LEAGUE OF MINNESOTA CITIES

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SINCE 1913

Local Government Aid
The Technical Details of Calculating a City's Need

This document describes the variables used to calculate a city's expenditure need and provides the technical details of the analysis used to determine those variables. This summary reflects changes that the 2003 Legislature made to the need variables. While the 2008 Legislature made other changes to the program, it did not alter the need variables. This technical summary does not describe other elements of the program, such as how the various aid bases are determined or how the transition mechanisms apply. For an overview of the LGA program, including discussion of aid bases, transition mechanisms and overall funding levels, please refer to the League document, "Local Government Aid 101" (pdf).

How the formula works: The basics

The formulas implemented in 2003 measure each city's *expenditure need* based upon a number of statistical variables, which are described below. These variables attempt to identify characteristics that cause some cities to need to spend more than other cities to provide the same level of service. The 2008 reforms did not make any changes to these need variables.

Each city's expenditure need is then compared to its *ability to pay*, or revenue-raising capacity. Those cities that have access to enough local revenues to pay for their spending needs do not receive LGA. Cities that have spending needs that exceed their local ability to pay receive a share of the LGA distribution.

Need variables for cities with populations over 2,500:

1. Pre-1940 housing percentage—the percent of housing units in the city built prior to 1940. This data comes from the 2000 census. This variable is often characterized as a proxy variable for the age of the city's infrastructure; cities with older infrastructure are expected to have higher per-capita costs for infrastructure maintenance and repair. The variable is also highly correlated with poverty and other socio-economic factors that may increase some city service costs.
2. Population decline over the past 10 years—the percentage by which the city's population has declined in the most recent 10 years for which estimates are available from the state demographer, metropolitan council (for cities in the seven-county metro area) or the census bureau. The calculation for aids payable in 2009 will likely use the decline from 1997 to 2007. Cities whose population has either grown or remained constant have a population decline percentage of zero. This variable represents the burden placed on city budgets when populations decline; some fixed costs of city services such as salaries and building space

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are hard to reduce quickly when population declines, so per capita spending may be higher in declining cities.

3. Accidents per capita—the 3-year average of the number of automobile accidents in the city as reported to the department of public safety divided by the city population. This variable is reflective of the level of service *overburden* in a city. A city that has a large employment base, a college or university, a regional shopping mall or other regional facility will generally have higher per capita costs for maintaining streets and other city infrastructure that is burdened by the additional use by non-residents. It also may need to have larger police and fire forces or more specialized fire equipment due to these facilities. Because of the traffic created by these facilities, there generally is also a correspondingly higher amount of traffic accidents per capita in these cities.
4. Average household size—the average number of people living in a household in the city as estimated by the state demographer or the census bureau, whichever is most current. This calculation does not include institutionalized populations living in on-campus college housing, prisons and jails, or group homes. This variable recognizes that the level of many city services is determined more by the number of housing units than by the population. The formula is attempting to explain differences in per capita expenditure need. Imagine two cities of 1,000 population that are similar in all respects except one has 400 housing units and the other has 500 housing units. The one with only 400 housing units, and a correspondingly higher average household size, can probably provide some city services for less money than the city with 500 housing units to serve. Cities with higher average household size will therefore generally have lower expenditure need per capita.
5. Metro or non-metro—cities located outside the seven-county metropolitan area receive a $35 increase in their per capita need measure. This variable reflects the fact that because most Greater Minnesota cities are geographically isolated from other cities, they have fewer opportunities to achieve economies in service provision through cooperative service agreements. They therefore are expected to have higher expenditure need per capita.
6. Adjusted net tax capacity (ANTC) per capita—the per capita strength of the city's tax base after adjusting for differences in assessment practices across the state. This is a *control variable*, which means it is used to estimate how much the other variables explain differences in expenditure need. But in the aid formula, differences in ANTC among cities do not impact their relative measures of need for aid distribution.

Need variables for cities with populations under 2,500:

1. Pre-1940 Housing percentage—see discussion above
2. Population decline 1990-2000—see discussion above
3. Commercial/industrial market value percentage—the percent of total assessed market value in the city that is classified as commercial or industrial property. This variable reflects the cost of providing services to commercial and industrial property, which is expected to increase a city's per capita expenditure need.
4. Population—from the most recent state demographer estimate or metropolitan council estimate (for cities in the seven-county metro area) or census count. This variable recognizes that larger cities generally provide more extensive services, so their per capita expenditure need is expected to be higher.

The technical details of the need formulas

The formulas adopted in 2003 measure each city's *expenditure need* based upon the statistical variables listed above. As the table below shows, each city's variables are multiplied by fixed coefficients, which weight the variables according to their relative importance in explaining differences in city spending need as measured by revenue base (levy plus state aids). The result for each city is a per capita dollar expenditure need. The average city per capita expenditure need for 2009 under the current formulas is about $413. The table below lists the range of values for each variable and the fixed coefficients by which they are multiplied to calculate need. There were no changes to either the variables or the coefficients during the 2008 session.

Need variables and their coefficients

(Low, high, and average values based on need data for 2009 distribution)

Large city variables	**Low value**	**High value**	**Average value**	**Coefficient**
Pre-1940 housing percentage	0.37	54.15	16.97	5.0734098
Population decline percentage	0	18.89	0.89	19.141678
Accidents per capita	0	0.0637	0.01356	2504.06334
Average household size	1.959	3.165	2.48	-49.10638
Metro city (metro = 1)	0	1	N/A	-35.20915
Constant (includes ANTC adjustment[1])				355.05
Small city variables	**Low value**	**High value**	**Average value**	**Coefficient**
Pre-1940 housing percentage	0.00	100.00	35.72	2.387
Population decline percentage	0.00	56.76	6.46	3.16042
Commercial/Industrial market value percentage	0.00	85.57	12.71	2.67591
Population (transformed[2])	55.26	404.25	226.93	1.206
Constant				-62.77

[1]ANTC is a control variable, so each city's need is adjusted uniformly by an amount equal to the average per capita ANTC times the ANTC coefficient (about 42.87). This amount is reflected in the constant.

[2]For cities under 2,500 population, population is transformed by the following formula: ((population^.3308) * 30.545) = *transformed population*.

Each city's expenditure need is then compared to its *ability to pay*, or revenue-raising capacity (see discussion, above). Those cities that have access to enough local revenues to pay for their spending needs do not receive LGA. Cities that have spending needs that exceed their local ability to pay receive a share of the LGA distribution.

About the data analysis

The need coefficients were determined using a computer-aided statistical technique known as regression analysis. This technique uses fiscal and demographic statistics for each city to explain variations in cities' *revenue base* (levy plus general state aids).

Many variables were tested to find those that were statistically correlated to variations in revenue base. For example, cities with a higher percentage of their housing built before 1940 generally have higher per capita revenue base than other cities. The regression analysis determines the expected change in revenue base among cities for a given change in the need variables. This expected change is reflected in the coefficients listed above. For example, all other factors being equal, a large city with a pre-1940 housing percentage that is one percentage point higher than another city would be predicted to have $5.07 more revenue base per capita.

Separate regression analyses were conducted for cities above 2,500 population and cities below 2,500 population. The need measure proposed by the governor and adopted by the Legislature in 2003 for the larger cities is based on a regression model that explained roughly 62.4 percent of the variation among large cities' revenue bases using the 6 need factors listed above (i.e. the model had an R-squared of .624).

Variations in revenue base for small cities have historically been more difficult to explain using regression analysis. Some analysts have suggested that this difficulty is partly the result of small cities offering a wider variation of types and levels of municipal services, and partly the result of small cities having greater variation in economic vitality. The need measure for the smaller cities is based on a regression model that explained roughly 20.3 percent of the variation among small cities' revenue bases using the 4 need factors listed above (i.e. the model had an R-squared of .203).

Sample calculation

Example city: Non-metro city of 17,000 population using average values from table above:

Expenditure Need

	city value	x	coefficient	=	factor
1. Pre-1940 housing factor	16.56	x	5.0734098	=	84.02
2. Population decline factor	0.67	x	19.141678	=	12.82
3. Accidents factor	0.0174	x	2504.06334	=	43.57
4. Household size factor	2.633	x	-49.10638	=	-129.3
5. Metro factor	0	x	-35.20915	=	0
6. Constant					355.05

Per capita expenditure need (sum of factors) 366.16

Expenditure need = per capita need * population
= 366.16 * 17,000
= 6,224,720

Prepared by Rachel Walker, June 2008