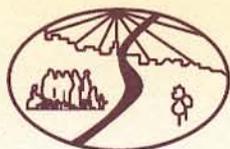


CUISR:

Community – University Institute for Social Research

*An Evaluation Of The Federation
of Canadian Municipalities Quality
of Life Reporting System*

by Bonnie Janzen



Building Healthy Sustainable Communities

Community-University Institute for Social Research

CUI SR is a partnership between a set of community-based organizations (including Saskatoon District Health, the City of Saskatoon, Quint Development Corporation, the Saskatoon Regional Intersectoral Committee on Human Services) and a large number of faculty and graduate students from the University of Saskatchewan. CUI SR's mission is "to serve as a focal point for community-based research and to integrate the various social research needs and experiential knowledge of the community-based organizations with the technical expertise available at the University. It promotes, undertakes, and critically evaluatea applied social research for community-based organizations, and serves as a data clearinghouse for applied and community-based social research. The overall goal of CUI SR is to build the capacity of researchers, community-based organizations and citizenry to enhance community quality of life."

This mission is reflected in the following objectives: (1) to build capacity within CBOs to conduct their own applied social research and write grant proposals; (2) to serve as a conduit for the transfer of experientially-based knowledge from the community to the University classroom, and transfer technical expertise from the University to the community and CBOs; (3) to provide CBOs with assistance in the areas of survey sample design, estimation and data analysis, or, where necessary, to undertake survey research that is timely, accurate and reliable; (4) to serve as a central clearinghouse, or data warehouse, for community-based and applied social research findings; and (5) to allow members of the University and CBOs to access a broad range of data over a long time period.

As a starting point, CUI SR has established three focused research modules in the areas of Community Health Determinants and Health Policy, Community Economic Development, and Quality of Life Indicators. The three-pronged research thrust underlying the proposed Institute is, in operational terms, highly integrated. The central questions in the three modules—community quality of life, health, and economy—are so interdependent that many of the projects and partners already span and work in more than one module. All of this research is focused on creating and maintaining healthy, sustainable communities.

Research is the driving force that cements the partnership between universities, CBOs, and government in acquiring, transferring, and applying knowledge in the form of policy and programs. Researchers within each of the modules examine these dimensions from their particular perspective, and the results are integrated at the level of the Institute, thus providing a rich, multi-faceted analysis of the common social and economic issues. The integrated results are then communicated to the Community and the University in a number of ways to ensure that research makes a difference in the development of services, implementation of policy, and lives of the people of Saskatoon and Saskatchewan.

CUI SR gratefully acknowledges support from the Social Sciences and Humanities Research Council of Canada through their Community University Research Alliance program. CUI SR also acknowledges the support of other funding partners, particularly the University of Saskatchewan, the City of Saskatoon, Saskatoon Health Region, Quint Development Corporation, and the Star Phoenix, as well as other community partners. The views expressed in this report, however, are solely those of the authors.

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ABSTRACT

The purpose of this report is to explore the suitability of the Federation of Canadian Municipalities' (FCM) Quality of Life Reporting System for development of a quality of life index. The report is divided into three sections: (1) a literature review of quality of life indicators and indices; (2) an evaluation of the appropriateness of both the FCM methodology and indicators for creating an index; and (3) an example of an index using FCM indicators.

Community quality of life initiatives generally involve the use of multiple, individual indicators and/or summary indices. Research and professional practice suggests that the best indicators and indices are generally those which: include broad-based community involvement in the development phase; have an explicit, well-defined theory to guide selection and aggregation of indicators; use reliable, valid, sensitive, and stable indicators; and use a combination of objective and subjective indicators. Aggregation of indicators into an index requires additional considerations, including: method of standardization; determining the relative importance of indicators; adjusting for direction of movement; scaling of variables; and contending with missing values. The standardized additive and factor analytic methods are two common statistical approaches used to combine indicators.

Although multi-indicator approaches provide a detailed view of quality of life, they do not provide a parsimonious understanding of the data. In contrast, summary measures have the potential to offer a valuable, integrative perspective of life quality. However, many conceptual and methodological problems are associated with its aggregation process. Thus, when developing an index and reporting its findings, transparency in the methodology is critical. There are numerous recent examples in the literature of simultaneous use of multi-indicator and composite measure approaches.

Strengths of the FCM reporting system include the collaborative approach taken with participating communities in the development of the indicator framework, use of reliable data sources, and choice of domains/indicators fairly consistent with other community quality of life initiatives. Weaknesses include lack of an explicit theory or model to guide indicator development, restrictions in the availability of data at the municipal level, and absence of subjective, leisure and environmental (physical) indicators. Although these limitations need to be addressed, FCM data is suitable for an aggregation procedure. Given the small number of communities participating, a standardized additive method was chosen over factor analysis as the method of aggregation.

Based on criteria identified in the literature review and subsequent descriptive analysis, a number of the original FCM indicators were excluded from the index. Using a subset of the FCM indicators, the standardized additive method was applied using two different types of standardization. While both methods produced similar findings, the % change method appears to be a more appropriate option for aggregation of the FCM indicators.

INTRODUCTION

The last decade has seen a resurgence in the development and application of community quality of life indicators (Land, 1999; Noll, 1996). This renewal has been attributed to a variety of factors, chiefly an emphasis on evidence-based decision-making, and as a means of assessing the impact of government cutbacks and restructuring of social programs (McCracken & Scott, 1998). Although difficult to define, most quality of life frameworks reflect the interdependence of social, health, economic and environmental conditions, a perspective consistent with the increasingly popular concepts of sustainable development and population health. The perceived significance and attractiveness of the quality of life concept is evident in the plethora of conceptual models and measurement approaches across a variety of academic disciplines. Further, many community organizations at national, provincial, municipal and/or neighborhood levels have developed reporting systems to assess its citizens' quality of life.¹

A recent example is the Federation of Canadian Municipalities' *Quality of Life Reporting System* (Federation of Canadian Municipalities, 1999). For each of the 16 participating communities, data was provided for 53 quantitative indicators. The intended purpose of the FCM system is to assist communities in prioritizing local needs, monitoring the outcome of government policies and services, and fostering intergovernmental co-operation.

While FCM's quality of life system presents data for each indicator separately (an example of a multi-indicator system), other quality of life initiatives have mathematically aggregated the indicators to provide a summary quality of life value.² Composite measures are often desired as they can economically and meaningfully summarize complex phenomena (Sharpe, 1999). On the other hand, many conceptual and methodological problems are associated with the aggregation process, leading some to question its appropriateness.

The present report's purpose is to explore the suitability of the FCM Quality of Life Reporting System for development of a quality of life index. The report is divided into three sections: (1) a literature review describing the important methodological and conceptual issues in indicator and index development; (2) an evaluation of the appropriateness of both the FCM methodology and indicators for creating an index; and (3) an example of an index using the FCM data.

LITERATURE REVIEW

Social indicators are measurements intended to summarize important characteristics of life conditions. They simplify information about complex phenomena as a means of enhancing understanding and communication (Hardi et al, 1997). When a set of indicators is combined mathematically, the resulting number is called an index. Thus, to a large degree, the quality of an index is dependent upon the quality of the individual indicators which comprise it. Many of the same conceptual and methodological problems identified with individual quality of life indicators are equally applicable to their aggregated counterparts. However, aggregation of indicators creates additional difficulties that need to be addressed, such as weighting and how to appropriately and meaningfully combine different units of measurement (Maclaren, 1996).

The following literature review is divided into five major sections: (1) community involvement; (2) theory; (3) indicator criteria; (4) objective and subjective indicators; and (5) statistical issues in combining indicators. The first four sections are relevant to the development and use of both indicators and indices, while the fifth section is more specific to composite measures.³

COMMUNITY INVOLVEMENT

A distinction is often made in the literature between “top-down” and “bottom-up” methods in developing quality of life indicators (Hardi et al, 1997; Sharpe, 1999). In top-down approaches, experts and researchers define the framework and particular indicators which comprise the study based on their knowledge and experience. This approach is consistent with more traditional quantitative research methodology in which research participants (in this context, communities) are not involved in the study design or choice of measurements. In contrast, bottom-up approaches are characterized by greater participation of a wide variety of individuals, community groups, and stakeholders, with experts involved on more of a consultative basis.

The extent and nature of community involvement in quality of life indicator development is influenced by the project’s purpose and scale. National or provincial projects that track quality of life across time and place would more likely benefit from a top-down approach which emphasizes consistency in indicator design and measurement. In such a situation, there would likely be little or no community involvement. Broad-based community involvement in large scale studies is more logistically difficult and expensive than in smaller scale projects.⁴ On the other hand, if the main purpose of a quality of life study is to provide useful information at a local level, community involvement in the development, identification, selection, and interpretation of quality of life measures is critical (Hay & Rutman, 1993). In such a situation, identifying indicators which have meaning and significance for a community is more important than the enhanced comparability of “one size fits all” indicators. Quality of life is increasingly being recog-

nized as a value-loaded and context-specific concept, increasing the importance of broad based local participation which “determines [the] quality and legitimacy of the information by ensuring that the project represents the community’s values as accurately as possible” (Besleme et al, 1999, p. 41).⁵ Bottom-up approaches are also consistent with the belief that when people are in control of determining the agenda, they are more likely to work toward achieving its goals.

The distinction made between bottom-up and top-down frameworks is admittedly a simplification. Involvement by communities and experts is typically a matter of degree. As Legowski (2000) concluded in a recent review of community-based quality of life projects, achieving balanced participation is often a formidable task:

a key theme to arise from our sample is balance, applicable throughout the process of developing all the aspects of an indicator framework, from vision through to indicators. Mention is made of balancing citizen input with that of experts, and seeking participation from a diverse cross-section of a population to balance the viewpoints of the so-called connected with those of the unconnected. With indicator selection, there is a need to balance the concerns and intentions of project funders, citizen participants and experts (p. 39).

THEORY

Choice of indicators for inclusion in a quality of life framework should be based on an explicit theory or model of what constitutes a positive quality of life (Sharpe, 1999; Cobb, 2000). A strong theory provides a reasoned means of thinking about a particular phenomena, provides some direction about where to look to find answers to problems, and is amenable to change in the face of convincing evidence (Cobb, 2000). While quality of life is a frequently used term in a variety of contexts, little consensus exists as to its defining elements. Varying definitions and interpretations have been in vogue over the last three decades, contributing to its conceptual uncertainty (Bates et al, 1996). Rather than developing out of a systematic social theoretical framework, the quality of life movement appears to have progressed in a makeshift fashion in response to varied information demands of decision makers (Beesley & Russwurm, 1989). Relatively little theoretical work exists defining the important quality of life domains or how they relate to one another (Bates et al, 1996).⁶ Extensive use of economic indicators has been attributed, in part, to their integration as elements of economic models, “such that variation in the values of the indicators tells us something about the functioning of the economic system” (Gilmartin & Rossi, 1980, p. 20). In contrast, theoretical underpinnings of quality of life are often inferred, based on choice of indicators (Hay and Rutman, 1993). Availability of data has been another driving force in determining which indicators comprise a quality of life framework. Rather than a well-defined concept dictating the means of measurement, “[T]he available statistic is ... used as an indicator of some-

thing and that something is defined by the indicator itself. Thus, the measurement process completely defines the concept; the concept, by default, is whatever the indicator measures” (Cobb & Rixford, 1998, p.11).

Attempts at measurement without theory are of questionable value in that they do not greatly improve our understanding of social and economic phenomena (Bayless & Bayless, 1982). The less direction one has from a model, the more difficult it will be to interpret and use that measure, particularly for informing public discussion (Innes, 1990). When an indicator is developed without connection to an explicit concept, its performance cannot be adequately assessed or enhanced because there is no standard against which to judge it (Rossi & Gilmartin, 1980). Perhaps the greatest danger is lacking an explicit theory is an often accompanying lack of awareness:

The usefulness of theory in devising indicators of QOL might not be self-evident. Common sense might appear an adequate basis for this work. However, common sense or conventional wisdom does not truly avoid theorizing. It merely treats theory unconsciously and takes for granted the fundamental questions that need to be addressed. As a result, the implicit theories on which common sense is based rely on untested and often conflicting assumptions. When people depend on conventional wisdom as a guide, they tend to presuppose, without reflection, that the values of their subculture are universal, when they are not (Cobb, 2000, p. 6).

The role of theory in index construction has also been neglected, leading to significant amounts of subjective judgment in the process (Diener & Suh, 1997). This lack of conceptual and theoretical order has resulted in inconsistent conclusions drawn about various communities’ quality of life (Diener, 1995). No procedures or guidelines exist for resolving disagreements about which variables best represent quality of life.⁷ Non-theoretical and unsystematic attempts at index development also make comparing or replicating studies difficult (Cutter, 1985). Many studies obtain different results simply because they include different indicators.

INDICATOR CRITERIA

Even when a concept is relatively clearly defined, a major challenge remains in making an appropriate link between the concept of interest and an observation for which data is available. That indicators are imperfect, overly simplistic representations of complex conditions is generally accepted (Innes, 1990). On the other hand, “accepting the fact that an indicator is an imperfect reflection of a situation that is hard to observe is one thing; setting the limits that enable us to distinguish the imperfect from the unacceptable is another” (CIHI, 1995, p. 8). Thus, in addition to an explicit quality of life theory or model, indicators must also be evaluated on the basis of traditional research criteria.

But when information is required for decision making, it must also be guided by pragmatic considerations, particularly with respect to its availability. As Hardi et al (1997) commented, indicators are often “products of a compromise between scientific accuracy and the needs of decision making and urgency of action” (p. 9). Some commonly used criteria in the research literature for evaluating indicators are briefly described below (Maclaren, 1996; Rossi & Gilmartin, 1980).

- *Validity*. A critical issue is how well the indicator represents the concept of interest. There are several types of validity, including content (the degree to which measurements actually reflect the variable of interest), construct (the degree to which a measurement reflects the hypothetical construct of interest) and criterion (the degree to which the measure relates to other measures of the construct). Validity cannot be determined for indicators that are not clearly connected to a particular concept.⁸
- *Reliability*. This criterion refers to the degree to which an indicator is consistent, reproducible and free from temporary, chance fluctuations (i.e. random error).
- *Sensitivity*. A sensitive indicator is able to detect change when the aspect of society being measured changes. Sensitivity is influenced by how reliably an indicator is measured and how directly it measures a variable (i.e. a direct measure is more sensitive than an indirect one). An indicator’s sensitivity is assessed over time so that its reaction to societal changes can be observed.
- *Stability*. A stable indicator is one which does not reflect irrelevant influences. An indicator’s stability can be enhanced by statistically adjusting its value to compensate for extraneous changes. Adjustments are commonly made to correct differences in the age composition of populations, as age is related to many social and health variables.⁹ It is important to note, however, that whether particular influences are considered irrelevant or relevant is dependent on the indicator’s context or purpose.
- *Scalability*. An indicator measured on an interval or ratio scale is necessary if one is interested in comparing relative changes in the absolute value of an indicator over time.
- *Intertemporal Comparability*. In order to reliably assess changes over time, an indicator must be exactly comparable in each time period. Potential sources of incomparability which need to be considered include: changes in the sensitivity of the measurement over time; changes in the composition of the population over time, and changes in measurement content over time.
- *Disaggregatability*. An indicator that can be broken down by other variables (for example, age, gender, social class, community) is generally more informative than one which cannot. A disaggregatable indicator can provide important information

on the equitable distribution of resources, significant deviations from overall patterns, and the success of programs or policies in reaching their target population.

- *Breadth of Application.* An indicator that is a valid measure of the concept of interest across various subgroups of the population (for example, subgroups which vary by age, gender, occupation, or social class) is generally more appropriate to include than one with a more limited application.¹⁰ Breadth of application results in a need for fewer indicators.
- *Normative interest.* This term refers to quality of life indicators that allow for unambiguous interpretation of changes in the value of an indicator as representing improvement or deterioration in the quality of life. Some researchers in the area consider normative interest criterion as too restrictive for single indicator approaches, as the usefulness of other types of indicators have been increasingly recognized (e.g. life satisfaction/happiness indicators and descriptive indicators) (Land, 1999). On the other hand, composite quality of life indices require more stringent adherence to the normative interest criteria.
- *Policy Relevance.* Efforts should focus on those indicators that are amenable to change.
- *Timing relative to the occurrence of a problem.* Indicators can potentially provide information prior to, concurrent with, or subsequent to the occurrence of a social problem. Leading indicators are typically the most valuable as they allow for proactive action.
- *Timeliness.* Dated information is typically less useful than recent data. However, timeliness depends on indicator type and its intended use.
- *Accessibility.* It is important that an indicator be cost-effective to collect and use. It is also critical whether data is collected both frequently enough and at the proper community level (e.g. municipal, provincial, or national).
- *Understandable by potential users.* An indicator should be geared toward a level of interpretability appropriate for the intended users.

OBJECTIVE AND SUBJECTIVE INDICATORS

Quality of life indicators are often grouped into two main categories, objective and subjective. Objective indicators are statistics which reflect a particular level of living conditions independent of personal evaluations (e.g. crime rate, poverty rate). In contrast, subjective indicators have a clear evaluative component (e.g. perceived neighborhood safety, perceived income adequacy). While rarely explicit, both indicator types reflect differing underlying theories of quality of life determinants. For objective indicators, it is command over resources (e.g. money, knowledge, property); for subjective indicators, it is the perception of quality of life circumstances (Noll, 1996).

Several advantages of objective over subjective indicators have been identified (Diener & Suh, 1997; Beesley & Russworm, 1989). As the source of objective indicators is usually existing data, they are typically more readily available and less expensive to gather. In addition, objective indicators are typically based on standardized definitions and fairly reliable data sources, providing greater opportunities for making comparisons both over time and between communities. Objective indicators are also more likely to have an extensive body of research from which to draw (Raphael, 1996). Finally, objective measures, if chosen properly, may be more sensitive to changes in social policies or programs than subjective indicators; thus policy and program effects on objective indicators may be easier to detect in a shorter amount of time.

Many disadvantages of objective indicators have also been noted. As mentioned previously, choice of objective indicators often appear to be guided more by availability of data than by an explicit theory. Even when variables are chosen in a more systematic manner, there is concern that current objective measures may focus more on what researchers identify as important, rather than community concerns (Raphael, 1996). There is also increasing awareness that the term “objective” is a misnomer, given that there is usually considerable subjectivity in selecting and measuring variables. That is, indicators are chosen with an explicit or implicit perspective on how the world operates (McCracken & Scott, 1998):

An indicator highlights certain aspects of a situation at the expense of others, allowing observers to see the world through a particular lens, channeling thoughts and actions in particular directions. In short, indicators are not neutral statistical constructs. They validate particular world views and prioritize selected areas of knowledge. The patina of objectivity is compounded if and when indicators are institutionalized. Usage over time tends to reify a particular understanding and measurement of an issue such as employment or productivity, making it into an objective reality rather than a social construction that privileges established interests and world views – in government, in business, or in academe (p. 110).

Objective indicators are also unable to capture the psychological processes that moderate the relationship between external conditions and individual experiences. Research suggests that objective factors are only modestly associated with people’s reported levels of subjective well-being (Diener & Suh, 1997; Diener, 1997). Objective indicators are also based on the assumption that there is widespread agreement about which elements in a community are desirable or undesirable (Land, 1999). Hence, whether such indicators clearly represent society’s notion of quality of life is questionable (Noll, 1996):

Using objective indicators starts from the assumption that living conditions can be judged as being favorable or unfavorable by compar-

ing real conditions with normative criteria like values or goals. An important precondition, however, is that there is political consensus first about the dimensions that are relevant for welfare, second a consensus about good and bad conditions and third about the direction in which society should move. This is of course sometimes, but not always the case. Probably there is consensus that we would consider a reduction of unemployment or crime and an increase of the average income or educational level as an improvement and progress. We could perhaps be less sure, when it comes to indicators like the age of retirement; and it might indeed be debatable whether a reduction of income inequality should in general be regarded as social progress, given the fact that there is a trade-off between distributional justice and efficiency concerning economic growth (p.5)

While use of subjective indicators in quality of life initiatives appears to be increasing,¹¹ they are not without their own limitations. In addition to their greater expense to collect, concern has been expressed with the reliability and validity of these measures (Cobb, 2000):

Treating self-reported measures as adequate representations of QOL presupposes that people are conscious of and able to articulate nuances of feeling, that transitory feelings represent durable conditions, that feelings are equivalent to values, that happiness or other reported feelings fully account for valued conditions, and that feelings can be quantified on an absolute scale (p. 16).¹²

The typically modest correlation between subjective and objective measures takes on additional significance when the well-being of marginalized individuals are considered (Raphael, 1996; Erikson, 1993). Concern has been expressed over people's capability in lowering their goals and aspirations in the face of limited access to resources. Instead, subjective indicators may be a measure of how well individuals have adapted to the constraints experienced in everyday life.

To overcome some of the limitations of both objective and subjective measures, most researchers have suggested using both sets of indicators. (Diener and Suh, 1997; Cutter, 1985; Noll, 1996). After all, quality of life is a multifaceted construct that likely requires varying approaches from different angles. Also, because the methodological limitations of objective and subjective indicators differ, they may provide alternative views of life quality not influenced by shared errors of measurement. (Diener and Suh, 1997). Further, despite the effects of adaptation, evidence suggests that objective life circumstances do matter to subjective quality of life (Diener, 2000). Although the two types of measures are related, each yield additional information about the quality of life that the other is unable to provide.¹³ Ideally, the decision to include objective/ subjective-

tive indicators should be guided by an explicit theory of quality of life and stakeholder input.

STATISTICAL ISSUES IN COMBINING INDICATORS

Though few explicit guidelines exist, the best approach to combine indicators likely involves consideration of both conceptual and statistical issues. That is, a clear and concise operational definition of key aspects of quality of life and a search for appropriate statistical techniques to assist in aggregation is needed (Rossi and Gilmartin, 1980).

Important statistical issues in combining indicators are considered below (Sharpe, 1999):

- *Differing Units of Measurement.* Individual indicators used in the construction of quality of life indices are often based on different units of measurement (e.g. mean income or percentage of lone parents). To take into consideration such issues and set the stage for aggregation, a standardization technique must be applied. While many different types of standardization approaches are available, among the most common methods used within the quality of life literature are those which express measurements, first, as the number of standard deviations from the mean per variable (i.e. z-scores), and, second, as a percentage of some target (e.g. base year).
- *Relative Importance of Indicators.* In real life, certain factors contribute to quality of life to a greater degree than others. An extremely important issue in the construction of an index is the significance (i.e. weight) applied to a particular indicator or indicator domain (Sharpe, 1999). Index values can be very sensitive to weights given to indicators. For example, one study examining the quality of life in 329 American cities found that there were over one hundred different cities that could be rated first, and over one hundred different cities that could be rated last, depending on the weighting approach. More interesting was the finding that fifty-nine cities could have been rated as best or worst, depending on the weighting of the same variables (Becker et al. 1987).

Weights can come from a number of sources, including: personal views of the index's developer; societal views gauged through public opinion polls, surveys, or focus groups; statistical techniques such as factor analysis; and theory. Each approach has its own strengths and limitations. The importance of theory and the limitations of relying solely on personal views have already been discussed. While the value of broad-based community involvement is well recognized, reliability of public opinion in prioritizing quality of life indicators has also been questioned.¹⁴ To avoid problems of weighting, some index developers have simply weighted all indicators equally in deriving an aggregate measure. This approach, while straightforward, has frequently been criticized on the basis that many indicators are highly correlated, likely producing misleading results (Lui, 1976).

- *Adjustment of the Direction of Movement.* An increase in a particular indicator value over time (such as income adequacy) may indicate improved quality of life, while in others (such as unemployment), an increase in value suggests a decline. When indicators are aggregated, variables moving in opposite directions need to be adjusted to have similar interpretations (i.e. increasing value equals improving quality of life; decreasing value equals deteriorating quality of life).
- *Scaling of Variables.* When determining change in indicators/indices over time using ratios, it is important to be aware of the relationship of ratios to their base values (Horn, 1993). The percent change for certain variables may be quite large simply because they are starting from such a low base.¹⁵ This may result in a variable with the largest variation having the most influence on the overall index value, even though it may not be the most important variable.
- *Dealing With Missing Data.* Missing data threatens the validity and reliability of a measurement instrument. There are different methods for dealing with missing data including: deleting all cases for which information is missing; substituting the average score for the missing data; linear interpolation; or inserting a random value (Tabachnick & Fidell, 1996).
- *Method of Aggregation.* Two major statistical approaches have been taken in forming quality of life indices from raw data, the standardized additive method and factor analysis (Dever, 1993; Bayless & Bayless, 1982):

Standardized additive method. The basic assumption in this approach is that quality of life for a particular community is a weighted average of various input variables. Scores for each indicator within a domain are summed to provide a domain summary score. Summary scores are then summed to form an overall quality of life score. Many community-based quality of life projects use some variation of the standardized additive measure. One advantage of linear summing techniques is the ease of interpretation and analysis. Most people understand what an average represents, that a higher average is better than a lower one. On the other hand, there may be little theoretical rationale for the domains or for the summation of indicators. That is, while there are some advantages to simplicity, it does not likely come close to representing real world complexity of relationships (Bayless & Bayless, 1982).

Factor Analysis. Factor analysis is a general name given to a set of statistical techniques most often used for the purpose of data reduction and summarization. In this approach, relationships between all indicators are examined (i.e. correlations) with the intention of reproducing the observed correlations in terms of a smaller set of the origi-

nal variables. The proportion of variance in indicator values that can be explained by each factor is calculated and combined to form factors on the basis of their relationships (Rossi & Gilmartin, 1980). Factor analysis also provides a mathematical solution for weighting indicators. Many quality of life projects described in academic journals use factor analytic methods to arrive at a reduced set of variables for measurement (Boelhouwer & Stoop, 1999; Ferriss, 2000; Diener, 1995).

Factor analysis can be extremely useful in reducing the number of indicators needed to assess quality of life. It also removes some of the subjectivity involved in selecting indicators from a larger pool of variables and attaching weights to them. On the other hand, factor analysis requires knowledge of more advanced statistical concepts and is more difficult for the layperson to understand. Multivariate techniques also require that certain underlying assumptions of the data be met. Toward this end, transformation of data is often required resulting in less straightforward interpretations. An adequate sample size is also important when conducting factor analysis. At least five to ten cases per variable is recommended (Tabachnick & Fidell, 1996).

CONCLUSION

The use of multiple, individual indicator approaches circumvent some, but not all, of the problems associated with indices. Both methods are criticized for the ad hoc selection of indicators and lack of a theoretical framework. Both also attempt to simplify very complex phenomena. However, while non-aggregated indicator frameworks allow for scrutiny from multiple perspectives, they do not provide a parsimonious understanding of the data (Diener & Suh, 1997). Composite values have the potential to provide a valuable, integrative perspective of life quality for answering the question, "How are we doing overall in terms of the quality-of-life? With respect to our past? With respect to comparable units?" (e.g. cities, states, regions, nations) (Land, 1999). Similarly, as Sharpe (1999) noted,

The most important advantage of single-indicator [composite] measures of well-being over multiple indicators is their ability to put forward a bottom line, which is immensely valuable for engaging the public on societal trends. Summary indexes permit one to discern the forest from the trees, a claim that multi-indicators cannot make (p. 47).

Viewing indices and multiple-indicator measures as complementary is a more productive approach. There are many recent examples in the Canadian literature of their

simultaneous use, such as the Index of Social Health (Brink & Zeesman, 1997), the Personal Security Index (Canadian Council on Social Development, 2000), the Edmonton Social Health Index (Edmonton Social Planning Council) and the Quality of Life Index (Shookner, 2000).

Nevertheless, serious conceptual and statistical uncertainties in the aggregation process remain. Choices are often made based on limited evidence and limited accessible data. A subjective element is also present. To contend with these weaknesses, transparency in choice of methods is critical, so that “the values and methods that go into constructing indicators be open for inspection so that others can determine if they share those values” (Cobb, 1998, p. 18).

EVALUATION OF FCM INDICATORS AND POTENTIAL FOR INDEX DEVELOPMENT

Sixteen Canadian municipalities are currently participating in FCM’s Quality of Life Reporting System. While considered a work in progress, the reporting system to date is comprised of fifty-three quantitative, objective indicators categorized into eight general areas: population resources, community affordability, community stress, community participation, employment, housing, health, and safety. Preliminary data was presented for each of the participating communities in FCM’s 1999 report. No aggregation of indicators has been conducted to date. The next section examines FCM indicators for the purpose of determining their suitability for aggregation.

In order for an indicator to be selected for inclusion in FCM’s monitoring system, it had to be: available on an annual basis, nation-wide; comprehensible at the community level; and understandable to a broad audience. The indicators appear, for the most part, to meet these criteria. Indeed, most of the quality of life indicator “check-lists” identify these three criteria as important aspects of good indicators. As outlined in the literature review, additional criteria are also important. It is important to keep in mind, however, that choice of variables for inclusion in FCM’s monitoring system was obviously constrained by availability of data, particularly since municipal-level information was being sought (FCM, 1999). For example, Statistics Canada focuses primarily at national and provincial levels. In addition to the Census, there are many potential rich sources of quality of life information included in a number of Statistics Canada surveys (e.g. National Population Health Survey, General Social Survey). Again, however, data is not necessarily collected on an annual basis and the sample sizes are often too small to provide reliable information at the geographic level required. Also, although the focus of the FCM system are local municipalities, the monitoring system is national in scope. When consistency in measurement across a broad range of Canadian communities is necessary, chosen indicators will be geared more to general rather than unique

qualities of a particular locale. In other words, depth is sacrificed for breadth.

With those considerations in mind, some of the main strengths and weaknesses of the FCM system are described below.¹⁶

- A positive factor in the indicator selection process was that representatives from participating municipalities contributed to the development of the indicators. The process was directed by a technical team of representatives from FCM and its sixteen municipal partners. The team was further divided into smaller groups, each comprised of a “lead” and “support” community representative to work in-depth on a particular indicator domain. Lead group members were also responsible for conducting stakeholder and citizen consultations within their communities. Based on their research, each team prepared concept reports which, in turn, were reviewed by the larger technical team. Thus, the process attempted to achieve a balance between national and community-based perspectives.
- Data for many FCM indicators were obtained from standard, reliable sources such as Statistics Canada (e.g. Census, Labour Force Survey), the Canadian Institute of Health Information and the Canadian Centre for Justice Information. Review of the FCM conceptual papers suggests that the technical teams gave much attention to the reliability of potential measures.
- The FCM system lacks an explicit theory, model, or definition of quality of life. As suggested in the literature review, the most effective indicators are those associated with a clear concept of quality of life, allowing for evaluation of each indicator (as a representative of the important concept) over time. Multiple indicator domains are also presented in the FCM report, but without any guiding framework to suggest the interrelationships between various domains.¹⁷ Readers are left to infer underlying theories based on which domains and specific indicators are included in the system.
- A holistic view of life quality encompassing social, physical, economic and health elements is implied in the selection of domains. Many domains included in the FCM system are also included in other quality of life projects. Additionally, research suggests that well-being is related to such factors.
- In contrast to current perspectives on quality of life, only objective indicators are included in the FCM system.
- Indicators of the physical environment are lacking. Physical environment is increasingly viewed as an integral part of quality of life, particularly within sustainable development frameworks.
- Indicators of leisure activities and opportunities are lacking. Recreation and leisure have traditionally been considered important domains in most quality of life studies.

- FCM community health indicators (e.g. infant mortality, low birth weight, mortality rates) largely reflect the traditional medical model of disease and death, as opposed to more current, holistic models of health. Indicators of mental health (other than the extreme example of suicide) are also missing.
- FCM's inclusion of the community participation domain is consistent with increasing evidence that factors such as social cohesion, social capital and community participation are important determinants of communities' well-being (Kawachi & Berkman, 1999). However, relative to other variables, these terms are still in the process of being meaningfully defined for consequent determination of the best method of measurement.
- There is an increasing focus in the quality of life literature on whether well-being is similar or different for various groups of Canadians. All FCM indicators can be disaggregated by community and some, for age and gender. Disaggregation by Aboriginal status would also be informative.
- Traditional quality of life frameworks have been criticized for including indicators more representative of higher rather than lower socioeconomic groups. In contrast, FCM's system includes a number of indicators relevant to lower income groups (e.g. community affordability for modest-income populations or public transportation as a percentage of minimum wage).
- The problem of dealing with small numbers (which can result in wide fluctuations in rates for a small number of events) arises for some FCM communities. However, if data can be collected for previous years, multiple-year averages can be easily calculated to enhance stability. For some FCM indicators, five years of data were already presented in the preliminary report (e.g. bankruptcies or infant mortality).
- With the exception of the suicide indicator, there appears to be a lack of control for extraneous variation in a number of FCM indicators. Differing age structures between communities over time can significantly influence a variety of variables, including morbidity, mortality, education, crime, income levels and charitable donations, among others.
- The use of service data as an indicator of life quality can be problematic. For example, hospitalization discharge data may be influenced by factors other than health status, such as availability of care, administrative decisions and hospital specialization. Thus, changes to the indicator over time (or differences between communities) is difficult to interpret. Other indicators in the FCM framework are similarly affected, such as the proportion of families receiving social assistance. In this case, the data is influenced by factors such as changing eligibility requirements and enforcement procedures. In other words, a decrease in the proportion of families receiving social assistance does not necessarily reflect improvement in

life conditions.

- The FCM system contains a number of descriptive indicators, such as population growth, age structure, family structure, and ethnic diversity, which provide a context within which to examine other indicators. In addition, they can assist in the development of goals and indicators which are more relevant to citizens' concerns. For an index, however, these contextual variables can create difficulties in interpretation. That is, it would be difficult to assess an increase or decrease in a value over time as positive or negative (e.g. percentage of the population in a certain age range).
- Missing data for a number of communities must be dealt with in future index development.
- Adequate sample size is an important criteria for more advanced statistical analyses. The sample size of 16 in the present study limits the choice of statistical procedures available when considering aggregation.

FCM's 1999 quality of life report, while comprehensive and informative, lacks the integrative perspective provided by composite measures. Though many of the limitations identified above need to be addressed, it appears that FCM data is suitable for an aggregation procedure. Given the small number of communities participating, a standardized additive method (as opposed to factor analysis) is the most appropriate route. Several examples of this approach are provided in the next section.

EXAMPLE OF AN INDEX BASED ON FCM INDICATORS

Using FCM data, this section provides an example of the standardized additive method of calculating a quality of life index.

DATA PREPARATION

Based on criteria identified in the literature review, a number of indicators were excluded from the index prior to any statistical analysis. An indicator was excluded if it met at least one of the criteria listed below:

- There were three or more missing cases. A case in this context is a community. If three or more communities were missing data for a particular indicator, the indicator was excluded.
- There was only one year of data currently provided (i.e. a time series cannot be demonstrated with only one year of data).¹⁸
- The meaning/interpretation of the direction of movement of a particular indicator (i.e. up or down) was considered ambiguous.

After the first three criteria were applied, a series of descriptive statistics were calculated for each of the remaining indicators.¹⁹ The data and graphs were examined to identify problem areas, in particular, skewness, kurtosis and non-normal distributions. Tests of normalcy were also conducted (e.g. Kolmogorov-Smirnov test). Several variables were identified as having non-normal distributions and consequently were transformed.

Pearson correlation coefficients were also calculated and examined, resulting in the following additional changes to the FCM framework:

- Several additional indicators were excluded (e.g. youth crime or illness-related work loss) from further analysis due to their low correlations with other indicators within their domain, and with other indicators in the total sample of indicators.
- Another indicator, Community Affordability Measure 1 (CAM1), was excluded because of its extremely high correlation with another indicator within its domain, Community Affordability Measure 2 (CAM2).
- Correlations were also studied to suggest more meaningful domains. Several indicators were moved to a different domain as they correlated more highly with those indicators than with those in their original domain (e.g. the suicide rate was moved to community safety, teen fertility to community health, and employment measures to community involvement).

The final quality of life framework consisted of sixteen indicators categorized into four general domains: economic well-being, community health, community safety and community involvement.

CONSTRUCTING THE INDEX

Two examples of indicators aggregation using the standardized additive method are presented below. Each example provides a different method of standardization.

Example 1: % change method²⁰

Quality of life (QOL) values for each indicator were calculated as follows:

1. A base year was chosen and set at a value of 100. Changes to indicator values in the subsequent years were expressed as a percent increase/decrease from the baseline value. For the FCM data, 1991 was chosen as the base year (when unavailable, the closest year to the base was used. Also, for several variables, a three-year average was chosen to reduce the likelihood of large fluctuations when the number of events were small).
2. 1996 (or the year closest to it) was chosen as the most recent year available.
3. The base QOL value for each indicator was calculated by dividing 100 by the

number of indicators (n=16). These were summed to provide domain QOL values. This value also determines the weight given to each indicator and domain. In this case, all indicators were weighted equally (i.e. 3.6%).

4. To determine the % change in indicators between the base year and the most recent year available:

$$\% \text{ change} = \frac{\text{current indicator value} - \text{base indicator value}}{\text{base indicator value}} \times 100$$

5. To determine the impact on the QOL value as positive or negative, a judgment was required (e.g. a negative % change in premature mortality was considered positive, whereas a negative % change in community affordability was considered negative).

6. To determine the QOL value:

- i. $\% \text{ change} \times \text{Base QOL value}$

$$+ 100$$

- ii. $\text{Base QOL value} \pm (\text{i}) = \text{current QOL value}$

7. To obtain the composite index value, the QOL values were summed for each indicator. A score greater than 100 for a particular community suggests an overall improvement in quality of life compared to the baseline year, whereas a score lower than 100 suggests an overall decline. Within a given year, communities with higher composite values indicate higher levels of life quality. Regarding FCM indicators (the total sample), the slight increase in the QOL value for 1996 suggests an overall improvement since 1991 (though the economic well-being index decreased slightly). On the other hand, Saskatoon's quality of life showed a decline, overall and for all four sub-indexes.

Example 2: z-score method

1. A base year of 1991 (or the closest year) was chosen.
2. For ease of interpretation, the base QOL value was set at 100.
3. Using a statistical software package (SPSS), each indicator was transformed linearly into z scores, such that the mean of the z score becomes 0 and its standard deviation becomes 1.
4. The impact on QOL value as positive or negative was determined.
5. The 1991 QOL value was calculated by simply adding or subtracting the 1991 z score value from the base QOL value. Whether the value is added or subtracted

depends on the results of step #4.

6. To obtain the composite index value, QOL values for each indicator were summed.
7. The steps were repeated to determine QOL Value for 1996.
8. When calculated for each of the participating communities, this method provides an indication of the relative standing of a community's quality of life (overall and for specific domains) compared to other communities in a given year. That is, the higher a community's particular QOL value, the higher (i.e. better) the standing of that community relative to others in the distribution. Changes in the composite value over time for a particular community will similarly indicate an increase or decrease in that community's relative quality of life compared to other communities. In the case of Saskatoon, the decrease in value between 1991 and 1996 indicates that Saskatoon's quality of life, relative to other FCM communities, decreased overall.

CONCLUSION

Both methods are examples of the standardized, additive method of aggregations. The difference lies in the type of standardization method used (i.e. % change from a base figure versus the z-score). Both indices provide an overall composite quality of life score, subscale values for the four major domains and individual indicator values. Both methods also share some of the same weaknesses. For example, they assume an additive relationship between the different indicators. It is unlikely, however, that quality of life can best be characterized as the sum of various factors.

An important difference between the two indexes is in the interpretation of composite values. The % change index for Saskatoon indicates a decrease in quality of life between 1991 and 1996. The z score index also shows a decrease in value. However, the z-score index value takes into consideration Saskatoon's quality of life relative to the other 15 communities. In other words, between 1991 and 1996, Saskatoon's quality of life decreased *compared to the other FCM communities*. The % change index only shows that Saskatoon has experienced a decrease in quality of life *compared to itself* in 1991. To know how Saskatoon compares with other communities, one would have to look at the composite scores of each community (or, for a rough indication, how it compares to the average value for all communities).

That said, the % change method appears to be a more appropriate option for the FCM indicators in that it is intuitively easier to understand and to calculate, and it provides information on the improvement or deterioration of a community's quality of life compared to itself, whereas the z-score method only provides information on a community relative to other communities.

Table 1. Sample QOL Index (% Change): All FCM Communities

INDICATORS	BASE QOL VALUE	BASE YEAR	BASE INDICATOR VALUE	MOST	INDICATOR VALUE	% CHANGE	QOL IMPACT	QOL VALUE
ECONOMIC WELL-BEING								
community affordability 2	6.3	1992	1.5	1996	1.4	-6.7	-	5.9
% spending 30%+ on rent	6.3	1991	33.5	1996	43.3	29.3	-	4.5
business bankruptcies per 1000 establishments	6.3	1991-93	16	1994-96	13.1	-18.1	+	7.4
consumer bankruptcies per 1000	6.3	1991-93 (average)	2.4	1994-96 (average)	2.6	8.3	-	5.8
Economic Well-Being Composite	25							23.6
COMMUNITY HEALTH								
infant mortality rate per 1,000 live births	6.3	1991-93 (average)	6.3	1994-96 (average)	6.5	3.2	-	6.1
% of births less than 2500 grams	6.3	1991	4.8	1996	4.8	0	neutral	6.3
premature mortality per 100,000	6.3	1991	671.5	1996	637.8	-5	+	6.6
teen fertility per women age 15-19	6.3	1991-93 (average)	26.3	1994-96 (average)	24.8	-5.7	+	6.7
Community Health Composite	25							25.7
COMMUNITY SAFETY								
suicide rate per 100,000	6.3	1991-93 (average)	10.8	1994-96 (average)	10.6	-1.9	+	6.4
violent crimes per 100,000	6.3	1991	1187.4	1996	1072.4	-9.7	+	6.9
property crimes per 100,000	6.3	1991	8.9	1996	8.8	-1.1	+	6.4
injury/poisoning related mortality	6.3	1991	3.7	1996	3.6	-2.7	+	6.5
Community Safety Composite	25							26.2
COMMUNITY INVOLVEMENT								
% voter turnout - federal	6.3	1993	65.9	1997	63.5	-3.6	-	6.1
per capita United Way contributions	6.3	1991	0.1	1996	0.1	0	neutral	6.3
% long term unemployment (25-44 year olds)	6.3	1996	29.6	1997	25.2	-14.9	+	7.2
% of total income from employment	6.3	1992	74	1996	73.6	-0.54	-	6.3
Community Involvement Composite	25							25.9
QOL COMPOSITE INDEX	100							101.4

Table 2. Sample QOL Index (% Change): Saskatoon

INDICATORS	BASE QOL VALUE	BASE YEAR	BASE INDICATOR VALUE	MOST RECENT YEAR	INDICATOR VALUE	% CHANGE	QOL IMPACT	QOL VALUE
ECONOMIC WELL-BEING								
community affordability 2	6.3	1992	1.4	1996	1.5	7.1	+	6.8
% spending 30%+ on rent	6.3	1991	32.5	1996	44.1	35.7	-	4.1
business bankruptcies per 1000 establishments	6.3	1991-93 (average)	21.7	1994-96 (average)	17	-21.7	+	7.7
consumer bankruptcies per 1000	6.3	1991-93 (average)	2.8	1994-96 (average)	2.8	0	neutral	6.3
Economic Well-Being Composite	25							24.9
COMMUNITY HEALTH								
infant mortality rate per 1,000 live births	6.3	1991-93 (average)	7.3	1994-96 (average)	9	23.3	-	4.8
% of births less than 2500 grams	6.3	1991	4.6	1996	4.4	-4.4	+	6.6
premature mortality per 100,000	6.3	1991	658.1	1996	643.6	-2.2	+	6.4
teen fertility per women age 15-19	6.3	1991-93 (average)	42.2	1994-96 (average)	44.9	6.4	-	5.9
Community Health Composite	25							23.7
COMMUNITY SAFETY								
suicide rate per 100,000	6.3	1991-93 (average)	13.2	1994-96 (average)	12.2	-7.6	+	6.8
violent crimes per 100,000	6.3	1991	1083	1996	1407	29.9	-	4.4
property crimes per 100,000	6.3	1991	8.9	1996	8.9	0	neutral	6.3
injury/poisoning related mortality	6.3	1991	3.7	1996	3.8	2.7	-	6.1
Community Safety Composite	25							23.6
COMMUNITY INVOLVEMENT								
% voter turnout – federal	6.3	1993	66.9	1997	62.4	-6.7	-	5.9
per capita United Way contributions	6.3	1991	0.2	1996	0.1	-50.0*	-	3.1
% long term unemployment (25-44 year olds)	6.3	1996	27.1	1997	23.5	-13.3	+	7.1
% of total income from employment	6.3	1992	72.9	1996	73	0.14	+	6.3
Community Involvement Composite	25							22.4
QOL COMPOSITE INDEX	100							94.6

*This provides an example of changes to small base values resulting in large percentage changes. The indicator contributes more to the change in index value than it should.

Table 3. Sample QOL Index (Z-Score Method): Saskatoon

INDICATORS	BASE YEAR	BASE QOL VALUE	Z SCORE (1991)	QOL IMPACT	QOL VALUE 1991	MOST RECENT YEAR	Z SCORE (1996)	QOL IMPACT	QOL VALUE
ECONOMIC WELL-BEING									
community affordability 2	1992	6.3	-0.17	-	6.13	1996	0.27	+	6.57
% spending 30%+ on rent	1991	6.3	-0.31	+	6.61	1996	0.26	-	6.04
business bankruptcies per 1000 establishments	1991-93 (average)	6.3	0.81	-	5.49	1994-96 (average)	0.61	-	5.69
consumer bankruptcies per 1000	1991-93 (average)	6.3	0.72	-	5.58	1994-96 (average)	0.34	-	5.96
Economic Well-Being Composite		25			23.8				24.26
COMMUNITY HEALTH									
infant mortality rate per 1,000 live births	1991-93 (average)	6.3	0.61	-	5.69	1994-96 (average)	1.72	-	4.58
% of births less than 2500 grams	1991	6.3	-0.33	+	6.63	1996	-0.79	+	7.09
premature mortality per 100,000	1991	6.3	-0.38	+	6.68	1996	0.14	-	6.16
teen fertility per women age 15-19	1991-93 (average)	6.3	1.41	-	7.71	1994-96 (average)	1.77	-	4.53
Community Health Composite		25			26.7				22.36
COMMUNITY SAFETY									
suicide rate per 100,000	1991-93 (average)	6.3	0.68	-	5.62	1994-96 (average)	0.54	-	5.76
violent crimes per 100,000	1991	6.3	-0.3	+	6.6	1996	1.09	-	5.21
property crimes per 100,000	1991	6.3	-0.16	+	6.46	1996	0.37	-	5.93
injury/poisoning related mortality	1991	6.3	0.37	-	5.93	1996	0.83	-	5.47
Community Safety Composite		25			24.61				22.37
COMMUNITY INVOLVEMENT									
% voter turnout – federal	1993	6.3	0.35	+	6.65	1997	-0.29	-	6.01
per capita United Way contributions	1991	6.3	-2.7	-	3.6	1996	-2.19	-	4.11
% long term unemployment (25-44 year olds)	1996	6.3	-0.38	+	6.68	1997	-0.26	+	6.56
% of total income from employment	1992	6.3	-0.3	-	6	1996	-0.16	-	6.14
Community Involvement Composite		25			22.9				22.8
QOL COMPOSITE INDEX		100			98				91.8

NOTES

- 1 For a listing of community indicator projects see: <http://www.rprogress.org/resources/resources.html>; <http://www.ccsd.ca/lp.html>.
- 2 Examples of recent QOL indices are: Index of Social Health (Brink & Zeeman, 1997), the Personal Security Index (Canadian Council on Social Development, 2000), the Edmonton Social Health Index (Edmonton Social Planning Council), the Quality of Life Index (Shookner, 2000) and the Pierce County Quality of Life Benchmarks (Pierce County Dept of Community Services, 1998).
- 3 While there is much academic research examining life quality according to many different perspectives (e.g. personal values, affective and cognitive processes, or personal and family relationships), this literature review will focus on quantitative, quality of place research in developed countries.
- 4 While difficult, large scale consultations have been conducted. One Canadian example is the National Forum on Health (1997) in which public discussion groups, conferences, meetings with experts, commissioned papers and letters contributed to the identification of national priorities.. Another recent example is the Canadian Council on Social Development's Personal Security Index (CCSD, 2000). In this study, Canadians were asked in a survey to indicate the relative importance they attached to three major issues (economic, health and personal safety). Canadians' opinions were then incorporated into the calculations of indicator values.
- 5 On the other hand, in a review of community quality of life projects, Legowski (2000) identified relatively few differences in the types of indicators included when she compared citizen- and non-citizen- (expert) based initiatives. For the most part, however, projects that did not involve citizens were dominated by economic issues. More research is needed in this area.
- 6 When important quality of life domains have been identified, they are typically based on a review of the literature. For example, Beesley and Russwurm (1989) identified thirteen major objective indicators common to most quality of life studies: education, leisure, health/medical care, employment, transportation, social environment, consumption/savings, physical environment, food/nutrition, social security, safety/justice, social opportunity/participation. Similar domains were identified in a more recent literature review of community quality of life projects (Legowski, 2000). On the other hand, specific indicators chosen to represent these domains vary widely among studies.
- 7 Diener (1995) and Ferris (2000) used what they termed a "value based" approach to overcome lack of established methods for choosing quality of life indicators. Based on previous cross-cultural research, these researchers identified six categories of "universal values" derived from cross-cultural research: mastery, affective autonomy, intellectual autonomy, egalitarian commitment, harmony, and conservatism. Indicators were then chosen to represent each value region based on availability of data.

- 8 As de Neufville stated, “The problem of determining validity is one reason to avoid indicators of the black-box variety, which are designed operationally rather than on the basis of a prior concept. It is meaningless to even think about validity without a precise concept against which to match a measure. Not to have any feeling about validity of a measure is to be unable to use it with confidence and expect it to behave predictably in new situations (in Rossi & Gilmartin, 1980, p. 34).
- 9 For example, crime data would be more representative if it were adjusted to a population standardized with respect to age since younger people are more likely to be involved in crime than older people. Thus, differences in crime rates over time may be due to either increasing criminal activity or changes in the age distribution of the population. A similar relationship holds for other variables such as employment, health, literacy, and income. If not adjusted, extraneous influences may also obscure the impact of social interventions. For example, in a community with a high proportion of elderly people, the effect of an education program targeting children might be lost in unadjusted data on literacy rates (Innes, 1990).
- 10 An example of an indicator which may lack breadth of application was identified by McCracken and Scott (1998). Commenting on the inclusion of suicide as an indicator of well-being for teenagers in a recent quality of life index, they made the following observation: “Is there a distinction to be made between men’s social health and women’s social health? Do the indicators used in the Index capture those things that are important to women’s social health? Teen suicide is clearly a key measure of youth health. Because boys are much more likely than girls to successfully commit suicide, they make up a much higher proportion of reported suicides. Yet we know that depression is very prevalent among teen girls. Is this [suicide] the best indicator then to capture mental health for teen boys and girls?” (1998, p. 121).
- 11 On the other hand, a recent review of Canadian surveys on subjective quality of life concluded that there was little data available which tracked the views of Canadians over time, and that there has not been any significant attempts to assess Canadian subjective quality of life since the early ‘80s (Mendelson, 2000). Any conclusions regarding evolution of Canadians’ views could not be drawn because of changes to survey questions
- 12 Some research, however, suggests that subjective quality of life evaluations are quite stable to unchanging conditions and sensitive to external changes which should affect evaluations of life quality (Atkinson, 1981).
- 13 For example, while some research has reported a relatively strong association between life satisfaction and composite social indices, the two variables are not synonymous. Some countries display approximately the same social indicator score, but differ considerably on life satisfaction. Conversely, some countries with similar life satisfaction levels are quite different in terms of objective social indicator scores (Diener, 2000).

- 14 For example, Myers (1987) found that when asked to weight the importance of various quality of life indicators (e.g. crime, water quality, cost of living, etc), respondents gave the same weight as they did to those indicators they previously identified as contributing most to a deteriorating quality of life in their community. According to Bates et al (1996), “This suggests that citizens may prioritize QOL domains on the basis of those factors that are viewed most negatively at the time and raises doubts about the ability to define a set of indicators that are consistently most important” (p. 8).
- 15 As Horn (1993) pointed out, the significance of a unit change becomes smaller with rising base values (e.g., a \$1 increase from \$1 is a 100% rise, but only a 50% rise from \$2). Also, starting from a small number, a unit increase expressed as a percentage is greater than a unit increase starting from a higher number (example: adding \$1 on \$10 is +10%, but adding \$1 on \$20 is +5%).
- 16 See **Appendix 1** for an evaluation of selected individual FCM indicators.
- 17 See Bates et al. (1996) for examples of quality of life models for multi-indicator systems.
- 18 Adherence to this criteria resulted in the exclusion of numerous variables. Many of these indicators should be reintroduced when additional data is obtained.
- 19 Age specific data was provided for several FCM indicators. If age was likely related to the indicator in question, the indicator was limited to a specific age-group (e.g. 25-44 year old, long-term unemployment rate to circumvent the lack of age standardization in the data set). Also, although most indicators represented data from a single year, three-year averages were calculated to enhance the stability of the measure when available.
- 20 This method is based on the aggregation procedure described in Schwartzentruber et al. (1997).

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Appendix 1. Comments on Selected Individual FCM Indicators

Indicator	Interpretation/Appropriateness for Index
Age Groups	--is considered a descriptive variable in its current form and would be difficult to interpret if included in an index.
Population Growth	--descriptive; that is, whether population growth is positive or negative likely depends on community capacity to deal with needs of changes in the population.
Immigrant/Refugee Populations	--descriptive; the meaning of an increase or decrease is ambiguous. --likely differing perspectives on whether an increase/decrease is positive or negative (an increase may be viewed as positive if considered as an opportunity to learn and share ideas, whereas others may view greater diversity as an increased opportunity for conflict.
Education	--considered a determinant of well-being. Persons with little schooling or who have no certificate or degree are more likely to get low-paying jobs that are fairly unrewarding and have a higher level of risk of occupational accidents or diseases. They are also more likely to experience episodes of unemployment or living on welfare. As well, the probability of a family being poor is greater the lower the level of schooling of its head. --education and age are related. Although the indicators are not standardized, <u>age-specific rates are available.</u>
Literacy (% with less than grade 9 education)	--research suggests that the probability of being functionally illiterate is higher in this education group. Not knowing how to read may have major negative effects on well-being by hindering access to health information and meaningful employment. --literacy is also related to age; the proportion of people with less than nine years of schooling increases with age. Thus standardization or age-specific rates are needed. --the operational definition of the variable may be problematic in highly multicultural areas; knowledge and skills acquired outside the traditional <u>education system are not taken into account</u>
CAM1 and CAM 2	--the two variables takes into consideration community affordability for both average and lower income residents. --shelter accounts for a significant weight in terms of overall costs; however, housing costs are based exclusively on rental information rather than home ownership.
Employment and unemployment rates	--job loss has been associated with the development of depressive symptoms such as fatigue, insomnia, loss of appetite and anxiety. Links have also been observed with various measurements of physical health. Loss of employment is also typically accompanied by a decrease in household income and a reduction in social activities, both of which are associated with poorer health. --these indicators also have their limitations. According to Statistics Canada, unemployed persons are those who offer their services on the job market and the term is thus more related to job-seekers than simply to persons without jobs. This rate underestimates the true unemployment rate by since it does not take into account persons who have stopped actively looking for a job. --interpretation of trends is also hindered by the fact that it may be influenced at the same time by its two components: the number of persons who are working (employed) and the number of persons looking for work (unemployed). Thus the unemployment rate may increase as much from a decrease or an increase in the number of jobs. --the measures do not reflect working conditions, the underemployed or the number of industries which are major employers in an area. --only one year of data provided.
Permanent, temporary and self-employment as a % of population employed	--only one year of data provided.

Indicator	Interpretation/Appropriateness for Index
Families receiving EI or social assistance as % of all taxfilers	<p>--changes over time in EI are difficult to interpret (changing employment prospects vs federal changes to decrease employment insurance coverage).</p> <p>--many changes in social assistance policies occurred in Canada between 1992 and 1996.</p> <p>--the data is heavily influenced by factors such as changing eligibility rules and enforcement procedures (which in turn vary throughout the country); therefore, data comparisons over time or between communities is difficult.</p>
Employment income as % of all income	<p>--changes in the proportion of community income from employment may reflect changing demographics, changes in the economic base, or changes to social assistance or employment insurance policies.</p>
Residential property tax revenues per resident	<p>--data for many communities is not available.</p>
Real estate sales per resident	<p>--data for many communities is not available.</p>
% lone parent families	<p>-this indicator measures social and economic vulnerability since the children of these families are often the financial responsibility of a single parent.</p> <p>-research suggests that these families are more likely to have a limited social network. Compared to two parent families with young children, persons in single-parent families with children under 18 are less happy, feel more isolated and have a more negative perception of their health. The level of psychological distress in children 15 or over is also higher. Children born or raised in underprivileged families are also more likely than advantaged children to experience health problems in later life.</p>
% of families that are low-income	<p>-- the prevalence of low income is associated with age, gender, marital status and ability: the groups most likely to be poor based on this definition are young people, elderly people living alone, young families, single-parent families, women and handicapped people.</p> <p>--for comparisons over time, care must be taken to ensure that the LICOs are calculated using mean estimated current expenditures for the same base year.</p>
Death rate from suicide per 100,000 residents (standardized to 1991 population)	<p>-death by suicide is an indicator of mental health and social breakdown. In Canada, suicide is the leading cause of death in men age 25-44 and the third ranking cause of potential years of life lost in persons under 75. It is likely a better indicator of social and mental well-being for men than women.</p> <p>-the indicator shows only the final consequence of the suicide phenomenon, since "successful" suicides represent only a small proportion of all attempted suicides.</p> <p>-forensic, social, cultural and religious factors may influence the reporting of suicide resulting in underestimations; underestimation of death due to suicide is estimated at 18% for females and 12% for males. Among young adults, some suicides may be classified as traffic accidents.</p>
Homelessness; children in care; crisis calls	<p>--data for many communities not yet available.</p>
infant mortality	<p>--infant mortality is an indicator of the level of mortality, health status and level of health care of a country as well as the effectiveness of its preventive care and the attention paid to the health of the mother and child.</p> <p>--likely a less sensitive indicator of health status in developed than developing countries.</p>
Low birth weight babies	<p>--low birth weight is considered an important indicator of risk to infants and has been shown to correlate with problems in child development.</p> <p>--low birth weight is strongly associated with poor conditions of the mothers during the prenatal period. Poor health and nutrition can result from poverty or other problems such as drug abuse. As such, low birth weight is a marker for a range of poor living conditions.</p> <p>--advances in fertility treatment has led to a rising number of multiple births, resulting in a greater number of smaller babies being born. This trend will have to be monitored to see how it affects the overall number of low birth weight babies.</p>

Indicator	Interpretation/Appropriateness for Index
Premature mortality (crude rates)	--likely a less sensitive indicator of health status in developed than developing countries.
Hospital discharges	--hospitalization stats cannot be used to measure the prevalence of a cause since the data concern hospitalizations (ie., discharges) rather than the persons hospitalized. A person may be hospitalized more than once in a given year (and thus counted more than once). --hospitalization statistics may be influenced by many other factors other than health status, such as availability of services, physical accessibility, administrative decisions and hospital specialization.
Youth offender charges per 100,000 residents; Violent crimes per 100,000 residents Property crimes per 100,000 residents	-police statistics do not record all crimes committed in a given area. The ratio between the number of crimes committed and those reported to the police varies as a function of the type of offence, ranging from 100% for homicides to approximately half for robbery and a third for assault. When several different criminal acts are committed during the same incident, only the most serious is recorded. --age standardized rates are needed
Injuries & poisonings per 100,000 residents Crude Mortality Rate Hospital Discharge Rate Due to Injury and Poisoning	--age standardized rates are needed.
Charitable donations	missing data
Recycling, kg per resident per year	missing data

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