Clustering Minnesota Cities

15 City Clusters Methodology

Recent *State of the Cities* reports have analyzed trends in demographics and municipal finances, and outlined policy implications for Minnesota cities. But without a classification scheme, it is hard to draw any "meaningful" conclusions for different cities. Grouping cities by size or location alone cannot provide satisfactory results for the analysis because of the diversity of cities in the same region or of the same scale. The hierarchical cluster method, which is based on multiple demographic and financial characteristics, reorganized the 853 cities into relatively homogeneous groups.

The House Research Department conducted such cluster analyses for Minnesota cities in 1988 and 1996[1]. Applying the cluster method to the updated 2000 Census data and 2002 municipal tax data reorganizes the 853 cities into alike groups. As in the original House Research analyses, the 853 cities were segregated into seven-county metro and non-metro cities. More than a dozen variables were tested and scores of combinations of these variables were analyzed. A few combinations yielded useful clusters that "make sense." The model selected for the report is based on four criteria variables similar to those used by Pat Dalton in her 1996 House Research Department report.

The four criteria variables are:
- 2000 Census population
- Population growth between 1990 and 2000
- Median household income in 1999
- Per capita commercial/industrial property market value in 2002

The population variable approximates both city size and demand for city services by residents. The growth rate reflects the changing character of the city and may signal extraordinary service demands in rapidly growing or declining cities. Household income represents residents' ability to pay for services and may identify low-income populations with unique service needs.

Commercial/industrial property market value approximates the level of economic activity in the city and the city's role in its region. It also represents service demand beyond that included in the population variable, including service demands from businesses and service demands from non-residents who come into the city to work or patronize businesses.

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[1] Pat Dalton, Legislative Analyst, provided both background information on her work on the 1996 House Research

Department report and generous help to this analysis

Predetermined clusters, outliers, and adjustment
Two groups of cities were predetermined prior to applying the cluster methodology. Minneapolis and St. Paul were classified as "metro central cities" for their extremely large populations and their unique roles in the regional economy. Cities in greater Minnesota with population less than 500 were grouped as "small rural cities." The population size of these very small cities generally determines their economic role and the demand for and ability to provide public services. Most cities in the group share similar characteristics in variables besides population size.

Three cities were excluded before running cluster analysis because of their extremely high population growth. They are Rogers (413 percent) in the metro area and Pleasant Lake (530 percent) and St. Michael (263 percent) in greater Minnesota.

The population and growth rates of three greater Minnesota cities—Appleton, Moose Lake, and Sandstone—are distorted by the dramatic change in a large institutionalized population. Their population growth rates were adjusted to reflect the change in their non-institutionalized population only. Some other cities that have a large share of institutionalized population, like Bayport, were left unadjusted because the institutionalized population has little impact on the city's growth rate.

Descriptive characteristics for city clusters
Besides the homogeneity in the four criteria variables used in the cluster analysis, cities in the same category also share similar patterns in some other variables that are highly correlated with one or more criteria variables. Table 1 summarizes each cluster's characteristics in the four criteria and in selected descriptive variables by classifying the z-scores of cluster means into five scales.

Take "metro high growth cities" as an example. Table 1 on page 3 shows that in general, cities in this group have the following characteristics compared to an average metro city: medium size, high growth rate, average median household income, average commercial/industrial market value per capita, low proportion of elderly people, low median age, below average percentage of minority population, high housing ownership, average share of people with bachelor's degree, low poverty rate, and high proportion of housing built in the last 10 years.

Table 1: Descriptive Variables for City Clusters

Cluster name	Population size	Population growth rate 1990-2000	1999 median household income	Per capita commercial/industrial market value in 2002	Percentage of people over 65 years old	Median age	Percentage of people that are racial/ethnic minorities	Homeownership	Percentage of people over 25 years old with at least a bachelor's degree	Poverty rate	Percentage of housing units built in 1990-2000
Metropolitan Clusters											
Central Cities	H*	L	L*	H	M	L*	H*	L*	M	H*	L*
Large Cities	H	M	M	H*	L	M	H	M	H	L	M
Old Cities	M	L	L	M	H	M	H	L*	L	H	L
Diversified Cities	M	L	L	H*	H*	H	M	L	M	M	L
High Growth Cities	M	H	M	M	L	L	L	H	M	L	H*
High Income Cities	L	L	H*	L	L	H*	L	H*	H*	L	L
Smaller Cities	L	L	L	L	H	M	M	L	L	H	L
Greater Minnesota Clusters											
Major Cities	H*	M	H	H*	L	L*	H	L*	H*	H	H
Regional Centers	H*	M	H	H	L	L	H	L*	H*	M	M
Sub-Regional Centers	M	M	L	H*	H	M	H	L*	H	H	H
Urban Fringe	H	H*	H*	H	L*	L*	L	H	H	L	H*
High Income Cities	H	H	H*	H	L*	L	L	H	H*	L	H*
Moderate Growth Cities	M	H	H	M	L	L	M	M	H	L	H
Established Cities	M	M	M	M	H	M	M	L	M	M	L
Small Rural Cities	L	M	L	L	M	M	M	H	L	M	L

Notes: Variables that are not specified years and sources are 2000 census data

[2]The five scales are classified by z-scores, which measure how many standard deviations the cluster mean is from the regional mean (either 7-county metro or Greater Minnesota unweighted average).

H* (Extremely High):   the cluster mean is more than +1.00 SD from the regional mean
H (High):   the cluster mean is between +0.20 SD and +1.00 SD from the regional mean
M (Medium):   the cluster mean is between –0.20 SD and +0.20 SD from the regional mean
L (Low):   the cluster mean is between –1.00 SD and –0.20 SD from the regional mean
L* (Extremely Low);   the cluster mean is more than –1.00 SD from the regional mean
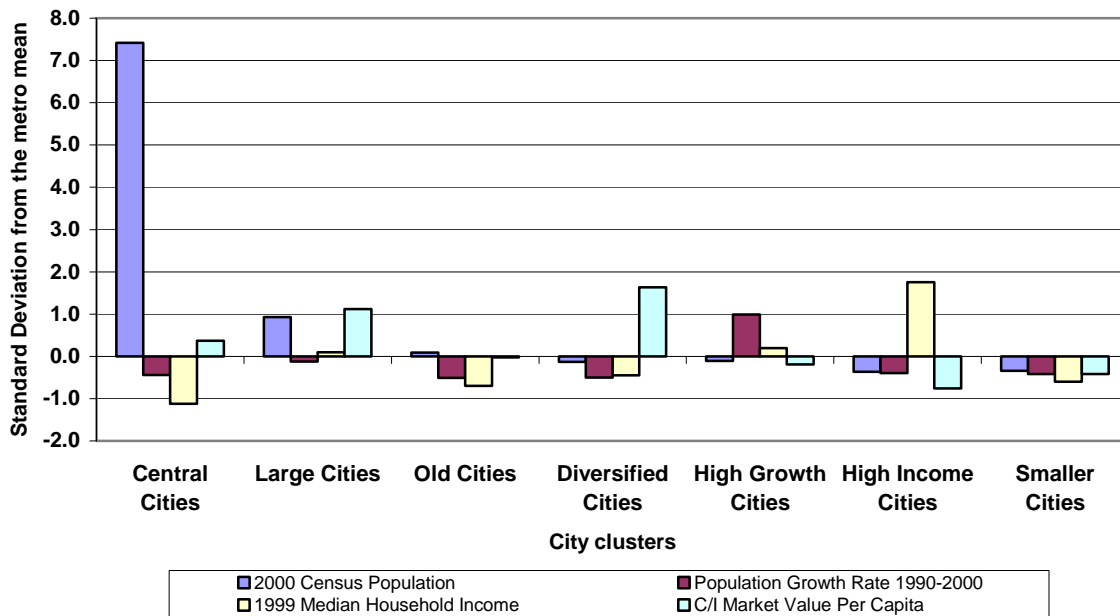
Metropolitan city clusters

There are seven city clusters for the seven-county metropolitan area. Table 2 on page 4 shows the criteria variable profiles for each cluster. Chart 1 on page 4 shows the graph of the standardized cluster profile.

Table 2: Cluster Profiles for Metropolitan Cities

Cluster Name	2000 Census Population	Population Growth Rate 1990-2000	1999 Median Household Income	C/I Market Value Per Capita	No. of Cities in the Cluster
Central Cities	334,885	4.7	$38,374	$10,772	2
Large Cities	58,192	20.1	65,710	16,247	12
Old Cities	22,396	1.3	47,924	7,901	13
High Growth Cities	13,887	74.0	67,969	6,699	35
Diversified Cities	12,834	1.6	53,498	20,043	15
High Income Cities	2,910	6.7	102,990	2,570	20
Smaller Cities	3,836	5.8	50,003	5,058	41
Metro Unweighted Average	**18452**	**26.0**	**63536**	**8,085**	**138**
Metro Standard Deviation	**42670**	**48.6**	**22449**	**7,304**	

Chart 1
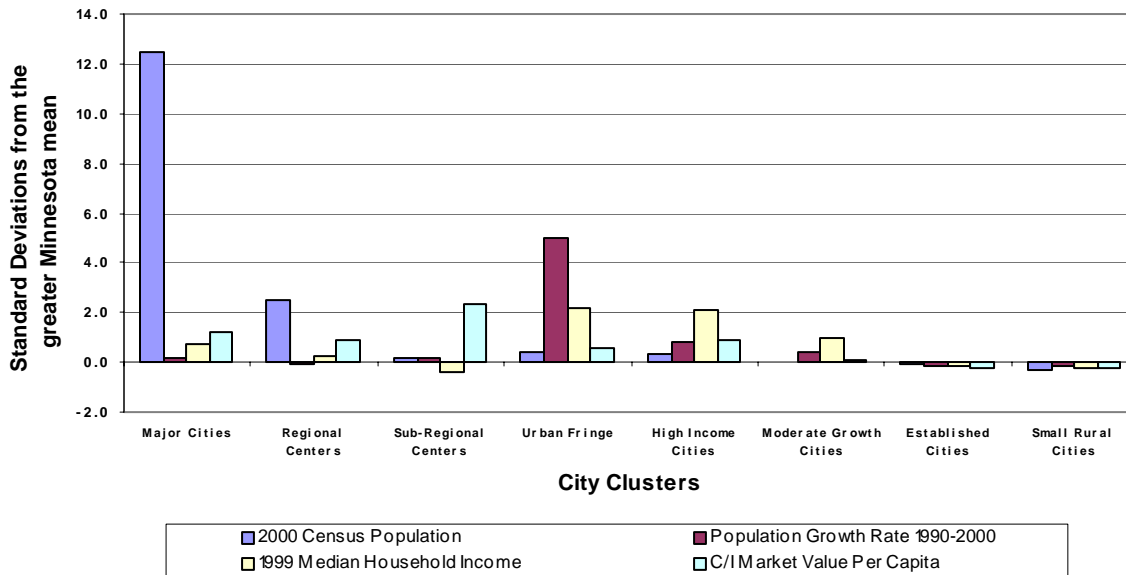**Cluster Profile for Metropolitan Cities**

Greater Minnesota city clusters

There are eight clusters for the Minnesota cities outside of the seven-county metro area. Variable profiles for the clusters of these cities are provided in Table 3 on page 5. Chart 2 on page 5 provides the bar graph of the standardized cluster profiles.

Table 3: Cluster Profiles for Greater Minnesota Cities

Cluster Name	2000 Census Population	Population Growth Rate 1990-2000	1999 Median Household Income	C/I Market Value Per Capita	No. of Cities in the Cluster
Major Cities	77,277	14.7	$40,067	$8,402	3
Regional Centers	16,977	6.2	35,768	7,075	22
Sub-Regional Centers	3,165	13.0	30,374	12,366	27
Urban Fringe	4,578	174.1	52,563	5,998	10
High Income Cities	3,956	36.1	51,934	7,248	25
Moderate Growth Cities	2,140	22.0	42,031	4,146	60
Established Cities	1,616	2.4	32,314	3,169	209
Small Rural Cities	214	1.7	31,858	3,113	359
GM Unweighted Average	**1,928**	**7.9**	**33,935**	**3,894**	**715**
Standard Deviation	6,050	33.2	8,535	3,665	

Chart 2
Cluster Profile for Greater Minnesota Cities

Minnesota Cities by Cluster

M Central Cities
Minneapolis
St Paul

M Large Cities
Apple Valley
Blaine
Bloomington
Brooklyn Park
Burnsville
Coon Rapids
Eagan
Eden Prairie
Edina
Maple Grove
Minnetonka
Plymouth

M Old Cities
Anoka
Brooklyn Center
Columbia Heights
Crystal
Hastings
Hopkins
New Brighton
New Hope
Richfield
Shoreview
South St Paul
West St Paul
White Bear Lake

M Diversified
Arden Hills
Coates
Forest Lake
Fridley
Gem Lake
Golden Valley
Lilydale

Long Lake
Maple Plain
Maplewood
Oak Park Heights
Osseo
Roseville
St Louis Park
Wayzata

M High Growth
Andover
Carver
Centerville
Champlin
Chanhassen
Chaska
Cologne
Cottage Grove
East Bethel
Elko
Farmington
Greenfield
Ham Lake
Hugo
Inver Grove Heights
Lakeville
Lino Lakes
Mahtomedi
Medina
Mendota Heights
New Market
Oak Grove
Oakdale
Prior Lake
Ramsey
Rogers
Rosemount
Savage
Shakopee
St Bonifacius
St Francis

Vadnais Heights
Victoria
Waconia
Woodbury

M High Income
Afton
Birchwood
Corcoran
Deephaven
Dellwood
Grant
Greenwood
Independence
Lake Elmo
Lakeland
Lakeland Shore
Minnetonka Beach
Minnetrista
North Oaks
Orono
Pine Springs
Shorewood
Sunfish Lake
Tonka Bay
Woodland

M Smaller Cities
Bayport
Belle Plaine
Bethel
Circle Pines
Dayton
Excelsior
Falcon Heights
Hamburg
Hampton
Hilltop
Jordan
Lake St Croix Beach
Landfall

Lauderdale
Lexington
Little Canada
Loretto
Marine on St Croix
Mayer
Medicine Lake
Mendota
Miesville
Mound
Mounds View
New Germany
New Prague
New Trier
Newport
North St Paul
Norwood Young America
Randolph
Robbinsdale
Spring Lake Park
Spring Park
St Anthony Village
St Marys Point
St Paul Park
Stillwater
Vermillion
Watertown
Willernie

GM Major Cities
Duluth
Rochester
St Cloud

GM Regional Centers
Albert Lea
Austin
Bemidji
Brainerd
Cloquet
Fairmont
Faribault
Fergus Falls

Hibbing
Hutchinson
Little Falls
Mankato
Marshall
Moorhead
New Ulm
Northfield
Owatonna
Red Wing
Virginia
Willmar
Winona
Worthington

GM Sub-Regional Centers
Aitkin
Alexandria
Appleton
Baudette
Baxter
Cambridge
Deerwood
Detroit Lakes
Grand Marais
Grand Rapids
Hinckley
International Falls
Long Prairie
Mahnomen
Mora
Motley
Park Rapids
Pequot Lakes
Perham
Pine City
Pine River
Princeton
Roseau
Spicer
Waite Park
Walker

Warroad

GM Urban Fringe
Albertville
Becker
Big Lake
Breezy Point
Isanti
North Branch
Rockville
Sartell
St Michael
Zimmerman

GM High Income
Avon
Buffalo
Byron
Cannon Falls
Clearwater
Courtland
Crosslake
Delano
Dundas
East Gull Lake
Elk River
Hanover
Hermantown
La Prairie
Mantorville
Medford
Monticello
Nisswa
North Mankato
Oronoco
Otsego
Rice
Sauk Rapids
St Augusta
St Stephen
Wyoming

GM Moderate Growth

Annandale
Brownsville
Buffalo Lake
Center City
Chatfield
Chisago City
Cohasset
Cokato
Cold Spring
Cottonwood
Dassel
Dodge Center
Emily
Eyota
Foley
Gaylord
Glencoe
Glyndon
Goodhue
Goodview
Harris
Henderson
Holdingford
Howard Lake
Isle
Kasson
Kenyon
La Crescent
Lake City
Lake Shore
Le Center
Le Sueur
Lester Prairie
Lewiston
Lindstrom
Lonsdale
Madison Lake
Maple Lake
Nicollet
Pine Island
Plainview
Redwood Falls

Richmond
Rockford
Rush City
Rushford
Sandstone
Sauk Centre
St Charles
St Clair
St Joseph
Stacy
Stewartville
Stockton
Taylors Falls
Wanamingo
Waverly
Winsted
Zumbrota

GM Established

Ada
Adams
Adrian
Albany
Alden
Amboy
Argyle
Arlington
Atwater
Aurora
Babbitt
Bagley
Balaton
Barnesville
Barnum
Battle Lake
Belgrade
Benson
Bird Island
Biwabik
Blackduck
Blooming Prairie
Blue Earth
Bovey

Braham
Breckenridge
Brewster
Brooten
Browerville
Browns Valley
Brownsdale
Brownton
Buhl
Butterfield
Caledonia
Canby
Carlton
Cass Lake
Chisholm
Clara City
Claremont
Clarissa
Clarkfield
Clarks Grove
Clearbrook
Cleveland
Coleraine
Cook
Cosmos
Crookston
Crosby
Danube
Dawson
Deer River
Dilworth
Eagle Bend
Eagle Lake
East Grand Forks
Eden Valley
Edgerton
Elbow Lake
Elgin
Ellendale
Ellsworth
Elmore
Ely
Evansville

Eveleth	Lafayette	Pelican Rapids
Fairfax	Lake Benton	Pennock
Fertile	Lake Crystal	Pierz
Floodwood	Lake Park	Pipestone
Fosston	Lakefield	Preston
Frazee	Lamberton	Proctor
Fulda	Lanesboro	Randall
Gibbon	Le Roy	Raymond
Gilbert	Litchfield	Red Lake Falls
Glenville	Littlefork	Renville
Glenwood	Luverne	Rock Creek
Good Thunder	Lyle	Rollingstone
Graceville	Mabel	Royalton
Grand Meadow	Madelia	Rushford Village
Granite Falls	Madison	Sacred Heart
Greenbush	Mapleton	Scanlon
Grove City	Marble	Sebeka
Hallock	Mazeppa	Sherburn
Halstad	Mc Intosh	Silver Bay
Hancock	Melrose	Silver Lake
Harmony	Menahga	Slayton
Hawley	Milaca	Sleepy Eye
Hayfield	Minneota	Spring Grove
Hector	Minnesota Lake	Spring Valley
Hendricks	Montevideo	Springfield
Henning	Montgomery	St James
Heron Lake	Montrose	St Peter
Hills	Moose Lake	Staples
Hoffman	Morgan	Starbuck
Hokah	Morris	Stephen
Houston	Morristown	Stewart
Hoyt Lakes	Mountain Iron	Thief River Falls
Ivanhoe	Mountain Lake	Tracy
Jackson	Nashwauk	Trimont
Janesville	New London	Truman
Jasper	New Richland	Twin Valley
Kandiyohi	New York Mills	Two Harbors
Karlstad	Olivia	Tyler
Kasota	Onamia	Ulen
Keewatin	Ortonville	Verndale
Kerkhoven	Osakis	Wabasha
Kiester	Parkers Prairie	Wabasso
Kimball	Paynesville	Wadena

Walnut Grove	Bingham Lake	Dalton
Warren	Biscay	Danvers
Waseca	Blomkest	Darfur
Waterville	Bluffton	Darwin
Watkins	Bock	De Graff
Welcome	Borup	Deer Creek
Wells	Bowlus	Delavan
West Concord	Boy River	Delhi
Westbrook	Boyd	Denham
Wheaton	Brandon	Dennison
Windom	Bricelyn	Dent
Winnebago	Brook Park	Dexter
Winthrop	Brooks	Donaldson
	Brookston	Donnelly
GM Small Cities	Bruno	Doran
Akeley	Buckman	Dover
Alberta	Burtrum	Dovray
Aldrich	Callaway	Dumont
Alpha	Calumet	Dundee
Altura	Campbell	Dunnell
Alvarado	Canton	Easton
Arco	Carlos	Echo
Ashby	Cedar Mills	Effie
Askov	Ceylon	Eitzen
Audubon	Chandler	Elba
Avoca	Chickamaw Beach	Elizabeth
Backus	Chokio	Elkton
Badger	Clear Lake	Elmdale
Barrett	Clements	Elrosa
Barry	Climax	Elysian
Beardsley	Clinton	Emmons
Beaver Bay	Clitherall	Erhard
Beaver Creek	Clontarf	Erskine
Bejou	Cobden	Evan
Bellechester	Comfrey	Farwell
Bellingham	Comstock	Federal Dam
Beltrami	Conger	Felton
Belview	Correll	Fifty Lakes
Bena	Cromwell	Finlayson
Bertha	Currie	Fisher
Big Falls	Cuyuna	Flensburg
Bigelow	Cyrus	Florence
Bigfork	Dakota	Forada

Foreston	Hewitt	Louisburg
Fort Ripley	Hill City	Lowry
Fountain	Hillman	Lucan
Foxhome	Hitterdal	Lynd
Franklin	Holland	Magnolia
Freeborn	Hollandale	Manchester
Freeport	Holloway	Manhattan Beach
Frost	Holt	Mapleview
Funkley	Humboldt	Marietta
Garfield	Ihlen	Maynard
Garrison	Iona	Mc Grath
Garvin	Iron Junction	Mc Gregor
Gary	Ironton	Mc Kinley
Geneva	Jeffers	Meadowlands
Genola	Jenkins	Meire Grove
Georgetown	Johnson	Mentor
Ghent	Kelliher	Middle River
Gilman	Kellogg	Milan
Gonvick	Kennedy	Millerville
Goodridge	Kenneth	Millville
Granada	Kensington	Milroy
Grasston	Kent	Miltona
Green Isle	Kerrick	Minneiska
Greenwald	Kettle River	Minnesota City
Grey Eagle	Kilkenny	Mizpah
Grygla	Kinbrae	Morton
Gully	Kingston	Murdock
Hackensack	Kinney	Myrtle
Hadley	La Porte	Nashua
Halma	La Salle	Nassau
Hammond	Lake Bronson	Nelson
Hanley Falls	Lake Henry	Nerstrand
Hanska	Lake Lillian	Nevis
Harding	Lake Wilson	New Auburn
Hardwick	Lancaster	New Munich
Hartland	Lastrup	Newfolden
Hatfield	Lengby	Nielsville
Hayward	Leonard	Nimrod
Hazel Run	Leonidas	Norcross
Heidelberg	Lewisville	Northome
Hendrum	Lismore	Northrop
Henriette	Long Beach	Odessa
Herman	Longville	Odin

Ogema	Sargeant	Underwood
Ogilvie	Seaforth	Upsala
Okabena	Sedan	Urbank
Oklee	Shafer	Utica
Ormsby	Shelly	Vergas
Orr	Shevlin	Vernon Center
Oslo	Skyline	Vesta
Ostrander	Sobieski	Viking
Ottertail	Solway	Villard
Palisade	South Haven	Vining
Pease	Spring Hill	Wahkon
Pemberton	Squaw Lake	Waldorf
Perley	St Anthony	Walters
Peterson	St Hilaire	Waltham
Pillager	St Leo	Wanda
Plato	St Martin	Warba
Plummer	St Rosa	Watson
Porter	St Vincent	Waubun
Prinsburg	Steen	Wendell
Quamba	Storden	West Union
Racine	Strandquist	Westport
Ranier	Strathcona	Whalan
Regal	Sturgeon Lake	Wilder
Remer	Sunburg	Williams
Revere	Swanville	Willow River
Richville	Taconite	Wilmont
Riverton	Tamarack	Wilton
Ronneby	Taopi	Winger
Roosevelt	Taunton	Winton
Roscoe	Tenney	Wolf Lake
Rose Creek	Tenstrike	Wolverton
Rothsay	Thomson	Wood Lake
Round Lake	Tintah	Woodstock
Rushmore	Tower	Wrenshall
Russell	Trail	Wright
Ruthton	Trommald	Wykoff
Rutledge	Trosky	Zemple
Sabin	Turtle River	Zumbro Falls
Sanborn	Twin Lakes	

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