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MEMORANDUM

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July 19, 2012

TO: Representative John Kefalas

FROM: Larson Silbaugh, Economist, 303-866-4720

SUBJECT: Considerations in Developing and Economic Well-Being Index

This memo presents a discussion of different aspects to consider when developing an economic well-being index. The discussion focuses on the methodology to be used and the strengths and limitations of choosing how to calculate the index in certain ways. Understanding the strengths and weaknesses of each approach will lead to designing an index best suited for the intended purposes. Examples to aid in the understanding of the methodology are also provided.

Summary

Before calculating an economic well-being index, Legislative Council Staff would need direction in the following areas:

- which well-being capabilities to use in an index and how to weight the various measures of well-being,
- whether a single index or multiple indices should be calculated,
- which benchmark to use to measure economic well-being, and
- how to treat missing or old data.

Purpose of an Economic Well-Being Index

The purpose of the capability approach to economic well-being is to determine a population's economic well-being. Using this approach, income is not used, but other indicators associated with well-being are substituted to measure the outcomes associated with higher incomes. When developing and calculating an index there are certain methodologies that are more appropriate, depending on how the index will be used.

What is an Index?

An index is a way to compare values to some benchmark. In this case, publicly available data will be used to compare different counties across the state for various types of well-being. The simplest way to calculate an index is to divide the value for a certain population by the benchmarked value. Example 1 demonstrates how an income index would be calculated to compare median income in Larimer County to median income statewide.

Example 1 **Calculating an Index for Median Household Income**

Larimer County Median Household Income, 2010: \$54,154
Colorado Median Household Income, 2010: \$54,046
Median Household Income Index for Larimer County= $\$54,154 / \$54,046 = 1.002$

An index could be calculated for each county in Colorado. A higher index represents higher household income. It is easy to interpret this index, median household income is 0.2 percent higher in Larimer County than the state as a whole, but that can be easily understood by comparing the income levels alone. In addition, calculating median household income does not necessarily equate to economic well-being. Is this sufficient income to provide housing or healthcare? The concept behind the capability approach to economic well-being is to move past income and measure other measures of well-being.

Adding these different measures of well-being adds complexity to the calculation of an economic well-being index. The rest of this memo discusses some of these complexities. The complexity of the index can add value and insight into the measurement of economic well-being, but the trade off is that the interpretation of the index becomes more difficult, data requirements increase, and the application of the index becomes more specific.

Included Variables and Weighting

One of the benefits of using the capability approach is that it uses a broader view of economic well-being than simply using a single measure, such as income. This fact requires that more variables are used to calculate the index. A decision must be made about which variables to include. In a previous presentation to the Economic Opportunity Poverty Reduction Task Force Metrics Committee, the capabilities included were education, mobility, employment, shelter and health. The

Human Development Index (HDI), a well known international capability index, uses health, knowledge, and income to compare countries to each other. There are other capabilities that could be included, such as entrepreneurship or crime statistics. Deciding which capabilities to include when calculating a well-being index implicitly leaves out some aspects of well-being. These exclusions may be either unintentional, theoretical, or practical.

Leaving a capability out of the index *unintentionally* is possible, but not really preventable. An example of leaving a capability out of the index for *theoretical* reasons would be income. The purpose of the capability approach to well-being is to measure how a population is doing relative to other groups, but income could be argued to influence well-being. The other type of exclusion would be *practical*. In general, this may occur when a capability is difficult to measure or is measured infrequently. Hard-to-measure capabilities are difficult to include in an index because it is not clear that the data are meaningful. An example of this at the international level would be freedom. Freedom is usually assumed to improve well-being, but it is almost impossible to meaningfully measure. An example of infrequently measured variables in Colorado would be county level non-farm employment. These data are based on establishment survey data, which are only conducted for the seven largest metropolitan areas in the state.

Once the variables are chosen, one must decide how to weigh them, or how much each variable should influence the index. Deciding how variables are weighted in an index necessarily requires making a value judgement. If an index were calculated using five capabilities (for example health, education, employment, mobility, and shelter) you could weight them various ways. The only requirement is that the weights equal 1.0. Example 2a-2c shows three different ways these five capabilities could be weighted:

Example 2a
Equally Weighted

$$.20(\text{Health}) + .20(\text{Education}) + .20(\text{Employment}) + .20(\text{Mobility}) + .20(\text{Shelter}) = \text{Index}$$

Example 2b
More Weight on Health and Education

$$.35(\text{Health}) + .35(\text{Education}) + .10(\text{Employment}) + .10(\text{Mobility}) + .10(\text{Shelter}) = \text{Index}$$

Example 2c
No Weight on Mobility

$$.25(\text{Health}) + .25(\text{Education}) + .25(\text{Employment}) + .00(\text{Mobility}) + .25(\text{Shelter}) = \text{Index}$$

The index in example 2a weighs each of the five capabilities equally. This means that when interpreting the index, none of the capabilities is more important to economic well-being than any other capability. Example 2b uses higher weights on health and education to emphasize these measures when considering economic well-being. Example 2c has four equally weighted measures, and no weight on mobility. This choice places no value on mobility.

A similar issue arises when more than one variable is used to measure a capability. Multiple variables are available to measure education, health, employment, mobility and shelter. These multiple variables can all be used to generate an index for each of the capabilities. In a previous memo, 12 data points were identified that could be used in an index for health, seven for education, five for employment, four for shelter, and four for mobility. For example, when computing a health index, it is not clear if life expectancy contributes more to well-being than access to care. This determination must be made for all 12 of the available measures, which requires some value judgement for each individual capability.

The county health rankings, an index published by the Robert Wood Johnson Foundation and the University of Wisconsin, has clear documentation on the weights that are placed on health measures. These weights are developed by health experts. The HDI weights health, knowledge, and income equally.

Before proceeding with calculating an economic well-being index, Legislative Council Staff would need direction on the capabilities to include and the weighting of those capabilities.

Single or Multiple Indices

The amount of data available for various measures of well-being make it possible to create an index for each of those measures. A single index is a way to synthesize well-being across many different measures and see how a population is doing overall, but this may make it more difficult to identify certain aspects of well-being that could be improved upon. Example 3 uses Larimer County to demonstrate how high index measures in certain capabilities can mask low index measures in other capabilities. For simplicity, each of the four capabilities of health, education, employment, and shelter are equally weighted.

Example 3 Single Index or Multiple Indices

| Capabilities | Variable | Index |
|---|--|-------|
| Health | Unhealthy days, inverted | 1.032 |
| Education | Percent of adult population with at least a HS diploma | 1.058 |
| Employment | Percent of population 16 years old and over that are employed | 1.003 |
| Shelter | Percent of occupied rental units with rent less than 30% of household income | 0.946 |
| Single Index | | |
| Single Index = $.25 \times (1.032 + 1.058 + 1.003 + 0.946)$ | | 1.010 |

Each of the indices use a single variable to measure a capability and is calculated by dividing the data point for Larimer County by the statewide value. For health, the average number of unhealthy days in the past 30 days reported between 2006 and 2010 was used. This was inverted, so that a higher score represents a healthier population. For education, the percent of high school graduates as a percent of the over 25 population in 2010 was used. For employment, the percent of the population 16 years and older that reported being employed in 2010 was used. For shelter, the percent of occupied rental units that paid more than 30 percent of annual household income in rent in 2010 was used.

Because the single index in Example 3 is greater than 1.000, it can be interpreted that Larimer County is better off than the state as a whole, but this is due to high scores for education and health. The shelter index is actually below the statewide average, meaning that renters pay a higher percentage of household income in rent than the state as a whole.

Computing more than one index for different capabilities adds to the resources needed to calculate an economic well-being index and increases the data requirements. In addition, it can add complexity to the interpretation of economic well-being, but adds to the understanding of what measures contribute or hurt economic well-being for a given population. The HDI publishes four indices; an overall index, an index for health, an index for knowledge, and an index for standard of living.

Before computing an economic well-being index, Legislative Council Staff would need direction on whether to calculate a single index or multiple indices for separate capabilities.

Which Benchmark to Use

One of the main purposes of an index is to compare two sets of things. It can be to compare between time periods, between nations, or to some benchmark or goal. In the previous examples, Larimer County has been compared to the state as a whole. This approach does not directly measure how economic well-being compares to economic well-being in a previous period or how well-being is measured against some goal. Example 4 shows three different indices for education, using the statewide average, high school attainment in 2000, and against the goal of 100 percent high school graduation.

Example 4
Percent of Population 25 years or Older with a High School Diploma

| | Value | Index for Larimer County |
|--|--------------|--------------------------|
| Larimer County, 2010 | 94.9 percent | |
| Statewide, 2010 (Compare to State) | 89.7 percent | 1.058 |
| Larimer County, 2000 (Compare over Time) | 92.3 percent | 1.028 |
| Goal (Compare to Goal) | 100 percent | 0.949 |

By using different benchmarks, an index can measure different things. Using the statewide average compares how Larimer county is doing relative to the rest of the state, but not if it is improving over time. Using the statewide average may actually result in some counties having lower index values if the statewide average increases, even if the measure for well-being improved for that population. Using a previous time period shows how each county is doing over time, but not how it is doing relative to other counties in the state. It may be difficult to find data on previous time periods for some measures of well-being, so there is an added data requirement when using a previous time period as the benchmark. Using a goal as the benchmark is another way to measure a county's well-being, but it can be difficult to choose an appropriate goal.

The County Health Rankings uses other counties to determine the rankings. Some examples of indices over time include the Consumer Price Index and the major stock indices. The HDI uses goals that are based on the highest observed measures of countries each year. For example, the life expectancy in 2011 in Japan was 83.4 years, the maximum value for any country. This was used as the benchmark for the rest of the countries for which the HDI was calculated.

Before proceeding with calculating an economic well-being index, Legislative Council Staff would need direction on which benchmark to use. If a goal is chosen as the benchmark, then appropriate goals would need to be developed.

State of the Data

Another complication with designing an economic well-being index is the state of the data that are used to calculate the index. Data could be missing, infrequent, or in a form that does not allow for comparison between counties. Excluding these data from an index may not capture important indicators of economic well-being, but including they may cause difficulty in interpreting the results.

In general, better data are available for larger populations. There are more data at the state level than the metropolitan area (MSA), and more data at the MSA level than the county level. Limiting data used in a county level index to only county level data ensures that each county has a unique value and reading for economic well-being, but it may exclude important information on well-being. One option is to use MSA or other level of data where available, and use the statewide average or the average index value for populations that do not have a unique value. This will keep missing data from increasing or decreasing the index value. For American Community Survey data, one way to get more reliable data for each county is to use a longer sample period.

In addition, data are released at various time periods and intervals. County level Census data are released once every 10 years. County level local area employment statistics are released monthly. If the index is calculated only when *all* of the data are new, then it may not be calculated frequently enough to be useful in tracking changes in economic well-being. If the index is calculated each time some information is released, then there might not be much new information so the index would not reveal any meaningful change in well-being. One way to include as much information as possible, and have a somewhat current index, is to use the most recent data available. In some cases, these data could be more than a year old and not all values would be from the same year.

Another data limitation in calculating an index is that data needs to be comparable between counties. Rates and per-capita measures are most meaningful because it allows the comparisons between counties across the state. For example, the total number of high school graduates is not comparable between Denver and Larimer Counties because Denver has a much larger population. The percent of the population with a high school diploma is a more appropriate measure because it allows comparison between counties of all sizes. Most data sets have information that can be used to compare populations of different sizes, but there are a few exceptions.

Before calculating an economic well-being index, Legislative Council Staff would need direction on how to treat old or missing data.

Summary

An economic well-being index can provide insights into comparing well-being between counties for a broad range of capabilities, but there are different ways to design and calculate an index. The methods depend on the intended use of the index and the judgements that must be made regarding the weighting of different measures of well-being. Before calculating an economic well-being index, Legislative council staff would need direction in the following areas:

- which well-being capabilities to use in an index and how to weight the various measures of well-being,
- whether a single index or multiple indices should be calculated and reported,
- which benchmark to use to measure economic well-being, and
- how to treat missing or old data.