Survey of 2009 indicate that about 18% of drug expenditures are on medications for NCDs. Estimates of out-of-pocket hospitalization expenditures among the privately insured population (ISAPRE) with additional coverage for catastrophic illness (CAEC) indicate that about 51% of such expenditures insured under this catastrophic coverage plan are due to NCDs. Finally, estimate using the broad measure of possible NCD health expenditures (discussed in the previous paragraph) using the Household Budget Survey indicate that in general 38% of expenditures among households with catastrophic expenditures are due to NCDs. By taking a weighted average of expenditures on medicines, hospitalization, and all other expenses using the estimates for the proportion of spending in each health category due to NCDs, we can arrive at a crude estimate of the overall proportion of catastrophic health spending due to NCDs. Our estimate is that among households experiencing catastrophic costs about 36% of their health costs are due to NCDs. We can then infer that since 36% of catastrophic costs are due to NCDs that 36% of cases are due to NCDs. This is a strong inference (since it is only true if households exclusively had only NCD expenditures or only non-NCD expenditures), but it is the best approximation we can make under the circumstances. Assuming that 36% of the 2 percent of cases with catastrophic health expenditures are due to NCDs, we arrive at an estimate that 0.8% (less than one percent) of Chilean households face catastrophic costs due to NCDs. Table 8 presents other estimates based on various thresholds.

For example, if catastrophic spending is defined as health expenditures exceeding 30% of household income, then the percent of Chilean households facing catastrophic health expenditures due to NCDs increases from 0.8% to 1.5%.

Table 7. Estimations of proportion of catastrophic health expenditures attributable to NCDs

	Health spending by category for households with catastrophic health expenditures ^a	Health expenditures due to NCDs	Catastrophic health expenditures due to NCDs
Medicines	25.9%	18.3% ^b	4.7%
Hospitalization	19.6%	51.1% ^c	10.0%
Other	55.5%	38% ^d	21.1%
Total	100 %		35.8% ^e

Table Notes: (a) Estimated from the VII Household Budget Survey; (b) Based on drug expenditures reported in the National Health Survey 2009; (c) Based on hospitalization data from catastrophic health coverage of private insurers (ISAPRE, 2012); (d) Estimated from the VII Household Budget Survey; (e) Estimate of overall proportion of catastrophic expenditures due to NCDs based on weighted-average of expenditures in 3 categories: medicines, hospitalization, and all other care.

Table 8. Percentage of Household Facing Catastrophic Health Costs due to All Causes and due to NCDs

Average monthly health expenditures as percent of household income	Percent of households facing catastrophic costs from all causes	Percent of households facing catastrophic costs from NCDs
10%	20.9%	7.5%
20%	8.6%	3.1%
30%	4.1%	1.5%
40%	2.1%	0.8%
50%	0.9%	0.3%

3.0 Lessons learned and future challenges

The pilot study in Chile derived baseline estimates for 3 indicators of the socio-economic and multi-sectoral aspects of NCDs. The study found that the Chilean central government devoted about 0.7% of its budget to NCD prevention and health promotion; that about 27% of the Chilean population is unable to afford a healthy diet (meeting national nutritional recommendations); and that about 0.8% of Chilean households face catastrophic health expenditures due to NCDs. The study was important in demonstrating the feasibility of deriving estimates of all 3 indicators in a brief period (approximately 4 months). However, significant challenges were encountered that provide important lessons for future estimations of these indicators.

First, all 3 estimates were subject to serious data limitations. The central challenge in estimating the investments of the public sector in NCD prevention and health program is to construct a systematic accounting system for monitoring these expenditures at a programmatic level across all ministries. This would require a significant and sustained commitment of resources. The absence of this systematic approach meant that indirect estimation methods needed to be

used to derive estimates. Hence, considerable uncertainty surrounds our estimates for the indicators and reasonable alternative hypotheses would have led us to quite different estimates. For example, calculation of the percent of government spending invested in NCD prevention and health promotion hinged on a reasonable guess that approximately 30% of man-hours in primary care clinics are directed toward these activities. But an alternative guess of 10% of time would have cut in half our overall estimate of the amount of government investment in NCD prevention and health promotion (118,409 million pesos instead of our estimated value of 249,035 million pesos). More precise estimates would have required substantial additional efforts that should be borne in mind in any future attempt to refine these figures. In addition, this lack of precision is a reflection of the financing of local clinics on a per-capita basis rather than fee-for-service, which makes it difficult to isolate the investment in NCD prevention and health promotion. In an under-financed and over-burden primary health care environment, it is likely that resources devoted toward health promotion are re-directed toward curative services as there is an express demand for curative services but less so for prevention.

This first attempt at estimating the socioeconomic aspects of NCDs has laid the foundation for better future estimates by generating knowledge of the specific types of data that are missing and the steps needed to obtain these data. For example, to enable direct measurement of households experiencing catastrophic health costs due to NCDs, future versions of the Household Budget Survey should include queries on the NCD status of household members as well as identifying which health expenditures are related to specific NCDs. In response to this lack of direct data, an important contribution of the pilot study in Chile was to develop an indirect methodology for identifying NCDs on the basis of classification of medical expenditures reported in the Household Budget Survey.

Other possibilities involve estimating the economic impact of NCDs not from household data, but individual data as is done in cost of illness studies (cost-of-illness). This methodology is better developed and can be applied using data currently available. The weakness of this approach is that it fails to consider the household as a unit of analysis, which is most appropriate when considering the economic impact of the disease on the population.

A challenge in estimating government investments in NCDs was the low response rate from the other government ministries. One suggestion in response was to develop a guide with a list of examples of types of government programs directed at health promotion or NCD prevention across a wide variety of ministries. The PAHO Think Tank report on NCDs and Development identified a list of 20 such activities across 8 ministries. To this list, we can add those programs identified by the Chilean pilot study. A further expansion of items would be possible based on a literature review of studies analyzing public health spending devoted to NCDs. Such a guide would be useful when initiating discussions with other ministries about their role in health promotion and NCD prevention. Furthermore, data collection could make use of a specially designed survey based on these categories of activities. It is evident that cross-sectoral commitment to this measurement effort must be ensured so that representative results are obtained and can be monitored over time. Above all, we note that the low response rate from

other government ministries is in itself an indicator of the need for an all-of-government approach to NCDs and health promotion.

In the context of measuring affordability of health diets, there were several recommendations for moving forward with this indicator. The first is to attempt to reflect the lower costs of healthy food in rural areas relative to urban areas. The second is to explore the possibility of alternative healthy diets. The healthy diet based on Chile's national nutritional recommendations was determined to be more costly than a diet based on Chile's current basic food basket. However, as noted earlier, this is a result of the particular set of nutritional recommendations that substitute healthy and more costly food for less healthy, and less expensive food. Exploring the costs of alternative "healthy" food diets is an important pending empirical investigation with significant policy implications. More fundamental is the question of what is meant by a "healthy" diet and especially the relationship between normative nutritional recommendations and empirical observation of the eating habits of a population. For effective monitoring of access to healthy foods, a consensus must be reached among stakeholders on these issues.

Despite all these problems, these estimates represent an important first look at the socio-economic dimension of NCDs in Chile and lay the foundation for future work within the region. They represent an important step forward in an evidence-based approach to NCDs. We look forward to estimating these indicators in other countries in the region and to continue further rounds of estimation in Chile to monitor trends and policy impacts.

4.0 References

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